SEASONAL FARMWORKER POWERLESSNESS

HEARINGS

BEFORE THE

SUBCOMMITTEE ON MIGRATORY LABOR

OF THE

COMMITTEE ON LABOR AND PUBLIC WELFARE UNITED STATES SENATE

NINETY-FIRST CONGRESS

FIRST AND SECOND SESSIONS

ON

PESTICIDES AND THE FARMWORKER

AUGUST 1, 1969

PART 6–A

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Format of Hearings on Migrant and Seasonal Farmworker Powerlessness

The Subcommittee on Migratory Labor conducted public hearings in Washington, D.C., during the 91st Congress on "Migrant and Seasonal Farmworker Powerlessness." These hearings are contained in the following parts:

Subject matter	*Hearing dates*
Part 1: Who Are the Migrants?	June 9 and 10, 1969
Part 2: The Migrant Subculture	July 28, 1969
Part 3–A: Efforts to Organize	July 15, 1969
Part 3–B: Efforts to Organize	July 16 and 17, 1969
Part 4–A: Farmworker Legal Problems	Aug. 7, 1969
Part 4–B: Farmworker Legal Problems	Aug. 8, 1969
Part 5–A: Border Commuter Labor Problem	May 21, 1969
Part 5–B: Border Commuter Labor Problem	May 22, 1969
Part 6–A: Pesticides and the Farmworker	Aug. 1, 1969
Part 6–B: Pesticides and the Farmworker	Sept. 29, 1969
Part 6–C: Pesticides and the Farmworker	Sept. 30, 1969
Part 7: Manpower and Economic Problems	Apr. 14 and 15, 1970
Part 8: Who Is Responsible?	July 20, 21, and 24, 1970

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FRIDAY, AUGUST 1, 1969

STATEMENTS

ADDITIONAL INFORMATION

MIGRANT AND SEASONAL FARMWORKER POWERLESSNESS

(Pesticides and the Farmworker)

FRIDAY, AUGUST 1, 1969

U.S. SENATE,
SUBCOMMITTEE ON MIGRATORY LABOR
OF THE COMMITTEE ON LABOR AND PUBLIC WELFARE,
Washington, D.C.

The subcommittee met at 9:30 a.m., pursuant to notice, in room 4232, New Senate Office Building, Senator Walter F. Mondale (chairman of the subcommittee) presiding.

Present: Senators Mondale (presiding), Cranston, and Bellmon.

Committee staff members present: Boren Chertkov, majority counsel; and A. Sidney Johnson, professional staff member to the subcommittee.

Senator MONDALE. The subcommittee will come to order.

This morning we begin the sixth in a series of hearings on migrant and seasonal farmworker problems. The underlying theme of our hearings is powerlessness.

In past hearings we have endeavored to obtain a broad introduction to the problem areas by hearing farm workers themselves tell of their own lives, their own problems. Last month, we heard testimony from both community and union organizers on the obstacles to their self-help efforts to improve their own situation. Last week we explored what really happens to the men, women, and children that are confronted with the severe economic and social stress of migratory farmwork related to us in our earlier hearings. We have also heard testimony on the border-commuter labor problem and the severe economic depression created by the surplus of desperately poor people forced to accept substandard living and working conditions along our borders with Mexico.

Today we are devoting our attention to a discussion of the effects of pesticides on farmworkers. Senator Gaylord Nelson of Wisconsin has brought the public's attention to the dangerous use of pesticides, and the effects that pesticides have on our Nation's environment and population. We will try to determine:

What the scope of the entire problem area may be?

What are the short- and long-range effects, if any, of the use of pesticides on farmworkers who apply them, or work in the fields soon after they have been applied?

Whether, in view of increasing production, and the proliferation of various new pesticides, adequate funds are being devoted to research on occupational hazards to farmworkers?

What Government programs exist for protection of the farmworker from pesticides and whether they are adequately funded and enforced?

Questions such as these must be explored to gain a full understanding of the special problems which pesticides may have for migrant and seasonal farmworkers.

This morning we are privileged to have several expert witnesses to discuss these problems.

Our investigation continues on Thursday, August 7, with a study of the legal problems of farmworkers.

I understand it has been agreed that the witness list as printed will be somewhat changed and our first witness will be Mr. Jerry Cohen, general counsel of the United Farm Workers of Delano, Calif.

Mr. Cohen.

STATEMENT OF JERRY COHEN, GENERAL COUNSEL, UNITED FARM WORKERS ORGANIZING COMMITTEE, DELANO, CALIF.

Mr. Cohen. Thank you, Senator Mondale.

Cesar Chavez asked me to thank you for holding these hearings because, as we understand, these are the first hearings in the history of the country that concern pesticides and the farmworker of our Nation.

I would like to summarize the main area of Farm Workers' concern. The reason the Farm Workers are testifying here today is because we believe that the table-grape industry in California is irresponsible in its use of economic poisons, uses the wrong kinds of poisons at the wrong time and in the wrong amounts, and in disregard of the health of both the consumer and the workers.

For example, we have recently discovered from those records which are available to the Farm Workers that the chemical that was used on cranberries, amino triazole, was sprayed on a thousand acres of table grapes in Kern County.

We also discovered, despite a denial of table-grape growers, DDT residue is found on the grapes.

Finally, the use of parathion, akin to nerve gas, in the State of California, is of grave concern to the union because it has caused and still is causing serious injuries to many farmworkers.

I submitted a prepared statement to the subcommittee. I don't wish to read the statement but I do wish to review some of the important aspects of this problem. I would like to briefly go into the history of the problem as it has developed from our point of view.

Senator Mondale. Mr. Cohen, we will put your prepared statement in its entirety in the record as though read, and you may proceed.

(The prepared statement of Mr. Cohen follows:)

PREPARED STATEMENT OF JERRY COHEN, GENERAL COUNSEL, UNITED FARM WORKERS ORGANIZING COMMITTEE, DELANO, CALIF.

On July 3rd, 1969, negotiations between the United Farm Workers Organizing Committee and 12 table grape growers came to an end when the 12 growers called for a recess. The use of economic poisons by the grape industry was the issue over which the negotiations foundered.

Article 25 of the Employer's Contract Proposals reads in part as follows:

> "The Union agrees that it will not harass any employer regarding the use of pesticides so long as the employer agrees to abide by the regulations heretofore referred to. The Union agrees that it will not embark upon any program regarding pesticides that can in any way be detrimental or harmful to the industry in which the employer belongs."

The United Farm Workers Organizing Committee has submitted a proposal which reads in part as follows:

> "The Company and the Union recognize the need to supply the consumers with healthy grapes picked and handled under the most clean, sanitary and healthful conditions possible. Furthermore, the Company and the Union recognize the need to conserve our natural resources and protect all forms of life from the serious dangers and damages caused by the improvident use of economic poisons. In the hope of taking progressive steps to protect the health of farm workers and consumers throughout the world and conserving for all mankind the benefits of our natural resources and surroundings the Company and the Union agree as follows:
>
> (1) The Health and Safety Committee shall be formed consisting of equal numbers of workers' representatives selected by the bargaining unit and Company representatives. Members of the Health and Safety Committee shall have free access to all records concerning the use of economic poisons.
>
> The Health and Safety Committee shall participate in the formulation of rules and practices relating to the health and safety of the workers including but not limited to the use of garments, materials, tools, and equipment as they may affect the health and safety of the workers and sanitation conditions.
>
> (2) The Company shall not use DDT, Aldrin, Dieldrin and Endrin. The Company shall not apply other chlorinated hydrocarbons which are dangerous to farm workers, consumers and the environm~~ent.~~
>
> (3) The Company shall not use any organic phosphate pesticides such as but not limited to Parathion without first receiving approval from the Health and Safety Committee. The Company shall notify the Health and Safety Committee as soon as possible but at least 72 hours before the application of the organic phosphate material. Said notice shall contain the information set forth in part 4 below: The Health and Safety Committee shall determine

the length of time during which farm workers will not be permitted to enter the sprayed field following the application of the organic phosphate pesticide. Any Company using organic phosphates shall pay for the expense for all farm workers of one baseline cholinesterane test and other additional such tests if recommended by a doctor. The results of all said tests shall be immediately given by the Company to the Health and Safety Committee, and, if requested to any other authorized union representative.

(4) The Company shall keep the following records and make them available to each member of the Health and Safety Committee and to any other authorized union representative.

a.) A plan showing the size and location of fields and a list of the crops or plants being grown.

b.) Pesticides and economic poisons used including brand names plus active ingredients, registration number on the label, and manufacturer's batch or lot number.

1. Dates and time applied or to be applied.
2. Location of crops or plants treated or to be treated.
3. Amount of each application.
4. Formula.
5. Method of application.
6. Person who applied the pesticide.

c.) Date of harvest.

The Union also included in its proposal, requirements relating to sanitation and tools and protective equipment. It is the United Farm Workers Organizing Committee's position that the subject of economic poisons is a necessary and proper subject of collective bargaining in the field of agriculture.

The 12 growers with whom the United Farm Workers Organizing Committee was dealing would not agree not to use DDT on table grapes even though DDT has now been banned in Michigan, Arizona and Sweden and hopefully will be banned in California by 1971. Furthermore, the 12 growers with whom the United Farm Workers Organizing Committee was negotiating desired that the Union agree not to discuss the use of economic poisons publicly. The United Farm Workers Organizing Committee will not be blackmailed by 12 growers, they will not exchange a contract for their right to discuss important issues both to the workers and to the consumers. The Union will not be muzzled on this issue.

The United Farm Workers Organizing Committee subsequent to the end of negotiations has begun to examine the conditions of the table grapes which are currently being sold throughout the United States.

As Page 27 of the Kern County Agricultural Commissioner's Report shows, 1,046 acres of grapes in Kern County alone were sprayed with economic poison Amino Triazole. This is the same poison that was used on cranberries in the late 1950's and caused the confiscation of the cranberries which were so treated. This poison is known to cause cancer in small mammals such as rats. This chemical has a tendency to cause malignant tumors of the thyroid glands in mammalian system. However, it is impossible to tell from the records that are currently available to the public which particular grapes were sprayed with this poison. Therefore to eat a Kern County grape is to play Russian roulette with one's health. Furthermore, the United Farm Workers Organizing Committee has taken tests of grapes which are now being sent to market. Thus far, we have sampled grapes from the fields of ____ different growers and in each instance DDT residues has been found on these grapes. This is, despite the fact that the state director of agriculture in the state of Washington said that grapes are remarkably free of chemical residues. It also flies in the face of a statement issued by the California department of agriculture claiming that grapes were safe . Many recent studies have shown that DDT which is stored in the body fat of humans, cause carcinogenic tumors in mice. The most recent of these studies is from the journal of the National Cancer Institute appearing on page 1101 and entitled, "Bioassay of Pesticides and Industrial Chemicals for Tumorigenicity in Mice: a Preliminary Note." It is the position of the United Farm Workers Organizing that grapes which cannot be peeled in a manner that bananas and oranges can should contain no DDT when they go to market.

It is very clear that as long as public officials make statements that grapes contaminated with DDT are safe to eat, they are not serving the interests of the consuming public.

It is clear to the Union that to ban DDT we must take the route of collective bargaining.

Perhaps the most painful proof of the inadequacy of current governmental regulations is the one year battle which the farm workers have waged to see public records relating to the use of economic poisons in Kern County, California.

During the summer of 1968 many farm workers came to visit the legal office of the United Farm Workers Organizing Committee and complained of symptoms varying from eye irritations and rashes to dizziness, nausea, vomitting, double vision, after having been in contact with sprays and dusts as the workers call it. In order to find out what materials are being used at what locations and what exact time, I visited the Kern County Agricultural Commissioner, C. Seldon Morley on the morning of August 22nd, 1968, I was told by commissioner Morley to return to his office on the following day. I was interested in seeing two types of records, permits to use injurious materials and the reports of commerical spray applicators on how the materials were used, that is under what wind, and weather conditions, in what quantity and formula, at what locations, and during what time. I left the commissioner's office at approximately 11:30 in the morning. At 1:34 in the afternoon a temporary restraining order was issued by the Kern County Superior Court preventing me from viewing the records of the commercial spray applicators. Subsequent to this, the United Farm Workers Organizing Committee did everything within their power to work this problem out privately without creating a public scandal over the mis-use of economic poisons in the grape vineyards. We did this believing that the fastest way of protecting the workers and the consumers was not by creating public hostility but rather by working the problem out through private agreement between the farm workers, the grape growers and the pesticide companys. We informed the growers that even if they did not want to enter into collective bargaining negotiations with us that at least they sit down and talk to us about the use of pesticides.

Rather than take the matter to a trial in the Kern County Superior Court which would have necessitated a factual disclosure of the mis-use of economic poisons and thus lessen the possibility of private agreement, the United Farm Workers Organizing Committee chose to appeal the temporary restraining order by challenging only the legal basis under the California statutes of the decision to withold the records from the public. Therefore, the United Farm Workers Organizing Committee commenced an extraordinary original proceeding in the court of appeal for the 5th district seeking to prohibit the superior court from enforcing a temporary restraining order on strictly legal grounds. The court of appeals stated in its decision of November 8, 1967, that exceptional circumstances justifying the resolution of the legal issue before the factual issue was heard at the trial court level were not in evidence and they therefore denied the farm worker's writ of mandate. Subsequent to that the United Farm Workers Organizing Committee on December 16, 1968, intervened in the case of Atwood Aviation vs. Seldon C. Morley, the agricultural commissioner of Kern County. We commenced the discovery process in this case to examine the public need for seeing the records concerning the use of economic poisons in Kern County.

However, the farm workers made a further effort to reach a private agreement with the pesticide companys and the growers to quickly solve this problem. Therefore, on January 7, 1968, as general counsel for the farm workers I wrote to Stephen Wall, who represented the pesticide companys and I proposed an agreement bwtween the pesticide companys, the agricultural commissioner, the table grape growers and the United Farm Workers Organizing Committee. In that agreement, the farm workers proposed to obtain the following information to adequately insure that workers were protected when they worked in the fields.

1. The following information currently on record with the Commissioner of Agriculture should be turned over to the United Farm Workers Organizing Committee:

a) A description and location of all properties treated with injurious materials.

b) Date of the treatment

c) Material and dosage used

d) Number of units treated

e) Type of crop involved

f) The identity of the equipment used

g) If applied by airplane, the name of pilot or pilots who applied the treatment.

h) The temperature and wind conditions during the time of the treatment

i) The name of the grower or grower representative for whom the treatment was applied

2. All growers who used their own eqipment to apply dangerous pesticides must deliver the following information to UFWOC:

a) Description of properties and location of property treated

b) Date of treatment

c) Material and dosage used

d) Identity of equipment used

e) Brief description of qualifications of person applying dangerous materials

f) Statement of tolerance level for workers and consumers for each kind of injurious material

g) Disclosure of amount of geybral used in vineyards and number of applications of geybral

3. All growers shall inform the United Farm Workers Organizing Committee three (3) days in advance of application of poisonous materials.

4. Growers shall post written warnings in fields in which injurious materials have been applied. Such warnings shall be in Spanish and in English and shall state in letters six (6) inches high the name of the material which has been applied and the date on which the field will become safe to work in.

The response which Mr. Wall wrote to us is contained in a letter which I am filing before this committee, Mr. Wall responded in part as follows:

> "I understood you to say also that you might now be satisfied with receiving from the subject reports that are now filed only those portions of data contained therein which could reasonably relate to the announced aim of your clinic in Delano primarily that of improving general health of agricultural workers in the area as well as the standards of safety applicable to their working conditions. I understand you to say also that your only other interest in seeing these specific reports on file now, was for your use in formulating some pertinent contract language for future use in negotiating labor contracts hopefully. You definitely stated that you were not interested in seeing the subject reports for using any part of the contained data in connection with your boycott efforts or as a basis of filing any lawsuit or lawsuits, but here is what you come back with. You want the name of the grower, the name of the airplane pilot, the name of the material and dosage used, the legal description of the prop-treated, the exact date of the treatment, and so on. These you intend to use in connection with your Delano clinic or in negotiation of future contracts? Your actual purpose is clearly evident, and there is not even a coincidental resemblance to the one you expressed, but the ends justifys the means in your league--right?" Very truly yours, Stephen E. Wall

I responded to Mr. Wall by assuring him that the information which we asked for was absolutely necessary to protect and reasonably and adequately develop safeguards concerning the use of economic poisons in the vineyards. However, Mr. Wall did not response to my subsequent letter of January 9th. Therefore, on January 14th Cesar Chavez wrote a letter to the table grape industry which is being submitted with this statement. The letter reads in part as follows:

> "There is one critical issue of such overriding importance that it demands immediate attention even if other labor relations problems have to wait. I mean the harmful effects of spraying grapes with pesticides or economic poisons as they are called. We have recently become more aware of this problem through an increasing number of cases coming into our clinic. We will not tolerate the systematic poisoning of our people...we will be damned and we should be if we will permit human beings to sustain permanent damage to their health from economic poisons. We are willing to meet with your representatives on the sole issue of pesticides even if you are not prepared to begin full scale collective bargaining at present. These talks would go on even as we pursue our final aim of fair agreement."

The growers did not respond to this letter in any way and so the farm workers had no alternative but to take the matter of the use of economic poisons to a public trial which took place on January 29th and 31st and was finished on February 5th, 6th and 27th. At that hearing the farm workers introduced a vast amount of evidence which was overwhelming regarding the peril to farm workers health of pesticide poisoning. An official report of occupational disease compiled by the state department of public health for Kern County for the year 1967 alone contained over 95 pesticide related injuries.

Enclosed are excerpts of testimony from various witnesses.

Thomas Milby who is the chief of the Bureau of Occupational Health in the State Health Department testified in part as follows:

Q Now, you mentioned organic phosphate compounds. Could you give us examples of those in economic poisonings?

A There is a long series of them. Parathion, TEPP, Diazion, Azodrin, and others.

Q And others?

A Many others.

Q These different pesticides, you say, actually destroy the Cholinesterase?

A They inhibit. They unite chemically with the Cholinesterase and inhibit its action in the destruction of this material Acetylcholine; and therefore, a nerve which is under the effect of the organic phosphate compound. This compound, which allows the impulse to go across, is not destroyed; and, therefore, you have a short circuit and a continuous nerve action.

Q Can you explain the effect on the human body by that short-circuit?

A Yes. This setup -- this particular physiological setup is in only certain parts of the body; that is, there are a number of several kinds of -- several nervous systems involved, and I won't go into a technical description of these. But the upshot is this -- that in the certain systems such as certain glands, such as the sweat glands, the salivary glands, and certain other glands are involved here, as well as certain of the voluntary muscle systems; therefore, in an individual who's under the influence of the organic phosphates, who has -- will have such things as muscle twitching, muscle paralysis, slavation. They will have difficulty breathing because of secretions which are built up because of this action. They will have pupillary constriction, which we call myosis. And you will have excessive sweating. You will have nausea and vomiting. You will have headache because of the central nervous system effect of this thing, and you will have several other symtoms.

Q Can that be lethal?

A Yes.

Q Has it been lethal?

A It has been lethal.

Q Do you know if it has been lethal to farm workers?

A It has been

Q Do you know, for instance, which kind of pesticides have caused fatalities to farm workers?

A Yes. I know from personal experience that Phosdrin, TEPP, which we spoke of before, Parathion, for three examples. All have been.

Q Dr. Milby, you talked about -- excuse me if I mistate this -- pupillary constriction, and headache. In your experience, do people who have been poisoned by Parathion, for example -- do they lose their sense of judgment?

A Well, they could, yes, but primarily because they are ill -- because they are exceedingly ill. And the usual picture of Parathion poisoning is headache, nausea, vomiting, and the other things I spoke of -- heavy sweating and difficulty in breathing. And, of course, under those circumstances, one could lose their judgment, but the compound itself would not primarily affect judgment.

Q I understand, but can it, because of the illness involved, cause a dizziness?

A Yes.

Q Do you have any idea as to the long-term effects of acute poisoning by Parathion, assuming the person lives?

A It is very difficult problem. There is not much known about it, but in my clinical judgment, in my experience, individuals who are poisoned by the organic phosphates, primarily Parathion, take a long time to recover. It may take months. And during this recovery phase, they have loss of appetite. They have lassitude, and they have symptoms which are difficult to evaluate. But they certainly have symptoms for many months, but in terms of years -- no, I think not.

Q Have there been any pesticides which you feels may cause permanent nerve damage?

A Yes. There have been several pesticides which have shown to have produced permanent nerve injury. These have not been used in California or elsewhere in this country to my knowledge, because the evidence that they produce permanent injury appeared during their early phase of production, and they were withdrawn. But to my knowledge there are no compounds used here which produce permanent nerve damage.

Q Doctor, have you done any work in regards to Malathion?

A Yes.

Q Is that a fairly nontoxic organic phosphate?

A Malathion is a compound which is handled very well by the warm-blooded animal; therefore, it is not very toxic to warm-blooded animals. It is quite toxic to insects.

Q In terms of this pesticide, Malathion, what would be the kind of dosage of concentrated Malathion to kill a human being?

A It would be several ounces.

Q How about Parathion?

A The toxic dose to an adult human being of Parathion would be more on the order of half a teaspoon.

Q And what about TEPP?

MR MR. JORDAN: Objection, if you will. Do I gather we are talking about taking it orally?

THE WITNESS: Yes, sir.

MR. JORDAN: Thank you.

THE WITNESS: The compounds are also toxic by skin absorption, but I was referring to oral dosage.

Q (By Mr. Averbuck) And TEPP -- how much orally would that take?

A In a rough approximation, several drops.

Q Several drops could kill?

A Several drops would be a lethal dose -- of lethal TEPP.

Q Now, the point has been brought out that this is the oral toxicity for lethal dosage. Is it possible for the human body to take these pesticides in any other avenues?

A Yes. The other two avenues -- routes of entry -- are through the skin -- through the intact skin, and also through the respiratory system -- through inhalation of dusts or mists. They are somewhat less toxic. Some of them are somewhat less toxic if applied to the skin. Some are more toxic by skin than by mouth. Respiratory toxicity is not well-understood.

* * * * * * *

Mr. Thomas C. Griffin, the owner of a pesticide company, under cross-examination from David Averbuck testified as follows concerning an injury which occurred to him personally.

Q (By Mr. Averbuck) Would you please explain the incident of when you got ill because of TEPP?

A I was flagging some TEPP over a very long period of time, and I did not take what were normally considered the proper precautions. At this time I was in charge of pest control just prior to going into business for myself a long, long time ago, but briefly, that is what happened.

Q And how did you know you became ill from TEPP?

A I had the common symptoms that one would suspect I have. I had pinpoint pupils. Vision was blurry, headache, sweating of the palms, and so on.

Q Did you have nausea?

A Yes.

Q And did you have trouble breathing?

A A little congestion.

Q In other words, you were good and sick.

Q Now, finally two points. I think this will sum it up. You talked about washing the grapes.

A That is correct.

Q Now, that was a little bit surprising because, am I correct in gleaning from your testimony, that you are saying that you wouldn't want this information out because you want to keep it hidden from the public?

A Not from the public at all. Certainly not from the public. What I am trying to say is this: That over the course of time, because of the way it was done, there was a general feeling by buyers that grapes that have been washed were not good grapes to buy because their appearance had been somewhat destroyed, and certainly in the past this was so. So, during the course of history of washing grapes, the term "washing", making an application, at this time became very very detrimental to the growers, and he was not interested in having anyone know this was done.

Q Even the buyer?

A Even the buyer. I am saying, however, that this kind of work can be done today and is often done today, and with the appearance of the grape being perfectly natural, because of the techniques that are used.

* * * * * * *

Seldon Morley, the Kern County Agricultural Commissioner, the official who is supposed to be responsible for taking all steps necessary to protect farm worker and consumer health testified as follows:

Q Mr. Morley, have you notified the Department of Public Health of Kern County that they should keep in contact with you if they did hear of any injuries in Kern County due to economic poisons?

A Not so far, no, sir.

Q Had you contacted the State Department of Public Health?

A No, sir.

Q Have you contacted any doctors? Have you contaced anybody?

A No, sir.

* * * * * *

In discussing the danger to health of many of the poisons used in table grapes, Edward Lester, President of the Central California Medical Laboratories, a laboratory in Fresno which conducts cholinesterase tests, testified as follows:

THE WITNESS: The Cholinesterase tests is a specific measure of nervous damage. It is run in two parts, as I said before. Plasma and red blood cells. It is essential that we determine a specific level in every individual before exposure, so that we have some basis of comparison during the coming season, or in the years to come. Now, this is called an individual worker's base line. Everything else will be compared tc this base line.

Now, at the time of exposure, if this is a person's base line of red blood cells and plasma, and exposure is at this period, the plasma is the first one to go down. It is also the first one to return to normal after that worker is no longer exposed to organic phosphates. The RBC follows in this manner. It trails behind the plasma, and this is the one that we are most concerned with in that RBC is the one that reflects more precisely the status of the central nervous system. Once the RBC goes down, it will delay a long time before coming up.

Now, from an economic standpoint, this means that if we can detect early changes in the plasma, it is very easy for us to recommend that such a worker be removed immediately from further exposure, and long before the RBC starts to drop and becomes dangerous.

This means that we are not dealing yet with clinical symptoms, acute symptomology, but rather we are dealing with the first preliminary indication of poisoning, and that further exposure will precipitate the clinical symptoms that have been described here today.

Now, if the worker can be removed by running these tests at an early enough stage, we are speaking then of removal from the job on one day, two days, three days, or a week. But once the RBC goes down, we may be speaking of a poisoning situation which may not return to normal for perhaps a month or longer. So, it is essential that we identify poisoning long before clinical symptoms appear.

Now, the curve I have drawn here are nice slopes. Actually it doesn't work quite that way. Every individual has different reserves to accommodate loss of Cholesterase, as was explained to you by Dr. Milby. Now, we find that when we give an individual with exposure at this point, we find that nothing happens for a considerable length of time. These are reserves that every individual has. Further exposures -- they reach various plateaus, various plateaus. In other words, it's not an even drop in Cholinesterase. What I am saying is that at this point, unless this worker were identified, even a small minor exposure will precipitate a fantastic drop in Cholinesterase. I personally have seen this drop from a normal level to this point in less than 30 minutes. At this point, clinical symptoms appear. The victim is prostrate, and we are talking about an emergency situation often requiring heroric measures.

* * * * * * *

Mr. Allen B. Lemmon, Assistant Director, State Department of Agriculture, who has responsibility for promulgating regulations as to when crews can enter the fields after they have been sprayed with economic poisons, testified in part as follows:

Q Currently, what is the time span that might elapse before a farm worker can go in the field after Parathion has been applied?

A It depends upon the quantity that has been applied as to what can be a safe length of time that must elapse.

Q Isn't fourteen days the recognized time?

A There are some cases where labels specify, because of particular dosage, that it must be longer than that.

Q And what is the longest that you know of?

A I recall some of twenty-one, and I am not sure whether there are any twenty-eight now or not. They have varied at various times according to the best information the health people can give us.

Q Now, do you remember in the 1951 incident, how long after application did the workers go into the fields?

A My recollection from that article was 33 days.

Q Thank you. I have no further questions.

* * * * * * *

Robert Van Den Bosch, a professor of entomology from the University of California testified in part as follows:

Q And water pollution? Is this not an area that concerns you as one who is interested in the integrated control of environment?

A Well, of course. This is one of the reasons why I am interested in integrated control, because it will bring about a rational and scientific and minimized use of these highly pollutant agricultural chemicals that we are dealing with.

Q You don't recommend, of course, that at present time we -- I will withdraw that. Are you a competitor of the plaintiff in this action?

A No.

Q Do you have any type of private practice or private employment?

A No.

Q You don't consider then that your school necessarily would conflict with the pest control operators?

A I think it will conflict with the pest control operators, and I think it will conflict with the chemical industry, because fundamentally, pest control as it is now practiced in the State of California and in the United States of America, is essentially not an ecological matter. It is a -- it is largely a matter of merchandising, and this is a fundamental problem in the whole matter of the pesticide problem that we are confronted with today. In essence, we are using the wrong kind of materials in the wrong places at the wrong times in excessive amounts, and engendering problems which increases the use of these materials, adds to the pollution problem, adds to the cost of agricultural pest control, adds to the -- you might say -- the concern of the general public, and in this essence I belong to a school of entomological research and pest control philosophy that is at odds with these people. But this is not an overt attack on either the pest control advocates or the agricultural chemical industry. It simply happens to be that this is one philosophy based against another. And the answer to the situation is -- which will prevail. Believe me, having been in this situation for twenty years, it's a long, tough fight and it's a long, tough fight ahead.

* * * * * *

Despite the overwhelming evidence of the harm caused by economic poisons Judge George Brown ruled that the records were not be seen. He ruled in part, "The importance of the agricultural chemical industry to this valley and this state is enormous, not only in terms of the employment and income which it generates but in terms of the astronomical increase in productivity and improvement in quality of food and fibre that has accompanied widespread use of agricultural chemicals."

Clearly in weighing the interests of the workers against the interests of the industry, Judge Brown recognized that at least in Kern County the interests in making profit outweighs the interest in the health of farm workers and consumers.

Subsequent to that time, the United Farm Workers Organizing Committee has taken legal steps to try and ban the use of DDT. David Averbuck, my associate, has filed suits in state and federal court to attempt to ban the use of DDT. Subsequent to that time the Farm Bureau has come out discussing the harmful effects of DDT and the state senate has currently proposed a ban on DDT in the home. Finally, they have proposed that all DDT be banned in California by 1971.

The United Farm Workers Organizing Committee's position is as follows:

If DDT is harmful to consumers in 1971 it is just as surely harmful to them now.

Therefore, the United Farm Workers Organizing Committee is currently embarking upon a testing program. So far, we have tested the grapes of Karahadian, Mel-Pak, Bagdasarian Ranch, Glass, Heggblade-Marguleas and Delano grapes from a Bank of America field. All of these grapes were found to contain DDT. We have tested grapes in Sacramento, in Seattle and Buffalo, and the grapes from the chain stores in these cities were found to contain DDT.

It is not surprising to the farm workers that the table grape industry should continue selling contaminated grapes. The table grape industry has shown its irresponsibility in various ways throughout the 4 year struggle to unionize that industry. They have persistently refused to obey the sanitation laws of the state of California. They have persistently recruited workers illegally from Mexico to break the strikes of American residents. They have extensively used illegal wetback labor. They have fired people for union activity. They have mislabeled grape in order to deceive the public into thinking nonunion grapes were union grapes.

Now they are using DDT and other chlorinated hydrocarbons, and, as we have just discovered from the Kern County Agricultural Commissioner's report, Amino Triazole even though they know that this creates unknown dangers to the American consuming public.

Had the table grape industry discussed the problem of economic poisons with the farm workers and had we worked out an agreement similar to the one which we proposed in our recent negotiations the problem could be well on its way to being solved. However, the growers have prevented this. Therefore we must now take our case to the public and to the United States Senate in hopes that some relief will be forth coming.

Mr. COHEN. Last year in the Coachella Valley various farmworkers came to see Cezar Chavez and described various times they have been in the fields and have been sprayed by the spraying apparatus. Subsequent to that in Kern County in the southern San Joaquin Valley, farmworkers came to us and described further injuries.

Last August 19 I went to see the Kern County agriculture commissioner, Mr. Morley, and I asked Mr. Morley to see the records of the commercial pest control operators. There are two types of records, and there are two types of problems that I think this committee should be aware of. First of all, in the State of California, only commercial applicators have to account for what chemicals they use in what amounts at what times, and how soon the crews can go in the field. The grower does his own spraying. He does not have to account to anybody as to how he uses those chemicals. That is one problem I think this committee should address itself to.

Senator MONDALE. Does the grower need a permit to apply pesticides, or is it just the commercial applicator?

Mr. COHEN. In California, both grower and commercial applicator need a permit to use the material. However, it is only the commercial applicator who must account to how he uses this material.

Furthermore, even though the commercial applicators have to account to the commissioner as to how they use the chemical, when we sought to see the public records on what chemicals were used, we were denied access to these records. I saw the agriculture commissioner on August 22. He told me to come back the next day to look at the record. Two hours after I left his office there was a temporary restraining order issued which was used for restraining seeing public records on the ground it was trade secret, that formula of the chemicals was a trade secret.

It is known that it would take but a drop of parathion to kill you and we think that the public interest in seeing that farmworkers and consumers know what is being sprayed outweights the economic interest of the pesticide companies.

So we attempted to negotiate with both pesticide companies and table-grape industry concerning their use of economic poisons. I approached the attorney for the pesticide companies and asked them to disclose information, and they refused to disclose it.

On January 14, Cesar Chavez wrote a letter to the grape industry and asked them to sit down and talk the matter over with the farmworkers because they won't tolerate the systematic poisoning of farmworkers any longer. They refused to respond to that.

(The Chavez letter and other documents and references, appear at the close of Mr. Cohen's testimony, starting at p. 3039.)

Mr. COHEN. In January we took the injunction to trial and during the course of the trial we had testimony as to the extent of injuries that had been reported to the State. Some 95 injuries in 1967 in Kern County alone reported to the State department of public health. I think this has to be understood in the context of the degree of knowledge that the farmworkers had about this problem.

Senator MONDALE. Those injuries are in Kern County, and 95 workers reported to the State department of public health that they had problems relating to pesticides?

Mr. COHEN. That is right.

Senator Mondale, I want to point out that in Tulare County we had our organizers interviewing farmworkers for 2 months for preparation for this hearing, and in preparation for taking the case to the public. Of the 600 workers interviewed, about 540 had symptoms relating to pesticides. They had eye injuries and nausea. In terms of 95 injuries, I think that is part of the type of injuries that we are reviewing. We presented evidence of those 95 major injuries.

We also asked one of the State officials in the State of California, Mr. Lemmon, who was responsible for promulgating regulations as to how soon a crew could go into a field after parathion is used, what their criteria are. In that particular instance, Mr. Lemmon told us that if a pound were used on ten acres, a group could enter the field 14 to 21 days after the application of parathion. This was despite the fact that we had access to an article written by Mr. Lemmon concerning workers in the grape vineyards who entered the field 33 days later and 12 out of 16 went to the hospital.

(The article referred to appears elsewhere in the printed record of this hearing.)

Mr. Cohen. We think currently the state of regulation in California is inadequate because the time period obviously isn't long enough.

Mr. Morley, who was Kern County agriculture commissioner, was asked if he had contacted anybody from the department of public health relating to the issue of farmworker injuries, and he said no, he hadn't. Then he was asked if he contacted anybody from the medical profession.

Mr. Averbuck asked, "Have you contacted the State department of health?" He answered "No." He asked, "Have you contacted any doctors? "No, sir."

This man, Mr. Morley, had responsibility for farmworker health in the county of Kern. He has not contacted anybody in the State department of public health, any doctors, to investigate the extent to which farmworkers are injured.

This is to say nothing about the effect of the DDT and parathion, and cranberry poisoning on consumers. We are talking about farmworkers now. Furthermore, at that hearing the director of the State department of public health, Dr. Milby, testified as to a death which occurred because of parathion poisoning.

Senator Mondale. Was this a farmworker death?

Mr. Cohen. This was a farmworker, yes, sir. That death had occurred even though the man had entered the field long after the prescribed time by the regulation. What they had done in that case was apply parathion to a certain amount of acreage. Then they applied the same amount of parathion to the same acreage and even though both applications of parathion were in and of themselves in accordance with the regulation, together they caused the parathion to break down into paraoxon which is even more deadly. So it resulted in death.

Mr. Morley's response to the question was, "We live and learn."

It seems to me that is not an acceptable response to the farmworkers.

As to the status of the case, even though we presented all of this information, the judge decided that we didn't have a right to see the records and the reason we didn't have a right to see the records was because he said, and I have it in my statement, he said that the pesticide industry was responsible for an astronomical increase in the quality of food and fiber and had brought much income into Kern County.

Because of the testimony of one of the witnesses of the pesticide company, he thought what we were doing would jeopardize the pesticide companies.

I want to explain how that works. Mr. Griffin testified on behalf of his company. He stated that being a commercial pesticide applicator, he had to account to the State for the way in which he used these chemicals and if the farmworkers or anybody else saw how he used the chemicals, that would only make a big grower apply his own poisons to his own grapes, and when the private grower uses a chemical, he doesn't have to account to anybody as to how he used it.

Mr. Griffin went on to say that the grape growers are doing things they don't want their buyers to know. They are washing grapes, he didn't go into details of what they meant, and he doesn't want the public to know what is going on.

I think Mr. Griffin was telling the truth when he said that. What the judge did was balance that against our interest in seeing that information. I think one of the problems we are faced with now is the problem that the farmworkers in California do not have access to any information as to what is being used in specific fields. And I want to give some recent examples as to what kind of thing can happen.

Last Friday some workers were sitting in the field and they were eating. They were taking a break in the late morning. A ground-rig spray came down the vineyard two rows away from them. They got up and shouted at the man operating the ground rig. He saw them and he heard them but sprayed them anyway. Six of the people began to vomit and they were dizzy for 2 days.

We can't go to the agricultural commissioner and see the information very quickly. What we have had to do is get some soil samples and grapes and test them.

Senator MONDALE. When did this happen?

Mr. COHEN. This happend Friday, the 25th.

Senator MONDALE. You say the pesticides were sprayed right on the workers?

Mr. COHEN. They were sprayed on the workers sitting there having a little break and they were eating. It was about 9:15 in the morning. They had gotten in the field at 6. They have a break at 9:15 in the morning, and then they have lunch.

Senator MONDALE. They became nauseous?

Mr. COHEN. They became nauseous and three of them vomited. That kind of thing happens a lot. That is an arrogant disregard for the farmworkers in the field.

Senator MONDALE. Is it unusual for a worker to actually be sprayed? I can see the problem of workers going into a field to work just after it has been sprayed, say within a day or two, or three, or however long it takes for danger to disappear, if it does. But, it is something else if there are actually instances in which the worker is sprayed by pesticides? Does this occur often?

Mr. Cohen. It occurs quite frequently, Senator. It doesn't occur in flagrant manner, as it occurred to these workers. It usually occurs because, since the growers don't have to account how they use the pesticide, they don't have to account to the agriculture commissioner as to the wind directions. So what they may do is spray in the field and not take into account the wind and drift. Some wind and drifts may reach workers 10 rows down. That happens quite often. The kind of example I gave you that occurred last Friday, that doesn't happen very often. It was the kind of thing that caused us to begin to investigate the records and it doesn't happen as often as the accidental injury to farmworkers.

But there is another aspect to it, and that is that our pickets get deliberately sprayed. On Saturday the 12th we were picketing "Lost Hills" near Delano and a man affiliated with the Farm Bureau turned on a tank of ammonia gas and he sprayed and gassed the picket line. I asked the officers of Kern County to help me turn that off and they refused, so I got to a city policeman and he and I had to go and turn off the ammonia gas and make this man who works with the Farm Bureau turn off the ammonia.

Saturday the 26th we were picketing the S. A. Camp farms. There were about 16 pickets on the line at that time. One of the former foremen of S. A. Camp brought a ground rig down the row and sprayed lindane on the pickets. Those kinds of things do happen. Those kind of injuries take place.

That is one of the reason I say we are dealing with a type of iceberg is because the kinds of injuries that we are talking about are very subtle and you know, for instance, farmworkers consider rashes as a way of life. Five hundred and forty people who reported incidents of illness to us in Kern County in the last 2 months consider when they go in the field they are going to get a rash.

Senator Mondale. How does the rash manifest itself?

Mr. Cohen. On the skin it has open sores, sometimes there are bumps on the hands, there are bumps on the legs, and faces become swollen. That usually follows the nausea and dizziness that occurs.

Senator Mondale. Are these rashes rather common in the field?

Mr. Cohen. They are very common in the field and they are accepted by the farmworker in the field. The other thing which is frightening, is that farmworkers do not know the word parathion, even though it is being bought by the Government as nerve gas, it was developed in World War II as a nerve gas and even though it is used in diluted form as chemical poison, it still has those effects on nervous systems of farmworkers if they enter the field too soon.

About 70 percent of the workers we have talked to don't even know what parathion is. They know what DDT is and they know there is DDT on grapes, but they don't know what parathion is. In terms of danger to farmworkers, the organic phosphates such as parathion are much more deadly and it should be restricted. They should be carefully restricted.

In relationship to this, I should like to mention our recent experience with 12 table grape growers who we were negotiating with. Those 12 growers broke up those negotiations over the issue of pesticides. They wanted us, the United Farm Workers, to sign an agreement whereby we would agree not to embark on any program regarding pesticides that can in any way be detrimental or harmful to the industry to which the employee belongs. That was an ultimatum which they issued to us.

In other words, in return for a contract on table grapes, they wanted us to shut our mouths about pesticides. The union's position was that it has a duty not only to workers but also to consumers who have been our friends in the national boycott and when we find DDT on the grapes, we are going to tell consumers about it. We have tested grapes of 13 growers so far and we have found DDT, DDE, or Aldrin on all 13. We wanted those growers to sign an agreement to very carefully regulate the use of organic phosphates poisoning. We wanted them to form health and safety committees. We wanted them to give farmworkers access to information which we currently can not get from the State Department of Agriculture.

They won't agree to that. We wanted them to ban DDT. We know DDT has been banned in Michigan, it has been banned in Arizona. The senate of California last week was deliberating whether to ban it by 1971. We think any union contract that covers the grape should include a ban on DDT.

Senator MONDALE. We asked the California Department of Agriculture to testify here, if they would, on this issue. We received a telegram that says it is not possible to have someone come to Washington to testify. We will put this telegram in the record, along with a recent press release that office issued.

(The material referred to follows:)

SACRAMENTO, CALIF., *June 31, 1969.*

Hon. WALTER MONDALE,
Senate Subcommittee on Migratory Labor,
Old Senate Office Building,
Washington, D.C.:

Not possible to have someone in Washington at 8/1/69 hearing. Califs pesticide regulatory program exceedingly effective in protecting persons, animals, and crops. Know of no one in Calif poisoned from use of DDT. We have received no reports of injury to farm laborers from use of DDT. Detailed statement for hearing record airmailed 8/30/69.

JERRY FIELDER,
Director, California Department of Agriculture.

ALLEGATIONS BY GRAPE BOYCOTT ACTIVISTS BRANDED "UNTRUE AND IRRESPONSIBLE" BY CALIFORNIA DEPARTMENT OF AGRICULTURE, JERRY W. FIELDER, DIRECTOR

State Director of Agriculture Jerry W. Fielder today branded as "completely untrue and irresponsible" the allegations being made by grape boycott activists that California table grapes are unsafe to eat because they contain residues of poisonous chemicals.

These claims are made in the form of leaflets and mimeographed sheets passed out to customers at retail markets in many parts of the country, Fielder said.

"We maintain tight controls and constant checks on spray residues on California produce," Fielder said. "And we have found that table grapes, like all other fresh fruits and vegetables, are remarkably free of chemical residues and perfectly safe to eat.

"Last year we officially tested many samples of table grapes on sale in various parts of the state and found no harmful residues on any of them. So far this year we have tested representative samples of table grapes grown in the Coachella Valley and found them similarly pure.

"Department chemists conduct such tests for pesticide residue throughout the year to assure consumers of safe and wholesome foods. Each year we analyze about 7,500 samples of fruits and vegetables in our chemistray laboratories to make sure they are free from illegal residues. California regulations specify the same stringent low tolerances for residues as those of the Federal Food and Drug Administration."

Fielder added that besides being safe to eat, grapes are a healthful food, rich in food energy, high in Vitamin A and containing calcium and carbohydrates.

"Consumers continue to buy, eat and enjoy California table grapes," Fielder said. "We don't believe many of them are being misled by the false statements in these leaflets.

"But as one of several agencies responsible for the enforcement of laws regulating the quality and purity of agricultural commodities, we want to go on record against these malicious attempts to destroy public confidence in California table grapes."

According to Fielder, the State Department of Public Health has reported that it has no knowledge of consumers of table grapes in California being harmed by pesticide residues.

Senator MONDALE. They say that the California pesticides program is protecting persons, animals, and crops, and they know of no one in California poisoned in the use of DDT and have received no reports of injury to farmlabor from use of DDT.

It is signed by Jerry Fielder, Director of California Department of Agriculture.

Will you comment on that quoted portion?

Mr. COHEN. Yes, I would like to comment on that. I think that is an extraordinary statement from Mr. Fielder. The State right now is conducting a survey on farmworker injuries. We know they have interviewed people in Tulare County. Tulare County is adjacent to Kern County. We know at least 85 or 95 percent of the workers we have talked to have had adverse symptoms. Many know of deaths, many know of people who have gone to Mexicali and haven't returned after they have been subjected to parathion poisoning. I think Mr. Fielder is also aware of that.

Mr. Fielder is also aware, I think, of 15 mothers who held a press conference in San Francisco last week and they have had their breast milk tested. In that milk they found they have four times more DDT than would be allowed if it were cow's milk. So they are nursing their babies with milk that would be unacceptable for sale if it were cow's milk.

To me that is poisoning because of DDT. Those mothers were going after the grape industry along with the union because they know we can't reform all of agriculture just because agriculture out of the goodness of its heart knows it is misusing pesticides. We have been negotiating with the grape industry and we know the subject of economic poisons is necessary and proper subject in any collective bargaining and the mothers agree with this. They had a public press conference and Mr. Fielder knew of that.

Senator MONDALE. Do you know of any people who became ill with rashes as a result of either spraying directly on employees, or drifting caused by wind or from entering a field too soon after spraying? What would be too soon? Do you have some notions about how soon employees ought to enter the field?

Mr. COHEN. Yes. For example, parathion, according to Mr. Lemmon, when we had him testify at the hearing——

Senator MONDALE. Who is Mr. Lemmon with?

Mr. COHEN. Mr. Lemmon is a member of the State Department of Agriculture. He has some responsibility for promulgating the regulation which controls when a crew enters the field which has been sprayed with parathion. Mr. Lemmon and Mr. Milby both admitted that parathion acted as nerve gas. Their position was that the State of California was adequately protecting farmworkers from the dangers of the nerve gas.

Mr. Lemmon testified that if you had a pound of parathion and sprayed it on 10 acres in very diluted form—one drop of parathion on your eye or skin would kill you—so it has to be very diluted to use it in the field. That crew can enter the field 14 to 21 days later. But the problem that we have with that regulation is that we introduced an article that was written by Mr. Lemmon and that article concerned poisoning in a Delano vineyard. In that case, 12 out of 16 workers ended up in hospitals and they entered the field days after the application of parathion.

Senator MONDALE. Is parathion being used?

Mr. COHEN. Parathion is being used.

Senator MONDALE. This was a case according to this doctor, where 33 days after spraying, farmworkers entered the field and they got poisoned?

Mr. COHEN. Yes, and I think that points out that even the State officials don't know under all situations how parathion breaks down. There may be weather conditions that causes parathion to break down to paraoxon. That killed the worker Dr. Milby talked about in the hearings. In terms of protecting the workers, to get back to Mr. Fielder's telegram, he states he doesn't know of any adverse effects or poisoning of DDT in that telegram, yet last Friday in the Fresno Bee an article appeared, and I would like to give it to the committee, in which the University of California recommends that DDT not be used next year on the crops, and it is interesting to note that the only two crops it should be used on are cotton and grapes. I don't know how they can differentiate on putting it on cotton and grapes. You can't peel a grape. Mae West said, "Peel me a grape." But you know you don't peel any grape, you just eat the grape.

So it seems to me that Mr. Fielder is indicating in the article that he may welcome University of California recommendations. So Mr. Fielder knows there are grave dangers because of DDT. What he does not, however, is that the union has a national boycott against grapes. So, what they want to do is say somehow DDT is safe to use on grapes, whereas it is not safe to use on other crops. That is inconsistent. I hope that the Senator from California could ask Mr. Fielder that question.

Senator MONDALE. We were hoping they would accept our invitation to testify here. I think it weakens their case.

Mr. COHEN. I am very sorry they didn't.

The other thing I would like Mr. Fielder to account for is how 1,046 acres of grapes last year were sprayed with amino triazole. That was the chemical used on cranberries. That chemical was said to have caused cancer in rats and maladjustments of thyroid glands.

By the way, their recent studies on DDT came out in the June issue of Journal of National Cancer Institutes, which says that

DDT causes carcinogenic tumors in mice. It has unknown effects on human beings.

This is a newspaper from Mexico. It has very interesting articles in it. This is probably the only protection North Americans get from DDT. It says cannibals in certain primitive islands in the Pacific—scientists from England discovered, have a propensity to eat English missionaries and English soldiers but they don't indulge in North Americans. The scientists did a study on it. They think the reason is that cannibals are naturally selecting out those people who don't have as much DDT in their bodies. So we have become unfit for human consumption.

That may be the only thing that Mr. Fielder has done for California, to protect cannibals in the West Pacific. I think that we have a serious problem.

Senator CRANSTON. What was the second question you would like to have answered?

Mr. COHEN. See, we are having a very major problem obtaining public records concerning the use of economic poisons. We filed a case in Riverside County and we can't get records as to how the growers are using the poisons. We can't get records in Kern County. Many of the countries don't even keep the record. But the records that are kept that we have seen have to do with the kind of chemical used on total number of crops. In other words, Mr. Morley of Kean County publishes a summary at the end of the year and now we have just received a 1968 summary which I have put before the committee in a little packet of materials—(printed at the conclusion of Mr. Cohen's remarks).

In that summary it says grapes and then the kind of chemicals, amino triazole. That is the chemical that was used on cranberries, 1,046 acres. We would like to know why they are using it, when using it, and which growers are using it. We would like to know which growers are continuing to use DDT. We have had to go and obtain grapes which, as you understand, is against every principle we stand for, and test them. We found on every grape we have tested DDT, or DDE, or aldrin, all chlorinated hydrocarbons that last a very long time and accumulate in the body. It would be a lot easier if we could have access to the records.

I would like Mr. Fielder to make that a little easier for us. We have been fighting it in the court now for a year. The attorney general of the State of California has intervened on our side of the case. It is going to take time. In the meantime farmers don't know what is being sprayed on them.

Senator MONDALE. So the farmworkers who have to work in the fields and who have reason to believe, based upon expert judgment, that these pesticides present a risk to their health, today have no way of knowing when they go into a field whether the field is safe, or not?

Mr. COHEN. That is correct. I would like to add one thing: It is kind of complicated but I think it is important that we understand this. The organic phosphates affect the chemical structure of the human body. If a man is exposed to too much organic phosphate poisoning such as parathion, he can become convulsive, go into coma, and die. In order to take preventive steps for the farmworkers until the chemical companies, (Shell and other chemical companies, should be developing that can kill bugs without killing humans), but until they do, it seems to me that we have to take as careful a look at the situation and that as many preventive steps as we can. One of the steps we could take is to give all of the farmworkers a cholinesterase test. The way phosphates work, it inhibits the cholinesterates in the human body and cholinesterates allow the body to function, and when that drops, he is in trouble.

In order to get what is called baseline test on farmworkers, we need to know what his normal cholinesterate level is. If we get a false baseline, we don't know when that man can be in trouble. A certain amount of exposure, and Mr. Lester testified to all of this in the hearing we had last January, a certain amount of exposure may cause a man's level to reach a certain plateau and he may go along with that plateau for a while and then he may get another exposure and he may drop to another plateau. But there comes a point when he falls off the cliff. But to know what point is the danger point for any particular man, we need to have baseline tests, and to establish valid baseline tests, we need to see the records.

Senator MONDALE. Are you saying that a worker may be nearing this danger point by the intake of these poisons?

Mr. COHEN. Right.

Senator MONDALE. But the worker may appear to be perfectly healthy?

Mr. COHEN. That is correct.

Senator MONDALE. But at some point, with one small additional application or dosage, he may arrive at the critical point where his life would be in jeopardy?

Mr. COHEN. That is correct, Senator. There are many articles written by Dr. Irma West from the State department of public health, and in her articles she says that over 3,000 children a year in the State of California receive some kind of injury from pesticides, either in agriculture or at home.

Senator MONDALE. Many times the workers will have their children with them?

Mr. COHEN. Yes, they will. As a matter of fact, I talked to a lady 2 days ago who had a little baby with her right near the edge of a vineyard in the car and a plane came over and sprayed something on the adjacent vineyard and it drifted over the car and there was a white mist on top of the car. They were lucky they had the car windows rolled up. I talked to a little girl who began to vomit. She ate grapes out in a field next to her field and they had obviously put phosphates on them a day or two before.

We have over 400 kinds of poisons in over 60,000 brand names, and it is completely uncontrollable. That is the kind of problem farmworkers and consumers are faced with today.

Senator MONDALE. You talked about workers in the field, and you have mentioned briefly that children might be along where their families are working. What about the workers who apply pesticides, either on the ground or by air? Is there evidence that these people, whose occupation requires them to be exposed to these dangers, adequately protect themselves or do they risk their own health by this?

Mr. COHEN. Senator Mondale, last summer—we don't know what the results are this summer, yet because they are not all in—last summer 12 pilots, crop dusters, plowed themselves into San Joaquin Valley and killed themselves.

Senator MONDALE. Twelve pilots who were spraying pesticides flew into the ground?

Mr. COHEN. That is right. They think the reason for that is their vision was affected because of the effects of phosphate poisoning, it gives you double vision and affects your depth perception. We have talked with people who have been on ground rigs for years and a Mr. Cramden comes to mind. That man has taken 10 or 12 years off his life. His lungs are in terrible shape. Doctors say he has been breathing sprays all his life and he has never been given adequate respirator protection. There is no standard in any field but there will be standards under the union contract. That was the major fight we had with the grape growers. They wanted us to drop the issue and we wanted them to take steps to protect the workers and children but also the people who necessarily handle the stuff during the course of the day.

Senatore MONDALE. Do you have any precautions to protect workers or applicators in the contracts which you have bargained collectively?

Mr. COHEN. Yes, we do, Senator. We have a health and safety clause. We have certain minimum standards that the growers have to live up to. The growers have to provide the workers with safety equipment and tools. I don't think those contracts are good enough yet because we are just learning about this problem.

Senator MONDALE. Do you think it has been helpful?

Mr. COHEN. I think it has been very helpful. I think it has been helpful because if you put in a union shop, if you put a poison in a United Auto Workers plant and it came down the belt, they just shut down the line until they get the poison out of there. When you get a union the workers get a sense of security and when something dangerous is happening, they leave the field and go to the foreman and they try to correct it. Without a union contract, a worker who complains about pesticides is going to get fired because it is the biggest issue in the valley right now.

Senator MONDALE. Senatore Cranston?

Senator CRANSTON. I hope the subcommittee follows up on the questions of Mr. Fielder. Thank you very much for your help.

(See the correspondence between Mr. Fielder and the subcommittee at the close of hearings on August 1, 1969.)

Senator MONDALE. Senator Bellmon.

Senator BELLMON. Thank you, Mr. Chairman.

I have a couple of questions I would like to ask, Mr. Cohen. First, you mentioned that you or your organization has conducted tests to determine DDT residues on grapes. Is this right?

Mr. COHEN. That is correct.

Senator BELLMON. Did you conduct these tests with your own laboratories, or how do you do it?

Mr. COHEN. No, there is a laboratory in Los Angeles that we send them to, and a laboratory in Buffalo, Sacramento, Seattle, and Chicago.

Senator BELLMON. Does one laboratory support the finding of the others?

Mr. COHEN. Yes, they use gas chromatography which is supposed to be a pretty foolproof method.

Senator BELLMON. Do you remember what the levels of DDT contamination were?

Mr. COHEN. We just got a report today from Washington, D.C., that talks about 18 parts per million for aldrin. That was on Bianco grape. Some of the grape has two and three parts per million. It is under seven parts per million, but the problem is they are using DDT and DDE and aldrin, they are using all kinds of pesticides, so if each one is under tolerance, together they may end up over tolerance.

And it seems to me tolerance for DDT now should be zero, that the numbers game we are playing is irrelevant. I think the Federal Government says tolerance for DDT is seven parts per million. We know DDT is stored in fatty tissue so you may eat something three or four times a day, but if it is going to stay in your tissue for 10 years, it seems to me there should be no residue on any food, especially grapes.

Senator BELLMON. You mentioned you have found evidence of aldrin in your tests. Does California permit use of aldrin on grapes?

Mr. COHEN. Yes, it does. It permits the use of DDE on grapes. They have an agreement to use sodium arsenic on grapes last year, too. Sodium arsenic caused an epidemic in German vineyards 6 years ago.

Senator BELLMON. What insects are the insecticides supposed to control?

Mr. COHEN. I am not an entomologist, but they control things like mealy bugs and red leaf hoppers.

Senator BELLMON. Do you have an alternate way of controlling these?

Mr. COHEN. At the hearing we had Professor Van Den Bosch, who is an entomologist from Berkeley; Professor Van Den Bosch went into detail on this. What is going on in California vineyards right now is that many salesmen are going to growers during times of the year when they really don't need the use of pesticides. They may have a beneficial bug out in the field and the salesman may come along and say you need to spray something on your grapes, so they kill it and then kill the beneficial bug, and then the grower has to rely upon pesticide to kill the harmful bug that comes up. A careful, controlled, integrated experiment using bugs and all kinds of methods has to be workable. What is happening now, we are having unilateral wholesale use of pesticides. It is being dumped all over the valley. A hundred million pounds of it every year in California. There must be a better way of doing it. I don't know what they are developing. If we put a man on the moon, it seems to me we could kill a bug without poisoning man.

The research they do goes to the bugs and how cheap it can be, but how do you protect a farmworker in the field and how do you protect the consumer? It seems to me they keep raising tolerance but what has to be done with DDT is they have to lower that tolerance to zero.

Senator BELLMON. We have a Federal Food and Drug Administration. Where do they fit in the picture? Why do they allow these abuses to continue?

Mr. COHEN. I know someone has submitted a statement today that talks about the fact that the reported incidence of injuries they have are not at all reflective of how many people are being injured every year because most States don't require reporting of injuries. I think Food and Drug Administration could do a lot more to solve the problem. The farmworkers don't have much faith in the FDA, and when they were labeling illegal with other growers, it took them 4 months just to slap their hands to stop them from doing that, even though it was violation of the Pure Food and Drug Act.

Senator BELLMON. You mention that the Food and Drug Administration allows seven parts per million of DDT as the human tolerance level.

Mr. COHEN. I think that is correct.

Senator BELLMON. Do you object to that?

Mr. COHEN. I think DDT should be banned.

Senator BELLMON. On what basis?

Mr. COHEN. I think it should be banned because if you read the article in the June issue of the Journal of American Cancer Institute, you find that DDT is causing tumors in mice. So it has unknown effect on human beings. If it is contaminating mother's milk to the extent that if it was cow's milk it could not be sold on the market, I think it should be banned. It appears on page 1011 of the Journal of the National Cancer Institute. I think it is a study of tumoragenicity in mice—a preliminary note and I suggest that everybody read it.

Senatore BELLMON. Is it accepted as authentic research?

Mr. COHEN. Yes, but I think Mr. Hayes may be the only exception to that. I think scientists do accept the fact that it causes unknown dangers to humans.

Senator BELLMON. I wonder why the FDA hasn't come to that conclusion.

Mr. COHEN. That is a good question.

Senator BELLMON. Have you ever tried to find out?

Mr. COHEN. We tried to find the FDA with one of our problems, and didn't get any result. So we are going to rely on ourselves, and ban it during bargaining negotiations.

Senator BELLMON. On what basis?

Mr. COHEN. I am saying that there are many scientists that have said it is injurious to human beings.

Senator BELLMON. You are saying the FDA is wrong in their conclusion?

Mr. COHEN. Yes.

Mr. BELLMON. Where are you getting your information other than in the one article that you cited?

Mr. COHEN. I think if you look at testimony that Mr. Yanacone developed in his hearing in Suffolk County, New York, you will find that scientists say that DDT causes grave danger to human beings. If you want us to tell horror stories, we will tell them. In Madison, Wis., Dr. Grace, who is a chemical pharmacologist, and in Tuckahoe, N.Y., states that DDT could be seriously affecting man's sex organ changes. I don't want my sex organs changed any way by DDT.

"They affect the sex organs of rats. DDT seen as peril to mother's milk."

Scientists are making statements like this every day about DDT. I think there is enough doubt that they had better take it off the market.

"The Federal Government recently has banned DDT for 30 days pending a study." That was in an article that appeared on June 16 by Gladwin Hill. If the Federal Government has banned use of DDT for 30 days, I think they have a valid reason to do it.

Senator BELLMON. Why does one Federal agency allow tolerance of seven parts per million when the other is banning?

Mr. COHEN. I don't know.

Senator BELLMON. Do you feel that perhaps the growers might be a little confused as to whether or not it is justifiable if the Federal agencies can't decide?

Mr. COHEN. The growers may be confused but I don't propose to take any chances with my health, and I hope the consumers of this Nation don't propose to take any chances with their health.

If I were confused, I don't think I would take the chance. I don't think I would let the consumers play Russian roulette with their lives.

Senator BELLMON. The memory I have of DDT was that during World War II troops were sprayed with DDT to get rid of some of the pests we were putting up with. I am sure we have learned a great deal about it since that time.

That is all the questions I have, Mr. Chairman.

Senator MONDALE. Thank you very much, Mr. Cohen, for your testimony. We appreciate your assistance. We will insert in the record, at this point, the documents you have presented as well as other relevant materials.

(The material referred to follows:)

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE

COUNTY OF KERN

No. 103595

ATWOOD AVIATION, INC., A CORPORATION, GARRIOTT CROP DUSTING, CO., INC., A CORPORATION, ARVINAIR CROP DUSTERS, ON BEHALF OF THEMSELVES AND ALL OTHER MEMBERS OF KERN COUNTY AGRICULTURAL CHEMICAL ASSOCIATION, AN UNINCORPORATED ASSOCIATION, PLAINTIFFS, VS. SELDON C. MORLEY, IN HIS CAPACITY AS AGRICULTURE COMMISSIONER OF THE COUNTY OF KERN, STATE OF CALIFORNIA, DEFENDANT

MEMORANDUM OF POINTS AND AUTHORITIES IN SUPPORT OF TEMPORARY RESTRAINING ORDER AND PRELIMINARY INJUNCTION

It appears from the verified complaint that plaintiffs who are not involved in the real dispute which is between the growers and the union organizers will likely suffer considerable harassment and expense unless defendant is immediately enjoined from disclosing these records prepared and furnished by plaintiffs. Mr. Morley the Agriculture Commissioner, according to the verified complaint admits that he does not know whether or not the disclosure could be made but that he may make the disclosure if insisted upon as it likely will be, and if that happens all of the damage will be done.

Surely it can harm no one to prevent this at least for the few days involved under the temporary restraining order so that there will be time to make a proper determination.

Certainly if there is an actual suit for damages alleging an injury the specific information in a given case can be required under normal discovery proceedings; therefore, there can be no hardship to anyone who has a legitimate claim and files suit thereupon.

Obviously these people who are putting the pressure on Mr. Morley seek to use the information for their own purposes totally unrelated to the reason for and the intent behind the Agricultural Code Section 11733 quoted in the complaint which requires plaintiffs to prepare these reports and send them to Mr. Morley.

The other code sections referred to in the complaint and which according to Mr. Morley are being relied upon by the persons seeking the disclosure are as follows:

JCP 1888

Public.—Public writings are:

1. The written acts or records of the acts of the sovereign authority, of official bodies and tribunals, and of public officers, legislative, judicial, and executive, whether of this state, of the United States, of a sister state, or of a foreign country;

2. Public records, kept in this state, of private writings."

CCP 1892

"*Public Right to Inspect and Copy.*—Every citizen has a right to inspect and take a copy of any public writing of this state, except as otherwise expressly provided by statute."

Government Code Section 1227

"*Inspection of Public Records and Other Matters.* The public records and other matters in the office of any officer, except as otherwise provided, are at all times during office hours open to inspection of any citizen of the State."

The subject Pest Control Operator Reports obviously are not public writings within the purview of Sections 1888 or 1892. Obviously also they are not "public records" within the purview of Government Code Section 1227, the only possibility being that they could be construed to be "other matters in the office of any officer".

Frankly, in the very limited time available due to the urgency of the situation here we have not been able to accomplish much research on the point and we have not found direct authority on the point but we doubt that the Court will ultimately rule that these people have the right to these records of private business transactions for use in the manner so obviously intended. In any event we urge the Court to grant plaintiffs the immediate prorection of the temporary restraining order and such surely can do no harm to anyone.

Respectfully submitted,

WALL & BYRUM.
By STEPHEN WALL.

JANUARY 7, 1969.

STEPHEN WALL, ESQ.
Bakersfield, Calif.

DEAR MR. WALL: Enclosed you will find a proposed agreement between the United Farm Workers Organizing Committee, your clients, and table grape growers.

As you know, we are involved in a case in which I am personally petitioning the court to inspect the records. However, as General Counsel for the United

Farm Workers Organizing Committee, I am representing not only my personal interests but also the interests of the Union. Therefore, I think it appropriate that the agreement should involve the United Farm Workers Organizing Committee and not me personally. As I told you in your office, the United Farm Workers Organizing Committee is anxious to fulfill its responsibilities to all farmworkers whether or not they are members of our Union.

The most pressing problem which faces us as of now is the ever-increasing danger to farmworker health and safety which arises from the use of dangerous pesticides in the vineyards. The enclosed proposal is an initial step in insuring adequate protection to farmworkers.

As you can see from Parts 2, 3, and 4 of the proposal, we are attempting to obtain information not only from spray applicators who are required to maintain records with the Agricultural Commissioner, but also from growers who are not required to submit any information to the Agricultural Commissioner. The reasons for this are as follows:

As Mr. Griffin stated to us, he has developed a certain expertise in the application of dangerous materials. This case will force him to disclose to the United Farm Workers Organizing Committee certain information concerning the use of pesticides. It is ironic that growers who do not possess the expertise which Mr. Griffin possesses do not have to disclose information to the Agricultural Commissioner. We are fully aware that one possible result of this case will be the ever-increasing use by growers of their own equipment which would inevitably lessen business for more responsible applicators. Therefore, we are anxious to put covered spray applicators as well as non-covered growers under the terms of this agreement. Section 4 which requires growers to post written warnings in the fields where injurious materials have been applied is a minimum safety requirement which I am sure you will fully support in light of your expressed concern for the health and safety of agricultural workers.

We request a meeting in your offices with your clients and representatives of the table grape growers of Kern County on either Thursday, January 9, or sometime in the afternoon of Friday, January 10. We would also appreciate an acceptance or rejection by Monday, January 13. We will assume that no response constitutes a rejection.

Yours truly,

JEROME COHEN.

PROPOSED AGREEMENT BETWEEN UFWOC, THOMAS GRIFFIN, ATWOOD AVIATION CO.,

C. SELDON MORLEY, AND TABLE GRAPE GROWERS IN KERN COUNTY

The United Farm Workers Organizing Committee has recently become aware of the extensive health hazards which accompany the use of pesticides in the vineyards. The United Farm Workers Organizing Committee, as a responsible union proposes to take the following steps to more adequately insure the health and safety of grape pickers whether or not they are members of our Union.

The United Farm Workers Organizing Committee will gather information to enable the farmworkers' clinic to more adequately care for workers who are victims of pesticide poisonings.

The United Farm Workers Organizing Committee will gather information in order to write contractual protections covering the use of dangerous pesticides.

Finally, the United Farm Workers Organizing Committee hopes to establish communications with each grower of table grapes in Kern County in order to develop procedures to insure the safety of the grape workers. The United Farm Workers Organizing Committee believes that this issue of farmworker health and safety supersedes other issues of conflict between the growers and workers and should be resolved even before such other issues are resolved.

A public hearing concerning UFWOC's right to see public records covering the application of economic poisons is scheduled for January 29, 1969. If the following conditions are met, this hearing will become unnecessary:

1. The following information currently on record with the Commissioner of Agriculture should be turned over to the United Farm Workers Organizing Committee:

(a) A description and location of all properties treated with injurious materials.

(b) Date of the treatment.

(c) Material and dosage used.

(d) Number of units treated.

(e) Type of crop involved.

(f) The identity of the equipment used.

(g) If applied by airplane, the name of pilot or pilots who applied the treatment.

(h) The temperature and wind conditions during the time of the treatment.

(i) The name of the grower or grower representative for whom the treatment was applied.

2. All growers who used their own equipment to apply dangerous pesticides must deliver the following information to UFWOC:

(a) Description of properties and location of property treated.

(b) Date of treatment.

(c) Material and dosage used.

(d) Identity of equipment used.

(e) Brief description of qualifications of person applying dangerous materials.

(f) Statement of tolerance level for workers and consumers for each kind of injurious material.

(g) Disclosure of amount of geybral used in vineyards and number of applications of geybral.

3. All growers shall inform the United Farm Workers Organizing Committee three (3) days in advance of application of poisonous materials.

4. Growers shall post written warnings in fields in which injurious materials have been applied. Such warnings shall be in Spanish and in English and shall state in letters six (6) inches high the name of the material which has been applied and the date on which the field will become safe to work in.

WALL & BYRUM,
Bakersfield, Calif. January 8, 1969.

JEROME COHEN, ESQ.
Delano, Calif.

DEAR MR. COHEN: This is in answer to your January 7, 1969 letter to me enclosing a copy of what you propose for agreement between the United Farm Workers Organizing Committee, my clients, and others. It is obvious either that we completely failed to communicate or else you are trying to be funny.

I understood you to say you would advise me as to which portions of the data contained in the subject filed reports you might accept as sufficient in order to settle the existing litigation with regard to those reports already filed. It was my thought that if you would demonstrate at least some degree of reasonableness and good faith by not now insisting upon receiving the privileged information such as specific descriptions of properties and names of persons and companys, which incidentally could be useful to you only in contemplated activity such as filing nuisance lawsuits for propaganda purposes related to your so-called table grape boycott, then perhaps this present litigation might be settled and all concerned could consider the over-all situation free of the increasing bitterness now being generated here.

I understood you to say also that you might now be satisfied with receiving from the subject reports that are now filed only those portions of the data contained therein which could reasonably relate to the announced aim of your Clinic in Delano, being primarily that of improving the general health of agrrcultural workers in the area as well as the standards of safety applicable to their working conditions.

I understood you to say also that your only other interest in seeing these specific reports on file now was for your use in formulating some pertinent contract language for future use in negotiating labor contracts, hopefully. You definitely stated that you were not interested in seeing the subject reports for using any part of the contained data in connection with your boycott effort or as the basis of filing any lawsuit or lawsuits.

But here is what you came back with: You want the name of the grower, the name of the airplane pilot, the name of the material and the dosage used, the legal description of the property treated, the exact date of the treatment, and so on.

These you intend to use in connection with your Delano Clinic or in negotiation of future contracts?

Your actual purpose is clearly evident and there is not even a coincidental resemblance to the ones you expressed. But the end justifies the means in your league—right?

Very truly yours,

STEPHEN E. WALL.

JANUARY 9, 1969.

STEPHEN E. WALL, ESQ.
Bakersfield, Calif.

DEAR MR. WALL: Thank you for your letter of January 8, 1969. I was pleased by your prompt response to my proposal of January 7, but was very sorry that you rejected that proposal even without meeting with us. Let me assure you that the United Farm Workers Organizing Committee is attempting to act reasonably and develop adequate safeguards concerning the use of economic poisons in the vineyards. We are available to meet to discuss this subject at your convenience. We hope that such a meeting will take place soon, for the delay in working out safeguards only hurts the workers and consumers.

Yours truly,

JEROME COHEN.

JANUARY 14, 1969.

MIKE BOZICK,
Chairman, Desert Grape Growers League,
Richard Bagdasarian Ranch,
Mecca, Calif.

DEAR SIRS: We are writing to request a meeting at a mutually agreeable time and place to begin negotiation of a collective bargaining agreement between the California table grape growers and the United Farm Workers Organizing Committee, AFL-CIO.

For nearly three and a half years now, since September 1965, we have carried on a struggle at great cost to both sides and it is time we made renewed efforts to resolve it.

Our international boycott has reached a critical stage in its development. In various communities we have made contact with labor, church, civil rights, and other groups friendly to our cause. The machinery has been set up and the boycott is taking on a certain momentum of its own. We must now decide whether to intensify our efforts and reach out into new communities. Before making that decision we would like to learn your intentions.

There is one critical issue of such overriding importance that it demands immediate attention, even if other labor relations problems have to wait. I mean the harmful effects of spraying grapes with pesticides, or economic poisons, as they are called. We have recently become more aware of this problem through an increasing number of cases coming into our clinic.

We will not tolerate the systematic poisoning of our people. Even if we cannot get together on other problems, we will be dammed—and we should be—if we will permit human beings to sustain permanent damage to their health from economic poisons.

We are willing to meet with your representatives on the sole issue of pesticides, even if you are not prepared to begin full-scale collective bargaining at present. These talks could go even as we pursue our final aim of a fair agreement.

We await your reply on both these proposals by January 20.

If you should answer in the negative on both counts, or if you should choose to ignore our request, we will have no choice but to escalate the boycott. We are appealing to the conscience of the American people to support the farm workers' demand for a better chance in life, and to express that support through decisions in the marketplace. The appropriate method for a nonviolent union such as ours is a direct appeal to the conscience of the American people. Our right to make that appeal, and their right not to buy California table grapes, are things you cannot take away from us. They are both constitutional rights; they are also matters of conscience. The boycott is a revelation of the moral force behind our movement.

Surely it must seem to you at times that you are only running away from the inevitable. The foundations of our resistance campaign are built on quicksand. All the time and effort and money you spend trying to break our strike could be used instead to eradicate misery and hunger, the byproducts of this malignant fog of poverty which has settled over our vineyards.

Should you negotiate an agreement with us, you will find us at best willing and serious-minded allies in all that makes for the prosperity of the table grapes industry. At worst you will be spared the cost of fighting the organization of farm workers. You see, gentlemen, your business is to grow grapes for profit; our mission is to organize workers.

Over thirty years ago officials of the nation's largest industrial giants went about saying that if they were forced to capitulate to the unions, it would not be long until the unions would strangle them and the whole economy to death. Today those giant corporations are still in business and making bigger profits than ever. Wages won through union sacrifice and union effort have supplied the consumer buying power for the most prosperous economic system in world history, and incidentally, for buying your grapes. So you, no less than American industry generally, have good reason to applaud the gains of those other unions. Yet when your own workers want the same benefits, you turn your backs on them.

There is talk at both federal and state levels of farm labor legislation. If we can't agree on wages, hours and working conditions—or at the very minimum even talk about the most important issue of all, which is the protection of human life from the dangers of economic poisons—then how can we ever agree on legislation? What alternative do you have? You won't be able to break our union or stop our boycott. So if you won't negotiate with us, the only route open to you will be repressive legislation, which the American people will not accept.

Viva la Causa!

CESAR E. CHAVEZ, *Director.*

REPORTS OF OCCUPATIONAL DISEASE AMONG AGRICULTURAL WORKERS ATTRIBUTED TO PESTICIDES AND OTHER AGRICULTURAL CHEMICALS, KERN COUNTY, 1967

Type of Industry	Occupation, age/sex	Date of	Nature and extent of injuries	Period of disability
Crop dusting	Swamper 23/M	8-14-67	Handling insecticide spray. Became very ill. Insecticide poisoning.	1 week.
Farm	Laborer, 27/M	7-11-67	Developed a sore throat while breathing insecticides in cantalopes. Chemical conjunctivitis and chemical trachea bronchitis.	Not stated.
Crop dusting	Loader, 27/M	9- 2-67	Reoccurrence of insecticide poisoning. Organic phosphate poisoning suspected. Hospitalized 3 days.	5 days.
Crop dusting	Crop duster, 20/M	7-26-67	Exposure to organic phosphate. Extensive signs and symptoms of phosphate intoxication.	2-3 weeks.
Crop dusting	Swamper, 18/M	10-10-67	Mixing liquid poison, it spilled on me. Organic phosphate poisoning, subacute, now recovering. Hospitalized 2 days.	2 weeks.
Crop dusting	Swamper, 49/M	8-12-67	General systemic poisoning secondary to exposure to inorganic phosphate crop-dusting chemicals.	7 to 10 days.
Crop dusting	Crop duster, 18/M	6-12-66	Accidental exposure to phosphate spray. Developed muscular spasms, and passed out. Had abdominal cramps, sweating and blurred vision. Hospitalized 2 days.	2 to 3 weeks.
Farm	Laborer, 23/M	1-18-67	Filling tank on wheel tractor with DD fumigant. Spray got in my eye, I dropped the tank and sprayed feet and legs. Hydrocarbon burns 1st degree left eye, medial aspect right foot, ankle; lateral aspect left foot, ankle.	2 days.
Farm	Laborer, 49/M	6- 5-67	Changing the hose while fertilizing. The hose blew a hole and I got the fertilizer in both eyes. Could not sleep last night because of pain. Conjunctivitis bilateral eyes chemical irritation.	None.
Farm	Laborer, 31/M	8-25-67	Working on ranch in Buttonwillow. Spray got on legs. Infected legs and feet.	2 weeks.
Farm	Laborer, 17/M	6-19-67	Spraying weed killer. Handle blew off covering patient all over with spray. Fine, superficial rash on both arm and upper body as well as a few areas on the face.	None.
Fertilizer company	Tractor driver, 33/M	6-29-67	Exposed to Bidrin chemical. Nausea, vomiting, cramps (abdominal), dizziness. Organic phosphate poisoning.	1 week.
Farm	Tractor driver, 64/M	5-16-67	Driving tractor through field which had been dusted with sulphur—noticed rash breaking out on both hands, now worse. Weeping eczema back of both hands and wrists—marked swelling of hands.	1 week.
Farm	Sulfur duster driver, 55/M.	6-28-67	Had been driving duster using Ortho-?-Dibrom-Kelthene 44. Emphysema and bronchitis aggravated by sprays.	Not stated.
Farm	Laborer, 36/M	9-17-67	Picking grapes and the insecticide gave him a rash; imflammation flexor surface both forearms and creases with some secondary infection.	1 week.
Crop dusting	Laborer, 19/M	8- 8-67	Mixing chemicals for the crop dusting plane and splashed it on my feet and legs (phosdrin insecticide). Poisoning with insecticide; nausea, vomiting, muscle twitching calves of legs, profuse sweating. Hospitalized.	1 week.
Farm	Ranch foreman, 58/M	3- 8-67	Injecting D.D. soil fumigant into ground, got some on right foot, irritated and infected now. Fumigant got into boot, blistered toe, now cellulitis entire toe.	None.
Farm	Unknown, 31/M	5-13-67	Driving down road chain broke on pump, pump spinned around and busted hose, some ammonia sprayed into right eye. Purulent conjunctivitis, right eye.	1 week.
Crop dusting	Pilot, 48/M	8-26-67	Hose blew off and I got sprayed. Continued working but sick to stomach, nausea continues, dizzy and spots before my eyes. Now I have trouble getting my breath. Chemical poisoning (Azadrin). Mild shock, hypotension, Dyspnea, cyanosis. Hospitalization recommended; patient refused.	Not stated.

REPORTS OF OCCUPATIONAL DISEASE AMONG AGRICULTURAL WORKERS ATTRIBUTED TO PESTICIDES AND OTHER AGRICULTURAL CHEMICALS, KERN COUNTY, 1967—Continued

Type of industry	Occupation, age/sex	Date of	Nature and extent of injuries	Period of disability
Farm	Unknown, 17/M	7- 8-67	Spraying weed oil and the wind blew it on his face and feet burning them. Contact dermatitis of face and feet.	3 days.
Farm	Laborer, 42/M	9-28-67	Loading grapes. Has rash on right side of face. Exposure to Sulfurdiox, rhinitis, pharyngitis, rash on right side of face.	3 days.
Farm	Laborer, 21/M	5-16-67	Spraying weeds, nozzle broke and he got sprayed with weed oil, itches. Chemical dermatitis.	1 week.
Farm	Laborer, 49/M	7-30-67	Working in vineyard, irritation of eyes from insecticides. Contact dermatitis.	None.
Farm	Ranch hand, 23/M	5-29-67	Working with sulfur, dusting in field. Also welding without protective glasses. Conjunctivitis, both eyes, irritative.	Not stated.
Farm	Laborer, 45/M	3-24-67	While flagging a plane crop dusting, was sprayed with chemical. Became nauseated and vomited within a few minutes. Appears nervous and apprehensive. Complains of dizziness, weakness, nausea, chest pain and blurred vision. Has erythematous rash over neck, chest and arms. Hospitalized for unknown length of time.	2 weeks.
Farm	Truck driver, 22/M	8-28-67	Was mixing Methel parathion and became sick. Was nauseated and felt weak and dizzy. Possible symptom exposure to parathion.	Not stated.
Farm	Truck driver, 38/M	2-17-67	Filling tank with D.D. solution, hose slipped and D.D. solution got in eyes and on back and chest. Chemical irritant conjunctivitis, bilateral, mild.	None.
Fertilizer and insecticide company (services).	Laborer, 29/M	7- 8-67	While spraying insecticides on cotton, sprayed self on arms and chest. Contact chemical dermatitis.	3 to 5 days.
Fertilizer and insecticide company (farms).	Laborer, 23/M	10-25-67	Was mixing a spray of zinc blue stone and lime and burned both hands. Vesicular dermatitis, contact type, fingers and hands bilateral, moderate.	5 to 7 days.
Spray and pest control	Sprayer, 37/M	2-17-67	While operating spray equipment some of the spray material blew back on him. Contact dermatitis with vesicular weeping areas around neck and forearms.	1 week.
Farm	Laborer, 32/M	5- 5-67	Was fumigating potato ground, got some chemical on right shoe, penetrated leather and burned right foot.	None.
Crop dusting	Groundrig, 22/M	6-25-67	Just started feeling sick. General systemic poisoning secondary to work exposure to inorganic phosphate crop-dusting chemicals.	4 to 6 days.
Crop dusting	Swamper, 42/M	7-28-67	Generalized systemic poisoning secondary to exposure to inorganic phosphate crop-dusting chemicals, incurred while at work.	Not stated.
Grop dusting	Swamper, 18/M	8- 2-67	General systemic poisoning secondary to exposure of inorganic phosphate crop-dusting chemicals incurred while at work. Weakness, nausea, vomiting, abdominal cramp-like pain.	7 to 10 days.
Crop dusting	Flagman, 19/M	7-27-67	Generalized systemic poisoning secondary to exposure to inorganic phosphate crop-dusting chemicals, incurred while at work. Hospitalized 1 day.	3 to 5 days.
Crop dusting	Unknown, age unknown/M.	10- 7-67	Parathion poisoning—severe, incurred while at work. Hospitalized 4 or 5 days.	1 month—6 weeks.
Crop dusting	Flagman, 18/M	5-20-67	General systemic poisoning secondary to exposure to inorganic phosphate crop-dusting chemical. Hospitalized for unknown length of time.	7 to 10 days.
Farm	Laborer, 38/F	Over a period of time.	I work with grapes and I developed a reaction from the dust on the grapes. Fatigue, weakness. Has sinus drainage which causes productive coughing. Has grayish streaked phlegm. Throat red.	4 days.
Farm	Laborer, 42/M	5-15-67	Was working where they had sprayed sulfur and developed a rash on his face, arms, and hands. Contact dermatitis.	7 days.
Crop dusting	Swamper, 42/M8	8-27-67	Inhalation Parathion, chemical poisoning. Hospitalized 7 days.	5 to 6 weeks.

REPORTS OF OCCUPATIONAL DISEASE AMONG AGRICULTURAL WORKERS ATTRIBUTED TO PESTICIDES AND OTHER AGRICULTURAL CHEMICALS, KERN COUNTY, 1967—Continued

Type of industry	Occupation, age/sex	Date of	Nature and extent of injuries	Period of disability
Potato contractor	Mechanic, 33/M	2–15–67	Planting potatoes in Wasco. Got piece of fertilizer in left eye. Eye markedly red. Swelling and edema present from the irritation to the conjunctiva.	Not stated.
Farm	Laborer, 25/M	5–11–67	Spraying weeds . . . got insecticide in eyes. Bilateral spray "burns" (erythema) of face and ears plus bilateral conjunctivitis.	None.
Farm	Laborer, 37/M	9– 7–67	I was fertilizing the ground, I opened the valve, fertilizer sprayed me. Chemical burns from fertilizer spray.	1 day.
Crop dusting	Flagman, 16/M	8– 9–67	Possible organic phosphate poisoning. Heat exhaustion.	7 to 10 days.
Farm	Laborer, 67/M	9–29–67	Working in vineyard, gradual onset of rash on left arm, possibly due to insecticides used in vineyard. Contact dermatitis.	None.
Farm	Laborer, 66/M	Gradual onset	After working in vineyard noted gradual appearance of a rash on both arms, believed due to insecticides. Contact dermatitis.	None.
Turkey ranch	Laborer, 52/M	6–21–67	Patient was spraying ground with oil. Wind caused to spray on hands. Hands show signs of burns or infection. Acute contact dermatitis of the hands.	None.
Farm	Laborer, 57/M	3–14–67	Packing carrots and insecticide from carrots caused burning rash. Bilateral contact dermatitis of hands and forearms.	2 months.
Crop dusting	Crop duster, 33/M	Unknown	Was exposed to phosphate poisoning. Ortho phosphate poisoning. Was Hospitalized.	Not stated.
Crop dusting	Crop duster, 47/M	Unknown	Exposed to phosphate sulfate. Phosphate poisoning. Hospitalized 3 days.	Not stated.
Crop dusting	Crop duster, 44/M	Unknown	Leak in lid of Phosdrin tank. Phosphate poisoning. Hospitalized for unknown length of time.	Not stated.
Farm	Laborer, 40/M	8– 9–67	After spraying insecticides noted gradual appearance of rash on body. Contact dermatitis from waist down with itching and scratching.	1 week.
Turkey ranch	Laborer, 52/M	6–22–67	Developed a crusting, itching rash over his hands and face, several days after using an insecticide. Contact dermatitis of hands and face.	1 to 2 days.
Farm	Foreman, 46/M	5– 1–67	I was working in poison and now I have diarrhea and sweating. (Malathion type drug). Nausea.	None.
Farm	Cowboy, 22/M	11– 5–67	Was working with cattle, organic phosphate. Swollen and has a rash. Possible organic phosphate poisoning rash and swelling of both wrists, ankles, thighs and face.	None.
Farm	Laborer, 39/F	Gradual onset	Working in vines noticed face irritating. Allergic rash on face due to sulfur.	2 to 3 days.
Farm	Laborer, 17/M	7– 4–67	While spraying with Tedion Thiodan 25-25, breathed fumes and later developed aching and soreness in shoulders and chest wall. Possible chemical toxicity.	None.
Farm	Laborer, 28/F	6–23–67	Allergic conjunctivitis of right eye due to grape spray.	None.
Farm	Laborer, 39/M	7–15–67	Patient got sulfur in his eyes. Allergic conjunctivitis.	None.
Farm	Laborer, 31/M	7– 6–67	Filling NH_3 tank on tractor, valve leaked permitting ammonia to escape striking chest and abdomen and lips. First degree burns from ammonia, chest, abdomen, slight burn to lips.	1 week.
Farm	Laborer, 42/M	6–20–67	I was dusting cotton and I got some sulfur into both my eyes. I was on the cultivator behind the sulfur duster. Mild bilateral eye irritation, probable chemical due to sulfur.	None.
Farm	Laborer, 59/M	5–19–67	A hose broke on a spray rig and I got some weed oil in my eyes. My eyes are burning now. Chemical conjunctivitis each eye.	None.
Agricultural pest control	Rig driver, 23/M	5–19–67	I was turning the rig in the field and aqua ammonia flew in both eyes. Chemical conjunctivitis in both eyes, worst in left.	None.

REPORTS OF OCCUPATIONAL DISEASE AMONG AGRICULTURAL WORKERS ATTRIBUTED TO PESTICIDES AND OTHER AGRICULTURAL CHEMICALS, KERN COUNTY, 1967—Continued

Type of industry	Occupation, age/sex	Date of	Nature and extent of injuries	Period of disability
Farm	Laborer, 22/F	9- 1-67	Picking grapes, sulfur and dust caused both eyes to swell. Bilateral allergic conjunctivitis with conjunctival edema and eczema-like reaction to eyelids.	1 week.
Farm	Serviceman, 47/M	5-23-67	Ran some Nemigon into right boot accidentally. Has burn all up and down right leg from top of foot about ⅔ way to knee.	None.
Farm	Laborer, 61/M	12- 8-66	Was down in vat where they dip potatoes, cleaning it. Felt burning in lungs and got sick to stomach. Says he was breathing chemical fumes (bichloride of mercury). Suspected chemical poisoning.	None.
Farm	Laborer, 46/M	4- 5-67	Was spraying weed killer, walking through the weeds, came in contact with lower legs causing burning and rash. Contact dermatitis on legs.	None.
Crop dusting	Laborer, 19/M	8-28-67	Loading chemicals on airplane, inhaled fumes, still has headache and nausea. Exposure to organic phosphate.	3 days.
Farm	Ranch foreman, 54/M.	5-11-67	Insecticide poisoning, both hands. Erythematous, palms.	Not stated.
Farm	Laborer, 58/M	5-23-67	Working with fertilizing equipment, valve came loose allowing ammonia to strike the right eye. Irritation right eye due to ammonia.	1 week.
Farm	Laborer, 21/M	7-14-67	Spraying cotton, some struck face and arms with subsequent blisters, scabbing and itching. Infected dermatitis left cheek, right elbow.	None.
Crop dusting	Flagman, 17/m	10- 1-66	Loading organic phosphates for crop duster, inhaled some dust. Phosdrin.	1 week.
Farm	Unknown/M	5-26-67	Mixing weed spray and got some powder in eye. Chemical irritation, no burn.	None.
Farm	Laborer, 38/M	6-15-67	Working in vineyard, sulfur got in both eyes. Bilateral conjunctivitis, burning of eyelids.	3 days.
Farm	Laborer, 17/M	6-26-67	Working in field, got weed oil in both eyes Bilateral conjunctivitis.	1 week.
Farm	Foreman, 45/M	4-67	Nausea, vomiting for 1 month. Blurred vision, difficult respiration. Organic phosphate poisoning (Thimite).	4 days.
Farm	Laborer, 25/M	7-22-67	Sprayed in eyes with weed oil. Burned both eyes.	1 week.
Farm	Laborer, 30/M	8- 5-67	Spraying weeds and ammonia sprayed into eyes and face. Chemical burns forehead and eyes.	1 week.
Farm	Laborer, 63/M	Unknown	Exposure to agricultural chemicals including sulfur sprays. Severe erythematous, oozing, crusted, edematous involvement of the exposed areas of the face, arms and neck.	1 to 3 weeks.
Farm	Laborer, 19/M	8-31-67	I was tieing small orange trees on a stake and my hands broke out from the spray on them. Allergic dermatitis both hands.	None.
Farm	Laborer, 28/M	8-10-67	Spraying some weeds, got weed poison in right eye. Chalazion, right eye. Caused by the irritant and rubbing.	1 day.
Farm	Laborer, 47/M	10-17-67	While working in cotton with insecticides, developed rash all over body. Contact allergic dermatitis—chemical.	None.
Crop dusting	Swamper, 18/M	8-10-67	Working with spray insecticides and became ill after coming in from field. Shortness of breath. Nausea—also drank water contaminated with insecticide.	2 to 3 days.
Farm	Laborer, 19/M	2-20-67	Eruption occurred on face after spraying weeds with a chemical. Contact dermatitis.	None.
Farm	Laborer, 22/M	8-28-67	I was spraying weeds and I got weed oil sprayed into both my eyes and onto my neck and arms. Mild chemical irritation of the eyes.	None.
Farm	Laborer, 37/M	5-15-67	I was fertilizing some fields and I got some aqua ammonia in my eye. Conjunctiva inflamed; mucoid discharge. Chemical conjunctivitis.	None.
Farm	Laborer, 27/M	10-12-67	Spraying weeds and got rash on both hands. Contact demratitis both hands.	1 week.

REPORTS OF OCCUPATIONAL DISEASE AMONG AGRICULTURAL WORKERS ATTRIBUTED TO PESTICIDES AND OTHER AGRICULTURAL CHEMICALS, KERN COUNTY, 1967—Continued

Type of industry	Occupation, age/sex	Date of	Nature and extent of injuries	Period of disability
Farm	Laborer, 33/M	6-26-67	Ammonia in both eyes while working. Chemical conjunctivities.	None.
Farm	Laborer, 17/M	5- 6-67	Was working around weed killer, started to break out face, neck, arms and hand. Multiple crusted infected areas with surrounding tissues red and inflamed.	None.
Farm	Laborer, 56/M	3- 9-67	I used ammonia and fertilizer in irrigating, skin on my right hand started to dry and crack. Celljulitis right major hand marked edema.	3 days.
Crop dusting	Swamper, 53/M	8-24-67	Loading plane with sacks Sevin and sulfur. Opened the sacks, transferred chemical to bucket to take to plane. Wearing mask and goggles. Sudden weakness, dizzy and could not get my breath. Chemical toxemia due to insecticide.	3 days.
Farm	Laborer, 52/M	6-27-67	Was working with chemicals on the ranch and got sick. Nausia, vomiting, diarrhea.	3 days.
Farm	Laborer, 54/M	7-12-67	Sulfuring grapes, has rash on arms and body. Typical erythematous popular rash over trunk and arms.	3 days.
Farm	Laborer, 58/M	9- 5-67	Working in the fields, came in contact with sulfur dust on weeds, has rash on both hands. Eczematoid reaction dorsum of hands, wrists, back of neck; allergic-type reaction.	3 days.

Source: State of California, Division of Labor Statistics and Research. "Doctor's First Repo rt of Work Injury." Compiled by State of California, Department of Public Health, 1968.

Excerpts From Testimony of Thomas H. Milby, M.D., Chief of the Bureau of Occupational Health, California State Health Department

The following are excerpts of *Thomas Milby*, chief of the bureau of occupational health in the California State Health Department.

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Thomas H. Milby, M.D., called as a witness on behalf of the intervener, and being first duly sworn, testified as follows:

DIRECT EXAMINATION BY MR. AVERBUCK

Q. State your full name, please.
A. Thomas H. Milby.
Q. What is your current occupation?
A. I am Chief of the Bureau of Occupational Health in the State Health Department—the California State Health Department, and I am a physician.
Q. How long have you been in the position of Chief of the Bureau of Occupational Health?
A. About three years.
Q. And before that—between 1962 and 1966—what was your occupation?
A. I was a medical officer in the same bureau.
Q. Were you not the head of Epi . . .
A. Head of the Epidemiology Section.

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Q. And what is that section concerned with?
A. It's concerned with the special studies of skin diseases.
Q. And between 1959 and 1962?
A. I was a medical officer with the US Public Health Service, Division of Occupational Health.
Q. Where did you receive your pregraduate training?
A. Purdue University.
Q. And following that, did you then obtain an M.D.?
A. An M.D. degree at the University of Cincinnati.
Q. And following that, did you have any internship–

A. I interned at Ohio State University Hospital in Columbus.
Q. Did you receive an M.S. Degree?
A. Yes, I have an M.S. degree from the University of Cincinnati in Industrial Hygiene.
Q. And finally, did you receive another degree?
A. Yes, a Master of Public Health degree from the University of California.
Q. Are you involved with any professional organizations?
A. Yes. I am the Secretary of the Western Industrial Medical Association. I am an editor of the Journal of Occupational Medicine—case report editor.
Q. And are you a member of the American Public Health Association?

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A. I'm a member of the American Public Health Association, and I am Board certified in occupational medicine by the American Board of Preventive Medicine.
Q. Would you please explain what it is when you're Board certified, to the court?
A. Yes. The American Board of Preventive Medicine is similar to the American Board of Surgery, the American Board of Internal Medicine, whereby one, to gain access to the Board, must fulfill certain residency requirements, certain training requirements, and pass certain examinations.
Q. Dr. Milby, do you have any connection with the University of California School of Medicine?
A. Yes, I'm a research associate at the medical center at the University of California in San Francisco.
Q. Have you done any—made any publications concerning economic poisons and pesticides?
A. Yes, I published a number of papers in the area of toxicology of these agents, and have been a contributor to a book on the subject.
Q. Have you done any research in the area—field research?
A. Yes. Over the period of the last four years, I have conducted a number of studies of economic poisons.

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A witness on behalf of the intervener, resumed the stand, having been previously duly sworn and testified as follows:
Q. You understand you are still under oath, Dr. Milby–
A. Yes.
Q. Has your department found that there have been special problems in agriculture due to the use of pesticides–
A. Yes, sir.
Q. Would you describe some of these problems?

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A. Well, there have been many problems. Possibly the most serious one that has occurred within the span of my memory with the Health Department is the last five or six years has been the episode of peach-picker poisoning in Stanislaus County, which I incurred several years ago, in which case there were some one hundred individuals, peach pickers, who were made clinically ill, and some undetermined number—probably far exceeding the one-hundred—who had aborbed enough of the toxin to have a detrimental effect on certain of their enzyme system specifically Cholinesterase. There have been other such episodes in the last eight or ten years. This is one that was studied in some great detail, and which has contributed somewhat to our knowledge of the problem.
Q. What is Cholinesterase?
A. Cholinesterase is an enzyme which is found in a number of tissues in the body, but its primary importance is that it is active in mediating nerve impulses; that is, as the nerve impulses—and I think you could think of it in terms of an electrical impulse—as a nerve impulse comes down the nerve, it needs to cross certain junctions, which are, in fact, spaces. Cholinesterase is an enzyme which is involved in this nerve crossing.
Q. Would it help you if you used the blackboard to describe the way it works?
A. I could do so if you like.
Mr. Averbuck. Your honor, with your permission?
The Court. Surely.

The Witness. This is a schematic of the nerve. The nerve impulse comes down this way, and it must cross a junction called the neuron here. When the nerve impulse comes to this spot, it must cross this space. To do so, a compound call Acetylcholine is produced here.

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Acetylcholine allows the impulse to cross to the other side. Almost instantaneously the Acetycholine is destroyed by an enzyme called Acetylcholinesterase. The term ASE. This compound destroys the Acetylcholine, and therefore breaks the contact. And in a normal situation, this is what occurs.

Q. (By Mr. Averbuck) What would be Cholinesterase in your description that you gave?

A. Well, in the first place, the Acetylcholine is produced. It is destroyed by Acetylcholinesterase. Any phosphate compounds destroy or inhibit the Acetylcholinesterase; therefore allowing the Acetylcholine to remain there, and, therefore, you have a short circuit.

Q. Now, you mentioned organic phosphate compounds. Could you give us examples of those in economic poisonings?

A. There is a long series of them. Parathion, TEPP, Diazion, Azodrin, and others.

Q. And others?

A. Many others.

Q. These different pesticides, you say, actually destroy the Cholinesterase?

A. They inhibit. They unite chemically with the Cholinesterase and inhibit its action in the destruction of this material Acetylcholine; and therefore, a nerve which is under the effect of the organic phosphate compound. This compound, which allows the impulse to go across, is not destroyed; and, therefore, you have a short circuit and a continuous nerve action.

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Q. Can you explain the effect on the human body by that short circuit–

A. Yes. This setup—this particular physiological setup is in only certain parts of the body; that is, there are a number of several kinds of—several nervous systems involved, and I won't go into a technical description of these. But the upshot is this—that in the certain systems such as certain glands, such as the sweat glands, the salivary glands, and certain other glands are involved here, as well as certain of the voluntary muscle systems; therefore, in an individual who's under the influence of the organic phosphates, who has—will have such things as muscle twitching, muscle paralysis, salavation. They will have difficulty breathing because of secretions which are build up because of this action. They will have pupillary construction, which we call myosis. And you will have excessive sweating. You will have nausea and vomiting. You will have headache because of the central nervous system effect of this thing, and you will have several other symptoms.

Q. Can that be lethal?

A. Yes.

Q. Has it been lethal?

A. It has been lethal.

Q. Do you know if it has been lethal to farm workers?

A. It has been.

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Q. Do you know, for instance, which kind of pesticides have caussed fatalities to farm workers?

A. Yes. I know from personal experience that Phosdrin, TEPP, which we spoke of before, Parathion, for three examples. All have been.

Q. Dr. Milby, you talked about—excuse me if I mistate this—pupillary constriction, and headache. In your experience, do people who have been poisoned by Parathion, for example—do they lose their sense of judgment?

A. Well, they could, yes, but primarily because they are ill—because they are exceedingly ill. And the usual picture of Parathion poisoning is headache, nausea, vomiting, and the other things I spoke of—heavy sweating and difficulty in breathing. And, of course, under those circumstances, one could lose their judgment, but the compound itself would not primarily affect judgment.

Q. I understand, but can it, because of the illness involved, cause a dizziness?

A. Yes.

Q. Do you have any idea as to the long-term effects of acute poisoning by Parathion, assuming the person lives?

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A. It is very difficult problem. There is not much known about it, but in my clinical judgment, in my experience, individuals who are poisoned by the organic phosphates, primarily Parathion, take a long time to recover. It may take months. And during this recovery phase, they have loss of appetite. They have lassitude, and they have symptoms which are difficult to evaluate. But they certainly have symptoms for many months, but in terms of years—no, I think not.

Q. Have there been any pesticides which you feel may cause permanent nerve damage?

A. Yes. There have been several pesticides which have shown to have produced permanent nerve injury. These have not been used in California or elsewhere in this country, to my knowledge, because the evidence that they produce permanent injury appeared during their early phase of production, and they were withdrawn. But to my knowledge there are no compounds used here which produce permanent nerve damage.

Q. Doctor, have you done any work in regards to Malathion?

A. Yes.

Q. Is that a fairly nontoxic organic phosphate?

A. Malathion is a compound which is handled very well by the warm-blooded animals; therefore, it is not very toxic to warm-blooded animals. It is quite toxic to insects.

Q. In terms of this pesticide, Malathion, what would be the kind of dosage of concentrated Malathion to kill a human being?

A. It would be several ounces.

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Q. How about Parathion?

A. The toxic dose to an adult human being of Parathion would be more on the order of half a teaspoon.

Q. And what about TEPP?

Mr. Jordan. Objection, if you will. Do I gather we are talking about taking it orally?

The Witness. Yes, sir.

Mr. Jordan. Thank you.

The Witness. The compounds are also toxic by skin absorption, but I was referring to oral dosage.

Q. (By Mr. Averbuck) And TEPP—how much orally would that take?

A. In a rough approximation, several drops.

Q. Several drops could kill?

A. Several drops would be a lethal dose—of lethal TEPP.

Q. Now, the point has been brought out that this is the oral toxicity for lethal dosages. Is it possible for the human body to take these pesticides in any other avenues?

A. Yes. The other two avenues—routes of entry—are through the skin—through the intact skin, and also through the respiratory system—through inhalation of dusts or mists. They are somewhat less toxic. Some of them are somewhat less toxic if applied to the skin. Some are more toxic by skin than by mouth. Respiratory toxicity is not well-understood.

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Q. But is it not true that Cholinesterase has a certain norma ; level in the body?

A. Yes. Certainly Cholinesterase does, and malnutrition in certain other states will reduce Cholinesterase level in plasma.

Q. You mentioned—we have talked about residues and about the different ways poisons can get to people. Let's extend that to that incident which you referred to—the peach harvest in Stanislaus County. Were you there— Did you approach the subject, or what happened?

A. Yes. Through the country health officers health in Stanislaus County we became aware that there was a serious problem among peach pickers insofar as they were becoming ill with some condition which wasn't described. We went to the area, and through doing blood tests—Cholinesterase—and through observing the operations, we determined that the peach pickers were becoming ill because of the residues on the peach trees. We reviewed in great detail the application of pesticides on these trees, because we had determined through methods, which I had discussed, and Cholinesterase testing, and through clinical operation, that the peach pickers had Parathion poisoning, and this was no longer in our minds a question.

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The question was why did they have Parathion poisoning, because in general, residues have not been shown to be toxic. We reviewed the problem very carefully, and found that as a matter of fact, in certain orchards in that area where they had applied Parathion in very heavy doses, although perfectly within legal limits—where they had applied Parathion in great amounts in these orchards—the Parathion or a Parathion related substance had remained and were producing, even as long as two and three and four weeks after the last application, was producing illness in the peach pickers.

Q. Dr. Milby, let me see if I understand what you said, The actual residue on the leaves were not in violation of the law. Is that correct?

A. The residue on the fruit was not in violation. There is no tolerance for residue on leaves, but the residue on the fruit was well within legal limits.

Q. And yet farm workers were still getting ill up to four weeks, did you say?

Mr. Jordan. I will object to leading his witness, your honor.

The Court. Objection overruled. He is merely restating the question.

Q. (By Mr. Averbuck) Did you say that even with this residue level, farm workers were injured over four weeks after the application?

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A. In some instances, yes.

Q. Dr. Milby, how did you discover the fact that so many applications had been put on the different crops?

A. In the case of peaches, the canners who buy the peaches, as a condition of purchase, require that they be provided with a schedule of the spray applications that went on those fruit trees over the year. We simply asked the canners for these records, which they provided to us. And we were able thereby to tell what sorts of pesticides and how much went on the trees.

Q. And the canners voluntarily gave them to you?

A. Voluntarily.

Q. Do you know of any other source you might have had if the canners would have refused?

A. Well, the Agriculture Commissioner in Kern County—or rather in Stanislaus County—would have made the information available to us.

Q. And how would he have made that information available to you?

A. Well, it was my understanding that he had it, because as part of his requirement, he received this information. He worked very closely with us and would have given us this information, except it was more convenient for us to get it elsewhere, because it was in the form we needed.

Q. Doctor, that incidence you gave us in peaches, that was with Parathion?

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A. That was with Parathion.

Q. Do you know if Parathion is currently being sprayed?

A. Yes, Parathion is a very popular pesticide. It is being sprayed, yes.

Q. What about TEPP–

A. TEPP is being used, as well.

Q. Finally, Doctor—excuse me—so I can get this straight, when you say that Parathion and TEPP are being sprayed now, do you mean right at this time of the year?

A. Well, first of all, let me say I am not an expert on when spray is applied to what products. I do know, however, in my experience with, for example, peaches, that Parathion is applied at almost all times of the year. It is applied before the leaves come out to destroy certain insects. It is applied about the time that the bugs come out to do other things. It is applied two or three times during the period when the leaves are out and the fruit is growing. I suppose there are other times of the year when it isn't but it is put on for many months, time and time again. And I am really not conversant enough with the use of this material and other crops to comment.

Q. Doctor, two more questions, please. Have there been other injuries from pesticides and economic poisons in Kern County to farm workers to your knowledge?

A. Based on the reports that we have received that we discussed yesterday

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Mr. Jordan. I will object to the question as calling for a conclusion. The answer so far indicates he does not know of his personal knowledge.

The Court. Objection overruled. He is basing it on the exhibit. Go ahead.

The Witness. Based on my knowledge of the reports which we have received, the answer is yes.

Q. (By Mr. Averbuck) The exhibit that we had a tough time getting in yesterday, and I apologize for that, that was finally—did get in—that was for the year 1967. Is here one for 1968?

A. We have nothing for 1968 which is ready for preparation. It takes a while to analyze these things.

Q. And, therefore, there may have been injuries in Kern County for 1968?

A. There may have been, but I have no personal knowledge of that.

Q. The fact that there were, according to that list, ninety-five different—over ninety-five different injuries in Kern County in 1967, does that mean it was a unique year, or were previous years similar?

A. We have no report—I have no similar reports on previous years.

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A. Yes, sir, you may conclude that. Only organic phosphate pesticides and certain war gas materials, to my knowledge.

Q. How do you know that the short circuit has occurred?

A. We measure the amount of Cholinesterase in the blood, which is an indirect indicator.

Q. What is the outward symptom that leads you to believe there is a short circuit?

A. It is a simple complex, sir. It is not any single symptom.

Q. Does it involve convulsing, for example?

A. It may.

Q. Is convulsing always a result of pesticide poisoning?

A. Asbolutely not. There are many things that cause convulsions.

Q. Does this short circuit—has this got anything to do with the synapses?

A. Yes.

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A. When he asked about pupillary constriction, there aren't very many things that cause that. And, as a matter of fact, the organic phosphate pesticides, to my knowledge, have their basis in the war gas materials. They don't happen to be gases, of course, but they have these so-called war gas, as I think of it, as a compound which inhibits Cholinesterase, which is an organic phosphate; so war gases and organic phosphate pesticides have a very close similarity.

Q. Doctor, the question was raised as to, possibly the validity of these First Doctor's Reports.

A. Yes.

Q. In your experience—or the trustworthiness of these Doctor's Reports—in your experience, Dr. Milby, have you found that doctors report all of the incidences that have been caused by pesticides, or that we only know some of them?

A. We have not done any studies on the reporting of physicians on pesticides. We have done studies on the completeness and validity of over-all reporting.

Q. And what has been your result?

A. We have found—number one—it's very difficult to answer that question about do they report everything they see. I don't known. We have found, however, that those cases which are reported are, in general, valid.

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Q. Finally, Doctor, in regards to Kern County—you mentioned there was a study that was done down here.

A. It—we have done a study in Kern County. Yes, sir.

Q. And do you know what that study concerned?

A. It was a—it had many facets to it, but, primarily, it was involved in collecting tissues to analyze for pesticides. There were primarily autopsy tissues; and, secondarily, there was a study which was done here to compare certain kinds of mortality—from certain causes in the pesticide days, that is now versus the days before pesticides, and to see whether there was any difference in the causes of death.

Q. Was there any difference?

A. No.

Q. Did the study also go into the question concerning different growers in these areas?

Excerpts From Testimony of Thomas C. Griffin, Coowner of a Pesticide Company

The Following are excerpts of Thomas Clyde Griffin, coowner of a pesticide company.

THE PAGES INDICATED BELOW ARE TAKEN FROM TRANSCRIPT

Thomas Clyde Griffin, called as a witness on behalf of the plaintiff, and being first day duly sworn, testified as follows:

DIRECT EXAMINATION BY MR. WALL

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Q. Would you state your name, please?

A. Thomas Clyde Griffin.

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Q. And what is your occupation?

A. I am engaged in the field of agricultural pest control.

Q. Are you a member of the organization known as the Kern Agricultural Chemical Association, which the members of whom are the plaintiffs in this proceeding?

A. One of the companies, which I am a co-owner, is a member of the Kern Ag Chemical Association.

Q. And you are also an officer of that company–

A. Yes. I am the president of that corporation.

Q. And what is the name of that corporation–

A. Southern Valley Chemical Company, Inc.

Q. Mr. Griffin, you made the declaration supporting application for preliminary injunction under oath, which has been filed in these proceedings that have been referred to. Is that correct?

A. That is correct.

Q. Are you that gentleman?

A. Yes, sir.

Q. Your honor, could I——

The Court. It has been admitted in evidence, Mr. Wall. It is not necessary to cover all the details.

Mr. Wall. All right, fine. I just want to refer him, your honor, without—I will not go in and repeat what is in there. I just want to——

CROSS-EXAMINATION BY MR. AVERBUCK

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Q. Mr. Griffin, so we can get that last question as clear as possible, I show you now a copy of your deposition.

Mr. Wall. Page, counsel.

Mr. Averbuck. Page 32. Line 9, I believe is when it starts. Could you please read that to the court?

The Witness. Do you wish me to start where you have outline it?

Q. (By Mr. Averbuck) Well, I believe that is where the question begins.

A. All right.

Q. Mr. Wall had objected so I believe I rephrased the question.

A. "Q I will rephrase the question. Do you feel you would have given this information to Mr. Morley had he requested it without giving you a guarantee of it being confidential?

"Mr. Wall. You mean all of the information contained is these reports?

"Mr. Averbuck, Exactly.

"The Witness. I am going to be perfectly honest with you and say this, that as a licensed operator in this county, having filed in this county, if I am given a report that has this information on it and this is the report that I am to file, then I will file it, regardless of whether—that is the way I see it, Steve.

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Q. Thank you. Did you ask them why they had limited to that period?

A. No, and I would like to point out—when I point out I would like to state this—and certainly, this is no reflection on the fine Kern County Department that we have down here where we have people to help us within this matter, but many times there are decisions that can only be made by those of us in the field. You ask if I ask them—should I make this—can I make this application or should I make it, and I suggest to you that this department itself has asked me at times to take part in their seminars to inform them on pest control.

Q. Thank you. Don't you feel somebody should watch over the people who apply economic poisons?

Mr. Wall. I object, your honor.

The Court. That will be sustained.

The Witness. Yes, I agree.

The Court. The objection was sustained.

The Witness. Sorry.

Q. (By Mr. Averbuck) Does your company use Parathion?

A. My company uses Parathion.

Q. Does your company use Malathion—

A. My company uses Malathion.

Q. When do you use Malathion?

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A. We generally use Malathion when I feel it is safer to use Malathion than it is Parathion.

Q. And could you give us examples of when it would be safer to use Malathion than Parathion?

A. Certainly, I would be more than—

Mr. Jordan. I will object to the relevancy of the question.

Mr. Averbuck. I think the answer will explain the relevancy.

The Court. I will overrule the objection.

A. I would use Malathion when I have a house on the property that is being treated, or when I might have adjoining livestock that are close and there could be a drift on that livestock. This is a discrimination I make for the safety of people around me or animals.

Q. So, in other words, you will not use Parathion if you feel it would hurt human beings?

A. Certainly, that is so.

Q. So you feel it can hurt human beings?

A. There is no question about it.

Q. What about TEPP? Do you use that?

A. Yes, I use Tetraethyl pyrophosphate.

Q. Do you use it now?

The Court. Didn't we all stipulate in the beginning that these things were—

Mr. Averbuck. There is a special point on this that was brought out in the deposition.

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The Court. I recall we stipulated that these could hurt people.

Mr. Averbuck. Well, this is a very crucial point, your honor.

Q. (By Mr. Averbuck) Do you use TEPP?

A. Yes, I do. Yes, I have. I do not use it now.

Q. Would you please explain to the court why you do not use it now—

A. I do not use it now because in a ground rig operation, and I am a ground rig operation—not an aircraft operation—the people that would be applying this thing, this material, have to be in close proximity, of ten working through the drift of insecticides, and as far as I am concerned, the drift of this insecticide in proximity to the workers, is too dangerous for my company to tolerate.

Q. Would it be fair for me to say that you feel, and I believe you stated this in your deposition—correct me if I am wrong; that you feel TEPP is so dangerous that even though you have confidence in your workers using it correctly, you still don't want them to use it?

A. This is correct in my ground rig spray operation. I do not intend to testify other than to my own operation and the type of operation it is, but as far as I am concerned, in my own operation there is a policy by me that this material will not be used.

Q. Have you ever personally been sick from TEPP?

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A. Yes, I have.

Q. Would you please tell the court about that one?

Mr. Jordan. Object, your honor.

Mr. Wall. Object, your honor.

The Court. What is the basis for the objection?

Mr. Wall. Irrelevant, your honor.

Mr. Jordan. It has no relevancy to any of the issues in this case, and I would be glad to hear an offer of proof.

The Court. Well, I would like to hear some arguments on the question of relevancy. Why isn't it relevant?

Mr. Jordan. What issue in the case, your honor, does this testimony as to what happened to him from insecticides, give to it?

The Court. Well, we are dealing here with a question, gentlemen, of whether or not we are going to issue the preliminary injunction against the use of some—not against the use, but to permit the inspection of records, and I think you have to balance the interests here when you get into this area, and one of the questions is: Is this dangerous to people, and under what circumstances is it dangerous to people?

And he said that this particular product, as far as he is concerned, if he applied it on the ground and it drifted against these workers, it would be dangerous to them.

Now, why isn't that relevant to the question of determining whether or not —it may be a little remote, actually, but I think it has some relevancy. It may go the weight of the thing, counsel, but I think it is relevant.

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Mr. Averbuck. Might I also add, your honor, that we also feel it is relevant, because one of the points that we wanted to be stipulated to earlier, our point was—even if handled properly, some of these things are so dangerous, they should not be used.

The Court. The objection is overruled; you may answer the question.

The Witness. Would you rephrase the question?

Q. (By Mr. Averbuck) Would you please explain the incident of when you got ill because of TEPP?

A. I was flagging some TDPP over a very long period of time, and I did not take what were normally considered the proper precautions. At this time was in charge of pest control just prior to going into business for myself a long long time ago, but briefly, that is what happened.

Q. And how did you know you became ill from TEPP?

A. I had the common symptoms that one would suspect I have. I had pinpoint pupils. Vision was blurry, headache, sweating of the palms, and so on.

Q. Did you have nausea?

A. Yes.

Q. And did you have trouble breathing?

A. A little congestion.

Q. In other words, you were good and sick.

A. For a very, very short period of time.

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Q. But you were sick.

A. Yes, I was.

Q. Do you know the cumulative effect of economic poisons on the environment of Kern County?

A. Do I know?

Q. Yes.

A. No, I don't know what they are.

Q. Mr. Griffin, isn't it a fact that you told Mr. Cohen that you recognized that there was something wrong with pesticides, and that you hoped someday you would be able to have viruses that will do the work?

A. I stated this—that with the regulation of pesticides as they are today; with the tremendous amount of time that it takes to get these products registered—that it was going to require a total picture of viruses, bacteria, and all the rest to properly control pests.

I do not believe that these pests totally can be controlled by insecticides or viruses. I think that it takes an integrated program to do this sort of thing, and I would like to mention that in this discussion, that this question that you have just brought up—this question came up before Mr. Wall and I—when we were endeavoring to try to find out just what part of this information you would be satisfied with. And I think Mr. Wall heard exactly what I was discussing at that time.

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Q. Are you familiar with the department—University of California Davis' Agricultural Department stating in their bulletin each year that they do not think organo-phosphates should be mixed?

A. If you are asking if I combine two organo-phosphates—is that the question?

Q. Yes.

A. No.

Q. Do you combine them with other chemicals?

A. As I recall, I believe some of these applications of combinations have been made, but like I say, you are asking me to make a determination over a volume of work which I am not prepared to say at this time.

Q. Now, finally, to points. I think this will sum it up. You talked about washing the grapes.

A. That is correct.

Q. Now, that was a little bit suprising because, am I correct in gleaning from your testimony, that you are saying that you wouldn't want this information out because you want to keep it hidden from the public?

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A. Not from the public at all. Certainly not from the public. What I am trying to say is this: That over the course of time, because of the way it was done, there was a general feeling by buyers that grapes that have been washed were not good grapes to buy because their appearance had been somewhat destroyed, and certainly in the past this was so. So, during the course of history of washing grapes, the term "washing," making an application, at this time became very detrimental to the grower, and he was not interested in having anyone know this was done.

Q. Even the buyer?

A. Even the buyer. I am saying, however, that this kind of work can be done today and is often done today, and with the appearance of the grape being perfectly natural, because of the techniques that are used.

Q. Are you saying then, that to show this information would permit the buyer to find out something you would rather he not find out?

A. I am saying this, that to permit the buyer to see this information and have this buyer boycott the purchase of those grapes without taking a look at them—and buyers certainly look at their grapes—they should make a determination on the visual inspection of those grapes rather than some report that I have file down in the Agriculture Commissioner's office.

Q. Have you been appointed by any buyer to make that decision for them?

A. No, but I have been appointed by growers to make that application for them.

Q. No further questions, your honor.

EXCERPTS FROM TESTIMONY OF C. SELDON MORLEY, AGRICULTURAL COMMISSIONER, KERN COUNTY, CALIF.

The following are excerpts of C. Seldon Morley, agricultural commissioner of Kern County.

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C. Seldon Morley, called as a witness on behalf of the plaintiff, and being first duly sworn testified as follows:

EXAMINATION BY MR. WALL

Q. Mr. Morley, would you state your fully name, please?
A. C. Seldon Morley.
Q. What is your occupation, Mr. Morley?
A. Agricultural Commissioner of the County of Kern.
Q. And how long have you been so occupied?
A. Since 1955.
Q. In such capacity, Mr. Morley, has it been your duty to prescribe rules for the filing with you of pest control operators' ports?

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A. May I hear that again?
Q. You are aware of the type of reports that we are concerned with in this proceeding?
A. Yes, sir.
Q. The pest control operator reports?
A. Yes, sir.
Q. And the question was, or intended to be—are you the man that ordered those filed with you?
A. Yes, sir.
Q. I see. And, you have taken the position with regard to this proceeding, Mr. Morley, that those reports were filed with you at your request in confidence, and with the understanding that you would maintain them in confidence. Is that correct?
A. That is correct.
Q. And you know of your own knowledge, do you not, Mr. Morley, that these records do contain trade secrets and other items of information which are personal and private business information of various persons?
A. Regarding the trade secrets—that is more for chemical companies or things like that. Regarding the others, I understand that they have been considered as confidential in their crops, and et cetera, and I have maintained them as confidential on that basis.

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Q. And from time to time over the years, you have met with members and representatives of the Kern Agricultural Chemical Association—members of whom I am representing in this proceeding. Is that correct?
A. Yes, sir.
Q. And this matter of the containing of confidential, private information, and the holding them in confidence by you, has been discussed numerous times at those meetings. Is that correct?
A. It has.
Q. And you have always maintained that confidence to the extent that you have even, on occasion, refused to let representatives of governmental agencies see them except going to the principals and getting their consent. Is that correct?
A. That is correct.
Q. But that doesn't apply to the Health Department, I believe.
A. I have co-operated with the Health Department regarding the application of pesticides.
Q. All right. Now, and when there has been any claim of any personal injury or any crop damage made to you, you do then make those available in such cases without any problem involved. Isn't that correct?
A. May I explain that a little bit?
Q. Yes.

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A. When there is a report of a crop damage, with the permission of the owner or the applicator, then we take that one report pertaining to that one job and let them see that one report.
Q. All right. Now, does the same hold true with regard to a claimed personal injury?
A. That is correct. Under those conditions.
Q. Yes, Now, is it your understanding, Mr. Morley, that in this attitude which you have maintained with regard to these reports, that you have been carrying out the policy of the California Department of Agriculture?
A. Yes, sir.

Q. And—may I see the—your honor, may I please see the file? I need to refer to that exhibit.

The Court. Yes. It's right there.

Q. (By Mr. Wall) Mr. Morley, I show you here—this is in evidence as Exhibit A. It is the declaration of Mr. Thomas C. Griffin.

Mr. Averbuck. May I take a look at that, your honor?

The Court. Don't you have a copy?

Mr. Averbuck. Well, I wanted to see what he was showing to him.

Mr. Wall. Policy Letter 1–3.

The Court. This declaration was served on all counsel, I presume.

Mr. Wall. Yes, your honor.

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Q. (By Mr. Wall) This is attached, Mr. Morley—it is designated Exhibit D, Page 1, 2, and 3—to the declaration of and supporting the preliminary injunction by Thomas C. Griffin. I ask you to look at that, and look at each page, if you will.

A. Yes, sir, I have read this.

Q. All right, Mr. Morley, that states that it is Policy Letter 1–3, and it shows that it is from the State Deparment of Agriculture and it is dated April 7, 1964, and it is signed by Charles Paul, then director, purportedly, and I ask you—does that set forth the policy under which you have been operating with regard to the confidentiality of these reports?

A. That is correct.

Q. And, insofar as you know, is the policy of the State Department of Agriculture still the same?

A. So far as I know.

Q. And I suppose that you advised them in some manner when this injunction matter came up, and had some discussion with your superiors in Sacramento on it?

A. I contacted them verbally, and told them the action I had taken, for their information.

Q. And I suppose they approved it.

A. There was no objection.

Q. I see, and then, if you will look at—on the second page, I believe it is—looking at the second page of this policy letter that we are referring to, and I ask you to note in particular Subsection 6 and Subsection 9. If you will look at 6 first, and it is your position, as I understand it, that these subject reports that this lawsuit is about are covered by that section?

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A. In part, yes, sir.

Q. That is, part of that section covers these reports?

A. Right.

Q. And also Subsection 9, as I take it.

A. Yes, sir.

Q. Excuse me, I referred to that as Exhibit A, and it should be for the record, Exhibit No. 1. Sorry. That is all.

The Court. This is your client. Correct?

Mr. Jordan. Yes, your honor.

The Court. I think we had better proceed with cross-examination and then we will have direct on your part.

Mr. Jordan. Thank you.

Mr. Averbuck. Your honor, may I ask a question? There are some other areas that were not touched by Mr. Wall. Am I free to go into them?

The Court. You can call him under Section 776 of the Evidence Code as an adverse witness. Perhaps, in view of that, may Mr. Jordan—we could—maybe it would be better procedurely if you did ask him—or would you prefer not to?

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Mr. Jordan. If it pleases the court, in the absence of any objection of counsel, I would like to move it forward as fast as we can with both of these parties presenting their evidence. I reserved the right to put something on later.

The Court. All right, you will proceed, Mr. Averbuck, please.

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A. Paragraph No. 5. Quote—

The Court. This question was compound. First he wants to know—is the paragraph that you are referring to on crop acreages in the law that you said you did not know. Is this what you are referring to?

The Witness. Yes, sir.

The Court. Now, the second part is—read it if it is.

The Witness. "List of persons reporting and reports made by farmers, stockmen, processors, dealers, handlers, and others, to the California Crop Reporting Service, as well as the tabulated copies of such reports and copies of reports made to the Federal Crop Reporting Board at Washington, D.C." And then in parentheses it has, "Federal regulations require confidentiality."

Q. Mr. Morley, as I look at No. 5, it's talking about reports that are made to the California Crop Reporting Service, and reports made to the Federal Crop Reporting Board of Washington, D.C. Are the pest control applicators' reports made either to the California Crop Reporting Service, or the Federal Crop Reporting Board at Washington D.C.?

A. Not that I know of.

Q. Thank you. Mr. Morley, Mr. Jordan this morning has stated that—and you have stated in your pleadings—that you have weighed the public policy in whether or not to show these records publicly. Is that true?

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A. That is true.

Q. Mr. Morley, what did you weigh in the public policy? As you weighed the public policy in this matter, what factors did you take into consideration?

A. I took into consideration this paragraph here. This policy letter. The requirements that we have regarding crop acreage. We assist in taking crop acreages. We have, in the office, the acres for individuals. That is not to be divulged although we may have them. That is included in those reports; therefore, the crop acreage in these reports would be divulged if they were released to the public, and that is considered one of the reasons why they are held confidentially.

Q. Can you give me other reasons—the other factors which you took into consideration when you felt that it was in the public interest not to let these records be made public?

A. I tried to consider everything that I could think of. I can't remember just all of them at the present time, but I tried to consider all factors, and—

Q. Would you like me to ask you some of them, or do you want to keep talking?

A. You may ask the questions.

The Court. If you want to finish the answer, you may.

The Witness. Would she quote my last part of that last three or four lines?

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Q. Would you please read that back? Excuse me, Mr. Morley, I didn't mean to cut you off.

(The answer was read by the reporter.)

A. I tried to consider all factors regarding crop acreage, the regard of the dosage of materials used, because that could be changed by the grower and still remain within the legal tolerance of the requirements of that material as it was registered. It is that grower's personal confidential right to do those for his own information, for his own crops, without divulging that information to anyone else. And I have maintained that confidentiality, and I took things like that into consideration.

Q. May I ask you if you took some other things into consideration?

A. Undoubtedly I did.

Q. Mr. Morley, did you take under consideration the health of farm workers?

A. I did because it is part of our work to. Under the Administrative Code, there is a section in there that relates to protection of persons.

Q. When you took the health of farm workers under consideration, did you contact the Department of Public Health in Kern County to ascertain their analysis of any health problems caused by pesticides in economic poisons?

A. Occasionally I do.

Q. When did you first contact the department?

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Mr. Wall. Your honor, may we please have counsel required to permit the witness to comple his answer?

The Court. Yes.

Mr. Averbuck. I'm sorry, your honor, I apologize.

The Court. I am sure it's not intentional, but if you would permit him to complete his answer. He sometimes takes a little time to think about these.

Mr. Averbuck. I understand, your honor.

The Witness. Thank you.

The Court. There is no hurry. Take your time and answer completely.

Q. (By Mr. Averbuck) Mr. Morley, have you contacted the Department of Public Health for Kern County to determine if there have been any problems with economic poisons in Kern County?

A. Occasionally I have.

Q. When was the first time you contacted them, Mr. Morley?

A. I do not remember.

Q. Mr. Morley, in your deposition, did you not state that you contacted them for the first time about the dangers of pesticides in Kern County one month age?

Mr. Wall. If the court please, may we have Mr. Averbuck show him rather then just ask him the summaries of the deposition?

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The Court. The objection is overruled, Mr. Wall, Under the Evidence Code you no longer have to show a witness a written statement or a deposition before you can read from it or impeach him with it.

Mr. Wall. I believe he does have to read from it, your honor, does he not?

The Court. He can ask him under the New Evidence Code provisions. It used to be the rule. I will get the section here.

Mr. Wall. Your honor, I will withdraw the objection.

The Court. It's under 785 of the Evidence Code.

Mr. Jordan. I think he is merely offering to refresh memory at this point, and I think it's okay to ask him if he said that in his deposition. Can you answer the question, Mr. Morley?

The Witness. Yes, sir. I was referring at that time as the first time to contact the Health Department regarding the inquiry I had for workers in the field. This was after some of your representatives came to the office for those —for that information of individual reports. I have contacted the Health Department that on occasion prior to this—a year or two ago—if I may use an example; but when I said about a month ago was when I was asked for these reports, and they said that they had heard someone had been injured by pesticides, I referred them to the Health Department, either county or state. Then I contacted them and asked them if they had anything. Now, that was the reason I answered at that time quote approximately one month ago, close quote.

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Q. Mr. Morley, have you notified the Department of Public Health of Kern County that they should keep in contact with you if they did hear of any injuries in Kern County due to economic poisons?

A. Not so far, no, sir.

Q. Had you contacted the State Department of Public Health?

A. No, sir.

Q. Have you contacted any doctors? Have you contacted anybody?

A. No, sir.

Q. Mr. Morley, do you know the toxicity of the different pesticides used to human man?

A. I have in the office some charts showing that.

Q. Mr. Morley, I show you this piece of paper here. Is that the chart you are talking about?

A. Yes, sir. This is one of them.

Q. May we mark that for identification, your honor?

The Court. Show it to the other counsel, if you will, please.

The Witness. May I explain the source of that chart?

Mr. Averbuck. Certainly. I will get to that, Mr. Morley. I will ask you about that.

Mr. Wall. There is no objection. That can go right into evidence.

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Q. (By Mr. Averbuck) Mr. Morley, on the day that Mr. Cohen came to see you in your office, back in August, did you specifically refuse to show him the applicator reports?

A. I told Mr. Cohen that they were kept in confidence and that I could not show him those reports.

Q. Did he come during office hours?

A. He did.

Q. Now, these records which you are referring to, I want to get some information in terms of these records so we know what we are talking about in this case in the record. Mr. Morley, is this a copy of your record?

Mr. Jordan. May we see it?

Mr. Wall. May we see it, please?

Mr. Averbuck. Yes.

The Court. I think the proper way to proceed here is if any document is going to be used to question a witness, or to be presented here, that we ought to mark it for identification and permit counsel to see it before it is used. That will apply all the way around. Everybody on every side.

The Clerk. Intervenor No. 4 for Identification.

Q. (By Mr. Averbuck) Mr. Morley, would you take a look at that, please?

The Court. Counsel, have you seen that?

Mr. Wall. If the court please, there is a copy of that in evidence.

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A. Under crop, and acreage.

Q. Excuse me. I don't think—I think I'm getting you mixed up a little bit. I'm concerned about trade secrets.

Mr. Jordan. May I ask for clarification, your honor? You are not asking him what information on there he considers as confidential.

Mr. Averbuck. That's right.

Mr. Jordan. You are asking him what he considers to be of the nature of trade secrets?

Mr. Averbuck. That is right.

The Witness. May I refer that to the chemical companies for their trade secrets regarding their formulas and et cetera.

Q. (By Mr. Averbuck) Do you feel that the formulas are trade secrets?

A. So far as they are concerned, I believe they are.

Q. Why do you believe they are, Mr. Morley?

A. From the different formulations that each one of them makes.

Q. Mr. Morley, are you aware that every one of these formulas are on the labels of the pesticides?

A. That is correct.

Q. And those labels are probably in every store in this state that sells pesticides.

A. But it does not give all of the ingredients in some cases, and I would like to refer that again to the chemical companies or the manufacturers to answer your question. I am not qualified to answer why they consider some of those trade secrets.

EXCERPTS FROM TESTIMONY OF EDWARD P. LESTER, DIRECTOR AND PRESIDENT, CENTRAL CALIFORNIA MEDICAL LABORATORIES, FRESNO & BAKERSFIELD, CALIF.

The following are excerpts of Edward P. Lester, director and president of central California medical laboratories, with offices in Fresno and Bakersfield, both.

PAGES INDICATED BELOW ARE TAKEN FROM REPORTER'S TRANSCRIPTS

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Edward P. Lester, called as a witness on behalf of the intervener, and being first duly sworn, testified as follows:

Q. Would you state your full name, please?

A. My name is Edward P. Lester.

Q. And what is your current occupation?

A. I am the Director and President of Central California Medical Laboratories, with offices in Fresno and Bakersfield, both.

Q. Where did you receive your undergraduate training?

A. I am a graduate from U.C.L.A., and I did my graduate work at the U.S.C. School of Medicine.

Q. Dr. Lester, have you ever been licensed by the State of California for anything?

A. I am Mr. Lester.

Q. Excuse me.

A. And I am a licensed clincical bioanalyst and laboratory director since 1954.

Q. And were you licensed prior to that?

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A. Yes. I was a licensed clinical technologist. 1950 through 1954.

Q. Now, is it true that in this state only an M.D. or a bioanalyst like yourself can legally be a director of a licensed clinical laboratory?

A. That is correct.

Q. And you do have a license in a clinical laboratory?

A. Yes.

Q. Do you have any professional affiliations?

A. At present, I'm a member of the California Association of Bioanalysts. I'm a former National Vice President of the American Association of Bioanalysts, and several other professional associations, including the American Association of Clinical Chemists, and other organizations dealing with my field.

Q. Are you familiar with Cholinesterase testing?

A. Yes, I am.

Q. When did you first become familiar with it?

A. As we understand it, we were one of the first clinical laboratories in the State of California to set this test up on a regular basis in early 1954, here in Bakersfield.

Q. So it has been over—almost fifteen years now?

A. Exactly.

Q. And have you run many Cholinesterase tests?

A. It would be hard to estimate in fiteen years' time, but it would be in excess of fifty thousand separate tests.

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Q. And for what purpose do you run these tests?

A. These tests are run only, in my experience, in case of exposure to organic phosphates.

Q. And by that, you are referring to such economic poisons as Parathion and TEPP?

A. Yes. We count several hundred, actually, different formulations.

Q. Have you ever done any work for the State Department of Public Health?

A. Yes. The State Department of Public Health lends considerable encouragement and technical assistance to clinical laboratories in the field; particularly the Bureau of Occupational Health. In addition, we have engaged in several research projects, and we have kept the state posted on the results of these research projects as it related to organic phosphates.

Q. Have you ever had any publications?

A. Yes. In this particular field alone, I presented a paper to the International Congress on Clinical Chemistry in Europe, and the paper was published in its entirety at the proceedings of that congress, published by Butterworth, 1961.

Q. Mr. Lester, are you presently administering Cholinesterase tests?

A. We are presently administering Cholinesterase tests on a routine basis for, I would suggest, most of the commercial operators in the San Joaquin Valley.

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Q. Would that include people from this country?

A. Yes.

Q. Are you familar with any injuries due to organic phosphate?

A. Many.

Q. How can you be certain that the Cholinesterase tests shows—might show an injury to biorganic phosphates?

A. I can say quite positively that the Cholinesterase test is a specific indicator of not only acute exposure to organic phosphates, but to subclinical forms of poisoning. The test is highly specific in this regard, and the test is run in two parts. It is actually two different tests. We run a test both on the plasma of the serum, which is the—that type of test which is first affected by the presence of organic phosphates, as well as the red blood cells.

Now, if the plasma is considered nonspecific, merely exposure or not exposure, then the RBC is conceded to be a direct measure—excuse me, I beg your pardon—the red blood cell test is conceded to be a specific measure of central nervous system damage.

Q. Mr. Lester, have you seen any injuries because of organic phosphates?

A. Yes, many.

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Q. Doctor—excuse me—Mr. Lester, have you been approached by the United Farm Workers Organizing Committee to set up a testing program?

A. Yes, I have.

Q. And in that regard, would you be working hand in hand with the United Farm Workers Organizing Committee in setting up that program?

A. If this is of their mind, yes.

Q. Mr. Lester, could you please explain how the Cholinesterase test spots—how you use the Cholinesterase test in determining the degree of toxicity that a person has acquired?

A. With your permission, may I use the blackboard?

The Court. Certainly.

The Witness. The Cholinesterase test is a specific measure of nervous damage. It is run in two parts, as I said before. Plasma and red blood cells. It is essential that we determine a specific level in every individual before exposure, so that we have some basis of comparison during the coming season, or in the years to come. Now, this is called an individual worker's base line. Everything else will be compared to this base line.

Now, at the time of exposure, if this is a person's base line of red blood cells and plasma, and exposure is at this period, the plasma is the first one to go down. It is also the first one to return to normal after that worker is no longer exposed to organic phosphates. The RBC follows in this manner. It trails behind the plasma, and this is the one that we are most concerned with in that RBC is the one that reflects more precisely the status of the central nervous system. Once the RBC goes down, it will delay a long time before coming up.

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Now, from an economic standpoint, this means that if we can detect early changes in the plasma, it is very easy for us to recommend that such a worker be removed immediately from further exposure, and long before the RBC starts to drop and becomes dangerous.

This means that we are not dealing yet with clinical symptoms, acute symptomology, but rather we are dealing with the first preliminary indication of poisoning, and that further exposure will precipitate the clinical symptoms that have been described here today.

Now, if the worker can be removed by running these tests at an early enough state, we are speaking then of removal from the job on one day, two days, three days, or a week. But once the RBC goes down, we may be speaking of a poisoning situation which may not return to normal for perhaps a month or longer. So, it is essential that we identify poisoning long before clinical symptoms appear.

Now, the curve I have drawn here are nice slopes. Actually it doesn't work quite that way. Every individual has different reserves to accommodate loss of Cholinesterase, as was explained to you by Dr. Milby. Now, we find that when we give an individual with exposure at this point, we find that nothing happens for a considerable length of time. These are reserves that every individual has. Further exposures—they reach various plateaus, various plateaus. In other words, it's not an even drop in Cholinesterase. What I am saying is that at this point, unless this worker were identified, even a small minor exposure will precipitate a fantastic drop in Cholinesterase. I personally have seen this drop from a normal level to this point in less than thirty minutes. At this point, clinical symptoms appear. The victim is prostrate, and we are talking about an emergency situation often requiring heroic measures.

EXCERPTS FROM TESTIMONY OF ROBERT VAN DEN BOSCH, PH. D., PROFESSOR OF ENTOMOLOGY, UNIVERSITY OF CALIFORNIA, BERKLEY, CALIF.

The following are excerpts of Robert Van Den Bosch, professor of entomology at the University of California at Berkeley.

PAGES INDICATED BELOW ARE TAKEN FROM ACTUAL REPORTER'S TRANSCRIPTS

Robert Van Den Bosch, PH.D., called as a witness on behalf of the intervenor, and being first duly sworn, testified as follows:

DIRECT EXAMINATION BY MR. AVERBUCK

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Q. State your full name, please.
A. Robert van den Bosch.
Q. Mr. van den Bosch, where do you now reside?
A. Kensington, California.
Q. And were you subpoenaed to come down here today?
A. Yes, I was.
Q. Dr. van den Bosch, what is your current occupation?
A. I am a Professor of Entomology at the University of California at Berkeley.
Q. When did you receive your Masters of Arts?
A. In 1943.
Q. And where?

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A. From Berkeley.
Q. Did you ever receive a doctorate?
A. Yes, in 1958 at Berkeley.
Q. What was that doctorate for?
A. In the field of entomology. Specifically, my training and background was in Economic Entomology.
Q. Did you do any work at the University of Hawaii?
A. Yes, I was there for two years in the Experiment Station.
Q. And did you do any work for the University of California at Riverside?
A. I was there for twelve years in the Experiment Station.
Q. Did that include considerable foreign travel?
A. Yes.
Q. Would you describe some of the traveling you did and the work you did?
A. One of my areas of activity is biological control which is, in this context, is the introduction of exotic beneficial insects—predaceous and parasitic insects to be used against agricultural pests. Since a great number of our agricultural pests are of exotic origin, one of the techniques of the pest control is to seek their native home, and to obtain therefrom the parasites and predators that affect them there; trans-ship them to California, in this case, screen them through a quarantine laboratory, and produce them in an insectory and release them in the field against the infestion of these pests in the hopes that they will establish their old relationships, and effect suppression, in general, of the pests. So this entails a considerable amount of foreign work.

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Q. In other words, you've left the country and have gone to many other countries?
A. Yes, I have spent about five and a half years overseas in the last twenty years.
Q. Do you have any relationship—or have you had any relationship with the Entomological Society of America?
A. Yes, I have been a member, I suppose now, almost—for almost twenty years.
Q. Did you ever hold any formal position with them?
A. I was a chairman of one of the subsections. A subsection of biological control.
Q. Have you received any fellowships because of your work?
A. I received the Guggenheim Fellowship to study the parasitism of aphids. I have received several grants, both from industrial and from the National Institutes of Health, and from the National Science Foundation for Research.

Q. In 1963, did you transfer to the Division of Biological Control?

A. I transferred from Riverside to Albany, which the Division of Biological Control—is one of the three divisions of the Department of Entomology and Parasitology at Berkeley. Yes

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Q. Have you had any speaking engagements?

A. Oh, yes, of various sorts. I have spoken before many agricultural groups; before various scientific groups; universities; international congresses of several kinds, relating to my field.

Q. And you were invited to those?

A. On a number of occasions, yes.

Q. Have you published any articles concerning insecticides in the pest control?

A. Oh, yes. I suppose—my list of publications is, oh, I guess, approximately eighty—but perhaps half of those are concerned with pest control in one sense or another, and many of them have involved the use of chemicals.

Q. And when were you appointed a Professor of Entomology at Berkeley?

A. I believe in 1967.

Q. And you have been in that capacity now for almost two years?

A. Yes.

Q. Have you had any form of public service?

A. No in the elective sense, or of a formal nature, that I can recall. I have given talks and I give to the United Fund, and things like that.

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Q. Now, Dr. Van Den Bosch, you mentioned that you work with integrated control—in the field of integrated control. Could you please explain that to the court?

A. Well, I am a school that has developed very strongly here in California, beginning with the organic insecticides revolution, you might say. At first we were very small and forlorn, but our program is burgeoning. Our basic philosophy is that pest control is essentially an ecological problem, and we have attempted to develop programs based on the management of pest problems in an ecological way, rather than through the use of any particular unilateral technique.

Q. Would you please explain in the name of ecological?

A. Well, ecology is the science of the relation of animals, you might say, in a succinct way—animals to their physical environment. Insect pests are animals and they have a rather complex environment in which they live. Their population is regulated, of course, by the physical and biotic mortality factors in the environment. And what we do in growing crops, attempting to control insects, cultivating, irrigating, harvesting, and all of the manifold things that we do in our crop production program, are factors which are ecological—or they play a role in the ecology of these pests and the creatures that feed upon them.

Q. Would it be fair to use the layman's term "environmental"—just over-all environment?

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A. Environment connotes something—the word I am seeking—encompasses, you might say. The environment is the thing in which we live. The entity in which we live. Ecology is a much more dynamic concept. In other words, we are creatures that live in an environment, but we have our own ecologies. Things impinge on us and we impinge on things, and they influence our health, vigor, activity, longevity, welfare, and so forth.

Q. Are you referring to, for example, chains of life?

A. Well, yes. The food chain concept is very well known in the field of ecology. In essence, we belong to a food chain in that we are the top consumer on the pyramid that begins at a very basic level.

Q. Now, you were explaining again on integrated control, and you're going into the philogophy of your department in regards to this.

A. Pest control is the management or regulation of insect population, and we early recognized that to attempt to regulate populations in the true sense of that word. The use of unilateral techniques, whether they be chemical, cultural, biological, physical, would not in themselves bring about, you might say, permanent alleviation or permanent suppression of these populations. And it became very clear immediately after the advent of DDT and its successors—the other chlorinated hydrocarbons and organic phosphorous materials—there was a very disruptive impact of these broadly toxic materials on the general eco-system.

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Q. Dr. Van Den Bosch, are you at all familiar with what is commonly known as DDT?

A. Oh, yes.This is, of course, a very well known material.

Q. And, to your knowledge, is it still used in Kern County?

A. Oh, yes.

Q. Does this—what happens to DDT after it is sprayed? Does it break down, as was described earlier, like Parathion?

A. No. DDT is a long-residue material. It has a very long "half-life," as they call it. I believe something on the order of ten years. It accumulates and it moves through the eco-system, and of course, it moves from Kern County, probably, to the middle of the Pacific Ocean or to the Antarctica; but it is, in essence, a very mobile material and a very long lasting material.

Q. There was a testimony this morning by Dr. Milby, that it is possible we could be poisoning ourselves with DDT. Do you take issue with that?

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A. No. Obviously we are ingesting it and it is accumulating in our bodies. The moot question is—how bad is this? If this is a poison and it's getting into our bodies, in that sense we are poisoning ourselves. The great heated debate of our era is whether this is actually hurting us or not, and I am not qualified to say. All I can say is that this is a poison and at maximum dosage it can kill us, and it is accumulating in our bodies; but I am not in the position to say what the chronic effect of this material is on the Homo sapiens.

Q. Dr. van den Bosch, you stated earlier that we were at the top of an ecological chain. Is that right?

A. Yes.

Q. Would that mean that, for instance, DDT could be transferred to us through the food we eat?

A. Well, it is, and it was at one time much more so, but the checks and blocks that have been developed to preclude this occurring have reduced this problem very strikingly. I can remember when we first started working with DDT. We used it on alfalfa at a pound an acre, and then fed it to our cow and this meant it was getting into the milk in very large quantities. We were ignorant in those days as we are of things that come along today, and all of that stopped; but right now the actual accumulation of DDT in our tissues is not as dramatic, and I think there has been a drop in the levels in the last two years, because of regulations on use of this material, and diminished use.

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Q. Do you know how it is used, for instance, on a crop like grapes?

A. I am not very—I prefer no to—or I can't answer the grape situation. I know how it is used on cotton, which is a sort of a standard field crop situation, and I suppose it's in general the same pattern.

Q. Finally, Doctor, are you familiar with Dipterex?

A. Dipterex. D-i-p-t-e-r-e-x.

Q. What is that?

A. Well, I believe it is also a phosphate material rather ephemeral in its topical residuality, you might say, but—I believe because it's absorbed into the plant very quickly after it's applied. In essence, that's what it is. It's a very ephemeral, I believe, organo-phosphorous material.

Q. Do you know of any particular problem that has been faced with this pesticide?

A. Well, for one thing, its effectiveness is breaking down as a control of Lygus here in California. It is one of the materials that we recommend for use on cotton because it has been rather effective, and it is in the form—in its original form—a rather safe material. However, it does metabolize or break down into a product called DDVP, which is about ten times as toxic—a very highly toxic material. Now, this is generally not a problem, but on occasion, and—I can remember one case in our own experiments where we were working with this material Dipterex, in highly alkaline water on the west side of the San Joaquin Valley—that the Dipterex or Dylox converted to DDVP in the spray tank, and where we were using it as a selective material on an experiment, it then turned into a disaster in that it wiped out literally all insects, good and bad, in the experiment; so there is this possibility that, under sometimes rather uncontrollable situations, the original Dipterex may convert actually in the spray tank into DDVP before the material is absorbed into the plant.

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Q. Finally, Doctor, one last question. Are you familiar with any of your staff ever becoming ill from Paration?

A. Well, at Riverside about twenty years ago, before they understood this material, and a number of other things, one of the laboratory technicians died from a Parathion poisoning. We have not observed symptoms of illness amongst our own people; however, this summer in one of our—in our experiment here at Rosedale where we were using Parathion at very short intervals—four-day intervals; four treatments in sequence, and we were aware of this problem developing—we had our research assistants routinely checked for Cholinesterase levels and quite to our surprise, several of them—I think either four or five out of the six—suffered reduced Cholinesterase levels which, of course, caused us to immediately withdraw them from sampling.

They weren't sick, and it was simply the initial indication that the level had gone down and we had better get those boys out of there. This disturbed me and surprised me that this kind of an exposure was enough to cause a general depression as it did amongst about eighty per cent of our assistants.

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Mr. Averbuck. Thank you. I have no further questions.

The Court. Mr. Jordan, you may cross-examine.

CROSS-EXAMINATION BY MR. JORDAN

Q. Is the control of agricultural pests a necessary thing?

A. Yes, it is.

Q. Is it essential to the enterprise of agriculture?

A. I would certainly think so.

Q. Is there a difference—two schools of thought—about the best way this can be accomplished?

A. I should think so. There may be more than two schools.

Q. At least—and I only know what I have heard you say, so feel free to correct me.

A. Yes.

Q. Do you feel the most effective way is through the ecological approach to control of the environment?

A. Well, let me explain this. We don't put on a hundred pounds of ecology to the acre to control insects as opposed to four pounds of Toxaphene or something of this sort.

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Q. All right. Did I understand correctly that in the tests—I will withdraw that—that is a part of your school of thought that the eradication or repression, I think you said, of the insect pest population, should be done by using both the ecological approach and the chemical pesticides?

A. Well, I don't think I quite said that. The chemical pest approach is part of the ecological approach. We are employing ecological principles and techniques in managing pest populations. We use insecticides and we prefer to use them wherever we can as augmentative temporary suppressants of populations that are out of hand, for one reason or another. But the important concept is that we look at the area we are dealing with, whether it's the cotton industry of California or the grape industry, or the walnut industry, or alfalfa, as an eco-system; a complicated, dynamic, very mosaic of species and factors, amongst which is the human being; of water, air, wind, good insects, bad insects, so forth and so on.

We recognize that if we do anything unilaterally in that environment, we are liable to trigger a very disruptive chain of events; and indeed, I can testify with absolute confidence, that the unilateral uses of insecticides has engendered this kind of development, as you pointed out the unilateral use of the rabbit in Australia engendered a problem there. So, when I talk about the ecological approach, I include the use of insecticides, chemicals, microbial, if you will, in that over-all philosophical approach.

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Q. Then in the county of Kern, am I not correct, they do use the ecological approach to the pest problem in agriculture?

A. Not widely, no.

Q. How do you control the pink bollworm?

A. Well, in the sense—in that sense, yes, because they have a system of exclusion, a quarantine system, but the pink bollworm doesn't occur here in Kern County.

Q. Well, translate this system of exclusion. What do they do, actually.

A. It was a matter of inspection and quarantine.

Q. Didn't they introduce anything into the county?

A. They have the detection traps. They have used the sterile male technique, which was not considered even by the experts, or the people involved, as a highly critical factor.

Q. In your experience—your testing, your reading of the learned publications—what is your personal opinion, do you feel is the most effective method of controlling pink bollworm?

A. Probably an integrated control program involving—

Q. Everything.

A. Yeah.

Q. Okay.

A. In the south—in the cotton belt, particularly in Texas, they have relied heavily on cultural controls which, in that area have been quite effective. In the Imperial Valley, they relied heavily on chemical control this year, and ended up with a secondary pest disaster in the form of the cotton Leaf Perforator; so what works in one area doesn't work in the other. The cultural program has not worked, but they are working on an integrated control approach in the Imperial Valley at this time.

Q. And more studies should be made, and continued observations of the attempts that are made, in reports—

A. Oh, of course. This is an on-going process.

Q. Very good, Do you recommend that there be no use of chemical pesticides in the State of California?

A. Of course not.

Q. Do you recommend in your professional opinion, that it is in the public interest to eradicate completely the use of DDT? Completely?

A. I have taken a stand on DDT in this respect; I personally no longer recommend the use of DDT on cotton in California. This is a personal conviction.

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Q. Air pollution is a similar type of problem, is it not?

A. In a sense. All of these things come under the—

Q. Well, air pollution, that we are now learning, has long-range harmful effects on humans. Is this not correct?

A. Yes, and DDT is part of the air pollution problem. It gets into the air.

Q. And you are also of the opinion, are you not, that air pollution has an adverse effect upon the animal population?

A. According to reports it does on us so——

Q. It does on us?

A. Yeah.

Q. Do you have an opinion——

A. It has——

Mr. Averbuck. I fail to see the relevancy. We are not talking about the air killing people, we are talking about pesticides killing people.

The Court. Objection overruled.

The Witness. It has been demonstrated that it affects plants. It has quite a toxic effect.

Q. And water pollution? Is this not an area that concerns you as one who is interested in the integrated control of environment?

A. Well, of course. This is one of the reasons why I am interested in integrated control, because it will bring about a rational and scientific and minimized use of these highly pollutant agricultural chemicals that we are dealing with.

Q. You don't recommend, of course, that at present time we—I will withdraw that. Are you a competitor of the plaintiff in this action?

A. No.

Q. Do you have any type of private practice or private employment?

A. No.

Q. You don't consider then that your school necessarily would conflict with the pest control operators?

A. I think it will conflict with the pest control operators, and I think it will conflict with the chemical industry, because fundamentally, pest control as it is now pacticed in the State of California and in the United States of America, is essentially not an ecological matter. It is a—it is largely a matter of merchandising, and this is a fundamental problem in the whole matter of the pesticide problem that we are confronted with today. In essence, we are using the wrong kind of materials in the wrong places at the wrong times in excessive amounts, and engendering problems which increases the use of these materials, adds to the pollution problems, adds to the cost of agricultural pest control, adds to the—you might say—the concern of the general public, and in this essence I belong to a school of entomological research and pest control philosophy that is at odds with these people. But this is not an overt attack on either the pest control advocators or the agricultural chemical industry. It simply happens to be that this is one philosophy based against another. And the answer to the situation is—which will prevail. Believe me, having been in this situation for twenty years, it's a long, tough fight and it's a long, tough fight ahead.

Q. What exact is your function in the university?

A. Well, I teach. I guide the activities of a number of graduate students. In other words, I direct their Ph.D. work.

Q. Do you teach entomology?

A. Yeah.

Q. Do you—you're not at Riverside—you're at Berkeley?

A. I'm at Berkeley.

Q. You were at Riverside?

A. Yes.

Q. Now, you were at an Experimental Station at Riverside?

A. Yes.

Excerpts From Testimony of Joe Sellers, General Manager, Atwood Dusters, Bakersfield, Calif.

The following are excerpts of Joe Sellers, general manager for the Atwood Dusters, Bakersfield area.

PAGES INDICATED BELOW ARE TAKEN FROM REPORTER'S TRANSCRIPTS

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Q. (By Mr. Wall) Would you state your name, please?

A. My name is Joe Sellers.

Q. Where do you live, Mr. Sellers?

A. 1515 Crestmont, Bakersfield.

Q. What is your occupation?

A. I'm general manager for the Atwood Crop Dusters, Bakersfield area.

Q. And is Atwood Crop Dusters one of the plaintiffs in this proceeding?

A. Yes, sir.

Q. And how long have you been in that capacity with Atwood Crop Dusters?

A. About twenty-five years.

Q. Would you describe briefly what has been your experience in this business in Kern County during the past twenty-five years?

A. Well, I flew in Kern County from '39 'til '50, and since that time I have served as the general manager for the company.

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Q. Mr. Sellers, I ask you to look at Plaintiff's Exhibit 7 and I ask you—is that the form that is used by your company in filing the reports with Mr. Morley of the type which are the subject of this proceeding?

A. It is.

Q. I'll ask you some questions, Mr. Sellers, about the different items thereon, if you will refer to it.

First off, does the report contain the date of application?

A. Yes, it does. Date or data did you say?

Q. The date.

A. That top line there is the date the invoice is made out. These are copies of the customer's invoices. The date of the actual application is in the column, "Date Flown."

A. It shows the date and the actual time of day, the pounds carried there of each load.

Q. You have been in the courtroom here during all of this proceeding. Is that correct?

A. Yes, sir.

Q. You have heard the testimony of the proceeding witnesses with regard to the trade secret aspect of various items of information given in these reports. Is that correct?

A. Yes, sir.

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The Court. Mr. Sellers, I believe you were on the stand under cross examination by Mr. Averbuck.

Q. (By Mr. Averbuck) Mr. Sellers, are you a member of the Kern County Agricultural Chemical Association?

A. I'm ex officio and on the executive committee.

Q. Pardon me?

A. I am an ex officio and on the executive committee.

Q. How many members do you have in that?

A. It varies between forty and fifty.

Q. And how many applicators—how many people are there in Kern County that could be members?

A. How many are there in Kern County that could be?

Q. Yes.

A. It is limited to applicators and chemical distributors and dealers.

Q. Is there anyone, to your knowledge, doing business as applicators or chemical distributors who is not included in your organization?

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A. Yes. Mr. Tom Griffin. He is in the ground applicating business.

Q. I see, but basically all the air applicators are?

A. Air applicators, dealers and distributors, and representatives of major manufacturing people.

Q. What is purpose of this association?

A. To exchange information with each other in the matters coming up in the applications—recommendations and application of these materials.

Q. Do you discuss with each other the things you have learned?

A. Yes, sometimes.

Q. For example, do you discuss with each other the things you have learned about wind movements in Kern County?

A. No, sir.

Q. Do you discuss with these people such things as the amount of pesticides you use and the dosage?

A. No, sir.

Q. You mentioned that you thought it was highly important information that you have concerning such things as the weather and dosage and where you applied it, did you not?

A. Yes, sir.

Q. And, in fact, didn't you state that this information was crucial to make certain you could do your job without causing crop damage?

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A. I did with relation to temperatures and materials that are being used.

Q. And yet you do—and in fact, also, it relates to whether or not there are houses in the area and whether there are people around.

A. That would be of major importance.

Q. Whether there are workers in the fields. Would that be a relevant factor also?

A. Yes, sir.

Q. And yet you say you do not share this information with your competitors?

A. That is right.

Q. Are you telling us today that you would rather see your competitors do it without the expertise you have, and make mistakes, just to make a buck?

A. Yes, sir. We would have less competitors that way.

Q. No further questions.

Public Health Problems Are Created by Pesticides

(By Dr. Irma West, M.D.)

Pesticides have made a generous contribution to public health by augmenting the production of food and fiber and by helping in the control of vector-borne diseases. Concurrently, the use of pesticides has resulted in human health and environmental contamination problems. The information in this paper is based on experience in California, where the leading industry is agriculture, where at least 20 percent of the nation's pesticides are used, and where over 40 percent of the nation's vegetable crops are grown.

It is also the state where a substantial number of signatures were collected for an initiative, which if it had been successful in reaching the 1964 ballot, would have asked voters to consider banning the use of most pesticides in California's agriculture.

Public health pesticide problems are noted for their technical complexity, scientific controversy, and public apprehension and confusion. Such problems are somewhat analogous to those arising from the use of certain drugs whose unwanted side effects are occasionally the object of widespread concern. The difference is that with pesticides, the whole population and its environment is involved. Furthermore, the public has been sensitized to the problems of environmental contamination by air pollution and radioactive fallout.

There is no adequate state surveillance program for detection and study of effects of pesticides on human health except for the acute effects experienced by employed persons working with pesticides. Unlike air pollution and radioactive fallout there is also no comprehensive environmental monitoring program except for pesticide residues on raw agricultural food products. Therefore only examples of some of these problems occuring in California can be selected for presentation.

MORBIDITY

For California, morbidity from pesticides can be only roughly estimated for young children; described more precisely for workers; and remains largely unknown for the remainder of the population.

A study of hospital emergency care of children, made by the State of California Department of Public Health, indicated that 3,000 California children received emergency medical or hospital treatment because of ingestion of pesticides during 1960. This number was about 10 percent of the total receiving emergency care for ingestion of noxious substances.

Reports describing occupation disease are available through reports of work injury required of all physicians in California.* The number of doctors' reports involving pesticides and other agricultural chemicals have doubled since 1954, and have ranged from 800 to 1,100 reports annually since 1958. The highest numbers were reported in 1959 and 1963. Most of the reports come from agriculture, which has the highest occupational disease rate of any industry in California. About one-half of these 800 to 1,100 reports are classified as skin disease and about one-third as systemic poisoning. The phosphate ester pesticides, parathion, phosdrin, and timet, account for most of the poisoning cases.

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*Each physican who attends an injured employee and each employer of such a worker is required by Section 6407 of the California Labor Code to file a report with the State Department of Industrial Relations when disability lasts beyond the day of injury or requires medical service other than ordinary first-aid treatment. By definition, work injury includes occupational disease. Under an interagency agreement with the State Department of Industrial Relations, the California State Department of Public Health through its Bureau of Occupational Health, reviews and analyzes these doctor's reports (doctors first report of work injury) which concern occupational disease. Reports are received only for the 80% of employed persons in California covered by the California Workmen's Compensation Law. Among the 20% excluded are federal employees, maritime workers, railroad workers in interstate commerce and self-employed.

For the past ten years about one occupational death from pesticides has been reported for each 100 reports of occupational poisoning from these chemicals. For phosphate ester pesticides the rate has been one death per 200 reported poisoning cases. Data on occupational disease from pesticides and other agricultural chemicals are probably understated, because reports of occupational disease are not received from self-employed agricultural workers, a group which comprises about one-third of all agricultural workers.

In considering the impact of pesticides on the health of workers whose occupation requires their use, two assumptions were made which later proved to be false. The first of these assumptions was that farmers, spray operators and their employees were generally prepared by knowledge, training, and equipment to handle the difficult and responsible task of safe application of hazardous pesticides. Unfortunately, it was soon found that employers were often either uniformed themselves or reluctant to provide adequate occupational safety information because they did not want to alarm workers about hazard. Moreover, pesticide salesmen often were reluctant to provide adequate safety information about their products. In short, economic incentives did not act in the direction of encouraging occupational safety in the application of pesticides. It was often less expensive to risk occupational disease than to prevent it.

The second assumption which proved to be false presumed that all physicians were prepared to deal with the casualties. Both the realities of pesticide application and the casualties resulting therefrom were upon us before prevention and treatment information was developed and disseminated.

Concepts in industrial hygiene and industrial medicine commonly used for many years in other industries have not been employed nor adapted to the agricultural setting. Such commonplace needs as clean drinking water, wash water, and sanitary facilities are rarely available in the fields, and are notably deficient in many of the living quarters of farm laborers. Yet, water and soap are vital to the prevention of the most serious occupational diseases occurring on the farm.

Since workers who regularly formulate and apply agricultural chemicals are among the first to be exposed to newly introduced pesticides, their health should be the subject of intense and continuous observation. Such observation would not only be essential to the well being of the worker but would also constitute an invaluable mechanism for discovering toxic manifestations which might have been missed during the course of the animal studies carried out in conjunction with the initial evaluation of the pesticide chemical in question. Unfortunately there is little if any of this kind of research under way in California.

MORTALITY

Although the mortality data for 1964 is not completely processed there may have been only one pesticide death in 1964. The average of five pesticide fatalities annually in California during the years 1960–1963 represents a considerable improvement over the previous four years, during which time an average of fifteen deaths were reported annually. This improvement can be partially accounted for by the reduction in deaths among children from sodium arsenite weed-killer which was removed from the home market in 1961 by the Department of Agriculture and by a widespread educational program by the Department of Public Health.

While only about 13 percent of pesticides are sold for use outside of agriculture, about one-half of all deaths from pesticides come from pesticidal materials sold for nonagricultural use. These deaths usually occur in youngsters following accidental ingestion of pesticides left around the home.

There has been no improvement in the number of deaths among workers exposed to pesticides. They have averaged about two annually over the past ten years. However, the amounts of pesticides applied is believed to have about doubled if the national figures apply to California.

The most frequent causes of these pesticide deaths were phosphate ester pesticides and methyl bromide. Information coming from the investigation of occupational deaths indicate that deaths from pesticides can be missed easily if a history of exposure is overlooked and appropriate chemicals tests omitted. Conversely, deaths attributed at first to pesticides have occasionally proved on more thorough investigation, to be due to other causes.

In just one of the 67 counties in Florida, there were eight accidental and five suicidal deaths from phosphate ester pesticides in 1963 alone. In that county the county medical examiner had undertaken a special study because it had become apparent to him that deaths from pesticides could be and were frequently missed. Eight out of the thirteen deaths would have been missed had not this special investigation been made. In previous years, two homicides involving parathion were detected in the same county because of these special investigations. Unless there is a high degree of suspicion and if a cholinesterase test is not performed the true cause of death may not be detected. In Florida and in most other states anyone can purchase for a few dollars enough parathion to kill several thousand people.

For many years in California the highly toxic phosphate esters can be applied only after a permit is obtained from the county Agricultural Commissioner. This procedure may account at least partially for the fact that California apparently reports a much lower proportion of pesticide fatalities than do the other states.

Another measure which has contributed to occupational safety in California is the medical supervision requirements covering agricultural workers applying the more toxic group of phosphate ester pesticides (parathion, phosdrin, thimet, d-syston, and bidrin). These requirements were included in the Agricultural Safety Orders in 1961. No worker who has been supervised according to these requirements has died or been seriously affected from occupational phosphate ester poisoning. These orders include: advance planning with the doctor for prompt and adequate treatment in case of a poisoning emergency; initial and periodic cholinesterase tests for each exposed worker; and medical observations of workers and medical interpretation of cholinesterase tests with appropriate recommendations to employer.

Here are several examples of deaths from pesticides occurring in California.

Case 1

The most recent occupational death from pesticides occurred in 1964 in a 28-year-old worker who had no record of occupational exposure to pesticides until his employment as a sprayer by a licensed agricultural pest control operator. He began his employment by applying parathion, tepp, and phosdrin under the direction of a more experienced sprayer. He attended one safety meeting at the company headquarters. His first job alone was assigned after three weeks of employment and was at a ranch in the adjoining county where he was to apply a mixture of phosdrin, parathion, tde (a mixture of chlorinated hydrocarbons) to lettuce. There is no record of his being placed under medical supervision as required by the California Division of Industrial Safety's Agricultural Safety Orders. No baseline cholinesterase tests were performed, nor were the required arrangements made in advance with a physician to take care of any poisoning emergency which might arise.

He began to spray 40 acres of lettuce at the ranch about 9:30 P.M. He was working alone and was last seen alive at midnight by an irrigator who said he had then sprayed half of the field. He was expected to complete his job about 2 A.M. It was a cool, cloudy, evening and he had no illumination except the headlamps of his vehicle. The ground spraying apparatus included a closed system for mixing the concentrates. However, the phosdrin was not mixed in the enclosed system as was the paration and tde. The phosdrin, a 50 percent concentrate, was poured manually from a five-gallon can into a tank on the truck and the sprayer had spilled the material on himself in the process.

The sprayer finished the job, secured his equipment on the truck and drove ¼ mile to the main road where he stopped the truck and began to vomit. He apparently tumbled out of the truck, landing face down in the ditch at an estimated time of 2:30 A.M. At 8:00 A.M. he was found by the owner of the ranch who described him as possibly still alive frothing at the mouth. He was pronounced dead on arrival at the hospital. Red cell, plasma, and brain cholinesterase were all close to zero postmortem, confirming the diagnosis of phosphate ester poisoning.

The area and the equipment pertinent to the incident were investigated. A wet spot smelling like the phosdrin formulation was found on the ground where the nurse rig, part of the spraying and mixing equipment, had been located. (Phosdrin itself is not odoriferous but this particular formulation was.) Three respirators were found in the rig and the torn mate to the glove was found where the nurse rig had been. The respirators were of the proper type. There was no change of clothes on the rig. There was vomitus in the truck cab. It was not clear if any protective device, except possibly the gloves, had been worn. The sprayer was reported to have had adequate water to decontaminate himself in case of a spill but there was no evidence that he had made an attempt to do so. Erratic tractor tracks were found in the field.

This death was entirely preventable. Phosdrin is absorbed through the skin and takes an estimated 12 drops of 50 percent concentrate remaining on the skin to be fatal to an adult. Pouring such materials is a hazardous operation in full daylight and with the most adequate protective clothing. Without help and in the dark, decontamination, a spill on the clothing and skin, such as occurred here, means certain death. However this worker could have survived if there had been someone working with him to help with decontamination and obtain prompt and adequate medical care. This death is the second in two years in California in which a spray applicator spilled a concentrated phosphate ester pesticide while he was working alone and was later found dead. The need for more closed systems for measuring concentrates is abundantly apparent, as is the need to heed the basic safety rule "never work alone with a hazardous chemical".

In the circumstances surrounding pesticide poisoning among workers, the operation of vehicles on the highway by poisoning victims is becoming more a problem. In this case the victim and his truck rig were entering a well-traveled highway.

Case 2

A young sprayer was found dead in the field in the tractor which had been pulling his spray-rig. He had been working alone pouring and mixing parathion concentrate into the spray-rig tank. In the process of mixing the concentrate, the worker contaminated his gloves hands on his trousers as he pulled the rig to apply the spray. Parathion was absorbed through the skin of his hands and thighs. He began to vomit, an early symptom of parathion poisoning. He could not remove his respirator and he aspirated the vomitus and choked. The diagnosis of poisoning was confirmed by postmortem cholinesterase tests.

Case 3

A young man came to work as a swamper for a agricultural aircraft operator. On the first day, he was put to work steam-cleaning and washing a crop-dusting aircraft. It was reported that he was not informed of any hazard nor was he given any protective clothing or equipment. His clothing was observed to have been thoroughly wet while he was working. In the early afternoon, he complained of not feeling well. His employer gave him two atropine pills and the swamper returned to work. Not long afterwards, he was found unconscious. He was admitted to the hospital and died several hours later. Apparently, the aircraft he was cleaning had been used to make several applications of demeton. The diagnosis of phosphate ester pesticide poisoning was confirmed by postmortem cholinesterase tests.

Contamination of the environment occasionally has produced acute human pesticide poisoning. A bale of blue jeans became contaminated from a leaky drum of phosdrin concentrate during transit by truck. Because phosdrin is a highly toxic phosphate ester pesticide and can be absorbed through the skin, six boys who wore unwashed jeans from this bale eight months later were poisoned, two seriously. This contaminated bale had also been stored in the ventilation intake area for a large department store for several months, potentially exposing the occupants of the entire building although no cases of illness were reported.

In California, during August and September of 1963, an outbreak of illness which sent 94 peach harvesters to physican was traced to parathion residues on the foliage of the orchards in which the affected individuals worked. The cause of the outbreak was shown to be related to the amount of parathion application and not to an unusually early entry into the orchards by the harvesting crews. (By law, there is a waiting period between pesticide application and crop harvesting so that the chemical will have deteriorated to the point where residues on the food are within safe limits.) Information obtained revealed that, although parathion could easily be recovered from all elements of the orchard environment, it was not present in amounts sufficient to account for the observed illness. This inconsistency suggested the presence in the spray residue of a compound evolved from parathion alteration which was considerably more toxic than parathion, but identifiable by routine analytical procedures only as parathion. Paraoxon was considered a likely suspect and was postulated as a prime cause of the outbreak.

Recently an episode of food poisoning involved about 28 persons, including the baker, who had eaten donuts made at a local bakery. Eight of the victims were hospitalized. An alert physician suspected an anticholinesterase agent. Cholinesterase levels of these patients were sufficiently reduced to confirm the diagnosis. Donuts and ingredients were analyzed for phosphate ester pesticides and found to contain diazinon. A concentrate had been spilled on a corner of the sack of donut mix. Pest control operations at the bakery were reported as being the most likely source of the diazinon. A full report of the incident is not yet available.

These examples are of immediate, obvious and substantial effects of acute and substantial exposure. Present methods of obtaining human health data are not usually sufficiently sensitive to pick up whatever delayed or less obvious effects may exist.

Inherent in any discussion relative to toxicology, there must be a clear understanding of the concepts of exposure and effect. We have found it most useful to think of exposure as either acute or long-term and to consider effect as either immediate or delayed. Thus, when considering the impact of synthetic organic pesticides on human health, it becomes apparent that most is known about acute exposures which produce delayed effects; and least is known about long-term exposures which produce harmful effects, either immediate or delayed.

A perplexing situation which seems to qualify as an immediate effect of chronic or repeated home environmental exposure has been attracting more attention.

Since 1957, 4 and possibly 5, Californians are known to have died from aplastic anemia or related blood dyscrasias in which exposure to the chlorinated hydrocarbon pesticide, lindane (hexachlorocyclohexane, gamma isomer), has been implicated either directly or circumstantially. In another instance the patient recovered. None of the deaths is attributed to lindane in mortality statistics. The American Medical Association's Council on Drugs maintains a registry on blood dyscrasias and lists 18 reports of major blood dyscrasias in which lindane exposure was implicated (Best, 1963). Additional cases have been reported and the problem has been discussed in medical literature from many countries (Sanchez-Medal et al. 1963) (Editorial, British Medical Journal, 1958) (Danopoulos et al. 1953) (Mastromatteo, 1964) (Council on Pharmacy and Chemistry 1952 and 1953) (Scott et al. 1959) (Huguley, 1961) (Jedlicka et al. 1958) (Friberg, 1953) (Marchand et al, 1956) (Albahary et al, 1957).

A stable or persistent chemical such as lindane vaporized into living quarters whether by a continuously operating dispenser or at intervals by a pest control operator, can produce a continuous exposure. The pesticide can recirculate in the dwelling assisted by air currents and heating and ventilating equipment. The potential for long-term, continuous and substantial exposure by inhalation does exist and it can be of a magnitude greater than workers handling lindane in industry may experience.

The two best sources of decades of abundant human toxicological experience with chemicals are found in the fields of pharmacology and industrial medicine. In both areas of human experience, lists of chemicals have been compiled which have been reported to adversely and sometimes permanently damage the developing blood cells in the bone marrow (Wintrobe, 1961) (Best, 1963). Apparently only a small proportion of persons exposed are seriously affected, and the degree of exposure is not necessarily related to the extent of damage to the bone marrow (Osgood, 1953). In pharmacology it is the antibiotic, choramphenicol, which has been the best known offender (Schmick et al, 1964) (Sharp, 1963). In industry, it has been the solvent, benzol (Vigliani, 1964) (Wintrobe, 1961).

This phenomenon is not predictable by animal experimentation. There are no laboratory tests which can prove or disprove a cause and effect relationship in the individual case. Only when large numbers of people are involved, such as there were with choramphenicol, have epidemiological studies have been useful in providing statistical evidence of the association between chemical exposure and bone marrow damage.

It is not surprising that as human experience with pesticides accumulates the problem of bone marrow damage arises here as it has with therapeutic drugs and industrial chemicals. In drug manufacture and in industry, stringent controls have been placed upon chemicals were epidemiological or even circumstantial evidence indicates that blood dyscrasia hazard may exist. However, only recently, after many years of use and many warnings from authoritive sources (Council on Pharmacy, 1952 and 1953) (California State Board of Health, 1952) have lindane vaporizers for home use become illegal in California. Even though a cause and effect relationship between lindane exposure and blood dyscrasis has not been proved, considerable circumstantial evidence has been accumulating for many independent sources and it would seem prudent to restrict all exposures of this chemical until research efforts can be mounted to settle the question of its relationship to bone marrow damage.

In regard to contamintion of the environment in trace amounts, encouraging reports are coming in both nationwide and within California in regard to pesticide residues on foods. A recent report from the State Department of Agriculture concerning random sampling at the market of fresh produce in Southern California states that 45 percent of these foods tested showed no pesticides, 52 percent showed a trace (1 PPM or less) and only 9 percent ranged between 1 and 3 PPM. None was above legal tolerances. The pesticide most often detected was DDT, with malathion, DDE and lindane in that order, but much less frequently found than DDT.

There is no regular monitoring for pesticide in soil, water, air, in wildlife, in and around the home, and in nonedible commodities. But they have been found in varying amounts in many places on a number of occasions. There is considerable interest in establishing standards or limits for pesticide residues in water, in fish and in game.

RECOMMENDATIONS OF THE GOVERNOR'S COMMITTEE ON PESTICIDE REVIEW

In 1963 the Governor directed a committee representing the University and nine state agencies, all with responsibilities regarding pesticides, to study the state's current programs, identify shortcomings, and recommend programs needed to meet the state's obligations toward its citizens. After a year's study a report was made public June, 1964. It is recommended reading for persons interested in a comprehensive and broad consensus of California's pesticide problems. Many recommendations were made. The most urgent concerned expanded research, programs for human surveillance and environmental monitoring, plus strengthening of pesticide registration with participation of public health and other state agencies in addition to agriculture. The committee emphasized that responsibilities for pesticides cut across many state agencies and that a permanent pesticide review committee should be established to coordinate these responsibilities. (The references to this report have been deleted but one may write to UFWOC, P.O. Box 130, Delano, Calif. for these names.)

[Editor's Note: Other articles by Dr. Irma West appear elsewhere in this volume].

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA IN AND FOR THE COUNTY OF KERN

No. 103595

ATWOOD AVIATION, INC., A CORPORATION, GARRIOTT CROP DUSTING, CO., INC., A CORPORATION, ARVINAIR CROP DUSTERS, ON BEHALF OF THEMSELVES AND ALL OTHER MEMBERS OF KERN COUNTY AGRICULTURAL CHEMICAL ASSOCIATION, AN UNINCORPORATED ASSOCIATION, PLAINTIFFS VS. SELDON C. MORLEY, IN HIS CAPACITY AS AGRICULTURE COMMISSIONER OF THE COUNTY OF KERN, STATE OF CALIFORNIA, DEFENDANT, JEROME COHEN, INTERVENOR

ORDER ON ORDER TO SHOW CAUSE AND DECISION GRANTING PRELIMINARY INJUNCTION

The named plaintiffs hereinabove listed will be referred to as plaintiffs, the named defendant will be defendant and Jerome Cohen, the intervenor, as intervenor.

PLEADINGS AND BACKGROUND

On August 22, 1968 this court, per the Honorable J. Kelly Steele, Judge, upon application of the plaintiffs and after the filing of the complaint herein, issued a temporary restraining order in the following language: "It is further ordered that pending the hearing and determination of said order to show cause the defendant and each of his agents, employees and representatives are hereby restrained and enjoined from disclosing to anyone any of the information shown or contained in any Pest Control Operator Report prepared by and furnished to defendant by plaintiffs, or any of them, excepting with the expressed consent of the person so preparing and furnishing."

In an entirely separate original proceeding commenced in the Court of Appeal, Fifth District, (5 Civ. 1043) intervenor sought a peremptory writ of mandate to require the defendant commissioner to exhibit the records herein involved. The Court of Appeal's concluding paragraph in its order dated November 8, 1968, stated: "Exceptional circumstances justifying an original determination of the questions involved by the appellate court not having been shown, the writ of mandate is denied, without prejudice, however, to the right of petitioner to seek a solution of the questions involved and the enforcement of the right, if any, of petitioner in the superior court."

Thereafter, and on December 16, 1968, intervenor filed a complaint in intervention in these proceedings wherein intervenor on behalf of himself, his family and his clients, the United Farm Workers Organizing Committee (UFWOC), AFL-CIO, and the members thereof, sought to examine the pest control operators records on file with the defendant agriculture commissioner of Kern County.

The hearings before this court on January 29, 30, 31 and February 5, 6, and 27 were hearings on the order to show cause issued on August 22, 1968 upon application of the plaintiffs as to why the defendant and "his agents, employees and representatives should not be enjoined and restrained during the pendency of this action from disclosing to anyone any of the information shown or contained in any pest control operator reports prepared by and furnished to defendant by plaintiffs or any of them except with the express consent of the person so preparing and furnishing."

Neither the complaint nor the complaint in intervention were at issue at the time of the hearings herein. These were not hearings upon the complaint in intervention nor on the complaint. The hearings were for the purpose of determining whether or not a preliminary injunction should issue pending the trial of the principal action on the issues made by the complaint and answers thereto and the complaint in intervention and the answer thereto.

MEMORANDUM

Plaintiffs, as commercial applicators of pesticides are required to be licensed and to apply to the defendant commissioner for permits to apply injurious and restricted pesticides (Agricultural Code Sec. 11732; Title 3 Administrative Code—Agriculture; Def's. Ex. B).

Section 11733 of the Agricultural Code requires each registrant to maintain a record of each pesticide application in the following language:

"Sec. 11733. *Records.* The registrant shall keep and maintain a record of each property treated that shows all of the following information:

(a) Date of treatment.

(b) Material and dosage used.

(c) Number of units treated.

(d) Any other information which the commissioner may require. The registrant shall report the information to the commissioner or the director when and as required."

The defendant commissioner requires a report entitled "Agricultural Pest Control Operators Report—Kern County" (Def. intervenor's Ex. 4 and Pltf's. Ex. 1) to be submitted by the tenth of each month for the preceding month's operations. As indicated in the exhibit this report contains information relative to the operator's name, type of pest control, property owner or lessee, location of property, date of treatment, material used and strength, brand of material, percentage of active ingredients, dose and total amount used, crop treated, acres or units treated, pest treated, velocity and direction of air movement and name of pilot or ground rig operator. As a matter of practice, the defendant commissioner has accepted the information required in forms other than on the form supplied by him. The reports are kept on file with the commissioner as part of his office records and hereinafter will be referred to as pecticide reports.

Enforcement of the agricultural pesticide control law contained in Division 6 of the Agricultural Code is vested in the State Director of Agriculture and local county agriculture commissioners. (Agricultural Code Sec. 11501, 11502 and 11503).

In August, 1968 intervenor was denied inspection of these reports by defendant commissioner. According to the defendant, intervenor did not state why he wanted the records, indicating he had the right to inspect them and would do so one way or another. Intervenor testified that he felt that as a member of the public he had the right to inspect these reports irrespective of the reason. The testimony established that the defendant offered to allow and did actually allow inspection of the applicators applications for permits to apply material and the permits themselves, and the annual report of the Kern County pest control operators for 1967 (Def's. Ex. C). The evidence also established that the defendant will make the information contained on the pesticide reports available upon request to the State Department of Agriculture, the Director of the State Department of Public Health and to the Division of Industrial Safety of the State Department of Industrial Relations. In the event of claimed pesticide injury to an individual, necessary information from such reports for the care and treatment of such individuals so claiming injury will be made available to the treating doctor or the county health department.

Intervenor claims the right to inspect the pesticide reports under the California Public Records Act (Chap. 3.5, Section 6250-6260 of the Government Code).

The sections immediately pertinent here are:

"6250. *Legislative findings and declarations.* In enacting this chapter, the Legislature, mindful of the right of individuals to privacy, finds and declares that access to information concerning the conduct of the people's business is a fundamental and necessary right of every citizen of this state."

"6253. *Public records open to inspection; time;*

Regulations governing procedure. Public records are open to inspection at times during the office hours of the state or local agency and every citizen has a right to inspect any public record, except as hereafter provided. Every agency may adopt regulations stating the procedures to be followed when making its records available in accordance with this section."

"6254. *Exemption of particular records.*

Nothing in this chapter shall be construed to require disclosure of records that are:

(d) Trade secrets;

(e) Geological and geophysical data, plant production data and similar information relating to utility systems development, or market or crop reports, which are obtained in confidence from any person;

(f) Records of complaints to or investigations conducted by, or records of intelligence information or security procedures of, the office of the Attorney General and the Department of Justice, and any state or local agency, or any such investigatory or security files compiled by any other state or local agency for correctional, law enforcement or licensing purposes;

(k) Records the disclosure of which is exempted or prohibited pursuant to provisions of federal or state law, including, but not limited to, provisions of the Evidence Code relating to privilege."

"6255. *Justification for withholding of records.* The agency shall justify withholding any record by demonstrating that the record in question is exempt under express provisions of this chapter or that on the facts of the particular case the public interest served by not making the record public clearly outweighs the public interest served by disclosure of the record."

Also pertinent to this cause is Evidence Code Sec. 1040.

"1040. *Privilege for official information.*

(a) As used in this section, "official information" means information acquired in confidence by a public employee in the course of his duty and not open, or officially disclosed, to the public prior to the time the claim or privilege is made.

(b) A public entity has a privilege to refuse to disclose official information, and to prevent another from disclosing such information, if the privilege is claimed by a person authorized by the public entity to do so and:

(1) Disclosure is forbidden by an act of Congress of the United States or a statute of this state; or

(2) Disclosure of the information is against the public interest because there is a necessity for preserving the confidentiality of the information that outweighs the necessity for disclosure in the interest of justice; but no privilege may be claimed under this paragraph if any person authorized to do so has consented that the information be disclosed in the proceeding. In determining whether disclosure of the information is against the public interest, the interest of the public entity as a party in the outcome of the proceeding may not be considered."

The legislative committee comment to this section, states, in part:

"Official information is absolutely privileged if its disclosure is forbidden by either a federal or state statute. Other official information is subject to a conditional privilege: The judge must determine in each instance the consequences to the public of disclosure and the consequences to the litigant of nondisclosure and then decide which outweighs the other. He should, of course, be aware that the public has an interest in seeing that justice is done in the particular cause as well as an interest in the secrecy of the information."

Also of importance is Evidence Code Section 1060.

"1060. *Privilege to protect trade secret.* If he or his agent or employee claims the privilege the owner of a trade secret has a privilege to refuse to disclose the secret, and to prevent another from disclosing it, if the allowance of the privilege will not tend to conceal fraud or otherwise work injustice."

Part of the legislative comment reads as follows:

"Therefore, the privilege exists under this section only if its application will not tend to conceal fraud or otherwise work injustice. The limits of the privilege are necessarily uncertain and will have to be worked out through judicial decisions."

The court is of the opinion that under these sections there is no absolute privilege of nondisclosure in this case and that the court is required on the facts of the case to weigh the public interest served by not making the records public against the public interest served by disclosure of the records. Upon weighing of these interests under the totality of facts and circumstances here involved, the court has concluded that the records should not be made available to intervenor.

Intervenor alleges in Paragraph XVIII of his complaint:

"Intervener (sic) JEROME COHEN must inspect said records in order to ascertain if the Agricultural (sic) Commissioner's office is doing a satisfactory job in protecting his clients and himself and his family; and in order to properly carry out his obligations to his clients in taking preventive steps against physical injury due to the use of economic poisons."

The intervenor testified at the hearing that he wanted the information because none of the governmental agencies involved can be trusted to perform their duty of enforcement of the various regulations and laws pertaining to registration, handling and use of pesticides, and that he personally wanted more knowledge regarding the use and application of pesticides and their effect in order that appropriate provisions regarding workers protection can be made an item of bargaining with growers and included in future contracts, that he would contemplate a research program on the effect of agricultural chemicals on humans, and would contemplate organizing policing crews from the union to prevent workers going into sprayed fields until the expiration of the waiting period after application and that he would contemplate injunctive proceedings to stop the spraying or use of particular kinds of injurious chemicals and that the union desires and needs this information in order to establish a health and benefit program including a cholinesterase testing program for organic phosphates for the benefit of field workers.

Of course, if, in the process of bargaining with employers—owners—growers, intervenor is able to obtain contractual provisions governing the use and application of pesticides for the protection of workers in addition to those required by law and regulations, that is a matter of private contract. It is difficult to understand, however, how the information in these records would assist in such bargaining and further, even assuming that such information could be helpful, it does not appear to the court to be a proper function of this court to require the opening of these records for this purpose. In this connection, it is interesting to note that the *plaintiffs* herein *contend* that the intervenor's effort to organize agricultural workers and the grape strike and boycott having been unsuccessful, the intervenor's motive and purpose are not in fact as hereinabove stated, but are to use the information acquired to keep alive controversy with the growers, to assist in selling unionization to workers and to invoke public sympathy and support and to force unionization not only through publicity but by using the information to commence and prosecute groundless law suits for alleged pesticide injuries against growers and owners.

The plaintiffs and the defendant both resist the inspection. One or both take the position and the court finds that the information contained in the reports has, in fact, been given and received in confidence under a long standing and statewide policy of county commissioners and the Department of Agriculture. Policy Letter No. I-3 from the State Department of Agriculture to all agriculture commissioners expresses this policy in writing (Pltf's. Ex. 1—Ex. D attached thereto). Sections A-5, 6 and 9 of that policy read as follows:

"A. The following records are considered confidential in accordance with provisions of law or because disclosure of their contents would not be in the public interest:

"(5) Lists of persons reporting, and reports made by farmers, stockmen, processors, dealers, handlers, and others, to the California Crop Reporting Service, as well as tabulated copies of such reports and copies of reports made to the Federal Crop Reporting Board at Washington, D.C. (Federal regulations require confidentiality.)

(6) Records, correspondence and lists of names which would reveal the confidential affairs of individual persons or firms, such as the volume of business done, the composition or secret formulas of products manufactured, prices paid or charged, financial condition, or like items.

(9) Information obtained under a pledge of confidence." (In this connection see also Evidence Code Sec. 1040 heretofore quoted, and *Richards v. Superior Court, 258 Cal. App. 2d 635; City and County of San Francisco v. Superior Court, 38 Cal. 2d 156, 161–164.*)

In effect, both the Department of Agriculture and the defendant have made the determination as a policy matter that the public interest is best served by maintaining the records in confidence. Such a policy is fully justified including the fact that requiring the disclosure of this information would seriously hamper the essential cooperation existing between all segments of the pesticide industry and the farmers on the one hand with the commissioner on the other.

The position is further asserted that these reports are immune from inspection under Government Code Section 6254(d)—Trade Secret, (e) market or crop reports, which are obtained in confidence from any person, and (f) investigatory files for correction, law enforcement or licensing purposes.

The court is of the opinion that subdivision (f) of Government Code Sec. 6254 is inapplicable and that subdivision (e) is of questionable applicability. However, the court is of the opinion that the reported information does contain vital trade secrets as testified to in detail by representatives of the applicators and manufacturers of pesticides, and that the disclosure of this information would be very damaging to a major industry and the public in Kern County, and the nondisclosure thereof will not work any substantial injustice. In this connection it is to be noted that an owner—grower applicator—as distinguished from a commercial applicator—is not subject to licensing nor to the reporting requirements of the law. The inevitable effect of requiring the disclosure of this trade secret information would be a shift from well regulated, licensed, experienced and qualified commercial applicators to inexperienced, unlicensed and less qualified owner—grower applicators, thus exposing workers and the public to greater danger of injury as well as resulting in the elimination of a large segment of an important commercial applicator industry in this county. The intervenor has, in effect, conceded that such a shift would take place. (Pltf's. Ex. 9).

There is no dispute that many commonly used pesticides—particularly the organic phosphates and chlorinated hydrocarbons—are highly toxic and can constitute a hazard to human health and welfare, including death, if not properly regulated and used, and there is no dispute that continuing research regarding the labeling, registering, testing, use and application of these pesticides should be conducted and rules and regulations for protection of workers and the public should be a matter of continuing study and revision. The evidence established that such research has been and continues to be conducted by appropriate agencies at an accelerated rate. While the ecological approach to the control of agricultural pests is an important one and should be pursued with vigor, it is equally obvious that this approach has not reached the point at this time where it can replace the use of agricultural chemicals. The importance of the agricultural chemical industry to this valley and this state is enormous, not only in terms of the employment and income which it generates, but in terms of the astronomical increase in productivity and improvement in quality of food and fiber that has accompanied widespread use of agricultural chemicals.

The court is of the opinion that research and the enactment and enforcement of regulations pertaining to pesticides is a proper function of appropriate governmental agencies and if the current regulations are not adequate then the proper place to go is to the legislature or to the governmental department involved for appropriate changes. It is significant that intervenor has not requested to appear, nor has he actually appeared at hearings for changes in regulations including hearings on proposed changes recently held by the Department of Agriculture.

For example, if there is a danger to agriculture workers from exposure to residue and by reason thereof a testing program—such as the cholinesterase test for handlers of organic phosphates—is indicated, then the regulations should require such tests as they do in the case of handlers. The same observation can be made with respect to owner—applicators being brought under the provisions of the regulations, or with respect to waiting periods, residue tests, etc. This would assure protection of all agriculture workers whether they belong to the union or not. In this connection the court is not unmindful of the very few agriculture workers who are members of UFWOC, AFL-CIO, as compared to the total number who may have some exposure to injury.

There are now very extensive and comprehensive regulations dealing with pesticides including those relating to residue waiting periods, registration and labeling of products, personal safety, first aid treatment, storage, etc. (see Pltf's. Ex. 11 entitled Pesticide Information and Safety Manual; Def's. Ex. F entitled Injurious Materials Safety Requirements based on the Safety Orders of the Division of Industrial Safety from the Department of State Industrial Relations; and Pltf's. Ex. 3 entitled Agriculture and Administrative Code Regulations).

These regulations were enacted or promulgated after being coordinated with all interested departments of government, organizations and individuals (see testimony of J. Blair Bailey). The evidence indicates that all of this research data and information on agricultural chemicals is available to intervenor or other interested organizations. The evidence also shows that intervenor, nor those intervenor represents, have not requested such information from these authoritative sources.

The provisions of some of these regulations and others are of particular interest including the following:

Pltf's. Ex. 11, California Administrative Code, Title 3, Chapter 4, Section 2462:

"2462. *Time and Conditions for Use.* No injurious material or restricted material shall be used in pest control or other agricultural operations in any area of this State in violation of any of the following conditions:

(a) No injurious material or restricted material shall be applied under any circumstances or in any location where damage, illness or injury appears likely to result, through direct application, drift or residue, to persons, animals (including honeybees) or crops other then the pest or vegetation which the material is intended to destroy;

(b) Application of injurious materials and restricted materials shall be substantially confined to the property to be treated, and no injurious materials or restricted materials shall be discharged onto any property without the consent of the owner or person in possession thereof;

(e) After any pest control material containing parathion, methyl parathion, or O-ethyl O-paranitrophenyl thionobenzenephosphonate (EPN) is applied at a rate greater than one pound of actual parathion, methyl parathion, or O-ethyl O-paranitrophenyl thionobenzenephosphonate (EPN) singly or in combination, per acre, the treated property shall be kept posted by the person who authorized the application for two weeks in such manner as to provide adequate warning to persons who enter the property by the point or points of normal entry. The warning notice that is posted shall be of such size that it is readable at a distance of 25 feet and be substantially as follows: WARNING DO NOT ENTER This property treated with (Parathion) (Methyl Parathion) (EPN) on . . . (date) and all persons are warned to stay out for two weeks;

(f) Before any employee engages in handling or applying injurious materials or restricted materials or is required to work in areas where residues of such materials remain in injurious amounts, he shall be informed by his employer of the precautions recommended by the manufacturer and by all appropriate industrial safety orders; and shall be provided with adequate protective devices as specified in such recommendations."

Also, California Safety Orders issued by the Department of Industrial Relations, Division of Industrial Safety, Safety Orders 3298 and 3298.2 (Def's. Ex. F) which read as follows:

"3298. *Application.* The Orders in this article shall apply to employment and places of employment involved in the growing and harvesting of farm crops and agricultural services."

"3298.2. *Communications.* Employers employing persons who do not speak the English language shall provide adequate means of communication so that instructions can be given effectively."

General Industrial Safety Orders 4146 and 4206 require:

"Employers shall instruct employees who may exposed to injurious materials of the hazards they may encounter and the methods of protecting themselves against injury by such substances."

Other safety orders and provisions as indicated by Ex. F require many safety practices.

Agricultural Code Section 11761 provides:

"11761. *Verified report; duty to file; time.* Any person that suffers any loss or damage as a result of the use or application by others of any pesticide, or of any substance, method, or device for pesticidal purposes; or for the purpose of preventing, destroying, repelling, metigating, or correcting any disorder of plants; or for the purpose of inhibiting, regulating, stimulating, or otherwise altering plant growth by direct application to plants shall, within 60 days from the time that the occurrence of such loss or damage, or some are of the loss or damage, is alleged to have occurred, a verified report of loss."

According to the defendant, not a single case of claimed pesticide injury to an agriculture worker from pesticide residues has evern been reported to his office. It is further indicated that if such an instance had been reported, appropriate action would have been taken. No member of UFWOC, the intervenor, nor the UFWOC medical clinic has ever requested any information required for treatment or care for an alleged pesticide injury to an individual.

Of the 94 first reports of occupational injury to agriculture workers attributable to pesticides and other chemicals (Int's. Ex. 3) during 1967, only 19 are farm laborers and not a single one is attributable to organic phosphates at which a cholinesterase testing program would be aimed. Also, with respect to the claimed desire to establish a cholinesterase testing program involving organic phosphates, the court notes that while the demand for the subjects records was made in August, 1968, no inquiry of a testing laboratory to set up such a program was made until November, 1968, and there have been no further efforts to set up such a program as of the date of the hearing.

ORDER

It is ordered that the defendant, C. Seldon Morley, in his capacity as Agriculture Commissioner of the County of Kern, State of California, and his agents and employees and representative be, and they hereby are enjoined and restrained during the pendency of this action from disclosing to the intervenor, to the United Farm Workers Organizing Committee, AFL-CIO, or any representatives thereof, or to the persons or organizations represented by the intervenor herein, any of the information shown or contained in any pest operators' reports or documents received in lieu of such formal report furnished to the said defendant by the plaintiffs or any of them.

Dated, March 27, 1969.

George A. Brown,
Judge of the Superior Court.

[From the Los Angeles Times, Apr. 15, 1969]

SUITS ASK BAN ON DDT IN CALIFORNIA, CROP CONFISCATION

(By George Getze)

Two suits to ban the use of DDT in California were filed Monday in the U.S. District Court here and the Superior Court in Sacramento.

David Averbuck, assistant general counsel for the United Farm Workers Organizing Committee, announced the filings at a press conference at AFL-CIO headquarters.

He said the suits also ask confiscation of all crops in California that have been sprayed with DDT, which, according to Averbuck, has been shown to have long lasting detrimental effects on the health of animals and which is affecting the human environment itself.

Plaintiff in the suits is Vicente Ponce, 34, a Coachella grape picker represented by Averbuck. The attorney said Ponce and other grape pickers have been sprayed with DDT from airplanes and ground rigs while working in the fields.

REFUSE TO DISCUSS PROBLEM

"The growers and sprayers have refused even to discuss the problem of the use of DDT and other economic poisons," Averbuck said.

"They haven't answered out letters, even though the UFWOC has agreed to divorce the subject utterly from its fight for union recognition and collective bargaining," he said.

He said that when the suits come up in court the UFWOC will present biologists and other scientists as expert witnesses as well as farmworkers who have been injured or made sick by the pesticide.

"Growers are using DDT in reckless disregard of its effects on human life and the environment," Averbuck said. He said that 70,000 pounds of the pesticide are used each year in Riverside County alone.

"We don't think the growers are using DDT to kill farmworkers, but on the other hand, we don't think they're using it innocently, either," he said.

"They're using it to make a buck."

Averbuck said that other poisons that break down after a few weeks are available. DDT, on the other hand, lasts for years and perhaps forever, and is being found in fish and birds in all parts of the world, even in places like Antarctica far from any fields where it is sprayed.

"What the long-term effects on life and the earth may be, nobody knows yet," Averbuck said. "Some medical scientists believe that DDT increases the incidence rate of cancer and other diseases."

The attorney agreed that some scientists doubt that DDT is harmful to man.

"But the farm workers don't want to be the guinea pigs in the process of finding out which scientists are right," he said.

According to Averbuck, "wise growers" have already stopped using DDT, and similar suits to Ponce's have been filed in Michigan and New York. In Arizona, where influential cattlemen protested the presence of DDT in the animals they sold for beef, the state legislature has ordered a year's moratorium in the use of DDT.

Two weeks ago Sen. Gaylord Nelson (D.-Wis.) called for a nationwide ban on the use of the pesticide.

Averbuck said that although the suits ask that all DDT stores in the state be seized and quarantined, and that all crops that have been sprayed be confiscated, it would not mean financial disaster for the state's agriculture.

"If it is done at the beginning of a growing season, before the crops have been repeatedly sprayed, a shift can be made to other poisons, ones that are not so long lasting," he said.

[From the Los Angeles Times, Apr. 17, 1969]

NEEDED: PESTICIDE CONTROL REVIEW

Issue: There is worldwide concern over the use of DDT in crop control. Shouldn't California review its rules and regulations?

Legal actions to ban the use of DDT in California have been filed in U.S. District Court here and in Superior Court in Sacramento.

Confiscation of all crops sprayed with the controversial chemical pesticide also is sought in the twin suits brought by the United Farm Workers Organizing Committee.

The court actions are a by-product of a so far unsuccessful union effort to inspect county records of chemical insecticides used in Kern and Riverside Counties.

The union charges that farmworkers have been poisoned and inspection of the records is necessary for their proper medical treatment.

Kern County Superior Judge George Brown has ruled, however, that the chemical mixtures and application methods are trade secrets and not open public records.

This is the stance long held by the chemical firms and pesticide applicators. And Kern County farmers accuse the union of raising the issue to promote its organizing campaign.

Without entering into the union-grower dispute, we believe the controversy outlines an area of great concern: a worldwide uneasiness over the use of pesticides.

Sweden has banned DDT for two years to discover if prohibition will reduce the amount finding its way into plants and animals. Arizona has instituted a one-year moratorium and a U.S. senator has called for a nationwide ban.

There is a large segment of the scientific community which contends insoluble DDT and certain other pesticides constitute a danger to man's very existence.

By the same token, other scientists and agronomists argue that pesticides are vital to food production.

California, the No. 1 agricultural state, is a leading user of pesticides. This is valid reason, we believe, for a complete and unemotional review of the problem. It is up to the Legislature and state health authorities to take the lead.

If the new rules and regulations are required, they should be considered and applied. While the health of the farm workers is of immediate concern, so is that of every child, woman and man.

Scientists Ask Ban on Dangerous Chemical, Warning . . .

all life on earth is threatened

(By Charles Golden)

A poisonous chemical covers the earth. It invades the tissues of every animal and human being, attacking the central nervous system, the intricate process of the body's chemistry, and even the sexual identify of the human race.

It falls with every drop of rain and every flake of snow, contaminates every lake and every river.

It threatens fish, birds, and other wildlife with extinction.

It is impossible to eradicate, and its toxic influence lingers for decades.

And more of it is being pumped each day into the air we breathe and the water we drink.

Science fiction? Some bloodcurdling tale from Edgar Allan Poe?

Unfortunately, no. This horror story is true, a prominent U.S. biologist warns. It is the disastrous story of the pesticide DDT, of how we have polluted our entire environment with it over the past 25 years—and how we are heedlessly continuing to spread this pollution.

"Everyone dismissed as over-emotional all the little old ladies who said that DDT was killing birds," said Dr. Charles F. Wurster Jr., 38, who is professor of biology at the State University of New York.

"But the little old ladies were right.

"Actually, the real situation is worse than the emotional people first thought. It's a real horror story.

"The most dangerous myth about DDT is that it can be used safely if people only follow the directions on the label.

"But it is impossible to use DDT safety. It is uncontrollable. The only answer is to outlaw it."

Dr. Wurster has set out to do exactly that. He is chairman of the Scientists Advisory Committee of the Environmental Defense Fund, a Long Island-based organization which has filed suits in three states to prevent the use of DDT.

In January, Dr. Wurster joined other biologists from across the country at a hearing called by the Wisconsin State Department of Natural Resources to debate a statewide ban on the use of DDT.

He testified at the hearing in Madison, Wis., that pollution by DDT has reached the level of "great worldwide damage."

Continued agricultural use of the potent pesticide, he warned, could cause "one of the worst environmental disasters ever perpetrated by man upon the life of this planet."

The Wisconsin debate, between conservation-minded scientists on one side and large chemical conerns on the other, has become the national battleground in the war against DDT pollution.

And the stakes are exceptionally high.

Since DDT came into widespread use immediately after World War II, scientists say, it has killed billions of birds and fish.

Some wildlife species are facing the immediate threat of extinction as a result of DDT poisoning.

Especially hard hit have been various types of eagles (including the American bald eagle), ducks, falcons, hawks, trout and salmon.

Bird populations are being sharply reduced because DDT causes birds to lay eggs with abnormally thin sheels. The eggs dry out and the shells break before the young can be hatched.

The chemical causes the breakdown of certain sex hormones in birds. This breakdown, in turn, interferes with calcium metabolism and results in the thin eggshells.

University of Wisconsin ecologist Joseph J. Hickey called DDT a "chemical of extinction."

After the fish and the birds, larger animals—even humans—could be seriously affected.

"You can't separate the danger to human beings from that to wildlife," Dr. Wurster emphasized. "Is man safe when wildlife is being poisoned? Isn't it likely that something is happening to man as well?"

Human beings, the scientist noted, have the same type of sex hormones as birds. Although there is no proof, he considers it likely that DDT may have similar detrimental effects on human sex hormones.

Long-range damage to human hormone production could, theoretically, result in subtle, but devastating changes.

These could conceivably include, over many years, a feminizing effect on men, or a tendency to masculinize women.

Other effects might include abnormalities in sexual characteristics, such as full-breasted men or bearded women.

But such grotesque sexual changes are only one possible result of the overall metabolic interference baused by DDT.

Metabolism is controlled by many highly specialized enzymes produced by the liver. These enzymes regulate the whole spectrum of body functions.

Therefore, Dr. Wurster noted, all the intricate workings of the body chemistry could be thrown out of kilter by DDT's poison.

"No one has the right to say that DDT is safe for humans," Dr. Wurster stressed. "The tests that supposedly 'prove' that DDT is safe in man are 10 years behind the times."

In the late 1940s, DDT became a popular ingredient in many large-selling insect sprays which were sold in stores throughout the country. It was found in almost every American household.

But after its dangers to wildlife were widely publicized several years ago, most manufacturers quietly remove it from their insecticides. However, it has continued to be used in large quantities by farmers fighting crop pests.

Dr. Wurster charges that DDT manufacturers—which include only about 10 U.S. firms—falsely claim that DDT is the only means of controlling such hazards as the malaria mosquito, the Dutch elm beetle and other pests.

The biologist insists that there are, in fact, plenty of safe non-persistent pesticides readily available, and that DDT manufacturers should be forced to switch to the production of these chemicals or get out of the business altogether.

One of the reasons conservationists favor a total ban on DDT is because it is "persistent." In other words, it stays around to contaminate the environment for decades.

It is a neuro-toxin which kills insects by attacking the central nervous system and paralyzing vital organs.

But it is also toxic to all forms of life, not just the insects it is supposed to kill. Dr. Wurster explained.

It is highly mobile and has spread like a deadly stain over the entire earth. Even penguins in the Antarctic have traces of DDT in their bodies.

Finally, it dissolves in fats—which means it is stored in living creatures.

"As far as we can tell, everyone on earth has some of the poison in his tissues," said Dr. Wurster.

Scientists in Germany reported finding extensive DDT contamination in milk samples and urged that "extensive application of DDT and similar products be dispensed with."

The U.S. Food and Drug Administration recently condemend a quantity of butter in Arizona found to be contaminated with DDT, but allowed the butter to be sold to a soap manufacturer.

And a special investigating committee of the Pennsylvania State Senate has reported that DDT and other "persistent pesticides" pose "sufficient hazards" to justify outlawing them in the state's forests and fields.

In the face of all this damning evidence, scientists say it is absurd to allow DDT to remain on the commercial market.

"The use of DDT is not consistent with modern scientific knowledge," Dr. Wurster said.

"Adequate alternative methods using safe, short-lived chemicals, are available for controlling insects."

Lake Michigan, which covers 22,000 square miles, already has been declared "irreparably contaminated" with DDT.

"We've created a mess," Dr. Wurster said. "Even if we stopped using DDT today, it would take many years for the damage we have already done to be repaired."

The Wisconsin hearings will resume sometime this spring, and scientists all over the world will be watching them intently.

The danger of DDT has become a matter of life and death. But it is still not too late to find a happy ending to this horror story which affects every living thing.

[From the Wall Street Journal, Mar. 4, 1969]

WISCONSIN HEARING ON BID TO BAN DDT COULD AFFECT FUTURE OF ALL SUCH PRODUCTS

(By Richard D. James)

Madison, Wis.—The agricultural chemical industry is under attack—again.

Ever since 1962, it has led a somewhat harried existence. That was the year the late Rachel Carson's best seller, "Silent Spring," appeared, alleging widespread, indiscriminate use of pesticides produced by the industry. Now, as before, the issue is pesticides, this time specifically 1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane—better known as DDT.

The battle is being waged on several fronts. Last summer, Illinois, Wisconsin, Michigan and Indiana signed an agreement calling for stricter controls on all pesticides, DDT included, that are polluting Lake Michigan. The Illinois legislature is considering a bill banning the use of DDT. In Pennsylvania, a state senate committee recommended a ban on its use in fields and forests. And Sen. Nelson (D., Wis.) says he plans again to seek legislation outlawing the insecticide nationally. "I think it's been clear for a long time to those scientists who are knowledgeable that DDT is having a devastating environmental effect," he says.

A HEARING IN WISCONSIN

The sharpest fight of the campaign, however, is shaping up here, and its outcome could have an important bearing on the future of DDT and pesticides generally. Focal point of the confrontation is a hearing being conducted by the Wisconsin Department of Natural Resources on a petition to ban the use of the chemical in the state. The agency has jurisdiction over keeping the state's water resources free of pollution, and under state law it can, upon petition by interested parties, restrict or ban the use of any substance it finds to be fouling the water.

In November, the department was petitioned by a group of Wisconsin conservationists called the Citizens Natural Resources Association. They were joined by the Wisconsin division of the Izaak Walton League. The two groups allege DDT is getting into the water from a variety of sources and is harming wildlife.

Hearings began in December and continued for 13 days, with about a dozen scientists appearing in support of a ban. Then the proceedings were recessed to allow the chemical companies time to prepare a defense. They are expected to begin presenting their case in a few weeks.

The case is of more than passing interest. Since "Silent Spring" appeared, research has turned up new evidence suggesting DDT may harm wildlife, and possibly humans too, in previously unsuspected ways. The hearings mark the first time many of the findings have been used as ammunition against pesticide makers. If Wisconsin finds the evidence sufficiently persuasive to ban or severely limit the use of DDT, conservationists and other DDT opponents are expected to carry their fight against the industry into other states.

Moreover, if the campaign against DDT proves successful, the industry expects attacks against similar insecticides. Finally, the loser here seems certain to appeal to the courts, raising the prospect of a precedent-setting legal decision.

COULD AFFECT LARGER MARKET

The industry attempts to play down its financial interest in the case. It says the DDT used in Wisconsin in 1967 amounted to sales of only $17,000. Even nationally, DDT volume isn't huge. In 1967, the largest period for which figures are available, sales totaled $13.7 million. However, the larger market that the industry believes would be threatend if the DDT issue goes against it totals about $200 million annually—more than 25% of manufacturers' total pesticide sales.

To bolster their attack, the Wisconsin conservationists enlisted the help of the Environmental Defense Fund, a small Long Island, N.Y.,-based group comprised mainly of scientists that has waged a steady battle against DDT and similar insecticides, chiefly in the courts, ever since it was formed in October 1967.

It has met only limited success in the courts, but its lawsuits against state and local agencies haven't been totally ineffectual. Among other things, the pressure the suits have generated as credited with prompting more than 50 cities in Michigan to stop using DDT against the Dutch elm disease.

The industry is fighting back through a DDT task force, organized several years ago under the aegis of the National Agricultural Chemical Association to contain the brush fires ignited by DDT's opponents. Most of its members are the companies that make DDT: Diamond Shamrock Corp., Allied Chemical Corp., Olin Mathieson Chemical Corp., Lebanon Chemical Corp., a privately held company; and Montrose Chemical Corp. of California, the largest maker. Montrose is owned jointly by Chris-Craft Industries Inc. and Stauffer Chemical Co. A sixth member, Geigy Chemical Corp., Ardsley, N.Y., doesn't make DDT.

CAUGHT OFF BALANCE

Thus, the industry is well organized to defend itself, but the Wisconsin attack seemingly caught it off balance. The task force didn't retain an attorney to represent it at the hearings until less than a week before they opened, and it apparently had almost no idea of what it would face in Madison. "Frankly, nobody knew what kind of hearing this was," says Louis A. McLean, the attorney finally picked by the task force. "We thought it would be something like a legislative hearing, where people get up and make statements of position." Mr. McLean is a long-time industry spokesman, who until he retired in July 1967 was secretary and general counsel for Velsicol Chemical Co., pesticide maker and Northwest Industries Inc. subsidiary.

In the past, pesticide manufacturers sometimes have tried to dismiss their critics as food faddists and neurotics. For example, in 1967 Mr. McLean wrote: ". . . the antipesticide people in almost every instance hold numerous beliefs in nutritional quackery and medical quackery, and they oppose public health programs."

The characterization rankles many of the scientists involved here, leading some to suggest that the industry this time has underestimated its opposition. Indeed, the Environmental Defense Fund and its attorney, Victor J. Yannacone Jr., have spearheaded the case against DDT with expert testimony from reputable scientists brought in from all over the country.

Included are fishery and wildlife biologists, botanists, an organic chemist, a pharmacologist and entomologist. Through its scientists advisory committee, headed by Charles F. Wurster Jr., a biology professor at the State University of New York at Stony Brook, the EDF has built up since its inception a pool of about 100 scientists to furnish opinions or testimony. Not all EDF witnesses are members.

The EDF contends a complete ban on DDT is needed because even small amounts of the pesticide applied in the most rigidly controlled manner will still pollute the water and atmosphere. Mr. Wurster testified DDT is easily picked up from the soil and carried throughout the world on wind-born dust and water particles. Other witnesses testified DDT has been found in nearly every part of the world, including dust collected over the Indian and Atlantic oceans. It even has been detected in the penguins of Antarctica, they assert.

The widespread contamination is harming wildlife, not necessarily by killing it outright, but by producing subtle metabolic changes, unsuspected until recently, that are gradually eliminating various species, the scientists say. Kenneth Macek, a biologist for the U.S Department of Interior's fish-pesticide laboratory at Columbia, Mo., reported his research shows that feeding low, sublethal doses of DDT to brook trout causes a higher mortality among their offsping and makes the trout more susceptible to environmental stresses.

DROP IN BIRD POPULATION

University of Wisconsin wildlife ecologist Joseph Hickey testified that since 1950 there has been a plunge in populations of birds of prey such as the eagle, osprey and peregrine falcon. At first, scientists didn't know why, he explained. Then in 1967 research showed the birds were laying thinner-shelled eggs that were breaking and failing to hatch. Because the change in eggshell thickness occurred after 1947, the start of widespread DDT use, the scientists theorized that DDT somehow was upsetting the birds' calcium metabolism, which is involved in eggshell formation.

Messrs. Hickey, Wurster and others believe the theory now is well documented. During the hearings they explained how researchers quite by accident found that DDT, even in small amounts, activates certain liver enzymes in rats, rabbits and some birds. Enzymes generally control the body's chemical functions; those involved in this instance affect estrogen, a female sex hormone that plays a role in calcium metabolism. In this subtle way, they argue, DDT exacts its toll.

Additional support came from Lucille Sticel at the Interior Department's Patuxent wildlife research center in Maryland. She told how she fed small amounts of DDT and DDD, a breakdown product of DDT, to mallard ducks. The results were thinner eggshells and increased breakage, she said.

Although the industry hasn't yet presented its side of the story, talks with Mr. McLean and others give some indication as to what lines it will follow. Mr. McLean questions the accuracy of the research studies and the qualifications of the scientists who conducted them.

He contends, for instance, that Mr. Wurster is an organic chemist, "but he was talking about things entirely unrelated to the field of chemistry. If a man wants his opinions respected, he should be qualified in the specialty in which he's speaking, and a scientist who's speaking outside his area of expertise is really no better qualified to foist an opinion than any person on the street."

Mr. McLean indicates the industry will call toxicologists and medical experts in its defense. "I think it's particularly interesting that although the EDF is basically talking about matters of health, it didn't bring one medical witness to the stand. And frankly I didn't expect them to, because I don't know of any medical toxicologist who's informed about pesticides who shares their fears."

The EDF argues that there are substitutes for DDT that are as effective but much safer because they are shorter-lived and therefore their harmful effects don't persist in the atmosphere.

The industry disagrees. It contends other pesticides aren't as effective, and because they are shorter-lived, they must be applied more often, increasing the chances for improper and harmful use. Beisdes, industry spokesmen say, DDT is safe. It must be approved by the Federal Government, they assert, and the Governmental agencies involved—the departments of Agriculture and Interior and the Food and Drug Administration—wouldn't approve any agent harmful to humans or wildlife.

The industry backs up its contentions on safety by citing a study of Montrose Chemical employes at a DDT plant. The study reports the employes are exposed to much higher levels of DDT than is the general public, yet they don't show any signs of harmful effects.

POSSIBLE EFFECTS ON HUMANS

So far, the issue of DDT's effects on humans hasn't been raised directly in the hearings. It was touched on briefly, though, by two witnesses. Richard Welch, a pharmacologist with Burroughs Wellcome & Co., a drug manufacturer, said the sex hormones affected in rats by the DDT-activated enzymes are the same ones found in man. He also explained that the amount of DDT needed to produce the effect "is within a range of DDT found in human fat . . . thus, if one can extrapolate data from animals to man, then one would say that the change in these enzymes probably do occur in man."

And Robert Risebrough, a biologist with the University of California's Marine Resources Institute, touched on the subject briefly in his testimony. "Our general point is that (the Food and Drug Administration) hasn't taken any consideration of the enzyme inducing capacity of these substances (DDT and similar pesticides). This is a decision which the FDA will have to make sometime in the near future. Will it permit an increase in the activity of these enyzmes in our liver? No responsible person could now get up here and say that this constant nibbling away at our steroids (the sex hormones) is without any physiological effect. It would be irresponsible."

Finally, the industry can be expected to hit hard on DDT's public health uses and benefits. "Too many people forget we need DDT for control of mosquitoes that carry encephalitis, and the world needs it to control malaria, says Mr. McLean.

Adds Samuel Rotrosen, chairman of the DDT task force and general manager of Montrose Chemical, "I don't say these people (EDF witnesses) aren't true scientists, but their interest appears to be 'let's worry about birds more than people.' I think we'll have qualified scientists who will put the picture in perspective."

There's no way, of course, to ell yet how the Wisconsin Natural Resources Board will rule. But it may have given some indication of its attitude on the DDT question last year in one of its technical bulletins. "The use of any persistent pesticide (which includes DDT) remains a calculated risk. Science has already shown chlorinated hydrocarbon pesticides (the family to which DDT belongs) to interfere with fish reproduction, behavior, and hereditary factors. Further, these residues may be harming a variety of animal life in many subtle ways, which will only become apparent through intensive research. To continue to use DDT . . . in the face of the present level of contamination would seem to be an invitation to disaster."

[From the Los Angeles Times, July 2, 1969]

COMPROMISE ON BANNING DDT AGREED TO BY SENATE GROUP

(By Jerry Gillam)

SACRAMENTO.—A compromise bill to outlaw all use of DDT in California effective Dec. 31, 1971, was agreed on Tuesday by the Senate Agriculture Committee, acting in closed-door executive session.

The chairman, Sen. Fred. W. Marler (R-Redding), scheduled a public hearing Thursday to vote on the amended legislation.

Sen. John A. Nejedly (R-Walnut Creek), author of the measure, agreed to the proposed changes, according to Marler.

Nejedley's original bill would have banned all use of DDT in the state starting next Jan. 1, but he couldn't muster the five necessary aye votes on the nine-member committee to approve this version.

The amended bill also would give the director of agriculture authority to extent the Dec. 31, 1971, cutoff date for one year—if no resonable alternate for DDT is developed and ready for use by that time for specific crops.

Marler noted this would give the pesticide industry a maximum of three years to come up with a suitable substitute for DDT.

DDT, the major pesticide used in the United States, is dangerous to fish and wildlife and even humans, according to some scientists, because it doesn't dissipate easily after use.

"All indications are that the amended bill does have the necessary votes to get out of committee," Marler said, although he added he wasn't "particularly happy" with the compromise version either.

"The lead time for a new pesticide can be 5–8 years," he told The Times. "And as far as I can tell, there is nothing on the horizon that will replace DDT in all of its present uses."

The Department of Agriculture has recommended a ban on the use ofDDT in the home and garden effective Jan. 1.

This prohibition also would apply to agricultural use of the pesticide in dust form, but this accounts for only about 20% of the total farm useage.

Liquid spray use of DDT would still be permitted under the department's proposed regulation.

Opponents have until July 11 to file their objections, but indications are strong that it will be adopted.

Meanwhile, the department has warned housewives not to try to dispose of DDT by flushing it down the sink or toilet into the sewage system or by placing it in any body of water.

[From the Los Angeles Times, June 13, 1969]

State Will Ban Home Usage of DDT and DDD

(By Jerry Gillam)

Sacramento.—The use of DDT and DDD in the home and garden will be banned effective Jan. 1, it was announced Thursday by the Department of Agriculture.

Also prohibited will be the agricultural use of both in dust form, which accounts for about 20% of the farming use of the two pesticides.

Although the department gave objectors until July 11 to file arguments, it left little doubt that its ban would then be made final.

A department spokesman said the exact number of brand-name housegarden bug killers containing DDT, DDD or combinations or compounds is not known, "but it's considerable—quite a few do."

Noting recent public and scientific concern about the effects of DDT and DDD, department Director Jerry W. Fielder said:

"We know of no reliable evidence that these pesticides are directly harmful to man, but they do represent a hazard to man's natural environment, including fish and wildlife.

PROPOSED ACTION EXPLAINED

"As part of our continuing program to regulate pesticides in the public interest, therefore, we believe this proposed action is necessary."

Application of DDT and DDD as farming pesticides by liquid spray would be exempt, if a permit is obtained from a country agricultural commissioner.

Liquid spray accounts for the bulk of farming use of the two pesticides.

Fielder said the six-month time lag before the effective date will allow for orderly disposition of present stocks of the two pesticides.

He said many firms and individuals could suffer a severe economic loss if the time lag wasn't permitted.

A group of 62 marine scientists last week urged complete prohibition of the use of DDT in California in an open letter to Gov. Reagan.

DDT, the major pesticide used in the United States, has been banned in Arizona, Michigan and Sweden.

Scientists say DDT is dangerous because it does not dissipate easily after use.

There is a pending bill in the Legislature by Sen. John A. Nejedly (R-Walnut Creek) to ban all use of DDT in California.

"What is being done today has nothing to do with Sen. Nejedly's bill," the spokesman said. "This has been under consideration for several months."

SAYS BAN DOESN'T GO FAR ENOUGH

Informed of Fielder's announcement, Nejedly said the ban didn't go far enough in his opinion, and he will continue to push his legislation.

It is scheduled to be heard June 19 by the Senate Agriculture Committee.

The department ban would cancel state registration of manufacturers of the two household-type bug killers. This would stop those products from being sold in California.

Violators could be prosecuted in court by the department.

DDT and DDD are chlorinated hydrocarbons that have been on the department's "injurious materials" list since 1963, meaning they could be used in large amounts in farming only by permit.

The department prevously reported the use of DDT as an agricultural pesticide has been reduced substantially over the last five years.

Fielder said the use of DDT and DDD for home and garden purposes isn't regulated by permit because this would be "impractical and hard to enforce."

He also said the ban should not hurt the housewife who wants to kill bugs.

"There are now available for home and garden use other registered economic poisons that will adequately do the same job at reasonable cost," Fielder said.

The director added the ban of the use of DDT and DDD is dust form on the farm would "eliminate a threat to the environment" because of its easy drifting ability.

"This dust is made up of minute particles," he said, "that tend to drift into non-target areas and contaminate them."

Fielder also noted that the University of California has agreed to conduct a study to advise which further applications of DDT and DDD should be curtailed.

[From the San Francisco Chronicle, Apr. 17, 1969]

Michigan Acts to Ban DDT Sales

Michigan, torn by dissention over pesticide control measures, took steps yesterday to outlaw the sale of DDT for farm and other uses and became the first state to ban the increasingly controversial chemical.

The State Agriculture Commission voted to cancel all registrations for the sale of DDT. Hearings would be required, if demanded by contesting interests.

Michigan, a leading State in which tourism and recreation is an industry second only to auto manufacturing, has been shaken by discoveries pointing to pesticides as a menace to commercial and sport fishing.

Last week, Governor William G. Milliken summoned the Governor William G. Milliken summoned the Governors of Illinois, Indiana, Wisconsin and Minnesota to an emergency meeting Sunday in Chicago to discuss the problem. Milliken may ask neighboring states to follow Michigan's lead in banning DDT to increasing perils to fish in Lake Michigan where chemicals used on crops are eventually carried by runoff into streams and rivers.

Increasing concentrations of DDT have turned up in the fat of salmon, whitefish, trout and perch and there has been talk of need to close down the State's commercial fisheries.

The State is caught up in a new fishing craze for a variety of salmon called the Coho which was introduced into Lake Michigan a few years ago. It has attracted sportsmen from out of State and created a fever of excitement.

[From the San Francisco Chronicle, Apr. 17, 1969]

New U.S. Ban On the Use Of Pesticides

The Agriculture Department, reflecting a tough new approach to the use of pesticides yesterday canceled authority for the use of mixtures containing DDT on cabbages and lettuce which are near maturtiy.

Officials said they acted to prevent buildup of dangerous residues. A ban on the use of another pesticide, Toxaphene, on near-mature cabbages and lettuce was ammounced last month.

Spokesmen said the ruling on DDT, following the pattern set in the Toxaphene order, will permit the use of the chemical in accordance with label directions during early growing stages.

In the cabbage-lettuce case, officials determined that even though the label directions would provide consumer protection, a chemical ban was needed because some producers were failing to follow the directions.

[From the San Francisco Chronicle, Apr. 14, 1969]

SWEDEN'S BAN ON DDT

STOCKHOLM

Sweden—the first country in the world to ban use of DDT—is accepting the role of guinea pig.

The ban is to last for two years and the first aim is to discover if a national prohibition will reduce the amount of DDT finding its way into plants and animals.

The decision came after an international conference in Stockholm to discuss the dangers of using the chemical.

It is recognized that since the chemical is so easily spread, a one-nation ban is bound to have a limited effect. Consequently, there is a move afoot to extend the measure to the rest of Scandinavia, and demands have already been heard in Norway for a total ban on DDT there.

The Swedish ban is comprehensive covering DDT and all its derivatives in every field. Agricultural and domestic uses are specifically mentioned in the regulations, so DDT will disappear from all sprays and insecticides used in Sweden.

Although the Swedes promulgated their ban in connection with an international conference to make an impact abroad their information had been gathered carefully for years.

Fish, birds and many plants were found to contain rising amounts of DDT, and its presence in human beings was distinctly on the increase. What disturbed the Swedish authorities most was the fact that no scientist was able to say for certain that DDT is harmless in the case of the higher forms of life.

On the other hand, evidence was presented at the Stockholm conference that DDT in remarkably small quantities could affect human metabolism. Russian investigations showed that certain people habitually working with DDT were found to suffer from changes in the liver which slowed down the elimination of waste products from the body.

Some stockholm scientists who investigated the presence of DDT in wildlife along the Swedish coast found that it is present in rapidly increasing quantities as one moves up the scale of predatory creatures.

Thus, gulls contain more DDT than the fish upon which they feed, while certain types of sea eagles, which prey upon both, exhibit the highest concentration of all. They were found to have 25 per cent by weight of DDT in their fat tissues.

It is often argued that DDT affects only lower forms of life, particularly the insects it was originally designed to kill. But it has also been shown to have poisonous effects of shellfish, and to cause thickening of the shells of birds' eggs. If the shells become too think the chicks are unable to hatch.

At present, there is hardly a part of the globe free of DDT. Eskimos in Greenland and seals in the Antarctic have it and both are far from the nearest source. Perhaps the Swedish ban will at least eliminate an annual contribution of 700 tons, but that is a small amount compared with the 11,000 tons used annually by the United States.

The strongest opposition is expected to come from countries involved in malaria control. DDT and its allied components are the chief chemicals used to eliminate mosquitoes.

[From the San Francisco Chronicle, Apr. 17, 1969]

THE FARM WORKERS' POWER PLEA

WASHINGTON

Farm labor leaders called yesterday for a law to assist farm workers in forming strong unions.

Spokesmen for the AFL-CIO United Farm Workers Organization Committee opposed farm labor union coverage under the National Labor Relations Act unless farm workers are permitted secondary boycotts and the right to strike.

The only way to end strikes, boycotts and child labor abuses is through strong unionization and signed contracts, Delores Huerta, union vice president, told a Senate labor subcommittee considering collective bargaining for farm workers.

Chairman Harrison A. Williams Jr. (Dem-N.J.) invited the union officials to submit draft legislation after hearing their report of what he described as a "breakdown of existing law."

Mr. Huerta and two union attorneys said California has state laws regarding sanitation and child labor but "all the laws are violated." She said the same is true with Federal immigration and anti-discrimination laws.

Reading from a statement of Cesar E. Chavez—union director unable to appear because of illness—Mrs. Huerta said:

"If farm unionism is to make progress—we need sufficient economic power under law to be able to wrench signed agreements from unwilling growers. . . . Coverage under the present NLRA would not give us the needed economic power—and it would take away what little we have."

[From the Washington Post, May 27, 1969]

DDT Peril Seen In Mother's Milk

Mother's milk is laced with about four times more DDT pesticide than is permitted in milk sold to the public, conservationist leader David Brower said yesterday.

"Some wit even suggested that if it were packaged in some other container, we wouldn't allow it across state lines," the former executive director of the Sierra Club said.

Brower, testifying before the House Merchant Marine and Fisheries Committee, said the average person carries more DDT in his body than is permitted in the meat he eats.

The California conservationist testified in support of legislation to create a council on environmental quality.

[From the New York Times, Jan. 15, 1969]

DDT Termed Peril to the Sex Organs

Madison, Wis., Jan. 14 (UPI)—A scientist warned today that the pesticide DDT could be seriously affecting man through sex organ changes and by reducing the effectiveness of drugs.

Dr. Richard M. Welch, a biochemical pharmacologist at Burrough-Wellcome Research Laboratories, Tuckahoe, N.Y., made the statements during testimony at a state hearing on a petition to ban DDT in Wisconsin.

Dr. Welch outlined experiments he had conducted with rats to determine the effects of DDT. He said those experiments showed alterations in the sexual mechanisms of both male and female rats and also that DDT interfered with effects of some commonly used drugs.

"If one can extrapolate data from animals to man then one can say this change in animals probably does occur in man," he said.

Among the effects of the chemical on rats, he said, were induction of enzymes, body catalysts; increases in the weight of the female uterus and deposition of dextrose in the uterus, and stimulation of production on the female sex hormome estrogen.

He said DDT also interfered with drugs used for treatment of disease by causing the body to break down the drugs faster than it would normally.

[From the Los Angeles Times, June 26, 1969]

Rhine Shows No Trace of Fish-Killing Poison

ONE SACK OF INSECTICIDE MAY HAVE CAUSED DEATHS IN WEST GERMANY, EXPERT SAYS

Dusseldorf.—The West German section of the Rhine River showed no more traces Wednesday of a poison that killed millions of fish, officials reported. A

Health Ministry water expert said one sack of insecticide may have caused all the touble.

The insecticide reportedly is relatively harmless to humans.

A spokesman for the North Rhine-Westphalia State Agricultrual Ministry said the poison began disappearing from the water late Tuesday. He added that fish put into the river showed no effects of poisoning. Earlier, trout had died within seven minutes after being put into the water.

The water expert told a news conference in Bonn: "As far as can be established, the poisoning was caused by about 100 kilograms (220 pounds) of Endo Solvan which is about a sackful."

Dutch authorities earlier said they had traced the poison to the German-produced insecticide which is marketed under the trade name of Thiodan. Amsterdam has shut off all water from the Rhine, which usually supplies about half the city's water needs.

EXPERT'S OPINION

The water expert, who is aiding investigation of the poison, said the insecticide could have been thrown, dropped or washed accidentally into the already heavily polluted river in the wine-growing region around Bingen, where the dead fish first were found last week.

Some West Germany experts theorize that the chemical may have gained added lethal qualities by reacting with other industrial chemicals and wastes in the river.

An official of the Rhineland-Palatinate Agriculture Ministry said Tuesday the chemical probably was dumped into the river from a ship or barge somewhere along a picturesque 12-mile stretch of the river between Bingen and St. Goarshausen in the heart of the Rhine wine country.

The North Rhine-Westphalia spokesman said drinking water taken from the Rhine for 3.5 million persons in the state had not been endangered by the chemical.

The poison pollution raised an outcry in the West German press.

Calling the Rhine "Europe's biggest sewer," the Stuttgarter Zeitung commented that "what has happened to the Rhine today could spread all over by tomorrow."

The Frankfurter Rundschau demanded more federal money to stop pollution.

There was evidence that the poison was becoming diluted as it flowed downstream.

Wild ducks were reported to have died in the Koblenz area after drinking river water but other ducks were showing no ill effects at Dusseldorf, 60 miles downstream to the north.

In the Netherlands, the Dutch Institute for Purification of Refuse Water said the drifting poison was being blocked near Dordrecht by the currents of the incoming sea tide. He hoped the ebbtide would carry it out into the North Sea.

Jan Van Veen, manager of the Amsterdam water works, said he has an emergency water supply of two to three months, enough to ride out the period of poisonous pollution.

West German Federal Health Minister Kaete Strobel expressed concern that drinking water supplies could be affected by the poison.

[From the Fresno Bee, Jan. 12, 1969]

'WETTERS ARE BIG FACTOR IN SPRAY MIXES'

Bakersfield.—Considerable research has been done on wetting agents in recent years by industry and public researchers. The differences they have found have been striking. But the variability in performance of individual wetting agents with different crop chemicals has been even more striking.

For this reason, ranchers will see more frequent reference to the use of specific wetting agents with specific crop chemicals. In many cases the chemical will come formulated with a given wetting agent.

SELF PROTECTION

Should a grower follow the label suggestion?

In most cases he should; one advantage is that if injury to a crop should occur then the user has legal recourse against one manufacturer instead of two, reminds Harold Kempen, Kern Country farm adviser. Secondly, he can be more assured of a satisfactory result—the object he is seeking.

However, many different brands of wetting agents are available and often they are of lower cost to the user. If adequately tested, certainly these can be used, Kempen said.

Results with wetting agents vary not only with the chemical used but with environmental conditions and the proportion used. Obviously the wetting agent has completely different physical characteristics at 120 degrees Fahrenheit than at 40 or 50 degrees. Likewise it has been shown that these "wetters" (as they are called in Australia) may react with an herbicide if used at high concentrations in the water diluent. Thus, adding the wetter to water before or after the herbicide, or to a wettable powder slurry, may change the result obtained.

While mentioning concentration, one must remember that the percentage of active ingredient varies with the brand used. Usually the active ingredient is considered to be mainly alkylarylpolyoxyethylene glycols. All labels include other compounds to stabilize and enhance the wettability.

Thus, wetting agents are different and the results obtained with crop chemicals might be related to the wetting agent used.

[From the Fresno Bee, Jan. 12, 1969]

GRAPE GROWERS GET OKAY TO USE THE SODIUM ARSENITE

The U.S. Food and Drug Administration has again cleared sodium arsenite for use by grape growers to control black measles on Thompson Seedless grapevines.

Curtis Lynn, Fresno County farm adviser, believes growers will be allowed to use the chemical permanently after 1969 because the FDA granted the extension as a result of tests being conducted by Dr. William B. Hewitt at the University of California at Davis. Hewitt's tests showed no residue of the arsenite is carried into the fruit.

In the meantime growers must obtain permits from the county agricultural commissioner's office both for purchase and use of the chemical.

Lynn suggests growers noticing 5 or 6 percent of their vines showing the symptoms of measles on the fruit last season start their corrective spray program either before pruning or at least four weeks after pruning.

Fred Jensen, Tulare County farm adviser, warns that "bud damage from sodium arsenite is always a possibility. Thompsons are more apt to be injured than spur pruned vines.

"When spraying Thompsons, direct the spray up and down the trunk, then keep the spray on the ground between vines. Avoid hitting the canes as much as possible. Complete treatment before bud push."

The UC pest and disease control program for grapes recommends the use of three quarts of sodium arsenite per 100 gallons of water.

ARTICLE XXV (Proposed)

The Union agrees that it will submit forthwith a program which will bring about an end to our present labor dispute which includes the picketing of our properties and the boycott of our product. Upon an acceptable proposal of the Union submission to bring about such a cessation of the dispute, any failure of an agreed to program by the Union, shall immediately and forthwith result in a cancellation of the entire Agreement between the Union and the Employer.

The Employer agrees that it will abide by any local, state or Federal regulations regarding pesticides.

The Union agrees that it will not harass any Employer regarding the use of pesticides as long as the Employer agrees to abide by the regulations heretofore referred to. The Union agrees that it will not embark upon any program regarding pesticides that can in any way be detrimental or harmful to the Industry in which the Employer belongs.

[UFWO Contract Language]

Consumer and Worker Protection Clause

PREAMBLE

The Company and the Union recognize the need to supply consumers with healthy grapes picked and handled under the most clean, sanitary and healthful conditions possible. Furthermore, the Company and the Union recognize the need to conserve our natural resources and to protect all forms of life from the serious dangers and damages caused by the improvident use of economic poison. In the hope of taking progressive steps to protect the health of farm workers and consumers throughout the world and conserving for all of mankind the benefits of our natural resources and surroundings, the Company and the Union agree as follows:

(1) The Health and Safety Committee shall be formed consisting of equal numbers of workers' representatives selected by the bargaining unit and Company representatives. Members of the Health and Safety Committee shall have free access to all records concerning the use of economic poisons.

The Health and Safety Committee shall participate in the formulation of rules and practices relating to the health and safety of the workers including but not limited to the use of garments, materials, tools, and equipment as they may affect the health and safety of the workers and sanitation conditions.

(2) The Company shall not use DDT, Aldrin, Dieldrin and Endrin. The Company shall not apply other chlorinated hydrocarbons which are dangerous to farm workers, consumers and the environment.

(3) The Company shall not use any organic phosphate pesticides such as but not limited to Parathion without first receiving approval from the Health and Safety Committee. The Company shall notify the Health and Safety Committee as soon as possible but at least 72 hours before the application of the organic phosphate material. Said notice shall contain the information set forth in part 4 below: The Health and Safety Committee shall determine the length of time during which farm workers will not be permitted to enter the sprayed field following the application of the organic phosphate pesticide. Any Company using organic phosphates shall pay for the expense for all farm workers of one baseline cholinesterane test and other additional such tests if recommended by a doctor. The results of all said tests shall be immediately given by the Company to the Health and Safety Committee, and, if requested to any other authorized union representative.

(4) The Company shall keep the following records and make them available to each member of the Health and Safety Committee and to any other authorized union representative.

(a) A plan showing the size and location of fields and a list of the crops or plants being grown.

(b) Pesticides and economic poisons used including brand names plus active ingredients, registration number on the label, and manufacturer's batch or lot number.

(1) Dates and time applied or to be applied.
(2) Location of crops or plants treated or to be treated.
(3) Amount of each application.
(4) Formula.
(5) Method of application.
(6) Person who applied the pesticide.

(c) Date of harvest.

SANITATION

(A) There shall be adequate toilet facilities, separate for men and women, in the field, readily accessible to workers, that will be maintained in a clean and sanitary manner. These may be portable facilities and shall be maintained at the ratio of one for every 35 workers.

(B) Each place where there is work being performed shall be provided with suitable, cool, portable drinking water convenient to workers. Individual paper drinking cups shall be provided.

(C) No worker under this agreement will be required to work when in good faith he believes that to do so would immediately endanger his health or safety.

(D) Workers will have (2) relief periods of (15) fifteen minutes which, insofar as practical, shall be in the middle of each work period.

TOOLS AND PROTECTIVE EQUIPMENT

(a) Tools and equipment and protective garments necessary to perform the work and or to safeguard the health of or to prevent injury to a worker's person shall be provided, maintained and paid for by the Company.

GROUND RIG CROP DUSTING; KERN COUNTY, 1968

Crop	Pest	Material	Spray or dust	Acres
Cotton	Loopers	Dibrom	S	1,194
	Mite, lygus	Dylox, Kelthane	D	564
	Weeds	Eptam	S	144
	Mite	Kelthane	S	21,943
	Loopers, mite	Kelthane, Malathion	S	230
	Mite	Kelthane, Phosphamidon	S	3,044
	Weeds	MSMA	S	48
	Defoliant	Magnesium chlorate	S	1,191
	Worms, bugs	Parathion, Thiodan	S	300
	Worms, lygus	Phosphate	S	78
	Weeds	Promytrene	S	236
	do	Sodium TCA	S	30
	Mite	Tedion	S	751
	do	Thimet	S	257
	Worms	Thuricide	S	20
	Weeds	Treflan	S	399
	Nutritional	Zinc	S	710
Total pesticide spray				54,229
Grapes	Fungicide	Botran, Delnav	S	15
	Weeds	Amino Triazole, Simazine	S	1,046
	Fungicide	Botran dust	D	27
	Rot, nutritional	Captan, Leaf Life	S	18
	Hopper, mite	Captan, Ethion, Thiodan, zinc Sulphur	S	578
	Loopers, mite	Captan, sulphur, Tedion, Thiodan	S	52
	Mite, hoppers	Captan, Gibrel, Kelthane, Thiodan Sulphur	S	111
	do	Captan, Gibrel, Kelthane, Thiodan	S	274
	Mite, growth	Captan, Gibrel, Nutraphes, sulphur Zinc	S	21
	do	Captan, Gibrel, Tedion, Thiodan	S	75
	Mite, hopper, rot	Kelthane, Captan, Thiodan, Sulphur	S	100
	Weeds	Cytrol	S	75
	do	Cytrol, Karmex	S	229
	do	Cytrol, Simazine	S	703
	Mildew	Cosan	S	399
	Hoppers, mite, nutritional	Delnav, Delmo Z, sulphur	S	130
	do	Delnav, Gibrel, sulphur	S	598
	do	Delnav, Gibrel, sulphur, Tedion Thiodan	S	140
	do	Delnav, Gibrel, sulphur, Thiodan	S	253
	Thrip, mite	Delnav, Thiodan	S	25
	Hoppers, mite, nutritional	Delnav, Nutraphos, sulphur	S	20
	do	Delnav, Sulphur	S	252
	do	Delnav, Delmo Z, sulphur, Thiodan		379
	Growth	Delmo Z, Gibrel, Urea	S	20
	Mite, hoppers	Delmo Z, Gibrel, sulphur	S	27
	Mite nutritional	Delmo Z, sulphur, urea	S	29
	Mite	Diazinon, Trithion	S	899

[From the Seattle Times, July 20, 1969]

CALIFORNIA GRAPES 'SAFE,' SAYS OFFICIAL

State Agriculture Director Don Moos has issued a statement that California grapes are safe to eat, United Press International reported.

Moos said the statement was prompted by inquiries received concerning information contained in grape boycott literature being distributed near groceries.

The boycott is in connection with a labor dispute between California table grape growers and vineyard workers.

"We have no reason to have any particular issue with the California labor dispute," Moos said. "We're in the business of assuring people as to what is wholesome."

"The official tests show that table grapes are remarkably free of chemical residues and are perfectly safe to eat," Moos said.

Senator MONDALE. Our next presentation is a panel consisting of Mr. C. C. Johnson, Chief, Consumer Protection and Environmental Health, HEW, accompanied by Dr. Simmons and Dr. Durham.

Those three witnesses will please come to the witness table. You can proceed with your statement in whatever order you wish. You may introduce the panel, Mr. Johnson.

STATEMENT OF C. C. JOHNSON, CHIEF, CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE; ACCOMPANIED BY DR. SAMUEL SIMMONS, DIRECTOR, DIVISION OF COMMUNITY STUDIES, OFFICE OF PRODUCT SAFETY, FOOD AND DRUG ADMINISTRATION, ATLANTA, GA.; DR. WILLIAM DURHAM, DIRECTOR, PRIMATE RESEARCH BRANCH, DIVISION OF PESTICIDES, FOOD AND DRUG ADMINISTRATION, PERRINE, FLA.; AND REO DUGGAN, DEPUTY ASSOCIATE COMMISSIONER FOR COMPLIANCE, FOOD AND DRUG ADMINISTRATION

Mr. JOHNSON. Thank you, Mr. Chairman. I would like to introduce my colleagues.

On my left is Dr. Samuel W. Simmons, Director of our community-studies efforts on pesticides. Immediately on my right is Mr. Reo Duggan. He is Deputy Associate Commissioner for Compliance in the Federal Food and Drug Administration. On my far right is Dr. William F. Durham, and he is Director of our Primate Research Laboratory.

I am the administrator of the Consumer Protection and Environmental Health, Department of Health, Education and Welfare.

Senator MONDALE. Proceed as you wish.

Mr. JOHNSON. I would like to read my statement, Mr. Chairman.

At the present time the pesticides programs of the Consumer Protection and Environmental Health Service are directed primarily at protection of the public and of those workers directly involved in the manufacture, handling, or application of pesticides through spraying or dusting operations.

The possible harmful effects to migrant agricultural workers, who commonly work at such jobs as thinning, weeding, or picking, have not been the subject of specific investigation. I believe, however, that certain of our findings have at least limited relevance to the situation of such workers. And there is no doubt that controls instituted primarily to protect pesticide applicators and minimize residues on food crops serve, at the same time, to hold down exposures for all agricultural workers.

I am sorry to say that we have at this time no scientific data which would show, without question, that the margin of safety thus provided is adequate in the case of migrant workers.

Senator MONDALE. Pardon me for interrupting there, Mr. Johnson. Is the scope of your effort directed primarily at protection of the consumer, or at the protection of the workers in the field, or just the applicators?

Mr. JOHNSON. The scope of our effort, Mr. Chairman, is protection of the public health of all people regardless of whether they are workers or consumers or laborers in the manufacturing plants. We have a total concern for the health and well-being of the American public.

Senator MONDALE. At this point you are not satisfied that you have the data that proves that there is a margin of safety protecting the farm worker?

Mr. JOHNSON. I think that the nature of the discussion that ensues as I read the paper will put this into a perspective that we can perhaps better understand.

Senator MONDALE. Very well.

Mr. JOHNSON. Regulation of the use of pesticides is carried out by several agencies. The responsibility for registration of pesticides and pest-control materials has been placed in the U.S. Department of Agriculture. These products may not be legally shipped in interstate commerce without prior registration as required by the Federal Insecticide, Fungicide, and Rodenticide Act.

When the proposed use of a pesticide will result in residues on a feed or food crop, the registration by USDA is not granted until a tolerance has been established by the Food and Drug Administration. Before registration, the petitioner must present FDA with experimental evidence on toxicity to establish what tolerances, if any, will be safe and to show that the tolerances can be met under the practical conditions of pesticide usage and to specify the conditions of use on the labeling for the pesticide.

The Department of the Interior has programs designed to protect fish and wildlife from pesticidal contamination. The Department of Transportation regulates shipment of pesticides by interstate carriers. And the Department of Defense has several programs involving the use and/or control of pesticides.

The various States and local governments also have requirements aimed at safeguarding the safety of citizens from the hazards of pesticides.

A memorandum of agreement between the Departments of Agriculture, Interior, and Health, Education, and Welfare was entered into in 1964 to coordinate the programs of these departments in pesticide use and control, pursuant to a report of the President's Science Advisory Committee pointing to the need for closer coordination and recommending that responsibility for the health aspects of pesticide use be vested in the Department of Health, Education, and Welfare.

The many different synthetic chemical pesticides can be grouped into three classes: the chlorinated hydrocarbons, organic phosphates, and the carbamates. We have prepared a chart showing representative pesticides in each of the three classes and their effects on man, including symptoms of poisoning.

Mr. Chairman, I would like to submit this chart for the record.

Senator MONDALE. Without objection, it is so ordered.

(The chart referred to follows:)

SYNTHETIC CHEMICAL PESTICIDES AND EFFECTS ON MAN

Pesticide class	Representative members of class	Signs and symptoms of poisoning in man
1. Chlorinated hydrocarbons	DDT, Aldrin, Chlordane, Dieldrin Endrin, Heptachlor, Kelthane, Lindane, Toxaphene	Dizziness, diarrhea, headache, nausea, tremor, convulsions and respiratory failure. (The basic mode of action for each of these pesticides is not known. It is entirely possible that chlorinated hydrocarbon insecticides of significantly different chemical structure have different modes of action; it is certain that there are qualitative as well as quantitative differences in their pharmocological action.)
2. Organic phosphorus	Parathion, Malthion, Phosdrin Diazinon, Chlorthion, Dimethorate, Guthion, Methylparathion, Phorate	Headache, giddiness, blurred vision, nausea, cramps, diarrhea, sweating, tearing, salivation, vomiting cyanosis, papielledema, uncontrollable muscle twitches, convulsions, coma, loss of reflexes, and loss of sphincter control. (The last four signs are seen only in advance cases.)
3. Carbamates	Carbaryl	Constriction of the pupils, salivation, muscular incoordination, violent epigastric pain, profuse sweating, lassitude and vomiting. These manifestations usually disappear within a few hours.

Source: (Information abstracted from "Clinical Handbook on Economic Poisons," Public Health Service, 1963).

Mr. JOHNSON. I believe it would be useful, first of all, to review the responsibilities and activities of CPEHS in this area, then to relate these, insofar as possible, to the subject of your inquiry. There are a number of other agencies in the Department of HEW whose programs also relate to the health and welfare of migratory farm workers, and we will submit for the record summaries of these programs if you wish.

Senator MONDALE. If you will, please.

(The documents referred to, subsequently supplied, follow:)

SUMMARY OF PROGRAMS PROVIDED BY DEPARTMENT OF HEW AND CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICES

HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION, COMMUNITY HEALTH SERVICE—MIGRANT HEALTH ACTIVITY

The Migrant Health Act was devised to help communities and States solve migrant health problems, including provision of service as people move. Seven years of successful operation of the Migrant Health Program have resulted in 115 grant-assisted projects to provide health services for migrant workers and families in one or more local areas of 36 States and Puerto Rico. These projects are not demonstrations or pilot activities. Instead, they provide actual medical, dental, hospital and related health services.

In addition to greatly needed remedial care, migrant health projects provide immunizations, family planning services, nutrition counseling, prenatal care, well child care, and other preventive services. Moreover, project staff members work with growers and other community groups to improve housing and environmental conditions, and to develop better understanding and acceptance of migrants. Finally, they work with migrants, themselves, to develop understanding and application of good personal health, homemaking and safety practices to prevent as much illness and disability as possible.

During the past year, migrant workers and family dependents made nearly 300,000 visits to physicians and 30,000 visits to dentists under project auspices. Sixty projects in 25 States have signed agreements with 162 short-term general hospitals to provide care for migrant patients. These projects also intensified early case-finding, strengthened medical services outside the hospital, and arranged for systematic advance planning for the discharge of hospitalized patients.

Statistical outputs in terms of services rendered are reported annually by each grant-assisted migrant health project. The following summarizes selected outputs for the past three fiscal years on which data has been compiled.

Visits	Fiscal year 1966	Fiscal year 1967	Fiscal year 1968
Medical care	165,000	176,000	190,000
Dental care	18,000	23,000	25,000
Field nursing	100,000	144,000	150,000
Hospital days			20,000
Migrant patients:			
Medical	94,000	100,000	110,000
Dental	14,000	17,000	19,000
Hospital			3,400
Sanitation inspections	75,000	88,000	100,000

Per Capita expenditures for personal health care for the Nation as a whole average more than $200 annually. Nationally, the amount per migrant totaled only $12 last year, $7.20 from grant funds and $4.80 from other sources.

For the first time in migrants' long history of neglect, the Migrant Health Grant provides a mechanism to bring this needy group higher on the priority list of States and communities. The program has demonstrated that the special incentive of project grants stimulates community planning and acceptance of responsibility. Many of the communities where migrants live and work temporarily are themselves below the national average in income. Outside financial help continues to be greatly needed.

CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICE, ENVIRONMENTAL CONTROL ADMINISTRATION—MIGRANT HEALTH ACTIVITY

The Environmental Control Administration of the Consumer Protection and Environmental Health Service allocates no resources specifically for migratory farm workers as a population group. However, the Bureau of Occupational Safety and Health and the Bureau of Community Environmental Management do tackle problems which affect migratory farm workers as well as other Americans. The Bureau of Occupational Safety and Health is concerned with exposures to extremes of temperature, both high and low, skin irritations produced by prolonged exposure to the sun's rays, noise exposure from the operation of agricultural machinery, and dust and pollen exposure which may cause sensitization causing chronic bronchitis or asthma. The Bureau of Community Environmental Management attempts to improve health and well-being by providing communities with information to modify human behavior and manage changes in the residential environment that affect health. These activities conducted by the Environmental Control Administration do not specifically target the migratory farm worker but do have an effect on his well being.

CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICE, FOOD AND DRUG ADMINISTRATION—MIGRANT HEALTH ACTIVITY

The Division of Pesticide Registration, Office of Product Safety, Food and Drug Administration, has the responsibility of advising the Pesticide Regulation Division of the U.S. Department of Agriculture regarding pesticide registration in respect to safety and possible human health hazards.

In carrying out this responsibility, the Division of Pesticide Registration evaluates the toxicological data and labeling on proposed new pesticide products or the labeling in connection with the re-registration of old products and determines if the products can be safely used as labeled. The Division then recommends whether or not the products should be registered.

In an effort to safeguard the health and safety of the migrant farmworker, the Division of Pesticide Registration recently notified the Pesticide Regulation Division, U.S. Department of Agriculture, that the caution statements on the labels of parathion (and other highly toxic chemicals) should be expanded to include a requirement that treated fields should be posted with signs specifying the date after which treated fields may be entered.

CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICE, FOOD AND DRUG ADMINISTRATION—MIGRANT HEALTH ACTIVITY

Essentially all of the research being carried out by the Division of Pesticides, FDA, provides peripheral information on the potential hazard of pesticides to migrant workers, insofar as these workers eat food, breathe air, and drink water from the common supply shared by the general population of the United States. This research involves among the various projects laboratory study of experimental animals exposed to known quantities of pesticides, measurement of exposure of workers to pesticides under actual work conditions, clinical evaluation of workers in pesticide manufacturing and formulating plants, study of accidental poisoning cases, and projects involving dosing human volunteers with pesticides. The accomplishments of this research program, together with those of the Division of Community Studies, are summarized in more than 300 scientific publications.

However, in addition to these generally applicable studies, the Division of Pesticides has also done some work—primarily at the Wenatchee, Washington Research Laboratory—bearing specifically and directly on the hazard of pesticides to agricultural workers. We have not, of course, distinguished whether the workers under study were migrant or resident in the area.

Methods for determining exposure of workers have been developed at the Wenatchee Station and are being applied in various work situations. Both direct and indirect methods are being used. The direct methods involve the use of some mechanism to trap the toxic material as it comes in contact with the workman during his exposure period. Our method uses alpha-cellulose absorbent pads for skin exposure and impingers or respirator pads for respiratory exposure. The indirect methods involve the measurement of some effect of the toxicant upon the exposed individual.

Values for dermal and respiratory exposure and for total exposure in terms of fraction of toxic dose have been determined using the direct method for 31 different work activities involving ten different pesticides. The results are summarized in Publication No. 212, attached.

Since migrant agricultural workers generally work at jobs not directly associated with pesticide application, such as thinning, weeding, or picking, their exposure levels tend to be in the lower range of those tested. For example, workers picking malathion-treated beans sustained less exposure than applicators who applied the pesticide to the crop.

In studies involving measurement of blood cholinesterase activity and excretion level of a metabolite (p-nitrophenol), parathion exposure level of agricultural crop workers was determined. Their exposure was intermediate between that of pesticide applicators and residents near orchards.

Residues on crops have, in a few instances, caused poisoning in agricultural workers from occupational exposure. Quinby and Lemmon (1958) reported 11 episodes of poisoning from contact with parathion residues involving more than 70 persons. This residue poisoning was mild and consisted predominantly of gastrointestinal symptoms. The crops involved were pears, apples, grapes, citrus fruits, and hops. Milby et al. (1964) reported additional outbreaks of residue poisoning in peach orchards in California. The sporadic nature of this disease is not understood. However, certain weather conditions, including temperature and rainfall, may play a part in its etiology.

The results of the research summarized here indicate that the exposure of agricultural crop workers to pesticides is relatively low in comparison with formulating plant workers, spray pilots and ground pesticide applicators, and other personnel having direct exposure to pesticide chemicals. There is no indication from the research summarized above or to our knowledge from that reported by others which indicates that pesticides used according to recommendations constitute a significant health hazard to migrant agricultural crop workers. However, continued surveillance and research are needed to assure that subtle effects have not been heretofore undetected or have required longer time intervals following exposure to develop. Also, continued research is necessary to obtain for new compounds the kind of data presently available for pesticides now in use.

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Exposure of Workers to Pesticides

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IN ORDER to evaluate the hazard to the health of workers using pesticides, it is important to know the amount of exposure which workers undergo while carrying out various jobs related to the preparation and use of these compounds. Both direct and indirect methods are available for measuring exposure. The direct methods are those which utilize some mechanism to entrap the toxic material as it comes in contact with the workman or to remove the retained toxicant at the end of the exposure period. The amount of toxicant trapped or removed is then a direct measure of the particular exposure being studied. The indirect methods involve the detection of the pesticide or its metabolite(s) in body tissue or excreta or the measurement of some pharmacologic effect of the toxicant on the exposed individual.

The indirect methods have been quite extensively employed in studying exposure of workers to pesticides. Thus, the exposure of workers to DDT has been estimated on the basis of their body fat content of DDT and DDE[1,2] or of urinary excretion level of the metabolite DDA.[3,4] Exposure of subjects whose occupations involved use of dieldrin has been determined from excretion levels of dieldrin-derived material in urine.[5] A number of surveys of exposure of workers to organic phosphorous insecticides using blood cholinesterase activity level as the criterion have been reported.[6-12] Exposure to parathion has been estimated from urinary excretion of the hydrolytic product *p*-nitrophenol.[13-15]

The indirect methods for measuring exposure to pesticides have been less used. The first study of this type was apparently carried out by Batchelor and Walker[16] who determined the exposure of orchard spraymen to parathion. These investigators used α-cellulose pads on the exposed skin area and in the respirator to entrap the pesticide and, thus, serve as an indicator of contamination. Later work has followed this general procedure although some refinements have been introduced. The methodology has been reviewed in detail by Durham and Wolfe.[17] The published studies of exposure of workers to pesticides which have been carried out using direct methods are summarized in Table 1.

The present paper reports the results of pesticide exposure studies using direct methods for a number of agricultural and public health vector control work situations. The effect of a number of factors on the level of exposure has been determined. Factors studied include wind, type of activity, method and rate of application, duration of exposure, route of exposure, and attitude of workmen. The hazard to workers of various activities involving different pesticides is evaluated.

Materials and Methods

Samples to permit measurement of exposure were collected in the field while the workmen

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were carrying out their usual duties. There were 31 different work activities studied, involving ten different pesticides. Although the results for ten of these work activities have been partially reported in previous publications from this laboratory, they are included here along with additional recent data to give the best available exposure values for these situations.

Estimation of the amounts of pesticide exposure that workers would potentially incur followed the techniques and procedures described in detail by Durham and Wolfe.[17] Potential dermal contamination was measured primarily by attaching absorbent α-cellulose pads for spray exposure, or layered gauze pads for dust exposure, to various parts of the body or clothing of workers and allowing them to become contaminated during a timed interval of work. Contamination of the hands was measured either by rinsing in a suitable solvent in a polyethylene bag or by swabbing with solvent-impregnated gauze swabs.

Respiratory exposure was estimated from the contamination of filter pads held in special single or double-unit respirators or from air concentration values determined by use of impinger-type air samplers or both.

The dermal and respiratory exposure pads were extracted with a suitable solvent in a Soxhlet apparatus.

Chemical analysis for the various compounds was done using the following methods: azinphosmethyl, Meagher et al;[18]; Chlorthion, a modification (Chemagro Corporation, unpublished data) of the Averell-Norris procedure;[19] DDT, a modification by Mattson et al[20] of the method of Schechter et al[21]; demeton and TEPP, a total phosphorus method[22]; dieldrin, O'Donnell et al[23]; DNOC (sodium salt of dinitro-o-cresol), Wolfe et al[24]; endrin, the paper chromatography procedure described by Mitchell[25] malathion, electron-capture gas chromatography[26]; and parathion, Averell-Norris.[19]

A total of 3,555 analyses of dermal pads and 333 analyses of respirator pads were carried out in the present study.

Dermal exposure values were calculated on the assumption that the exposed person wore a short-sleeved, open-necked shirt, no gloves or hat, and that his clothing gave complete protection of the areas covered. This amount of clothing was elected since it represented just about the smallest amount of protection which was observed in the field. However, some spraymen wore additional protective clothing such as a hat or cap, long-sleeved shirt, or even a jacket or coveralls. It was considered advisable to calculate potential exposure based on the lesser amount of protective clothing so that safety recommendations derived from these calculations would tend to be on the conservative side. The surface areas of the usually unclothed body parts (face, back of neck, "V" of chest, forearms, and hands) were determined using Berkow's[27] values for surface area. The total calculated dermal exposure was the sum of the exposures of the usually unclothed body parts.

The respiratory exposure was assumed to be equivalent to the contamination of the respirator pad or pads. Alternatively, air concentration values taken as near the breathing zone as possible were multiplied by an assumed value for lung ventilation rate of 1,740 liters/hr[28] during the light work involved in spraying to obtain respiratory exposure.

Calculation of the total exposure in terms of the percentage of the toxic dose was made by the procedure described by Durham and Wolfe.[17] The calculations were based on comparison between the dermal and respiratory exposure values determined here and values by Gaines (unpublished data) for doses toxic to the rat.[29]

Results and Comment

The values of dermal and respiratory exposure and for total exposure in terms of fraction of toxic dose per hour of work as determined in the present study are shown in Table 2.

Factors Affecting Level of Exposure.—There were wide ranges in exposure level for a given work activity with a specific pesticide depending on the environmental conditions, technique of the operator, and, perhaps, other factors. These variations ranged up to about 200-fold for dermal exposure associated with applying parathion to fruit trees with an air blast dilute spray machine and up to almost 300-fold for respiratory exposure associated with spraying parathion on fruit trees using a concentrate spray machine.

Wind.—The most important environmental condition studied with regard to effect on exposure was wind. Wind was thought to be an important factor in determining the 552 mg/hr exposure to parathion for an operator spraying parathion in a fruit orchard with an air blast machine. This level was the highest potential dermal exposure determined in the present study. This exposure

Table 1.—*Summary of Published Studies on Potential Exposure of Workers to Pesticides Using Direct Methods*

		Exposure			
Compound	Activity	Dermal (mg/hr)	Respiratory (mg/hr)	Total (% Toxic Dose/hr)	Reference
Azinphosmethyl	Checking cotton for insect damage	5.4	el*	(0.04)†	51
Azinphosmethyl	Air blast spraying fruit orchards during night	541	0.47	6.5 (3.5)‡	34
Azinphosmethyl	Air blast spraying fruit orchards during day	755	0.54	8.4 (4.9)†	34
Azinphosmethyl	Air blast spraying fruit orchards	12.5	0.26	(0.1)	30
Azinphosmethyl	Air blast spraying fruit orchards	9.9	0.1	0.15	46
Azinphosmethyl	Air blast spraying fruit orchards	27.2	0.04	0.18	This paper
Azinphosmethyl	Filling spray tank	52.9	1.27	0.72 (0.46)§	30
Azinphosmethyl	Working in formulating plant	10.1	0.56	(0.1)	30
Benzene hexachloride	Spraying forests	(70.3)	(3.06)	(0.29)	52
Benzene hexachloride	Hand spraying for mosquitoes	(10.2)	(4.29)	(0.15)	Wassermann, M. et al, unpublished data
Carbaryl	Air blast spraying fruit orchards	25.3	0.29	0.03	33
Carbaryl	Air blast spraying fruit orchards	24.9	0.48	0.02	46
Chlorthion	Operating aerosol machine for mosquitoes	(3)	(0.3)	(0.003)	53
DDT	Indoor house spraying	543	...	(>0.31)	54
DDT	Indoor house spraying	1,755	7.1	(1.02)	48
DDT	Outdoor house spraying	84	...	(>0.05)	54
DDT	Outdoor house spraying	243	0.11	(0.14)	48
DDT	Spraying forests	(212)	(4.92)	(0.15)	52
Dieldrin	Hand-spraying of dwellings for disease vector control	(18.6)	...	(>0.33)	55
Dieldrin	Spraying pear orchards	14.2	0.25 (0.03)‖	0.24	56
Dieldrin	Operating power air blast machine spraying fruit orchards	15.5	0.03	0.25	This paper
Dieldrin	Power hand gun spraying fruit orchards from portable machine	15.1	0.03	0.25	This paper
DNOC	Spray-thinning apples	63.2	0.4	(0.25)	47
DNOC	Spray-thinning apples	57.5	2.75	0.20	34
DNOC	Spray-thinning apples	24.4	0.03	(0.1)	24
DNOC	Chemical thinning apple blossoms by power hand gun spraying	55.1	0.13	0.13	This paper
DNOC	Chemical thinning apple blossoms by power air blast spray machine	22.5	<0.05	0.05	This paper
DNOSBP	Herbicide spraying corn and pea fields with boom ground sprayers	88.7	0.12	(0.57)	24
Endrin	Spraying orchard cover crops for mouse control	2.6	0.01	0.21	56
Endrin	High pressure power hand gun spraying orchard cover crops for mouse control	3	0.01	0.25	This paper
Endrin	Operating power air blast or boom sprayers treating orchard cover crops for mouse control	2.5	0.01	0.21	This paper
Endrin	Dusting potatoes	18.7	0.41	1.5	56
Endrin	Spraying row crops	0.15	el	(0.01)	33
Endrin	Piloting airplane during air application	1.18	0.08	0.29 (0.16)‡	33
Malathion	Operating aerosol machine	(6.6)	(0.3)	(0.003)	53
Malathion	Air blast spraying fruit orchards	2.5	0.08	0.002 (0.001)‡	33
Malathion	Air blast spraying fruit orchards	30	0.11	0.01	This paper
Malathion	Persons outdoors during air application to populated area.	(0.89)	(0.055)	(<0.001)	57
Malathion	Persons indoors during air application to populated area	(0.25)	(0.012)	(<0.001)	57

Table 1.—*Summary of Published Studies on Potential Exposure of Workers to Pesticides Using Direct Methods (Continued)*

		Exposure			
Compound	Activity	Dermal (mg/hr)	Respiratory (mg/hr)	Total (% Toxic Dose/hr)	Reference
Methyl Parathion	Checking cotton for insect damage	0.7	el	(0.02)	51
Parathion	Air blast spraying fruit orchards	77.7	0.16	(5.4)	16
Parathion	Air blast spraying fruit orchards	2.4	0.03	0.43 (0.18)‡	33
Parathion	Air blast spraying fruit orchards	19	0.02	1.33	45
Parathion	Concentrate air blast spraying fruit orchards	28	0.06	1.95	45
Parathion	High pressure power hand gun spraying fruit orchards	55.8	0.19	(3.9)	16
Parathion	Hand knapsack mist spraying tomato bushes	9.1	0.29	(0.82)	58

* el indicates "below the experimental limits of the chemical method."
† All values shown in parentheses were not included in the original paper but were calculated by the present authors.
‡ Calculations based on the original authors' published dermal and respiratory exposure data indicated that the correct total exposure as a percentage of the toxic dose per hour should be the values shown in parentheses rather than the figures originally published.
§ These original values were calculated on the basis of maximum exposure. The recalculated values shown in parentheses are based on mean exposure.
‖ Study of the original data on which the published respiratory value (0.25 mg/hr) was based indicated that this figure was derived in error and should have been 0.03 mg/hr.

indicated that the sprayman was receiving 37% of the toxic dose per hour of work. However, the operator was wearing very effective protective clothing and probably actually absorbed only a small fraction of the estimated potential exposure.

Type of Activity.—There appeared for each given pesticide to be a significant variation in hazard depending upon the type of activity in which the worker was engaged. In the case of DDT, as shown in Tables 1 and 2, indoor house spraying was about 4 times as hazardous as flagging for airplane dusting of fruit orchards, approximately 7 times as hazardous as outdoor house spraying, and over 30 times as hazardous as operating an air blast spray machine in a fruit orchard.

Various phases of an operation determined different rates of exposure. For example, in airplane application of 1% TEPP dust to a fruit orchard, the loader received about 3 times as much exposure as the pilot and about 4½ times as much as the flagman. A similar finding has been reported by Jegier[30] who noted for orchard air blast spraying considerably higher rates of dermal and respiratory exposure to azinphosmethyl during loading than during the spray cycle as a whole.

Activities which did not involve direct contact with insecticides were generally associated with relatively low levels of exposure. For example, entomologists observing mosquito control operations with Chlorthion or malathion incurred 0.002% of the toxic dose per hour. Workers picking pole beans one and two days after application of malathion dust sustained 0.001% and less than 0.001% of the toxic dose, respectively. The exposure levels (as the percentage of toxic dose) for these two activities were the lowest of all work activities studied.

Loaders and flaggers for air applications received relatively high levels of exposure, particularly by the dermal route. For example, a flagman in aerial application of DDT to a fruit orchard had a dermal exposure rate of 517 mg/hr. It is possible that in this instance the worker, knowing that DDT was a relatively nontoxic compound, made little effort to keep out of the drift. Airplane loaders—particularly those working with dusts—often became heavily contaminated as shown by the maximum (135 mg/hr) value for TEPP exposure, which corresponded to about 83% of the toxic dose.

Method and Rate of Application.—The amount of potential exposure depended also upon the method of application. There was more exposure while operating equipment

Table 2.—*Potential Dermal and Respiratory Exposure of Workers to Selected Pesticides as*

Compound	Formulation	Rate of Application (Lbs Active Ingredient/Acre)	Activity	No. of Samples Analyzed	
				Dermal	Respirator
Azinphosmethyl	0.05% spray	·3	Operating power air blast machine spraying fruit orchards	215	8
Chlorthion*	5% aerosol	...	Operating aerosol machine for mosquito control	112	10
Chlorthion*	5% aerosol	...	Entomologist field observers checking for mosquito control near aerosol machine operation	170	20
DDT	0.09% spray	8	Operating power air blast machine spraying fruit orchards	258	15
DDT	35% dust	17.5	Flagging for airplane dusting of fruit orchards	21	1
Demeton	0.03% spray	2	High pressure power hand gun spraying fruit trees in nursery	48	6
Demeton	0.03% spray	2	Driving tractor pulling high pressure power hand gun sprayer in nursery	31	3
Dieldrin*	0.02%-0.03% spray	2-2.5	Operating power air blast machine spraying fruit orchards	42	2
Dieldrin*	0.03% spray	2.5	Power hand gun spraying fruit orchards from portable machine	42	2
DNOC*	0.02%-0.04% spray	1.1-2.1	Chemical thinning apple blossoms by power hand gun spraying	25	6
DNOC*	0.02%-0.04% spray	1.1-2.1	Chemical thinning apple blossoms by power air blast spray machine	177	22
Endrin*	0.05% spray	1.2	High pressure power hand gun spraying orchard cover crops for mouse control	194	10
Endrin*	0.05% spray	1.2	Operating power air blast or boom sprayers treating orchard cover crops for mouse control	70	12
Malathion	0.04%-0.08% spray	3-4	Operating power air blast machine spraying fruit orchards	44	7
Malathion	0.03%-0.08% spray	3-4	High pressure power hand gun spraying fruit orchards	94	13
Malathion	4% dust	1.4	Operating power duster applying pesticide to pole beans	14	4
Malathion	4% dust	1.4	Picking pole beans one day after dust application	194	6
Malathion	4% dust	1.4	Picking pole beans two days after dust application	42	1
Malathion*	2.5-5% aerosol	...	Operating aerosol machine for mosquito control	166	14
Malathion*	2.5-5% aerosol	...	Entomologist field observers checking for mosquito control near aerosol machine operation	238	30
Parathion	0.05% spray	2-3	Operating power air blast machine spraying citrus groves	40	8
Parathion	0.05% spray	2-3	Driving tractor pulling portable tower hand gun power sprayer during application in citrus groves	30	5
Parathion	0.05% spray	2-3	High pressure power hand gun spraying from tower position of portable spray machine—citrus groves	41	7
Parathion	0.05% spray	2-3	High pressure power hand gun spraying from ground position near portable tower sprayer—citrus groves	76	13
Parathion	2% dust	1	Piloting airplane dusting fruit orchards	18	3
Parathion	9% spray	...	Flagging for airplane application to fruit orchards	75	12

(Table continued on pp 628-629.)

Determined by a Direct Method

	Exposure		
Value	Dermal (mg/hr)	Respiratory (mg/hr)	Total (% toxic dose/hr)
Range	1.1-146	0.02-0.08	0.01-0.95
Mean	27	0.04	0.18
Range	1.9-12	0.08-0.5	0.01-0.02
Mean	6.8	0.28	0.01
Range	0.8-1.6	0.05-0.08	0.001-0.003
Mean	1.1	0.07	0.002
Range	3.2-392	0.02-0.27	0.002-0.23
Mean	54	0.1	0.03
Range	395-517	...	...
Mean	420	0.2	0.24
Range	1.6-5.8	0.01-0.03	0.17-0.62
Mean	3.1	0.01	0.33
Range	1-2.5	0.01-0.03	0.11-0.29
Mean	1.9	0.01	0.21
Range	6.3-31.1	0.02-0.04	0.1-0.5
Mean	15.5	0.03	0.25
Range	3.4-29.5	0.02-0.04	0.06-0.48
Mean	15.1	0.03	0.25
Range	7-90.2	<0.02-0.42	0.02-0.22
Mean	55.1	0.13	0.13
Range	2.9-131	<0.04-0.08	0.01-0.31
Mean	22.5	0.05	0.05
Range	1.5-7.1	0.001-0.03	0.12-0.59
Mean	3	0.01	0.25
Range	1.3-6.1	<0.001-0.02	0.1-0.49
Mean	2.5	0.01	0.21
Range	5.9-59	0.02-0.24	0.002-0.02
Mean	30	0.11	0.01
Range	8.4-194	0.01-0.25	0.003-0.06
Mean	67	0.09	0.02
Range	17-32	0.22-1.23	...
Mean	23	0.73	0.01
Range	<0.5-28	...	<0.001-0.01
Mean	3.9	<0.02	0.001
Range	<1.5-4.3	...	...
Mean	2.1	<0.02	<0.001
Range	3.7-53	0.02-0.10	0.001-0.02
Mean	29	0.09	0.01
Range	2.3-6.4	0.04-0.09	0.001-0.003
Mean	4.1	0.06	0.002
Range	1.3-38	0.01-0.07	0.09-2.60
Mean	18	0.03	1.17
Range	5.5-25	0.01-0.06	0.38-1.77
Mean	12	0.03	0.84
Range	1.0-28	0.004-0.05	0.07-1.94
Mean	11	0.03	0.77
Range	20-113	0.02-0.19	1.35-7.8
Mean	47	0.09	3.3
Range	8.3-19	0.01-0.04	0.57-1.35
Mean	13	0.02	0.87
Range	9.5-306	0.003-0.08	0.65-20.8
Mean	84	0.02	5.72

which directed spray upward into the air where it was more subject to drift than when operating equipment that directed the spray downward. For example, taking into consideration the difference in dilution of the sprays being used, potential exposure while operating an air blast machine spraying fruit orchards with parathion was about 12 times as great as during application of the same compound on row crops with a boom-type sprayer that directed the spray downward and, thus, resulted in less drift. The effects of some other methods of application on exposure, particularly by the respiratory route, are discussed below under route of exposure.

Another variable which might be expected to influence exposure of applicators was rate of application. This value is shown in table 2 for each of the exposure situations studied. Very little data on the influence of changes in rate of application on exposure were obtained, however, because all operators tended to use approximately the same dosage in a given circumstance. The maximum variation in application rate which was observed in these studies was for DNOC which varied from 1.1 to 2.1 lbs of active ingredient per acre. The application rates which were generally used were those recommended by the Washington State University and the US Department of Agriculture.

Duration of Exposure.—In addition to the level of contamination incurred per hour of work, the hazard of pesticide exposure for a worker was also related to the amount of time he worked at these particular duties. Thus, it has been pointed out that, on the average, poisoning can be expected to appear most quickly, most frequently, most diversely, and most severely in those persons most extensively exposed.[31] Many work situations involving pesticide exposure did not last a full 8 hr/day and those that did usually were not continuous for many days. Particularly in the application of pesticides to agricultural crops, the work not only was usually seasonal but also was broken up into separate spraying or dusting periods of a few days each, as the pest infestation warranted. For example, air blast spraying of a fruit orchard with parathion was usually carried out only three or four times during a grow-

Table 2.—*Potential Dermal and Respiratory Exposure of Workers to Selected Pesticides as*

Compound	Formulation	Rate of Application (Lbs Active Ingredient/Acre)	Activity	No. of Samples Analyzed	
				Dermal	Respirator
Parathion	1% dust	0.3-0.4	Operating tractor-mounted boom ground duster in row crops	198	33
Parathion	0.09% spray	0.5	Operating tractor-mounted boom ground sprayer in row crops	48	7
TEPP	1% dust	0.5	Piloting airplane dusting fruit orchards	30	5
TEPP	1% dust	0.5	Flagging for airplane application to fruit orchards	24	5
TEPP	1% dust	0.5	Loading for airplane application to fruit orchards	34	6

* Partially reported in previous publication.

ing season. Each spray period for an individual orchardist or sprayman lasted for one to six days of eight to ten hours each, depending on the size of the orchard to be covered. These spray operations were often hampered by wind, thereby extending the period required to complete the application. However, in the case of such an extended spray period, the number of hours per day was lower. In fact, there were waiting periods of several days when adverse weather did not permit any spraying at all. These delays spread the sprayman's exposure over a relatively long period. The increase in the period over which a given amount of exposure was spread tended to decrease the toxic effect and to prevent the occurrence of illness. This has been shown to be true in various animals studied, including man. The time factor in relation to dosage is particularly important in the case of the organic phosphorus pesticides. For example, rats can withstand over a 24-hour period a dosage approximately equivalent to the acute LD_{50} level (office of Pesticides, Communicable Disease Center, unpublished data).

Route of Exposure.—The potential dermal exposure to each compound in every work situation studied was much greater than the potential respiratory exposure. The respiratory exposure for the various work situations studied ranged from 0.02% to 5.8% (mean, 0.75%) of the total (dermal plus respiratory) exposure. The fact that the skin receives a higher dose than the lungs has been noted in other work situations studied by direct methods at this laboratory[16,17,32] and by other investigators.[30,33,34] In general, it is true that chemicals given at equivalent doses are absorbed more rapidly and more completely from the respiratory tract that through the skin and that studies with volunteers revealed a lack of toxic effect from large dermal doses of parathion.[35] However, parathion applied to the skin of laboratory animals has shown high toxicity[29,36] and a number of authors[37-44] have attributed instances of parathion poisoning in people to dermal contact.

In the various situations studied the average potential respiratory exposure tended to be higher in agricultural dusting operations than during agricultural spraying operations. For example, in the ground application of parathion to row crops, the average respiratory exposures were 0.16 mg/hr with dust and less than 0.01 mg/hr with spray. The respiratory exposure in these instances represented 1.6% and less than 0.2% of the total exposure with dust and spray, respectively. A relatively high respiratory exposure (0.73 mg/hr; 3.2% of the total exposure) was also noted in the ground application of malathion dust to pole beans. The potential dermal exposure was found to be about the same for a given pesticide application regardless of whether the material was applied as a spray or as a dust formulation. Thus, ground application of parathion to row crops gave skin contamination levels of 4.7 and 8.8 mg/hr with spray and dust formulations, respectively.

Disproportionately high respiratory exposure values in relation to dermal exposure levels were also found in two spray operations—use of Chlorthion aerosol for mosqui-

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Determined by a Direct Method (Continued)

	Exposure		
Value	Dermal (mg/hr)	Respiratory (mg/hr)	Total (% toxic dose/hr)
Range	1.4-17	0.03-0.41	0.12-1.43
Mean	8.8	0.16	0.71
Range	2.2-11.3	...	0.15-0.72
Mean	4.7	<0.01	0.33
Range	10-53	0.02-0.47	6.29-34.5
Mean	24	0.17	15.4
Range	16-21	0.03-0.12	9.67-12.9
Mean	16	0.07	10.2
Range	43-136	0.03-0.43	25.7-83.4
Mean	73	0.15	44.2

toes (respiratory exposure, 0.28 mg/hr or 3.9% of the total exposure) and, to a smaller degree, low-volume concentrate spraying of parathion in fruit orchards (respiratory exposure, 0.06 mg/hr or 0.2% of the total exposure). These latter values were about three times as great as the respiratory exposure for similar parathion applications using conventional high-volume spray. These disproportionately high respiratory exposures were probably due to the fact that the spray in these two instances was made up of particles of significantly smaller size than was usually the case with sprays. The small particles tended to remain suspended in the air longer and, thus, presented a greater opportunity to be inhaled. Also, the path of the smaller droplets was more easily changed by the influx of air into the nose, thus diverting these particles from their normal extracorporal path into the respiratory tract. The question of exposure levels involved in concentrate spraying has been dealt with more thoroughly elsewhere.[45]

The data on relative respiratory exposure (expressed as percentage of total [ie, dermal plus respiratory exposure] for workers applying different types of pesticide formulations is summarized in Table 3 for all the exposure situations measured in the present study. These results indicate that relative respiratory exposure is higher for aerosol (2.87% of total exposure) and dust (0.94% of total exposure) formulations than for dilute spray formulations (0.23% of total exposure).

Attitude of Operator.—Although it is a rather difficult concept to document with specific exposure data, observations made in the present study suggest that, for a given operation, considerably lower exposure was sustained by a careful operator than by a careless one. Among the factors noted were differences in avoiding contact with both concentrated and dilute formulations during loading and mixing, washing before eating or smoking, and wearing protective clothing and respirator when needed. In addition, the careless operators sometimes sprayed on windy days or under other adverse conditions while the careful spraymen waited for better conditions.

Comparison of Present Results With Previous Studies of Exposure.—In table 1 are listed results of previously published studies using direct methods to determine dermal and respiratory exposure of workers to pesticides. In a number of instances, the original workers did not calculate total exposure on the basis of fraction of toxic dose per hour. However, these values have been calculated by the present authors and inserted where indicated. Also included in the Table are some exposure values from the present paper (excerpted from Table 2) for comparison with previously published results. Papers in which authors have merely determined air concentrations of pesticides in work areas and made no calculations of actual respiratory intake have not been included in the tabulation. The results from the present study were generally in good agreement with those published previously, in those instances in which direct comparisons were possible.

Values for exposure to azinphosmethyl while spraying fruit orchards have been reported from Australia,[46] Canada,[30] Israel,[34] and the United States, as reported in this paper. The dermal exposure levels for this compound determined by Simpson (9.9 mg/hr), by Jegier (12.6 mg/hr), and that reported in the present paper (27.2 mg/hr) were similar. Known differences in procedure apparently account for some, if not all, of the variation which does occur among these results. Thus, although both Jegier and Simpson generally followed the procedures initially described by Batchelor and Walker,[16] there were some differences in technique. Jegier used α-cellulose strips only

Table 3.—*Relative Respiratory Exposure (Expressed as The Percentage of Total [Dermal + Respiratory] Exposure) for Workers Applying Different Types of Pesticide Formulations*

Type of Formulation	No. of Activities	Respiratory Exposure Value	% of Total
Dilute Spray	19	Range	0.02-0.5
		Mean	0.23
Aerosol	4	Range	0.3-5.8
		Mean	2.87
Dust	7	Range	0.05-3.2
		Mean	0.94

on the forehead and wrists of the subject instead of on the four body areas (shoulders, back of neck, "V" of chest, and forearms) sampled in the present study. Also, both Jegier and Simpson calculated hand exposure on the basis of the wrist pad contamination while the whole hand was rinsed in the present study to determine exposure. In our experience pads placed on the wrists gave lower results for hand contamination than did washing the entire hand area, particularly in regard to exposure during mixing and loading. The much higher dermal exposure results (541 and 755 mg/hr for nocturnal and daytime spraying, respectively) obtained by Wassermann et al[34] cannot be explained at this time. The difference between nocturnal and daytime exposure levels was due to the greater amount of protective clothing worn when spraying in the cooler temperatures at night. The respiratory levels for the present study (0.04 mg/hr) were considerably lower than those obtained by Wassermann et al (0.54 mg/hr) and somewhat lower than those reported by Simpson (0.10 mg/hr) and by Jegier (0.26 mg/hr). It is particularly interesting to note that Jegier obtained good correlation for respiratory exposure determined from pads (0.26 mg/hr) and from air samples (0.30 mg/hr).

The dermal exposure level for operators thinning apple blossoms with DNOC, as determined much earlier at this laboratory (63.2 mg/hr) by Batchelor et al,[47] was somewhat higher than that found in the more recent studies (24.4 mg/hr, 22.5 mg/hr). The markedly higher respiratory level found earlier (1956 value, 0.40 mg/hr; present values, 0.13 for hand-gun and less than 0.05 for air blast equipment) was apparently due to the use at that time of uncovered respirator pads which permitted impingement of spray and apparently resulted in counting as respiratory exposure particles which would not be inhaled through the presently used funnel-covered respirator pads. These differences were discussed in detail by Wolfe et al.[24] The dermal exposure level for DNOC (57.5 mg/hr) determined in Israel by Wassermann et al[34] agrees well with the values determined here (22.5 and 55.1 mg/hr); however, the respiratory level determined by Wassermann and his colleagues (2.75 mg/hr) is very much higher than the present values (0.13 and less than 0.05 mg/hr) or even than that obtained earlier with uncovered respirators (0.40 mg/hr). In fact, the respiratory exposure level of 2.75 mg/hr is higher than that for any compound studied by other laboratories in outdoor spraying activity and approaches the level for DDT exposure during indoor house spraying (7.1 mg/hr).[48]

Dermal malathion exposure as determined in the present study (30.3 mg/hr) was higher than that (2.5 mg/hr) published by Jegier,[33] probably due at least partly to the differences in technique mentioned above. Respiratory results (present paper, 0.11 mg/hr; Jegier, 0.08 mg/hr) were comparable.

Also, for parathion spraying, the present dermal exposure level (19.4 mg/hr) was higher than that reported by Jegier (2.4 mg/hr) while the respiratory values were similar (present paper, 0.02 mg/hr; Jegier, 0.03 mg/hr).

Evaluation of Hazard to Workers.—From tables 1 and 2, it can be seen that in studies at this laboratory three compounds—endrin, parathion, and TEPP—have been involved in operations in which the mean value for the percentage of toxic dose potentially absorbed per hour exceeded 1%. All three of these compounds are known to have caused occupational poisoning. There is only one other compound (demeton) listed in the tables which is known to have caused occupational poisoning in the sort of work activities under study here. Therefore, it appears that, in general, the results of these exposure tests correlate well with use experience.

The highest mean value for fraction of toxic dose received per hour of work (44.2%) was for workers who loaded airplanes with 1% TEPP dust. Although there have been numerous illnesses among workers in this occupation, the number who become ill has been quite low considering that the workers potentially would, on the average, be subjected to almost one half the toxic dose per hour of work. Three factors may account for the low morbidity rate. First, observations have indicated that the number of hours per day or per week the worker is actually loading airplanes is quite low. Secondly, in such a situation where it is obvious that high contamination of the worker may occur, much more attention is generally given to the use of adequate protective clothing and respiratory devices than in less hazardous jobs. Thirdly, probably only a small percentage of the dry dust impinging on exposed skin areas is actually absorbed.

Although much attention has been, and rightly should be, given to prevention of exposure to compounds that are more acutely toxic, the importance of also minimizing exposure to other less toxic compounds should not be overlooked. For example, malathion, while not a compound of high systemic toxicity, has been shown to be a skin sensitizing agent and a potential cause of dermatitis in exposed individuals.[49] The fraction of toxic dose received during application of some of the less toxic chlorinated hydrocarbon pesticides may be compartively low; however, these compounds are stored in body fat following absorption. Although no adverse health effects have yet been shown in workers with continued, high-level exposure to DDT[3] or pesticides generally,[50] the continued contact with absorbed chlorinated hydrocarbon compounds resulting from fat storage and the possible additive pharmacologic effect of various related pesticides in this chemical class are factors that should be considered. Also, certain dusts, even those inert ones which do not contain pesticides or other added chemicals, may cause discomfort and even precipitate illness in some people.

The exposure studies reported in the present paper and similar studies which have been published previously from this and other laboratories (as summarized in table 1) indicate that, in general, agricultural and public health vector control workers using pesticides in various activities are exposed to relatively small fractions of the toxic dose each day. Surveys of illness, and of various physiologic manifestations of pesticide exposure, such as symptomatology, blood cholinesterase activity, fat storage of DDT and other chlorinated hydrocarbon pesticides and their metabolities, and urinary excretion of DDA, *p*-nitrophenol, and other pesticide biotransformation products confirm this impression of a generally low-level of exposure of workmen to pesticides. Both direct and indirect studies have shown that the exposure levels of workers, while higher than those for the general population, are generally relatively low in comparison to the toxic level. In many instances in which poisoning of a pesticide worker does occur, it is possible to show an obvious disregard for one or more safety recommendations to account for the illness.

Thus, the results of the present study are consistent with the idea that pesticides can be used safely provided recommended precautions are followed. In fact, a number of pesticides are so nontoxic that occupational poisoning associated with their use has not been reported and the exposure levels (as the percentage of toxic dose per hour) are so low that it is doubtful that it will occur. However, a few of the more toxic compounds (such as endrin, parathion, and TEPP) have caused occupational poisoning in the past. Their relatively high exposure values indicate that even minor lapses in adherence to safety precautions might be sufficient to allow poisoning to occur.

Summary

Values for dermal and respiratory exposure and for total exposure in terms of fraction of toxic dose were determined for 31 different work activities involving ten different pesticides.

There were wide ranges in exposure level for a given work activity with a specific pesticide, depending on the environmental conditions, particularly wind and technique of the operator; but other factors could not be excluded. Also, for a given pesticide there was a significant variation in hazard depending upon the type of work activity involved. Various phases of an operation often produced different levels of exposure. Gen-

erally, the loading operation was the most hazardous part of the spraying or dusting cycle. Exposure also depended upon the method of application. Not only was the hazard related to the length of time worked, but the use of dusts or fine aerosols rather than sprays greatly increased respiratory exposure.

As reported in previous exposure studies, the potential dermal exposure to each compound in every work situation studied was much greater than the potential respiratory exposure. However, the practical importance of this potential difference must be viewed in light of the fact that chemicals given at equivalent doses are absorbed more rapidly and more completely from the respiratory tract than through the skin.

The results from the present study were generally in good agreement with those published previously in those instances in which direct comparisons were possible.

The present results indicate that, in general, workers using pesticides in agriculture and public health vector control are exposed to relatively small fractions of the toxic dose each day. These findings are consistent with the idea that pesticides can be used safely provided recommended precautions are followed. However, the relatively high exposure values associated with a few of the more toxic pesticides (such as endrin, parathion, and TEPP) indicate that even minor lapses in adherence to safety precautions might be sufficient to allow poisoning to occur.

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GROWTH OF PROCESSED FOODS

In 1908 there were three cans of food used per family, while in 1963, 680 cans and jars were consumed per family. Almost 30 billion cans of food are consumed annually in this country. This is only one segment of the food industry. The frozen-food packers also have a spectacular story of product development and acceptance. In the last 25 years, their production has increased from 648 million pounds to more than 8.5 billion pounds. —Mounce, D. M.: Standards of Safety for Foods in Relation to Public Health, *Amer J Public Health* 56:952 (June) 1966.

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PARATHION RESIDUES AS A CAUSE OF POISONING IN CROP WORKERS

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The application of parathion as a pesticidal spray in fields and orchards leaves a residue that declines rapidly on most crops for the first few days and more gradually during a period of weeks. Persons not actually engaged in spraying but working among trees and vines thereafter run a risk of poisoning that depends on a number of factors. Eleven episodes of poisoning from contact with parathion residues, involving more than 70 persons, have been analyzed. The crops involved were pears, apples, grapes, citrus fruits, and hops. The workers were engaged in picking, thinning, cultivating, and irrigating. Absorption apparently was by the dermal rather than the respiratory route. It was favored alike by the removal of protective clothing and by the persistent wearing of contaminated clothing. Certain weather conditions may have increased the likelihood of contamination. One episode involving 16 cases occurred 33 days after the spraying. Regulations intended to minimize the hazards of using parathion need to be reviewed with respect to the poisonings that have occurred from the persistence of toxic residues.

From the early days of agricultural use of parathion (0,0-diethyl-0-p-nitrophenyl thiophosphate), it has been recognized that a potential hazard to the workmen exists "from the point of opening the bag to the ultimate possibility of a contact with material residual at thinning or suckering time." [1] Leach,[2] Haller,[3] and doubtlessly others recognized the hazard to all workers—even those whose only exposure was in areas after application. Nevertheless little attention was given to the hazard of contact with residual parathion. One difficulty pointed out by Kay and co-workers [1] was the lack of suitable analytical methods for separating parathion residues from the plant products. Moreover, all the deaths and the majority of the serious illnesses from parathion were associated with known direct exposures while mixing or applying the material or from relatively concentrated material left in a container. Such poisonings occurred sporadically among many people so exposed.

One instance of poisoning in harvesters to be described in this paper was known to have occurred as early as 1949. Though widely discussed, it has never been previously published. Other unpublished reports of similar poisoning have come from several states in this country and from provinces of Canada. When large groups of workers were involved, the pattern of illness sometimes suggested food poisoning or water-borne gastroenteritis. When small groups were involved, heat stroke was sometimes suspected. When illness was recognized as poisoning, it was sometimes mistakenly attributed to the inhalation of parathion vapor so that attention was diverted from the major source of exposure (dermal). The earlier outbreaks were seldom checked by blood cholinesterase determinations.

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A 1951 outbreak which was confirmed by cholinesterase determination was summarized before a scientific meeting in 1952 by Conley.[4] On May 25, 1951, 300 acres of vineyard near Delano, Calif., were sprayed at the rate of 1.9 lb. of parathion per acre. On June 27, 33 days after application, 24 men were stripping and thinning the vines. None had had previous exposure to cholinesterase inhibitors. After about seven hours of work, some became ill and ultimately 16 of the 24 developed symptoms and were hospitalized. The chief symptoms were headache, nausea, vomiting, diarrhea, miosis, weakness, and mild shock. Symptoms were relieved by doses of atropine 1/100 grain (0.6 mg.) administered at short intervals. Most were discharged from the hospital within 24 hours, one was hospitalized for three days. Blood samples taken on July 6 still showed "low" cholinesterase activities. On June 29, the leaves showed a residue of 8 ppm of parathion.

Lieben and associates [5] described an outbreak of illness occurring in 1952 in 20 of 52 teen-age tobacco pickers in Connecticut. Although parathion poisoning was suspected, the authors presented some evidence that poisoning was not involved. No similar illness occurred in other camps. Blood cholinesterase activities were normal in five of the exposed boys including three who were ill. There was no essential difference in the paranitrophenol excretion of the normal and the sick boys on the day after illness. Most important, the sick boys returned to work and showed no further illness although their level of paranitrophenol excretion (presumably reflecting rate of parathion absorption) approximately doubled during the next 10 days. In a related study, Schaefer and Vance [6] have reported measurements of parathion residues on tobacco at different intervals after application. They mentioned that no proved illness due to skin absorption of parathion has come to the attention of the Connecticut State Department of Health among many thousands of workers, many of them children, while handling tobacco leaves containing spray residues.

Being aware of the logical possibility of excessive exposure from contact with residues, Braid and Dustan [7] carried out an excellent study of parathion residues on immature peaches. They found that residues persist far longer on the fruit (half-life of 7 to 10 days) than on the leaves (approximately 2 days) of the same peach tree. The authors mentioned "ill-effects supposedly due to residual parathion during thinning operations." However, further investigation [8] revealed that the case histories of the two persons in question were so confounded with recent heavy spray exposures in both cases and with contradictory autopsy findings in one case that their interpretation is difficult. Bobb [9] reported residues in two successive years on peach trees indicating a half-life of about two weeks on bark, but only 2% of the residue persisted on the leaves after one week.

Report of Cases

The following instances of parathion poisoning associated with direct exposure to residues are arranged in chronological order and designated by the name of the town near which they occurred (table 1). Direct study by one of us was possible in some cases. Other cases were brought to our attention long after they occurred. Thus the thoroughness with which it has been possible to study the cases has varied. However, all of these cases give some additional proof to the conclusion already suggested by the literature, namely, that dermal contact with parathion residues can cause poisoning under practical conditions of work. Such poisoning apparently occurs more frequently than has been recognized before.

TABLE 1.—*Data on Parathion Poisoning in Crop Workers Exposed to Residues*

Location	Yr.	Crop	Activity	Parathion* (Lb. Acre)	Days Since Last-Sprayed	Persons, No.		Previous Exposure While Spraying	Effect on Cholinesterase	Response to Atropine
						Exposed	Ill			
Marysville, Calif	1949	Pears	Picking	2.50	12	60	20-25	No	...	Yes
Highland, Calif.	1951	Citrus	Cultivating	..	8	1	1	No	...	Yes
Delano, Calif [4]	1951	Grapes	Stripping and thinning	1.87	33	24	16	No	Yes	Yes
Oroville, Wash	1952	Apples	Thinning	2.25	2	2(?)	2	Y/N†	Yes	Yes
So. Okanagan Valley, B. C [10]	1952	Apples	Thinning	?	2	4	4	...	Yes	Yes
Riverside, Calif.	1952	Oranges	Picking	12.00	16-19	30	11	No	Yes	Yes
Riverside, Calif	1953	Oranges	Picking	?	17	7(?)	7	...	...	Yes
Entiat, Wash.	1953	Apples	Thinning during spraying	2.25	0	1	1	No	Yes	...
Manson, Wash	1954	Apples	Irrigating	2.5(?)	1	1	1	No	...	...
Wenatchee, Wash.	1954	Apples	Thinning	2.25	2	5	4	No	Yes	Yes
Yakima, Wash.	1955	Hops	Picking	2.25	1	7+	7	No	Yes	Yes

* Best data available reflecting weight of actual parathion per acre.
† One patient had had previous exposure and one had not.

In Marysville, Calif., on July 8, 1949, at 8 a. m. three crews of 30 men each began picking pears. Two of the crews picked in areas sprayed on June 27 (12 days earlier) with 2.5 lb. of parathion per acre. The other crew picked in a block sprayed on an earlier date. Residue analysis, done two days before the picking started, from the trees sprayed on June 27 showed only 0.00156 grains of parathion per pound of fruit (0.22 ppm). Picking had therefore been undertaken with reasonable assurance that residues were not high on the fruit.

The day was hot and humid with little air motion. Onset of symptoms ranged from 12:30 p. m. to 8 p. m. Most of the men became ill between 2:30 and 4 p. m. By mid-afternoon a dozen pickers in the first two crews became ill and quit work. Some lay down and others left for their homes. Almost all those who were ill and who remained at the ranch began to vomit and were then hospitalized. By evening at least 20 to 25 men had been to the hospital. Two were so sick that they had to be brought by ambulance. All but four vomited and retched continually. Temperatures were subnormal, pulses fast, and the men perspired excessively. The four who did not vomit had vertigo. Pallor and weakness were also common symptoms. Two or three complained of twitching of the arm and leg muscles.

The response of the patients to atropinization was striking. Within 20 to 25 minutes all improved and 10 men wanted to go home. Nine of the seriously affected were detained in the hospital for overnight observation. A few had repeated doses of atropine. All but two were released the next morning. The diagnosis was acute parathion poisoning by inhalation.

None of the pickers had had prior exposure to organic phosphates. None of the third crew picking in the orchard sprayed earlier had similar symptoms. All pickers had different lunches and different sources of water. Some ate pears; others did not.

TABLE 2.—*Blood Cholinesterase Activities* in Orange Pickers, Riverside, Calif., 1952*

Case No.	RBC	Plasma
1	0.11	0.18
2	0.12	0.22
3	0.20	0.22
4	0.21	0.20
5	0.21	0.38
6	0.38	0.21
7	0.39	0.29
8	0.52	0.25
9	0.54	0.38
10	0.57	0.58

* Modified Metcalf method in terms of micromoles per five microliters per 30 minutes. Normal ranges: rbc, 0.8-1.4; plasma, 0.3-0.5.

On July 11 a sample of 100 leaves was taken for residue analysis from the plot sampled earlier. It showed 6.5 ppm or 0.0313 mcg. per square centimeter of leaf surface. Four days later a sample of leaves showed 2.9 ppm or 0.0146 mcg. per square centimeter of leaf surface, indicating the considerably greater amount and persistence of residues on leaves as compared with fruit.

In Highland, Calif., a 22-year-old tractor driver disked a citrus orchard on the morning of May 30, 1951. The foliage of the low, closely set trees was dusty. Parathion had been applied eight days earlier and the orchard was still posted with warning signs. The driver brushed against the trees as he drove along. It was so hot and still that he removed his shirt. Although this man had had unrecorded previous exposure to sprayed foliage, at no time was he exposed to the process of spraying. At about 2 p. m., which was somewhat after lunch, the driver became violently ill. He called a nearby pest control operator who supplied the patient with atropine tablets and had the patient taken to the local hospital. Signs and symptoms included vomiting, abdominal cramps, sensation of feeling "numb all over," and pinpoint pupils which still reacted to light and accommodation. His skin color was ashen, and mild cyanosis was present. Urine and blood studies, as well as physical examination revealed no other positive findings except 3+ mucus in the urine with two to four white blood cells per high power field and a trace of albumin. Upon admission, 1/50 grain (1.2 mg.) of atropine (1/200 grain [0.3 mg.] intravenously and the remainder intramuscularly) gave the patient an immediate sense of relief. The atropine furnished by the pest control operator was lost or misplaced on the way to the hospital. The pupils dilated but some vomiting continued as long as two and one-half hours after admission. The patient slept soundly throughout the night, but when he awoke it was noted that his pupils were contracted again and other symptoms returned. Another dose of atropine (1/100 grain [0.6 mg.] subcutaneously) relieved him again and he required no further treatment.

In Oroville, Wash., a 48-year-old orchardist sprayed his apple trees with parathion from June 13 to 20, 1952, at a rate of 2.25 lb. per acre. He started thinning in trees sprayed two days earlier. Seven days after starting to thin, he noted visual disturbances, was dizzy, and returned home where he became nauseated and vomited. He was seen to have pinpoint pupils. He had heaviness of his legs and excessive sweating. His physician gave him atropine which afforded fairly immediate relief. Three weeks after this experience, the patient had a normal plasma cholinesterase activity but his erythrocyte value was 0.38 Δ pH per hour by the Michel method.[9A]

In retrospect this patient had noted that four hours before the recognized onset of his illness, both he and his daughter had had a warning sign of twitching of the eyelids. The 12-year-old daughter had helped her father thin his recently sprayed orchard. Her only sign of illness was uncontrollable twitching of the eyelids four hours before the onset of her father's illness; the significance of the twitching was not realized at the time.

In South Okanagan Valley, British Columbia,[10] on Aug. 4, 1952, four workers became ill after thinning in an apple orchard sprayed two days earlier with parathion. Their symptoms suggested food poisoning but were relieved by atropine. Red blood cell cholinesterase activities three or four days later ranged from 26% to 55% of Michel's normal values; plasma activity was not determined. Cholinesterase determinations in six employees of the Department of Finance, whose only possible exposure was incurred while assessing the orchards, showed no such depletion. Six orchardists who had sprayed parathion for three years but without recent exposure had essentially normal cholinesterase activities.

In Riverside, Calif., on Aug. 8 and 11, 1952, a 6-acre orange grove was sprayed at a rate of 12 lb. of parathion per acre. From 16 to 19 days after these applications, on Aug. 27, a crew of 30 men picked oranges from the dusty trees from about 6 a. m. to 2 p. m. No picker had had previous exposure to an organic phosphorus insecticide nor had he picked on other sprayed areas. Seven men became ill a little after lunch; three others became ill later the same day; and another became ill the next day, making a total of 11. Symptoms were weakness, vomiting, and profuse perspiration. One man was almost unconscious; two were reported as hardly able to see. Ten of the men were hospitalized and treated with atropine. Their blood cholinesterase activities, apparently tested on the day of onset, were reduced (table 2).

Again in Riverside, Calif., on July 6, 1953, seven orange pickers became ill while picking oranges and others had their onsets after returning home from work. The grove had been sprayed with parathion 17 days earlier. Three workers were so ill they were hospitalized overnight. Brief hospital records revealed symptoms of nausea, sweats, and abdominal cramps. Miosis was recorded for only one of the patients. This sign and other symptoms were relieved in all three cases by a single dose of 1/50 grain (1.2 mg.) of atropine. No cholinesterase determinations were done.

The etiology of this group of cases might be hard to accept as parathion residues 17 days old were it not for the more completely documented episode described above, apparently due to residues 16 to 19 days old. Moreover, within the same month as the second outbreak at Riverside, a third outbreak was associated with 34-day-old residues, and another at nearby Bryn Mawr with 33-day-old residues, although the latter two outbreaks have not been described in detail for lack of clinical records.

In Entiat, Wash., in early June of 1953, a woman thinned apples for two days in an area being sprayed with 0.03% parathion (as water-wettable powder) at a rate of about 2.25 lb. per acre. Although she felt the spray hit her often, her greatest exposure was to residues, for some of the trees she thinned were still wet. During the morning of her second

TABLE 3.—*Blood Cholinesterase Determinations by Michel Method in Case of Parathion Poisoning (Entiat, Wash.)*

Days Since First Known Exposure	△ pH Hr. RBC	Plasma
3	0.22	0.21
7	0.28	0.16
9	0.25	0.14
14	0.38	0.40
14	0.35	0.50

day of exposure, she became dizzy and unsteady. At lunch time she was not as hungry as usual. By 4 p. m. she was weak and vomiting. This condition continued throughout the night and next morning when she sought medical advice, at which time miosis was noted. Her blood cholinesterase activities were as shown in table 3.

The failure of the plasma cholinesterase activity to show any recovery for nine days and the recurrence of mild symptoms of poisoning led the attending physician to suspect she had continued her exposure unintentionally or against medical advice.

In Manson, Wash., in 1954, a woman thought on each of two occasions that she was poisoned by malathion after spraying her flowers with two heaping tablespoonfuls of 25% water-wettable powder in two to three gallons of water in a hand sprayer. Her exposures to malathion were on June 28 and July 7, 1954. Each application was followed shortly by headache, nausea, and dizziness. She was under the misimpression that her husband and son had sprayed the family orchard with malathion. Subsequent investigation revealed that the orchard and her garden (all in the orchard) had been sprayed with parathion at the rate of about 2.5 lb. per acre. Although her memory of details was in question, calendar records showed that she irrigated the orchard for the five days following the second cover spray of parathion on June 23. The weeds in the orchard were wet with the spray and later white with residues when she walked through the orchard five or six times daily changing sprinklers. She wore the same dusty "pedal pushers" throughout and her legs were bare half-way below the knees. The second illness was preceded by additional exposure to residues.

In Wenatchee, Wash., during the first week in June, 1954, five persons related by blood or marriage began thinning apples from 1 to 10 hours per day for six days a week. On June 24, four of the five showed moderate symptoms of organic phosphorus poisoning while the fifth exhibited only muscle twitchings of the eyelids. The exposure, symptoms, and cholinesterase activities of the five exposed persons are shown in table 4.

For four days before the onset of the symptoms, all five people had been thinning in trees sprayed from 32 to 108 hours previously. On the day of onset, they had thinned in an area sprayed three days earlier. Although no analyses of residues on leaves and fruit were performed, the degree of exposure was evidenced by the fact that visible amounts of white powder were noted on clothing and arms.

The spray used was 0.13% parathion applied at the rate of about 2.25 lb. of actual parathion per acre. The exact dates of scattered light rains while the thinning was in progress are uncertain. However, all informants recalled that there was some "sprinkle" heavy enough to cause them to stop work one day. Another day they continued to thin in a light rain. On one occasion one of the thinners, an older boy, continued to thin after he removed his shirt because of the heat. He was one of the two ill enough to require medical treatment.

One of the patients was hospitalized over night and improved on a dosage of 1/100 grain (0.6 mg.) of atropine every two to three hours during the night. She was discharged the following morning but relapsed and had to be given atropine again later in the day. The other treated patient was given considerable relief by a single dose of 1/100 grain of atropine.

In Yakima, Wash., on Aug. 31, 1955, two pilots from a commercial airplane dusting service applied a total of about 7 tons of 4 and 5% parathion dust on four different hop farms, totaling 280 acres, at the rate of 50 lb. per acre (2 to 2.5 lb. actual parathion). This high concentration was used just before harvest in a desperate effort to check mite damage to the valuable crop. The application was repeated about 48 hours later on Sept. 2 with 4% parathion dust. (After these heavy applications, both pilots became severely affected.) At least six hop pickers were mildly poisoned by handling the crop which the pilots had recently dusted. Some rumors were current that there were many (up to 60) other mild untreated illnesses among other pickers. Under the circumstances, the investigator of this outbreak (G. E. Q.) felt that partial credence must be given to these rumors.

Five of the six investigated illnesses were associated with treatment of a single field. Picking had started Aug. 24, but no illness occurred among pickers until Sept. 1, the day after the first dusting with 5% parathion. On that day a crew of seven pickers renewed the harvest of hop vines. The procedure involved the cutting of the vines first at the ground level and then from the supporting wires about 15 ft. overhead. The vines dropped onto the bed of the picking vehicles where they were caught by the pickers who then placed the ends of each vine into clamps on a carriage belt which carried the vines into a shredder. Vines frequently fell on the pickers, and their blue denim clothing became white with dust. The air around the pickers was cloudy with the dust.

A 19-year-old daughter of the manager of a hop farm was one of a crew of seven hop pickers which included her sister and five others, most of whom were Mexican itinerant farm

TABLE 4.—*Parathion Poisoning in Family Group Engaged in Thinning Fruit at Wenatchee, Wash., 1954*

Case No.	Age, Yr.	Sex	Exposure	Symptoms Day of Onset	Cholinesterase △ pH/Hr.* Date	RBC	Plasma
1	28	F	Thinning 10 hr./day for 4 days in orchard sprayed from 2-4 days earlier	Hiccups, nausea, vomiting, sweating, weakness, shortness of breath, headache, numbness of arms, twitching eyelids and facial muscles, tachycardia, miosis	6/25 6/26 6/29 7/14 8/18	0.26 0.29 0.40 0.43 0.56	0.14 0.24 0.36 0.59 0.61
2	14	M	Same as above	Nausea, vomiting, sweating, heart consciousness, weakness, twitching eyelids	6/26 7/13 8/18	0.30 0.46 0.48	0.24 0.66 0.70
3	37	F	Same as above	Giddiness, almost fainted, sweats, nausea, weakness, twitching eyelids	6/26 7/13 8/18	0.29 0.44 0.54	0.24 0.64 0.80
4	39	M	Thinning 4 hr., irrigating 4 hr.	Twitching eyelids			
5	46	M	Thinning†	Nausea, headache, twitching eyelids	0/26 7/13 8/18	0.26 0.41 0.48	0.16 0.52 0.60

* Michel method.
† Also applied parathion May 29 and 31 and June 1, 1954

laborers. Picking was begun in the field behind the home of the girls' parents. The convenient location was doubtlessly somewhat responsible for the decision to pick in that field rather than one dusted some days previously. About 4 p. m. on Sept. 1, the girl had to stop work and came into her mother's house sweaty, nauseated, and vomiting. Her mother described the ashen pallor as "green." The retching which followed the vomiting lasted about four hours. There were sweats and chills. Retrospective questioning revealed that uncontrollable twitching of the eyelids was the first symptom or sign. After the girl had vomited continually for some time, the mother suspected the cause of the illness and called a physician. He prescribed atropine. One tablet was taken and vomited. However, the second tablet taken four hours later was retained. The patient recovered and felt well enough to go back to work again on Sept. 5 in the same field. She was made ill again by her reexposure, and vomiting was the only recalled sign.

The 21-year-old sister of this patient worked two days longer than her sister before becoming ill on Sept. 3. Presumably all work was in the same field, which was dusted for the second time Sept. 2. As with her sister, the first sign was twitching of the eyelids. This was followed by nausea, vomiting, and chills. She and her sister had both complained of the odor and taste of parathion while working in the dust. She was given atropine orally at home but was unable to retain the tablets. Vomiting was so severe that she was hospitalized for three days. Atropine, 1/150 grain (0.4 mg.) in 1,000 cc. of 5% dextrose given intravenously, stopped the vomiting. The dose of atropine was repeated intramuscularly in six hours. She was also given one dose each of phenobarbital and meperidine (Demerol) as a sedative. On the day she was discharged from the hospital, she fainted and fell while in a store but required only bed rest to recover.

A 17-year-old Mexican itinerant laborer was the third person of the crew of seven who showed signs of poisoning. On Sept. 3, he complained of dizziness, followed by perspiration, nausea, vomiting, and pain in the chest. He was noted to have pinpoint pupils. He collapsed while on the picking machine and was taken to a hospital. He was relieved by atropine, 1/150 grain (0.4 mg.) given subcutaneously. The cholinesterase activity of his whole blood was reduced as measured by the bromothymol blue screening test (Wolfsie and Winter) [11] and the blood showed hemoconcentration.

The fourth sick crew member, a 30-to-40-year-old Mexican woman, was seen vomiting on Sept. 1. No other history was obtained, probably because of the inability of the woman to speak English and because the significance of the illness was not realized at that time.

The fifth sick crew member, a young Mexican male, was noted to have been ill on Sept. 3 "just like the four others" but was not seen by a physician nor any English-speaking person who made any careful observations of the patient. He recovered spontaneously and shortly afterward left the state.

While working with another crew on the same farm where the five pickers had become ill, a young Mexican hop picker fainted while on a picking machine. The date of onset of his symptoms could not be ascertained except that they occurred between Sept. 4 and 8. He was taken to one of the physicians who had seen several cases of parathion poisoning during the year. There were no signs noted in fragmentary office records. Since a bromothymol blue screening test on Sept. 8, 1955, showed "normal activity" and the patient had recovered from his syncope, he was returned to the hop farm.

The second of the four hop farms dusted by the two pilots previously mentioned produced one case of poisoning on Sept. 4, 1955. The foreman on this farm stated that no other pickers were ill. The superintendent of the four hop farms and the physicians concerned with the care of the employees knew of no illnesses occurring in connection with the other two farms.

A young Mexican hop picker was brought into a physician's office in a small town away from the medical center where the group of poisoning cases had been recognized. On Sept. 4, after considerable vomiting, he had collapsed while on a hop-picking machine. When first seen he was pale, nauseated, and vomiting. He collapsed in the doctor's office after complaining of cramps and abdominal pain. That same morning he had felt perfectly well. He was hospitalized and treated as a suspected food poisoning case even though there was no diarrhea. When his abdominal cramps became somewhat localized in the right lower quadrant and the white blood cell count was found to be elevated, he was seen by a surgical consultant and followed for possible appendicitis. However, this consultant had attended one of the sisters who had been poisoned on the other farm. When he noted that the pupils were smaller than normal and only poorly reactive, even late in convalescence, he considered this to be another case of parathion poisoning. Earlier observations on the size of the pupils had not been made. The patient recovered from marked weakness during four days in the hospital.

Comment

Mild poisonings have been caused in workers thinning, picking, cultivating, or irrigating crops of apples, pears, grapes, oranges, and hops treated with 1 lb. or more of parathion per acre. Several of the known instances of poisoning involved exposure to foliage or fruit sprayed not more than two days earlier. However, contact with pear trees, citrus trees, and grape vines caused poisoning as much as 12, 17, and 33 days, respectively, after application of parathion. In general, the episodes of poisoning involving old residues are not so well documented as those involving residues not more than two days old.

On the other hand, the episode occurring at Delano, Calif., in 1951, 33 days after the vineyard had been sprayed was thoroughly investigated, and the cause of illness was confirmed by low cholinsterase values and relief of symptoms by atropine. Moreover, the causal relationship was further supported by the finding of a residue of 8 ppm of parathion on the leaves. That there might be considerable variation from crop to crop as to the dangerous period after spraying is to be expected from the fact that there has been a similar difference between crops demonstrated in regards to the persistence of parathion residues.[12] Though no half-life is reported for grape foliage, the above-reported residue of 8 ppm 35 days after application is far greater than would be expected on most crops, and yet citrus fruit has been reported to retain parathion for a half-life of 60 to 80 days.[12a]

The physician who attended the men poisoned at Marysville, Calif., in 1949, and other physicians have attributed the poisoning to parathion vapor and laid heavy emphasis on the respiratory route of exposure. The preoccupation with vapor is evident in several attempts to measure the respiratory exposure of workers.[13] Considerable note was also made of the high temperatures to which poisoned workers have been exposed.

Although it is true that the vapor pressure of technical parathion doubles with a rise of temperature from 68 to 79 F, the vapor pressure even at 103 F is only 1μ Hg, which is capable of producing at most a concentration of only 15 mcg. per liter of air. It would seem most unlikely that workmen would be subjected to such saturated air for prolonged periods if at all. On the other hand, all thinners and harvesters have extensive contact between the fruit and their hands and less extensive contact between their arms and other parts of their body and the foliage.

In an attempt to measure such exposure Batchelor [14] persuaded apple thinners to wear cotton gloves, respirators, and absorbent pads during their thinning operations. In general the recovery from gloves was several times as much as from the arms as calculated from the absorbent pads, and the recovery from the respirators was below the sensitivity of the method. Batchelor and Walker [15] and Culver and co-workers [16] have also shown that the skin is the principal route of absorption even during actual spraying or aerosol operations. Therefore, it seems reasonable to presume that dermal contact is more important than inhalation in explaining the exposures resulting in the poisonings described above. Apparently no one has succeeded in reasonably estimating the importance of the oral exposure resulting from eating, drinking, or smoking without washing the hands or from eating fruit while harvesting.

The role of temperature in the etiology of these outbreaks is apparently still undetermined. One might speculate that sweating in response to high temperatures produced a layer of moisture on the skin which made parathion adhere more easily and perhaps facilitated absorption of the compound. Certainly it was recognized that high temperatures and humid working conditions did cause some workers to remove their shirts and otherwise disregard protective clothing, thus increasing the area of skin exposed. However, occurrence of most of these outbreaks during hot weather may merely be a reflection of the fact that most crop operations from which the poisoning episodes ensued are normally carried out during the relatively warm summer months.

In several of the earlier episodes the occurrence of light rains just prior to the outbreaks of poisoning caused some workers to believe that moisture on the recently sprayed foliage increased the amount of the residue that was transferred from the leaves onto the skin. The absence of such meteorological conditions before some other outbreaks certainly implies that, if it is a factor at all, rain or moisture on the crop is not essential to poisoning.

One other exposure factor was contaminated clothing. Most of the laborers who do thinning and similar agricultural tasks wear their work clothing for about a week or longer without laundering. The white dust and odor of parathion were noted on the clothing of many of those who became ill. Prolonged wearing of contaminated clothes increases the likelihood of poisoning.

One striking feature of the group of outbreaks described in this paper is the physical nature of the crops implicated thus far. All had foliage at least chest high. This may imply that workers are poisoned in this way only when dusted or bathed in the dilute residues practically from head to foot. After seven years of using this insecticide, the lack of poisonings from residues deposited on much lower row crops appears significant.

The clinical picture in this type of poisoning produced only by residues on the foliage of plants was somewhat different from that in most cases produced by exposure during spraying or dusting. The chief difference was one of relative mildness so that the onset tended to be more gradual and the entire course more benign. No doubt the relative mildness of this type of organic phosphate poisoning has caused many physicians to attribute such illnesses to causes other than the insecticides to which the crop workers were exposed. Because of the paucity of published reports of poisoning by residues, physicians have heretofore tended to insist on a history of direct exposure to sprays, concentrates, or dusts before giving serious consideration to a diagnosis of parathion poisoning.

The epidemiologic picture of poisoning produced by residues differs strikingly from the picture of poisoning produced by exposure to concentrates, sprays, or dusts. In connection with residue poisoning, it has frequently happened that a large proportion of the persons exposed became sick. In poisoning after direct exposure to formulations, it is unusual to have more than one or two cases among any group of workers.

It is obvious that regulations and recommendations which have been promulgated to prevent occurrence of such episodes are not only justified in purpose but probably need review, modification, and improved enforcement if such incidents are to be prevented.

Summary

Mild poisoning has followed exposure to residues of parathion on several kinds of crops (pears, grapes, hops, citrus fruits, and apples) among agricultural workers engaged in picking, thinning, cultivating, and irrigating. The lack of a direct exposure history incidental to the application of parathion is not necessarily grounds for ruling out intoxication by this compound. The route of absorption of parathion most likely to produce poisoning of this type appears to be dermal rather than respiratory. The relatively mild poisoning—frequently in groups—from exposure to parathion residues differs from the usually more severe cases—generally sporadic—resulting from direct application procedures.

Addendum

Since this article was submitted for publication one more incident has occurred which appears to be due to parathion residues. In Wenatchee, Wash., four cases of mild poisoning occurred on June 18, 1957, in the same group of five people exposed in 1954 (table 4) and two others. For about two weeks they had been thinning apple trees with residues estimated to be two to five days olds. The most severely ill patient (case 1) in the 1954 outbreak had a similar but less severe symptom picture as in her prior experience. Her eyelids and those of three co-workers had twitched uncontrollably for two days prior to occurrence of faintness, nausea, vomiting, and difficulty in breathing. Her nephew's observation of pinpoint pupils in this patient is open to question, since this sign was never observed during her two-day hospitalization. However, her blood cholinesterase activity about 48 hours after onset was still at a level at which symptoms of poisoning might be expected to occur (0.26 Δ pH per hour for red blood cell count and 0.23 Δ pH per hour for plasma). One other woman, who had not been thinning in the 1954 outbreak, had her onset about 18 hours later with a similar clinical picture. Both women were partially relieved of symptoms by single doses of atropine several hours after onset, but each had a recurrence of vomiting and other symptoms the following day. A third woman co-worker had twitching of the eyelids and "cold sweats" at nights for a period of several days as well as dizziness, weakness, and "weak stomach." A fourth co-worker had only twitching of the eyelids for about the same two-day period, as did his co-workers. In addition to the recognized dermal and respiratory exposures incident to thinning the trees, one of the patients (case 1) used her teeth about twice a day to loosen the adhesive tape with which she protected her fingers from excessive friction.

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Parathion Residue Poisoning Among Orchard Workers

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Following an outbreak of illness among peach harvesters, 186 peach orchard workers were studied in relation to pesticide application practices and fruit harvesting procedures representative of the orchards in which they worked. It was necessary first to establish a diagnosis of organic phosphate poisoning and then to associate observed illness with the intensity of parathion application. Information obtained revealed that, although parathion could easily be recovered from all elements of the orchard environment, it was not present in amounts sufficient to account for the observed illness. This inconsistency suggested the presence in the spray residue of a compound evolved from parathion alteration which was considerably more toxic than parathion, but identifiable by routine analytical procedures only as parathion. Paraoxon was considered a likely suspect and was postulated as a prime cause of the outbreak.

HEALTH HAZARDS associated with the manufacture, formulation, distribution, and application of the organic phosphate pesticide, parathion, have been frequently described and will not be reviewed here. It has not been so clearly recognized, however, that for many days or weeks after application of parathion spray formulations to argicultural field crops, resulting residues may constitute an important health hazard to argricultural workers.

In 1958, Quinby and Lemmon [1] summarized 11 episodes of poisoning from contact with parathion residues involving a total of more than 70 workers who were involved in harvesting, thinning, cultivating, and irrigating such crops as apples, grapes, citrus, and hops. Although six of the outbreaks occurred within two days of pesticide application, in the remainder of the episodes, the residues had been from 8 to 33 days old. In general, the illnesses were characterized by a gradual onset and a relatively benign clinical course. Percutaneous absorption was thought to be the primary route of entry of the toxicant.

Although we are aware of no other published reports describing poisoning by organic phosphate residues, cases have occurred on a sporadic basis in California over the past several years and, in 1959, more than 275 cases of parathion residue poisoning were reported among workers harvesting citrus crops throughout the state.[2]

In early August, 1963, the California Department of Public Health was notified of an outbreak of parathion poisoning among orchard workers who were harvesting peaches in the northern part of California's San Joaquin Valley.

Description of Area and Workers

The epidemic was centered around the town of Hughson in Stanislaus County. Several hundred peach orchards with a total of about 24,000 acres under cultivation are located in this major peach-growing area. For the annual harvest, during August and September, these orchards employ 7,-500 to 8,500 agricultural workers, most of whom are migrants. The orchards in this area grow a number of varieties of peaches and because each variety of peach becomes ready for picking at a slightly different time, the harvest season extends over a six to eight week period. As a result of this prolonged harvest period, a grower in the area is able to employ a small crew, usually 15 to 25 workers, for the entire season. The pickers move from one variety to another and often from one grower to another as the fruit becomes ready for harvest.

The harvesting of peaches has not been mechanized. Each piece of fruit must be picked from the tree by workers using ladders and chest-slung bas-

From the Bureau of Occupational Health, California State Department of Public Health.

kets or canvas bags. In this process there is manual contact with all of the fruit and a great deal of contact between the upper half of the body and tree foliage. The picker's breathing zone is often closely surrounded by branches thick with leaves, affording maximum opportunity for inhalation of pesticide residues rendered airborne by the picking process. The San Joaquin Valley summer heat, the constant use of ladders, and the pace induced by piecework combine to make the job hot and uncomfortable. As a result, clothing is light and often sweat impregnated. Shirts are open at the collar, and often shirt sleeves are short or rolled above the elbow.

General Study Plan

The general study plan consisted of relating the worker's health to his occupational environment. During the course of the field work, three groups consisting of 186 peach orchard workers exposed to parathion residues were identified and studied. The first group was made up entirely of cases of poisoning reported by local physicans. These cases were selected to provide information on the clinical manifestations of the toxicant involved and also served to identify orchards with unsafe residue levels. A second group was comprised of workers employed in a sample of these unsafe orchards. Some of these workers had been poisoned and sought medical attention and some had not. This group was selected to provide information on the prevalence of clinical illness in these orchards as well as an estimate of the prevalence of subclinical illness as reflected by depression of blood cholinesterase levels. This group also provided subjects for environmental studies from which maximum daily assimilation of residue could be estimated. A third group was selected at random in order to estimate the prevalence of cholinesterase depression in the universe of orchard workers employed in the Hughson peach-growing area.

To study the relationship between pesticide application and the occurrence of reported clinical illness, pesticide spraying schedules were collected from all growers in whose orchards illness had been reported. These schedules were then compared to a second group of schedules selected from orchards in which no illness had been reported. The second group of schedules was obtained from two large canneries and represented all of the fruit purchased in the epidemic area by these two firms. These schedules were readily available because a copy of the grower's pesticide application schedule is required by all fruit processors in California as a condition of purchase. Except for several schedules which were excluded for technical reasons such as incompleteness or illegibility, all were used for comparison purposes.

Finally, leaf and fruit specimens were collected from both orchard groups, those with associated illness and those with no associated illness. These specimens were analyzed for residues in an attempt to relate residue levels to presence of illness.

For the purpose of this paper, cholinesterase depression is defined as depletion of *either* red blood cell (true) cholinesterase *or* plasma (pseudo) cholinesterase, or *both* to a level below the range of normal variation reported by Wolfsie and Winter [3] as:

RBC: 0.53–1.21 pH units per hour.

Plasma: 0.44–1.38 pH units per hour.

All cholinesterase values were determined by the electrometric method of Michel [4] as modified by Hamblin and Marchard.[5] All parathion analyses were carried out using the method of Averill and Norris.[6] However, because this method does not differentiate between parathion and its S-phenyl isomer, its S-ethyl isomer, or its oxygen analog (paraoxon), any value reported as parathion may reflect the presence of these other forms.

Results

Group 1.—The first group was made up of 94 orchard workers who became clinically ill during the period between Aug 4 and Sept 15 and who sought medical care from local physicians because of the severity of their complaints. The figure shows these 94 cases as they appear when converted to a weekly attack rate based on the total picker work force.[7] The spread of cases with time generally coincides with the period of peak peach harvest, which extended from July 28 to Sept 15, 1963.

At the time of illness, cholinesterase levels were determined on blood collected from 68 of these cases and found to be depressed in 66 of them. The 26 cases in which no cholinesterase levels were determined were considered by the attending physicians to be so typical of organic phosphate poisoning that no laboratory verification of the clinical diagnosis was necessary. The most consistent complaints described by these clinically ill workers were nausea, vomiting, occipital headache, profound weakness, and extreme malaise. Other manifestations of parasympathetic stimulation including miosis, blurred vision, dizziness, excessive sweating, salivation, diarrhea, and abdominal cramping were reported, but not consistently so. It is noteworthy that several clear-cut cases failed to demonstrate miosis at any time during the course of illness. Although a number of patients were hospitalized for 24 to 48 hours, symptomatic treatment with large, parenteral doses of atropine (1.2 to 2.4 mg) repeated as necessary appeared to give satisfactory relief in every case.

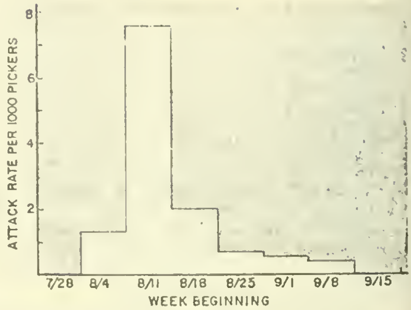
One death during the epidemic was attributed to parathion poisoning by a local pathologist. Although it was determined that the deceased had worked for no more than 1½ days in an orchard from which one other case of clinical illness had been reported, his activities and exposure during several of the days immediately prior to his hospitalization could not be traced. The clinical course of this fatal illness is obscure, but it was reported that upon hospitalization seven days after known work exposure, both red blood cell and plasma cholinesterase levels were depressed. Sixteen days after exposure, following nine days of hospitalization, the patient died. Cholinesterase levels at the time of death were reported to be in the low-normal range. Postmortem examination led to a final diagnosis of "bilateral terminal bacterial pneumonia" and "organic phosphate poisoning."

Group 2.—The second group consisted of 68 volunteers from a total work force of about 100 workers who were employed in six orchards from which clinically recognizable cases of organic phosphate poisoning were being reported. Among these 68 volunteers were 62 pickers, 2 fruit graders, 2 orchard owners, 1 labor contractor, and 1 cook. All 68 were interviewed, and a blood specimen for cholinesterase determination was obtained from each of them. In addition, 14 volunteers from these six orchards were examined for skin parathion contamination. In the course of this procedure, various skin surfaces of measured area were scrubbed with alcohol-moistened cotton swabs which were then sent to the laboratory for analysis. To further evaluate skin exposure, a shirt was acquired from one worker who stated that it had not been laundered for eight days. The condition of the shirt bore out his claim. To estimate respiratory exposure to airborne residues, breathing zone dust samples were collected on lapel-mounted filter paper air samplers and analyzed for parathion. The results of the analysis of these environmental samples will be described later in this paper.

From Table 1, it can be seen that 84% of the 68 volunteers in this group showed evidence of significant organic phosphate absorption reflected by depression of blood cholinesterase levels. Moreover, from this table it is clear that once an individual becomes sufficiently ill to seek medical care, his cholinesterase levels are very likely to be depressed. However, it is equally as clear that cholinesterase depression, in itself, is not always accompanied by symptomatic illness, even of a mild degree.

It is of interest to note that of the six volunteers who were not employed as pickers, none had sought medical care, and five were asymptomatic with normal cholinesterase levels. Only one, the labor contractor, was placed in a category indicating both complaints and cholinesterase depression.

Group 3.—In order to arrive at some estimate of the prevalence of cholinesterase depression among peach pickers in the epidemic area, 45 workers residing in seven groups of living units were studied. The living units consisted of trailer parks, labor camps, and motels and were selected only on the basis of proximity to the harvest area. The workers were interviewed and blood samples were obtained



Clinical attack rate per 1000 pickers by week.

from each of them. Only individuals who were actively engaged in peach picking were included in the study group. None reported working in orchards with which clinical illness had been associated, nor had any of them sought medical attention during the peach harvesting period. Sixteen, however, complained of minor signs and symptoms, including nausea, vomiting, headache, dizziness, weakness, insomnia, and anorexia, which several thought referable to their work. As shown in Table 2, 35% of these 45 orchard workers had absorbed a significant amount of organic phosphate pesticide as reflected by depression of blood cholinesterase levels. Table 2 also relates cholinesterase levels to presence and extent of clinical illness. In this group, as in the second group, it is clear that a worker may be asymptomatic even though his blood cholinesterase is significantly depleted.

The status of the cholinesterase levels of the entire population of several thousand pickers cannot be realistically extrapolated from these 45 cases. However, the prevalence of cholinesterase depression in this small sample suggests that the problem of significant parathion residue absorption extended beyond the few score cases reported by physicians or discovered by study of a highly selected group of pickers working in orchards from which illness had been reported.

Pesticide Spraying Schedules.—In all orchards studied, parathion was applied in the form of 25% wettable powder in water suspension. Essentially all spraying was done by tractor-drawn spray blowers. Schedules varied from one to seven applications over the growing seasons at rates of one to two pounds of parathion per acre at each application. The frequency and rate of pesticide application depended largely upon the degree to which the orchard owner felt his crop was threatened by insect predators.

Pesticide spraying schedules from 16 illness-producing orchards were compared to pesticide spraying schedules from 43 no-illness orchards. This com-

Table 1.—Cholinesterase Levels by Extent of Illness Among 68 Workers From Six Illness-Producing Orchards

Extent of Illness	No. of Workers Sampled	% With Depressed Cholinesterase
Clinical poisoning by physician diagnosis	21	95
Complaints but no medical care sought	14	86
Asymptomatic	33	76
Total Cases	68	84

parison indicated that the only cholinesterase inhibiting compound used in every illness-producing orchard was parathion. However, it was apparent that application of parathion, in itself, was not the determining factor in the causation of illness because 40 of the 43 orchards without associated illness also applied it. Organic phosphate pesticides other than parathion were used only irregularly, and therefore, their effect in the causation of the epidemic could not be assessed.

The important differences between the orchards with associated clinical illness and those with no associated illness appeared to be related to total parathion application and to the time interval between the last application and the start of harvest. The 40 parathion-using orchards with no associated clinical illness applied a mean parathion dosage of 4.38 pounds per acre for the season and waited a mean interval of 45 days between the last application of parathion and the start of harvest. Comparable means from the 16 orchards with associated clinical illness were 7.14 pounds and 23 days. Thus, the orchards without illness applied less total parathion per acre and waited longer between the last application and harvest. While this information is of interest, it is not really useful as time and dosage have an uncertain effect on residue levels at harvest and both vary in this particular comparison.

The interval between the final parathion application and the first day of harvest (the spraying-picking interval) was eliminated as a variable by matching the group of illness-producing orchards and a group of no-illness orchards with comparable mean intervals. This was accomplished by eliminating all of the orchards in the no-illness group with a spraying-picking interval of more than 40 days. The final matched groups consisted of 16 illness-producing orchards with a mean interval of 22.9 (standard deviation 7.7) days and 26 no-illness orchards with a mean interval of 22.4 (standard deviation 6-1) days.

Table 2.—Cholinesterase Levels by Extent of Illness Among 45 Peach Pickers From Miscellaneous Camps, Motels, and Trailer Parks

Extent of Illness	No. of Workers Sampled	% With Depressed Cholinesterase
Clinical poisoning by physician diagnosis	0	0
Complaints but no medical care sought	16	25
Asymptomatic	29	41
Total Cases	45	35

Table 3 compares the mean parathion dosages for these two matched groups of orchards. Note that the total dose for the season after Jan 1 was significantly higher in the orchards from which clinical illness had been reported. The dosage applied after July 1, 1963, however, does not show a significant difference between the two groups of orchards. It was not possible to make a similar comparison (holding dosage constant) to determine the effect of the spraying-picking interval on illness because matching groups could not be constructed from the data available.

Parathion Residues and Total Worker Dose.—Foliage specimens were collected from 11 orchards, six with associated illness and five with no associated illness. Leaves from the former group of orchards were obtained within three days of the onset of clinical illness among employees and leaves from the latter group of orchards were collected at random during the harvest period. Residues were removed by surface stripping with benzene and analyzed for parathion. The mean parathion content of the foliage from the six illness-producing

Table 3.—Comparison of Matched Groups of Orchards by Parathion Dosage

Time Interval and Orchard Group	Mean Dose, Pounds/ Acre	Standard Deviation	Significance of Difference by "t" Test
After July 1, 1963			
Orchards with illness	2.24	1.10	Not sig
Orchards without illness	1.78	0.81	nificent
After Jan 1, 1963			
Orchards with illness	7.14	2.60	0.01
Orchards without illness	4 99	1.95	

orchards was 4.4 parts per million by weight (PPM) with a range of 1.0 to 7.2 PPM. The mean parathion content of the foliage from the five no-illness orchards was 1.9 PPM with a range of 0.9 to 3.6 PPM. While these figures suggest that illness is more likely to be associated with higher parathion residues levels, the considerable overlap between the two orchard groups rendered impractical any attempt to use residue levels as an indicator of worker risk.

Fruit samples were collected from five of the above orchards, three of which had produced clinical illness and two of which had not. Results of the analysis of these samples for parathion content ranged from 0.02 PPM to 0.5 PPM parathion by weight. No levels were found which exceeded the permissible tolerance for peaches of 1.0 PPM. (US Department of Health, Education, and Welfare, Food and Drug Administration, Federal Insecticide, Fungicide and Rodenticide Act [1947] and Miller Pesticide Residue Amendment [1954] to the Federal Food Drug and Cosmetic Act of 1938.)

Variations in weather are known to exert a complex effect on parathion degradation rates and resulting residue levels. However, in this study

Table 4.—Parathion Contamination of Pickers From Orchards That Produced Clinical Illness

Description of Sample	No. of Observations	Parathion, µg per per square inch of skin surface	
		Range	Mean
Palm of hand, sorters	3	2.0-4.7	3.4
Palm of hand, pickers	5	0.5-7.0	2.8
Forearm, pickers	3	0.4-4.7	2.0
Upper arm, pickers	2	0.2-1.4	0.8
Back of neck, pickers	3	0-1.4	0.5

One shirt, worn eight days: total parathion—960µg

weather was not a variable because all of the orchards in the small peach-growing area were necessarily subjected to essentially identical weather conditions.

Table 4 lists residues found on the shirt of 1 and on the skin of 14 pickers working in orchards that produced maximum rates of clinical illness. These data confirm the presence of parathion on the arms and trunk as well as on the palms of hands and suggest that contact with leaves and tree surfaces contribute to total exposure. Because of limitations of the alcohol swab sampling technique, the values for skin contamination are probably about 10% low.[8] Breathing zone air samples from these same orchards were collected on filter paper and analyzed for parathion. The highest value obtained by this method was 35 µg of parathion per cubic meter of air. According to Durham and Wolfe[6] these values may be 10% to 15% low due to evaporation of parathion into the airstream passing through the filter. Airborne parathion vapor exposure was not measured but estimated as zero, based on studies by others.[9]

Table 5 details an estimate of the maximum fruit, skin, and air exposure to parathion which could be encountered by a picker. These are maximum values based on measurements obtained from the two orchards which had produced the highest rates of clinical illness.

Although the total daily dose of parathion absorbed through the skin cannot be precisely determined, work by Durham and Wolfe[6] suggests that parathion is slowly and inefficiently absorbed and that residues found on the skin constitute many times the quantity which will be absorbed in eight hours. Likewise, the quantity found on a shirt is more than would be absorbed in a single day. Thus, the maximum quantity of parathion absorbed through the skin of the individuals studied was probably less than 3,000µg per day and the maximum total dose by all routes was less than about 4,000µg per day.

Comment

From the very beginning of the epidemic, local physicians had implicated parathion as the causative agent. Their reasoning was based on observation of the clinical syndrome and on some knowledge of the spraying practices prevalent in surrounding orchards. Our evaluation of spraying schedules indicated that parathion was the only organic phosphate applied in every illness-producing orchard and supported their contention. The slight variance of the clinical picture of poisoning described here from the classical syndrome of intense parasympathetic stimulation seen in cases of poisoning among workers exposed to sprays or concentrates is almost certainly related to the insidious manner in which the poison was assimilated. Thus, the slow rate of absorption produced a gradual but progressive depletion of blood cholinesterase elements until, at a critical level, mild to moderately severe clinical illness became apparent.

Table 5.—Daily Maximum Exposure Which Could be Encountered by a Picker by Sources of Agent and Routes of Entry

Route of Entry and Source of Exposure	Parathion, µg
Ingestion	
4 peachers per day with residue level of 0.5 PPM by weight	500
Inhalation	
Airborne dust, based on highest breathing zone value of 35 µg/cu m and breathing rate of 10 cu m/day	350
Airborne vapor, estimated negligible	0
Dermal*	
Palms of two hands about 63 square inches total and 7µg per square inch maximum	440
Backs of hands, forearms, and face about 351 square inches total and 4.7µg per square inch maximum	1650
Back of neck and "V" of neck about 40 square inches and 1.4µg per square inch maximum	56
Upper arms and remainder of trunk based on shirt	960
Lower limbs assumed negligible because contact with foliage minimal	0
Total dermal exposure	<3000
Total exposure all routes	<4000

*Surface areas determined using Berkow's method as quoted by Durham et al.[6]

Careful environmental sampling revealed that although parathion could be recovered and identified without much difficulty, the maximum daily dose with which a worker could come into contact was not in excess of 4 mg. Because this quantity of parathion, even if completely absorbed, constitutes only about one-half of the daily dose reported to be capable of producing progressive cholinesterase depletion,[10] the presence in the orchard environment of one or more compounds, derived from parathion, but considerably more toxic is hypothesized. The presence of such a compound could be the result of contamination of the original spray material (unlikely) or the product of parathion aging, weathering, plant alteration, or other form of degradation. The most likely suspect is the oxygen analog of parathion, paraoxon, a cholinesterase inhibiting compound with cutaneous toxicity ten times that of parathion.[11] (Routine analytical capacity for the determination of paraoxon was not available at the time of the study. One leaf residue sample analyzed for paraoxon indicated the presence of 3.0 PPM paraoxon and 2.8 PPM parathion.) Also to be considered are the S-phenyl and S-ethyl isomers of parathion. Both of these isomers and the analog are potent, direct, in vitro inhibitors of cholinesterase. (Extrapolation from parathion toxicity suggests that absorption of as little as 2 mg per day of paraoxon would be sufficient to produce progressive cholinesterase depletion.) Cook and Pugh [12] reported the presence of these three compounds plus an unidentified "light product" in a sample of parathion irradiated with ultraviolet light under laboratory conditions. Although they did not identify this "light product," they reasoned that its cholinesterase inhibiting properties were at least as potent as paraoxon.

Available information [13-15] has indicated that parathion disappears in a rapid and continuous manner and has suggested that multiple sprayings applied over a six-month period should not result in residue accumulation. This concept would tend to implicate the final spray application closest to harvest in the causation of residue poisoning. However, our data cannot support this concept for the following reasons: (1) In no orchard studied, regardless of illness experience, did the final parathion application exceed the recommended rate of 2.5 pounds per acre followed by a 14-day interval between spraying and harvest.[16] (2) Analysis of data previously presented here can detect no significant difference between matched orchard groups when compared by amount of parathion applied during the five weeks preceding the outbreak described. Such differences appear only when earlier applications are included in the analyses. These findings suggest that the observed illnesses were the result of residue accumulation related to total amount of parathion applied during the entire growing season. It should be noted that the relative contribution to the total leaf residue levels of the winter, spring, or early summer parathion applications is not known. Likewise, while the last spraying was not the deciding factor in the causation of illness, it certainly contributed by adding to the already present foliage residues.

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Mr. JOHNSON. Under the Pesticide Chemicals Amendment to the Federal Food, Drug, and Cosmetic Act, pesticides which are not generally recognized as safe by qualified experts may not be present in or on raw agricultural commodities for food use unless a safe tolerance, which may even be zero, has been established by FDA.

The primary responsibility for obtaining proof of safety of residue tolerances is placed on the industry or firm promoting the use of pesticide chemicals. The FDA is responsible for the scientific judgment concerning the safety of the tolerance. As of July 1, 1968, there were 3,115 tolerances or exemptions established on 175 pesticide chemicals. New pesticide chemicals, formulations, and other methods of insect control are constantly being developed. New tolerances are required, and existing tolerances must be reviewed in terms of current agricultural practice and need, in keeping with the policy that tolerances should not be higher than necessary for safe and effective use.

For example, FDA has recently published an order to reduce DDT tolerances. This action was initiated by a finding that good agricultural practices would permit lower tolerances. In fact, analysis of a large number of samples over the past several years showed that the level of DDT found on most fruits and vegetables is far below the 7-p.p.m. tolerance for that pesticide. Some other tolerances have also been reduced. The intent is to establish tolerances no higher than needed in current good agricultural practices.

Senator MONDALE. That sentence perplexes me a little bit. Is the purpose of your effort to protect first of all the health of the American people, or to do so insofar as consistent with good agricultural practice?

Mr. JOHNSON. It is two-fold, Mr. Chairman.

First of all, all of our tolerances are, in our judgment, safe for purposes of human consumption. This is a first criteria. Then, notwithstanding this, we still keep them as low as practical and feasible in accordance with good agricultural practice.

Senator MONDALE. So it is not your policy to say: "Well, this pesticide is carried to the consumer. It is dangerous, but if we are going to kill the bug that that pesticide is directed at, the farmers may nevertheless continue to use it."

Mr. JOHNSON. Absolutely not. Actually, with regard to the basis whereby we set tolerances, we know what has been accepted throughout the world by the Food and Agriculture Organization of the UN as to what is the normal total body uptake of pesticides of various types. That is our takeoff point. It is the best judgment that we have.

We keep everything in terms of total diet studies within the confines of these recommendations.

The Food and Drug Administration carries out other activities of control and investigation with respect to pesticides. There are surveillance activities to determine compliance with tolerances and sanctioned uses, which includes inspectional investigations in the growing fields and the analysis of preharvest and postharvest samples. There are information and educational activities to keep the grower and cooperating State officials knowledgeable of our findings, both good and bad. This assists the grower in avoiding shipments of foods with illegal residues. There are control activities to remove hazardous foods from consumption channels through State and Federal legal actions. Furthermore, there are total-diet investigations, which are used as an index to the dietary intake of pesticide residues, and community epidemiological and ecological studies.

FDA has a primate research laboratory at Perrine, Fla. Here the long- and short-term toxicology and biochemistry of pesticides and related chemicals are studied in primates, and the results of these studies are used in assessing hazards to man from environmental exposure to these chemicals.

Investigations bearing specifically and directly on the hazards of pesticides to agricultural workers and others associated with the handling and application of pesticidies are conducted by the Wenatchee, Wash., research laboratory of FDA's Division of Pesticides and the Division of Community Studies located in Atlanta, Ga.

Mr. Chairman, there are currently 15 community studies in progress under State health departments and universities. I have a summary of these to submit for the record, if you so desire.

Senator MONDALE. If you would, please.

(The information referred to follow:)

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
PUBLIC HEALTH SERVICE,
CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICE,
Washington, D.C., July 30, 1969.

Hon. WALTER F. MONDALE,
Chairman, Subcommittee on Migratory Labor,
Committee on Labor and Public Welfare,
U.S. Senate,
Washington, D.C.

DEAR SENATOR MONDALE: This is in reply to your letter of June 24, 1969, and the telephone communication from Mrs. Marsha Carlin of your office [Editor's note: Miss Carlin was employed by the Legislative Reference Service, Library of Congress.] to Dr. S. W. Simmons of the Division of Community Studies, Office of Product Safety, Food and Drug Administration.

These communications request a report about research projects underway which concern pesticides and their effects on farmworkers.

A list of research projects being conducted by the Division of Community Studies is enclosed, which includes the start-up date and a brief description of each project subject matter. There are a total of 15 projects, all operating under contract, 9 with State Deparments of Health and 6 with universities. Some of the universities holding contracts have subcontracts with State Departments of Health and some of the State Departments of Health holding contracts, subcontract certain specialty work to university medical schools.

A completion date for these projects has not been set as there is no beforehand way of knowing what, if any, is the long term effect of continuous low level exposure of pesticides on the health of people. The only way that this can be determined is to study people intensively over a long period of time. At present, some 1,500 people are under study, including both occupationally exposed and control groups. The duration of these studies will be determined by a careful evaluation of the data as the work progresses. All project contracts are reviewed and negotiated annually to insure that the work has continued significance and that meaningful results are being obtained.

Enclosed with this letter are reprints reporting information obtained from community studies projects. Three reprints are grouped under "Morbidity and Mortality from Pesticides," and four under "Effects of Pesticides on Farmers and Migrant Workers." A number of other research publications containing information on the effect of pesticides on man and the detection and determination of pesticide residues are also enclosed.

All of the Community Studies, with the exception of the New Jersey Study, include a considerable number of study subjects who are associated with agriculture. In the southwest, west, and to some extent in Florida, Latin American workers are included in some of the study groups and migrant workers are involved in studies of acute cases of poisoning by pesticides. Since it is the intent of these studies to observe each subject for a number of years, the mobility of migrant farmworkers presents extreme difficulty for long term observation. The selection of study subjects is based on an expectation that the person will reside in a given area for a long period.

If you have any questions regarding this information or if we may be of further assistance, please do not hesitate to call.

Sincerely yours,

CHARLES C. JOHNSON, JR.,
Assistant Surgeon General Administrator.

[Enclosures]

COMMUNITY STUDIES PROJECTS UNDER STATE HEALTH DEPARTMENTS AND UNIVERSITIES

1. The Arizona Community Study is comparing pesticide exposure levels, blood pesticide concentrations, and clinical characteristics (physical and biological) in five urban families and in five rural families in Pima and Maricopa Counties. The latter resides in an area intensely sprayed in the summer months. A close surveillance is also maintained on aerial spray pilots and loaders with reference to total DDT blood levels as well as cholinesterase levels. The surveillance of this group of workers is being conducted since it appears that pilots and particularly loaders sustain the highest exposure to cholinesterase-inhibiting compounds and also represent the highest DDT exposure. The study is done under contract by the University of Arizona, Tucson, Arizona, and was started in May, 1965.

2. In California, a study of blood dyscrasias in a sample of the population regularly exposed to lindane is in progress. Also this project is studying the causal relationship between seasonal neonatal jaundice in the Imperial Valley and the use of cotton defoliants. This study is supported by contract with the California Department of Public Health, Berkeley, California, and was started in May 1965.

3. In Weld County, Colorado, location of the Colorado Community Study, a multiple regression study is being made to determine the source of families' pesticide exposure. Potential sources are evaluated which include house dust, soil, food, water, and drift from treated fields. These family units are under continuous medical and biochemical surveillance. Another study involves occupationally exposed persons, including pilots and ground crews of aerial spray companies and personnel employed in the manufacture and processing of pesticides. This work is carried out under a subcontract with the University of Colorado Medical Center, Denver, Colorado. This project is supported by contract with Colorado Department of Health, Greeley, Colorado, and was started April 1965.

4. The Florida Study is continuing a state-wide program designed to maintain liaison with all licensed pesticide workers—even after they have left the industry. This is being done in an effort to determine the health status of these people over a period of years. The Dade County area of Florida—due to the extensive use of large amounts of organic phosphorus insecticides—has a number of poisonings from these compounds. The Florida project studies biochemical and physiological changes in poisoning cases and also considers improved patient management and therapy. A contract with the Florida Board of Health supports this work, started in January 1965.

5. The Hawaii Community Study supported by contract with the University of Hawaii, Honolulu, is conducting an island-wide survey of the possible relationship between maximal daily household pesticide use and certain chronic respiratory diseases. In addition, a study is presently being conducted on the relationship of pesticides to cardiovascular disease, asthma, bronchitis, and sinusitis. This is carried out in cooperaton with the Hawaiian NIH Cardiovascular Study and the Hawaii Department of Health. University of Hawaii contract was started in May 1965.

6. A contract with the Idaho Department of Health supports the Idaho project which is centered in an area where pesticides are applied in large

amounts over a comparatively short growing season. Research at this project includes close surveillance of exposed persons—especially people who reside in close proximity to heavily treated areas. This contract project was started in May 1967.

7. The Iowa Community Study is seeking a possible causal relationship between pesticide exposure and prolonged recovery time of pesticide-exposed surgical patients who have received the muscle relaxant, succinylcholine. Other studies underway deal with man's exposure to pesticides through his food chain. This involves investigating the study of the metabolism and storage of pesticides by animals used for food by man. These studies are carried out under contract by the Institute of Agricultural Medicine, University of Iowa, College of Medicine and a subcontract with the Veterinary Diagnostic Laboratory, Iowa State University. The contract started in December 1965.

8. The Louisiana Study is concerned with agricultural workers and family units in southeastern Louisiana and pest control operators in New Orleans. At all community studies, emphasis is placed on the study of population segments receiving heavy exposure to pesticides and on long-term surveillance. Also, each study is involved in the development of ecological data on the movement of pesticides in the environment of their respective area. Clinical and biochemical studies of exposed persons are conducted under contract with the Louisiana State University Medical Center and a subcontract with the Louisiana State Department of Health. This contract started in June 1967.

9. In Michigan, a study is conducted through contract with the Michigan Department of Public Health and a subcontract with Michigan State University. Five occupationally exposed groups of workers are under medical and biochemical surveillance. These include fruit growers, truck farmers, commercial applicators, dairy farmers, and urban dwellers. These groups are believed to represent a spectrum of the pesticide exposure. This contract started in February 1965.

10. The Mississippi Study is supported by contract with the Mississippi State University, analytical work is conducted at the laboratories at Starkville and epidemiological and clinical studies are carried out in the Greenville area in conjunction with pesticide research at MSU's Delta Experiment Station. Intensive medical study of selected occupationally exposed persons is provided by subcontract with the University of Mississippi Medical Center, Jackson, Mississippi. In addition to the studies of occupationally exposed workers, the Mississippi Study maintains a close surveillance on pilots of spray planes, since 25 percent of all U.S. fatal spray plane crashes in 1964–1966 occurred within the area of the Mississipi Delta. This contract started in June 1967.

All community study projects investigate crashes of planes engaged in the application of pesticides. This is carried out under an agreement with the Bureau of Aviation Safety and the Federal Aviation Administration of the Department of Transportation.

11. The New Jersey Community Study is located in the highly industrialized area of Trenton. There, intensive surveillance is maintained of persons involved in the manufacture and formulation of pesticides. This effort is supported by contract with the New Jersey Department of Health, started in March 1965.

12. The South Carolina Study closely follows the employees of pesticide formulating and manufacturing plants in the Charleston area in addition to the study of farm families and persons involved in the application of pesticides. The work is conducted by the Medical College of South Carolina, Charleston, under contract. Analytical chemistry is provided under subcontract by the South Carolina Department of Health. This contract was started in June 1967.

13. The Texas Study, conducted under contract with the Texas Department of Health, is situated in the agricultural area in the southern tip of the State where warm temperatures and modern irrigation practices permit an unusually long growing season. Massive amounts of insectivides, herbicides, and defoliants are applied by aerial sprayers and ground applicators. Numerous persons are occupationally exposed, and acute illness frequently occurs as a result of accidental exposure. These illnesses are investigated by personnel from the Study Team; exposed persons are kept under biochemical, medical, and physiological surveillance and hospitalized when necessary. This contract was started in April 1965.

14. The Utah Study, located at Salt Lake City, provides for regular medical and biochemical surveillance of occupationally exposed workers who apply pes-

ticides to the extensive marshy lake beds characteristic of the Great Salt Lake Basin area. It is also proposed that water, fish, and muck in watershed areas be analyzed. This is accomplished by contract with the Utah Department of Health, Salt Lake City, Utah, started in June 1967.

15. The Washington State Community Study is in the center of the fruit-growing region. The study involves the effect of spraying operations on orchardists and people living adjacent to fruit orchards. Also, the Washington project is re-examining approximately 1,000 people who had prolonged occupational exposure to lead arsenate and were originally studied by Dr. Paul Neal of the National Institutes of Health in 1938. The study is carried out under contract by the Washington Department of Health. The contract was started in March 1965.

(A list of publications of the pesticides program of the National Communicable Disease Center accompanied by Charles C. Johnson's communication is available through the Public Health Service of the Department of Health, Education, and Welfare.)

Mr. JOHNSON. These studies consist of epidemiological and ecological investigations in areas of heavy pesticide usage throughout the United States. Within each study area a pesticide-usage profile is developed. Concurrently, levels of pesticides and their metabolites in man and the environment are determined. These data should eventually provide information on the movement of pesticides in the environment and their routes of entry into man.

Basically, each study consists of compiling the medical history of about 100 volunteers selected because their occupations or their environment subject them to greater exposure to pesticides than the population at large. A group of individuals with minimal pesticide exposure are selected to serve as controls for comparison purposes.

These investigations include the direct measure of exposure of workers by methods such as attaching absorbent patches on the skin of spraymen during actual spray operations. Measurement of this sort and/or respiratory inhalation have been carried out for a number of pesticides and for workers doing various agricultural jobs associated with spraying or dusting operations.

Senator MONDALE. Would those studies extend as well to the workers in the field?

Mr. JOHNSON. They extend to workers in the field, Mr. Chairman, I might add.

Senator MONDALE. You say jobs associated with spraying or dusting, but it would go beyond that?

Mr. JOHNSON. It does. These studies include the actual applicator, and also workers in the field that may be subject to any fallout as a result of such application. I think that is correct, isn't it, Dr. Simmons?

Dr. SIMMONS: That is correct.

Mr. JOHNSON. The Division of Community Studies also assists State officials in conducting State pesticide projects. These projects are designed to determine pesticide-related health problems within the States and to improve the State and local competency in handling these problems. Each project consists of a multifaceted program, including training in the safe use of pesticides, surveys to develop pesticide usage profiles, pesticides safety review, environmental monitoring, disposal of pesticide wastes, monitoring of people, morbidity and mortality reporting, and comprehensive planning and activating of programs on the public-health aspects of pesticides.

The present results of our community studies indicate that, in general, workers using pesticides in agriculture and public-health vector control are exposed to relatively small fractions of the toxic dose each day. Since migrant agricultural workers generally work at jobs not directly associated with pesticide application, their exposure levels would tend to be lower.

For example, workers picking malathion, an organophosphate of pesticide-treated beans, have significantly less exposure than the pesticide sprayers treating these beans. However, it must also be borne in mind that spraymen may be expected to wear protective clothing and to observe other recommended safeguards not observed by workers in the fields.

Residues on crops have, in a few instances, caused poisoning in agricultural workers from occupation exposure. Eleven episodes of poisoning from contact with parathion residues involving more than 70 persons were reported as early as 1958.

The crops involved in these episodes of poisoning by residues have included pears, apples, grapes, citrus fruits, and hops. The poisoned workers were engaged in picking, thinning, cultivating, or irrigating.

Outbreaks involved exposure to foliage or fruit sprayed not more than 2 days earlier. But in some cases the age of residue was as much as 33 days. Absorption of toxicant was favored by failure to wear protective clothing or by the persistent wearing of contaminated clothing.

I might add at this point, Mr. Chairman, that this brings out the opportunity to bring out that when you talk about pesticides and its relation to the worker, it is pretty hard to separate this from total environment in which the worker lives. In a situation where you work a certain period of time through intermediate exposure and you can take off your clothes and take a shower and wear clean clothes the next day, that is different from a situation where you put the same clothes back on the next day, and there is not sufficient sanitary facilities in the living environment from these workers to practice the kind of body cleanliness they should.

Senator Mondale. That can be very important, can it not, if you get a chemical in your hair and you don't take a shower? That can continue to poison your system, can't it?

Mr. Johnson. It can be very important, and my emphasis is that we need to consider the total environment in which the worker lives and exists and not just the working environment in which he exists in the field. There has to be good water and sewage and housing in order to make any of the kinds of practices that we think are necessary for his health and well-being to be really effective.

Coming back to the remarks on worker exposures, outbreaks of residue poisoning in peach-orchard workers in California were reported in 1964.

In line with its responsibilities in reviewing registrations and labels, FDA recommended to USDA in August 1968 that consideration be given to requiring the posting of signs warning against entering fields treated with highly toxic pesticides and specifying a date after which treated fields may be safely entered. The State of California has such a requirement for certain pesticides.

It is well to bear in mind that exposure to pesticides is only one of many factors affecting the health of farm workers, as well as all citizens of this country. Today the farm worker may be exposed to an ever-increasing variety of body insults from his environment, including agricultural chemicals, inadequate diets, a lack of sanitation, poor sewage disposal, and low-quality housing. The collective and cumulative effects of these exposures are only partly known. While the health of an individual might tolerate slightly polluted water, air, or food, he probably cannot adapt to their collective attack with adverse effects. If at the same time he is subject to noise, crowding, and other environmental stresses, his health and well-being can be damaged or destroyed. Efforts to identify the effects of a single stress or a single route of exposure cannot hope to define the impact of the total environment on the individual.

We have not as yet evaluated the medical significance of this discovery. However, it is certainly a most interesting development.

Pesticides have made significant contributions toward elevating our standard of living during the 20th century. They have controlled malaria, typhus, dysentery, plague, and other diseases transmitted by insects. They have also brought vast economic and social benefits through better health and increased quantity and quality of foodstuffs.

In less than 20 years the production of synthetic chemical pesticides in the United States has increased from a level of a few million pounds a year to nearly 1 billion pounds annually. Almost 60,000 pesticide formulations are now registered in the United States, and each of these contains one or more of the approximately 800 different pesticide compounds.

The increased production and use of pesticides as well as many other industrial chemicals has without doubt presented increased hazards to the health of many persons—maufacturers' employees, applicators, migrant and other farm workers, and the consumer. It is difficult to estimate the incidence of illness due to pesticide poisoning, as reports of these poisonings are not required in most States.

The mortality rate in the total population due to poisoning by pesticides is estimated at one fatality per 1 million in population per year. This figure includes intentional iningestions of pesticides in suicides.

There is need for more data and better statistics. The reporting systems need strenghening on a nationwide base. All cases of pesticide poisoning should be investigated. To actually bring this about would require that physicians report all cases involving significant exposure to pesticides and that adequate time and personnel be available to conduct epidemiological investigations.

Mr. Chairman, there are a number of other problems which we face in carrying out our mission. For example, the 15 community studies are not fully staffed because of the difficulty in obtaining qualified people. We would like to fully staff the present community studies and to provide staffs to other States that would like to participate.

Mr. Chairman, public policy for the use of pest-control chemicals involves many considerations. The interrrelated Federal, State, and local efforts are indicative of the complexity of most environmental problems. We at HEW are keenly aware of the work being done in the field of pesticides by other departments, and every effort is made to avoid duplication of effort.

In fiscal year 1969, FDA spent $14,618,000 on activities associated with pesticides. These funds have been concentrated in studies where current knowledge indicates the most exposure to pesticides.

With the creation of the Consumer Protection and Environmental Health Services on July 1, 1968, the Department of Health, Education, and Welfare focused in a single agency the responsibility for identifying health hazards in man's environment, developing, and promulgating criteria and standards for the control of such hazards, and carrying out appropriate corrective programs. Thus, the mission of the Consumer Protection and Environmental Health Service is to assure effective protection for all against controllable hazards to health in the environment and in the products and services which enter our lives.

On April 21, 1969, Secretary Finch appointed a Commission on Pesticides and Their Relationship to Environmental Health. Dr. Emil Mrak, retiring chancellor of the University of California at Davis, an internationally renowed authority in the field of food chemistry, is Chairman of this commission of experts from the fields of environmental health, agronomy, entomology, and from industry. Their mission is to evaluate all aspects of pesticide usage and report their recommendations for research and policy guidelines by October 1969.

We are concerned with all aspects of pesticide usage—the benefits and the risks—as they affect the health of all our people.

This concludes my statement, Mr. Chairman. If you or other members of your subcommittee have questions, I will be happy to try to answer them.

Senator MONDALE. Are there any farm workers on the Commission just appointed by Secretary Finch?

Mr. JOHNSON. There are representatives that I think are associated with the conditions to which the farm workers are exposed.

I might say that Dr. Milby, whose name was mentioned ealier, is on the Commission. He also is Director of our community studies projects in the State of California, and he is an occupational industrial hygienist by profession. He has some of the best data that we are collecting in terms of exposure of agriculture and occupational exposure in this area.

I think we do have adequate representation in this respect.

Senator MONDALE. Thank you, Mr. Johnson.

Senator Bellmon?

Senator BELLMON. Thank you, Mr. Chairman.

Mr. Johnson, you mention the fact that the 15 community studies are not fully staffed. I am a little curious to know if this problem of inadequate staffing or inadequate support is a problem throughout your agency.

Mr. JOHNSON. Certainly, Senator Bellmon. I think in this time of budget stress, in this time of awakening concern for the problems of the environment, it would be wrong to assume that any of the agencies that are involved in trying to enhance the quality of the environment have a staff that will be required to do all that is required. The problem is great. We are only beginning to recognize throughout the country this problem.

This committee, along with other distinguished committees in the Congress, is now giving the attention I think long-deserved of the problems that beset us in the environment. There is a great deal to be done. All of the lack of support is not necessarily budgetary, but certainly these are considerations that have to be taken into account.

By and large, there is a training question. It takes highly trained and well-skilled experts in some of these areas to come up with the kind of decisions and opinions that we need in order to carry forward the program that has to be carried out.

Senator BELLMON. I am very familiar with the problems and weaknesses in the laboratories that exist in the State departments of agriculture, at least in the one State I know best. These tests that have to be made on foodstuffs and on the different commodities that move in interstate trade are very difficult to conduct sometimes. And they do, as you say, require skilled technicians.

Do you feel that the laboratories that you rely upon are well staffed and that their findings can be relied upon?

Mr. JOHNSON. For the work that we put out, sir, we have every confidence that the quality of efforts and the competence of the scientist are good. We would like to be able to carry out more analyses to give a broader coverage to our area of responsibility.

These are decisions beyond my immediate office.

Senator BELLMON. Do you feel that, for instance, the figure you have given here of 7-p.p.m. DDT, do you feel there has been enough research to establish that that is a safe level? And do you feel when a test is made and a report is issued showing the level of DDT on grapes that we can rely on the adequacy of that report?

Mr. JOHNSON. I will answer the last one first, and I would like to discuss the first part of your question a little bit.

I have every confidence that when we issue a report based on the analysis conducted in our laboratories that that report will sustain the confidence of the scientific community. This is not our problem.

Perhaps we should have a system that gives us an opportunity to do more analyses of certain types of good crops. We have been discussing just grapes, and there are many food crops that are exposed to different types of pesticide.

Within the limitation of our resources we try to give as balanced coverage concerning the seriousness of the problem as we can. Let me discuss for a moment the basis against which we make that judgment.

I remarked a little earlier as to the UN Food and Agricultural Organization and the WHO recommendations for total body input of different types of pesticides. We participated in this work. Our experts participate in these international bodies that help determine on the basis of the best evidence that they can gather what should be the permissible levels of intake.

Let's take DDT for an instance. The FAO recommends that the average person should not take in more than 0.01 milligrams of DDT per kilogram of body weight per day. Now, if you translate that into terms that you and I understand, that says that the average man who eats a normal daily American diet, probably 19 or 20 years old, one of the heavier eaters—I have a son who can certainly qualify for that—weighs about 150 or 160 pounds, should not take in more than seven-tenths of a milligram of DDT a day.

Now, starting with that figure, we are able to construct on a model the kinds of diets that people eat and the amount of DDT that they would be taking in on the basis of that. And different kinds of good eaten in different quantities, subjected to different tolerance levels, help to make up that ultimate decision that we are staying within the recommendations of the Foreign Agricultural Organization and WHO recommendations.

Actually, our studies indicate that on the whole the average American has taken in about one-tenth on a total basis, total body-burden basis, of DDT that is recommended as the outside level against which we begin to have some doubt.

Senator BELLMON. Do you have studies showing what the people who work in the fields with these products are taking, how close are they to their maximum?

Mr. JOHNSON. These particular studies would include workers in the fields. What you have to add to that is the exposure they get from their occupational exposure.

Senator BELLMON. That is what I am referring to.

Mr. JOHNSON. This is a different situation. There are the 15 community studies which give us indications as to what is happening in these areas.

Senator BELLMON. How close are the agricultural workers to their maximum level of tolerance?

Mr. JOHNSON. This is done on a little different basis. Actually, when we look at the occupational exposure, we are doing more in-depth studies as to what actually happens to the human body to varying levels of exposure that affect him in a deleterious way in terms of his health. You cannot at this particular point say that what we are doing in the food-basket study for people who are not always working in the fields is what happens to them in an occupational setting.

On the other hand, we have a major program in my particular service that is concerned with occupationnal illnesses and diseases. And the study results that we get and will get out of the 15 community studies will help us to make judgments in this respect.

Perhaps, Dr. Simmons, you would like to speak a little more pointedly to Senator Bellmon's question.

Dr. SIMMONS. In the 15 community studies, there are farm workers involved or associated agricultural workers involved in every one of them. And these people are given thorough physical and neurological examinations once a year. Then they are followed regularly throughout the year by conducting a battery of biochemical tests to determine if there is any aberration in organ function.

Now we also make blood tests to determine the levels of pesticides. And where we can, we get tissues to analyze that also. So we have information on the storage level of pesticides in these workers as opposed to the people who are not exposed through occupation. And, of course, it is high.

Not only that, but we have conducted feeding experiments with people over a period of 2 or 3 years, where the level of DDT in this instance built up to several hundred parts per million, which is much higher than you get in agricultural workers, of course.

Now, at that time we had no adverse clinical illness, no clinical illness in the human volunteers, but we did not conduct an in-depth biochemical study that we are conducting on our community studies today, which includes farmers. And we have set these things up to determine what effect long-term, low-level exposure on people pesticides have on their health. And we can determine that only by following them over a period of year, constantly testing them with dozens and dozens of different biochemical tests. And at the present time we have found some differences in certain biochemical tests with people heavily exposed and people not exposed, but they need confirming. Also, we do not know whether they will ever be of significance as far as clinical illness is concerned.

But, to answer your question shortly, yes, we do know the levels of pesticide storage in people working in different agricultural pursuits. And a lot of other people are working on that too.

Senator BELLMON. Is this level approaching what you have found to be an intolerable conditon, or is there still a margin of safety? Can you tell us if we are approaching a time when there is a grave danger to those who work with these pesticides?

Dr. SIMMONS. The maximum level found in farm people has never caused illness that we know of. I am excluding acute poisoning, but I am talking about during their normal occupation, not spillage or drinking or anything like that.

In fact, we have had people who did not show clinical illness with 600 or 700 p.p.m., which the agricultural worker doesn't even approach. However, the purpose of these studies is to not find out what the high level will do but what a low level will do over a generation, because that is what is the concern of the President's Advisory Committee and several other committtess. That is, what is the effect on the health of the people of low-level, long-term exposure.

We understand the level for acute poisoning. But the question is, will 7 p.p.m. have any effect over 20 years? That is the thing we don't know, and that is what our community studies are trying to find out.

Senator BELLMON. Thank you. I have a couple of other questions I would like to ask Mr. Johnson.

How many Federal agencies are involved in this problem of trying to assure us that the safety of the food we eat and the conditions under which we work is adequate?

Mr. JOHNSON. Let's say that almost every department in the broad scope of its mission is and should be in some degree concerned with the quality of our environment. That, I think, is the scope of your question.

In terms of food particularly, certainly the Department of Agriculture, the Department of HEW, the Department of Transportation, and in some respects the Defense Department are all more or less directly involved, as well as the Federal Trade Commission.

Senator BELLMON. Is there anywhere in our Federal structure one central authority or one place where all of these different agencies are brought together to concentrate on this one problem?

Mr. JOHNSON. Certainly in terms of the health aspect, within my own mind at least, there is no question that the Department of HEW is a central authority for the health impact of the environment on men.

Senator BELLMON. Do you have the authority you need to really cope with this problem?

Mr. JOHNSON. We are certainly continually apprising ourselves of what our legal tools are and what our legal needs should be. The

Federal Food, Drug, and Cosmetic Act certainly has a very broad-based legal document that gives us a great deal of authority. This has been amended from time to time, and I dare say that in the future we will perhaps ask for other amendments to it.

Senator BELLMON. One other question. Perhaps someone on the panel can answer that.

It was stated here earlier that we ought to develop pesticides that give us an opportunity for controlling the insects we are after but which are not dangerous or which are not harmful to people. Chemically is this possible?

Mr. JOHNSON. Senator Bellmon, I often say that in this day and age, where we are shipping people to the moon and bringing them back and living to tell us what their experience is all about, that nothing is impossible. In the scientific community I think that part of the background of the scientist is that he is an eternal optimist. That if there is a problem to be solved, we should be able to bring the scientific resources to bear to solve that problem.

It is just a matter within what period of time we are talking about, it is also a matter of how many dollars we want to address to that particular problem. If you go all out to do something and bring all of the minds that are capable of contributing to this, you have a monstrous undertaking in terms of both resources and dollars.

Yes, I would say that ultimately it will be possible, certainly, to have less harmful pesticides than now exist in our environmental area.

Senator BELLMON. Thank you very much, Mr. Johnson.

Senator MONDALE. Thank you, Senator Bellmon.

As I understand the Federal authority to act in this field, it is based upon the jurisdiction of the Government to prohibit shipment of dangerous pesticides in interstate commerce. And if it is determined that a certain pesticide is dangerous, we can prohibit shipment. That, in effect, prevents its use on a commercial basis. Is that correct?

Mr. JOHNSON. That is partially correct, Senator Mondale. The other side of this is that once the pesticide is used, then the Food and Drug Administration authority is to prohibit the shipment of foodstuffs.

Senator MONDALE. So it affects the shipment of pesticides, but if it is pesticide-contaminated food, for example, and this is determined by FDA, FDA can prohibit its shipment in interstate commerce?

Mr. JOHNSON. That is correct.

Senator MONDALE. Has that been done?

Mr. JOHNSON. Most certainly, sir.

Senator MONDALE. Can you give us a few examples?

Mr. JOHNSON. I would be glad to submit that for the record.

Senator MONDALE. I don't care to go into the details, but just give some examples of food that has been denied the right of interstate shipment because of contamination.

Mr. DUGGAN. We have a number of shipments of fresh food and vegetables that have been seized. Recently we have seized honeydew melons, alfalfa, celery, and wheat.

Senator MONDALE. Perhaps you could submit a recent representative list for the record.

Mr. DUGGAN. We will do that.

(The information referred to, subsequently supplied, follows:)

LIST OF COMMODITIES SEIZED BECAUSE OF PESTICIDE CONTAMINATION: FISCAL YEAR 1969

Commodity and quantity	Destination	Place of origin	Date approved	Pesticide and amount (p.p.m.)	Tolerance level (p.p.m.)[1]
Alfalfa hay, 13,230 lbs	Bonita, Calif	Yuma Ariz	10-11-68	Parathion, 1.30	1.00
				Methyl-parathion, 1.60	1.00
Alfalfa hay, 83,800 lbs	El Cajon, Calif	do	12-5-68	Parathion, 34.00	1.00
				Methyl-parathion, 6.30	1.00
Alfalfa hay, 46,150 lbs	do	do	12-6-68	Toxaphene, 9.60	NTE
Cabbage, 120 crates	Savannah, Ga	Boone, N.C	10-2-68	Toxaphene, 24.07	7.00
Carrots, 172 crates	Cleveland, Ohio	Cherry Creek, N.Y	9-13-68	Dieldrin, .22	.10
				Chlordane, .29	.30
Carrots, 40 bags and 264 cartons	Detroit, Mich	Phoenix, Ariz	12-12-68	Endrin, .16	NTE
Carrots, 258 cartons	Chelsea, Mass	do	12-13-68	Endrin, .05	NTE
Carrots, 80 cartons	Bronx, N.Y	do	12-16-68	Endrin, .05	NTE
Carrots, 2,400 lbs. and 270 cartons	Detroit, Mich	do	12-18-68	Endrin, .10	NTE
Carrots, 152 cartons and 50 bags	do	do	12-18-68	Endrin, .11	NTE
Carrots, 5,856 lbs	Pittsburgh, Pa	do	12-19-68	Endrin, .10	NTE
Carrots, 2,050 lbs	Buffalo, N.Y	do	12-19-68	do	NTE
Carrots, 4,752 lbs[2]	Baltimore, Md	do	12-20-68	Endrin, .07	NTE
Bird feed mix, 700 lbs	Whichita Falls, Tex	Argentina	8-5-68	Aldrin, .24	NTE
Canary seed and mixed bird seed, 16,700 lbs	San Antonio, Tex	do	8-16-68	Aldrin, .10	NTE
Parakeet feed mix, 103 bags	Waco, Tex	do	8-5-68	Aldrin, .57	NTE
Lettuce, 26,400 heads[2]	Chicago, Ill	Salinas, Calif	9-30-68	DDT, 9.10	7.00
Lettuce, 20,424 heads	Landover, Md	Toltec, Ariz	11-22-68	Parathion, 2.65	1.00
				Toxaphene, 10.25	7.00
Orange flavor, orange peel and beef jerky, 180 gals., 730 lbs. and 60 lbs.	Buffalo, N.Y	Los Angeles, Calif	10-14-68	Trichlorobenzene, 13.80	NTE
Coho Salmon, 6,405 lbs	Superior, Wis	Grand Rapids, Mich	3-27-69	DDT and homologs, 16.30	NTE
				Dieldrin, .24	NTE
Coho Salmon, 17,043 lbs	Duluth, Minn	do	3-27-69	DDT and homologs, 17.38	NTE
				Dieldrin, .25	NTE
Shell eggs, 22,500 dozs	Wakefield, Nebr	Pelahatchie, Miss	8-6-68	Dieldrin, 0.5	Zero
Shell eggs, 1,830 dozs[1]	Rochester, N.Y	do	9-23-68	do	Do.
Spaghetti, macaroni and egg noodles, 2,298 lbs	Greenbay, Wis	Minneapolis, Minn	3-10-69	DDT, .31	NTE

[1] NTE—No official tolerance established.
[2] Unaccomplished.

Senator MONDALE. In those cases, the Federal Government determined that the sale and consumption of those goods would be injurious to the health of consumers, is that correct?

Mr. DUGGAN. Yes, sir.

Mr. JOHNSON. I think that is partially correct. Again, Mr. Chairman, ours is a legal regulatory agency, and in those instances they were seized because they exceeded legal tolerance limits for those particular residues on those particular food crops.

Senator MONDALE. Which in turn had been established to protect the consumer from a health risk due to contamination.

Mr. JOHNSON. That is correct.

Senator MONDALE. What comparable authority do you have, if any, to protect against the use of dangerous pesticides in the field or the dangerous application of dangerous pesticides, even though according to your standards the final product—fruit or vegetable—is shippable in interstate commerce?

Mr. JOHNSON. That basic legal responsibility is with the U.S. Department of Agriculture, Mr. Chairman. Our participation is to provide the health consultation in establishing whether or not there is an overriding dangerous health implication in the use of a pesticide, and, if so, then to make sure that the labeling that goes with the use of the pesticide properly describes the method and conditions under which it can be used.

Senator MONDALE. So that your effort is essentially consumer-protection related and not worker related. That is, there is generally no on-going surveillance of the methods of application in fields by your Department to determine whether the health of the workers is being risked, and no study of that is going on in a systematic, thorough basis.

Mr. JOHNSON. At this time we do not have what would be called the legal responsibility, but we are very much concerned and we do exercise through our research and demonstration capabilities this concern. And we do have some knowledge of how this is done and where possible in our educational programs with the states.

Senator MONDALE. But at this point where the risk exists to the consumer, in your judgment, you have a tool which you use in preventing shipment?

Mr. JOHNSON. That is correct.

Senator MONDALE. But where there is a risk to workers, all you have is studies and educational efforts?

Mr. JOHNSON. In the Department of Health, Education, and Welfare, that is correct. I believe there is greater authority in the U.S. Department of Agriculture.

It has been pointed out to me, Mr. Chairman, that some 37 States have use-application legislation.

Senator MONDALE. But basically at this point, restrictions, if they do exist to protect the farm worker, basically are a State responsibility and not a Federal level responsibility?

Mr. JOHNSON. It is certainly not found in HEW.

Senator BELLMON. Mr. Chairman, I might say that some of those State laws are drawn to establish liability in case there is an operator that causes damage to another person's crop. They are not at all concerned with workers.

Senator MONDALE. In other words, some of those State laws may not have worker-protection elements involved at all. We might ask the staff to analyze that point.

(Communications regarding this matter follow:)

U.S. DEPARTMENT OF LABOR,
BUREAU OF LABOR STANDARDS,
Washington, July 8, 1969.

Hon. WALTER F. MONDALE,
Chairman, Subcommittee on Migratory Labor,
Committee on Labor and Public Welfare,
U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: In reply to your request of June 20, we are pleased to furnish the following information regarding State and Federal regulations dealing with pesticides.

As indicated in the enclosed Department of Health, Education, and Welfare publication, generally there are two types of State pesticide laws—registration laws and use and application laws. The registration laws have been adopted by 47 of the States with only Indiana, Delaware, and Alaska without such provisions. Thirty-nine States have use and application laws.

California, in its occupational disease studies (see enclosed) points out that farm laborers accounted for more than half (704) of the 1,347 reports of occupational disease attributed to pesticides and other agricultural chemicals in 1966.

A recent Bureau of Labor Standards' study of State fire and labor codes shows only eight States with other than miniscule coverage of storage facilities for hazardous chemicals such as pesticides. Of these, only two States, Maryland and Delaware, have adopted the minimal requirements of the American Insurance Association's "Fire Prevention Code." (see enclosed). The other State requirements are more permissive.

Federal regulation of pesticides has been entirely on the basis of labeling, transportation, and certification with the exception of aerial application which is regulated by the Federal Aviation Agency. (see 14 CFR 137).

The Pesticides Regulation Division of the Agricultural Research Service, U.S. Department of Agriculture is charged with the responsibility of administering the "Federal Insecticide, Fungicide and Rodenticide Act" which covers labeling and certification. (see 7 CFR 361; 363).

The Hazarduous Materials Regulations Board in the Department of Transportation regulates interstate transportation of pesticides. (see 49 CFR 171–179). Water transportation is regulated by the U.S. Coast Guard. (see 46 CFR 146). Air transportation is regulated by the Federal Aviation Agency (see 14 CFR 103).

If we may be of any further assistance, please do not hestitate to call on us.

Sincerely,

DAVID A. SWANKIN, *Director.*

[Enclosures]

EXCERPT FROM PESTICIDE LAWS AND LEGAL IMPLICATIONS OF PESTICIDE USE—U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE—PESTICIDES PROGRAM TRAINING GUIDE

* * * * * * *

STATE PESTICIDE LEGISLATION

Generally, there are two types of state pesticide laws, First, there are registration laws, specifying certain controls over the distribution and sale of pesticides in intrastate commerce. In addition, some states have set up pesticide tolerances for agricultural commodities sold within the particular jurisdiction. Secondly, there are a group of laws which are generally considered peculiar to the states: those which regulate within the state the use and application of the substance themselves. The first set of laws have been generally modeled after the Federal Insecticide, Fungicide and Rodenticide Act by way of the Council of State Governments' so-called "Uniform State Pesticide Act." The registration laws, dealing with pesticide marketing within state boundaries, have been adopted in more or less similar form by 47 of the 50 states. Only Indiana, Delaware and Alaska are without state labeling regulations.

In actuality, the state registration laws are relative uniform when compared to the use and application laws. There is a great divergence of coverage, unfortunately most inadequate, among the states' use and application legislation. Other than the Federal Aviation Agency (FAA) regulations, no applicable Federal counterpart to these laws exists since they regulate activities which are by their nature normally intrastate. Some states have taken significant steps to insure generally ample licensing provisions, specific regulations as to the use of pesticides, inspection of equipment, etc., by way of Custom Applicators Acts, Pest Control Operators Laws and Aerial Application Regulations. Other states, however, either have no laws dealing with pesticide use or have what might be considered only partial coverage of the problem. While the lack of uniformity is evident, such divergence can be explained in part by the varying needs and desires of the people in different areas. However, certainly the greaatest shortcoming in the field of pesticide laws today is the incomplete coverage within the states over the use and application of these potentially harmful substances, which have been known to cause injury in a variety of ways. Undoubtedly, this can be overcome by some centralized effort which could be exerted against each individual state problem. However, more practically, a uniform or guideline act, presented to the states as a basis from which they may fill gaps existing in current state codes or adopt as a whole or in part with or without variations to suit particular circumstances, seems to be the most desirable approach to this difficulty. It is noteworthy that uniformity was stressed by the House Committee on Agriculture before the passage of the Federal Insecticide, Fungicide and Rodenticide Act in 1947 so as to minimize conflicts between state laws.

While there is much that could be said in support of uniform state pesticide use and applications acts; there are, of course, very definite problems of enforcement that vary from state to state. Pragmatically, it is difficult from a practical point of view to enforce licensing, inspections, examinations and technical rules over the use of pesticides. Some states already have adequate means by which surveillance is maintained over custom applicators, pest control operators and the like. Other states have poorly enforced powers in existence. Still others, however, have no system through which control over these persons is maintained. A licensing system would, in reality, reduce by some factor the apparent threat to public health from pesticide contamination. The problem is, however, whether this apparent threat would be alleviated by a scheme of more strict control over those who use, handle and apply pesticides. States which now have controls over that class of persons have met with successes are varied as the laws themselves. However, one point is clear, a program of enforcement is only as effective and vigorous as the agencies who administer it. Having well-written laws is one thing while adequate enforcement is quite another.

The great number of state statutes, both registration and use and application, are listed below. The list is a compilation of the major pieces of pesticide legislation now in force in the United States.

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TABLE D

STATE PESTICIDE LAWS

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
ALABAMA	Insecticide, Fungicide and Rodenticide Act (1951)	1. Alabama Professional Applicators Law (1953, as amended) 2. Regulations concerning Professional Applications (1953)
ALASKA	------------------	--------------------------
ARIZONA	Pesticide Act (1956) with rules and regulations	1. Arizona Pest Control Applicators Act (1953, as amended)
ARKANSAS	Economic Poisons Act (1947) with regulations	1. Regulations on the Control of 2,4-D 2,4,5-T (1959, as amended) (amended 1966) 2. Arkansas Agricultural Application Service Licensing Law (1961) (revised 1966) 3. Pest Control License Law (1951) 4. Pest Control Law (1965) 5. Regulations of State Plant Board
CALIFORNIA	1, Agricultural Code Sections 1061-1079 2. California Administrative Code (Economic Poisons) 3. Department of Agriculture Regulations Injurious Materials	1. California Injurious Materials Law (1949, as amended) with regulations 2. Regulations pertaining to Injurious Herbicides (1962) 3. Regulations: Agricultural Pest Control Business (1961, as amended with regulations concerning Agricultural Pest Control Operators)
COLORADO	Insecticide, Fungicide and Rodenticide Act (1947)	Custom Applicators Law (1961)

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
CONNECTICUT	Pesticide Law (1963)	1. Aerial Application of Insecticides, Fungicides, Herbicides and Fertilizers (1958) 2. Connecticut Tree Expert Law (1949) 3. Connecticut Law Limiting the Discard of Pesticides (1961) 4. Custom Applicators Act (1963)
DELAWARE	------------------	-------------------------
FLORIDA	Pesticide Act (1953) (revised, 1966)	1. Regulations: Commercial Spraying of Lawns and Ornamentals (1959) 2. Residential Pesticide Sprayings 3. Florida Structural Pest Control Act (1959, as amended) 4. Regulations of Board of Health
GEORGIA	Economic Poisons Act (1949)	Structural Pest Control Act (1955, as amended)with regulations
HAWAII	Economic Poisons Act (1945) (revised, 1966)	Herbicide Sale and Use Act (1949, as amended) with regulations
IDAHO	Economic Poison Act (1963)	Idaho Commercial Sprayer's and/or Duster's Law (1951, as amended with regulations)
ILLINOIS	Economic Poison Law (1962)	1. Illinois Herbicide Law (1959) 2. Custom Application of Pesticides (1965) 3. Custom Spray Law (1966)
INDIANA	-------------------	Regulations No. 2 Aeronautics Commission of Indiana
IOWA	Pesticide Act (1963) with regulations	Section 5 and 6 of Pesticide Act (1963)

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
KANSAS	1. Agricultural Chemical Act (1947) 2. Livestock Remedy Law	1. Kansas Aerial Spraying Law (1953, as amended) 2. Kansas Pest Control Act (1953, as amended) with regulations 3. Kansas Chemical Spray Law (1963)
KENTUCKY	1. Economic Poisons Law (1956) 2. Food, Drug and Cosmetic Law	Kentucky Termite and Pest Control Industry Law (1960) (Kentucky Structural Pest Control Act)
LOUISIANA	Pesticide Act (1952)	1. Louisiana Herbicide Law (1954) with regulations 2. Custom Applications of Pesticides (1964) 3. Ornamental Spraying Law (1965) 4. Structural Pest Control Law (1960)
MAINE	Economic Poisons Law (1952)	Regulation of Pesticides (1963)
MARYLAND	Pesticide Law (1958)	----------------------
MASSACHUSETTS	1. Pesticide Law (1961) 2. Labeling of DDT Preparations (1947)	1. Law Licensing Persons Applying Chemicals to Waters (1960) 2. Pesticide Board Rules and Regulations (1962)
MICHIGAN	Insecticide, Fungicide and Rodenticide Act (1949)	1. Michigan 2,4-D Act (1959) 2. Michigan Custom Applicators Law (1959) 3. Equipment Operator's Act (1959)
MINNESOTA	Economic Poisons and Devices Law (1945)	Minnesota Custom Applicators Law (1953, as amended) (revised 1966)
MISSISSIPPI	Economic Poisons Act (1950)	1. Law Regulating Application of Hormone type Herbicides by Aircraft (1952, as amended) with regulations 2. Professional Pest Control Operators Law (1938) with regulations

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
MISSOURI	Economic Poisons Act (1955)	----------------------------
MONTANA	Economic Poisons Act (1947, as amended)	----------------------------
NEBRASKA	Economic Poison Law (1961)	----------------------------
NEVADA	Economic Poison Law (1955) with regulations	Nevada Custom Pest Control Operators Law (1955) with regulations
NEW HAMPSHIRE	Economic Poisons Law (1949)	Pesticide Control Law (1966)
NEW JERSEY	Economic Poison Act (1951)	------------------------------
NEW MEXICO	Economic Poison Act (1951)	Pesticide Applicators Law (1965)
NEW YORK	Pesticide Law (1960)	1. Water Quality Standards Law 2. Pesticides in Grape Vineyards Law (1963, as amended)
NORTH CAROLINA	Insecticide, Fungicide and Rodenticide Act (1947)	1. North Carolina Aerial Crop-Dusting Law (1953) with regulations 2. North Carolina Structural Pest Control Act (1955)
NORTH DAKOTA	1. Insecticide, Fungicide and Rodenticide Act (1947) 2. Livestock Medicine Law (1943)	1. North Dakota Pesticides Damage Claim Act (1955) 2. Aerial Spraying, Dusting, Fertilizing & Insect Control Law (1957) 3. Regulations of the Aeronautics Commission (1957)
OHIO	1. Economic Poisons Act (1966) 2. Livestock Remedies Law (1949)	Ohio 2,4-D Law 1961
OKLAHOMA	Pesticides Law (1955)	1. Oklahoma Pesticide Applicators Law 1961 with regulations 2. Ornamental Spraying or Pruning (1965) 3. Phenoxy Herbicides (1965) 4. Structural Pest and Termite Control Law (1955) with regulations

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
OREGON	Economic Poisons Act (1953)	1. Control of Application of Agricultural Herbicides and Insecticides Law (1953, as amended) 2. Herbicide Tax Law (1961)
PENNSYLVANIA	Pesticide Act (1957	----------------------------
RHODE ISLAND	Economic Poisons Law (1951)	Custom Applicators Act (1963)
SOUTH CAROLINA	Economic Poisons Law (1953)	----------------------------
SOUTH DAKOTA	1. Insecticide, Fungicide and Rodenticide Act (1947) 2. Poison Law (1939)	South Dakota Spraying and Dusting Law (1953)
TENNESSEE	Insecticide, Fungicide and Rodenticide Act (1951)	Tennessee Pest Control Act (1955, as amended) with regulations
TEXAS	1. Insecticide, Fungicide and Rodenticide Act (1963) 2. Livestock Remedy Act	Texas Herbicide Law (1953, as amended) with regulations
UTAH	Insecticide, Fungicide and Rodenticide Act (1951)	Utah Economic Poison Application Act (1951) with regulations
VERMONT	Insecticide, Fungicide and Rodenticide Act (1947)	Vermont Aeronautic Commission Regulations (1949)
VIRGINIA	Insecticide, Fungicide and Rodenticide Act (1948)	-------------------------
WASHINGTON	Agricultural Pesticide Act (1961)	1. Pesticide Act (1961) 2. Pesticide Application Act (1961) amended, 1967 3. Regulations Relating to Commercial Applicators (1961) 4. Regulations: Use of Toxic Insecticides (1952)

STATE	REGISTRATION LAWS	USE AND APPLICATIONS LAWS
WEST VIRGINIA	Economic Poison Law (1961)	------------------------------
WISCONSIN	Economic Poison Law (1951)	Pest Control Operator's Law (S.B. 172 - Feb. 24, 1967) (Pending)
WYOMING	Economic Poison Law (1943, as amended)	Aerial Spraying Registration Regulations (1951)

WHPC Publication 1229/ Wash., D.C. 20210

January 1968

AGRICULTURE and the CHILD LABOR Requirements

under the

FAIR LABOR STANDARDS ACT
as amended in 1966

UNITED STATES DEPARTMENT OF LABOR

WAGE AND HOUR AND PUBLIC CONTRACTS DIVISIONS

Child Labor Bulletin No. 102 (Revised)

CHILD LABOR REQUIREMENTS IN AGRICULTURE UNDER THE FAIR LABOR STANDARDS ACT WHICH APPLY IN ALL STATES

1. Are there child-labor requirements of the Fair Labor Standards Act that apply to agriculture?

Yes. The requirements for agriculture are more limited than in other industries. They apply, however, whether the farm is small or large and do not depend on the number of man-days of agricultural labor used, as in the case of the minimum-wage requirements.

They apply generally to farmers whose crops or products go either directly or indirectly into interstate or foreign commerce, as in the case of a farmer who sends his product outside the State or delivers his product to a canner, processor, or dealer who he knows or has reason tc believe will send it outside the State, either in its original form or as an ingredient of another product. For example, tomato growers who send their tomatoes to a cannery within the same State are covered if the canned tomato product made from their tomatoes goes out of the State.

2. What employment is permitted under these child-labor requirements?

- Farmers may employ minors 16 years of age and over at anytime in any agricultural occupation.

- No minor under 16 may be employed at anytime in an agricultural occupation declared hazardous by the Secretary of Labor, except on the home farm by his own parents.

- Children under 16 may *not* be employed in agriculture during school hours, except by parents on the home farm.

3. What is meant by "during school hours?"

During school hours means the hours when the school for the school district where the child is living while employed is in session. (This means that, if school is open in the place where a crew leader takes his workers, the children may not work during the hours the school is open.)

- Children should be enrolled in the local school in the fall as soon as it opens even though the family is going to another area later or back home.

"School hours for the school district where such employee is living while he is so employed" do not apply in the spring to a child from another school district if the school he last attended has closed for the school year; however, local school attendance laws may require that these children attend school even if the school they last attended in another district is closed.

4. How can a farmer or a crew leader be sure that the school the child last attended is closed?

A written statement signed by the school official of the school the child last attended would constitute satisfactory evidence. This statement should contain the name of the child, the name and address of the school, the date the school closed for the current year, and the date the statement was signed. Employment before May 15 should be avoided. Crew leaders should remind parents to bring this school statement with them.

5. How old must a child be to work on a farm outside school hours?

A child may be employed at any age *before* and *after* school hours on any school day, or at any time during a school holiday or vacation period, except in occupations declared hazardous by the Secretary of Labor. A *16*-year minimum age applies in such occupations at *all* times; i.e., during school hours, before and after school, and during vacations.

6. What are the agricultural hazardous occupations?

Occupations in Agriculture particularly hazardous for the employment of children below the age of 16 are:

(1) Handling or applying anhydrous ammonia, organic arsenic herbicides, organic phosphate pesticides, halogenated hydrocarbon pesticides, or heavy-metal fungicides, including cleaning or decontamination equipment used in application or mixing of such chemicals.

(2) Handling or using a blasting agent. For the purpose of this subparagraph, the term "blasting

agent" shall include explosives such as, but not limited to, dynamite, black powder, sensitized ammonium nitrate, blasting caps, and primer cord.

(3) Serving as flagman for aircraft.

(4) Working as -

(i) Driver of a truck or automobile on a public road or highway.

(ii) Driver of a bus.

(5) Operating, driving, or riding on a tractor (track or wheel) over 20 belt horsepower, or attaching or detaching an implement or power-take-off unit to or from such tractor while the motor is running.

(6) Operating or riding on a self-unloading bunk feeder wagon, a self-unloading bunk feeder trailer, a self-unloading forage box wagon, a self-unloading forage box trailer, a self-unloading auger wagon, or a self-unloading auger trailer.

(7) Operating or riding on a dump wagon, hoist wagon, fork lift, rotary lift, rotary tiller (except walking type), or power-driven earthmoving equipment or power-driven trenching equipment.

(8) Operating or unclogging a power-driven combine, field baler, hay conditioner, corn picker, forage harvester, or vegetable harvester.

(9) Operating, feeding, or unclogging any of the following machines when power-driven: Stationary baler, thresher, huller, feed grinder, chopper, silo filler, or crop dryer.

(10) Feeding materials into or unclogging a roughage blower or auger conveyor.

(11) Operating a power-driven post-hole digger or power-driven post driver.

(12) Operating, adjusting, or cleaning a power-driven saw.

(13) Felling, bucking, skidding, loading, or unloading timber with a butt diameter of more than 6 inches.

(14) Working from a ladder or scaffold at a height over 20 feet.

(15) Working inside a gas-tight type fruit enclosure, gas-tight type grain enclosure or gas-tight type forage enclosure, or inside a silo when a top unloading device is in operating position.

.(16) Working in a yard, pen, or stall occupied by a dairy bull, boar, or stud horse.

Exceptions:

(A) These standards do not apply to the employment of a minor under 16 by his parent or by a person standing in the place of his parent on a farm owned or operated by such parent or person.

(B) Student-learners under 16 enrolled in a bona fide cooperative vocational education training program in agriculture are exempt from the provisions of this Interim Order provided the following requirements are met:

(1) Such student-learner is employed under a written agreement which provides:

(i) that the work of the student-learner in the occupations declared particularly hazardous shall be incidental to his training;

(ii) that such work shall be intermittent and for short periods of time, and under the direct and close supervision of a qualified and experienced person;

(iii) that safety instructions shall be given by the school and correlated by the employer with on-the-job training and;

(iv) that a schedule of organized and progressive work processes to be performed on the job shall have been prepared.

(C) Any educational or training program for which an exclusion has been obtained from the Secretary of Labor.

7. What are some of the jobs still permitted on farms under the agricultural hazardous order?

Examples of some of the permitted jobs are: Handling many chemical pesticides and fertilizers;

Driving a truck or automobile on the farm proper and helpers on motor vehicles;

Loading and unloading trucks;

Operating garden-type tractors;

Picking vegetables and berries, and placing them on conveyors or in containers;

Clearing brush and harvesting trees up to 6 inches in butt diameter;

Working from ladders at heights less than 20 feet, such as picking of most fruits;

Hand planting and cultivation;

Raising and caring for poultry;

Milking cows;

Processing and storing milk and dairy products;

Detasseling corn;

Cleaning barns, equipment storage buildings, chicken coops, etc.;

Mowing lawns;

Riding, driving or exercising horses;

Picking cotton;

Handling of irrigation pipes;

Harvesting curing and storing tobacco;

Riding on transplanters.

8. How can a farmer or crew leader be sure a minor is at least 16 years of age?

The Act provides that a farmer or crew leader may protect himself from unintentional violation of the child-labor requirements by having on file an age or employment certificate showing the minor to be the legal age for the occupation in which he is employed. He is not required, however, to obtain this certificate. Families should bring with them some evidence of date of birth for their children—either a birth certificate or baptismal certificate.

9. Where can such a certificate be obtained?

Age and employment certificates issued under State child-labor laws may be obtained in every State except four. These State age and employment certificates are issued usually by local school officials, or a representative of the State labor, welfare, or education department.

In the four States without such systems, the Wage and Hour and Public Contracts Divisions, U.S. Department of Labor, issue Federal certificates of age. These may be obtained in the Divisions' offices located in Boise, Idaho; Jackson, Mississippi; Columbia, South Carolina; and in

Dallas, Texas (also in Field Offices located in Texas).

10. Do these child-labor requirements apply to all children?

Yes. These child-labor provisions of the Act apply to the agricultural employment of all children—*migrants* as well as *local resident* children. The only exemption provided is that a parent may employ his own child on his farm without regard for these requirements.

11. Is a farmer in violation of the Fair Labor Standards Act if the underage children working on his farm were not hired by him personally?

Both the farmer and the crew leader may be held responsible for every underage child working on a farm. This includes children hired either individually or as a part of a family group by labor contractors, processors, or others.

12. What records must be kept by farmers and crew leaders for minors working on farms?

Every employer (other than a parent or guardian standing in place of a parent employing his own child or a child in his custody on his farm) who employs in agriculture any minor under 18 years of age on days when school is in session or on any day if the minor is employed in an agricultural occupation found to be hazardous by the Secretary of Labor shall maintain and preserve records containing the following data with respect to each and every such minor so employed:

(1) Name in full.

(2) Place where minor lives while employed. If the minor's permanent address is elsewhere, give both addresses.

(3) Date of birth.

It is not necessary that records be maintained in any particular order or form. They must be kept in a safe and accessible place and be open at anytime to inspection and transcription by authorized representatives of the Secretary of Labor. These records must be preserved for at least 3 years.

If a minor is subject to the minimum wage requirements of the Act, additional records showing his pay and hours of work are required.

13. Are minors subject to a minimum wage?

The 1966 Amendments to the Fair Labor Standards Act extended minimum-wage protection to certain farm employees, including minors, whose employer in any calendar quarter of the preceding calendar year used more than 500 man-days of agricultural labor. Such employees, unless otherwise exempt, must be paid at least $1.00 an hour beginning February 1, 1967; $1.15 an hour beginning February 1, 1968; and $1.30 an hour beginning February 1, 1969. There is an exemption for migrant hand harvest laborers 16 years of age or under employed on the same farm as their parents, if (a) they are paid piece rates in an operation generally recognized as piecework in the region, and (b) the piece rate is the same as paid workers over age 16. Employment of such minors is subject to the prohibitions against employment in hazardous occupations or during school hours. The overtime provisions of the law do not apply to farmworkers. Further information may be obtained from the Divisions' nearest offices.

The above requirements do not apply to children employed by their own parents on the home farm.

14. What are the penalties for violation of the child-labor requirements of the Fair Labor Standards Act?

The Secretary of Labor may ask a Federal district court to restrain future violations of the child-labor requirements of the Act by injunction. The Act provides, in case of willful violation, a fine up to $10,000. For a second offense, committed after conviction for a similar offense, a fine of not more than $10,000 or imprisonment of not more than 6 months, or both, may be imposed.

15. What other Federal laws affect the employment of children in agriculture?

The Sugar Act of 1948 contains certain provisions with which producers engaged in the production and harvesting of sugar beets or sugarcane must comply to obtain maximum benefit payments. These provisions include a minimum age of 14 years for employment and a maximum 8-hour day for children between 14 and 16 years of age. Members of the immediate family of the legal owner of at least 40 percent of the crop at the time the work is performed are exempted from these provisions. The 16-year minimum age set by the Fair Labor Standards Act would, however, apply to children who work on sugar beets or sugarcane during school hours unless they are the farmer's own children.

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ADDITIONAL INFORMATION

Inquiries about the Age Discrimination in Employment Act of 1967 will be answered by mail, telephone, or personal interview at any office of the Wage and Hour and Public Contracts Divisions of the U.S. Department of Labor. Offices are listed in the telephone directory under the U.S. Department of Labor in the U.S. Government listing. These offices also supply publications free of charge.

Offices listed in *Italics* are staffed by investigation personnel whose duties frequently require them to be away from the office. Telephone messages and requests for information may be left at these offices when regular personnel are not on duty. Personal appointments may be arranged by either telephone or mail.

Alabama: *Andalusia, Anniston,* Birmingham, *Dothan, Florence, Gadsden, Huntsville,* Mobile, Montgomery, *Opelika, Selma, Tuscaloosa*

Alaska: *Anchorage*

Arizona: Phoenix, *Tucson*

Arkansas: *El Dorado, Fayetteville, Fort Smith, Hope, Jonesboro,* Little Rock, *Pine Bluff*

California: *Bakersfield, Fresno,* Hollywood, Long Beach, Los Angeles, *Modesto, Monterey,* Oakland, *Redding, Riverside,* Sacramento, *San Diego,* San Francisco, *San Jose, San Mateo, Santa Ana, Santa Rosa, Stockton, West Covina,* Whittier

Colorado: Denver, *Pueblo*

Connecticut: *Bridgeport,* Hartford, *New Haven, New London*

Delaware: *Wilmington*

District of Columbia, College Park

Florida: *Clearwater, Cocoa, Fort Lauderdale, Fort Myers,* Jacksonville, *Lakeland, Leesburg,* Miami, North Miami, *Orlando, Pensacola, St. Petersburg,* Tampa, *West Palm Beach*

Georgia: *Albany, Athens,* Atlanta, *Augusta,* Columbus, *Gainesville,* Hapeville, *Macon, Rome,* Savannah. *Thomasville, Valdosta*

Hawaii: Honolulu

Idaho: *Boise*

Illinois: Chicago, Springfield

Indiana: *Evansville,* Indianapolis, South Bend

Iowa: *Burlington, Cedar Rapids, Davenport,* Des Moines, *Fort Dodge, Mason City, Sioux City, Waterloo*

Kansas: *Pittsburg, Salina, Topeka,* Wichita

Kentucky: *Ashland,* Lexington, Louisville, *Middlesboro, Pikeville*

Louisiana: *Alexandria,* Baton Rouge, *Hammond, Houma, Lafayette, Lake Charles, Monroe,* New Orleans, Shreveport

Maine: Portland

Maryland: Baltimore, College Park, *Hagerstown, Salisbury*

Massachusetts: Boston, *Lowell*, Springfield, *Worcester*
Michigan: Detroit, Grand Rapids, *Lansing*
Minnesota: Minneapolis
Mississippi: *Biloxi, Columbus, Clarksdale, Greenwood, Hattiesburg,* Jackson, *Tupelo*
Missouri: *Cape Girardeau, Columbia, Joplin,* Kansas City, *St. Joseph,* St. Louis, *Springfield*
Montana: *Great Falls*
Nebraska: *Grand Island, Lincoln,* Omaha
Nevada: *Reno*
New Hampshire: Manchester, *Laconia*
New Jersey: *Camden,* Newark, Paterson, Trenton
New Mexico: Albuquerque, *Las Cruces, Roswell*
New York: *Albany,* Bronx, Brooklyn, Buffalo, Hempstead, New York, *Rochester,* Syracuse
North Carolina: *Asheville,* Charlotte, *Durham, Fayetteville, Goldsboro,* Greensboro, *Hickory, High Point,* Raleigh, *Wilmington, Winston-Salem*
North Dakota: *Bismarck,*
Ohio: Cincinnati, Cleveland, Columbus
Oklahoma: *Ardmore, Enid, Lawton, Muskogee,* Oklahoma City, Tulsa
Oregon: *Eugene, Medford,* Portland, *Selma*
Pennsylvania: *Allentown, Altoona, Chester, DuBois, Erie, Greensburg,* Harrisburg, *Indiana, Johnstown, Lancaster, Lewistown,* McKeesport, *New Castle,* Philadelphia, Pittsburgh, *Reading, Scranton, Uniontown, Washington,* Wilkes-Barre
Rhode Island: Providence
South Carolina: *Charleston,* Columbia, *Florence, Greenville, Spartanburg*
South Dakota: *Aberdeen, Rapid City,* Sioux Falls
Tennessee: *Bristol, Chattanooga, Columbia, Jackson, Johnson City,* Knoxville, Memphis, Nashville
Texas: *Abilene, Amarillo, Austin, Beaumont,* Corpus Christi, Dallas, El Paso, Fort Worth, *Galveston, Harlingen,* Houston, *Laredo, Longview, Lubbock, Lufkin, Midland, Odessa, Paris,* San Antonio, *Texarkana, Tyler, Victoria,* Waco, *Wichita Falls*
Utah: *Ogden,* Salt Lake City
Vermont: *Burlington, Montpelier*
Virginia: *Alexandria, Norfolk,* Richmond, Roanoke, *Waynesboro*
Washington: Seattle, *Spokane, Tacoma*
West Virginia: *Bluefield,* Charleston, Clarksburg, *Huntington, Logan*
Wisconsin: Madison, Milwaukee, *Oshkosh*
Wyoming: *Casper, Cheyenne*
Puerto Rico: *Arecibo, Caguas,* Hato Rey, Mayaguez, *Ponce,* Santurce
Canal Zone, Virgin Islands: Santurce, Puerto Rico
American Samoa, Eniwetok Atoll, Guam, Johnston Island, Kwajalein Atoll, Wake Island: Honolulu, Hawaii

Occupational Disease in California Attributed to Pesticides and Other Agricultural Chemicals

SUMMARY

The 1,347 reports of occupational disease attributed to pesticides and other agricultural chemicals received in 1966 compares with 1,340 in 1965 and 1,328 in 1964.

Occupational diseases are not included from among self-employed farmers and unpaid family labor, 28 percent of the agricultural work force, and from self-employed one-man operations in structural and agricultural pest control work. Data in this review, therefore, undoubtedly understate the incidence of occupational disease attributed to pesticides and other agricultural chemicals.

The rate of occupational disease from agricultural chemicals in agricultural services (6.6 reports per 1,000 workers) was nearly twice that for workers in all agriculture (3.5 reports per 1,000 agricultural workers).

Since 1951, there have been 32 occupational fatalities implicating agricultural chemicals. In this same period, 82 children and 22 other adults died in California from accidents attributed to pesticides and other agricultural chemicals, a total of 136 accidental deaths.

Organic phosphate pesticides were implicated in 19 percent of the 1,347 reports in this series; followed by herbicides, 11 percent; fertilizers, 10 percent; halogenated hydrocarbon pesticides, 7 percent; and phenolic compounds, 7 percent.

There were 233 reports of systemic poisonings in 1966. The organic phosphate pesticides were blamed in 173 of these.

Forty percent of workers with occupational disease attributed to agricultural chemicals were expected to lose some time from work. Ten percent of such workers were hospitalized.

Farm laborers accounted for more than half (704) of the 1,347 reports of occupational disease attributed to agricultural chemicals; nonfarm laborers, 15 percent; and operatives, including truck and tractor drivers, 14 percent.

Eighty percent of pest control chemicals moved beyond local areas are moved by truck. Chemicals are usually transported in concentrated form, creating potential health hazards in transportation and storage of pesticides in the event of mishap.

BACKGROUND

Occupational disease caused by agricultural chemicals continues to be one of the most important occupational health problems in the State. Diseases caused by these chemicals include a high proportion of serious acute illness. In 1966, 42 percent of the 557 reports of all occupational poisonings were attributed to agricultural chemicals, although only 5 percent of the 27,626 reports of all occupational diseases received were attributed to these chemicals. Further, these cases are concentrated in the agriculture industry which has the highest rate of occupational disease in California: 11.9 reports per 1,000 agricultural workers in 1966, or more than two and a half times that for all industrial divisions (4.5 per 1,000 workers for all industry).

The acute effects of pesticides and other agricultural chemicals on workers in California, as recognized and reported by physicians, have been summarized by the Bureau of Occupational Health of the California Department of Public Health since 1950. While limited to the segment of the population covered by the California Workmen's Compensation law, these data are the only regularly available information in the United States on acute conditions caused by agricultural chemicals. As such, they have been of continuing interest to persons concerned with the effects of agricultural chemicals on the health of people. Although the use of pesticides and other agricultural chemicals is widespread in home and garden, the effects of this contact on the health of the general population are not completely known.

Comments in earlier reports of the Bureau of Occupational Health pointed to needed improvements for the protection of workers using agricultural chemicals. These comments still apply, as demonstrated by a review of the 1966 doctors' reports. Among the needed protective measures are: provision of washing facilities for farm workers in the fields; adequate supervision of agricultural chemical users; improvement in the engineering of crop-dusting aircraft and related equipment; and standardization of labeling on pesticide containers. As recently as the summer of 1967, an outbreak of pesticide poisoning in the San Joaquin Valley was reported to have sickened about 25 peach pickers. Yet similar outbreaks among fruit pickers had occurred there in 1959 and 1963.

FIRE PREVENTION CODE

A code prescribing regulations governing
conditions hazardous to life
and property from fire,

also

A suggested ordinance adopting the Fire
Prevention Code and establishing a
Bureau of Fire Prevention.

Edition of 1965
Superseding the Edition of 1960 with
Amendments of 1961.

Recommended by the
AMERICAN INSURANCE ASSOCIATION
successor to the
National Board of Fire Underwriters

Engineering and Safety Department
85 John Street, New York, N. Y. 10038
222 West Adams Street, Chicago, Ill. 60606
465 California Street, San Francisco, Calif. 94104

ARTICLE 20

HAZARDOUS CHEMICALS

Section 20.1. Scope.

This article shall apply to materials not otherwise covered in this code which are highly flammable, or which may react to cause fires or explosions, or which by their presence create or augment a fire or explosion hazard, or which because of their toxicity, flammability, or liability to explosion render fire fighting abnormally dangerous or difficult; also to materials and formulations which are chemically unstable and which may spontaneously form explosive compounds, or undergo spontaneous or exothermic reactions of explosive violence or with sufficient evolution of heat to be a fire hazard. Hazardous chemicals shall include such materials as corrosive liquids, flammable solids, highly toxic materials, oxidizing materials, poisonous gases, radioactive materials, and unstable chemicals, as defined in section 20.2.

Section 20.2. Definitions.

a. **Corrosive liquid** shall mean and include those acids, alkaline caustic liquids, and other corrosive liquids which when in contact with living tissue, will cause severe damage of such tissue by chemical action; or in case of leakage will materially damage or destroy other containers of other hazardous commodities by chemical action and cause the release of their contents; or are liable to cause fire when in contact with organic matter or with certain chemicals.

b. **Flammable solid** shall mean and include a solid substance, other than one classified as an explosive, which is liable to cause fires through friction, through absorption of moisture, through spontaneous chemical changes, or as a result of retained heat from manufacturing or processing. Examples are: white phosphorous, nitrocellulose, metallic sodium and potassium, and zirconium powder.

c. **Highly toxic material** shall mean a material so toxic to man as to afford an unusual hazard to life and health during fire fighting operations. Examples are: parathion, TEPP (tetraethyl phosphate), HETP (hexaethyl tetraphosphate), and similar insecticides and pesticides.

Section 20.11. Highly Toxic Materials.

a. Highly toxic materials shall be separated from other chemicals and combustible and flammable substances by storage in a room or compartment separated from other areas by walls and floor and ceiling assemblies having a fire resistance rating of not less than one hour. The storage room shall be provided with adequate drainage facilities and natural or mechanical ventilation to the outside atmosphere.

b. Legible warning signs and placards stating the nature and location of the highly toxic materials shall be posted at all entrances to areas where such materials are stored or used.

Section 20.12. Poisonous Gases.

a. Storage of poisonous gases shall be in rooms of at least one-hour fire-resistant construction and having natural or mechanical ventilation adequate to remove leaking gas. Such ventilation shall not discharge to a point where the gases may endanger any person.

b. Legible warning signs stating the nature of hazard shall be placed at all entrances to locations where poisonous gases are stored or used.

Section 20.13. Corrosive Liquids.

Satisfactory provisions shall be made for containing and neutralizing or safely flushing away leakage of corrosive liquids which may occur during storage or handling.

SUMMARY OF 62 PESTICIDE ACCIDENTS INVESTIGATED

(1963 - 1966)

ACCIDENT NUMBER	STATE	SPECIES	DATE	PESTICIDE USED	MIXTURE	HOW CONSUMED	EFFECTS
1	Montana	Cattle	December 1963	Grasshopper bait stored since late 1930.	Thought to contain arsenic.*	Cattle broke into storage area and ate bait.	38 cattle died. *No sample collected as owner burned barn and buried ashes.
2	Idaho	Cattle and Chickens	November 1963	Mormon cricket bait.	Rolled wheat impregnated with oil solution of aldrin.	Junk dealer allegedly purchased 40 sacks of Mormon cricket bait clearly marked "poison." Removed all labels and placed the grain on sale at auction where it was purchased for animal feed.	25 chickens and 8 calves and cattle died. Others were poisoned but recovered.
3	Minnesota	Cattle	April 1964	Grasshopper bait purchased in 1938 or 1939 by previous owner of farm.	Sodium arsenite.	Heavy spring rains washed grasshopper bait from storage area onto grazing area.	7 head of young cattle died.
4	Idaho	Cattle	November 1963	Ground Squirrel bait containing sodium fluoroacetate.	Compound 1080 issued only under license granted by manufacturer. Use restricted to cooperative programs administered by State and Federal agencies.	Bait was apparently issued to a previous land owner in 1956. At an undetermined date, it was removed from storage by a second party and placed on trash pile. Cows apparently chewed on one of the sacks which contained, or previously contained, the rodent bait.	4 Cattle died.
5	Minnesota	3-year-old boy	June 1964	Parathion concentrate being used for cabbage insect control.		Boy apparently inhaled or drank residues of parathion from a jar which had been used by father to mix spray for cabbage insect control.	The boy died. Special antidote (2-PAM chloride) was administered but too late to help.
6	Florida	5-year-old girl 2-year-old boy	June 1964	Parathion.		Children were apparently playing with quart-size spray gun containing parathion that had been left by parents on top of wall cabinet in kitchen.	The boy died and the girl recovered after hospital treatment.
7	California	28-year-old man	July 1964	Phosdrin.	Phosdrin + DDD + Parathion	The man was operating a ground sprayer. Protective clothing was worn, but apparently phosdrin was spilled on his clothing sometime during the reloading operation.	The man died. He was found sprawled on the ground the morning following the spraying.
8	South Carolina	Cattle	June 1964	Lindane spray used for fly and lice control.	3½ gallons of 20% lindane per 300 gallons of water.	Farmer treated 230 head of cattle with a dosage 8 times the recommended amount for fly control and 4 times the recommended amount for the control of lice.	All the cattle became ill; 3 died.
9	Colorado	17-year-old boy	July 1964	Chemically treated sorghum and broomcorn seed.	Sorghum seed treated with captan and heptachlor. Broomcorn seed treated with methyl mercury dicyanimide (panogen).	The youth was employed to operate a tractor-drawn drill to plant sorghum and broomcorn. Gloves were not worn on several occasions and treated seed was handled with bare hands.	The youth recovered after hospital treatment.
10	Florida	4-year-old boy	August 1964	Parathion.	60% parathion concentrate.	The boy and his 2 older brothers had been playing with empty 30-gallon drums in the vicinity of their home. The 4-year old crawled into drum, and others turned it upside down on him. It is undetermined as to how long he stayed in the drum.	The boy recovered after treatment with extremely large doses of atropine.
11	Colorado	Cattle	August 1964	Prepared fly control solution containing dichlorvos (DDVP).		80 dairy cows became ill after spraying for fly control. Examination of contents of spray drum in glass jar showed definite separation with insecticide settling to bottom of jar. It was theorized that the concentration applied to cattle was far in excess of the recommended 1%.	None died. Several cows remained off feed, and milk production was down for several days.
12	Florida	3-year-old boy	September 1964	Parathion.		Father had purchased insecticide powder from a local individual (not associated with an authorized dealer or firm) for controlling cockroaches in his home. Powder was dispensed from a paper bag and sold in unmarked paper cups. He hand-sprinkled the insecticide on floor of home. The child apparently ingested some of the powder while eating a piece of fried chicken. The piece of chicken is thought to have been dropped on the floor prior to eating.	The child died approximately one hour after ingestion.
13	Minnesota	Cattle	August 1964	Diazinon used for controlling flies. Label stated "do not use on animals."		Farmer applied the spray containing diazinon directly to the hides of the cattle for controlling flies.	Entire herd sprayed; 2 died.
14	Texas	35-year-old man	July 1964	Parathion used for spraying cotton.		The man had applied parathion to cotton fields for 3 days with a ground sprayer. Investigations showed that respirator had not been used while treating fields day of his death.	The man was found dead the morning following the spraying.
15	South Dakota	3-year-old boy	September 1964	Ethylene dibromide used for destroying honey bees.		Chemical had been poured into pop bottle for convenience. The child apparently drank some of the contents thinking it was pop.	The boy died.

PESTICIDE ACCIDENTS INVESTIGATED

ACCIDENT NUMBER	STATE	SPECIES	DATE	PESTICIDE USED	MIXTURE	HOW CONSUMED	EFFECTS
16	Tennessee	Cattle	August 1965	Diazinon.	2 or 3 tablespoonfuls of diazinon to 2½ to 3 gallons of water.	Owner ran out of regular spray concentrate while treating dairy herd for fly control. To complete spraying herd, he took another bottle of insecticide from storage in a feed room and dumped its contents into the sprayer and applied it thoroughly over the remainder of the animals. Examination of the bottle disclosed that it had contained a diazinon spray. Label on bottle stated "do not spray animals with this product."	1 bull and 30 cows died.
17	Idaho	Cattle	August 1965	Lindane 25% wettable powder used for control of lice.		Owner applied lindane by hand from a shaker-type container. Lindane should not be applied to calves as a dust of greater concentration than 0.1%.	6 calves died.
18	Texas	5-year-old girl	September 1965	Strobane-DDT concentrate.		A can of Strobane-DDT was found on floor of the garage. The cap or lid had been removed and a hole had been punched in the plastic seal. Some of the pesticide was found spilled on the floor near the open container.	The girl died 1[illegible] hours after receiving hospital treatment.
19	Texas	2-year-old boy 3-year-old girl	October 1965	Arsenic acid used as a desiccant to defoliate cotton.	75% arsenic acid.	The family had recently moved to farm in Texas and a number of empty one-gallon plastic bottles previously containing the arsenic acid were found in the garage. The children had been using these plastic containers for footballs. The family moved again and the children took some of the plastic bottles with them. Apparently one of the bottles still contained some of the defoliant and the 3-year old sister gave the boy a drink from the bottle and then took one herself.	Both children were sent to the hospital for intensive treatment. The girl recovered but the boy died.
20	Iowa	Cattle	August 1965	20% aldrin granules.		The owner had put the aldrin granules in an empty salt bag after he had finished planting his corn crop that spring. He told a boy working for him to salt the cattle. By mistake, the boy got the wrong bag.	Out of 9 steers affected, 2 died.
21	Mississippi	16-year-old boy	August 1965	Insecticide used for control of insects on cotton.	Emulsifiable concentrate containing 8% methyl guthion, 6% ethyl guthion, 26.8% ethyl parathion.	The boy, without any protective clothing, had been riding the spray boom of the tractor used in applying the insecticide.	The boy was rushed to a hospital but was not admitted allegedly due to administrative delay. He was later taken to another hospital where he was pronounced DOA.
22	Maryland	4 Children 6 months to 4 years	October 1965	Mevinphos, an organophosphate.	4 pounds per gallon.	The 4 children had accompanied their mothers to a "pick your own vegetable" farm to pick kale. The children played near a farm dump. A gallon container, in which about a pint of concentrate was left, was picked up by the children. Apparently some of the insecticide was spilt or rubbed on the clothing or bodies of the children.	All 4 children were taken to a local hospital and responded to treatment with atropine sulfate antidote.
23	Iowa	Sheep	November 1965	Toxaphene.		Dip had been placed in the vat and no one can recall it being mixed before sheep were dipped.	First sheep died; the next 4 showed signs of toxicity but recovered after treatment.
24	Mississippi	15-month-old boy	December 1965	Weed killer containing sodium arsenite.	55% sodium arsenite by weight (equivalent to 41.9% arsenic trioxide).	Youth had been left at neighbor's home while mother was Christmas shopping. While playing, child found the container of weed killer that was stored in the shed.	The boy died within 30 minutes after arrival at hospital.
25	California	Cattle	July 1965	Cutworm bait containing endrin.	0.75% endrin (active ingredient) on apple pomace (inert ingredient).	The bait was ordered by farmer adjacent to the affected ranch for aerial application to a sugar beet field for control of cutworms. The material was unloaded inside the fence where cattle were grazing. Apparently the cattle ripped open the containers and ate the bait.	34 Angus yearlings died.
26	South Carolina	2 Children 3- and 4-years-old	December 1965	Paris green used for mole control in tobacco beds had been stored in shed since 1954.	Copper aceto-meta-arsenite.	Children playing in shed believed to have knocked container of Paris green off the shelf. Children were found playing with the container and apparently consumed some of the material.	Children recovered after treatment and apparently suffered no ill effects.
27	Connecticut	6-year-old boy	March 1966	Herbicide containing sodium arsenite used to kill potato tops.	66% concentrate of sodium arsenite.	Empty cans of the herbicide were left in pile in open area on farm. Some children occasionally played in this area. It was learned from other children that the boy had poured some of the residue from the containers into a cup, added some water from a drainage ditch, and drank it.	The boy died in the hospital following a period of apparent recovery.
28	Arizona	35-year-old man	May 1966	Pesticide used to control cabbage loopers on lettuce.	½ gallon of Thuricide 90 TS (Bacillus thuringiensis) and 1½ pints of Phosdrin EC 47 (mevinphos) per 100 gallons of water.	Farm worker became ill after spraying 3 or 4 acres of lettuce with pesticide. Protective gear was available (rubber gloves and respirator) for use when mixing and applying pesticide, but was not worn.	The man recovered after treatment.
29	South Carolina	15-year-old boy	May 1966	Spray for aerial application to control aphids and leaf miners on tomatoes.	Parathion concentrate, 8 pounds per gallon.	While the youth was pouring parathion concentrate into mixing barrel, he spilled some on his clothing. He changed his shirt but did not remove all contaminated clothing or wash thoroughly with soap and water until several hours later.	The boy recovered after hospital treatment. NOTE: In 1965, this boy was reportedly admitted to hospital after breathing mevinphos dust while loading a spray plane.

PESTICIDE ACCIDENTS INVESTIGATED

ACCIDENT NUMBER	STATE	SPECIES	DATE	PESTICIDE USED	MIXTURE	HOW CONSUMED	EFFECTS
30	South Carolina	2-year-old boy	May 1966	Insecticide used for controlling tobacco budworms, tobacco hornworms, and other tobacco pests.	10% TDE and 1% parathion dust.	Four 25-lb bags of insecticide were placed on the back porch of house after purchase. Child was playing with hammer and broke one of the bags getting the material on his hands.	Child died in hospital.
31	South Carolina	Cattle	June 1966	Pesticide used for killing thistles.	40% sodium arsenite and 60% inert materials.	Patches of thistle growing in a 40-acre pasture were sprayed. However, 7 days later enough rain occurred to cause runoff. Cattle pastured in the field were found dead the day after it rained.	10 cows died.
32	Minnesota	City Population	July 1966	Malathion, DDT, parathion.	240 acres treated. ½ treated with .3 pounds of DDT and .208 pounds of malathion per acre. The other half which covered residential, business, and park areas received .3 pounds DDT and .0833 pounds of parathion per acre.	City was conducting a mosquito control program. The intended materials for control were malathion and DDT. However, 5-gallon container of parathion had been mistakenly placed in the shipment and was not detected until completion of application. The city officials were promptly notified of mistake at approximately 9:30 p.m. and by 10 p.m. the residents were notified of the situation and instructed to evacuate. Some of the residents received a direct application of the pesticide. A woman and child were treated for possible effects from the pesticide application.	No ill effects noted. It has not been determined how the can of parathion was inadverently placed with the malathion. The containers for both were identical except for printed material on labels.
33	West Virginia	Cattle	July 1966	Parathion 8-P.		Cattle were sprayed by owner for flies supposedly with Clovap--a fly spray containing Ciodrin and Vapona. Two gallons of the material were poured into a 3-gallon sprayer from a 5-gallon can. A card was lying on top of the can on which was written "DDVP (Dipona)." The owner apparently assumed the can contained Vapona; however, the can was plainly labeled Parathion 8-P.	64 calves, 27 cows, and 1 bull died. Cattle continued to die even after treatment with atropine. All animals were buried in trenches.
34	Michigan	Cattle	May 1966	Aldrin "20"	Oats, treated seed corn, untreated rye grass seed, aldrin "20."	A bin used for storing treated corn and odds and ends, including part of a 50-pound bag of aldrin "20," was cleaned out and its contents fed to a group of 235 steers weighing from 650 to 900 pounds.	75 steers died.
35	Texas	10-month-old boy 21-year-old woman	May 1966	Diazinon 25E.	One quart diazinon 25E to 1½ gallons of water.	Mother sprayed entire home with mixture to control household insects. She neglected to read the label which specified that the formulation should be used for lawn and garden insect control.	Child became ill 45 minutes after entering the sprayed house. Woman became ill next morning. Both responded to hospital treatment.
36	Tennessee	26-month-old boy	June 1966	Endrin emulsifiable contentrate.	19.5% emulsifiable concentrate.	The child's great-grandfather had drawn some endrin emulsifiable concentrate from a larger container into a fabric softener bottle to be used in his garden. While he was mixing the spray, the child picked up the bottle and drank an undetermined amount of its contents as well as spilling some on his clothes.	Child responded to hospital treatment.
37	Texas	3-year-old boy	June 1966	Organophosphate insecticides used on cotton.		The child had been playing in an area where spray machines were washed and drained. It is not known how the child obtained the insecticide but it is presumed that he ate contaminated dirt as was his habit on occasion. Dirt was found in his stomach at time of autopsy.	Child died in hospital. Lab tests conducted at the hospital inditated organic-phosphate insecticide poisoning.
38	Texas	28-year-old man	July 1966	Spray containing methyl parathion concentrate.		The man had been spraying cotton fields for a week prior to his death. Masks and other protective equipment were available but were not worn. Continual exposure to organophosphate insecticides was noted to have been the cause of death.	Man died in hospital.
39	Ohio	14-year-old boy	July 1966	Parathion used for treating sweet corn and potatoes.		Youth was employed by custom spray operator. Spray operator and youth had been treating sweet corn and potatoes with the parathion mixture. Respirators and other recommended safety devices were apparently not used.	Youth died in hospital while receiving treatment. Autopsy revealed that the cause of death was due to inhalation of parathion.
40	North Carolina	46-year-old man	May 1966	Liquid mercurial seed disinfectant.		The man worked at cotton gin where he treated cotton seed with liquid mercurial seed disinfectant. Masks and other safety equipment were available but apparently were not used.	The man died. Autopsy revealed that the cause of death was respiratory arrest due to chronic mercury poisoning.
41	Florida	32-year-old woman	July 1966	Parathion.	15% wettable parathion dust.	The owner of combination night club and diner had applied, by hand sprinkling parathion dust around counters and floors including the kitchen of establishment. Approximately 6 hours later, cleaning people entered the building and became ill from the vapors. The 32-year old woman was admitted to the hospital for treatment; one other woman and 2 men were sent to the hospital for observation but did not need medical attention.	Woman responded to hospital treatment.
42	North Carolina	2-year-old girl	July 1966	Diazinon.	25% emulsifiable concentrate.	Mother of child was spraying her home for household insects. After mixing spray, she set the bottle down and left the room. Upon returning, she found that the child had drank some of bottle's contents.	Child was pronounced DOA at hospital.

PESTICIDE ACCIDENTS INVESTIGATED

ACCIDENT NUMBER	STATE	SPECIES	DATE	PESTICIDE USED	MIXTURE	HOW CONSUMED	EFFECTS
43	North Carolina	5-year-old boy	July 1966	Formulation containing dioxathion used for control of lice and flies on swine.	10.5% dioxathion concentrate.	Father of child had poured some dioxathion from its original glass container into plastic milk bottle to prevent breakage. Child found the container and took a sip thinking it was tea.	Child responded to hospital treatment.
44	North Carolina	55-year-old man	August 1966	Hydrogen cyanide gas used for fumagating purposes.	96% hydrocyanic acid.	The man, manager of an exterminating company, was making final check on fumagating job where hydrogen cyanide gas (released at the rate of 1.5 pounds per 1,000 cubic feet) was being used in small house containing all furniture and appliances. He opened the refrigerator and drank water from open plastic bottle which is thought to have been contaminated with hydrogen cyancide gas.	Man died in hospital.
45	Teas	Cattle	April 1966	Toxaphane used for controlling ticks, lice, and horn flies.	45% toxaphene, 0.45% gamma isomer of benzene hexachloride.	20 stocker steers and heifers, average weight 275 pounds and 4 to 8 months old, were sprayed until wet. The animals were also drenched with phenothixaine at rate of 2 ounces per animal. Animals were pastured overnight in a 40' X 50' lot. It was concluded that surplus pesticide dripped off cattle onto grass and hay and cattle fed on the contaminated feed during the night.	5 calves were found dead the next morning. The remaining were ill. After washing calves with detergent and water and administering chloral hydrate, calves gradually recovered over a 4- to 5-day period.
46	South Carolina	2-year-old boy	July 1966	Guthion H-E concentrate used for spraying cotton fields.	22.2% guthion H-E concentrate.	The child found a cup that had been used for measuring the guthion H-E concentrate and apparently drank some of the insecticide remaining in the cup.	Local doctor administered atropine sulfate intravenously and sent child to hospital where he was pronounced DOA.
47	Massachusetts	Cattle	August 1966	Herbicide containing sodium arsenite used for killing grass and weeds.		Herbicide was used by a gas transmission company for spraying around gasline markers near fence line of two adjacent pastures. Within few days, grass within a 10-foot radius of markers was dead; a great deal being within pasture fences. Animals apparently fed on affected grass.	2 heifers died of acute arsenic poisoning. A Holstein cow and a young bull recovered after treatment.
48	Maryland	44-year-old man	August 1966	Pesticide used for controlling spider mites and other pests on apple trees.	1¼ pints of 40% tepp EC 5 pounds of 50% Sevin WP 5 pounds of 50% captan WP 500 gallons of water	Before mixing the pesticide, owner of nursery instructed worker to follow label directions and furnished rubber gloves and a respirator; neither had been used. While mixing the formulation worker apparently rubbed chemical on his neck after becoming ill and in dazed condition. He crawled under the elevated wooden platform used for mixing pesticides and was further exposed to accumulated spillage from previous mixings.	Worker recovered after hospital treatment.
49	South Carolina	4 Children 1 Adult	May 1966	Defoliant containing arsenic trioxide used for controlling brush and weeds.		Children along with other residents of area harvested blackberries along spur line which was partially sprayed with herbicide. Two children consumed blackberries directly. The other 2 and one adult consumed them in a serving of pie. The company, contracted to do the spraying, immediately discontinued use of the herbicide when county health officials informed them of the accident.	The 4 children and one adult recovered after hospital treatment.
50	New Jersey	Adult Male	August 1966	Parathion dust used for control of cabbage looper on cabbage.	1% parathion dust.	Insecticide was applied to field with tractor-drawn dusting equipment. The rate of application was 35-40 pounds of 1% parathion per acre. Apparently neither respirator nor other available safety equipment used. It was concluded that the worker apparently handled all pesticides in same manner and regarded them rather matter-of-factly after many years of farming.	Worker recovered after treatment.
51	Maryland	6-month-old girl	September 1966	Oixsinon used as roach killer.	Emulsion containing 1.5% diazinon.	Mother took her children to her mother-in-law's home along with can of condensed milk and a half-gallon container (unlabeled) containing about 8 ounces of a white "milky" liquid. No mention was made as to what was in the bottle. Thinking it was milk, mother-in-law placed the container in the refrigerator and later prepared a bottle for the baby. The baby consumed 40cc of its contents.	Baby died in hospital.
52	Alabama	2-year-old girl	July 1966	Insecticide concentrate.	45% toxaphene, 1.96% lindane, 10% methylated naphtalene, 25% petroleum distillate, 18.4% inert ingredients	Child was left in pickup truck with soda bottle containing insecticide. Color of concentrate was similar to cola, and child drank from bottle.	Vomiting was induced at home, and child was rushed to hospital where she died following day.
53	Horth Carolina	79-year-old woman	September 1966	Arsenic.	3.5% arsenic trioxide.	Woman, with failing eyesight, asked 81-year-old husband, who could not read, for bottle of milk of magnesia. Husband handed her poison by mistake.	Woman was first treated as a diabetic patient, which she was. When poison bottle was discovered, proper treatment was administered. Woman died approximately 10 hours after ingestion.
54	Alabama	Cattle	October 1966	Parathion emulsiable concentrate purchased for control of clover head weevil.	48% active ingredients.	Parathion was apparently mistakenly painted on backs of 8 or 9 cattle for fly control. When mistake was discovered, owner administered treatment. Parathion was properly labeled.	3 or 4 head of cattle were saved but 3 registered Hereford bulls and 2 cows died.

PESTICIDE ACCIDENTS INVESTIGATED

ACCIDENT NUMBER	STATE	SPECIES	DATE	PESTICIDE USED	MIXTURE	HOW CONSUMED	EFFECTS
55	Pennsylvania	1½-year-old boy 3 -year-old boy	October 1966	Sodium flouride.	95% sodium flouride.	Children found bottle of poison purchased by an aunt at a local drug store. Older child allegedly sprinkled poison over chocolates, and both ate chocolates.	Both children died in hospital approximately 8½ hours after ingestion.
56	Minnesota	5-year-old boy	October 1966	Lindane tablets used in vaporizers.	98% gamma isomer of benzene hexachloride.	Lindane tablets being used in vaporizer in basement of home. It was not determined how child obtained tablets.	Child was found lying at foot of basement steps in convulsions. It was first assumed that he had fallen and struck his head. He was rushed to hospital for X-rays. A younger brother then volunteered information that stricken child had eaten the tablets. He was taken to another hospital, but died about 66 hours after ingestion.
57	Texas	15-year-old girl	August 1966	Parathion used for controlling cockroaches.	4% parathion.	Parents purchased insecticide from local grocer who formulated it by mixing emulsifiable concentrate in water and rebottling it in a used quart-size, screwtop, glass, disposable bottle. There was neither a label nor directions for use. The formulation was sprayed on walls and floors in home and remainder was stored in bathroom. Youth was apparently exposed to insecticide.	Youth was found on floor in convulsions and rushed to hospital where she was pronounced D.O.A.
58	New Jersey	adult man	July 1966	Parathion-mevinphos	One-quarter lb. of parathion and one-quarter lb. of mevinphos per acre.	Workers mixing formulation exposed because protective equipment not worn except for rubber gloves during later part of day.	Two men became ill and required treatment at poison control center and hospitalized for 3 days.
59	New York	15-month-old baby	Dec. 1966	Parathion	15% wettable powder	Powder applied by hand in home. Empty container placed in garbage can. Child found container and became exposed.	Child found ill in kitchen. He was taken to hospital for treatment and subsequently recovered.
60	Connecticut	4-week-old baby	Dec. 1966	Diazinon	4% diazinon	Bottle of mixed formulation was placed in the refrigerator. The formulation was fed to the baby by mistake.	Mother discovered error and took child to hospital for treatment. The infant was discharged the next day.
61	Vermont	Cattle	Dec. 1966	Diazinon	5 quart diazinon 25E to 25 gals. of water	Spray applied to interior of barn with cattle inside the building. Lable not followed in that Spray was about 2½ times recommended rate and cattle were not removed from barn during spraying.	Four cows had severe symptoms of dyspnea and anorexia, and several others milder symptoms. Cattle were washed and treated by a veterinarian.
62	Nebraska	4½-year-old boy 2-year-old boy	Aug. 1966	Parathion	10% granular parathion	A bag of insecticide was placed on top of a 50-gallon drum in the storage building. The children broke into the building, knocked off the bag, and played with the granules.	Father of children discovered them and rushed the children to a hospital for treatment after giving them a bath and changing clothes. Both children recovered

Plant Pest Control Division
Agricultural Research Service
United States Department of Agriculture

The protection of man, his food and fiber supplies, and his forests from the ravages of pests of all kinds is essential to the continued growth and strength of America and the progress and well-being of its people.

Even with modern pest control methods, harmful insects, diseases, nematodes, and weeds still cause serious damage to crops and livestock, with the estimated loss amounting to nearly one-fourth of our total yearly production. The cost of controlling these pests comes to over $3.1 billion a year.

Some 10,000 species of insects in the United States are classed as public enemies, of which several hundred are particularly destructive and require some measure of control. Other pests capable of causing serious economic loss include 600 weed species, 1,500 plant diseases, and 1,500 species of nematodes (microscopic worms).

Of the 457 million acres of farmland in the United States, 15 percent (69 million acres) produces crops needing some degree of protection from insect pests. Some form of weed control is used on all cropland and also on a high percentage of the more than one billion acres of forage and grazing land. Most grain and all cotton seed requires chemical treatment for prevention of plant diseases.

CHEMICALS -- A MAJOR WEAPON AGAINST PESTS

Pesticides are generally the most effective and, in many instances, the only weapons available to fight pests that damage or destroy crops, livestock, and forests or endanger human health and oru natural resources.

The development since 1945 of modern pesticides, together with other technical advances, has made possible a spectacular advance in American agricultural efficiency. During the past two decades, farm output per acre has increased by at least a third, keeping pace with the needs of an exploding population at home and growing markets abroad.

At the same time, these chemicals have played a major role in protecting man's health and well-being. They not only are used to produce and protect the abundance and nutritional quality of our food, but serve us directly in suppressing the pests that transmit malaria, yellow fever, typhoid, and many other diseases, and in controlling poisonous plants.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE SEPTEMBER 1966 - Rev.

USDA Policy on Pesticides

The U. S. Department of Agriculture has major responsibilities for protecting man, animals, plants, farm and forest products, and communities and households against pests. In carrying out these responsibilities, the Department seeks to:

(1) Protect the health and well-being of people who use pesticides and consumers who use food and other products protected by pest control chemicals, and

(2) Protect fish, wildlife, soil, air, and water from pesticide pollution.

The Agriculture Department uses in its own pest control programs and encourages others to use those means of effective pest control which provide the least potential hazard to man and wildlife and least danger of air and water pollution.

The Department strongly supports the use of biological, cultural, mechanical, and ecological pest control methods or non-persistent and low toxicity pesticides whenever such means will do the job effectively and safely. When residual or long-lasting pesticides are necessary, the Department urges they be used in the smallest effective amounts applied precisely to the infested area, and no more often than needed for effective control or elimination of the target pest.

The Department implements this policy through its own research and control programs. USDA scientists recently developed a new low-volume spraying technique for applying undiluted malathion, an effective but non-persistent chemical of low toxicity to warm-blooded animals. The technique has been used successfully against grasshoppers, cereal leaf beetle, boll weevil, and spruce budworm. In boll weevel spraying, this low-volume method has reduced the amount of insecticide used per acre from three gallons of liquid to 16 ounces of undiluted malathion. One planeload can do the work which previously required 23 planeloads. Before any pesticide can be registered with directions for low volume application, adequate data must be available to show that the use would be safe, effective, and would not result in illegal residues on food.

The Federal-State program to control the imported fire ant, begun in 1957 in the Southeastern State initially used 2 lbs, of heptachlor per acre for control. Continued USDA research cut use to 1-1/4 lbs. per acre, and then to two applications of only 1/4 lb. spaced 3 to 6 months apart. Finally, heptachlor was entirely replaced with the much less toxic mirex bait which is considerably less hazardous than heptachlor.

The average number of fungicide applications needed to control potato late blight in the northcentral and northeastern states has been reduced from ten to five per year. USDA scientists made this possible through development of more accurate disease forecasting and related proper timing of fungicide applications.

As a result of research work, the U. S. Department of Agriculture has switched from the use of pesticides to insect sterilization in the battle to keep the Mexican fruit fly under control along the border with Mexico. Male flies treated with either chemosterilants or gamma radiation are released to mate with females, thereby preventing reproduction and keeping the fly population in check.

Pesticides and the Farmer

The use of chemicals to fight pests dates back at least to the ancient Greeks who employed brimstone (sulfur) as an insecticide. Common salt probably was used in ancient times as the first chemical weed killer.

In the U.S., settlers in the Great Plains in 1869 prevented their own starvation by use of Paris green, a crude arsenical, to save their potato crops from the Colorado potato beetle. Settlers also treated their grain seeds with copper sulfate to protect grain from plant disease.

In recent years, pesticides have become a common tool of progressive farmers. Last year, nearly $1 billion worth of pesticides were used to produce and protect agricultural and forest products.

Herbicides were used for weed control on more than 70 million acres of agricultural land in 1962 at a cost of more than $272 million. Principal application: approximately 25 million acres of corn, 6 million acres of cotton, 3 million acres of soybeans, 20 million acres of small grains, and 7 million acres of pasture and rangeland. Herbicide usage is increasing markedly each year.

It is estimated that insecticides are used by farmers to protect 32-1/2 million acres of grains (including corn, feed sorghum, and rice), 12 million acres of cotton, 2-1/2 million acres of fruit and nuts, 2 million acres of vegetables (including potatoes), and about 20 million acres of other crops. These treated crops occupy about 15 percent of the total crop acreage.

Of the 758 million acres of forest land, less than three-tenths of one percent is subjected to any pesticide treatment in any one year.

Ninety-seven percent of our native grasslands have never had a pesticide applied to them. About 75 percent of the total land area of the U. S. has never had any pesticide applied to it.

Pesticides and the Consumer

The effectiveness of modern pesticides in controlling agricultural pests helps keep food cost down and quality high. It is estimated that if pesticides were to be completely withdrawn from farm use, crop and livestock production in the United States would drop by 25 to 30 percent.

This sharp cut in production could boost the price of farm products by 50 to 75 percent, and increase food's share of the family budget from less than one-fifth at present to as much as one-third. The quality of this reduced supply of vegetables, fruit, meat, and other food items would be visibly poorer than at present.

Without pesticides, potato production would be virtually wiped out in the East by disease, and peaches and citrus fruit probably would be destroyed by insects and disappear almost completely from food markets.

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During the Second World War, production of sweet corn in the United States was greatly reduced due to the depredations of the European corn borer and the corn earworm. In 1946, blight destroyed over 50 percent of the tomato crop in ten states. These popular table foods were restored to full production through protection with modern pesticide.

Some of the American consumer's favorite vegetables might be priced out of the food markets if weeding on farms was still done by costly hand labor instead of with chemical weed killers.

Pesticides in the Home and Garden

Approximately 15 percent of all pesticides sold are purchased for home and garden use, and last year totaled over 50 million pounds of insecticide preparations. By controlling destructive or disease-carrying pests, these chemicals help make possible our modern way of life.

The aerosol principle, now a commonplace method of applying insecticides in the home as well as dispensing everything from deodorants to whipped cream, was invented during World War II by U. S. Department of Agriculture scientists. About 80 million aerosol "bug bombs" were sold in 1965 for use against such common home pests as flies, mosquitoes, roaches, and ants, and for protection of flowers and ornamentals.

Wildlife Conservation and Pest Control

Protecting man, his food, and his fiber against pests is conservation in the broadest sense of the word. Protecting wildlife is a vital part of the Department's dedication to conservation.

The nation's farmers, ranchers, and foresters play a key role in maintaining an abundant wildlife population because it is their agricultural and forest lands that provide the habitat for most of the nation's wildlife.

USDA takes this fact into account in conducting research and helping landowners and operators plan the water conservation measures now in use on two million American farms.

The Soil Conservation Service of the U. S. Department of Agriculture reports that in 1964 there were 7.9 million acres devoted to preserving wildlife habitat within the nation's 2,989 Soil Conservation Districts. In 1965, our farm and ranch lands contained over 1.4 million man-made ponds, 3,891 multi-purpose dams, 30,525 miles of hedgerow, 11.8 million acres of seeded rangeland, 11.8 million acres planted in trees, and numerous other conditions favoring the expansion of our wildlife and fish populations.

Pesticides are used in ways directly beneficial to wildlife. For example, herbicides are employed to eliminate poisonous plants and brush from rangeland and aquatic weeds from ponds, lakes, and streams. Treated rangeland is replanted with forage suitable for grazing by antelope, deer, elk, and other wildlife species as well as cattle. Elimination of aquatic weeds permits growth of food plants needed by fish and other aquatic life.

Increases of up to 65 percent in the deer populations have been reported in areas of Texas from which the screwworm fly, a highly destructive animal parasite, had been recently eradicated by the USDA, with non-chemical means, in cooperation with southern states and livestock producers in those states.

National forests, administered by the Forest Service of the Department of Agriculture, shelter many species of fish, birds, and mammals. Through careful planning and supervision, pesticides can and are being used to protect timber and range values in these forests without adversely affecting wildlife populations or their habitat.

About one-third of the big game animals taken by hunters in the U. S. comes from the national forests. In recent years, the population of deer, bear, antelope, elk, moose, and other big game in these forests has been at one of the highest levels recorded in the past two decades, according to Forest Service estimates.

In the application of pesticides to forest lands, the Forest Service carefully delineates the infested areas to be treated, marks off buffer zones bordering lakes and streams, and monitors the effects of certain pesticides on wildlife and fish in and near treated areas. Federal and State fish, wildlife, and public health agencies are consulted during the planning of chemical pest control projects by the Forest Service and are often directly involved in the monitoring of these projects.

The control of diseases, insects, weeds, and other pests harmful to man, livestock, farm crops, and forests contributes directly to preserving an abundant and healthy wildlife population.

PROTECTING PRODUCERS AND CONSUMERS

The U. S. Department of Agriculture carries out many programs and works with other agencies to help safeguard men, animals, and their environment from the ravages of pests and from potential hazards associated with pesticide use. Federal laws and regulations administered by USDA govern the movement and sale of pesticides in interstate commerce. Pest quarantine barriers are maintained to keep foreign pests from entering the country. Monitoring programs keep watch on pesticide residue levels, if any, in meat and poultry products, and measure the effect on agricultural pesticides generally. Continuing research is conducted in an effort to find better and safer pest control methods. Public education and information programs promote the safe use of pesticides.

Registration

Every commercial pesticide formulation must be registered with the U. S. Department of Agriculture before it can be sold in interstate commerce. Before registration is granted, a pesticide must meet rigid tests, proving its claimed effectiveness against a particular pest or pests and demonstrating its safety to humans, crops, livestock, and wildlife when used as directed.

A pesticide manufacturer often must undertake as much as 3 to 5 years of exacting scientific research to obtain proof acceptable to the U. S. Department of Agriculture of the safety and effectiveness of a single new pest control chemical. In addition, the Department itself conducts intensive research on pesticides to assure the development of effective and safe use practices.

In the two decades since the development of DDT, 2,4-D, and other pest control chemicals, over 60,000 pesticide formulations based on more than 800 individual active chemical ingredients have been registered with the U. S. Department of Agriculture's Agricultural Research Service.

When application is made for registration of a pesticide with directions for use on food or feed crops, the U. S. Department of Agriculture withholds registration and notifies the applicant that he must petition The Federal Food and Drug Administration for a tolerance to cover any residues resulting from such use. This legally enforceable level is set well below the point at which residue might be harmful to consumers.

A three-way agreement was concluded in 1964 providing for coordination among the Departments of Agriculture, Health, Education, and Welfare, and Interior on the clearance of pesticide registration applications and the establishment of residue tolerance levels.

Forty-eight states have laws which in some degree regulate the sale and use of pesticides within the state. A number of states also set residue tolerance limits for foodstuffs grown and marketed within the state's boundaries.

Labeling

Federal regulations regarding pesticide labels are designed to protect both the user of pesticides and persons who may also be exposed. The law requires that key warning and caution statements be displayed on the front panel of pesticide labels. The nature and scope of any safety claim on the label must conform to the proven facts.

All pesticide labels must bear registration numbers indicating the product has been accepted by the U. S. Department of Agriculture as adequate to permit both safe and effective use when label directions are followed.

During 1965, the U. S. Department of Agriculture had U. S. Marshals seize 71 shipments of separate pesticidal products on charges that the products were shipped interstate in violation of the Federal Insecticide, Fungicide, and Rodenticide Act. Alleged violations included lack of Federal registration, adulteration, misbranding, and other illegal practices.

Watching for Residue

USDA meat and poultry inspectors conduct a continuing pesticide residue surveillance program to insure that meat from animals and birds slaughtered under Federal inspection is free from harmful pesticide residues. The Food and Drug Administration monitors the entire range of food products for the same purpose. In total diet studies done periodically on marketed foods eaten by a 16-to-19 year-old boy, the biggest eater in America, FDA tests have found that residue is either not present at all, or is found in amounts so small as to constitute no human health danger.

All pest control programs in which the Department participates and which involve the use of pesticides are monitored -- often by outside conservation agencies--for any adverse effects on wildlife, fish, and beneficial insects. The data obtained is used in the planning of future programs for maximum safety and effectiveness.

As part of a national program to monitor the total environment for pesticide residues, USDA scientists and technicians are engaged in checking the soil and water at 55 locations throughout the Nation to determine the extent and nature of residues traceable to agricultural chemicals. These locations cover both agricultural areas of high pesticide use and such non-farming areas as forests, plains, arid rangeland, and hardwood regions.

Federal Pest Control Programs Reviewed, Monitored

The Federal Committee on Pest Control, established in 1961 at the request of the Secretary of Agriculture, reviews all pest control activities in which the Federal Government participates. The committee, consisting of representatives of Agriculture, Interior, Defense, and Health, Education, and Welfare Departments, examines each proposal for soundness of planning and any possible hazards to the public generally and to wildlife. Similar review committees have been established in many states and provide an added safeguard against possible hazards in pest control programs where there is no Federal participation.

Federal pest control programs involve less than 3 percent of all the pesticides used in this country each year. When warranted, the use of pesticides in these programs is carefully monitored before, during, and after the program.

A U. S. Department of Agriculture Pesticides Committee also reviews and directs the Department's efforts to develop safe and effective control programs. The Committee cooperates with other Federal and State agencies and private organizations to coordinate research and to provide effective regulatory programs.

Quarantine Barriers

Federally established quarantines against agricultural pests have two objectives: To keep potentially dangerous insects and diseases from entering the country, and to prevent the spread of established pests from one State or region to another inside the country.

Most of our most destructive agricultural pests are of foreign origin. The majority of these were introduced prior to 1912 before the Federal Plant Quarantine Act was passed.

Plant quarantine inspectors of the U. S. Department of Agriculture intercept potentially dangerous pests at ports of entry on an average of once every 16 minutes. During 1965, inspectors prevented 32,572 insects, diseases, and other plant pests and 446,247 lots of prohibited plant material from entering the United States. They examined ships, planes, trains, cars, and -- in cooperation with customs inspectors -- over 36.6 million pieces of passenger baggage.

USDA animal quarantine inspectors, checking animals shipped to the United States, turned back more than 19,600 during 1965 because of disease and other livestock pests.

When a major pest accidentally manages to get through the quarantine barriers, the cost can be high to farmers and the public. A Federal-State program costing $10 million including the expense of extensive aerial spraying was needed to eradicate the Mediterranean fruit fly after it slipped into Florida in 1956 and became established there. It would have cost the Florida fruit industry $20 million a year to live with this pest.

Similarly the discovery of witchweed, a parasitic native of Africa, in North Carolina in 1956, led to a Federal-State control program which cost $25 million through 1964. This pest is a potentially serious threat to the country's $5 billion corn, sorghum, and sugarcane crops. Multiple herbicide treatments have succeeded in confining witchweed to 35 contiguous counties in North and South Carolina where the damage it does is minimal.

PEST CONTROL WITHOUT PESTICIDES

From necessity, pesticides will continue to be the major pest control weapons in the foreseeable future. However, their use has created special problems such as:

- -- some 70 species of insects in the United States have developed resistance to chemicals used against them.
- -- the misuse of some chemicals may result in harm to beneficial insects, birds, and other wildlife as well as fish.

Non-chemical pest control methods -- including biological, cultural, and mechanical -- are both very old and very new. These methods sometimes are sufficient, but more often their most effective use is in combination with chemical control. Research into non-chemical and specific chemical pest control techniques by the U. S. Department of Agriculture has received increasing emphasis and funds in recent years. More than two-thirds of the research on insects is now devoted to developing new biological controls for major pests and basic information about insects. The search for new ways of controlling weeds, diseases, and nematodes also is being greatly intensified by USDA.

Predators and Parasites

The biological approach to the control of insect pests was one of the early pest control weapons developed by U. S. Department of Agriculture scientists. In 1888, the Department sent an entomologist to Australia to seek natural enemies of the cottony-cushion scale which then threatened the citrus industry in California. He returned with the vedalia beetle, which devoured the scale and saved an industry.

U. S. Department of Agriculture scientific explorers have repeatedly traveled around the globe in search of insect parasites, predators, and diseases that might help control agricultural pests in this country. In all, some 650 species have been imported and at least 100 of these have become successfully established here.

A parasitic wasp brought here from Japan by U. S. Department of Agriculture scientists now helps reduce infestations of Japanese beetle in the Eastern States. Other beneficial insects introduced into the U. S. are providing some control of such major insect pests as gypsy moth and European corn borers, Larch casebearer, and balsam woolly aphid.

A beetle imported from Australia in 1944 has brought Klamath weed under effective control on 400,000 acres of western rangeland. The beetle feeds on the weed but does not eat grass or other valuable plants. Rangeland that was almost worthless for grazing because of this weed has been made useful again.

Sterilization, Attractants

The screwworm fly, a parasite of livestock, wildlife, and humans, has been eradicated from all but a small area of the Far West through a unique program conducted by the Department of Agriculture's Research Service and cooperating states. In this program, millions of male screwworm flies were sterilized by radiation. Released in infested areas, the mating of these sterile males with native females halted the reproductive process, wiping out this costly pest.

A number of chemical sex attractants of major insect pests have been identified and isolated. The use of these is being exploited in the hope that they will prove useful in control work.

Diseases Against Insect Pests

USDA scientists are also developing a kind of pest control observed in nature: The killing of insects by their own diseases. The ideal microbial insecticide is one that is highly infectious for at least one pest insect but preferably for a large number of kinds. It is easily and inexpensively produced. It is capable of being stored for a long period. And it poses no hazard to man, animals, or beneficial insects.

Certain carefully tested microbial insecticides are now being used under scientific guidance against some forest and farm pests in the United States and other countries. In addition, two kinds of microbial insecticides are being produced commercially in this country having been registered with USDA for specific uses. One preparation contains milky disease spores for killing Japanese beetle grubs, and the other is a bacterium for use on a limited number of crops to control certain kinds of caterpillars.

Trapping, Burning, Flailing

Three hundred and seventy light traps using ultraviolet or black light lamps caught from 50 to 80 percent of the adult tobacco hornworm moths in a USDA experiment covering a 113-square mile area of North Carolina. When unmated female moths were added to light traps, the catch of male moths greatly increased.

Flame cultivation, or the selective burning off of weeds using a mechanized multiple flame thrower, is gaining wider use in cotton and other crops as a result of the recent development of a new hooded flame nozzle and other refinements by USDA agricultural engineers.

Another new mechanical pest control technique developed by the Department involves a machine which vacuums up fallen immature cotton bolls or squares and destroys any boll weevils on them by flailing.

Pest-Resistant Plants

It usually takes several years to develop a crop variety resistant to a single pest, and much longer to incorporate multiple resistances to a complex of insects, diseases, and nematodes, which must be controlled on a single crop.

Twenty-four varieties of wheat resistant to the hessian fly are grown on 8-1/2 million acres in 26 States, with the net benefit to farmers estimated at $16,000,000 to $18,000,000 per year from use of these varieties.

The wide use in recent years of four USDA-developed varieties of alfalfa resistant to bacterial wilt disease has prevented an annual loss of $100 million in farm income that would have resulted from planting wilt susceptible varieties on the same acreage.

Certain varieties of potatoes have been found resistant to at least 14 species of insects, including leafhoppers, Colorado potato beetle, and the tuber flea beetle.

Pesticides Information Center

The Pesticides Information Center was established in 1965 as part of the USDA's National Agricultural Library. Scientific and technical information on pests and their control is made available by the Center to scientists, administrators, and others working in the pest control field. A Pesticides Documentation Bulletin listing pertinent literature is published bi-weekly by the Center.

USE PESTICIDES EFFECTIVELY AND SAFELY

The U. S. Department of Agriculture carries on a continuing program to inform the public -- farmers, homeowners, gardeners, and others -- concerning the safe, effective use of pesticides. The Department distributes popular publications on the subject, furnishes radio and television stations with safety announcements, produces motion picture and exhibits for groups showing, and uses numerous other means of disseminating information to the public on pest control and pesticide safety.

Complementing and reinforcing the national pest control information program are the joint Federal-State cooperative educational programs conducted by the individual States working with USDA's Federal Extension Service. These programs are tailored to bring detailed information to specific audiences such as farmers, pesticide applicators and dealers, gardeners, and others who have specific pest control problems. In addition to mass media outlets, Extension makes frequent use of workshops and group demonstrations to encourage the safe use of pesticides.

The States receive all new information on Federal pesticide registrations and regulations, and on the latest research-based suggestions concerning the best means for controlling pests. This information is available to everyone through local county agents or State land-grant universities.

Among the materials issued by the U.S. Department of Agriculture on safe, effective use of pesticides are: Publications --"Your Home and Safe Use of Pesticides," "Farmers' Checklist for Pesticide Safety," "Safe Use of Pesticides," "Aerial Application of Agricultural Chemicals," and others. Motion pictures --"Pests or Plenty?" and "Safe Use of Pesticides." Slide set --"Safe Use of Pesticides."

Safety Rules for Pesticide Use

** Read the container label ... follow the directions.

** Mix pesticide solutions in a well-ventilated area, preferably outside.

** Avoid inhaling pesticide sprays or dust.

** Never smoke while handling pesticides.

** When using a pesticide outdoors, apply when there is little or no wind ... to minimize drifting of the spray or dust.

** Don't use pesticides near wells, cisterns, and other water supply sources.

** Avoid chemical contamination of streams, lakes, or ponds in order to protect fish and wildlife.

** When protecting food crops against pests, observe proper times and rates of application.

** Keep weed control chemicals away from flowers, ornamental shrubs, and other valuable plants.

** Wash with soap and water and change clothing immediately if you spill a pesticide on skin or clothing.

** If a pesticide is swallowed accidentally, call a physician at once. If splashed in eyes, flush with water immediately.

** Store pesticides in closed, well-labeled containers, where children and pets cannot reach them. Do not place near food, feed, or seed.

** Wrap empty pesticide containers, or those with unwanted pesticides, in heavy layers of newspaper and put them in the trash can, if trash collection service is available. If there is no such service, carry containers or surplus pesticides to sanitary land-fill type dump or bury at least 18 inches deep in a level, isolated place where water supplies will not be contaminated.

PROTECT

Use Pesticides Safely

FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE

Mr. JOHNSON. I think there is a wide variance between the kinds of legislation that exists in any of the States that they have it. Some of it is good. Some of it should be updated.

Senator MONDALE. But the basic point is that insofar as consumer protection is concerned, we have authority to prevent shipment of contaminated food. But insofar as those most exposed to the danger of pesticides, the farm workers, there is no Federal protection.

Mr. JOHNSON. There is not, except that which is provided under the Federal Pesticide, Fungicide, and Genocide Act.

Senator MONDALE. Basically it is a State responsibility, and you would have to look at those statutes. And I would ask the staff to prepare a study on that, particularly Senator Bellmon's point that many of those statutes are not drawn with the protection of the worker in mind. He has another kind of point in mind.

I would like to ask Dr. Simmons a few questions, if I might, since I understand he has been making the studies to which you have reference.

Dr. Simmons, you say there are 15 studies which are directed, at least in part, at the farm worker. When were these studies begun? How sophisticated are they, in your judgment, in reflecting a comprehensive and responsible picture of the exposure to pesticide problems of the farm worker of America today? Can you respond to that?

Dr. SIMMONS. These studies were started in 1965, the first one, but they have been added to since then. And it took a considerable period to get people and get them going, so most of them have been in full-scale operation 2 or 3 years. Some of them were just started a little over a year ago.

Senator MONDALE. Were these studies exclusively directed to pesticide risks to which the farm workers are exposed?

Dr. SIMMONS. We are studying the long-term effect of exposure of pesticides to people, and I would say that probably over 50 percent of the some—1,500 people in these studies are farm people in one way or another—actual farmers or sprayers, pilots, or something of that sort.

Senator MONDALE. Do they tend to be the applicators or the farm workers?

Dr. SIMMONS. We have all kinds. We selected the farm workers. We selected applicators. We selected, in a few instances, formulators and manufacturers.

Senator MONDALE. Are some of the results of these studies such that you can tell us what the disclosures established thus far about the dangers to the migrant and farm workers in the use of pesticides in the fields?

Dr. SIMMONS. As Mr. Johnson pointed out before, the dangers to migrant workers are not any greater than to other farmers. And, of course, the information you get from one farmer will apply to the other. We have not encountered any frank illness or known danger to health among farmers using pesticides other than acute illnesses caused by accident. But we do not know what will occur after 10 years or so. But pesticides used as directed according to the label which has been approved has not caused illness among farmers.

Senator MONDALE. You are not limiting your study on that condition, are you, that the farmer pursued the specific instruction of the labeling?

Dr. SIMMONS. No.

Mr. JOHNSON. Could I amplify that last point a moment, Mr. Chairman? When we talk about a "frank illness," we are talking about something that has a cause-effect relationship that puts you in a hospital bed and under the care of a doctor because of that. What we don't know and what we hope to get some indication of out of these community studies is, do these low-level exposures contribute to liver ailments or kidney ailments or heart disease or respiratory ailments? Until we get this kind of an insight into this type of environment to which the worker is exposed, it is very difficult to say that they do or they don't.

We know the people get ill and they get ill from a lot of things. For instance, a parallel might be the relationship between smoking and health. No one can say for certain, but the highest statistical evidence of relationship between certain types of manifestations and smoking causes us to conclude that this is bad for your health.

Senator MONDALE. Are you saying, then, that the pesticide studies are highly tentative in terms of the risk to which a farm worker may be exposing himself over the long term?

Mr. JOHNSON. That is correct.

Senator MONDALE. So it should not be taken to be final or definitive in this field.

Mr. JOHNSON. It can't at this time. We do not have enough data. The studies have not been underway for enough time. We have considerable time in terms of laboratory and animal experimentation. In the final analysis you have to be able to translate in this——

Senator MONDALE. You have more research on animals than people?

Mr. JOHNSON. It is a lot easier to sacrifice an animal and find out what happened to his liver or kidney than it is a human being.

Senator MONDALE. In this case human, right out there in the field.

Mr. JOHNSON. That is correct. And that is the reason we have now designed the kind of studies that will give us the kind of information that will further interpret what we learn in the laboratory.

Senator MONDALE. Dr. Simmons, do you in your office receive reports from around the country that may be submitted by State or local governments, or others, of injuries and deaths related to pesticides?

Dr. SIMMONS. Not each individual one, but we do receive and have published on the mortality and morbidity in this country.

Senator MONDALE. Does that relate to pesticides?

Dr. SIMMONS. Relating to pesticides.

Senator MONDALE. What do your reports show in terms of morbidity and mortalities last year relating to pesticides?

Dr. SIMMONS. I don't think that we have it for last year, but it runs approximately about 150 to 200 deaths per year.

Senator MONDALE. From pesticides?

Dr. SIMMONS. From pesticides.

Senator MONDALE. Is that principally farm workers?

Dr. SIMMONS. No, not necessarily. I can't give you a breakdown.

Senator MONDALE. Could you give us a breakdown?

Dr. SIMMONS. I don't know.

(Thereafter the following information was subsequently supplied by Mr. Johnson:)

A BREAKDOWN OF THE OCCUPATIONS OF PEOPLE WHO DIED FROM PESTICIDES

Data are not available which would enable us to furnish a complete breakdown relating occupations to deaths due to pesticide poisoning.

Senator MONDALE. Do you feel that the 150 deaths reported in that last year which you made reference fully reflects the number of deaths arising from exposure to pesticides?

Dr. SIMMONS. I don't think so. But it is more accurate than the estimated morbidity.

Senator MONDALE. You said that you had 150 to 200 per year or something like that. By what magnitude do you think this underestimates the number of deaths and injuries derived from pesticides?

Dr. SIMMONS. I don't know because there are accidental deaths that are diagnosed as something else. And I don't know how many.

Senator MONDALE. In other words, a person may die of pesticide exposure.

Dr. SIMMONS. Let me give you an example. In Dade County, Florida, there were three deaths reported to the Poison Control Center. They happened to have a very good medical examiner, and they had recorded 29 deaths.

Senator MONDALE. I read or heard of a specialist in this field who says he thinks those estimates are about 400 percent under the actual deaths and injuries attributable to pesticides. Would you reject that out of hand?

Dr. SIMMONS. No, I would not. As I say, we found three at the Control Center in Dade Country, and there were 29 at the medical examiner's office. I don't think that is a typical one. But certainly if you had them thoroughly investigated, you would find them considerably higher.

Senator MONDALE. So that we don't know, but it won't be unusual if we had an in-depth national survey to find 800 or more deaths per year from pesticides?

Dr. SIMMONS. Yes. I wouldn't think it would be that much, but I wouldn't be surprised.

Mr. JOHNSON. I think the answer, Mr. Chairman, is that we just don't know.

Senator MONDALE. Now we are trying to find out whether farm workers are exposed to serious risk. We have a national statistician who just testified that it is entirely possible that there are 800 or more deaths per year. Based upon spot check he finds that to be a reasonable possibility.

We recognize this isn't a hard scientific fact. We also recognize that hundreds of people are dying yearly from pesticides, and we want to see a sense of urgency that shows some concern about the value of human life. I know that you agree with me on that.

Mr. JOHNSON. I certainly do.

Senator MONDALE. We are trying to get something here we can deal with.

Dr. Simmons, you talked about the number of deaths, maybe 150 to 200, that are actually reported, and the possibility there might be four times that. What about injury figures? Do you have figures reflecting that?

Dr. SIMMONS. This is not a reportable thing in the States. We have studied this for years, and picked up information on it. And a lot of other people have, too, and there have been all kinds of estimates given, anywhere from 100 to 500 for each. We have been using—and this is indefensible, but it is all we can do—we have been using 100:1. So you can multiply your deaths by 100 and get the number of poisonings, but this gain is just a judgment.

Senator MONDALE. So if you had 800 deaths, you could multiply that times 100?

Dr. SIMMONS. That is right.

Senator MONDALE. To get 80,000 poisonings per year from pesticides?

Dr. SIMMONS. The figure we are using is around 150 to 200 multiplied by 100, because it stays fairly level, that is, the mortality rate.

Senator MONDALE. How many years have you been monitoring these figures?

Dr. SIMMONS. I have forgotten when we first published on it. I believe it was—Dr. Durham, do you remember the date we first published on the mortality and morbidity?

Dr. DURHAM. I think it was 1961, Dr. Simmons.

Senator MONDALE. What has been the trend in deaths and injuries?

Dr. SIMMONS. About the same.

Senator MONDALE. It has held constant.

Dr. SIMMONS. About the same. Of course, we don't work this up every year. It is a big problem. You have to circularize the States and work it up.

Senator MONDALE. You send a questionnaire to the States and ask for the figures. How many of the States respond?

Dr. SIMMONS. We get something from all of them.

Senator MONDALE. How many responses do you think are things you could use in your statistics?

Dr. SIMMONS. Most of them, all of them. We have communitiy studies in 15, and they know what is happening in those States. We have people assigned or contractual agreements with 15 others. So we have pretty good coverage and have people working in the State health departments that can get that data for us.

But the trouble of it is, they do not always have the correct figure, because a lot of this isn't reported.

Mr. JOHNSON. I would like to be sure that we keep this in the right perspective.

First, I want the record to be abundantly clear that if anybody is concerned about the migrant workers anymore than I am, they are well out ahead of the pack. I want to be sure that not only the migrant workers and farm workers are adequately protected from insults that come from environments. When we analyze the problem, we want to be sure we don't use one set of statistics which are somewhat obscure in terms of a specific objective that we are shooting too far and draw a wrong conclusion.

These 150 to 200 deaths include suicides. They include accidents.

Senator MONDALE. What percentage are suicides?

Mr. JOHNSON. I am not sure.

Senator MONDALE. What do you guess?

Mr. JOHNSON. I would not hazard a guess, but I will be glad to look these up and see if we can give you a breakdown on it. The mortality figures should not be too difficult to answer, is that correct, Dr. Simmons? But they do include suicides, they do include even this as a homicidal weapon.

(The following information was subsequently supplied by Mr. Johnson:)

WHAT PERCENTAGE OF THE DEATHS FROM PESTICIDES ARE SUICIDES?

There is no way to determine on a nationwide basis, the number of suicides from the use of pesticides. In most States, there is simply no single category of suicidal, accidental, or homocidal deaths which represent poisoning by pesticides. In the case of both suicides and homocides, these are frequently reported as accidental deaths unless there is definite proof to the contrary. The available data on this question is from Dade County, Florida where information of mortality records for the years 1956 through 1967 showed a total of 121 deaths attributed to pesticides, 69 of which were placed in the category of suicide. This is about 57.4% of pesticide deaths attributable to suicides in this study.

Mr. JOHNSON. This occurred again down in Florida just last year, where one man poisoned his whole family with parathion.

It also includes accidental deaths and these airplane pilots that you hear about dying.

Senator MONDALE. It is not just the farm workers, but if the pilots are flying in the field, because they have been poisoned because of what they are flying, might it not be a reasonable inference that it is not healthful to the workers on the ground either?

Mr. JOHNSON. We all agree there is some hazard to the workers. What we do not agree on is the degree of risk and what can be done about it and whether or not the pesticides are being used outside of their recommended limitation.

Senator MONDALE. That is right, doctor. I am not being critical of you, because this is our problem. It is not yours. Until we agree, we are letting the farmworker take the risk and continue to die and suffer injury, that is what bothers me.

Mr. JOHNSON. I am not sure that is a valid conclusion.

Senator MONDALE. You tell me why it isn't.

Mr. JOHNSON. I think what we are talking about is that within the limitation of the knowledge we have—and it is our job to assess this in terms of the environment—we believe that if the users of insecticides use these within the limitations of their prescribed usage, which are set out by the labels, that our Food and Drug Administration examines on the basis of the scientific evidence that they have, that the risk in terms of the need are within the bounds of safety. And we are continuing to study it because scientific knowledge is never firm. It is always changing. As we get more knowledge, then we do things differently. But you can't just stop everything.

I might give as an example that we know 50,000 people a year are killed by automobiles.

Senator MONDALE. That is right, and we passed the Auto Safety Act to do something about it. We now know there is an act that gives you authority to protect the consumers—and I am glad you have it—from the distribution of foods that have dangerous contaminants. But you have no similar authority to protect the farm workers who are most exposed.

Mr. JOHNSON. I am not saying we shouldn't have the authority. I want to be sure we get the problem in the right perspective.

Senator MONDALE. I respect what you are doing. I respect your work. But the thrust of your testimony is to try to play down the risk.

Mr. JOHNSON. Absolutely not. I think, Senator Mondale, that within the Department, when I came on board July 1 of last year, one of the first things that I said we were going to give high priority to was the problem of the pervasive use of pesticides in this country. And we have proceeded to do that.

I just want to be sure we do it within the realm of scientific knowledge and reason and not one of emotion. I think that there is a lot of evidence that points to exactly what you are saying. But when we begin to zero in on the specifics, let's be sure that we are doing it on the basis of the best knowledge that we can project.

I am supporting what you are trying to do, but I want to be sure we do it in the right perspective with the best knowledge and that we don't do it on the basis of emotional appeal.

Senator MONDALE. Mr. Johnson, would you agree with Dr. Simmons, who estimated it is not an unreasonable suggestion that 800 people are dying annually from pesticides, and that a multiple of 100-to-200 times that are being injured from pesticides? Would you disagree with that figure?

Mr. JOHNSON. I am saying there is no basis for agreement or disagreement. I don't know the statistics. Until I could see the basis against which that assumption was made, I have no basis for agreeing or disagreeing. I don't think very many people do, and I think anybody who thinks they know that, when there is absolutely no system for collecting the data—but that doesn't mean I am not in sympathy with having a need to have that kind of data, that I am not in sympathy with the need to protect the workers.

Senator MONDALE. Mr. Johnson, if you say there are no such statistics that assist you in recommending measures to protect the farmworkers, when will you have the figures that will be sufficiently persuasive to you to justify legislative recommendations? Will it be next month, the end of the year, or when will we have the figures?

Mr. JOHNSON. Certainly it will not be next month. The statistics we can give you in the immediate future are those we know we can get and place reliance on. Basically these are mortality data. Until we have a system that requires the reporting of morbidity data in terms of toxic poisonings, either acute or long-term effects, we will have to make some estimates. This system really has not been set up.

We will continue to utilize the knowledge, the information and data that we get from the States and give the best estimate that we can. To project these beyond the data that you get, I think, is courting with unreality and is a very difficult and hazardous thing to do.

Senator MONDALE. Are you testifying that the present data base will not disclose that which will be sufficient to justify any action to protect the farmworker?

Mr. JOHNSON. I have not said that in anything that I have said.

Senator MONDALE. Would you tell us when you will have data that you think will be adequate?

Mr. JOHNSON. I think we have data that tells us we have a problem out there. I would not have even become interested in pesticides if I didn't think the current research and knowledge and information gave us that evidence.

What I am saying is that I don't think that data is specific enough to tell us exactly what we have to do. It tells us we have to do something, that's all.

Senator MONDALE. Could you tell us what steps you are taking to get the specific data?

Mr. JOHNSON. The Secretary of HEW has established the HEW Commission on Pesticides in the Environment, as discussed in our statement. I believe we are going to get from it some guidance and expertise, in a consolidated fashion that will give us a better basis against which to make the decisions that you are talking about. I certainly think that our 15 community studies are producing data and information that will have to be taken into consideration. I would hope that we are not talking about something of a long-term nature. I think we have to keep things within the realm of scientific recognition and there will be a time, I hope in the very near future (and this could be 1 or 2 years) when we are going to do something on the basis of the information we have. We will do it promptly, and then we are going to modify this on further evidence as it evolves through our study and demonstration processes.

Once again I want to say that we are an actuary agency. We are going to do something to protect the health of the people in this country. Pesticides are one of the things threatening in some degree and there may be other alternatives and we hope we can find this, but we can not look at this in a vacuum, we have to look at it in the total effects of what does it do to our health in all aspects, and that is what I hope we are able to do.

Senator MONDALE. Do you have data indicating the tolerance levels for aldrin?

Mr. JOHNSON. For which product?

This will vary depending on the products you have in mind.

Senator MONDALE. For aldrin on grapes?

Mr. JOHNSON. For grapes we have 7 parts per million tolerance for grapes with aldrin.

One tenth per part per million in aldrin.

Senator MONDALE. I have a survey here prepared by C. W. England, dated August 1, 1969, submitted to us by the Farm Workers, that Thompson seedless grapes being sold in Washington Safeway Stores had 18 parts per million of aldrin.

Mr. JOHNSON. Certainly, Mr. Chairman, if that were so, and those samples were submitted to the FDA so we would be sure that the analytical technique was scientifically accurate, we would ban those grapes from the market.

Senator MONDALE. We will give you a copy of this and I would ask you to immediately determine whether that is true.

Mr. JOHNSON. We would be glad to.

Senator MONDALE. Thank you very much. I would like to express my appreciation to all of the members of the panel.

Mr. JOHNSON. Thank you.

Senator MONDALE. We will print your prepared statement in its entirety at this point in the record.

(The prepared statement of Mr. Johnson follows:)

PREPARED STATEMENT OF CHARLES C. JOHNSON, JR., ADMINISTRATOR, CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICE, PUBLIC HEALTH SERVICE, U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. Chairman, at the present time the pesticides programs of the Consumer Protection and Environmental Health Service are directed primarily at protection of the public and of those workers directly involved in the manufacture, handling, or application of pesticides through spraying or dusting operations. The possible harmful effects to migrant agricultural workers, who commonly work at such jobs as thinning, weeding, or picking, have not been the subject of specific investigation. I believe, however, that certain of our findings have at least limited relevance to the situation of such workers; and there is no doubt that controls instituted primarily to protect pesticide applicators and minimize residues on food crops serve, at the same time, to hold down exposures for all agricultural workers. I am sorry to say that we have, at this time, no scientific data which would show, without question, that the margin of safety thus provided is adequate in the case of migrant workers.

Regulation of the use of pesticides is carried out by several agencies. The responsibility for registration of pesticides and pest control materials has been placed in the U.S. Department of Agriculture. These products may not be legally shipped in interstate commerce without prior registration as required by the Federal Insecticide, Fungicide, and Rodenticide Act. When the proposed use of a pesticide will result in residues on a feed or food crop, the registration by USDA is not granted until a tolerance has been established by the Food and Drug Administration. Before registration, the petitioner must present FDA with experimental evidence on toxicity to establish what tolerances, if any, will be safe and to show that the tolerances can be met under the practical conditions of pesticide usage and to specify the conditions of use on the labeling for the pesticide.

The Department of the Interior has programs designed to protect fish and wildlife from pesticidal contamination; the Department of Transportation regulates shipment of pesticides by interstate carriers; and the Department of Defense has several programs involving the use and/or control of pesticides.

The various States and local governments also have requirements aimed at safeguarding the safety of citizens from the hazards of pesticides.

A Memorandum of Agreement between the Departments of Agriculture, Interior, and Health, Education, and Welfare was entered into in 1964 to coordinate the programs of these Departments in pesticide use and control, pursuant to a report of the President's Science Advisory Committee pointing to the need for closer coordination and recommending that responsibility for the health aspects of pesticide use be vested in the Department of Health, Education, and Welfare.

The many different synthetic chemical pesticides can be grouped into three classes: the chlorinated hydrocarbons, organic phosphates, and the carbamates. We have prepared a chart showing representative pesticides in each of the three classes and their effects on man, including symptoms of poisoning. Mr. Chairman, I would like to submit this chart for the record.

I believe it would be useful, first of all, to review the responsibilities and activities of CPEHS in this area, then to relate these, insofar as possible, to the subject of your inquiry. (There are a number of other agencies in the Department of HEW whose programs also relate to the health and welfare of migratory farm workers, and we will submit for the record, summaries of these programs if you wish.)

Under the Pesticide Chemicals Amendment to the Federal Food, Drug, and Cosmetic Act, pesticides which are not generally recognized as safe by qualified experts may not be present in or on raw agricultural commodities for food use unless a safe tolerance (which may even be zero) has been established by FDA.

The primary responsibility for obtaining proof of safety of residue tolerances is placed on the industry or firm promoting the use of pesticide chemicals. The FDA is responsible for the scientific judgment concerning the safety of the tolerance. As of July 1, 1968, there were 3,115 tolerances or exemptions established on 175 pesticide chemicals. New pesticide chemicals, formulations, and other methods of insect control are constantly being developed. New tolerances are required and existing tolerances must be reviewed in terms of current agricultural practice and need, in keeping with the policy that tolerances should not be higher than necessary for safe and effective use.

For example, FDA has recently published an order to reduce DDT tolerances. This action was initiated by a finding that good agricultural practices would permit lower tolerances; in fact, analysis of a large number of samples over the past several years showed that the level of DDT found on most fruits and vegetables is far below the 7 ppm tolerance for that pesticide. Some other tolerances have also been reduced. The intent is to establish tolerances no higher than needed in current good agricultural practices.

The Food and Drug Administration carries out other activities of control and investigation with respect to pesticides. There are surveillance activities to determine compliance with tolerances and sanctioned uses which includes inspectional investigations in the growing fields and the analysis of pre- and post-harvest samples. There are information and educational activities to keep the grower and cooperating State officials knowledgeable of our findings, both good and bad. This assists the grower in avoiding shipments of foods with illegal residues. There are control activities to remove hazardous foods from consumption channels through State and Federal legal actions. Furthermore, there are total diet investigations, which are used as an index to the dietary intake of pesticide residues, and community epidemiological and ecological studies.

FDA has a primate research laboratory at Perrine, Florida. Here, the long and short term toxicology and biochemistry of pesticides and related chemicals are studied in primates and the results of these studies used in assessing hazards to man from environmental exposure to these chemicals.

Investigations bearing specifically and directly on the hazards of pesticides to agricultural workers and others associated with the handling and application of pesticides are conducted by the Wenatchee, Washington Research Laboratory of FDA's Division of Pesticides and the Division of Community Studies located in Atlanta, Georgia.

Mr. Chairman, there are currently 15 Community Studies in progress under contract with State health departments and universities, and I have a summary of these for the record if you so desire.

These studies consist of epidemiological and ecological investigations in areas of heavy pesticide usage throughout the United States. Within each study area a pesticide usage profile is developed. Concurrently, levels of pesticides and their metabolites in man and the environment are determined. These data should eventually provide information on the movement of pesticides in the environment and their routes of entry into man. Basically, each study consists of compiling the medical history of about 100 volunteers selected because their occupations or their environment subject them to greater exposure to pesticides than the population at large. A group of individuals with minimal pesticide exposure are selected to serve for comparison purposes.

These investigations include the direct measure of exposure of workers by methods such as attaching absorbent patches on the skin of spraymen during actual spray operations. Measurements of this sort and/or respiratory inhalation have been carried out for a number of pesticides and for workers doing various agricultural jobs associated with spraying or dusting operations.

The Division of Community Studies also assists State officials in conducting State pesticide projects. These projects are designed to determine pesticides-related health problems within the States and to improve the State and local competency in handling these problems. Each project consists of a multifacted program including training in the safe use of pesticides, surveys to develop pesticide usage profiles, pesticides safety review, environmental monitoring, disposal of pesticide wastes, monitoring of people, morbidity and mortality reporting, and comprehensive planning and activating of programs on the public health aspects of pesticides.

The present results of our community studies indicate that, in general, workers using pesticides in agriculture and public health vector control are exposed to relatively small fractions of the toxic dose each day. Since migrant agricultural workers generally work at jobs not directly associated with pesticide application, their exposure levels would tend to be lower. For example, workers picking malathion—an organophosphate pesticide—treated beans have significantly less exposure than the pesticide sprayers treating these beans. However, it must also be borne in mind that spraymen may be expected to wear protective clothing and to observe other recommended safeguards not observed by workers in the fields.

Residues on crops have, in a few instances, caused poisoning in agricultural workers from occupational exposure. Eleven episodes of poisoning from contact with parathion residues involving more than 70 persons were reported as early as 1958.

The crops involved in these episodes of poisoning by residues have included pears, apples, grapes, citrus fruits, and hops. The poisoned workers were engaged in picking, thinning, cultivating, or irrigating.

Outbreaks involved exposure to foliage or fruit sprayed not more than two days earlier, but in some cases, the age of residue was as much as 33 days. Absorption of toxicant was favored by failure to wear protective clothing or by the persistent wearing of contaminated clothing. Outbreaks of residue poisoning in peach orchard workers in California were reported in 1964.

In line with its responsibilities in reviewing registrations and labels, FDA recommended to USDA in August, 1968 that consideration be given to requiring the posting of signs warning against entering fields treated with highly toxic pesticides and specifying a date which treated fields may be safely entered. The State of California has such a requirement for certain pesticides.

It is well to bear in mind that exposure to pesticides is only one of many factors affecting the health of farm workers, as well as all citizens of this country. Today the farm worker may be exposed to an ever-increasing variety of body insults from his environment including agricultural chemicals, inadequate diets, a lack of sanitation, poor sewage disposal, and low quality housing. The collective and cumulative effects of these exposures are only partly known. While the health of an individual might tolerate slightly polluted water, air or food, he probably cannot adapt to their collective attack without adverse effects. If at the same time he is subject to noise, crowding and other environmental stresses, his health and well-being can be damaged or destroyed. Efforts to identify the effects of a single stress or a single route of exposure cannot hope to define the impact of the total environment on the individual.

This complex interrelationship of all environmental impacts is well illustrated by findings recently revealed by an FDA research team conducting a community study in Dade County, Forida. They have discovered that 125 patients taking phenobarbital or diphenylhydantoin (two drugs widely used to control convulsions) had strikingly lower levels of DDT residues in their blood than the average of the general population, and that such residues were nonexistent in the fat of four patients.

We have not, as yet, evaluated the medical significance of this discovery; however, it is certainly a most interesting development.

Pesticides have made significant contributions toward elevating our standard of living during the 20th century. They have controlled malaria, typhus, dysentery, plague, and other diseases transmitted by insects. They have also brought vast economic and social benefits through better health and increased quantity and quality of foodstuffs.

In less than 20 years, the production of synthetic chemical pesticides in the United States has increased from a level of a few million pounds a year to nearly 1 billion pounds annually. Almost 60,000 pesticide formulations are now registered in the United States, and each of these contains one or more of the approximately 800 different pesticide compounds.

The increased production and use of pesticides as well as many other industrial chemicals has without doubt presented increased hazards to the health of many persons . . . manufacturers' employees, applicators, migrant and other farm workers, and the consumer. It is difficult to estimate the incidence of illness due to pesticide poisoning as reports of these poisonings are not required in most States. The mortality rate in the total population due to poisoning by pesticides is estimated at 1 fatality per 1,000,000 population per year. This figure includes intentional ingestions of pesticides in suicides. [Staff note: See letter correcting this sentence appearing at the end of the statement.] There is need for more data and better statistics. The reporting systems need strengthening on a nationwide base. All cases of pesticide poisoning should be investigated. To actually bring this about would require that physicians report *all* cases involving significant exposure to pesticides and that adequate time and personnel be available to conduct epidemiological investigations.

Mr. Chairman, there are a number of other problems which we face in carrying out our mission. For example, the 15 Community Studies are not fully staffed because of the difficulty in obtaining qualified people. We would like to fully staff the present community studies and to provide staffs to other States that would like to participate.

Mr. Chairman, Public policy for the use of pest control chemicals involves many considerations. The interrelated Federal, State and local efforts are indicative of the complexity of most environmental problems. We, at HEW, are keenly aware of the work being done in the field of pesticides by other departments and every effort is made to avoid duplication of effort.

In fiscal year 1969, FDA spent $14,618,000 on activities associated with pesticides. These funds have been concentrated in studies where current knowledge indicates the most exposure to pesticides.

With the creation of the Consumer Protection and Environmental Health Services on July 1, 1968, the Department of Health, Education, and Welfare focused in a single agency the responsibility for identifying health hazards in man's environment, developing and promulgating criteria and standards for the control of such hazards, and carrying out appropriate corrective programs. Thus the mission of the Consumer Protection and Environmental Health Service is to assure effective protection for all against controllable hazards to health in the environment and in the products and services which enter our lives.

On April 21, 1969, Secretary Finch appointed a Commission on Pesticides and Their Relationship to Environmental Health. Dr. Emil Mrak, retiring Chancellor of the University of California at Davis, an internationally renowned authority in the field of food chemistry, is Chairman of this Commission of experts from the fields of environmental health, agronomy, entomology, and from industry. Their mission is to evaluate all aspects of pesticide usage and report their recommendations for research and policy guidelines by October, 1969.

We are concerned with all aspects of pesticide usage—the benefits and the risks—as they affect the health of *all* our people.

This concludes my statement Mr. Chairman. If you or other members of your Subcommittee have questions, I will be happy to try to answer them.

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE,
August 29, 1969.

Hon. WALTER MONDALE
Chairman, Subcommittee on Migratory Labor,
Committee on Labor and Public Welfare,
U.S. Senate,
Washington, D.C.

DEAR SENATOR MONDALE: On August 1, 1969, I testified before the Senate Subcommittee on Migratory Labor. On page 8 of my written statement presented at that hearing I stated: "The mortality rate in the total population due to poisoning by pesticides is estimated at 1 fatality per 1,000,000 population per year. This figure includes intentional ingestions of pesticides in suicides."

I have learned from the Director, Division of Community Studies that this above statement is not correct in that recognized cases of suicide and homicide are excluded from the above estimate. Therefore, I ask your permission to change "includes" in the above statement in the record to "excludes".

Sincerely yours,

CHARLES C. JOHNSON, Jr.,
Assistant Surgeon General, Administrator.

Senator MONDALE. Our final witness is Mr. Jerome Gordon, President, Delphic Systems and Research Corp.

Mr. GORDON. Thank you, Mr. Chairman.

Senator MONDALE. You may proceed as you wish. You have a prepared statement.

Mr. GORDON. I have submitted my prepared statement to you for the record, Mr. Chairman.

(The prepared statement of Mr. Gordon follows:)

STATEMENT OF JEROME B. GORDON, PRESIDENT, DELPHIC SYSTEMS RESEARCH CORP.

INTRODUCTION—THE DANGER AND THE THREAT OF PESTICIDE POISONING

I should like to start off the discussion today, by asking what the following three women, one, a young mother of two children and the wife of a farmer in Lubbock, Texas, another a mother of four children in suburban Westchester County, New York, and lastly, a farm worker in Coachella, California have in common with each other and the subject matter of today's hearing: Pesticide Safety and Farm Workers? The answer is amazingly simple, yet vitally disturbing.

All of them have been seriously poisoned by highly toxic pesticides developed from nerve gas research to the extent that they have either been seriously disabled or actually paralyzed!

To make matters worse, all of them are victims of a carelessly regulated agricultural chemical industry and all three have been on the receiving end of some of the most blatant forms of arrogant bureaucracy in this country. Yet their plight, as hapless, as totally inconceivable to the minds of most Americans, can be multipled several hundred thousand-fold in the unwritten, unspoken anguish of the nation's farm workers. It is brought home by the following facts that—over fifty million pounds of a pesticide, originally developed in WW II as a German Nerve Gas, are being spread unchecked on America's farms and gardens. The result is that *uncounted* thousands of the nation's migrant farm workers, farmers and suburban homeowners have been fatally overcome or seriously disabled.

To compound the felony, U.S. manufacturers export almost 60 million lbs. of the deadly materials to users overseas, the largest consumers being Canada and Mexico. Within domestic agri-business the big users are the commercial fruit-crop growers in California and the cotton producers in Mississippi and Texas. Together, they account for almost one-half of the acreage treated by pesticides annually in the U.S.

The very fact that this situation actually exists in this country, and that all three groups; the farm worker, the farmer and the suburbanite are powerless in changing it is why this hearing is being held today.

Even more foreboding is the prospect that the occupational and general health danger from these "nerve agent" pesticides could ironically increase in the future, with the probable banning of persistent insecticides such as DDT and DDD by many states and the federal government. This bizarre situation is the product of an unwieldy and unresponsive federal and state pesticide regulatory program that has permitted the increased production and use of these deadly nerve agents, but has not subsidized the development of more selective and less toxic substitute pesticides by the U.S. agricultural chemical industry, even in the wake of the pesticide crisis raised by the publication of Rachel Carson's book, the "Silent Spring" in the early nineteen sixties.

THE POISONING POWER OF ORGANIC PHOSPHORS

The pesticides in question derived from German nerve gas research, are called organic phosphors and appear under such trade names as Parathion, Methyl Parathion, TEPP, and in less lethal dosages, as Malathion. They are first cousins, chemically, to the nerve agents GB and VX involved in the current chemical and biological warfare controversy.

The odorless, colorless liquid or powder form of the pesticide is so powerful that a minute amount—less than .00424 of an ounce, swallowed by a human is fatal in less than five minutes! Even under ideal condition, continued cumulative exposure can result in disabling partial paralysis and mental debility.

Both the organic phosphor compounds and the war gas nerve agents GB and VX use the same "kill mechanism." They prevent the manufacture of enzymes which carry body "messages" controlling respiration.

In other words, victims simply suffocate. Early symptoms include pinpointing of eye pupils, tightness in the chest, convulsions, paralysis and finally respiratory failure. Even more insidious is that less than lethal dosages of the pesticides have symptoms resembling the onslaught of an attack of flu!

THE VICTIMS

To illustrate the monstrous power of the pesticides, let us discuss the case of one of the three women mentioned earlier, Mrs. John Ford of Lubbock, Texas.

One glowing afternoon in September of last year, a Piper Pawnee crop-dusting plane buzzed monotonously over the fields adjacent to the cotton growing area surrounding Lubbock, Texas. The plane, operated by a pesticide applicating service based at nearby Shallwater Airport was spreading the pesticide Parathion as protection against a blight of "green bugs" infesting the neighboring farm. Mr. Ford and his two young children were in town on some errands, Mrs. Ford a young mother of 28 was preparing the evening meal. Nothing unusual you might say. Just a typical country scene.

However, there was one difference. Mrs. Ford was being slowly paralyzed from the waist down through insidious little enzymes called cholinesterase released by the pesticide Parathion and attacking the vital function of her central nervous system.

The morning after the crop-dusting incident, Mrs. Ford felt that she was coming down with a touch of the flu—the first symptoms of Parathion poisoning. This wasn't unusual either, since a flu epidemic had broken out in Lubbock the week before.

Mrs. Ford isn't one to be overly concerned about ailments concerning herself—she is when it comes to her children. But, at her husband's urging she went to see her family physician to get a flu shot. Her physician examined her and diagnosed the ailment as the "flu" and gave her the prescribed dosage. Everything seemed to be improved for a while, except that by the end of the first week following the incident, Mrs. Ford began to feel a numbing in her lower body and gradually began to lose control over her legs. It was during this period that she consulted a second physician who correctly diagnosed the case as Parathion poisoning; however, it was too late to apply the antidote, Atropine. Mrs. Ford was lucky to be alive, but the control over her lower limbs will be a long time in returning to normal use. She is a victim of the carelessness and callousness of both government, industry and the medical profession.

What was interesting about Mrs. Ford's case was the perniciousness of the pesticide, Parathion. Mrs. Ford was inside the house, while the spray plane was delivering its deadly product. Further, the pesticide had penetrated so deeply into everything on the Ford homestead; that a chemical analysis of the peach trees on the property showed traces of Parathion particles in the pits!

What did the applicator and the manufacturer of the chemical, W. R. Grace and Company have to say? Nothing. It is their contention that Mrs. Ford is psycho-somatic and is imagining her chronic condition. Nor, would they reveal, what the contents were of the pesticide—the manufacturer is protected under U.S. law from ever revealing the chemical formulations of his product.

Because of an epidemic of "green bugs" again this past spring, Mrs. Ford was forced to move several hundred miles away to New Mexico during the spraying period, because Parathion was again being applied to her neighbor's property!

Actually, Mrs. Ford was probably not the victim of Parathion, but rather a "frankenstein-like" compound called Paraoxon. This compound, evolved from the excessive and frequent use of Parathion, has been found to be 2 to 3 times as toxic as Parathion itself! In that regard, Mrs. Ford has a lot in common with the 186 peach orchard farm workers who were poisoned by the compound in a 1962 massive outbreak of pesticide *residue* poisoning in California.

Writing on the subject of "Parathion Residue Poisoning Among Orchard Workers" in the August 1964 edition of the *Journal of American Medical Association*, public health researchers; Milby, Ottobani, and Mitchell noted the following from their investigations of the pesticide disaster. First, that the outbreak occurred *even though the Parathion application met the State of California standard of 2.5 pounds per acre followed by a 14 day interval between spraying and harvest.* Second, *that the illnesses were the result of resi-*

due accumulated related to total amount of Parathion applied during the entire growing period. All this goes to show is that even if you follow the intent of the present pesticide control laws you still can get hurt!

But Parathion and the other organic phosphors can be fatal. Let's look at the sickening roll call.

Just this past June, the Dominican Republic reported 8 accidental deaths from Parathion poisoning of river water. The same statistic last year was over 30 fatalities.

In an eighteen month period over 1966 and 1967, six California farm workers died from pesticide poisoning. They had mistaken the pesticides for wine or water because they were in unmarked bleach containers, a violation of the California Farm Safety Regulations.

In 1965, twenty-eight persons in San Diego, Calif., were poisoned by the pesticide diazinon which accidentally contaminated doughnut mix in a local bakery.

In 1967, in nearby Tijuana, Mexico, 17 persons were fatally poisoned and 300 were reported ill when Parathion was carelessly spilled on a truck which was later used to transport confectionery sugar.

In California, fruits and vegetables, not cheesecake on the silver screen or the esoteric production of integrated circuits for complex electronic gear, is the leading industry. Production of table grapes is a billion dollar industry. Over one hundred million pounds of pesticides—20% of the nation's total—are used in California's agri-business. Not so surprising, the agricultural industry has the highest occupational disease rate—over 50% higher than the industry in second place and almost three times as high as the average rate for all industries in the state.

Pesticide poisoning is high among the most serious causes of fatal and nonfatal occupational diseases. The number of doctors' reports involving pesticides and other agricultural chemicals have doubled since 1951 and in California have ranged from 800 to 1,100 reports annually. Over the ten-year period from 1955 to 1965, about one occupational death from pesticides has been reported for each 100 reports of occupational poisoning from these chemicals. The villains in these cases are the familiar family of phosphate ester pesticides—Parathion, Phosdrin and Thimet, Demeton and Tetraethyl Pyrophosphate (TEPP). The wonders of chemical technology have made the unit costs of these pesticides so cheap that, for example, $5 worth of Parathion is sufficient to cause the death of several thousands people if dispensed without proper controls.

While farm workers in California are exposed to considerable risk of pesticide poisoning, the most formidable record of occupational disease and injury is in the agricultural aircraft industry. Pesticides are applied by air to half of the acreage treated in California.

The complement of 1,000 agricultural pilots apply about 10 to 15% of the nation's pesticides, at a considerable price. One pilot is killed in an air accident for each million acres treated. In addition to having the highesst fatal injury rate of any occupation in California, over half the disabling work injuries are due to pesticide poisoning. For most other industries the occupational disease injury rate is 5% or less of total work injuries. However, considering the amount of pesticides and other agricultural chemicals used by this group, the cost in occupational disease is considerably less than among farm workers and ground applicators who apply the other half of these chemicals.

The frequent victims of pesticide poisoning are children. In the period from 1951 to 1965, roughly 60% of the accidental deaths attributable to poisoning from pesticides in California were among children. The most frequent causes for this toll are the improper safeguards—in the private home or farm—for the storage of pesticides and the contamination of clothing by adults in the household or on the job who apply the chemicals. Two incidents drawn from the annals of the California Department of Public Health files are representative:

An 18-month old child of an agricultural aircraft pilot was found at home in a state of acute respiratory distress, semi-conscious and with "pin-point" pupils of the eyes. She was rushed to a local hospital and treated by a physician for severe organic phosphate poisoning. Fortunately, she recovered. On the morning of her illness, her father had come home after applying a highly toxic phosphate ester pesticide. He cleaned his boots with paper towels, threw them in a nearby wastebasket and put his boots in the bathroom. The child contracted the poisoning from either the boots or the paper towels.

In the second instance, a group of families, with children, were picking berries on a farm. They were followed by a spray rig carrying a five gallon tank of TEPP concentrate. A four-year old girl sampled the can, which her older brother had opened. She died in twenty minutes.

Because of readily available supplies of pesticides for both commercial and private use, suicide and accidental deaths from pesticide poisoning is an increasing problem. While only 13% of pesticides are used in the home for pest control, 50% of all accidental deaths and suicides, traced to pesticide poisoning, are from non-agricultural uses of pesticides. For example, in just one of Florida's 67 counties there were eight accidental and five suicidal deaths from phosphate pesticide poisoning in 1963 alone.

HOW IGNORANT ARE WE OF THE DANGER

While the data on fatalities and non-lethal poisonings are illustrative, they nevertheless are the tip of the unseen iceberg. The real fact of the matter is that we are simply not counting many of non-lethal and fatal pesticide poisonings.

In an article entitled "Some Health Related Needs in Pesticide Investigations" appearing in the March 1969 edition of *Industrial Medicine*, Dr. S. W. Simmons, Chief of the F.D.A. Pesticide Research program, made some revealing guesstimates of the size of the pesticide poisoning peril, nationally.

Dr. Simmons believes that there are possibly as many as 100,000 cases of non-lethal pesticide poisoning a year, with perhaps upwards of 150 to 200 fatalities, as well. Remember that the non-lethal poisonings would include such cases as Mrs. Ford's in Texas and the orchard pickers in California. Dr. Simmons goes on to say, that part of the reason for the amazing state of ignorance about public and occupational health hazards from pesticides, is that pesticide poisoning is not a reportable disease event in most states! A further problem is that while most communities have Poison Information Centers, most family and industrial physicians are not adequately equipped either by dint of training or practice to adequately diagnose and treat pesticide poisonings,

In fact, the present status of information on occupational poisoning generally is pretty thin. Witness this unpublished statement prepared by Victoria Trasko of the Occupational Health Program, National Center for Urban and Industrial Health, U.S. Public Health Service, for last year's testimony on the Occupational Safety and Health Act of 1968.

"Occupational poisonings were identified for 6,901 cases in 15 different States. *This is definitely an understatement of the real occurrence of poisonings in these states.* A few of the states provided data both on total number of cases of occupational (poisonings) for some years, and frequency distributions for other years. Some states tabulated their data by causative agent and *it could not always be determined whether the agent was associated with systematic poisoning or other physiological conditions.*

"There is also no doubt that poisonings occurred in the other 9 States (out of a total of 23 reporting data for the entire United States), but these could not be identified because only gross totals for occupational or industrial poisonings were reported."

An interesting statistic from Miss Trasko's study on occupational poisonings data is that *of the 800 cases of agricultural chemical poisoning reported, almost all were chiefly from California.*

This leads to a most important revelation, that *only California counts farm work injuries and incidencies of occupational disease in the entire United States. Neither the federal government or any of the remaining 49 states do!*

INDUSTRY AND THE PUBLIC INTEREST—IS THERE ANY?

A point that must be raised at this juncture is the position of the agricultural chemical industry in all of this. Do they really care about the effects of the products they sell? Have they really done anything since the "Silent Spring" crisis of the mid-sixties?

First, let's look at the scope of the industry's operations and growth.

The growth and use of pesticides in this country has been enormous. More than 650 varieties have been invented over the last quarter-century. These new chemical compounds, as well as several others, have been forumlated into

60,000 trade names. About 59% of the pesticides used are insecticides, 15% fungicides, another 15% defoliants and herbicides, 10% fumigants and 1% rodenticides. In contrast to many areas of the world, only 1% of all pesticides produced in the United States are used for control of diseases, such as malaria. By far the greatest use of pesticides in this country is in commercial agriculture.

The following extract from a major industry publication, *Chemical Week*, gives you some idea of the rapidity with which the industry has expanded.

"Chemical pesticides production has been growing at a 16%/year clip recently, and projections or market growth and price patterns indicate that pesticides will pull ahead of fertilizers in total sales by '75.

Manufacturing value of pesticides production topped $1 billion in '68; sales at consumer prices can only be estimated, but they probably were close to $1.7 billion last year, including exports of about $200 million. Fertilizer sales (on the same basis) now are about $2.7 billion, but pesticides should close that $1-billion gap by the mid-'70's.

By '70 pesticides sales at consumer prices should reach $2 billion, and by '75 they are expected to top $3 billion—or slightly more than projected fertilizer sales at that time. Pesticides sales at manufacturers' price levels should exceed $2 billion in '75 (see chart on next page).

Farmers' outlays for pesticides have grown at a 15%/year rate since '60, jumping from $87 million to more than $1 billion in '68. At the same time, farm value of crop production has grown only 2% and the number of harvested acres has decreased from 340,000 to 294,000. In '50 farmers spent 25¢/acre for pesticides (0.5% of the value of farm production); *last year they spent $3.65/acre* (4.6% of production value). By '75 the figure will be closer to $8–9/acre (see table)."

In their zeal to become a $3 billion industry by the mid-seventies, they have proliferated an uninformed agricultural service superstructure—signified by the appearance of pesticide "detail men" in major commercial growing areas in this country. The net result has been the proliferation of sales of less than effective, but highly toxic pesticide formulations to applicators and users.

In the case of the highly toxic organic phosphor pesticide Parathion, this has resulted in an increase in production volume of 188 percent over the seven year period from 1960 to 1967. Industry consultants expect this rate of increase to be maintained into the seventies (see below).

WHAT'S AHEAD FOR TODAY'S MAJOR PRODUCTS

	Relative production rates (1968=100)			
	1960	1964	1968	1975
Herbicides:				
Trifluralin	0	10	100	260
Atrazine	15	40	100	140
Amiben	0	0	100	260
2,4-D	45	70	100	140
Insecticides:				
DDT	120	90	100	0–50
Malathion	30	50	100	200
Systemics [1]	0	25	100	500
Parathion	30	50	100	125

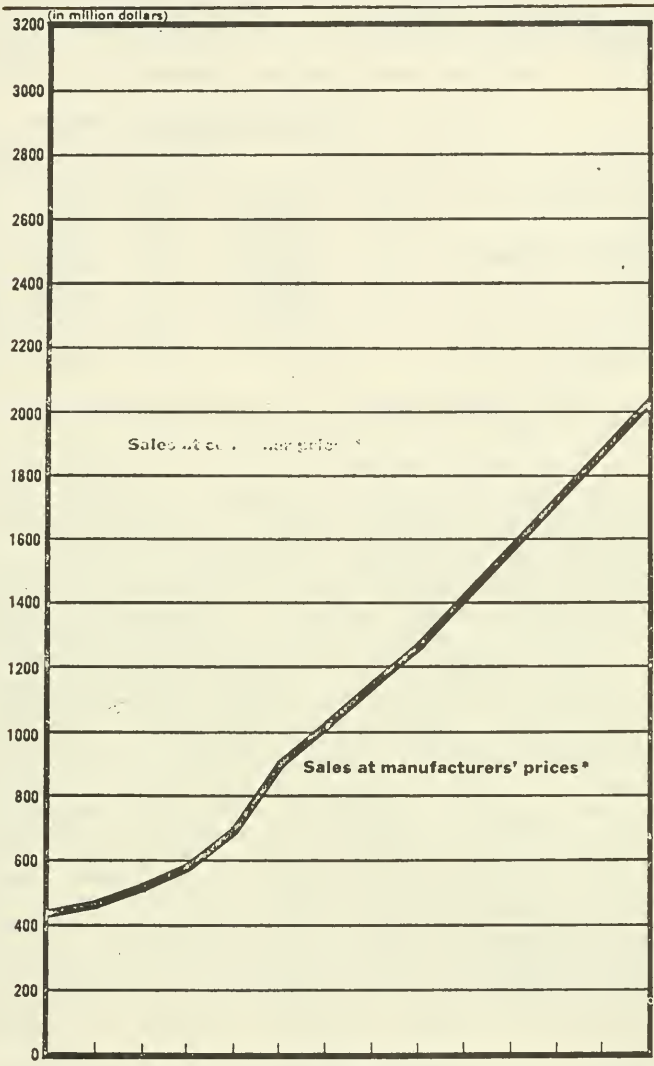
[1] Includes demeton, dimethoate, disulfoton, methyl-demeton, phorate, phosphamidon.

Source: Arthur D. Little, Inc.

A kind of curiosity is why should such major producers of a highly toxic pesticide like Parathion such as Shell, Monsanto, Cyanamid, Stauffer and American Potash want to continue manufacturing the stuff in newer versions, if the risks of acceptance are so high?

If the enclosed chart from *Chemical Week* is any criterion, the economic motivation to produce less toxic pesticide agents should be of vital concern in the research and development decisions of most firms in the industry. With the fielding of a potentially less toxic product, the risks of acceptance at the toxicity testing stage could be reduced by half providing about a 9% reduction in overall costs of development ($500,000 for the typical product)! That savings,

Pesticides sales will top $3 billion by '75



*Includes export sales.

Sales to farmers have tripled since '60

	'55	'60	'64	'68
Farmers' pesticide purchases (millions)	$184	$292	$500	$1,065
Harvested acreage (million acres)	335	319	292	294
Purchases/acre	$0.55	$0.91	$1.70	$3.65
Purchases vs. farm production value	1.0%	1.5%	2.3%	4.6%

Sources: U.S. Dept. of Agriculture; Arthur D. Little, Inc.

through reduction in risk, could result in an upward spiral of development of increasingly less toxic pesticide products! A highly desirable goal.

The U.S. Department of Agriculture and the companies must be thinking of something else.

PESTICIDES RESEARCH: BIG OUTLAYS, HEAVY ODDS

Step	Average cost per compound	Chance of reaching next step	Cumulative odds	Total R&D cost
Synthesis and initial screening	$400	1:100	1:100	$400,000
Toxicity testing	100,000	1:10	1:1,000	1,000,000
Field evaluation	400,000	1:4	1:4,000	1,600,000
Product development	200,000	1:2	1:8,000	400,000
Process development and pilot plant	200,000	1:1.5	1:12,000	300,000
Test marketing	200,000	1:1.5	1:18,000	300,000
Commercialization	[1] 1,000,000	1:2	1:36,000	2,000,000
Total	2,100,400			6,000,000
Sales over $5 million/year		1:10	1:360,000	

[1] This assumes no marketing organization has been established. Otherwise, the commercialization step would be reduced to $200,000. Source: Arthur D. Little. Figures are for 1964, latest year for which they are available.

GOVERNMENT AND THE PUBLIC INTEREST—IS IT WORKING?

The next logical series of questions deal with the problem of how the major federal and state pesticide regulatory programs are operating and, what if any is provided in the way of protection for farm workers and others?

In the legislative lexicon, pesticides are called "economic poisons," a euphemism devised by Congress and the Agriculture Department to distinguish between the purportedly beneficial nature of the potentially lethal stuff and "hazardous materials" generally. In fact, the "economic poisons" are specifically exempted from coverage under the Federal Hazardous Materials Act.

With well over 60,000 trade names of pesticides in existence, the job of industry surveillance and compliance with existing pesticide manufacturing and applications standards is virtually impossible. The response of the Johnson administration after the submission of the Scientific Advisory Council report on pesticides in 1965 was effectively to hobble the federal regulatory program.

Surveillance and regulatory functions were split between the Public Health Service and the Agricultural Research Service. The PHS Office of Pesticide Research has responsibility for conducting basic research on human and environmental health hazards of pesticide use and is also responsible for inspecting establishments involved with the formulation of pesticide chemicals. If that were not enough, the PHS is supposed to monitor areas of concentrated pesticide use in major commercial agricultural centers in this country. However, the fine Byzantine hand of the agricultural interests has made sure that the PHS cannot issue cease and desist orders. Violations are to be turned over to the Agricultural Research Service for disposition and prosecution. But the ARS hasn't filed a major violation prosecution with the Justice Department in the 22 year history of the Federal Insecticide, Fungicide and Rodenticide Act of 1947.

On September 10, the U.S. General Accounting Office issued a report on regulatory enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act. The substance of the GAO review was that there was little effective compliance action and no request for prosecution by the Justice Department in 13 years. "This was true," the GAO found, "even in instances where repeated major violations of the law were cited by the Agricultural Research Service (of the Department of Agriculture) and when shippers did not take satisfactory action to correct violations or ignored ARS notifications that prosecution was being contemplated." ARS conceded the truth of the GAO's charges.

As usual, the GAO report was hardly noticed. Little action has been taken since Rachel Carson's *Silent Spring* raised important public health issues in 1964 and the chemical-agri-business bloc squelched them before fundamental, enduring reforms were developed.

That law contains some neat provisions to dissuage investigators from digging into the pesticide chemicals industry. Information on the production of synthetic organic compound pesticides is compiled by the U.S. Tariff Commission, not Agricultural Research or Public Health. Further, information on the exact ingredients of specific formulations are not permitted to be disclosed by law to protect "trade secrets."

WHAT ABOUT THE STATE PROGRAMS?

California is better than most states in the regulation and use of pesticides; but the form of regulation leads to abuses by special interest groups that have severely weakened the national pesticide regulatory program and have blocked efforts to seek increased protection of farm workers.

The four-part regulatory structure consists of: a) registration or licensing of pesticide products; b) licensing of agricultural pest control operators; c) the registration and use, by permit, of injurious materials such as the highly toxic phosphate ester pesticide family; d) sampling of crops for pesticide residue inspection. As in the federal program and some other state programs, the responsibilities for regulation of pesticides is in the hands of the Department of Agriculture and, in the case of California, the County Agricultural Commissioner.

GOVERNMENT IGNORES MOST PESTICIDE VIOLATIONS

With the exception of registration, testing and evaluation of specific pesticide products, the California program is effectively run by County Agricultural Commissioner. For example, an agricultural pest control operator must register with the Commissioner in each county in which he does business and supply a monthly report of his operations in the county. The Commissioner also issues licenses for agricultural aircraft operators and administers special examinations for agricultural aircraft pilots. Most important, the Commissioner issues permits for the use by farm operators of chemicals registered by the California Department of Agriculture as injurious materials. These include the toxic phosphate ester family of pesticides and 14 other pesticides.

The State Department of Agriculture, to ensure quality control over application of pesticides, inspects and analyzes samples of fruits, produce and meats in wholesale marketing distribution facilities to check on pesticide residues on food offered for sale in the State. The U.S. Food and Drug Administration does the same thing in interstate traffic. Tolerances for pesticide residues used in California are the same as those developed by the Federal Food and Drug Administration.

These tolerance levels are set for the particular crop and practically none are developed for the foliage on which the crop is grown. The outbreak of pesticide poisoning among the 186 peach harvesters in California in 1962 was traced to excessive application of Parathion on the foliage, but not the crop.

The effectiveness of this program of regulation by state and federal agricultural authorities has come under serious attack recently in a salient area—registration, evaluation and testing of pesticide products. Under the Federal Insecticide, Fungicide and Rodenticide Act, the U.S. Agricultural Research Service can take action to remove products from the market, cancel the registration of products and prosecute those who ship products that violate the law.

The GAO report last September detailed that Research Service's concept of "law and order" is for the benefit of pesticide industry. The report went on to show that of 2,751 samples of products tested and reviewed during fiscal 1966, 750 were found to be in violation of the law. Of these, 70% or 520 were in "major" violation of the law. In 1967, of 4,958 samples taken 23% or 1,147 were found in violation.

Part of the reason for the situation is the old complaint of fiscal starvation and bureaucratic passivity toward vested interests. The pesticides regulation division has a staff of about 150 of which 26 are field supervisors and 5 are supervisory inspectors. In fiscal 1968 the total budget of the agency was $3.6 million. By way of contrast, the California State Assembly appropriated and spent $20 million last year for agricultural research support for its state university and college system.

Obviously, federal and state agricultural agencies are oriented toward maximizing the productivity-increasing features of agricultural chemicals, generally, and pesticides, specifically. The fact that no research in the U.S. is currently conducted into the occupational health hazards of agricultural and industrial chemicals is indicative of the general lack of concern in the regulatory organization for worker interests.

A portent of the future direction of public policy in this area is the fact that the budget of the Bureau of Occupational Health of the California State Department of Public Health was cut by one-third as part of Governor Reagan's attempt to bring "efficiency" into government operations.

If a severe budget cut were not enough, the Bureau of Occupational Health was also in jeopardy of being legislated out of existence. The chief legislative analyst of the California State Assembly, Alan Post, uncovered the fact that the Bureau's existence was subject to legislative approval. Recently legislation has been introduced into the Assembly to rectify the anomaly before the Bureau's existence becomes an object of lobby pressure. This may seem like just another administrative oversight, but the Bureau is practically the only source of information on occupational disease and health hazards among farm workers for the United States. (California is the only state in the country where injuries among farm workers are counted and where farm workers are also covered by Workmen's Compensation.)

California is one of the few states to have developed safety standards for agricultural operations. The standards are administered by the Division of Industrial Safety of the State Department of Industrial Relations. Safety orders for injurious materials (as defined in Section 2461 of Title 3 of the California Administrative Code) cover four areas: first, the provision of medical services by an employer engaged in commercial operation who uses toxic pesticides; second, decontamination of equipment; third, precautions for aircraft crop dusting and spraying; and fourth, standards for equipment used in both ground and air application of pesticides and other injurious agricultural chemicals. By far the most important of these for protection of the farm worker is the standards of medical supervision over application of pesticides. Even this is weakened, since control over recommendations and reports filed with the Division of Industrial Safety covering the determination of restricted activities for employees exposed to injurious materials, is under the employer.

The question of safety brings us back to the paradoxical imbalance between spending on Pesticide Research and Development and Pesticide Safety. The U.S. Department of Agriculture spends over $180 million annually on research activities in contrast to the totally inadequate annual pesticide program of the Food and Drug Administration of approximately $5 million.

It is astounding to compare the U.S. Department of Agriculture spending of over $180 million on pesticide-related research, while allocating *less than $160 thousand annually* for pesticide safety *and not even including farm workers in any of the programs.* It is almost beyond comprehension that within the highly subsidized American agricultural business that there is outright refusal on the part of embattled grape industry to "bargain" on control of pesticides in the fields with the grape workers.

It is interesting to note that last year, Sen. Ralph Yarborough, Chairman of the Senate Committee on Public Welfare and Labor specifically asked about insecticide safety programs on the nation's farms in a colloquy with representatives of the American Farm Bureau. The response was loaded with remarks by each state farm bureau chief about "roll-bars on tractors," but nothing was mentioned about pesticide safety. If Mrs. Ford's case is any illustration of the Farm Bureau's concern for its own constituents, then something is very much awry.

FARM WORKERS AND THEIR POWERLESSNESS VIS-A-VIS PESTICIDES

The pesticide problem would appear to be the literal apotheosis of the migrant farm workers dilemma. These people are prey to the most unspeakable of occupational health hazards—death through nerve gas asphyxiation, and yet they are unprotected by safety legislation in all states save California. They have no recourse to Workmen's Compensation medical and income benefits in almost two thirds of our country. They can't even inspect public records in states where they exist like California to ascertain whether existing pesticide rules have been violated. Employers won't even recognize their right to safe and healthful workplaces—a right purportedly guaranteed by every state industrial accident commission in this country to every workingman and woman, as a "bargaining" point. Then what we have is a class of workers who rival the "helots" of ancient Sparta who were slaughtered at the whim and discretion of the warring Spartan landowners.

SOLUTIONS TO THE PROBLEM

What we have seen so far is a trail of misfortune, lain with broken promises and dominated by an indifferent, callous bureaucracy, both governmental and private. Be that as it may, the remaining issue is one of what can we do to mitigate the pesticide hazards to farm workers and others in the short run, and what long range solutions should we seriously consider tackling, not only the pesticide safety issue, but the whole problem of improving occupational safety and health condition for farm workers, generally.

In the short run, I would like to suggest the following remedies.

First, the establishment of a phased ban of the use of organic phosphor pesticides to be in total effect within 5 to 7 years, at the latest.

Second, the content of periodic cholinesterase tests by uniformed members of the U.S. Public Health Service on the nation's farm worker population.

Third, the development of an intensive instructional and remedial program of diagnosis of pesticide poisoning for physicians in both rural and suburban areas.

Fourth, the adoption, through Amendment of the existing Federal Harmful Materials Act and the Federal Insecticide, Fungicide and Rodenticide Act of stricter pesticide residue tolerances than those presently in use to prevent the creation of "frankenstein-like" derivative compounds resulting in possible pesticide residue poisoning.

Fifth, adoption of stricter, yet lucid standards for proper labelling of pesticide products to show both oral toxicity and residue toxicity levels in English and in Spanish.

Sixth, the creation of a special instructional program administered by the U.S. Department of Agriculture Extension Service in the proper use, storage and labelling of pesticides, as well as, use of simple Pesticide public health precautions for the benefit of both Spanish-speaking and English-speaking migrant farm workers.

In the long run, I would consider the following as being most important to rectify the present imbalance in the overall pesticide safety picture.

First, federal subsidization of the development of new families of selective less toxic pesticides as substitutes for the broad spectrum organic phosphors.

Second, a minimum of a ten fold increase in the funding of Department of Health, Education and Welfare Pesticide Research and Surveillance Programs from its present level of less than $5 million annually.

Third, enactment of a special workmen's compensation program for the nation's farm workers to provide adequate medical and income benefits to fill-in presently non-existent protection against the hazards of work in the nation's fields and vineyards.

Fourth, the development of a nationwide system of farm worker injury and occupational disease reporting, with procurement of data from the states on a contract basis, with federal reimbursement for development and operating expenditures. .

Sixth, revision of the existing federal pesticide regulatory legislation to shift the present responsibilities split between the U.S. Agricultural Research Service and the Food and Drug Administration into a proposed executive level environmental health protection agency.

Seventh, the earmarking of Department of Defense Chemical and Biological Warfare defensive systems research and development and procurement funds to serve the dual purposes of protecting the nation against the very slim likelihood of chemical warfare attack and the nation's farm workers, farmers and suburbanites against the very strong possibility of pesticide poisoning of ourselves and our environment.

The technology is available for monitoring and pinpointing excessive and dangerous concentrations of pesticides in our environment and in agriculture. A number of firms, in instrumentation research and development, such as EXOTECH, Inc. of Rockville, Md. have actually developed portable systems for just such a possible use from research work currently supported by the Defense Department. This would be a positive example of the much-wanted, but little in evidence, military-civilian technology transfer process.

Finally, part of the pesticide safety problem comes from our failure to recognize that a problem really exists. Dr. Irma West, a leading champion of pesticide control among environmental health specialists, writing in *California Medicine* has summarized the issues involved clearly:

"Man has manipulated his environment on so large a scale that he has inadvertently invented and produced a multitude of the most complicated new problems ever to confront the health professions. Unfortunately, we have been slow to realize that plans for health and safety should be built into technologic advances in the planning stages. By the time technical tools are in operation and their use results in undesirable and unexpected effects upon people and their environment, the best opportunity to minimize these effects efficiently and humanely is largely lost."

NEWS RELEASE—DELPHIC SYSTEM & RESEARCH CORP.

"Fifty Million Pounds of a pesticide originally developed in WW II as a German Nerve Gas are being spread unchecked on America's Farms and Gardens. The result is that uncounted thousands of the nation's migrant farm workers, farmers and suburban homeowners have been fatally overcome or seriously disabled." This is one of several allegations made in a statement by worker safety advocate Jerome B. Gordon in testimony released today at a Hearing in Washington held by the U.S. Senate Sub-committee on Migratory Labor, headed by Sen. Walter Mondale of Minn.

The pesticides in question derived from German nerve gas research, are called organic phosphors and appear under such trade names as Parathion, Methyl Parathion, TEPP, and in less lethal dosages, as Malathion. They are first cousins, chemically, to the nerve agents GB and VX involved in the current chemical and biological warfare controversy.

The odorless, colorless liquid or powder form of the pesticide is so powerful that a minute amount—less than .00424 of an ounce, swallowed by a human is fatal in less than five minutes! Even under ideal conditions, continued cumulative exposure can result in disabling partial paralysis and mental debility.

Both the organic phosphor compounds and the war gas nerve agents GB and VX use the same "kill mechanism." They prevent the manufacture of enzymes which carry body "messages" controlling respiration. In other words, victims simply suffocate. Early symptoms include pinpointing of eye pupils, tightness in the chest, convulsions, paralysis and finally respiratory failure. Even more insidious is that less than lethal dosages of the pesticides have symptoms resembling of the onslaught of an attack of flu!

Mr. Gordon further contends that the occupational and general health danger from insecticides such as Methyl Parathion, Parathion and Malathion could ironically increase in the future, with the probable banning of persistent insecticides such as DDT and DDD by many states and the federal government. To quote Mr. Gordon; "This bizarre situation is the product of an unwieldy and unresponsive federal and state pesticide regulatory program that has permitted the increased production and use of these deadly nerve agents, but has not subsidized the development of more selective and less toxic substitute pesticides by the U.S. agricultural chemical industry even in the wake of the pesticide crisis raised by the publication of Rachel Carson's book, the "Silent Spring" in the early nineteen sixties."

"The situation is not helped any by the facts uncovered by pesticide researchers of the existence of more toxic "frankenstein-like" compounds evolved from excessive and frequent application of organic phosphor pesticides. One of these derivative compounds, Paraxon has 2 to 3 times the toxicity of Parathion."

Citing specific instances of pesticide poisoning and government research findings, Mr. Gordon goes on to state that "we are not counting over one hundred thousand cases of pesticide poisoning and several hundred fatalities annually. This anomolous situation is the product of: a) the fact that physicians frequently mis-diagnose deadly Parathion poisoning as "flu"; b) persons directly affected by exposure to potentially fatal organic phosphor pesticide poisoning are least well informed about the potential hazards; c) pesticide poisoning is not a recordable occupational disease event in most states."

Major victims of this state of affairs, according to Mr. Gordon are the nation's migrant farm workers. "These people are prey to the most unspeakable of occupational health hazards—death through nerve gas asphyxiation, and yet they are unprotected by safety legislation in all states save California. They have no recourse to workmen's compensation medical and income benefits in almost two thirds of our country and they can't even inspect public records in states where they exist like California to ascertain whether existing pesticide rules have been violated." It is astounding to think that the U.S. Department of Agriculture spends over $132 million on pesticide-related research, while allocating less than $160 thousand annually for pesticide safety and not even include farm workers in any of the programs. It is almost beyond comprehension that within the highly subsidized American agricultural business that there is outright refusal on the part of embattled grape industry to "bargain" on control of pesticides in the fields with the grape workers.

"Part of the problem, Mr. Gordon suggests, is the non-think attitude of the Agricultural Chemical Industry. In their zeal to become a $3 billion industry by the mid-seventies, they have proliferated an uninformed agricultural service superstructure—signified by the appearance of pesticide "detail men" in major commercial growing areas in this country. The net result has been the proliferation of sales of less than effective but highly toxic pesticide formulations to applicators and users. This can be seen in the fact that average consumption of pesticides per farm acreage has trebled in volume over the period from the mid fifties to the late sixties. In the case of the highly toxic organic phosphor pesticide Parathion, this has resulted in an increase in production volume of 188 per cent over the seven year period from 1960 to 1967. Industry consultants expect this rate of increase to be maintained into the seventies."

Among the possible remedies recommended by Mr. Gordon in his testimony are the following:

1. A phased ban of the use of organic phosphor pesticides.
2. Federal subsidization of the development of new families of selective less toxic pesticides as substitutes for the broad spectrum organic phosphors.
3. A minimum of a ten fold increase in the funding of Department of Health, Education and Welfare Pesticide Research and Surveillance Programs from its present level of less than $2 million annually.
4. Enactment of a special workmen's compensation program for the nation's farm workers to provide adequate medical and income benefits to fill-in present non-existent protection against the hazards of work in the nation's fields and vineyards.
5. Revision of the existing federal pesticide regulatory legislation to shift the present responsibilities split between the U.S. Agricultural Research Service and the Food and Drug Administration into a proposed executive level environmental health protection agency.
6. The earmarking of Department of Defense C.B.W. defensive systems research and development and procurement funds to serve the dual purposes of protecting the nation against the very slim likelihood of chemical warfare attack and the nation's farm workers, farmers and suburbanites against the very strong possibility of pesticide poisoning of ourselves and our environment.

Mr. Gordon is President and founder of the New York-based policy research consulting firm, Delphic Systems and Research Corporation. Mr. Gordon has authored a number of articles on worker safety and health and collaborated in the preparation of one of the strongest versions of the Coal Mine and Safety and Health Act of 1969, co-sponsored by Rep. Ken Hechler of W. Virginia and Sen. Harrison Williams of New Jersey.

Mr. Gordon is a resident of Ossining, New York and a native of Lynn, Mass.

[From a biweekly magazine, HARD TIMES, issue of November 8–15, 1968]

MAYDAY

By Ralph Nader and Jerome Gordon

PESTICIDES: SLOW OR SUDDEN DEATH FOR CALIFORNIA FARM WORKERS

Three months ago a group of Cuban refugees escaped to the U.S. on a Soviet-built Antonov crop-dusting aircraft. When the plane touched down in Florida, it was immediately quarantined by Federal Immigration and Florida State Health officials and returned to Cuba the following day. The passengers in the aircraft emerged retching and vomiting and were rushed to nearby clinics; they had been made ill by the noxious pesticide parathion that was all over the aircraft.

In 1965 twenty eight persons in San Diego, Calif. were poisoned by the pesticide diazinon which accidentally contaminated doughnut mix in a local bakery.

In 1967, in nearby Tijuana, Mexico, 17 persons were fatally poisoned and 300 were reported ill when parathion was carelessly spilled on a truck which was later used to transport confectionery sugar.

But the worst disaster from pesticide contamination of food occurred in Colombia last year: 77 people were fatally poisoned, 146 were hospitalized and upwards of 600 were reported ill from flour contaminated by the traces of parathion spilled on the floor bed of a truck used to transport the flour.

On September 10, the U.S. General Accounting Office issued a report on regulatory enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act. The substance of the GAO review was that there was little effective compliance action and no request for prosecution by the Justice Department in 13 years. "This was true," the GAO found, "even in instances where repeated major violations of the law were cited by the Agricultural Research Service [of the Department of Agriculture] and when shippers did not take satisfactory action to correct violations or ignored ARS notifications that prosecution was being contemplated." ARS conceded the truth of the GAO's charges.

As usual, the GAO report was hardly noticed. Little action has been taken since Rachel Carson's *Silent Spring* raised important public health issues in 1964 and the chemical-agri-business bloc squelched them before fundamental, enduring reforms were developed.

While regulations exist in this country for registration, dosage limitations and residue tolerances, violations or misapplications can have tragic consequences reaching far into the lives of an affected people. Farm workers in California know this to be true:

In August and September of 1963 an outbreak of pesticide poisoning among 94 peach harvesters was traced to the residues on the foliage of the orchard in which they were working. The cause of poisoning was the *amount* of parathion applied and not the premature entry into the orchard by the harvesting crews, according to the California Department of Public Health. (California law stipulates a waiting period between the application of a pesticide and crop harvest, so that the chemical will have deteriorated to the point where residues on the fruit are within "safe" limits.) The final cause was determined to be the presence in the spray residues of a compound evolved from parathion alteration which was considerably more toxic than parathion; but it was identified by routine analysis simply as parathion. The mishap resulted in one death and lengthy hospitalization for many others.

It is difficult to work through bureaucracies for compliance of existing safety standards—and next to impossible to campaign politically for additional safeguards. A case in point is the recent experience of Cesar Chavez and his United Farm Workers. Over the past 18 months in California there have been six deaths among farm workers due to accidental ingestion of pesticides mistaken for water or wine. Some of the pesticides were improperly stored in empty plastic bleach containers. The bottles were either mislabeled—or the workers, many of whom cannot readily read or write English, misunderstood the labels. This is in spite of the fact that California State Safety Orders explicitly require farm operators to properly inform farm workers of hazards, even for workers who do not understand English.

This summer, as part of their organizing operations, the United Farm Workers Organizing Committee sent legal aides into the fields to get affidavits from the grape-pickers about specific instances of pesticide poisoning. The affidavits—as well as information in the application and use registers kept by the State County Agricultural Commissioner's office—would have revealed the extent of possible violations of State pesticide standards.

The information is presumably open to the public, and the Farm Workers requested access to the records through the Kern County Agricultural Commissioner. They were summarily informed they could not obtain access to such information; two hours after their appearance at the Commissioner's office an injunction was issued by the Kern County Court barring them from looking at the records.

A hearing is under way to determine the legality of that move on the part of the State agency.

Chavez's troubles are not limited to the effects of toxic pesticides on his workers, but also involve the pollution of the local water supply beyond the tolerance of even the most moribund suburbanites. Last summer, the State Department of Public Health condemned the use of the local water supply in Delano for the consumption of infants below the age of six months. The ground water supply—the major source of supply for the water system in the Delano area—is loaded with nitrate residues from the applications of fertilizer to the crops in the fields surrounding the Delano area. Nitrates are normally tolerable in the digestive systems of children and adults beyond the age of one year; but to infants below one year of age—and particularly to infants during the first six months of life—the residues are highly toxic.

AMERICAN BABY FOOD POISONS EUROPEAN INFANTS

Prof. Barry Commonor, of the Washington University in St. Louis, recently reported on the increasing incidents of nitrate poisoning uncovered by European public health officials among infants traced to the consumption of unrefrigerated American-processed baby food.

Chavez's people now are forced to purchase bottled water for their children. On an average income of $1,232 per year for farm workers, buying bottled water—for which local public officials provide no funds—can be an intolerable necessity.

Large scale grass roots efforts aimed at controlling the spread and use of pesticides have met with something less than success in California. In 1964, a petition banning the use of most pesticides in California's agriculture failed by only a few thousand signatures to reach the ballot. The Brown administration —in the wake of the 1962 peach harvester debacle—tried to avoid the problem by appointing a commission to investigate and report on recommendations for regulating the use of pesticides. The Reagan administration has done nothing to expand significant control over the registration and use of pesticides in California; and Reagan may even dismantle existing machinery for doing the job.

In California, fruits and vegetables, not cheesecake on the silver screen or the esoteric production of integrated circuits for complex electronic gear, is the leading industry. Production of table grapes is a billion dollar industry. Over one hundred million pounds of pesticides—twenty percent of the nation's total—are used in California's agri-business. Not so surprising, the agricultural industry has the highest occupational disease rate—over fifty percent higher than the industry in second place and almost three times as high as the average rate for all industries in the state.

Pesticide poisoning is high among the most serious causes of fatal and nonfatal occupational diseases. The number of doctors' reports involving pesticides and other agricultural chemicals have doubled since 1951 and in California have ranged from 800 to 1,100 reports annually. Over the ten-year period from 1955 to 1965 about one occupational death from pesticides has been reported for each 100 reports of occupational poisoning from these chemicals. The villains in these cases are the familiar family of phosphate ester pesticides—parathion, phosdrin and thimet, demeton and tetraethyl pyrophosphate (TEPP). The wonders of chemical technology have made the unit costs of these pesticides so cheap that, for example, $5 worth of parathion is sufficient to cause the death of seven thousand people if dispensed without proper controls.

The growth and use of pesticides in this country has been enormous. More than 650 varieties have been invented over the last quarter-century. These new chemical compounds, as well as several others, have been formulated into 60,000 trade names. About 59 percent of the pesticides used are insecticides, 15 percent fungicides, another 15 percent defoliants and herbicides, ten percent fumigants and one percent rodenticides. In contrast to many areas of the world, only one percent of all pesticides produced in the United States are used for control of diseases, such as malaria. By far the greatest use of pesticides in this country is in commercial agriculture.

While farm workers in California are exposed to considerable risk of pesticide poisoning, the most formidable record of occupational disease and injury is in the agricultural aircraft industry. Pesticides are applied by air to half of the acreage treated in California.

The complement of 1,000 agricultural pilots apply about 10 to 15 percent of the nation's pesticides, at a considerable price. One pilot is killed in an air accident for each million acres treated. In addition to having the highest fatal injury rate of any occupation in California, over half the disabling work injuries are due to pesticide poisoning. For most other industries the occupational disease injury rate is five percent or less of total work injuries. However, considering the amount of pesticides and other agricultural chemicals used by this group, the cost in occupational disease is considerably less than among farm workers and ground applicators who apply the other half of these chemicals.

The frequent victims of pesticide poisoning are children. In the period from 1951 to 1965, roughly 60 percent of the accidental deaths attributable to poisoning from pesticides in California were among children. The most frequent causes for this toll are the improper safeguards—in the private home or farm—for the storage of pesticides and the contamination of clothing by adults in the household or on the job who apply the chemicals. Two incidents drawn from the annals of the California Department of Public Health files are representative:

An 18-month-old child of an agricultural aircraft pilot was found at home in a state of acute respiratory distress, semi-conscious and with "pinpoint" pupils of the eyes. She was rushed to a local hospital and treated by a physician for severe organic phosphate poisoning. Fortunately, she recovered. On the morning of her illness, her father had come home after applying a highly toxic phosphate ester pesticide. He cleaned his boots with paper towels, threw them in a nearby wastebasket and put his boots in the bathroom. The child contracted the poisoning from either the boots or the paper towels.

A 4-YEAR-OLD DIES IN 20 MINUTES

In the second instance, a group of families, with children, were picking berries on a farm. They were followed by a spray rig carrying a five gallon tank of TEPP concentrate. A four-year-old girl sampled the can, which her older brother had opened. She died in twenty minutes.

Because of readily available supplies of pesticides for both commercial and private use, suicide and accidental deaths from pesticide poisoning is an increasing problem. While only 13 percent of pesticides are used in the home for pest control, 50 percent of all accidental deaths and suicides, traced to pesticide poisoning, are from non-agricultural uses of pesticides. For example, in just one of Florida's 67 counties there were eight accidental and five suicidal deaths from phosphate pesticide poisoning in 1963 alone.

California is better than most states in the regulation and use of pesticides; but the form of regulation leads to abuses by special interest groups that have severely weakened the national pesticide regulatory program and have blocked efforts to seek increased protection of farm workers.

The four-part regulatory structure consists of: a) registration or licensing of pesticide products; b) licensing of agricultural pest control operators; c) the registration and use, by permit, of injurious materials such as the highly toxic phosphate ester pesticide family; d) sampling of crops for pesticide residue inspection. As in the federal program and some other state programs, the responsibility for regulation of pesticides is in the hands of the Department of Agriculture and, in the case of California, the County Agricultural Commissioner.

GOVERNMENT IGNORES MOST PESTICIDE VIOLATIONS

With the exception of registration, testing and evaluation of specific pesticide products, the California program is effectively run by the County Agricultural Commissioner. For example, an agricultural pest control operator must register with the Commissioner in each county in which he does business and supply a monthly report of his operations in the county. The Commissioner also issues licenses for agricultural aircraft operators and administers special examinations for agricultural aircraft pilots. Most important, the Commissioner issues permits for the use by farm operators of chemicals registered by the California Department of Agricultural as injurious materials. These include the toxic phosphate ester family of pesticides and 14 other pesticides.

The State Department of Agriculture, to ensure quality control over application of pesticides, inspects and analyzes samples of fruits, produce and meats in wholesale marketing distribution facilities to check on pesticide residues on food offered for sale in the State. The U.S. Food and Drug Administration does the same thing in interstate traffic. Tolerances for pesticide residues used in California are the same as those developed by the Federal Food and Drug Administration.

These tolerance levels are set for the particular crop and practically none are developed for the foliage on which the crop is grown. The outbreak of pesticide poisoning among the 95 peach harvesters in California in 1963 was traced to excessive application of parathion on the foliage, *but not the crop*.

The effectiveness of this program of regulation by state and federal agricultural authorities has come under serious attack recently in a salient area—registration, evaluation and testing of pesticide products. Under the Federal Insecticide, Fungicide and Rodenticide Act, the U.S. Agricultural Research Service can take action to remove products from the market, cancel the registration of products and prosecute those who ship products that violate the law.

The GAO report last September detailed that Research Service's concept of "law and order" is for the benefit of pesticide industry. The report went on to show that of 2,751 samples of products tested and reviewed during fiscal 1966, 750 were found to be in violation of the law. Of these, 70 percent or 520 were in "major" violation of the law. In 1967, of 4,958 samples taken 23 percent or 1,147 were found in violation.

Part of the reason for the situation is the old complaint of fiscal starvation and bureaucratic passivity toward vested interests. The pesticides regulation division has a staff of about 150 of which 26 are field supervisors and 5 are supervisory inspectors In fiscal 1968 the total budget of the agency was $3.6 million. By way of contrast, the California State Assembly appropriated and spent $20 million last year for agricultural research support for its state university and college system.

Obviously, federal and state agricultural agencies are oriented towards maximizing the productivity-increasing features of agricultural chemicals, generally, and pesticides, specifically. The fact that no research in the U.S. is currently conducted into the occupational health hazards of agricultural and industrial chemicals is indicative of the general lack of concern in the regulatory organization for worker interests.

A portent of the future direction of public policy in this area is the fact that the budget of the Bureau of Occupational Health of the California State Department of Public Health was cut by one-third as part of Governor Reagan's attempt to bring "efficiency" into government operations.

If a severe budget cut were not enough, the Bureau of Occupational Health was also in jeopardy of being legislated out of existence. The chief legislative analyst of the California State Assembly, Alan Post, uncovered the fact that the Bureau's existence was subject to legislative approval. Recently legislation has been introduced into the Assembly to rectify the anomaly before the Bureau's existence becomes an object of lobby pressure. This may seem like just another administrative oversight, but the Bureau is practically the only source of information on occupational disease and health hazards among farm workers for the United States. (California is the only state in the country where injuries among farm workers are counted and where farm workers are also covered by Workmen's Compensation.)

California is one of the few states to have developed safety standards for agricultural operations. The standards are administered by the Division of Industrial Safety of the State Department of Industrial Relations. Safety orders for injurious materials (as defined in Section 2461 of Title 3 of the California Administrative Code) cover four areas: first, the provision of medical services by an employer engaged in commercial operation who uses toxic pesticides; second, decontamination of equipment; third, precautions for aircraft crop dusting and spraying; and fourth, standards for equipment used in both ground and air application of pesticides and other injurious agricultural chemicals. By far the most important of these for protection of the farm worker is the standard of medical supervision over application of pesticides. Even this is weakened, since control over recommendations and reports filed with the Division of Industrial Safety covering the determination of restricted activities for employees exposed to injurious materials, is under the employer.

Part of the pesticide problem comes from our failure to recognize that a problem really exists. Dr. Irma West, a leading champion of pesticide control among environmental health specialists, writing in *California Medicine* has summarized the issues involved clearly:

"Man has manipulated his environment on so large a scale that he has inadvertently invented and produced a multitude of the most complicated new problems ever to confront the health professions. Unfortunately, we have been slow to realize that plans for health and safety should be built into technologic advances in the planning stages. By the time technical tools are in operation and their use results in undesirable and unexpected effects upon people and their environment, the best opportunity to minimize these effects efficiently and humanely is largely lost."

DEATH STALKS THE GARDEN

Thousands of home-gardeners have suffered peculiar "flu" symptoms after spraying their flowers and shrubs with a common form of pesticide. They rarely learn that they have been mildly "poisoned" by an organo phosphor compound. In more lethal strengths, the same chemical agent is used in "nerve gas," and can wipe out huge populations of men or animals in a few minutes. But despite the obvious hazards, very little is being done to control the widespread foreign and domestic sale of highly toxic pesticides: beyond that, the Army is continuing its secret tests of nerve gas as a weapon of mass annihilation.

Army experimenters had an unexpected windfall of data from the accidental exposure of several thousand sheep to air-sprayed nerve gas near Dugway, Utah. The chemical that killed these sheep also goes into the organo phosphors pesticides—such as the widely distributed garden product called Parathion. Until the end of World War II, Parathion itself was the favorite candidate for the standard nerve gas in the Army Chemical Corps' arsenal. Then the Army "liberated" the secret German nerve gas, "GB," and it won out over Parathion, for two reasons: it was easier to disseminate, and it would not so readily arouse public fears as would the use of a common pesticide like Parathion. "GB" was saved for people and Parathion relegated to weeds.

Both agents have the same toxicity: .2 milligrams per kilogram of body weight. Both use the same "kill mechanism": they prevent the manufacture of enzymes which carry body "messages" controlling respiration. In other words, victims simply suffocate. Early symptoms (the whole process can take less than five minutes) include pinpointing of eye pupils, tightness in the chest, convulsions, paralysis, and finally respiratory failure. If the dose is less than lethal, the symptoms resemble the onslaught of an attack of the flu.

Current hearings in Wisconsin into the environmental hazards of the chlorinated family of insecticides—the most notable of which is DDT—focus concern about the chemical "synergy" of simultaneous and continued exposure to different pesticides: there is some evidence that since both the organic phosphor pesticides and the chlorinated insecticides accumulate in the fatty body tissues, under certain conditions (such as malnutrition stress), genetic damage could occur.

In 1966 alone, over 55 million lbs. of organic phosphor pesticides were manufactured for use in US agri-business. The passage of the Federal Insecticide, Fungicide and Rodenticide Act and the public disclosures of pesticide abuses had indicated that some reduction or stablization in manufacture and use would occur. But there has been a growth of 188 percent in the production of organic phosphor pesticides over the period from 1960 to 1966, as compared to an increase of 25 percent in the production of all classes of pesticides over the same period. Effective substitutes exist, such as the pesticide Malathion with 1/2,000 of the toxicity of the organic phosphors, and the price differential between the two is nominal.

In 1966 alone, US manufacturers exported 59 million lbs. of organo phosphor pesticides to users overseas, the largest consumers being Canada and Mexico. Within domestic agri-business the big users are the commercial fruit-crop growers in California (the villains of the current United Farm Workers Organizing Committee confrontation with the California pesticide regulatory program), and the cotton producers in Mississippi and Texas. Together, they account for almost one-half of the acreage treated by pesticides annually in the U.S.

Federal and state governments subsidize the organo phosphor business through secret military chemical and biological warfare research, agricultural pesticide research and bio-chemical research. In fiscal 1967, a total of $70 million in unclassified pesticides research was funded by the Department of Agriculture and the Public Health Service. An equal amount is estimated to be spent on pesticide chemical research by private industry and state universities. Only $5 million is currently allocated for the support of research into the occupational and environmental health hazards of pesticides by the PHS.

In the legislative lexicon, pesticides are called "economic poisons," a euphemism devised by Congress and the Agriculture Department to distinguish between the purportedly beneficial nature of the potentially lethal stuff and "hazardous materials" generally. In fact, the "economic poisons" are specifically exempted from coverage under the Federal Hazardous Materials Act.

With well over 60,000 trade names of pesticides in existence, the job of industry surveillance and compliance with existing pesticide manufacturing and applications standards is virtually impossible. The response of the Johnson administration after the submission of the Scientific Advisory Council report on pesticides in 1965 was effectively to hobble the federal regulatory program.

Surveillance and regulatory functions were split between the Public Health Service and the Agricultural Research Service. The PHS Office of Pesticide Research has responsibility for conducting basic research on human and environmental health hazards of pesticide use and is also responsible for inspecting establishments involved with the formulation of pesticide chemicals. If that were not enough, the PHS is supposed to monitor areas of concentrated pesticide use in major commercial agricultural centers in this country. However, the fine Byzantine hand of the agricultural interests has made sure that the PHS cannot issue cease and desist orders. Violations are to be turned over to the Agricultural Research Service for disposition and prosecution. But the ARS hasn't filed a major violation prosecution with the Justice Department in the 13 year history of the Federal "rat and bugs chemicals" act.

That law contains some neat provisions to dissuade investigators from digging into the pesticide chemicals industry. Information on the production of synthetic organic compound pesticides is compiled by the US Tariff Commission, not Agricultural Research or Public Health. Further, information on the exact ingredients of specific formulations are not permitted to be disclosed by law, to protect "trade secrets."

Senator MONDALE. Proceed as you wish. You might tell us a little bit about your background and expertise in this field.

Mr. GORDON. I am currently conducting a major evaluation study for the U.S. Bureau of Labor Standards in connection with the occupational safety work injury program. This study takes into account such things as topics you have heard from Dr. Simmons this morning, the potential under enumeration of work injuries and occupational disease.

Last year I testified before the major committee on the same topic of the potential under enumeration of industrial injuries and occupational diesease in this country. I collaborated with Senator Williams of New Jersey and Representative Heckler of West Virginia in the preparation of their version of the Coal Mine Safety & Health Act of 1969. I would like to make one quip, if I may,

For a moment I thought my name was not Jerome Gordon, but really John Yossarion of Catch-22 fame. I say that not so much with tongue-in-cheek but with some reservation about what has really transpired here this morning.

I think that is distrubing to realize that we are using a pesticide derived from German World War II nerve gas. We are using about 55 million pounds of this in the United States, about half of which is in concentrated forms in both Texas and California, and to lesser extent in Mississippi and Louisiana, and we export this lethal material overseas in the guise of assistance for underdeveloped nations. Just yesterday, talking to a friend of mine from the Defense Department, he pointed out an article in Aviation Weekly which stated that the American Air frame industry is involved in the construction of agricultural aircraft and was trying to fill up its demand for this kind of aircraft by exporting them overseas with the potential burgeoning market for pesticide application out of the United States.

I think it is kind of interesting to note that less than 3 weeks ago eight people died in the Dominican Republic from Parathion poisoning of river water, and that 30 people died there last year from the effects of Parathion poisoning.

I think what is disturbing is that we continue to use these nerve agents after having had a cumulative experience of their unfortunate application during World War II in Nazi death camps and having seen most recently in this country a rather large controversy raised about the Chemical and Biological Warfare research.

I would like to read an extract which comes from an unclassified Army technical manual, Chapter 2, of Training Manual 8–285, dealing with treatment of chemical agent casualties, dated January 1968. This is available to the press and it is unclassified.

> Nerve agents are among the most deadly chemical agents. They include 'G' agents and 'V' agents. Examples of G agents are Tabun GA, Arsene GB, and Somen GD. The standard is VX. Several related but somewhat less toxic compounds here proved to be most useful in medicine and agriculture. They include DFP, TEPP, OMPA, Parathion, Malathion, and Carbamates.

It is further interesting to note that the Army has a word of precaution for its own troops.

> Widespread use has occasioned many accidental poisonings, some fatal. The symptoms and treatment of poisoning by these compounds are similar to those of poisoning by nerve agents.

So we are dealing with exactly the same animal.

Senator MONDALE. Have there been American farm workers, to your knowledge, who died from this nerve gas type pesticide?

Mr. GORDON. There have been farm workers who had died, from records, some of which has been compiled by a lady who couldn't be here today, Dr. Irma West at the California Bureau of Occupational Health.

Senator MONDALE. I understand this is a hideous type of death that occurs. It affects the nervous system, normal nervous system restraints disappear, and the person dies with convulsions. Is that correct?

Mr. GORDON. Senator, I would like to read to you an extract from a deposition that was forwarded to me by an attorney in Texas, whose client, Mrs. John Ford in Lubbock, the wife of farmer, a constituency I think the American Farm Bureau should be mightily concerned about, was poisoned in a rather strange way. I would like to relate part of that background information from the statement that I prepared for the committee today, because it is rather disturbing.

Mrs. Ford was sitting in her house in Lubbock, Tex., in August of last year, while her husband and two kids were outside doing some marketing in the nearby center of Lubbock, Tex. The property next door was being sprayed with the nerve agent Parathion. Mrs. Ford was not in the direct path of the aircraft or drift pattern of pesticide application.

Mrs. Ford on the morning after the spraying in the field adjacent to her, began to feel the early symptoms, rather insidious symptoms of Parathion poisoning. She thought she had the flu! What was most unfortunate in Mrs. Ford's case was that her own personal family physician diagnosed her malady as flu and gave her the appropriate shot. .

Within 1 week Mrs. Ford's lower limbs began to lose effective control and she became temporarily paralyzed.

Now what is tragic about this is that going to a second physician in the area, unfortunately a week after the incident, her case was carefully diagnosed as Parathion poisoning and the available antedote, which is atropine, was administered. I will discuss atropine later because it is a rather insidious antedote.

I think what was interesting about Mrs. Ford's case was the perniciousness of the pesticide. Mrs. Ford was inside the house while the plane was delivering the chemical on the property adjacent to hers. But after chemical examination of the peach trees on her property, they found that residue from the pesticide had penetrated so deeply that in fact it was found in the pits of the peaches on the trees.

Now the manufacturer of the chemical W. R. Grace through its subsidiary Estes Chemical, they and the Texas Agricultural Commission have contended that Mrs. Ford can't possibly be paralyzed when in fact she has media proof of her paralysis and some of this has been forwarded to the committee.

What is absurd about this, and why I related it back to the outset of the testimony is that because of another epidemic of the pest, green bugs, in the area, on cotton, Mrs. Ford was forced to move several hundred miles away to Albuquerque, N. Mex., to avoid this past Spring what occurred last August.

What poisoned Mrs. Ford was not Parathion itself but this compound we heard about from Jerry Cohen this morning, Paraoxon. It is interesting to note that Paraoxon can be developed within the existing stated tolerances for application of Parathion to the fields. And it is a very minute amount, less than 2½ pounds per acre.

In the deposition which I have here you get some feel for the danger of Parathion poisoning and its product, Paraoxon, because the field was sprayed in the course of the year six or seven times, again within the allowable residue tolerances set up by the Texas State Agricultural Commission.

Now even with the existing standards, Mr. Ford has a set of companions, the 186 peach pickers who were poisoned by the same compound Paraoxon in 1962 in California.

Let me read an extract of an article that is, ironically, from the research of Dr. Milby, current head of the California Bureau of Occupational Health.

First, that the outbreak occurred even though Parathion application met the State of California standards of 2.5 pounds per acre followed by 14-day interval between spraying and harvesting.

Two, that the illnesses were the result of residue accumulated to the total amount of Parathion during the entire growing cycle.

All of this goes to show you can get seriously hurt by following the letter of the law, the present pesticide control law, both nationwide and in individual States.

Senator MONDALE. We have heard testimony that if they just followed instructions on pesticide containers, the risk to health would be avoided. Do you have a comment on that?

Mr. GORDON. I would like to interject one comment.

Another individual who I thought should have been here today was Dr. Van Den Bosch, a noted entomologist from the University of California at Berkeley. It is not only Dr. Van Den Bosch's contention but it is the contention of a number of experts in the field that in fact the existing labeling requirements which FDA and C. C. Johnson's administration have charge of, are totally inadequate from two regards. First, there is no lucid statement about the possible harm or toxicity of using the stuff. Second, there is absent, and this is most important and most damaging in the case of the operations of the American chemical industry, information on the relative effectiveness of the pesticide products.

Most importantly, very few people I think in the field farmers, farm workers, and even suburbanites, don't realize what available antedotes there are. Most shamefully, the method of treatment and antedote are not formally placed or fixed lucidly on the label.

Senator MONDALE. I talked to Dr. Van Den Bosch, and he said, as I recall, that most doctors are not trained to identify or work with pesticide poisoning. They don't know how to diagnose it, and they don't know how to treat it if they can diagnose it.

Mr. GORDON. I think that, as I stated both in my news release and testimony, is a serious component of the overall fault with our data on occupational health, particularly in areas like pesticidal poisoning.

Senator MONDALE. You heard the testimony from Dr. Simmons this morning about the data that they have and possible margins of under reporting. I thought it was fairly candid testimony, that he believes it would be fair to estimate that there are maybe 800 deaths other than 150 to 200 that were reported, and in the magnitude of a hundred times or more that many injuries.

What does your expertise tell you about those figures?

Mr. GORDON. I think Dr. Simmons' estimates are well within the range of not only possibility but probability. I would like to go further and corroborate that information with a professional colloquy from a colleague of Dr. Simmons at HEW, Miss Victoria Trasko, who is in the National Center for Urban and Industrial Health, of the U.S. Public Health Service.

In an unpublished statement last year prepared for the Occupational sonings statistics are indeed for only 6,901 cases from only 23 States in this country that accumulated the information and at best most of that information was relatively incomplete."

The mere fact, as Dr. Simmons pointed out briefly before, that medical examiners or records compiled by medical examiners and records compiled by individual vital statistics agents, are so at variance, is indicative of this. She says this is definitely an understatment of the real occurrences of poisonings in these States.

And specifically in the case of agricultural chemical poisoning she has the following remark.

"Of the 800 cases of agricultural chemical poisoning reported, almost all were from California."

These lead to another point which the Nation really doesn't know about.

Senator MONDALE. You heard one of the witnesses say that you can discount these figures because an undetermined percentage are related to suicide and murder.

Mr. GORDON. That was said, yes.

Senator MONDALE. Do you have any information upon which you could express your opinion as to whether it can be simply dismissed as another form of homicide in America.

Mr. GORDON. I would only say that I would think the problems of having a personal family physician record on a death certificate whether it was homicide or suicide, for example, in a case of a family, would be quite conceivable, knowing the kind of oath the physician might have.

Senator MONDALE. My point is that if a farm worker, and that is what we are hearing testimony on today, is being exposed to loss of life or injury by being exposed directly to pesticides in the field, that is one thing. But if all of these things can be dismissed just as another manifestation of crime statistics, that is something else.

My feeling was that FDA was trying to leave us with the other impression, that there was no source of alarm because of the pathological manifestation of American psyche, or some such nonsense.

Would you respond to that?

Mr. GORDON. I think that question was perhaps in part directed at me. I think the problem with FDA and its research programs is in fact the research programs that Dr. Simmons and Dr. Johnson were talking about this morning are kind of lopsided. For example, in the 15 cooperative studies that Dr. Simmons and Dr. Johnson talked about this morning that are currently being conducted in the United States, and rather interestingly they all began in 1965, only one of them is in California.

California is currently consuming 20 to 30 percent of the total volume of pesticides applied in this country, and in terms of the materiality of the issue at hand, it would seem to me that of the 15 studies,—if in fact that is all of the funds available for conducting that kind of research, that a significantly greater relative proportion should be allocated to some of the major areas of concentrations of use of pesticides.

I think that the FDA is a victim of the typical mind-set that is normally associated with "hard" scientists of that kind of bent. I think this is injurious also to their own causes and to the health and welfare of the Nation, and more particularly in this case to the farm workers.

Senator MONDALE. Are you familiar with what protections are available now nationally to a farm worker if he suspects his health or life is in jeopardy from exposure to pesticides?

Mr. GORDON. It is rather humorous. The Department of Agriculture spends over $180 million a year on pesticide research and in a documented report which I believe has been forwarded to your committee they spend less than $160,000 a year for pesticide safety. Most of those funds for pesticide safety go into the development of these advertising gimmicks on the part of agriculture and chemical manufacturers.

As you see, the sign says "Stop before using any pesticide, read the precautions." If there really are no lucid precautions on the bottles or containers, this is really a sham. It is further interesting to note that the only Spanish language program that the U.S. Department of Agriculture has in operation is not in California, is not in Texas, but rather is in Puerto Rico.

Senator MONDALE. Say that again.

Mr. GORDON. The only pesticide safety operation of this variety that the U.S. Department of Agriculture runs in the Spanish language directed at certain Spanish language employees on farms is in Puerto Rico, and not in the area of major pesticide use in this country: California, Texas, Louisiana, and Mississippi.

Senator MONDALE. Do you know if the Department of Agriculture make surveys or seeks to determine the amount or risk to the farm worker from exposure to pesticides?

Mr. GORDON. The Department of Agriculture at the present time has no safety authority to conduct any surveys in the fields for agricultural workers and, ironically, for the farmers. I think if I can proceed with a bit more summation of the statement, this will become clearer.

A significant facet that was perhaps glossed over is the motivation, frankly, of a rather large ungainly industry in the United States, the U.S. agricultural chemical industry. It is kind of interesting to hear statements from pesticide manufacturers to the effect that they have done such humane things as add 10 years to the useful life span of underdeveloped nations like India. That is really a specious argument.

In the case of the United Statees with over 60,000 trade name products, less than 1 percent of these pesticides are actually used for things like control of diseases like Malaria. Here is an extract that I read into my testimony from a major industry publication, Chemical Week, and I think I would like you, Mr. Chairman, to pay particular attention to what industry says about itself and its future and its market.

"Chemical pesticides production", according to the statement in Chemical Week, "has been growing at a 16 percent yearly clip and projection of market growth and price patterns indicate that the pesticides will pull ahead of fertilizers in total value by 1975."

The value of pesticides is about $1 billion now and if we add markup on sales it is more in the order of $1.7 billion to $2 billion. By 1975 the industry expects to be somewhere in the order of $3 billion."

What is insidious about this was the remark made by Dr. Van Den Bosch concerning over-application, the over-selling of pesticides by the agricultural chemical companies. This is what the consultants in Chemical Week said:

> Farmers' outlays for pesticides have grown at 15 percent rate per year, since 1950, jumping from absolute level of $87 million to more than $1 billion in 1968. At the same time farm value of crop production has grown only 2 percent and the number of harvested acres has decreased from 340,000 to less than 294,000. In '50 farmers spent less than 25 percent per acre for pesticides, or 5 percent of the value of farm production. Last year in 1968 they spent over $3.65 per acre, or roughly 5 percent of production value. By 1975 that figure will be $8 to $9 per acre.

So I think, as I indicated in my testimony, we are compounding a felony on a national level.

Now the question is since the public health specialists and industry know about the toxicity or organic phosphors that we were talking about this morning such as Parathion and Malathion, is there a trend in production either upwards or downwards in this regard, and what are the implications of that in conjunction with probable banning of DDT? I would like to quote some statistics.

By 1975 the production of DDT according to the consultants from Arthur D. Little who prepared this report for Chemical Week, DDT will be about 50 percent of the 1968 level of production. In contrast Malathion another organic phosphor will be about 200 percent of 1968 level. Parathion, the most deadly organic phosphor will be 125 percent of its current level. So industry in the wake of the late Rachel Carson's book Silent Spring, has really not considered entering into the active development of more selective, less toxic pesticides.

The curiosity to me, is why major manufacturers of Parathion continue to manufacture this stuff. Using the consultants data from Chemical Week, it is rather interesting to postulate something that could happen for the benefit of the farmworkers, farmers, and suburbanites in this country.

With the fielding of potentially less toxic products, the risks of acceptance at toxicity testing stage, the stage that the FDA and C. C. Johnson's agency are most responsible for, if they were reduced by half, this would bring about a nine percent reduction in overall costs for research and development for the typical pesticide product or an average of savings $500,000 per product.

That savings through reduction of and risk could result in an upward spiral of development of increasingly selective, less toxic pesticides which I think is a desirable goal, a goal which unlike other basic industries in the United States would not have to be subsidized.

Another point that was glossed over this morning, and addressed in questions asked by Senator Bellmon and by you, Mr. Chairman, was why does this anomalous condition of regulatory deficiencies exist between U.S. Department of Agriculture and FDA?

I would like to read from a report that was prepared by U.S. General Accounting Office in the course of a review of the entire pesticide regulatory program and released last September and probably smothered in the back pages of the New York Times.

On September 10 the U.S. General Accounting Office issued a report on regulatory enforcement of the Federal Insecticide, Fungicide, and Rodenticides Act. The substance of the review was there was little effective compliance action and no review by the Justice Department in over 13 years.

This was true, the GAO found, even in instances where repeated major violations of the law were cited by the Agricultural Research Service and when shippers did not satisfactorily act to correct violations or ignored Agricultural Research Service notifications that prosecutions were being contemplated.

The extent of that violation is in the data accumulated on the samples that the GAO reviewed that did not meet specifications laid down by the Federal Insecticide, Fungicide, and Rodenticide Act. Under the act, U.S. Agriculture Research Service can take action to remove products from the market, cancel registration, and classify those who ship products who violate the law.

GAO found that in over 2,751 samples of products tested and reviewed during fiscal year 1956, over 750 were found to be in substantial violation of the law. Of these 70 percent or 520 with major violation of the law. A 1967 total of about 5,000 samples were taken and 23 percent were found to be in violation. I don't consider this to be effective compliance of the regulation.

Senator MONDALE. What this committee is interested in is the extent to which American farmworkers' health is jeopardized. That is the question that concerns this committee as a part of the overall review of the life of the farmworker of this country. What I think is becoming increasingly apparent is that whatever national thrust there is for protection of one kind or another, there is little or no thrust directed toward the protection of the person whose life and health is most in danger, mainly the worker most exposed to pesticides by either applying them, or being exposed to them by drifting or being permitted or forced into the field too early, or working in the fields where the pesticides used were too dangerous or have been inaccurately applied. And, we find the data the Federal Government has is wholly inadequate.

Indeed, the Director of the H.E.W. program said it was so inadequate that he couldn't base any judgment as to what action should be taken. We have only 15 pilot studies, even though the Director of statistics says there were 800 deaths a year and 80,000 injuries a year attributable to pesticides. I can't understand, and I don't think it can be explained by saying that there are more being killed on American highways. I think we have a right with this kind of a problem to see some concern expressed about health and lives of people who are working in the fields.

I don't see any sense of interest or commitment. Apparently it is basically a State's responsibility, and we are going to have an analysis of that, but according to Senator Bellmon, most of the State laws to which reference was made have no worker protection element in them at all. They have other objectives.

So here we see, as we have seen in every area that we have studied, whether it is farm bargaining power, whether it is housing, whether it is consumer protection, working conditions, the matter of life itself, there is little or no concern.

The individual worker, to my knowledge, has nothing he can do to protect himself. He is not an expert in these fields. He doesn't know. There are for all practical purposes no unions, except the attempt in California to include pesticide protection in collective bargaining agreements. The Federal Government in effect has no responsibility, it only has some preliminary pilot studies. Most of the States have shown no concern, and I am afraid that this is a very serious indictment about our concern for the value of life.

Mr. GORDON. A serious concern, Senator. I would like to make two comments before I get into that subject directly.

Looking back at my own statement, it is kind of interesting to note that in California, which is again the only State that compiles any information at all on occupational injury and occupational disease for agriculture, the agriculture industry has the highest occupational disease rate, almost three times as high as that incurred by all industries in California. We were talking about applicators before, agricultural aircraft pilots, people who are directly in contact with this stuff. It is interesting to note that the complement of 1,000 agricultural pilots in California apply 10 to 15 percent of the nation's pesticides and one pilot is killed in an air accident for each 1 million acres treated.

Senator MONDALE. I think we heard testimony from Mr. Cohen that 12 pilots in one season flew into the ground in California. Is that correct?

Mr. GORDON. That is correct. There is even a more fatal absurdity, and I would like to read it to you. It describes the mentality of some of these applicators in the field and it is a good example of what you might call the lack of self concern about the occupational health conditions of the job. It relates to the symptoms of Parathion in a person, not only for the applicator, but also his son.

I would like to read from the deposition:

> Is there any danger from your knowledge of this Parathion, any danger from it coming in contact with human beings and animals?

The answer is "yes".

> Could you explain that to us?
> Answer:
> Of course I have been working around the Parathion several years. It has never bothered me and I have had it all my life all over me and I go wash it off as soon as possible. Of course we have fliers sprayed occasionally intentionally and naturally they are going to get sprayed some. I never know any that is hurt. It gives some of them a headache.
>
> Last year some of the companies started putting less water in the Parathion and had some pilots getting sick. Of course, it is sickness of the lungs. They use atropine to counteract that. They get a new drug. I don't know what the name of the new drug is. My boy got sick with it last year working on the airplane with it and he vomited and the doctor gave him atropine and he came home. They sent him back again to another doctor. They put him to bed and gave him Pam. In 15 minutes he was all right. But he was just about dead.

That is the kind of mentality of the unfortunate people who are involved in the application of the stuff.

Senator MONDALE. They tell me that one of the intricacies of the use of antedotes of pesticides is that it takes a different kind of dosage for children and a lot of doctors are unaware of this. They will give the wrong dosage, which can be almost as dangerous as the pesticide.

Mr. GORDON. That is right.

I would like to read from the Army Training Manual about the effect of using the antedote. I don't want to read too much of it but I would like to read the effects of it.

> If administration of atropine in doses of about 2 milligrams is repeated within an hour, the symptoms become more moderate in degree and some will have drowsiness, slowness of memory, feeling that body movements are slow, blurring of near vision.

Which was a significant factor in the death of these 15 agricultural pilots last year.

> Further administration of atropine will result in severe and incompacitating symptoms, including very dry mouth, thirst, hoarseness, dialated pupils, blurring of near vision, very rapid heart beats up to /60 beats per minute, urinal retention, constipation, restlessness, disorientation, hallucinations.

So here we have a product which almost has some effects as LSD, and yet it is used as an antedotes for pesticides.

The Army says, "Abnormal behavior may require restraint."

Senator MONDALE. I regret that our time is such that we can't go any longer, but we may be submitting some questions to you for the record, if you can respond, and that will be true of some of the other witnesses, also.

I will ask the staff today to ask the Food and Drug Administration whether these readings on the Thompson seedless graps are accurate.

Also, I am going to order included in the record, at this point, a statement submitted by the National Agricultural Chemical Association. Although they were asked to testify, they were unable to attend the hearings because of schedule conflicts. Similarly, the California Department of Agriculture was unable to accept our invitation to testify, and I shall order printed their statement. I am also going to order included in the record a statement on the Insecticide crisis by Dr. Robert Van Den Bosch. Other pertinent communications, letters, and documents shall also be included at this point in the record.

Thank you very much, the hearing is now adjourned.

Whereupon, at 12:15 p.m., the committee recessed, to be reconvened at the call of the Chair.

(The material referred to follows:)

PREPARED STATEMENT OF THE NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION

This statement is submitted on behalf of the National Agricultural Chemicals Association [1] in response to an invitation from the Subcommittee. In cooperation with the United States Department of Agriculture, the Food and Drug Administration and the Public Health Service of the Department of Health, Education, and Welfare, and counterpart agencies in each of the states, this Association has participated in the development of laws and regulations dealing with pesticides for the past thirty years. It is the purpose of this statement to outline the industry, its products, and the existing regulatory controls over pesticides, with brief references to current pesticide-related research programs.

The principal regulation of pesticides rests with the United States Department of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. § 135. This statute requires all pesticides shipped in interstate commerce to be registered with the Department of Agriculture and to display the registration number on the label. The burden is on the applicant for registration to establish the safety and efficacy of the product and the suitability of its labeling before registration is granted. Under a formal interagency agreement published in the *Federal Register* on May 1, 1964, 29 *F.R.* 5808–09, each product that is submitted for registration is reviewed carefully not only by the Pesticides Regulation Division of the Department of Agriculture but also by the Fish and Wildlife Service of the Department of the Interior, the Office of Pesticides of the Public Health Service and the Food and Drug Administration. Each agency reviews the label from its own expertise before registration is approved by the Department of Agriculture.

If the product is not for a food-producing use, it may be shipped in interstate commerce following its review, evaluation and registration. If the pesticide is to be used in agriculture for the production of food, the Department of Agriculture issues a certificate of usefulness certifying that the product is useful for the control of the insects claimed on the label. The applicant must then submit a petition to the Food and Drug Administration requesting that a tolerance for a residue of the pesticide be established on each crop on which

[1] NACA is a non-profit trade association representing the manufacturers and distributors of approximately ninety percent of the pesticide chemicals used in agriculture in the United States. Its principal office is located at 1155 Fifteenth Street, N. W., Washington, D. C.

the pesticide is directed for use. The permissible tolerances are stated in terms of parts per million. The approved levels represent a safety factor of approximately 100 between the no-effect level of the pesticide in laboratory animals and the maximum permissible residue. The applicant must develop experimental data with the use of the product under several of the varying climatic conditions in the United States to establish the time and minimum rate of application needed to achieve insect control and to determine the maximum residue likely to remain when the product is so used. If this residue is less than the established safety level, the tolerance is set at the lower level of the two values. Once the tolerance is established, and the tolerance may not permit any residue to remain if a safe level cannot be determined, the Department of Agriculture will register the product when the label instructions and warnings and cautions meet the statutory criteria.

Pesticides are also registered annually in each of forty-eight states, where the label statements are subject to constant review. Most state laws are similar to the Federal Act. Development of a new pesticide from the laboratory to the user requires from five to eight years and an average expenditure of some $4,000,000.

A pesticide, when used, is usually a combination of many ingredients, though generally we refer only to the active ingredients. Inert ingredients will include solvents, carriers, diluents, spreaders, stickers, detergents, and other materials, used to control the percent of active ingredient, including water. The active ingredients are produced principally by basic chemical manufacturers and the petroleum companies. Inert ingredients are supplied by a variety of producers. Pesticides include not only insect control materials but also defoliants, desiccants, plant growth regulators, rodenticides, disinfectants, fungicides, herbicides, nematocides, and others.

Chemicals are essential farm tools. They are not optional control techniques. Fertilizers replace soil nutrients which are used by crops for growth and yield. Pesticides protect the crop, increase yields, prevent or destroy weeds, and preserve the harvest in storage until use. Pesticides are used extensively in improving the public health and eliminating disease vectors. The World Health Organization is a major user of pesticides. Wildlife management requires the application of many pesticides to protect food supplies, control disease, eliminate undesirable wildlife such as trash fish, and to control many predators of desirable wildlife, such as the sea lamprey which threatened to destroy the trout and whitefish populations in the Great Lakes.

Safe use of pesticides is a concern of all persons. Industry's deep interest is obvious. The focal point of safe use is, of course, the label. A pesticide will not be registered under Federal Law unless the label provides instructions for use and cautions, adequate if complied with, to prevent injury to man and desirable animals. Persuading people to read and follow labels is a continuing program of every one connected with the production and use of pesticides.

Educational programs must be and are conducted at the local level with the support of county, state and Federal governments and the agribusiness industries. Short courses on safe pesticide use are conducted by most land grant colleges. Information on safe use is disseminated through the schools, the extension service, farm organizations, Federal and state agencies, county commissioners, county agents, Four-H Clubs, farm newspapers, magazines, radio, television and other forms of available communication.

NAC sponsored with the National Safety Council the ongoing stop sign program. A facsimile of the stop sign is attached to this statement. Stop signs are used on many pesticide containers, in advertising and other literature distributed to growers.

This industry has led the way to improve labeling of a number of pesticides. Ten years ago, parathion dust formulations containing two percent or less of parathion were not required to bear the word POISON or a skull and crossbones. Industry, after careful review, concluded that these products should be labeled with the word POISON and the skull and crossbones and made this recommendation to the United States Department of Agriculture. A copy of the Association bulletin, dated December 18, 1959, relating to this subject is attached to this statement. As a result of this recommendation, the regulations of the Department of Agriculture were appropriately modified, and since then all parathion products regardless of the amount of toxicant bear a poison label.

Multi-lingual posters and symbols for the illiterate are widely distributed. Representative samples are being supplied to the Committee. These posters are designed to prevent injury and illness to workers and to improve the safe handling and use of pesticides. They are made available by the Chevron Chemical Company as part of that Company's safety program. Chevron is headquartered in San Francisco.

Product labels warn that people should not enter a field treated with a pesticide for a period of time which is related to the specific product used. Attached to this statement is a sample of the label for Niran, a proprietary parathion formulation of the Monsanto Company. The label directs that persons should be kept out of the treated areas for forty-eight hours. Appropriate posters, therefore, should be used for a period of forty-eight hours after application to avoid the worker's exposure to a residue of the material.

The label also directs that the product not be used within a certain period of time prior to harvest. These directions are standard for parathion products and are approved by the Department of Agriculture. For example, the label directs that parathion not be applied to apples, apricots, blueberries, cherries, grapes, peaches and other fruit within fourteen days of harvest. This helps assure that the residue at the time of harvest will not exceed the maximum permissible limit. The maximum tolerance for parathion is one part per million in or on the raw agricultural commodity.

If the residue at harvest should exceed this amount, the crop is subject to seizure and destruction by the Food and Drug Administration. Farm workers employed to pick crops are, therefore, not subject to exposure to parathion residues in excess of one part per million, only a portion of which is on the outside of the crop since the tolerance is for the whole fruit item. Since parathion is a relatively rapid breakdown product, it is extremely doubtful that any detectable parathion would remain on a crop fourteen days after application. The patterns of use of pesticides in agriculture and the extremely tight controls on residues have combined to protect workers in the field from exposure to quantities of pesticides which might be injurious.

Research into all aspects of pesticide use and its relation to man and his ecology is conducted on a broad scale. Close to one hundred million dollars will be spent this year on pesticide-related research. The Public Health Service is conducting in depth community health studies in areas of heavy pesticide use. Representative segments of the population of workers exposed to pesticides are monitored. Research programs are underway in eleven states—New Jersey, Louisiana, Florida, Texas, Hawaii, Michigan, Iowa, Colorado, Washington, California, and Arizona. Research laboratories at Wenatchee, Washington, and Perrine, Florida are devoted to pesticides. Industry monitors the health of plant employees on a regular basis.

Nationwide monitoring of soils in several thousand sites is a program of the Department of Agriculture. The Department of the Interior operates laboratories at Gulf Breeze, Florida, Ann Arbor, Michigan, and Denver, Colorado. Pesticide levels at one hundred sixty sites along all coasts are monitored by monthly collection and analysis of clams and oysters. Six species of fish are collected and analyzed quarterly from many stations in the Great Lakes and mallard and black ducks and similar water fowl are monitored regularly for pesticide residues.

The Department of Health, Education, and Welfare is studying the atmospheric distribution of pesticides on the East Coast and the presence of these materials in the principal river drainage basins in the United States. The Office of Product Safety of the Food and Drug Administration conducts, six times yearly, a market basket survey in thirty different markets. A week's supply of food for a nineteen year old boy (reputed to be our biggest eater) is purchased off the shelves and analyzed for all pesticides. These surveys have shown pesticide residues to be consistently below the tolerance level set by the Food and Drug Administration.

Active water, soil and air monitoring programs are being conducted by several states—Alaska, California, Delaware, Georgia, Iowa, Massachusetts, Michigan, North Carolina, Texas, and Wisconsin.

Combined, these studies produce an impressive mountain of data. Better reader acceptance is gained by proclaiming the threatened extinction of birds such as the osprey (which is currently thriving in Maryland), but the dull routine facts, based upon painstaking research, reflect that the risk-benefit equation is in balance. The last Senate Committee to study this subject, the Subcommittee on Reorganization and International Organizations of the Committee on Government Operations, under the Chairmanship of Senator Ribicoff, also came to this conclusion. (S. Rep. No. 1379, 89th Cong., 2d Sess. (1966) at 64–65.)

The additional one hundred million people predicted for our population by President Nixon, must be fed. True, protein requirements can be satisfied by processed fish scales and algae, but the American citizen today demands to live, not just exist.

Tremendous resources are brought to bear daily on the pesticide issues. No new approaches are apparent. Continued and repeated effort at education stressing the need to treat pesticides with respect and care is the anticipated program of the future. Pesticides can be and are handled safely—they perform their funcion, an essential function—but users must assume some responsibility for avoiding misuse and the hazards which result.

This Association and the industry it represents will continue their efforts toward efficient and safe use of all pesticides. Continued education seems to be the most promising approach to even safer and more careful handling and use of pesticides.

(Exhibits attached to this statement have been retained in the Subcommittee's files. They consist of actual posters, literature showing labelling of chemicals as they are sold, and other informative information about the industry.)

National Agricultural Chemicals Association,
Washington, D.C., December 18, 1959.

MEMBERS OF THE INDUSTRY

Re Labelling of organic phosphate insecticides

In recent months there have been a number of accidental deaths resulting from misuse of parathion dust formulations where the actual amount of toxicant was 2% or less. In these incidents it has been established that lack of adherence to safe use practices was a major factor.

Under Interpretation 18 of the regulations for the enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act, parathion dusts 2% and below are not required to be labelled with the skull and crossbones and the word poison.

The basic producers of parathion have held two meetings to discuss the problem of misuse of parathion formulations. At a meeting held at the NAC offices on November 18 they recommended that labels of *all* parathion products should bear warning and caution statements the same as now required for parathion formulations containing more than 2% parathion, which includes the skull and crossbones. They feel that such labelling coupled with an increased educational campaign to inform users of the hazards of parathion would do much to reduce the likelihood of further deaths due to mis-use.

The parathion producers further recommended that NAC should approach the Pesticides Regulation Branch requesting that Interpretation 18 be revised to require that labels of all Parathion products bear the skull and crossbones and other warning and caution statements now required to appear on formulations containing more than 2% parathion.

These two recommendations have been reviewed by members of the NAC Lawyers Committee and that Committee has approved the parathion producers recommendations.

Since the meetings on parathion, the question of whether similar action should be taken in regards to certain other organic phosphate pesticides has been raised by USDA and at least one of the states. NAC conducted a telephone survey of basic producers of TEPP, systox and disyston. The producers of these chemicals have stated that it would be desirable to require all formulations, regardless of percent of active ingredients, to bear a poison label, including the skull and crossbones.

We have advised the Pesticides Regulation Branch of the above recommendations and have asked that they consider amending interpretation 18 of the regulations for the enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act to require that a poison label, including the skull and crossbones, appear on all formulations containing Parathion, TEPP, systox and disyston. Mr. J. C. Ward, Branch Chief, informs us that they are now considering the industry recommendations and will contact us when these recommendations have been thoroughly reviewed.

In view of the above described action and in light of anticipated changes in regulations, we urge members of the industry to voluntarily adopt the labelling program for Parathion, TEPP, systox and disyston. We have been informed that in at least two states, Florida and Massachusetts, action will likely be taken to require such labelling at the state level if the regulations are not revised by USDA.

We believe it will be of benefit to the industry to voluntarily adopt this labelling program. The labelling program and an increased educational program to inform users of potential dangers from highly toxic organic phosphate pesticides when they are improperly used should reduce the chances of further deaths due to mis-use.

Yours very truly.

L. S. Hitchner,
Executive Secretary.

Chevron Chemical Co.,
San Francisco, Calif.,

New Pesticide Safety Posters Can Be Read by Illiterates

Chevron Chemical Company has produced four new pesticide safety posters for distribution through members of the National Agricultural Chemicals Association.

Three of the high-visibility posters can be comprehended by workers who can't read. All four of them communicate warnings in either English or Spanish.

The brilliant yellow, black and white posters, 24" wide by 35" high, were prepared for mounting wherever agricultural workers congregate or pass-by, as a means of promoting increased understanding of fundamental safety, precautions for those who work around pesticides.

L. F. Czufin, Manager of Advertising and Public Relations for Chevron Chemical Company asserted that the posters are the end product of intensive research by a team of industrial safety psychologists, language experts and graphic art experts who attempted to achieve the optimum in quick sight impressionability with a minimum of words.

These posters, completely non-commercial, are available at cost to other companies. Individual company names are imprinted. California Chemical Company has absorbed development costs as part of its commitment and concern with the proper usage of pesticides. Czufin said, "This is one of several steps we've taken over the years in our continuing effort to encourage proper pesticide precautions."

Another step in this program was the company's production of the award-winning motion picture, "Prescription for Safety." This film is available to other pesticide manufacturers (with their name in the titles) for showing to their customers in the pure interest of safety.

California Department of Agriculture,
Sacramento, July 30, 1969.

Hon. Walter F. Mondale,
Senate Subcommittee on Migratory Labor,
Washington, D.C.

Dear Senator Mondale: In response to the telephone call by Mr. Boren Chertkov, Counsel for the Senate Subcommittee on Migratory Labor, we are enclosing a statement pertaining to the California pesticide regulatory program.

It is not possible for us to have someone in Washington, D.C. to testify at the subcommittee hearing on Friday, August 1, and it will be appreciated if you will accept our statement for the record.

If you have further questions, please let us know and we will do the best we can to supply you with information.

We feel strongly that our pesticide regulatory program is exceedingly effective in protecting persons, animals, and crops.

Sincerely,

Jerry W. Fielder,
Director.

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THE CALIFORNIA PESTICIDE REGULATORY PROGRAM

BY
A. B. LEMMON

The California Pesticide Regulatory Program

By
Allen B. Lemmon *

Contents

I. Introduction

The preceding report on the "Use of Pesticides" prepared by the *President's Science Advisory Committee* provides an excellent basis for evaluation of a state's pesticide regulatory program. The report emphasizes the great gains that have been made in the production of food, feed, and fiber through proper use of pesticides. California leads the nation by a wide margin in the production of fruits and vegetables. Its agriculture is the most diversified in the world, with no one crop dominating the State's farm economy. More than 140 crops are produced in commercial volume in California. When the various horticultural specialty crops are included, the total exceeds 200.

In order to reach this great production, California farmers have made full use of pesticides and other modern farm methods. They have realized that there are hazards in use of pesticides and have strongly supported effective laws to assure that their produce is not only safe for their consumers, but will comply with the strictest standards that may apply anywhere in the world.

Strict enforcement of laws is necessary if full protection is to be received. In addition to the staff of the California Department of Agriculture, there is the County Agricultural Commissioner, who in his respective county,

* Chief, Division of Plant Industry, California Department of Agriculture, Sacramento, California.

and under the supervision of the State Department of Agriculture, enforces the regulations pertaining to application and use of pesticides. The County Agricultural Commissioners, with their staffs numbering about 700, have an intimate knowledge of almost every farm in their counties and provide California with agricultural law enforcement that is unmatched.

II. Legal requirements

California has had a comprehensive pesticide regulatory program for many years. The program has four parts which can be described as: (a) control over the composition and labeling of the individual pesticide products; (b) licensing of the business firms and aircraft pilots applying the materials; (c) restricting sale and use of particularly hazardous materials by requiring permits; and (d) testing of fruits and vegetables and other produce for pesticide residue.

a) Registration or licensing of each pesticide product

Each pesticide, and this term includes all insecticides, fungicides, disinfectants, rodenticides, herbicides, and similar materials used around homes and in industry as well as on farms for control of pests, must be registered with the State Department of Agriculture before being offered for sale in California. When a pesticide is first offered for registration the manufacturer submits extensive information on tests that have been made to establish the effectiveness of the product against the pest which is to be controlled, information with regard to both the acute and chronic toxicity, and information concerning any hazard involved in the use of the product. A hazard may include possible injury to people applying the material, to the crops being treated, to livestock, and to honeybees. In many cases special attention is given to need for protection of fish and wildlife. Consideration is also given to hazards that might arise if the material drifts onto adjacent areas or contaminates bodies of water. All of this information developed by the manufacturer for a single product may cost a million dollars or more, and the summaries submitted may consist of several thousand pages. The information now required for registration of new chemicals is considerably more extensive than that required a few years ago. Where problems develop in older products, re-evaluation is made, and this includes consideration of a proper tolerance for any pesticidal residue that may remain on a crop that has been treated. If the product is not intended to be applied to a food crop, or if it is of a type that dissipates rapidly and leaves no residue, then a tolerance is not needed.

At the present time manufacturers secure federal registration either before or about the same time that they request registration in California. This means that there is simultaneous evaluation of the information by the Pesticide Regulation Division of the U.S. Department of Agriculture, the U.S. Food and Drug Administration if there is need for a tolerance for pesticidal residue, and the staff of the California Department of Agriculture. There is exchange of information between these agencies. There is no provision in California law for a registration under protest. If a pesticide product appears unacceptable for registration in the State, it is refused registration. Registration may be refused, after hearing, on the basis that a product is of little or no value for the purpose for which it is intended, or is detrimental to vegetation, except weeds, to domestic animals, or to the public health and safety even when properly used. Registration may also be refused in case false or misleading statements are made or implied by the registrant.

Products containing sodium fluoroacetate, commonly known as Compound 1080, and those containing thallium are restricted by law and may be licensed only for sale for use by specially trained people. These two types of materials are not permitted to be sold generally within the State, except for materials for ant control containing thallium not more than one percent.

b) Licensing of agricultural pest control operators

Each agricultural pest control operator is required to be licensed by the Department of Agriculture before engaging in the business of applying pesticides for hire in California. Also, each agricultural pest control operator must first register with the County agricultural Commissioner in each county in which business is to be done, and render a monthly report to him of all work done in the county. In the case of application by aircraft, each pilot must pass an examination to demonstrate his knowledge of the nature and effect of the materials being applied by aircraft. If either the agricultural pest control operator or an agricultural aircraft pilot does not comply with the law and regulations, he is subject to prosecution on a misdemeanor charge, or his license may be suspended or revoked.

c) Injurious materials

Certain pesticides have been declared to be injurious materials or injurious herbicides and can only be used under permit from the County Agricultural Commissioner. The Director of Agriculture, after investigation and hearing, designates those materials that, because of their high toxicity or special hazards, can only be used under permit. The law provides that it is illegal to sell any of these materials to a person required to have a permit unless he has such permit. At the present time herbicides containing 2,4-D and several related compounds are placed in this category. The injurious materials include such arsenic compounds as sodium arsenite solution, calcium arsenate, and lead arsenate, and a number of the highly toxic organic phosphorus compounds, including parathion and Phosdrin. Chloropicrin is also classed as an injurious material. In all, five hormone-type herbicides and fourteen other pesticides require special permit to buy and use.

If all the directions on labels of pesticides and the rules and regulations governing their use are carefully followed, there should be no injury or damage, or excessive residue remaining at harvest.

d) Pesticide residue inspection

The California Department of Agriculture regularly inspects and analyzes samples of fruits and vegetables, feeding stuffs, milk, hay, meat, and other produce in wholesale channels to be certain there is no excessive pesticide residue on the food offered for sale in the State. This is really a double check to be sure that the program guiding sale and use of pesticides has been completely successful. Samples are also drawn from retail markets as a further check. No residue at all is found on over half of the produce available to the housewife. Much less than one percent may be slightly over tolerance and the remainder well within the tolerances established.

The Federal Food and Drug Administration draws samples from lots of produce that may move interstate. During the past year it made no seizures of California produce.

The tolerances for pesticide residues established under the authority of the *Agricultural Code* and listed in the *California Administrative Code* are essentially the same as those established by the Federal Food and Drug Administration under federal law. They are based upon extensive toxicological information developed by the applicant for a tolerance through tests on animals, and are evaluated by competent people. The tolerances are expected to provide adequate safety factor so that there will be no hazard to consumers of the food even if it were accidentally contaminated with many times the tolerance. Whenever new information is developed that indicates need for review of a particular tolerance, such evaluation is made.

III. Protection of wildlife

The California Department of Agriculture has always recognized the need to protect beneficial wildlife. As early as 1915 special instructions were provided to those engaged in poisoning rodents and other pest animals calling attention to precautions necessary to prevent damage to other animals.

When thallium first was proposed for use for rodent control, the Department of Agriculture recommended legislation which was enacted to restrict possession and use of this toxicant to governmental officials for use for pest control purposes. Similar restrictions were placed on sodium fluoroacetate when it first became available for use.

Wherever information has been submitted that a particular usage is detrimental to wildlife an evaluation is made and a way is found to alleviate the situation and protect the wildlife. For example, some years ago it was found that rotenone spray applied to dairy animals for cattle grub control was fatal to fish if permitted to drain into streams carrying fish. Arrangements were made to prevent such runoff until the rotenone had deteriorated and would no longer be toxic to fish. Labels of rotenone products are required to warn against effect on fish. A typical label reads: "Caution: To protect fish and wildlife do not contaminate streams, lakes, or ponds with this material."

There is an excellent working arrangement with the California Department of Fish and Game, which brings to the attention of the Department of Agriculture any pesticide wildlife problems. Such problems are investigated together by these agencies, and solutions are developed.

Even though considerable research is now being carried on to determine current pesticide levels and their trends in man and his environment, further research is needed in this field. More information is needed concerning any toxic effects pesticides may have on wildlife, as reliable scientific information must be available to support regulatory actions.

IV. Conclusion

The program for regulation of the sale and use of pesticides in California provides even greater control over these materials than is exercised by the Federal Government as recommended in the report of the *President's Science Advisory Committee.* The California program restricts nineteen pesticides to use under specific regulations and requires a permit to purchase and use them. As need arises, additional materials can be placed under these restrictions.

The pesticide residue testing of samples of fruits, vegetables, and other produce confirms that by controlling labeling and application of pesticides the food offered for sale in retail markets is free of pesticide residues that might be detrimental to health.

Summary

California farmers use large quantities of pesticides to protect their many growing crops. Strict enforcement of comprehensive laws is necessary to guide proper handling and use of pesticides.

The California pesticide regulatory program includes licensing of each pesticide product, qualification of those engaged in the business of applying pesticides, restriction of the sale and use of particularly hazardous materials by requiring permits for use, and testing of fruits and vegetables and other produce for pesticide residue.

The effectiveness of the program is confirmed by the fact that surveys of produce on the retail markets generally show all food to be free from excessive pesticide residue.

Consideration is given to protection of wildlife by requiring cautions on labels of pesticide products and instructions to pest control operators concerning precautions to be taken in handling these materials.

Résumé *

Les fermiers californiens utilisent de grandes quantités de pesticides pour protéger leurs nombreuses récoltes sur pied. Une rigoureuse mise en vigueur de lois intelligibles est nécessaire pour guider la manipulation correcte et l'usage des pesticides.

Le programme de la réglementation californienne sur les pesticides inclut une licence pour chaque produit pesticide, la qualification de ceux qui ont en charge leur application, des restrictions de vente et d'utilisation pour les produits particulièrement dangereux, en requérant des permis d'utilisation ainsi que la pratique d'essais sur fruits, légumes et autres denrées pour la recherche des résidus.

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* Traduit par S. Dormal van den Bruel.

L'efficacité de ce programme est confirmée le fait que le contrôle des produits présentés à la vente au détail prouve généralement que toutes les denrées alimentaires sont exemptes de doses exagérées de résidus de pesticides. La protection du gibier est assurée par l'exigence d'avertissements devant figurer sur les étiquettes des produits pesticides et d'instructions aux opérateurs quant aux précautions à prendre lors de leur manipulation.

Zusammenfassung*

Die kalifornischen Farmer wenden große Mengen von Schädlingsbekämpfungsmitteln an, um ihre zahlreichen Pflanzenkulturen zu schützen. Die strenge Durchführung umfassender gesetzlicher Maßnahmen ist notwendig, um eine richtige Handhabung und Anwendung von Schädlingsbekämpfungsmitteln durchzusetzen.

Das „California Pesticide Regulatory Program" beinhaltet die Zulassung eines jeden Schädlingsbekämpfungsmittels, die Frage der Eignung der in der Anwendung der Schädlingsbekämpfungsmittel beruflich Tätigen, ferner einschränkende Maßnahmen für Handel und Anwendung besonders gefährlicher Stoffe, indem es Erlaubnisscheine für deren Anwendung fordert, weiterhin die Überprüfung von Obst und Gemüse und anderen Produkten auf Schädlingsbekämpfungsmittel-Rückstände.

Die Wirksamkeit dieses Programms wird durch die Tatsache bestätigt, daß die Kontrollen der Produkte im Einzelhandel im allgemeinen zeigen, daß alle Lebensmittel frei von übermäßigen Schädlingsbekämpfungsmittel-Rückständen sind.

Berücksichtigung findet auch der Schutz der frei lebenden Tiere, indem man Warnungen auf den Etiketten der Schädlingsbekämpfungsmittelpackungen und Belehrungen der Schädlingsbekämpfer über Vorsichtsmaßnahmen bei der Anwendung dieser Stoffe fordert.

References

Agricultural Code, State of California.

California Administrative Code, Title 3, Agriculture.

President's Science Advisory Committee, Jerome B. Wiesner (Chairman): Report on "Use of Pesticides". The White House. May 15, 1963. Reproduced in Residue Reviews 6, 1 (1963).

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* Übersetzt von O. R. Klimmer.

U.S. SENATE,
Washington D.C., September 4, 1969.

Mr. JERRY W. FIELDER,
Director, California Department of Agriculture,
Sacramento, Calif.

DEAR MR. FIELDER: I am in receipt of your letter of July 30, 1969 and your statement pertaining to the California pesticide regulatory program which you enclosed.

I think your statement is an important contribution to the hearing record, and I have accordingly ordered that it be made a part of the record of our hearings in Pesticides and the Farmworker on August 1, 1969.

During our hearings, Jerome Cohen, a witness for the United Farm Workers Organizing Committee asked that you respond to two questions:

1. What is the basis for your statement that DDT can be safely used on grapes when it has been recommended *not* to be used on any other crop except cotton?

2. Why don't you take positive steps to have private growers release their pesticide records, so that the public will know what is being put on their grapes?

I would very much like to have your response to these questions so that it can also be printed in our hearing record. Your cooperation in this matter is deeply appreciated.

Thank you very much for your interest in, and cooperation with, the work of the Subcommittee.

With warm regards.

Sincerely,

WALTER F. MONDALE,
Chairman, Subcommittee on Migratory Labor.

CALIFORNIA DEPARTMENT OF AGRICULTURE,
Sacramento, September 17, 1969.

Hon. WALTER F. MONDALE,
Chairman, Subcommittee on Migratory Labor
U.S. Senate,
Washington, D.C.

DEAR SENATOR MONDALE: Thank you for your letter of September 4, 1969. I am pleased that you are including our statement pertaining to the California pesticide regulatory program as part of the record of your hearings on pesticides and the farm worker.

My response to your questions is as follows:

1. What is the basis for our statement that DDT can be safely used on grapes when it has been recommended *not* to be used on any other crop except cotton?

DDT has been used through the years on a wide variety of crops to protect a broad spectrum of pests that attack such crops. Both the United States Food and Drug Administration and the California Department of Agriculture have established on many crops tolerances for DDT that are adequate to safeguard the health of the people eating the fruits and vegetables. Because of the concern over the effect of DDT and other long-lived pesticides on the environment, we propose to reduce the total usage and restrict use of DDT for the control of those pests on those crops where there is no other satisfactory alternative material. In the case of grapes the grape bud bettle is occasionally a pest on certain varieties of grapes, and when it occurs it is very damaging. Usually only a small acreage is attacked at one time. It attacks grapes in the spring when buds are forming, and the use of DDT at this time does not leave any residue on grapes at the time they are harvested. We have not had a problem with this pest for several years.

2. Why don't we take positive steps to have private growers release their pesticide records so that the public will know what is being put on their grapes?

In California each commercial pest control operator is required to file with the County Agricultural Commissioner, in accordance with the Commissioner's regulations, a monthly report covering the work done in that county during the previous month. These reports include the names and locations of the customers, and customer lists are regarded as private business. Various counties do make summations of the pesticides used and distribute such information to those that are interested. A copy of the news release stating our Departmental policy is enclosed. We would like to emphasize that whenever there is a case of actual or suspected illness resulting from exposure to pesticides, the Departmental will make available to the exposed person, his family, his physician, his attorney, and any other responsible interested party all of the information it has which could bear on the illness.

3. Is it true that grapes in California have been sprayed with Amino Triazole? If so, how much of that chemical was used and how many acres of grapes were involved?

Amino Triazole is not sprayed on grapes. It is occasionally used for control of weeds, but such use is carefully limited so that there will be no chemical either on the grapevines or on the grapes. Application for weed control is made at a time of year when there are no grapes on the vines.

If there is any further information that we can send you, please inform us.

Sincerely,

JERRY W. FIELDER,
Director

AUGUST 11, 1969.

JERRY W. FIELDER,
Director, California Department of Agriculture,
Sacramento.

California Director of Agriculture Jerry W. Fielder today made a policy statement regarding the release of information on agricultural pesticide applications.

In issuing the statement, Fielder said it reaffirmed the Department's position on release of pesticide information. He noted that severe controversy exists involving several lawsuits, and unwarranted charges by litigants, organizations, and other interested parties critical of restrictions on the release of such information.

The Director declined to comment directly on litigation at this time, saying he hoped these cases could be handled through the legal process itself.

Director Fielder's statement of policy on pesticide information releases follows:

1. "In any case of actual or suspected illness resulting from exposure to pesticides, the Department will make available to the exposed person, his family, his physician, his attorney and any other responsible interested party, all the information it has which could bear on the illness. Further, it is expected that each County Agricultural Commissioner will make such information available from his files.

2. "If property damage results from pesticide application, the Department will make available to the injured party, his attorney, and any other responsible interested party, its information concerning the material used, and manner of application."

3. "In case of complaint about improper method of application which endangers persons or property, information will be made available as to the applicator and requirements for proper applications. This includes applications by either aircraft or ground equipment.

4. "Permits issued by County Agricultural Commissioners for the application of pesticides are considered public records.

5. "The type of information developed in investigations into illegal or improper practices is naturally confidential, as it is in any investigative process of law. Information concerning confidential business relationships and customer lists revealed in routine reports is also confidential in nature.

"This type of information is contained in the pest control applicator's reports and at this time the status of such confidentiality is being decided by the courts. The Kern County Superior Court has ruled against the release of such information."

Fielder said the Department of Agriculture will continue to require its licensed pest control operators to comply strictly with all laws and regulations governing the application of chemicals.

"There is no excuse," Fielder said, "for an applicator to apply materials while workers are in the field. The Department will not tolerate the placing of improper amounts or types of materials in any circumstances. The law carefully controls the amounts and types of pesticides and herbicides that may be used.

"There is nothing static about the Department's position. If needs change, so will the Department's position. Restriction on the granting of permits is under continued review.

"If the courts decide that records now held confidential by the Department are a matter of public record, the Department will fully comply."

The California Pesticide Regulatory Program

There are many factors that contribute to the ability of California farmers to produce a large portion of the nation's food and fiber supply. Nature has been good to us in providing a wide variety of climate and a large fertile land area for production of a great variety of crops. Also, we have been protected from the introduction of new pests that occur in other parts of the United States and other parts of the world by our geographical location. The mountains on the north and the east, desert on the south, and the ocean on the west all serve as barriers to many pests and keep them from becoming established in California. Our plant quarantine inspection system has tried to prevent introduction of such pests through movement of man and his commodities. In spite of these protection factors we do have pest problems that require use of pesticides.

The great distance to markets, particularly to the eastern part of the United States, has made it necessary for California farmers to try to produce the highest quality fruits and vegetables. To do this they use the best available information and the most satisfactory cultural practices. They try to take advantage of natural factors such as parasites or predators to control those pests that have become established in California, but they still must use a wide variety of pesticide materials to produce good safe, high quality food.

On grapes there are a variety of pests that become serious at various times, but all the grapes are never treated at the same time. In developing his pest control program the farmer tries to use pesticides that will be most effective during the dormant season if the life cycle of the pest indicates that this is the time to attack it. The growing cycle in some cases requires other treatments, while any treatment that is given at the time that there is fruit on the vines must be so regulated that there will not be pesticide residues in violation of federal and State tolerances at the time that the crop is harvested. For example, any DDT that is used on grapevines must be used prior to 40 days before harvest to assure that there will be practically no residue on the grapes themselves at the time of harvest. Samples of grapes drawn from supplies in retail markets show them to be safely within legal pesticide tolerances.

Through the years California farmers have supported legislation and regulations that provide the most thorough control over sale and use of pesticides of anywhere in the world. The regulatory program has several facets. First, each pesticide product must be registered by the California Department of Agriculture before being offered for sale in the State. The label is carefully scrutinized to be certain that there are adequate directions for use and any necessary precautions. It is illegal to use a pesticide for a purpose not specified on the label. All of the commercial pest control operators that apply pesticides for hire in agriculture are required to be licensed, and each pilot that applies the materials by the use of aircraft must pass a special examination covering his knowledge of the nature and effect of the materials being applied.

Regulation is carried on at the county level in California, as there is a County Agricultural Commissioner who enforces pesticide laws and other agricultural laws in each county. The County Agricultural Commissioner's regulations require each pest control operator monthly to file a statement showing all the work done in the county. These reports are reviewed to be certain that there is compliance with the requirements of laws.

Certain materials through the years have proved to be troublesome either from the standpoint of presenting danger to those that are handling or applying the materials, or because they may cause illegal residues through drift to neighboring crops. These materials have been classified under California law as injurious materials or injurious herbicides. There are 35 such materials so listed, and each can only be used under a permit from the County Agricultural Commissioner. This applies to individual farmers applying their own material as well as to the commercial pest control operators.

Finally, there is an extensive sampling and analysis program covering California fruits and vegetables and other produce offered for sale to be certain that any residues that may remain are below the accepted federal and state legal tolerances. These tolerances or permissible limits are established on the basis of safety to people consuming the produce as well as not greater than the amount that may be likely to remain as the result of good agricultural pest control work. In other words, even though a larger amount might be safe, if a smaller amount is the limit that is needed to control the pest, then the smaller amount is the limit that is permitted.

There has been a good deal of speculation throughout the United States and the world with regard to the place of DDT insofar as injury to people, animals, crops, and the total environment. Our experience has been that DDT is one of the least hazardous materials from the standpoint of handling by man. We have had broad experience through the years, and do not know of anyone in California having been poisoned from the use of DDT. There have been cases where children have swallowed products containing DDT in petroleum oil bases or other solvents, wherein the amount of solvent would be fatal whether there was any DDT in it or not. DDT is not readily absorbed through the skin, so from the standpoint of those applying the material and those working in areas where it has been applied it is regarded as one of the safer materials. The amount that is applied to grapes is rather small as compared to the acreages of grapes that are grown. Many of the farm laborers that work in the Delano area or throughout the southern San Joaquin Valley are local people and not migratory labor as we understand the term. Many of these people have lived in the area for years and are familiar with many of the pesticides used. We have not received reports of injury to them from use of DDT. There have been studies made of DDT exposure of workers in chemical manufacturing plants where they received exposure many many times that would be possible under agricultural operations, and these studies have indicated that currently man is exceedingly resistant to DDT poisoning.

In order to provide further details we are attaching a reprint from "Residue Reviews", Volume 6, which describes the California pesticide regulatory program in greater detail.

The Insecticide Crisis

Robert van den Bosch
Department of Entomology & Parasitology
University of California, Berkeley

A crisis in chemical pest control is acknowledged by some and denied by others. But, proliferating pest problems, sharply rising pest control costs, increasing environmental pollution and burgeoning pesticide related legal entanglements leave little doubt that there is a problem.

In the following statement the several factors that have contributed to this crisis will be discussed, and policies and practices that might bring relief, offered.

The Bases of the Problem

The underlying cause of today's insecticide dilemma lies in the lack of ecological consideration given the synthesis, experimental development, registration and utilization of the new synthetic materials.

The organic insecticide revolution began in the 1940's with the discovery of the insecticidal property of DDT. Prior to that time the insecticide spectrum consisted of a few heavy metal compounds, some botanically derived products, certain petroleum fractions, sulfur, and sundry other materials.

These pesticides were not very effective, but neither were they particularly disruptive to the environment. Consequently, at the time of DDT's advent most persons concerned with pest control were totally unaware of the disruptive potential of the synthetic materials. And so, the new insecticides were released into the environment literally without misgivings, and they effected such spectacular control of age old pests, that all but a few persons were oblivious to the ecological fire they had kindled.

The problems associated with the synthetic insecticides appeared simultaneously with the introduction of DDT. Some very perceptive persons foresaw their occurrence and called attention to them as they developed. But in the early flush of excitement over the new materials these warnings were largely ignored. Indeed, very little was done until the early 1960's when Rachel Carson shocked the world with Silent Spring, and forced serious attention to be given the hazards posed by the materials. And even then, attention was as often focused on the symptoms as on the root causes of the problem.

The basic flaw in the modern synthetic insecticides is their ecological crudeness. This largely stems from the fact that the materials have been synthesized by chemists at the behest of chemical company managerial and sales executives. These are people with little or no knowledge of ecological principles; they know how to synthesize toxic chemicals and how to merchandise them, but they have no real appreciation of their ecological impact. Thus, toxicological and marketing considerations have been the fundamental criteria applied to the development of the modern insecticides. As a result, the materials have had devastating ecological impact, and they have created staggering environmental problems.

For example, the entire biosphere has become contaminated with DDT. Pelagic fishes, Antarctic penguins and boreal frogs contain the material. The water of many lakes and even the Baltic Sea are so polluted with DDT that some fish cannot reproduce and others are unfit for human consumption. Our own bodies have accumulated the material and nursing mothers pass it on to their babies. DDT degrades so slowly that each year an increasing amount accumulates in the biosphere, despite breakdown.

This is cause enough for concern, but it hardly reflects the full magnitude of the insecticide problem. In fact, there is reason to believe that the organochlorines have passed their zenith, since legal restrictions on their use and public pressures against them are forcing their replacement by more ephemeral materials. But in a number of ways the replacement materials pose greater problems than those created by the organochlorines.

Many of the DDT substitutes are organophosphates which are extremely toxic to mammals and a broad spectrum of lower animals, including insects. A disturbing use pattern is beginning to characterize the organophosphates: they are being used redundantly and their use is actually aggravating pest problems. There are 3 basic reasons for this: (1) the materials are characteristically short lived, and must often be used repeatedly against given pest infestations, (2) their severe impact on insect natural enemies, and the resultant elimination of these forms from treated areas, frequently permits rapid resurgence of the target pests and outbreaks of previously inocuous species, (3) the wide scale and repetitious use of the materials has hastened genetic selection for pest resistance to the pesticides.

These 3 factors and the essentially unilateral way in which the materials are used have contributed to an expanding pesticide treadmill worldwide. This in turn is reflected in a proliferation of pest problems, increased hazards to humans and lower animals and finally a tremendous increase in the cost of pest control.

In essence, a situation has developed in chemical pest control that is bordering on the chaotic, and it has been largely brought about by the very materials that were developed to give efficient pest control.

Shortcomings in the Development, Registration and Utilization of Insecticides

It is quite apparent that the inherent ecological shortcomings of the modern synthetic insecticides have increasingly contributed to environmental disruption and to pollution. This in itself is serious, but the problem goes far beyond the simple ecological crudeness of the materials, for ecology is also largely ignored in their experimental development, registration, and exploitation.

Spokesmen for the insecticide industry have frankly stated that, for economic reasons, the industry is not interested in ecologically selective materials. Literally all of the companies are seeking another DDT or Parathion; a product that will have wide potential use so that it can capture the broadest possible market and thereby recoup development costs and insure a profit. To them, the ideal material is one which can be registered and labeled for use against a very broad spectrum of pests on a variety of crops. But, it is precisely this type of toxicity spectrum that dooms a material to be ecologically disruptive.

Experimental screening of newly developed insecticides by chemical company entomologists and many federal and state researchers is simply concerned with the determination of the killing efficiencies of the materials and the acquisition of residue data. Essentially nothing is determined of the ecological impact of the insecticides, because such data are not pertinent to federal registration and the ultimate labeling of the materials.

In essence federal registration of a new insecticide involves 2 criteria; (1) the demonstration of reasonable killing efficacy against given pests on given crops and (2) evidence that the material can be used in such a way as to meet established residue standards and pose minimum hazard to warm blooded animals.

These criteria are grossly inadequate. For one thing, performance data usually only indicate that a material will kill substantial percentages of given insects. They do not show that such kills may not be economically feasible, or that the very use of a material may engender problems of greater severity than those against which it is directed.

In effect, then, federal registration requires no testing of the impact of insecticides on the insect communities to which they are applied. Consequently, there is no statement on an insecticide label to indicate that because of ecological impact, the material can lead to pest resistance, pest resurgence or secondary pest outbreaks. The user in reading an insecticide label has no way of knowing that the material he is about to apply, in addition to killing the pest of concern may, in fact, aggravate that very problem and engender others. Each year countless insecticide users suffer serious economic losses because of this, and there is no way for them to redress these losses through lawsuit, because the defendant chemical companies can (and do) maintain that an infestation occurring subsequent to the use of a pesticide may simply be an "act of God." In other words, the federally approved label exposes the insecticide user to economic loss while simultaneously protecting the manufacturer and seller from accountability. This is all well and good insofar as the chemical companies are concerned, but it leaves the insecticide user open to irretrievable economic loss. Quite clearly, the latter should know the ecological risks he takes in using a broad spectrum insecticide, and these risks should be stated on the label.

Shortcomings in the System of Pesticide Recommendation and Use

Thus far, the discussion has dealt only with the shortcomings in insecticide synthesis, experimental development and registration, and their effects on the insecticide problem. Nevertheless, it is apparent that even before a material is brought into use, it may have characteristics that doom it to be a pollutant and a hazard to man and other life forms. This in itself is cause for concern, but the system under which insecticides are recommended and dispensed is even more disturbing.

Under the prevailing system, pest control advisement and pesticide use are substantially matters of merchandising. The insecticide manufacturers and the agro-service companies, through intensive advertising and the aggressive activities of their sales personnel, dominate pest control. The salesman is the key to the system, for he serves as diagnostician, therapist, and pill dispenser. And what is particularly disturbing is that he need not demonstrate technical competence to perform in this multiple capacity.

In other words, the man who analyses pest problems, recommends the chemicals to be used and effects their sales is neither required by law to demonstrate (by examination) his professional qualifications (as do medical doctors, dentists, lawyers, veterinarians, barbers, beauticians, realtors, etc.) nor is he licensed. Yet this person often deals with extremely complex ecological problems and utilizes some of the most hazardous and ecologically disruptive chemicals devised by science.

For example, today in California, where roughly 1/3 of the nation's insecticide use occurs, there is no official roster of pest control advisers and pesticide salesmen. A man can move into a county to make pest control recommendations and sell insecticides without the Agricultural Commissioner even knowing that he is there. Because of this, illicit recommendations can be made and unregistered products sold, without the perpetrators being identified or called to account.

The chemical industry has made some effort to upgrade the quality of its field personnel but this is really only a gesture, because the men remain salesmen, and merchandising is their real charge. In fact, the very system forces aggressive salesmanship first, because of the great number of companies (at least 100 in California) competing for the market and second, because of the variety of incentives (e.g. commissions, bonuses, profit sharing) utilized by the companies to encourage their field men to make sales.

A particularly disturbing practice is that utilized by some of the larger basic manufacturers who market their own materials. These companies encourage their salesmen to recommend the "captive" company insecticides even in situations where they are not especially effective. A frequent tactic is to mix the "captive" material with a more effective or appropriate one and represent it as a sort of super nostrum. Anything to sell the company product! Such practices will almost surely increase, for the basic manufacturers are absorbing more and more of the local agro-service companies and using them as outlets for the "captive" materials.

Finally, even with the most conscientious salesman there is the long standing rationale which goes somewhat as follows: "I knew that field didn't require treatment, but if I hadn't sold the grower a spray job a rival salesman might have come along later in the day and talked him into treating. Why should I lose the sale?"

All of this is perhaps shrewd merchandising or pure pragmatism, but it is also the antithesis of scientific pest control.

Thoughts on Ways to Improve the Situation

Chemical pesticides are indispensable to highly effective pest control, and their importance will increase as the booming human population creates a greater demand for food and fibre and protection from arthropod borne diseases and nuisance insects. But this goal will be in high jeopardy if we continue to use insecticides in an inefficient, disruptive and pollutive manner. New policies of pesticide development and use must be devised and implemented if we are to avoid ecological disaster. The need for these innovations is urgent. Above all, it is absolutely necessary that there be a general realization that pest control is an ecological matter and that pesticides must be developed, registered and utilized in this context.

Following are some thoughts on how this might be accomplished.

1. There is a critical need for more sophisticated (ecologically selective) pesticides which can be fitted into pest management systems. Selectivity must involve more than safety to man, domestic animals and wildlife. The selective materials must also have limited toxicity ranges within the Arthropoda (insects and insect like organisms) so as to pre-

serve insect predators and parasites, pollinators (including honeybees), decomposers, aquatic insects (fish food), etc.

Such materials will, for technological and economical reasons, be more costly than existing broad spectrum insecticides. But because of their very nature (ecological selectivity), they will be used less intensively, effect better control of target pests, cause essentially no secondary pest problems, and be less conducive to the development of resistance in the pest species. For these reasons they should be less costly to the user over the long run, and infinitely less hazardous to man and the general environment.

2. The developmental costs for the ecologically sophisticated materials will unquestionably be greater than those for the existing broad spectrum insecticides (approximately $4 million per material today). Furthermore, the market potential for a given selective insecticide will be considerably smaller than that for a new broad seectrum material.

The chemical companies, as they have in the past, will surely balk at shouldering the full developmental costs of selective pesticides, and if certain adjustments are not made, will refuse to synthesize them. Because of this, the federal government may have to devise a system to underwrite the developmental costs of the ecologically sophisticated materials. It is envisaged that such support would largely be used for studies concerned with the analysis of the materials' health hazards and their impact on the environment.

The funds need not be paid directly to the chemical companies, but instead used to support the critical developmental research by federal and experiment station researchers.

3. Until such time as selective pesticides become generally available,

broader ecological criteria must be applied to the registration of the wide spectrum insecticides. This applies to the registration of new materials and the re-labeling of existing ones. It is only reasonable that the insecticide user have available to him (via the insecticide label) information which describes the ecological shortcomings of the material he contemplates using. He should be warned that a material can do him harm as well as good.

4. The professional qualifications of pest control advisers must be upgraded. In other words, a pest control technocracy is needed to implement the increasingly complex integrated control programs which are already being developed and which will certainly proliferate in the future.

Basic professional qualifications for pest control advisers (including salesmen, so long as they act as advisers), should be established and determined by examination. These persons should be licensed and subject to a code of conduct just as are people in the other professions.

The company affiliated salesman, with his built in conflict of interest and sales motivation, must be phased out of pest control advisement. Eventually, direct contact between the salesman and the lay user of insecticides must be eliminated. Instead, just as in human medicine, the salesman should deal only with the pest control adviser (agro-technologist). It is further envisaged that the user himself should be required to consult with a licensed agro-technologist (pest control adviser) on decisions involving use of insecticides. Many of today's insecticide abuses are committed by the user who applies the materials himself after obtaining them from a salesman or distributor.

5. The integrated control concept must be fostered among pest control researchers, and research on pest management systems expanded as rapidly

as possible. There is a critical need for information on pest economic thresholds, pest ecology and phenology and the nature of agro-ecosystems. Such studies will provide critical information which will permit better timing and placement of insecticidal treatments and lead to the development of alternative control measures.

6. There is an urgent need to develop a training program for agro-technologists (pest control advisers). Ecologically oriented economic entomologists, versed in the principles of integrated control, are extremely rare today and badly needed. The training of such persons will entail curriculum planning, staffing of faculties and the development of internship programs. This implies a need for federal grants to support on-going costs of the programs and to provide fellowships for the students of agro-technology. The fellowships, in part, might well be in the form of research assistantships established from funds allocated to subsidize the development of ecolcgically selective pesticides. Other agencies such as N.I.H. and N.S.F. might also support the fellowship program and the development of curricula and facilities for the training of agro-technologists.

VEGETABLE GROWERS ASSOCIATION OF AMERICA,
Washington, D.C., August 4, 1969.

Hon. WALTER F. MONDALE,
Senate Office Building
Washington, D.C.

DEAR SENATOR MONDALE: In connection with your hearings as Chairman of the Subcommittee on Migratory Labor and your discussion of pesticides, will you kindly insert in the hearing record my testimony on pesticides presented before an Assembly Committee meeting of the Wisconsin State Legislature.

Thanking you, I am,

Respectuflly yours,

CHARLES M. CREUZIGER,
President.

Enclosure.

PREPARED STATEMENT OF CHARLES M. CREUZIGER, PRESIDENT, VEGETABLE GROWERS ASSOCIATION OF AMERICA, STURTEVANT, WIS. BEFORE A COMMITTEE OF THE WISCONSIN STATE LEGISLATURE

Mr. Chairman, my name is Charles M. Creuziger. I am a vegetable grower from Sturtevant, Wisconsin. In partnership with my sons, I own and operate a 650 acre vegetable farm, growing cabbage, potatoes and onion sets.

In addition to my vegetable growing activities here in Wisconsin, I am privileged to be President of the Vegetable Growers Association of America, a nonprofit organization with membership today of approximately 20,000 members. The Vegetable Growers Association of America is the only national association of vegetable growers with membership in 30 states including Wisconsin.

My past activities and association with farm interests and groups are as follows: I served for five years as President of the Wisconsin Potato Growers Association; I served as President for two years of the Wisconsin Muck Farmers Association. I have also served five years as President of the Racine County Agricultural Society.

My remarks this afternoon in opposition to Assembly Bill 163 are submitted for your consideration both as an individual Wisconsin farmer and as President of the Vegetable Growers Association of America.

Man's progress from earliest times is marked by a multitide of developments for his benefit—yes, some even for his survival. Among such items are many types of machinery, medicines, and pesticides. Possibly none of these has been without risk to man. It's the benefit to risk ration that must determine whether the developments are to be accepted by man.

DDT became well known in February, 1944 when the U.S. Army used it to halt an epidemic of typhus fever in Naples, Italy. DDT was dusted over inhabitants to control body lice, which can carry the disease.

By 1948, DDT had done so much for man to control insect vectors of diseases, such as those which spread malaria, typhus, and yellow fever that the Nobel prize in "Physiology or Medicine" was granted to Dr. Paul Mueller of Switzerland for discovering the insect-killing properties of this chemical. Additionally at that time DDT was the number one residual control for several kinds of flies, most household insects, and some insects of field, vegetable and fruit crops. Yes, and those who had worked diligently during the period of World War II and thereafter to ease the world food shortage were happy to have DDT, the first modern insecticides.

1. First, it is agreed that *anything* with the potential hazard of a chemical pesticide, or even a human medicine, *should be controlled.*

DDT has been progressively controlled since its regulated use by the public began in the mid-1940's. As scientific studies have professed, additions to, and deletions of its uses have been granted.

2. To *ban anything* which is a product of commerce, the concerned governmental regulatory agency or agencies must have sufficient proof of hazard, for example. The benefit to risk ratio is to be taken into consideration, just as with human medicines, food additives, and automobiles, the latter of which kill many more people and wildlife than even the wildest emotionalist "suspects". Possibly everyone should put himself in the same position (momentar-

ily) as an individual who has developed a product of commerce which has met all the regulatory requirements, but emotional outcries are made for the government to ban it without due process of investigation to determine the total good versus the total harm. Automolbiles and many human medicines could be banned today on similar emotional efforts only.

Several federal agencies are charged with individual and cooperative responsibilities relative to chemical pesticides. Involved are such as the Department of Agriculture, Food and Drug Administration, Public Health Service Department of Interior, and Department of Defense.

The Fish and Wildlife Service (of the Department of Interior) carries the major responsibility to advise on hazards to wildlife, the apparent major concern of those proposing the ban of DDT. If and when the Fish and Wildlife Service has ample evidence to support the governmental ban of DDT or any other pesticide, the Department of Agriculture could not afford to continue its label registration. In general, Wisconsin accepts by reference the regulations on pesticides as established by these federal agencies which act individually and collectively through governmental organization.

Why, then, has not DDT been banned federally? Because there is not sufficient evidence to support the ban, even though the southerly areas of much higher DDT use than Wisconsin are also considered.

3. Again, to control DDT or any other chemical pesticide is desirable—and it is progressively being done. At present there is no University of Wisconsin, College of Agricultural and Life Sciences recommendation for it in Dutch elm disease or mosquito control, two areas of major concern. Nor is there a recommendation for its use in the College's 1969 Insect Control special circular 113 primarily on control of insects attacking crops and livestock. The pesticide labeling section of the Wisconsin Department of Agriculture, *under present law*, has the authority to delete DDT label registrations which can be proven justified, similar to the U.S. Department of Agriculture's authority at the federal level. Similarly, the Conservation Division of the Department of Natural Resources, *under present law*, has authority of issuing permits for DDT and five other chemical pesticide uses in forest and non-crop areas. The *question arises* as to whether we need legislation to *ban* DDT or to stress enforcement of existing legislation and possibly strengthening any legislation which is deemed necessary to better *control* DDT.

4. Banning DDT would impose distinct hardships on growers of carrots, lettuce, celery and some fruits. In the case of carrots, DDT is considered a "must" for a profitable, marketable quality product. The aster leafhopper is the only known means of transmitting the yellows disease to carrots, lettuce and celery, and the purple disease to potatoes. DDT is the best and most economical control of this leafhopper by far.

A recent federal deletion of toxaphene for control of cabbage worms has caused revival of a former DDT recommendation which was dropped in the 1969 Special Circular 114 of the University of Wisconsin College of Agricultural and Life Sciences—dropped solely as a compromise. Thus the deleted parathion-DDT combination is now reinstated. This is an example of where there is a satisfactory substitute for DDT one day but not the next—if there had been a ban on DDT, no satisfactory recommendation would have been available for a very serious economic pest problem. A similar emergency is already anticipated with lepidopterous larvae on potatoes—whereas the use of DDT would not be absolutely essential on potatoes at the present, it is expected that with the use of the present DDT substitutes (systemics which fail to work on Lepidoptera) that within a year DDT will be necessary to prevent a rather disastrous attack on caterpillars on potatoes. Even if we do not use all of the materials in our arsenal, let us not cut our lines so thin with bans that we have no defense when a real emergency arises.

For Pest Control Operators, who commercially control insect and other pests in and attacking buildings, DDT remains recognized as a very effective and safe material against several pests. Among others are powder post beetles, silverfish, ants, several "pantry pests", flies, mosquitoes, bed bugs, fleas, and ticks.

World and national traveling have presented real threats for people bringing home diseases which can be transmitted by our insects or ticks. Malaria, for example, has been nearly eliminated from many sections of the world, due primarily to judicious use of DDT. It is such foreign use, primarily in human disease-control which accounts for the major production of DDT in the U.S.A.

Encephalitis is a dread disease which crops out in the U.S.A. periodically. When such occurs, the U.S. Public Health Service is usually called in for help —and their help includes advice to control the disease-transmitting mosquitoes —with DDT. One might conclude, without much emotion, that those who support the outright *ban* on DDT could ethically be accused of indirect killing of humans who would succumb to the onslaught of encephalitis without the benefit of DDT to control the mosquito vectors.

Lest we forget, DDT got the 1948 Nobel Prize in the "Physiology or Medicine" category (through the name of Dr. Paul Mueller of Switzerland) primarily for its miraculous control of an epidemic of typhus fever in Naples, Italy, in 1944 and subsequent victorious feats against the vectors of other diseases such as malaria and yellow fever.

Let there be systematic, scientific investigation and regulatory action on pesticides. There are primarily the Federal Committee on Pest Control and expert committees of the National Academy of Sciences which screen research and survey reports to guide the U.S.A. in regulating pesticides. At State levels there are also regulatory agencies, expert committees, and educational and research agencies which may be guided by these national groups, adapting to State needs. Presently there is a "Committee on Persistent Pesticide Residues" consisting of fourteen scientists, appointed by the National Academy of Sciences; the Committee's forthcoming report should definitely guide both Federal and State Regulatory and educational agencies. It is doubtful if this expert Committee will recommend the "death" of Nobel Prize-Winning DDT or any other pesticide, unless there is much more critical information of hazard than has been published to date.

Thank you.

U.S. Department of Agriculture,
Office of Information,
Washington, D.C. July 2, 1969.

Mr. Boren Chertkov,
Subcommittee on Migratory Labor
U.S. Senate, Washington, D.C.

Dear Mr. Chertkov: In response to a request from Miss Marsha Carlin of your committee staff, we are enclosing for your information a copy of, "*1968 Abstracts: Report on Pesticides and Related Activities*," issued by this Department in February of this year. Miss Carlin had asked for figures on the amount of money spent by this Department for pesticide safety education for the farmer, particularly the migratory laborer. You will find on page 44 of the "Abstracts" a table listing approximmately $4.7 million as the expenditure for "information, education, and coordination," during fiscal year 1968 and 1969 and estimated for 1970. Of this amount, the Federal and State Extension Services had available (on a matching fund basis) $4.4 million in 1968 and 1969, and the Office of Information $58,000 and $76,000 respectively for pest control information and education, including pesticide safety (table 2, part A, page 43). These are the agencies primarily responsible for pesticide safety education in this Department.

No records are available on the specific audiences participating in our pesticide safety programs. Safety programs are basically designed for the pesticide user generally including the farmer and commercial applicator, farm supervisor and laborer. A few states such as Texas, Arizona, and California have on occasion conducted Spanish-language safety programs for farm workers, but this has not been on a continuing basis, as far as we know.

Of the pesticide funds used by the Department's Office of Information, about one third to one half underwrites the cost of safety programs and materials such as the continuing radio-television campaign to reduce pesticide accidents and safety cartoons for newspapers and magazines. This effort is aimed primarily at the housewife, gardener, and other small user of pesticides but also reaches the farmer and rancher.

We will be pleased to provide you with any additional information or materials you may need.

Sincerely,

Eugene M. Farkas,
Special Reports Division.

1968 ABSTRACTS

REPORT ON PESTICIDES AND RELATED ACTIVITIES

- Research
- Education
- Information
- Regulation
- Control
- Monitoring

For

Assuring adequate supplies of wholesome, economic food and fiber

Managing the environment for the long range good of man

U.S. DEPARTMENT OF AGRICULTURE AND COOPERATORS

February 1969

EXAMPLES OF PESTICIDE AND RELATED ACTIVITIES

OF THE

UNITED STATES DEPARTMENT OF AGRICULTURE

PROTECT

Use Pesticides Safely

FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE

February 1969

I N T R O D U C T I O N

The pesticide and related activities of the Department of Agriculture continue to be directed toward the development and use of safer, more specific and more effective pest control measures. These activities involve Research, Education, Information, Regulation, Pest Control and Monitoring.

Eleven USDA Services and Agencies are participating in a coordinated program. Within some Services a number of Divisions are engaged in several aspects of the program. The program is described under nine general targets. The nationwide effort is supplemented by programs in several foreign countries.

The activities reported are representative of a total budget program for F.Y. 1968 of $132,123,000. The Department supports work done by public and private agencies through such mechanics as contracts and grants. Major grant funds are expended to State Agricultural Experiment Stations and Schools of Forestry through procedures authorized by the Hatch and McIntire-Stennis Acts.

TARGETS OF USDA PROGRAM

I. To gain knowledge of the taxonomy, biology, ecology, physiology, pathology, metabolism, and nutrition of pests and host plants and animals.

II. To improve and develop means of controlling pests by nonpesticidal methods.

III. To develop safer and more effective pesticide use patterns, formulations, and methods of application; and improved methods for detecting, measuring and eliminating or minimizing pesticide residues in plants, animals and their products, and in other parts of the environment.

IV. To study the toxicity, pathology and metabolism of pesticides and investigate levels, effect, and fate of their residues in plants, animals and their products and in other parts of the environment.

V. To study economic aspects of pest control; survey pesticide use; determine the supply and requirements for pesticides; and give assistance to control agencies and industry in emergencies.

VI. To control pests and protect the environment during and after control operations.

VII. To monitor the presence and distribution of pesticides in plants, animals, and their products, and in the environment.

VIII. To administer the regulatory statute--the Federal Insecticide, Fungicide and Rodenticide Act--to assure properly labeled pesticides, with guidelines for their safe and effective use, and to prevent the marketing of harmful, adulterated or misbranded products.

IX. To educate and inform the public about the importance of pesticides and pest control, and the need for safe and proper use of pesticides; maintain a Pesticides-Information Center; coordinate and review pesticide and pesticide-related activities of the U.S. Department of Agriculture and coordinate them with other Federal, State, and private organizations.

Table 1. PARTICIPATING USDA SERVICES AND AGENCIES

Organizational Unit	Research	Education	Information	Regulation	Control	Monitoring
Agricultural Research Service						
Agricultural Engineering Research	X					
Animal Disease and Parasite Research	X					
Animal Husbandry Research	X					
Animal Health					X	
Crops Research	X					
Entomology Research	X					
Human Nutrition Research	X					
Information			X			
Market Quality Research	X					
Pesticides Regulation				X		
Plant Pest Control					X	X
Plant Quarantine					X	
Soil and Water Conservation Research	X					
Agricultural Stabilization and Conservation Service	X					
Cooperative State Research Service	X					
Forest Service						
Forest Pest Control					X	
Forest Protection Research	X					
Information and Education		X	X			
Timber Management Research	X					
Watershed, Recreation & Range Res.	X					
Federal Extension Service		X				
Economic Research Service	X					
Consumer and Marketing Service						
Livestock Slaughter Inspection						X
Processed Meat Inspection						X
Technical Services						X
National Agricultural Library		X				
Office of Information			X			
Office of the General Counsel				X		
Research Program Development and Evaluation Staff	X					

COORDINATION OF DEPARTMENTAL AND INTERDEPARTMENTAL ACTIVITIES RELATED TO PESTS AND THEIR CONTROL

Current Activities: The Department engages in extensive research, regulation, control, monitoring, education, and information programs related to pests and their control. Associated with these programs are numerous departmental, interdepartmental, USDA-State and international coordination, planning and communication activities.

General interdepartmental coordination and planning is accomplished through participation in the Federal Committee on Pest Control (FCPC) and its several subcommittees and the Federal Weed Control Committee. These are supplemented by participation in Federal Council for Science and Technology Subcommittees on Environmental Quality and Water Resources.

Cooperation with States is affected through exchanges between Department research and extension leaders and their counterparts at agricultural experiment stations or cooperative extension services and between Department control and regulatory units and departments of State governments or the Council of State Governments. Department scientists and research leaders have represented the United States in several meetings with representatives of foreign governments.

The several approaches to coordination and planning involve task forces, committees, work groups and scientist to scientist relationships. Technical competence and leadership of this and other Federal departments, States, industry and foreign governments are utilized.

Selected Examples of Recent Activities and Progress:

1. The Department continues to participate in and contribute technical competence and services to the parent interagency Federal Committee on Pest Control and its five subcommittees on research, monitoring, information, program review, and safety. Some highlights involving USDA participation are:

   a. Final preparation for publication of a report outlining and summarizing Federally financed research on pest control.

   b. Final preparation for publication of a report on Federal pesticide monitoring activities.

   c. Review of Federal financed pest control programs for efficacy and safety and the development of suggested changes where needed.

   d. Identification and evaluation of Federal pest control information programs.

   e. The development of a review and evaluation mechanism for considering pesticide safety problems. This Department was instrumental in the establishment of a new FCPC Subcommittee on Safety and Pesticide Disposal.

2. The Department of Agriculture is dedicated to assuring an adequate supply of wholesome food and fiber and to managing the environment for the long range good of man.

   To insure communication, review and planning relating to its programs in these areas, the Department continues to have an active Pesticide Committee. It is composed of representatives of the agencies within the Department that are concerned with research, education, information, regulation, control and monitoring programs.

   In addition the Department, in 1968, established a Food Safety Work Group. Pesticide residues in foods and feeds are a part of the concern of this group.

   An Environmental Quality Executive Committee-Work Group, with Department-wide representation, continues to consider the role of pesticides in the environment as a part of its activities.

3. The Department continued to stress public information as a means for gaining understanding of USDA pest control policy and to further the safe use of pesticides. Numerous press releases and articles in the Agricultural Research magazine were published on pest research and control activities. Many of them were concerned with new, nonchemical methods. The TV-radio service of the Department was used to present different informational features to millions of people. In addition, the Department Office of Information and agency staff prepared and released many other printed and filmed materials dealing with the need for pesticides and requirements for their safe use.

4. Experts and officials representing the United States of America and three European nations -- Belgium, the Federal Republic of Germany, and The Netherlands -- met in Bonn, Germany, December 18-20, 1967, to consider some significant aspects of agricultural chemicals, including their regulation and their possible impact upon consumer safety and the quality of the environment. The meeting was held at the initiative of the U.S. Department of Agriculture.

   Residue data provided both by the United States and the European nations were compared and evaluated. It became evident that residues generally appear to be within safe limits for all chemicals and for all foods as set up by the tolerances of the nations involved.

   The delegates met again in Washington on March 26 to 29, 1968, to further explore these and other areas relating to the use of agricultural chemicals.

   Representatives of the United States, The Federal Republic of Germany, and The Netherlands have agreed that the generally low levels of pesticide residue found in food products need not impede the substantial flow of trade between their Nations.

4. (Cont'd)

After a detailed review of procedures for setting and enforcing safe residue levels, the delegates found that the systems used in the three participating Nations are essentially the same.

The delegates agreed to free and continuous exchange of data on research and regulatory activities underway in their respective Nations.

5. In connection with the 1967 meeting with Belgium, The Federal Republic of Germany and The Netherlands, the U.S. Government delegation prepared a comprehensive discussion of the regulation of pesticides in the United States. This document was prepared cooperatively by the Department of Health, Education, and Welfare-Food and Drug Administration and the Department of Agriculture.

An outline of the procedures to be followed in the regulation of pesticides is presented. In addition, the detailed residue analytical data on approximately 45,000 samples of raw agricultural commodities confirm the safety of our food supply.

6. The Departments of Agriculture and Health, Education, and Welfare represent the United States on the Codex Committee on Pesticide Residues of the Codex Alimentarius Commission. The third annual meeting of the Committee was held in Arnhem, Holland, in October. Progress was achieved in the furtherance of international pesticide residue tolerances.

The following table shows the use of pesticide coordination funds for fiscal years 1968 and 1969:

	1968 Actual	1969 Estimate
USDA pesticide safety campaign conducted by the Department and other public agencies and for coordinating Department pesticide information with other Federal agencies	$58,038	$75,600
Review and evaluation of the Department's cooperative pesticide and related activities research program and continued preparation of USDA progress report	15,000	---
Maintain up-to-date information on all registered U.S. pesticide uses, including nonfood uses; publish and distribute an index of registered uses of fungicides and nematicides in the U.S.	42,767	50,000
Publish information developed by the FCPC monitoring subcommittee documenting all Federal pesticide monitoring programs	---	3,000
Produce release prints of two TV features on pesticide monitoring	1,750	---
Reproduce additional copies of "The Regulation of Pesticides in the United States."	1,000	---
Conduct U.S.-European meeting in Washington, D.C., on pesticide tolerance levels	5,359	---
Unobligated or unallotted balance	101,086	96,400
Total	$225,000	$225,000

Table 2 (Part A). FUNDS AVAILABLE FOR PESTICIDE AND RELATED ACTIVITIES
United States Department of Agriculture
Totals by Agency for Fiscal Years 1968, 1969, and 1970 Estimated
(Thousands of Dollars)

Agency	1968			1969			Estimated 1970
	Program	Facilities	Total	Program	Facilities	Total	Total
Agricultural Research Service	82,698	3,100	85,798*	84,903	--	84,903*	85,422
Agricultural Stabilization and Conservation Service	9,509	--	9,509	8,522	--	8,522	8,522
Cooperative State Research Service	8,977	1,191	10,168	9,200	700	9,900	9,300
Consumer and Marketing Service	420	--	420	580	--	580	635
Economic Research Service	512	--	512	517	--	517	517
Federal Extension Service	4,400	--	4,400	4,400	--	4,400	4,400
Forest Service	20,309	639	20,948	19,075	759	19,834	20,877
National Agricultural Library	295	--	295	295	--	295	295
Office of Information	58	--	58*	76	--	76*	58
Research Program Development and Evaluation Staff	15*	--	15*	--	--	--	--
TOTAL	127,193	4,930	132,123	127,568	1,459	129,027	130,026

* Includes resources drawn from a $225,000 intra- and interdepartmental pesticide coordination fund first appropriated to the Department in Fiscal Year 1965.

Table 2
(Part A)

Table 2 (Part B) FUNDS AVAILABLE FOR PESTICIDE AND RELATED ACTIVITIES
United States Department of Agriculture
Totals by Target for Fiscal Years 1968, 1969, and 1970 Estimated
(Exclusive of New Facilities)
(Thousands of Dollars)

TARGETS	1968	1969	1970 Estimated
1. Fundamental Biology	17,627	18,064	18,044
2. Improved Means of Nonpesticidal Control	21,210	22,222	22,364
3. Improved Pesticide Use Patterns	11,677	11,757	11,781
4. Toxicology, Pathology, Metabolism & Fate	5,480	5,760	5,764
5. Economics of Pest Control, Use, Supply, and Requirements	651	639	642
6. Pest Control	61,063	59,249	60,829
7. Monitoring	1,072	1,250	1,305
8. Regulation	3,645	3,856	4,156
9. Information, Education & Coordination	4,768	4,771	4,753
TOTAL	127,194	127,568	129,638

Table 2 (Part C). FUNDS AVAILABLE FOR PESTICIDE AND RELATED FACILITIES
United States Department of Agriculture
Totals by Agency for Fiscal Years 1968 and 1969
(Thousands of dollars)

Agency and Facility	Fiscal Year 1968	Fiscal Year 1969
Agricultural Research Service:		
Facilities for control of plant diseases, nematodes and insects, Beltsville, Maryland (Total cost - $2,338,000 including $338,000 planning funds provided in F.Y. 1965)	$2,838	--
Grassland Restoration Laboratory, Temple, Texas (approximately 80% of laboratory relates to pesticides research) ($150,000 planning funds provided in 1968)	120	--
Additional facilities for horticultural research on ornamentals at Corvallis, Oregon, and Puyallup, Washington (approximately 80% of laboratory relates to pesticides research)($25,000 planning funds provided in 1968)	20	--
Modernization of tobacco research laboratory, Oxford, North Carolina (Total cost $150,000) approximately 80% relates to pesticides research)	120	--
Enlarging Soil and Water Research Station, Orono, Maine (approximately 5% of laboratory relates to pesticides research) ($45,000 planning funds provided in 1968)	2	--
TOTAL, ARS Research Facilities	3,100	--

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Table 2 (Cont'd)
(Part C)

Agency and Facility	Fiscal Year 1968	Fiscal Year 1969
Cooperative State Research Service		
Grants to State Agricultural Experiment Stations	$1,191	700
TOTAL, Cooperative State Research Facilities	1,191	700
Forest Service		
(Research)		
Athens, Georgia, construction, Forestry Science Laboratory	265*	95*
Delaware, Ohio, design and specifications, Insect and Disease Laboratory	39	573
Olympia, Washington, construction, Silviculture and Animal Problems Laboratory	65*	--
Durham, New Hampshire, design and specifications, Forestry Science Laboratory	10*	15*
Hamden, Connecticut, construction, Forest Insect and Disease Laboratory	210	--
Moscow, Idaho, design and specifications, Forestry Science Laboratory	40	5
Subtotal, Forest Research Facilities	629	688
(Action)		
Asheville, North Carolina, greenhouse	10	
Alexandria, Louisiana, office and laboratory space		71
Subtotal, Forest Pest Control Facilities	10	71
TOTAL, Forest Service Facilities	$639	$759

* Portion of total cost applicable to pesticide-related research

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
PUBLIC HEALTH SERVICE,
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION,
July 25, 1969.

To: Boren Chertkov.
From: Cherry Y. Tsutsumida, Division of Health Care Services.
Subject: Requested information on effects of pesticides on migrant workers.

As per telephone request today, I am sending you some information which might be relevant.

Please keep in mind that this information reflects only those incidents which have been reported to us. To our knowledge, there is no single source which can give you the kind of information which could be most useful to you.

The Farinholt booklet, though dated, probably gives the best definition of the problem. It serves as a good outline for any inquiry into the problem.

The other information is State reported incidents.

Finally, we have included some general information on the health of the migrant in general. If we can be of any further help, please feel free to call 557–6331.

WORK ACCIDENTS

Reports of occupational disease attributed to pesticides and other agricultural chemicals in California: 1964—1,328; 1965—1,340; 1966—1,347. Data undoubtedly understate incidence because they do not include self-employed farmers and unpaid family labor.

Farm laborers accounted for more than half of the 1,347 reports of occupational disease attributed to farm chemicals.

Injury rate in agriculture in California is still twice as high as rate for all industries taken together. Agricultural injuries represent almost 8% of all lost-time injuries but agricultural workers represent less than 4% of all employess. 68.3 disabling injuries per 1,000 workers in 1965 compared to 65.6 in 1966.

In 1964 contact with insecticides, sprays, defoliants, and fumigants disabled 183 farm workers; in 1966 disabilities resulting from such contacts rose to 254 although fewer persons were at work.

County Farm Bureaus are encouraging improved follow-up on medical care for injured workers.

In Florida, each year since 1956, pesticides have been responsible for 9–10% of all deaths due to poisons by solids, liquids, gases and vapors. Pesticides have been responsible for 49% of deaths due to poisoning among children. In Puerto Rico, pesticides are leading cause of fatal poisoning.

Nationwide, Negroes were involved in about 18% of accidental poison deaths. Among the accidental deaths due to pesticides in Dade County, 72% involved Negroes. Nationwide, men represented about 62% of accidental poison deaths. Among accidental pesticide cases in Dade County 67% were men.

Three groups make up large majority of fatal and nonfatal poisoning by pesticides: young children, young to middle age adult males who are occupationally poisoned, and middle age to older adults who suicidally ingest pesticides (south Florida data).

There is a nationwide need for more reliable data on poison mortality and morbidity. . . .

On June 13, 1968, 23 cotton workers near Santa Rosa, Texas, were poisoned with the chemical parathion.

Sources: California State Department of Health, Bu. of Occ. Health; Pesticide Poisoning in South Florida, Arch Environ Health—vol. 17, Nov. 1968. Morbidity and Mortality Weekly Report, CDC (report of Texas State Dept. of Health, San Benito, Texas).

MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
PUBLIC HEALTH SERVICE,
April 3, 1969.

To: Coordinator for Rural and Migrant Health.
From: Paul Agnano.
Subject: Health hazards in use of agricultural pesticides.

A review of available reference materials on the subject confirms the previous opinion that the State of California has done more work in this area than other agricultural States. The references requested by Boren Chertkov and transmitted March 13, 1967 are particularly pertinent to the question of magnitude and seriousness of the problem throughout the country.

To up date and supplement our office reference materials, I have asked the Migrant Health Project Sanitarians in California, Colorado and Michigan to send us reports of studies or similar information bearing on the subject.

On the Federal level, I have contacted Dr. Savage, of the Pesticide Unit of the Communicable Disease Center, Atlanta, Georgia who offered to make available some preliminary morbidity data being tabulated from State sources. He is also forwarding some reports of classical cases pesticide poisoning in Florida and lower Texas. Dr. Savage suggests, however, that interpretation of the data should be qualified because the present reporting system and method of collecting data have been implemented only recently for cases beginning in 1968.

The Pesticide Unit of CDC is coordinating its activities with the Poison Central Program which operates through some 20 poison control centers dispersed throughout the country. The Director of the Poison Control Program is Mr. Henry Verhultz, located in Silver Springs, his telephone number is 495--5347.

Summary

The 1,347 reports of occupational disease attributed to pesticides and other agricultural chemicals received in 1966 compares with 1,340 in 1965 and 1,328 in 1964.

Occupational diseases are not included from among self-employed farmers and unpaid family labor, 28 percent of the agricultural work force, and from self-employed one-man operations in structural and agricultural pest control work. Data in this review, therefore, undoubtedly understate the incidence of occupational disease attributed to pesticides and other agricultural chemicals.

The rate of occupational disease from agricultural chemicals in agricultural services (6.6 reports per 1,000 workers) was nearly twice that for workers in all agriculture (3.5 reports per 1,000 agricultural workers).

Since 1951, there have been 32 occupational fatalities implicating agricultural chemicals. In this same period, 82 children and 22 other adults died in California from accidents attributed to pesticides and other agricultural chemicals, a total of 136 accidental deaths.

Organic phosphate pesticides were implicated in 19 percent of the 1,347 reports in this series; followed by herbicides, 11 percent; fertilizers, 10 percent; halogenated hydrocarbon pesticides, 7 percent; and phenolic compounds, 7 percent.

There were 233 reports of systemic poisonings in 1966. The organic phosphate pesticides were blamed in 173 of these.

Forty percent of workers with occupational disease attributed to agricultural chemicals were expected to lose some time from work. Ten percent of such workers were hospitalized.

Farm laborers accounted for more than half (704) of the 1,347 reports of occupational disease attributed to agricultural chemicals; nonfarm laborers, 15 percent; and operatives, including truck and tractor drivers, 14 percent.

Eighty percent of pest control chemicals moved beyond local areas are moved by truck. Chemicals are usually transported in concentrated form, creating potential health hazards in transportation and storage of pesticides in the event of mishap.

Source: California State Department of Health Bureau of Occupational Health.

Work Injuries in California Agriculture, 1966

Trend of Work Injuries

The number of on-the-job injuries to agricultural workers continued to decline in 1966. California farmers and firms providing agricultural services recorded 15,325 lost-time employee injuries, down from 15,843 in 1965 and 16,022 in 1964.

Agriculture was one of the three major industry divisions that registered a lower work injury rate in 1966 than in the previous year, and the rate on farms dropped more than in either construction or government, the other major industries with declining rates. The agricultural job injury rate fell by 4 percent—from 68.3 disabling injuries per 1,000 workers in 1965 to 65.6 in 1966.

Although the injury rate reduction in recent years indicates progress, it is still twice as high as the rate for all industries taken together. Looked at another way, agricultural injuries represented almost 8 percent of all lost-time job injuries recorded in California during 1966, although less than 4 percent of all employees worked on farms.

There has been an upward trend of injuries involving mechanical harvesters and pickers, reflecting the increased mechanization of the harvest. When farm machines are used in large numbers, the specter of serious injury is always present. The table below compares the trend of mechanical harvesting equipment injuries with all lost-time agricultural injuries during the past 10 years.

Year	Lost-time agricultural work injuries: Total	Lost-time agricultural work injuries: Involving harvesting machinery [1]
1956	16,672	221
1957	16,165	231
1958	15,841	243
1959	17,883	214
1960	17,121	219
1961	16,724	237
1962	16,104	253
1963	16,474	226
1964	16,022	255
1965	15,843	285
1966	15,325	318
Percent change, 1956–66	8.1	43.9

[1] Includes harvesters, combines, diggers and pickers.

Statistics are not available on the number of farm employees working on or in proximity to harvesting equipment. It seems very likely, however, that the number has risen much more than the 44 percent rise over the past decade in accidents involving harvesting equipment. As one indication of this, the number of tomato harvesters used at the season's peak in California increased to 609 in 1966 from 272 in 1965, according to agricultural experts. Sixty-six percent of the acreage in tomatoes was machine harvested in 1966, up from 25 percent in the previous year.

What are some of the factors that have acted to reduce the number of work injuries on farms in general, and to limit the rise in the number of injuries involving crop harvesting equipment?

As agricultural engineers and manufacturers have developed new equipment, efforts have been made to engineer safety into the design of machinery now coming into wide use. Although more farm employees are now exposed to the hazards inherent in working on heavy machinery, it is easier to supervise them than to supervise a large crew of field hands during the peak of the harvest. Adequate supervision can prevent accidents.

Although it is somewhat early to tell, it appears that the introduction of mechanical pickers has resulted in a reduction in the number of agricultural accidents involving strain or overexertion. In the past when large numbers of

Braceros were brought in to work in the fields, each year hundreds of farm hands suffered strain or overexertion in lifting containers or in stooping for long periods of time. The major push toward mechanization of the harvest has occurred since 1964 when accidents involving strain or overexertion disabled 3,458 farm hands. By 1966, the number of lost-time injuries involving strain or overexertion declined to 3,060, a drop of 11½ percent. In vegetable farming, where the introduction of harvesting equipment has been rapid, the number of injuries caused by strain or overexertion fell 43 percent in the two years between 1964 and 1966.

Another factor that has tended to reduce farm injuries in recent years has been the safety programs instituted to create greater awareness by farmers of the need to encourage safety among their workers in the face of contraction in the available agricultural work force. Several County Farm Bureaus have embarked on programs encouraging members to provide improved "follow-up" on the medical care received by injured workers. Even with minor injuries, farmers have been urged to immediately arrange for the injured worker to be taken to the employer's own physician for treatment, instead of leaving to the worker the responsibility for seeing a physician. It is believed in many cases this has prevented minor injuries from later developing into disabling injuries.

Environmental hazards on the farm continued as an area of concern in 1966. Increased mechanization of agriculture has been accompanied by increased utilization of toxic substances to control crop damage by pests. In 1964, contact with insecticides, sprays, defoliants, and fumigants disabled 183 farm workers. In 1966, disabilities resulting from contact with such economic poisons had risen to 254 although fewer persons were at work.

WORK FATALITIES

On-the-job accidents claimed the lives of 88 California agricultural workers during 1966. Seventy-two of those killed worked on farms, and 16 worked for agricultural service establishments. In 1965 there were 73 agricultural deaths in California.

Vehicle Accidents

Accidents involving trucks, automobiles, or farm labor buses killed 34 workers. Twenty-one deaths occurred in truck accidents, eleven involved automobiles, and two resulted from accidents involving buses transporting farm workers.

Two fatal accidents illustrative of vehicular mishaps involving farm workers are described below:

A farm laborer was hoeing weeds around a cook house near where a 2½-ton truck was parked, while the driver picked up lunches for the field workers. The laborer stepped behind the truck to sharpen his hoe. A high wind was blowing, and the laborer apparently did not hear the truck driver return to the truck and start it. The worker was knocked down by the backing vehicle and run over. He died two weeks later after suffering severe crushing injuries.

A cantaloupe picker stepped between the trailers of a large truck to get a drink of water from a can on the rear of the front trailer. The driver of the truck moved the vehicle forward without warning, and the picker was crushed to death under the wheels of the rear trailer. The drinking water should not have been placed where the workers had to walk between vehicles and could not be seen by the driver.

Farm Tractor Accidents

Seventeen workers were killed while operating farm tractors. Most of the fatalities could probably have been prevented if seat belts and roll bars or adequate canopies had been installed on the tractors.

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The Health of the Migrant Worker

J. ROBERT LINDSAY, M.D., and HELEN L. JOHNSTON, Washington, D. C.

A MIGRANT WORKER is a person engaged in agricultural pursuits whose work necessitates his traveling for a portion of the year beyond normal commuting distance from his home. Thus he must set up temporary residence in other places for at least brief periods. Frequently other members of his family travel with him for all or part of each crop season. They may travel within a single state or move into or across several different states.

Included in the group for which the migrant health program of the Public Health Service has concern are both intra- and interstate domestic migratory farm workers and their families; excluded are foreign nationals imported under contract for temporary work in agriculture, and permanent community residents such as farm owners, farm family members, and year-round farm employees.

The program for the importation of foreign workers under Public Law 78 was formally brought to a close in December 1964. As a result, during the 1965 crop season, foreign migratory workers were being replaced by domestic farm workers drawn chiefly from Texas and the states of the Southeast and the Southwest.

Work Force

Many domestic migrant workers are "hired" through an "employment agency" system operated by the Department of Labor in which the growers register their needs. The Department of Labor then tries to match the requests with available manpower, as determined by negotiations at home-base areas from which migrants normally come. In addition, however, sizeable numbers of domestic migrant workers are so-called "free wheelers" who simply take a chance on finding work on the basis of knowing a particular employer or having worked in a particular area in previous years. The migrant farm work force that registers with the Department of Labor has been estimated variously at from less than 50 to about 90% of the total force in different parts of the country. Exact work force figures are difficult to obtain because of the difficulty in getting accurate counts of "free-wheelers" or "walk-ins."

The number of persons actually moving in the stream of farm migration probably approximates ¾ million or more each year. They are drawn from a labor pool in home-base counties and states which probably numbers 2 or 3 million persons.

Agricultural migrant laborers find employment at the peak of the crop season in about 48 of the 50 states. Nearly 1000 of our 3000 counties use 100 or more at the peak of a normal crop season. Michigan, Texas, California, New York, and Florida are among the states which head the list of those dependent on an outside supply of labor.

However, the peak number of workers in a state or community is somewhat deceiving when one tries to equate this with the problems to a community in providing needed health services for the workers. A large community that is amply supplied with health resources and that has prepared to handle a large number of migrants may indeed be able to accommodate an influx of 10,000 workers and families. Contrasted to this, as small a number as 300 migrants may pose a tremendous burden to a small community if its health resources are inadequate even for its permanent residents, and if no planning has been done in anticipation of the migrant influx.

Some domestic farm workers who leave home for part of the year to harvest crops are able to find nonagricultural jobs when farm work is not available. Even when earnings from other occupations are included, however, the total earn-

Dr. Lindsay is chief, and Miss Johnston is deputy chief, Migrant Health Branch, Division of Community Health Services, U. S. Public Health Service, Department of Health, Education & Welfare.

ings of domestic agricultural workers average approximately $1,000 per year per worker, according to estimates made by the U. S. Department of Agriculture. The pay rate is usually established at the "going rate" for harvesting or other crop work to be done in the particular local work area. It is usually set by local employers before the season starts.

In some instances, migrants prefer to specialize in certain crops, not so much because they disdain working in others, but simply because they gain experience and consequent superior skill in picking beans or tomatoes, for example, and in view of the typical piece-rate basis of payment, earn more money working at this crop.

Women and children who migrate do remunerative farm work to some extent. Because of the family's needs in order to survive, there is a real temptation to allow children to work in the fields instead of seeking out schools for them when the family arrives at a work location. The average annual income *per family*, including the earnings of the women and children, has been estimated at under $3,000.

As is recognized, a sizeable portion of the American public moves intermittently for work in other kinds of industry such as building and highway construction. However, most of these workers are covered by minimum wage laws, have unemployment compensation to tide them over periods when no work is available, and have fringe benefits, including in many cases some type of health insurance protection. Agricultural workers in general lack these benefits. Those who migrate annually also lose local residence status and, therefore, fail to qualify for the local services available to others in their income group.

We have no way to compare the migrant agricultural worker's educational level directly with that of factory workers. We do, however, have some information regarding the agricultural worker's general level of education. Usually his children are taken from school to make their trek northward before the school term has ended in the home-base area; they return to the home-base in the fall after school starts. Thus, they typically fall behind their peers in educational accomplishments. The average educational achievement of migrant adults is about the fifth grade.

Health Service Barriers

Language difficulties are common. The largest number of migrant workers are Spanish-speaking. Many are unable to speak English and therefore have great difficulty in communicating with health workers, especially when they are in northern work areas in which few people speak Spanish. In addition, approximately 20,000 Navahos and members of other Indian tribes enter the migrant work force during part of each year. These people frequently are also unable to communicate in English so that difficulties arise in obtaining services of any kind.

In addition to linguistic problems, other cultural barriers interfere with the provision and use of health services, not only among the Spanish-speaking Texan and the Indian but also among the southern Negroes, Puerto Ricans, and low-income Anglo-Americans. All of these groups may differ in some respects in health understanding and practices from the middle-class "Anglo" culture represented by the community in which they may find themselves for part of the crop season. This may lead to a failure on the part of the predominantly Anglo-American health workers and communities to understand the health concepts of the migrant worker. On the other hand the migrant may frequently misunderstand modern scientific medical concepts. As a result, much of the effort to improve the health of migrants needs to be funneled along educational channels focused on the workers and on their temporary communities.

To help overcome workers' language and educational deficiencies in making work arrangements, the system of crews and crew-leaders is in fairly common use on the East Coast but less so in other parts of the country. Under this organizational pattern, one crew member—usually one who is fluent in English and has more education than the average worker—makes work appointments with growers in northern work areas (often through the Department of Labor's federal-state recruitment system), agreeing to supply a given number of workers at a given time and for a given period. This crew-leader then recruits the workers, usually in his home territory, and often provides them transportation to the job, withholding a certain amount from each worker's pay to reimburse him for transportation or other costs. In some cases the reimbursement for various services rendered by the crew-leader may amount to a few cents for each unit of the crop picked, such as a bushel of potatoes or hamper of beans.

There is often a fairly rapid turnover in crew membership, especially among persons not related to the leader. The original crew may start out from Florida, work in North Carolina, perhaps drop off a few members and add a few in North Carolina, and go on to work in Delaware or New York, again with some change in the composition of the crew at each stop.

In addition to the change in the composition of the crew during migration in a particular crop year, there is also a change in the composition of the migratory force itself from year to year. As some people settle and find other types of work, new people join the migrant stream because of their inability to find work in their home-base areas or because their own small farm no longer is able to compete in the agricultural market. Lacking skills or knowledge of other work, they tend to seek employment in agriculture.

This seasonal and annual turnover in population poses obvious problems in trying to measure accomplishments in a health program. It is like trying to measure the achievements of health services set up to serve the members of a parade. Parade members in one city block might be fully immunized at one point in time but a few minutes or hours later, an attempt to evaluate the immunization effort in the same block might reveal a very low level of immunization.

When the workers are on location they are usually housed in buildings provided either by the grower on his farm, by a farmer cooperative which provides housing for workers that may serve as a reservoir for several farm employers, or by a company which contracts for a crop. In addition, in some cases a local housing authority may make housing available. The charges for the housing vary from no charge—typical in cases where the housing is provided by the grower for his own workers but no others—to fairly standard rental charges. Usually, public-housing authorities charge rent.

Of concern to many citizens, and of special concern to the migrant health program, is the fact that in many areas the housing provided lacks an adequate supply of water suitable for drinking and other household purposes. It is also frequently lacking in proper sanitation facilities. Even if the facilities are adequate and approved for a given number of people, the number actually occupying the housing during the crop season may far exceed the number for which the housing has been certified. Overcrowding increases the health needs of workers and families who may already have greater needs for health maintenance and health care than local community residents.

Most migrant families make their own provisions for buying, preparing, cooking, and storing the food that the family consumes. Cooking and food storage equipment is often provided by the family—frequently on a makeshift basis. In some cases, where male workers are not accompanied by their families, growers may provide a facility where workers may purchase or cook their meals. Food is sometimes taken to the fields, particularly the luncheon meal, either by each worker or family, or by a vendor who sells sandwiches and soft drinks. In many cases, no provision is made for proper food storage in the fields.

The domestic migrant is in most cases an American citizen or eligible for citizenship. Accordingly, he is free to come and go as he pleases. Many health departments offer screening for venereal disease and tuberculosis for local migrant workers as a protection against spread of these diseases to the local community, but there are no requirements for either health examination or certification of freedom from disease in order to work in agriculture.

Experience indicates that migrants generally have no greater incidence of venereal disease and tuberculosis than other similar low-income nonmigratory residents. The migrant family does suffer, however, from diseases such as diarrhea, respiratory infections (including pneumonia), skin diseases, frequent pregnancies and complications of pregnancies, muscular aches and pains, and accidents and trauma. In past years, most communities have been able to provide little if any treatment for these conditions.

Most migrants, in leaving their homes to harvest crops, lose their residency status so far as their eligibility for county hospital and local welfare services is concerned. Even when a community is willing to provide them with health care, frequently additional assistance and supplementation of the existing health resources are needed in order to provide for a migrant influx that may in some cases double the population of the community during the height of the harvest season.

Migrant Health Act

The Migrant Health Act of 1962 was designed to help communities make adjustments in community health services in order to meet the health needs of migrant farmworkers and their families. Thus a setting would be provided in which migrants could be encouraged to take increasing responsibility for meeting their own health needs.

The 1962 Act enabled the Public Health Service to make grants to public or voluntary nonprofit groups to pay part of the cost of family health service clinics in providing general medical care on an outpatient basis to workers and other migrant family members. It also enabled payment of part of the cost of other types of project services to improve migrants' health conditions or services and further authorized expanded effort by the Public Health Service to develop and supplement state and local project effort.

Up to July 1965, 63 migrant health projects had received grant assistance. These projects provided services in one or more counties of 32 states and Puerto Rico. Most of the projects provide family clinic, public health nursing, health education, and sanitation services. Some add dental, nutrition, social work, and other related health services.

About 15% of the projects are under voluntary group sponsorship. Most are sponsored by state or local public health agencies. Regardless of sponsorship, each of the projects involves many community groups which have a contribution to make to the improvement of migrant health conditions and services. Such groups include local physicians, growers, agricultural extension groups, church organizations, welfare agencies, educational institutions, and many others. On the average, about 40% of total project costs are met from other than grant sources. These other contributions are often in kind rather than in cash. They may be in donated facilities, equipment, supplies, transportation, services which in some cases include medical and nursing care, or other items needed for project operation.

The law enacted in 1962 was for a 3-year period. An act providing a 3-year extension was recently passed by Congress and was signed by the President on Aug. 5, 1965. The extension expands the scope of the grant-assisted services to include in-hospital care in short-term general hospitals. The experience of project-sponsored clinics indicates that such an expansion is needed and will be welcomed by many project directors. Much frustration has arisen from the fact that project staff members could take patients only as far as the hospital door and at that point had to "pass the hat" in order to get the bills paid so that patients could be admitted.

There are also geographic areas where need exists but no projects have yet been developed. This lack and the continuing need for grant assistance in some of the areas now receiving migrant health grants indicate that program extension and expansion are necessary if the illnesses and injuries of migrants are to be treated adequately whenever and wherever they occur and prevented to the fullest extent possible.

Division of Community Health Services
U.S. Public Health Service
Washington, D.C. 20201

MARCH 13, 1969.

MEMORANDUM

To: Boren Chertkov, staff, Senate Subcommittee on Migratory Labor,

From: Acting Coordinator for Migrant and Rural Health, Division of Health Care Services, CHS

Subject: Data on work injuries or fatalities in agriculture from the use of toxic substances (insecticides, herbicides, and fungicides)

Attached are data from several recent sources on poisoning cases resulting from work in agriculture. We may be able to find additional data if more are needed. Also attached is the report of the National Consumers Committee for Research and Education, Inc. on "The New Masked Man in Agriculture." [Editor's note: Printed in part 6–B.]

As you know at the time the Migrant Health Act was passed in 1962, Congressional documents stated that grant funds should be used to support health services for migrants, *not* to make studies or to conduct demonstrations. Accordingly, the Migrant Health Program of the Public Health Service has not used migrant health grant funds for studies of work hazards affecting migratory workers or other studies.

Using State funds, the California migrant health project has investigated the problem, at least in a limited way. We will try to get anything we can from them.

HELEN L. JOHNSTON.

1. U.S. 1965—Accidental deaths on farms, by age, sex and accident type p. 86—*Accident Facts, 1967 edition.*

All ages and all accidents—2,321; poisoning only—43.

Age groups over 14—all accidents—1,845; poisoning only—34.

(Poisonings include deaths from poisoning by gases and vapors and deaths from poisoning by solids and liquids.)

2. Bureau of Occupational Health, California Department of Public Health, February 15, 1965 (*California's Health, vol. 22, no. 16, February 15, 1965*).

The Bureau "conducts research in occupational diseases, including studies on the effects of agricultural pesticides on crop dusters, produce pickers and pesticide control operators. The risk of serious occupational illness among these groups is high. . . ."

3. *Work Injuries in California Agriculture* (reports for 1955 and 1966 published by Department of Industrial Relations, California).

Parathion and other organic phosphate insecticides—53 (1955); organic phosphate insecticides—77 (1966).

Other insecticides, sprays, fumigants—134 (1955); 177 (1966)

4. *Work Injuries in California Agriculture, 1966, p. 5.*

"Environmental hazards on the farm continued as an area of concern in 1966. Increased mechanization of agriculture has been accompanied by increased utilization of toxic substances to control crop damage by pests. In 1964, contact with insecticides, sprays, defoliants, and fumigants disabled 183 farm workers. In 1966, disabilities resulting from contact with such economic poisons had risen to 254 although fewer persons were at work."

5. Thomas Saunders, Chief, Division of Industrial Safety, Department of Industrial Relations, California (Hearings on Migratory Labor, 1964)

"We recently investigated and analyzed 143 disablements involving the use of organic phosphates in a variety of agricultural uses, mostly in the Central Valley. We attempted to draw a picture of the typical person injured. This is what we found.

"He was of Mexican descent, about 29 years old; he did not speak or write English. He was poorly paid, generally poorly housed and clothed. He knew nothing about the hazards to which he was exposed and received only the barest instructions and supervision on the use of these materials.

"Just yesterday on my desk was . . . a report to the insurance company, the doctor's first report of a work injury. It says that the nature and extent of the injury was chemical poisoning with severe nausea, vomiting and diarrhea; working in the grapes.

"It said for the name of the employee: 'See attached list,' and the attached list of this one incident lists the names of 53 men who received this poisoning from agricultural chemicals."

Recommendations (paraphrased from Mr. Saunders' statement):

(1) If the children or minors are to be permitted to engage in agricultural work, then the type of work which they are permitted to do must be severely limited.

(2) If non-English-speaking workers are employed, then the type of work they are permitted to do must be limited; in every case, supervision must be provided; and that supervisor must be able to converse from English and the language of the worker.

(3) Definite responsibility for adequate and competent supervision of the workers must be required and enforced.

(4) The employer must be financially responsible in case of injury to an employee or damage to property or bodily injury suffered by other parties.

(5) The employer must be required to carry workmen's compensation and the claim of the injured worker must be promptly and equitably processed.

(6) Standards of safety for the machines, equipment and processes involved in today's agriculture as in other industries.

6. Statement of Donald McLachlan, Michigan Association of Cherry Producers (Hearings on Migratory Labor 1964):

"Health hazards are few in the orchards because the use of poisonous insecticides is halted several weeks in advance of harvest to avoid residue problems and their toxicity is dissipated before the harvest starts."

U.S. DEPARTMENT OF AGRICULTURE,
FEDERAL EXTENSION SERVICE,
Washington, D.C. July 9, 1969.

Mr. BOREN CHERTKOV
Subcommittee on Migratory Labor,
U.S. Senate, Washington, D.C.

DEAR MR. CHERTKOV: Reference is made to a telephone call I received from Miss Marsha Carlin re pesticide safety education programs with migratory labor.

Our Extension pesticide education program has generally been directed to producers, applicators, pest control operators, home gardners, fieldmen, technicians, chemical salesmen, dealers and professionals. Others are also welcome, although I am not aware of any concerted educational effort directed specifically to migratory labor. Any information passed along to this group would normally be through their foreman or crew leader.

I feel that much of the information developed for use with other audiences could also be adapted for use with migratory labor. Examples are included among the publications enclosed.[1] Note especially the one-sheet items from Puerto Rico.

If you have any additional questions, please give us a call.

Sincerely,

L. C. GIBBS,
Coordinator, Agricultural Chemicals Program.

UFWOC PESTICIDE PRESENTATION BY UNITED FARM WORKERS ORGANIZING COMMITTEE, AFL–CIO

DDT and many other pesticides are poisoning workers in the grape fields of California and grape consumers around the country and yet the grape growers and federal government will not sensibly limit use of pesticides until the public demands it. This is the message which Marion Moses, a Registered Nurse from Delano, California, and representative of the United Farm Workers Organizing Committee, is carrying to 75 cities in the United States and Canada. She is meeting with churches, students, labor unions, and other interested organizations and individuals, explaining the facts about effects of pesticides.

[1] [Editor's note: Printed in volume 6–B.]

Many farm workers in Delano have been injured or killed by breathing or touching small amounts of such toxic poisons as Parathion, Tepp, and other commonly used pesticides. In some cases, only one drop on the skin of a worker can kill him in a few agonizing minutes. Research also shows that when grapes are bought by the consumer, they still carry dangerous amounts of many highly poisonous sprays which are impossible to wash off and are eaten with the grapes and stored indefinitely in our bodies.

Miss Moses cites abundant evidence that pesticides are not working anymore to control insects; with insect pests becoming resistant and helpful insects being destroyed, more and stronger pesticides are applied in a desperate but futile effort by the growers to stop the pests. Meanwhile, scientists are finding that pesticides are dangerous to man and the natural world in general. Varieties of cancer and other ailments of man can be traced to pesticides, and serious imbalances in nature are now known to be influenced or caused by these chemical poisons. Fish and wildlife are being wiped out in unprecedented numbers, and several species have dwindled near extinction.

Cesar Chavez, Director of United Farm Workers Organizing Committee, has been trying to negotiate with the growers to limit the kinds and amounts of pesticides used on the grapes and to get safe working conditions for the laborers who handle the pesticides, but the growers have repeatedly refused to bargain at all and have denied the Farm Workers Union access to *public records* of pesticides used on the grapes. Miss Moses reports that at present no one is stopping the growers from spreading dangerous pesticides in the fields and on the consumers table. The Food and Drug Administration says in its own report that it can't handle the problems involved with control of pesticides, and the Department of Agriculture also reports that they do not do independent analyses of pesticides and instead entrust our lives to the opinion of pesticide safety given to the USDA by the manufacturers. Almost no research is being done on the methods of biological control of pests, nor is much research being done on the health hazards of the many pesticides now being used. Yet great amounts of money are available to create more toxic insect killers and investigate better ways to promote and sell the poisons created.

Miss Moses will go into detail on these issues, and will call upon public support for actions to limit pesticides and to provide protection for workers and consumers. The Farm Workers Union believes that if the public becomes better informed about the widespread hazards of pesticides, pressures can be placed on the growers and government to stop the poisoning of workers and consumers and encourage negotiation of the issues.

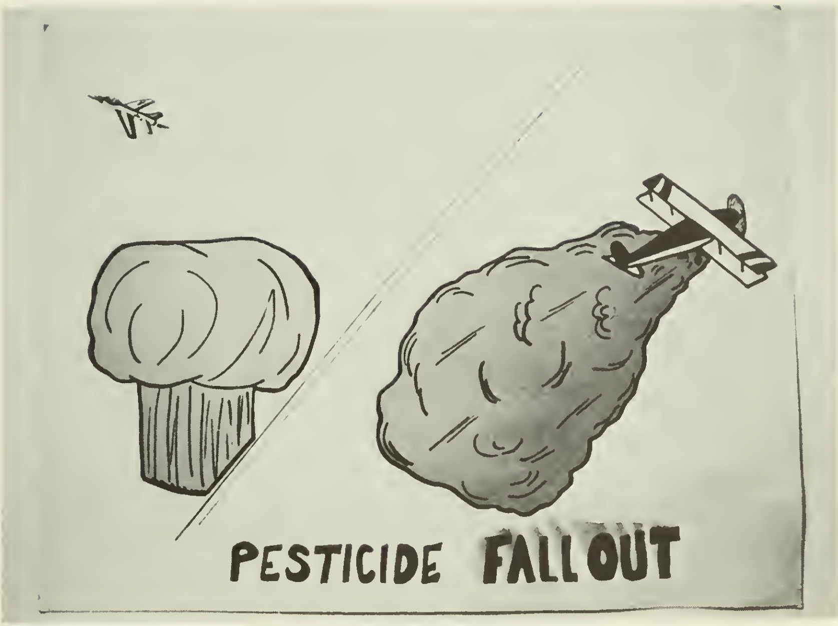
1. PESTICIDE FALLOUT

Pesticides are found everywhere in our environment. Traces have been found in penguins in the Arctic Circle. The oceans are now polluted with pesticides. Pesticides are in the air, the snow, they come down with the rain. Pesticides appear in water and air miles from where they were originally used. Every living organism that has been tested for pesticides has been found to have some in their system. There is hardly a square foot of real estate on the entire planet earth that is not somehow contaminated with pesticides.

Before Rachel Carson wrote her book Silent Spring, most people felt that pesticides were a "good thing". DDT was a household word and great advances in agriculture and public health were credited to pesticides. Rachel Carson called pesticides elixers of death and gave documented cases of the alarming and serious dangers of the use of pesticides. Many things she predicted have come to pass and man is finally beginning to see the terrible toll that the use of these poisons has taken on man and his environment. See exhibit 1.

2. BALANCE OF NATURE

In order to understand the problems that are presented by the use of pesticides we must first see that man is at the top of a complex system in nature that includes plants, animals, bacteria, air, water, soil and all living things. This system of nature is called the ecosystem and a study of it and its relationships is called ecology. Looking at the pesticide problem as it related to the total environment is called the ecological approach. This is the only valid approach to the pesticide problem because it takes into account not only the pest that is being killed but also effects on air, water, soil, fish, birds, man and other factors involved in the control of pests.

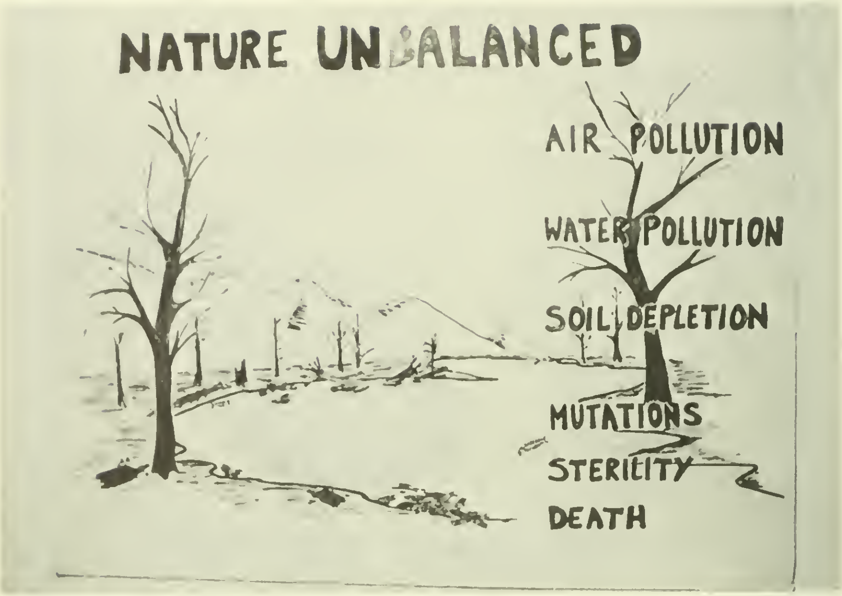


The agricultural and the chemical (pesticide) industry say that the balance of nature is a meaningless concept—that technology and man's ability to "control" nature have destroyed the balance of nature and any return to it is not only impossible but undesirable. We say that it is man's failure to take nature into consideration—his attempts to "beat nature into submission" that have created the serious crisis from the uncontrolled use of pesticides. Exhibit 2 (not available).

3. NATURE UNBALANCED

The average person is now aware that we are in the midst of an environmental crisis. Pollution of air and water is no longer a problem that can be dealt with later. but the average person is probably not aware of the relationship of pesticides to the pollution problem. Agriculture is one of the greatest polluters in the nation. Pesticides are a heavy contributer to air pollution and in agricultural states the run off of pesticides and fertilizer contribute to over 40% of the water pollution. In California where the heaviest use of pesticides anywhere in North America occurs the ground water is contaminated with pesticides and the neighboring Pacific Ocean is now polluted. Most of the pesticides are sprayed by crop dusters (from the air). It is a very cheap method which is why it is used. But it is very costly in terms of its effects on non-target crops, animals, pests and people.

Pesticides have resulted in three kinds of effects on living organisms. Mutations, sterility and death. Many have caused mutagenic changes, chromosomal changes, birth defects similar to those of Thalidomide. In fact many of the weed killers used have a chemical structure similar to Thalidomide. Birds have become sterile and their egg laying capacity greatly reduced because of the build up of pesticides in their bodies. The American Bald Eagle is practically extinct because of the use of DDT and similar types of poisons. Pesticides have resulted in the deaths of millions upon millions of fish. A recent episode you may be familiar with was the massive fish kill in the Rhine River due to pesticides. And in the early 60's we had 5 million fish in the Mississippi killed because of pesticides. See exhibit 3.



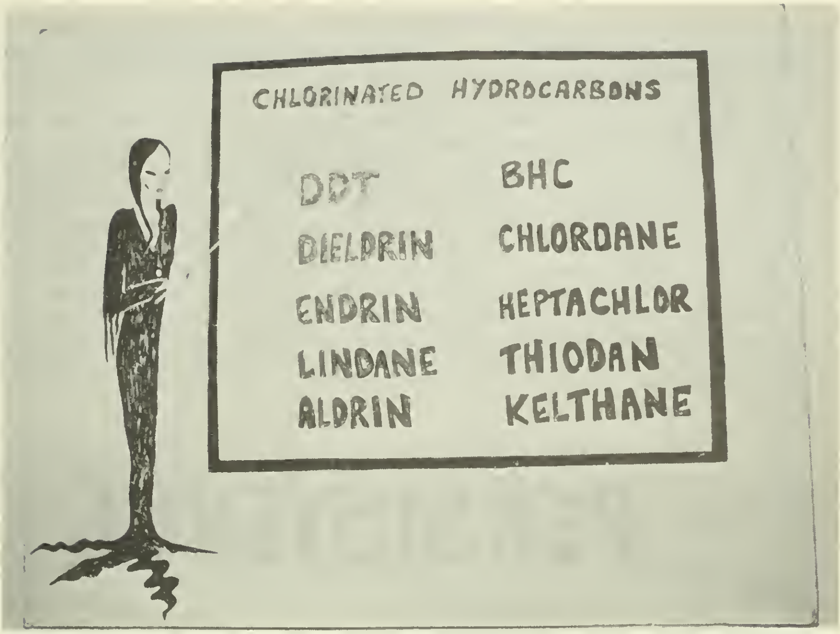
4. CHLORINATED HYDROCARBONS

The best known member of a class of poisons called chlorinated hydrocarbons is DDT. But there are other members of this family that are equally as dangerous as DDT and some of them even more so. The chlorinated hydrocarbons are not found in nature—they are chemical poisons invented by man. They are nerve toxins, that is, they exert their poisonous effects on the brain, spinal cord and nerves. This means that they will affect all body functions, eating, sleeping, reproduction, etc. No one knows exactly how DDT and the chlorinated hydrocarbons kill, but we know that they do.

Dieldrin is a compound that is 50 times as toxic as DDT. It is closely related to Aldrin, another of the highly toxic chlorinated hydrocarbons. Aldrin and Dieldrin are banned in Ontario, Canada. They were until very recently used by the Armed Forces to spray airports, in spite of the evidence of serious effects on wildlife and contamination of air and water for miles around. Endrin is a compound so toxic that its stay on the market was relatively short. Shell Oil Company, who manufactures Endrin, in attempting to keep the compound on the market used among other arguments in its favor that "it was only killing fish". Heptachlor was recently found in 120,000 turkeys which were therefore confiscated by FDA. Heptachlor breaks down into a compound called Hetachlor Expoxide which is even more dangerous than Heptachlor. Thiodan was responsible for the massive fish kill in the Rhine River recently. Two barrels of it that fell overboard 12 years ago finally eroded and leaked out causing death of the fish and contamination of the water supply for all the communities along the river.

DDT has been banned in Arizona, Wisconsin, Canada, Sweden and Germany. It's use has been restricted in the United States. We mustn't get too comfortable because DDT has been banned and think that the pesticide problem is solved. 80% of the DDT manufactured in North America isn't used in the U.S. or Canada anyway. Most of it is shipped overseas. Yet compounds of the same family which are even more toxic are still being used. It is important that any ban on DDT also include the other "hard" pesticides which are as dangerous as DDT and possibly even more dangerous. It is also important to understand that partial bans on DDT are not effective. As long as DDT is being used anywhere in the world it is going to be found every where in the world. If Canada bans DDT and we still use it in the U.S. the wind will carry DDT into Canada.

In California DDT was banned except for cotton and grapes. See exhibit 4.



5. PERSISTENCE

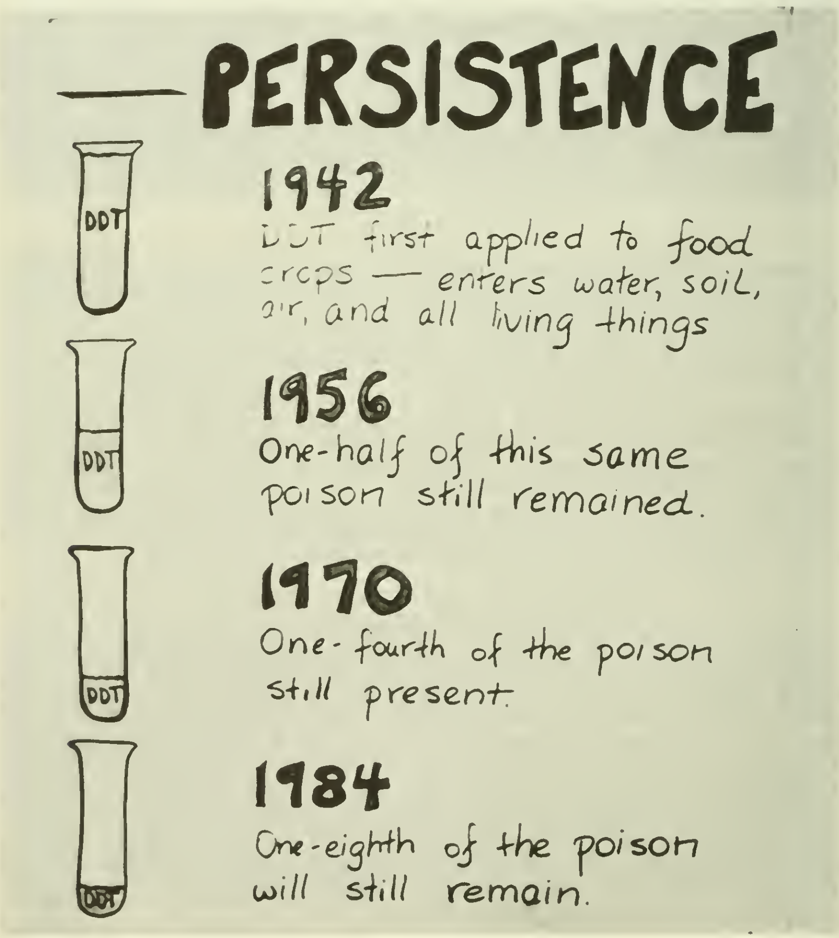
This is probably the biggest problem presented by DDT and the chlorinated hydrocarbons. That is, they are persistent, they do not break down and can be found in the soil in the original form they were put there as long as 14 years after application. DDT probably has a half life of 14 years. This means that in 14 years half of the DDT applied will still be active and poisonous—14 years later half of that amount will still be active and poisonous—14 years later half of that amount and so on until it is gone. Considering that DDT has been applied to the earth in millions of tons since 1942 we can see the problem. Some scientists say that if we stopped using all the chlorinated hydrocarbons immediately that it would take *at least* 40 years before reasonably safe levels were found. Some scientists also say that it may already be too late—that there is already too much DDT, Dieldrin, Endrin, etc. in the ecosystem. The results are seen only in future generations and we may have already seriously affected the reproductive cycle irreversibly. See exhibit 5.

6. HOW MUCH IS DDT? (BIO-ACCUMULATION)

The most serious problem with the use of DDT and the chlorinated hydrocarbons is that we store them in our bodies. Fat people are storing more than skinny people because DDT is stored in the fatty tissue. The average American is storing 10 to 12 parts per million (ppm) of DDT in their bodies. No one knows what the long term effects are. No one knows how DDT is broken down, or excreted in the human body. No one knows if there is a point where storage of the poison stops. We do know that sudden weight loss can cause symtoms of poisoning since the DDT goes directly into the blood stream when the body loses fat. This can be a very serious problem in babies and children who tend to lose weight very rapidly during illness. We also know that breast milk contains 4½ times as much DDT as milk sold to the public. There is mounting evidence that DDT and other pesticides cross the placental barrier, that is, that when a women is pregnant DDD in her blood stream passes into the baby's blood stream. See exhibit 6.

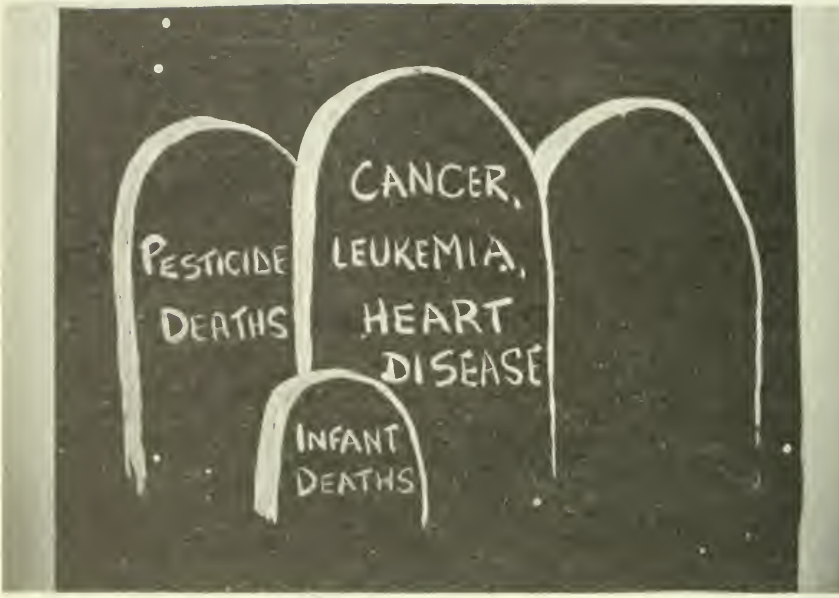
7. PESTICIDE DEATHS

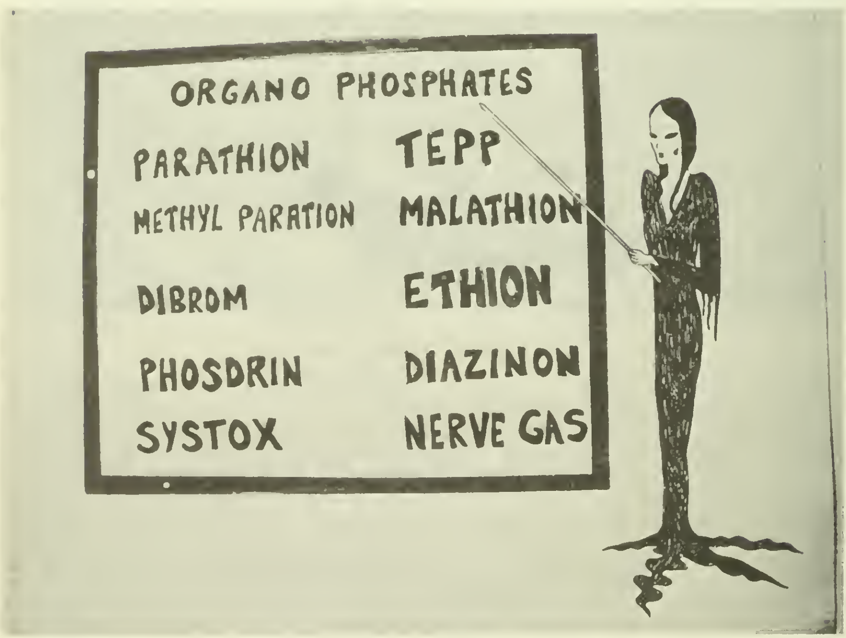
There are some studies that have been done which should alarm us about the build up of DDT in our bodies and also the fact that it lasts so long and can't be broken down. There have been two studies done which indicate hazards to human health. One study was done by the National Cancer Institute. In this study 130 pesticides were studied to see if they were carcinogenic, that is, to see if they could cause cancer. DDT was proved to be a carcinogenic in this study. There was another study done by Dr. Deichmann of the University of Miami under a Public Health Service grant. The study was done in the state of Maryland and it showed that people who died of cancer, Leukemia, and heart disease had 2½ times as much DDT in their body tissues as people who died of natural causes. A study done by Dr. Mizrahi at Salud clinic on children from 1 to 16 years of age showed that over 40% had blood tests results indicating poisoning with pesticides. 42% of the chilren showed levels of pesticides *higher* than that considered safe for the adult population. A recent survey done by the Public Health Department in California showed that 80% of the workers surveyed had one or more symptoms of pesticide poisoning. See exhibt 7.



8. ORGANOPHOSPHATES

There is another group of chemical poisons that are used to spray crops in California. Theses are the organo-phosphates or nerve gases. These compounds were invented by the Germans during the second world war for reasons we all know well. When describing the difference between this group of poisons and the DDT type we can make a distinction between slow and sudden death. The chlorinated hydrocarbons being the slow death and the organophosphates being the sudden death compounds. The most commonly used of the nerve gas type of chemicals is Parathion. Six drops of parathion on the skin is fatal. Another commonly used poison is TEPP. One drop of TEPP is fatal. These are the direct, instant killers. Farm workers die every year from these compounds. A little four year old who was following behind her parents while they applied TEPP with a ground rig apparatus, stuck her finger into the jug of TEPP and died twenty minutes later. Every year pilots who fly the crop dusters that spray the organo-phosphates are killed from the effects on their vision—last year 11 crashed into the ground and were killed. Because of the effects on vision many farm workers have been seriously injured or killed while operating farm machinery or merely driving home in their cars after work. In order to understand how the nerve gases kill we must first understand cholinesterase. See exhibit 8.


PESTICIDE DEATHS
CANCER, LEUKEMIA, HEART DISEASE
INFANT DEATHS


ORGANO PHOSPHATES
PARATHION
TEPP
METHYL PARATION
MALATHION
DIBROM
ETHION
PHOSDRIN
DIAZINON
SYSTOX
NERVE GAS

9. ORGANO-PHOSPHATE POISONING (CHOLINESTERASE)

Cholinesterase is a substance that we all have in our bodies. It is an enzyme and it is absolutely essential that we have enough of it in our bodies for our nervous system to work properly. It is necessary for the proper functioning of the brain, spinal cord and nerves. If we think of electricity running through a wire and think of the nerve impulse running through our nerve fibers in the same way—then think of cholinesterase as a circuit breaker, it stops the impulse, pulls out the plug so to speak. It is necessary that nerve impulses do not charge constantly or the nervous system becomes overworked and overloaded resulting in convulsions, coma and death. The nerve gas chemicals are the only compounds known which reduce the amount of cholinesterase in our bodies. In other words, the nerve gases kill by destroying cholinesterase. And when cholinesterase is destroyed we begin showing symptoms of dizziness, giddiness, blurring of vision, nausea, vomiting, diarrhea and if nothing is done this will lead to convulsions, coma and death. The tragedy is that we know these symptoms so well in the valley. Because so many have died and nothing has been done.

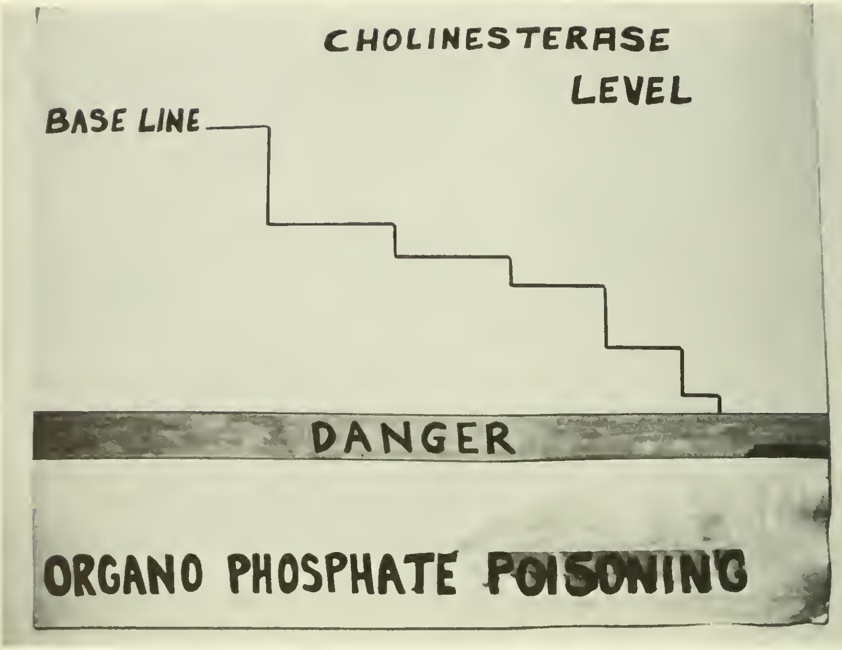
Two cases will be read from an article written by Dr. Irma West of the Bureau of Occupation Health of the State of California Department of Public Health.

Case 1. A 16 year old and a 21 year old were hired to apply a pesticide dust consisting of phosphate ester (another name for organo-phosphate) mixed with sulphur. The estimated adult fatal dose for this pesticide is five drops orally (eaten or ingested) and six drops dermally (absorbed through the skin). The workers used knapsack dusters, starting work at 7:30 AM. At noon, the 21 year old worker became ill and remained at the side of the field in his car and vomited. After a while he felt better and drove home. Fortunately he did not have an auto accident. Workers with phosphate ester poisoning are poor risks with any moving machinery. The 16 year old worked until 4:00 PM when he vomited and went home. At 8:00 PM he complained of weakness and giddiness and was taken to a physician's office. The boy's clothing was reported to have been covered with sulphur. The physician called the Poison Information Center for information about sulfur which is relatively non-toxic. The boy was sent home with a prescription. At 9:30 PM the boy became worse and was taken to the local hospital. This time, the label from the pesticide container was brought with the patient. The boy was again sent home although he was unable to walk. At 7:30 AM the boy was found moribund in his bed, still in his contaminated work clothing. He died in the ambulance en route to the hospital. Death due to Phosphate ester poisoning was confirmed by post mortem cholinesterase tests.

The 21 year old worker, although asymtomatic, reported the next day for a cholinesterase test which confirmed he had been poisoned by a phosphate ester chemical. He had not worked with phosphate ester pesticides before. The 16 year old had applied the same pesticide on one occasion two months before.

Case 2. Because of engine trouble, an agricultural aircraft pilot attempted a forced landing in an unplanted field. The plane rolled into a fence and turned over. The hopper of the airplance contained a dust formulation of TEPP, another of the phosphate ester pesticides. The estimated adult fatal dose for TEPP concentrate is one drop orally or dermally. The pilot was not injured but was covered with dust. He walked a distance of 50 feet to a field worker, stated he felt fine, and asked for a drink of water. After drinking the water, he began to vomit and almost immediately became unconscious. By the time the ambulance arrived, the pilot was dead and the ambulance driver, the pathologist, and the mortician became ill from handling the body.

It is important to understand that it is possible to be poisoned by the nerve gas compounds and not have any symptoms. Small amounts of exposure will reduce the cholinesterase a small amount. Repeated small exposures can accumulate and build up to the point where poisoning and death occur. When the cholinesterase level drops, depending on how low it has dropped, it takes a long time for it to come back up to normal. It can take as long as 2 or 3 months. During this time the worker is vulnerable to even tiny amounts of exposure which can again throw him into the danger zone. See exhibit 9.



10. HOW PESTICIDES ENTER THE BODY

Pesticides enter the body in three ways. We breath them in, we eat them in our foods and they are absorbed through the skin. Most of the serious poisonings among workers have been from absorption through the skin. Workers have been seriously poisoned (and died) merely from picking fruit that had been sprayed weeks before. From your own experience you will see that there is no protection. Look at the aerosol bug and/or weed sprays that you may have around your home. Most of them are conveniently and attractively packaged. Some will even go so far as to state that they are non-toxic to humans and pets. But then read the small print. You will see lengthy instructions warning you not to breath the fumes, not to get it on your skin, not to spray around food, not to use in a closed area, to have adequate ventilation, etc., etc. Also it is almost impossible for the average consumer to know what he is buying because the common name (if any) is often not given. Aslo it is not stated on the label what the poison is and how dangerous it is. The Shell pest strips are a good example of this. They are packaged in gold foil and the average person doesn't know that the yellow waxy strip is a nerve gas and that the only "safe" way to use it is when the ventilation and space is such that it wouldn't concentrate enough to do it's job of killing. So that the only way you can use it is to put it inside a room where the vapor is constantly emitted—getting on and in your food, your children in potentially dangerous amounts. See exhibit 10.

11. RESIDUES

The food that we eat is contaminated with pesticides. All the dangerous compounds that we have been discussing are being used in the vineyards of California. We will speak here of grapes because this is the crop we know the most about. And because they are one of the heaviest sprayed crops in California. By the time the grapes get to market there are still pesticides "left over", that is, there is a residue left on them. And it is not only one or two, but many different pesticides that remain on them. You will perhaps be told that it really doesn't matter that the amounts are so small and that "a little bit won't hurt you". There is no such thing as being a little bit poisoned. It has become well known and is an accepted fact that the most minute and tiny

amount of pesticides can be concentrated in animal tissues many thousand fold and that there is no predictable safe level.

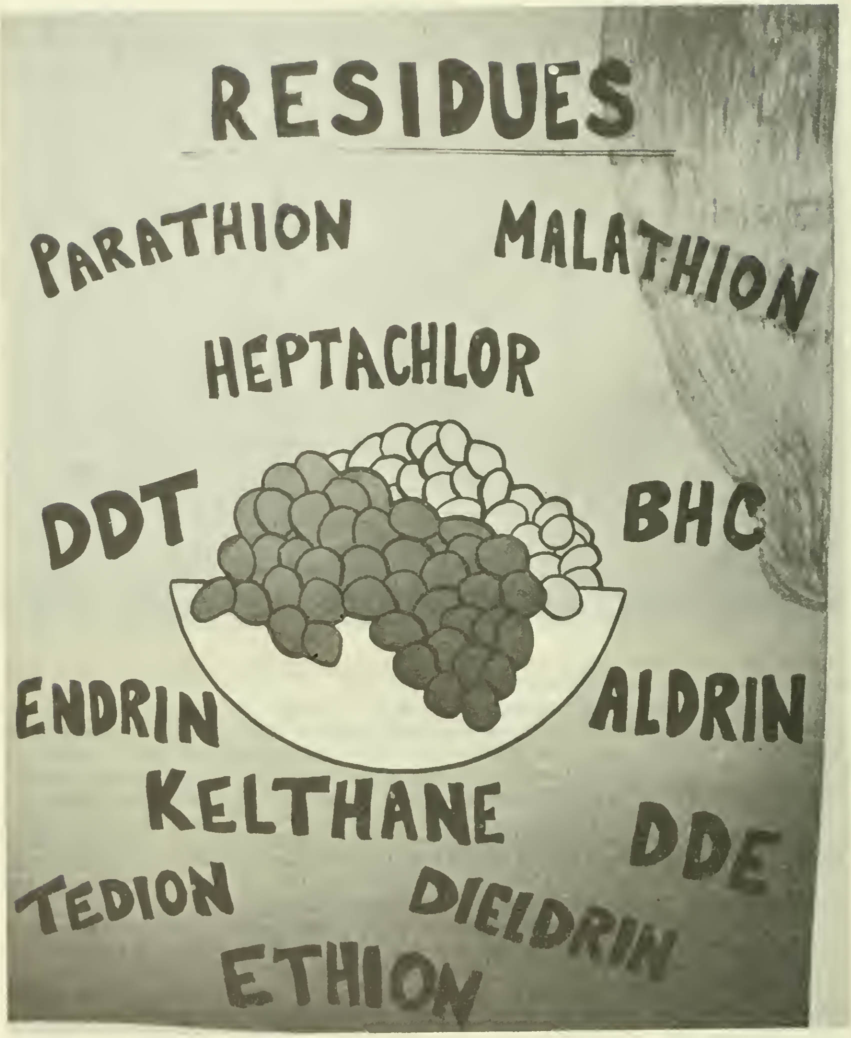
We must understand how tolerances are set in order to understand the magnitude of the problem of the poisons on our food. A tolerance is the amount of a pesticide residue that is allowed to be on food when it is sold to you. In other words it is not a question of "are we going to allow poison on grapes" but a question of "how much poison are we going to allow on grapes". In order to determine a tolerance, the pesticide in question is fed to a laboratory animal until the animal develops symptoms or a symptom. A no-effect level (which is the point before the animal developed the symptom) is then determined. The amount of pesticide at this no-effect level is then divided by 100 and this amount is considered safe for human consumption.

By using such a method Thalidomide would pass hands down. And in fact the herbicides (2,4,D and others) have been used in fantastic quantities because they were considered "safe" by the above standards.

The danger of this approach to tolerances of course is that it measures acute toxicity only. It does not take into consideration the long term effects, the effects on the human embryo, the effects on children, infants, the sick, in other words it has nothing to do with people. Also it is based on the assumption that this is the only food that the pesticide will be ingested on. We get a little bit on a lot of foods and eat multiple fruits and vegetables every day—so there is no such thing as a safe level of these poisons. Nor does this approach take into consideration the multitude of poisons that we are exposed to. For example a bunch of grapes that were tested in Cleveland had 9 different poisons on them. And we know that some compounds that are not as harmful alone can be lethal in combination with other pesticides, which may also not be considered harmful. See exhibit 11.

12. EL PATRONCITO Y DON SOTACO

We see then that "a little bit won't hurt you" completely evades and avoids the real problem which is the uncontrolled and increasing use of more and more toxic chemicals in more and more toxic combinations. Even if we as-



sumed for the sake of argument that a "little bit" of Parathion won't hurt you, what about a little bit of Sevin, and a little bit of Parathion, and a little bit of DDT, and a little bit of TEPP and a little bit of Dieldrin, etc. We know that these pesticides are harmful because we see evidence of it every day in the farm workers seen at our clinic in Delano. We see very severe skin diseases that do not respond to treatment—the dermatitis gets worse and worse until the skin cracks and a secondary infection sets in. Many times the workers are left with scarring before the condition clears up. We see many workers with visual disturbances, blurring of vision, double vision, just not being able to see right. We see very severe cases of asthma in childrin and adults, related to the spraying season. We have workers become ill because they are sprayed while they are still in the fields. Workers are poisoned because they are sent in to pick crops while dangerous levels of pesticides are on the vines. When the crop is ripe, or the market is ready, the health of the worker is the last consideration. Workers are sent in to pick and if they become ill they can either quit or put up with it. Farm workers are the guinea pigs. See exhibit 12.

13. PESTICIDE RESEARCH

These lovely ladies are deciding what the "safe" level of poisonous pesticides will be this year. The Food and Drug Administration is responsible for seeing that we have a safe food supply. The Department of Agriculture is responsible for the regulation of pesticides. The University of California (you may substitute your favorite land grant college) does a large amount of the agricultural research on pesticides and makes recommendations to the growers.

How safe are your foods? How good a job does the FDA do of protecting you? The FDA can speak for itself. An article in the July 1969 San Francisco Chronicle stated the following:

> A confidential report by seven senior Food and Drug Administration officials concluded that the Federal government does a completely inadequate job of protecting Americans from dangerous drugs, tainted food and household products that can kill or harm them.
>
> The report . . . said that the FDA has neither the money, manpower, or legal authority to do the job effectively.

The FDA has a very poor record of protecting the American consumer. They have shown themselves to be much more responsive to industry pressures than the public health. The recent whitewash done on Aldrin in grapes is just another example among many.

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How do pesticides get on the market in the first place? What are the controls to see that the pesticide manufacturer is checked. An article that appeared in the Washington Post on May 5, 1969 stated:

> The top pesticide official of the U.S. Agriculture Department has reported his agency registers pesticides mostly on the data supplied by chemical manufacturers. Harry W. Hays, director of the Pesticides Registration Division said his department does not "analytically" check pesticides information partly because of the high cost of such a screening process.

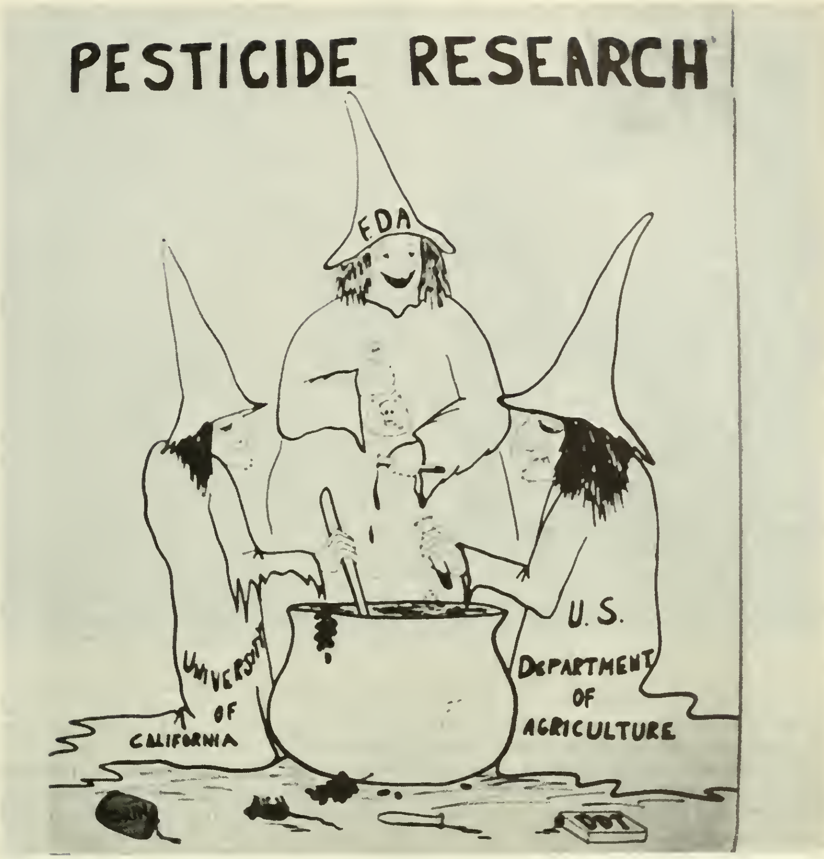
The Department of Agriculture is the least progressive department in our federal government. The committees in both the house and the senate are dominated by the "confederate generals". Agriculture has one of the strongest lobbys in Washington. And the pesticide industry is an agriculture allied industry. So the situation in registering and controlling pesticides is put in the hands of the group that derives the profit from their use. This is open to obvious abuse and is a large part of the reason why the use of pesticides is out of control. The U.S. Department of Agriculture spends over $180 million on pesticide related research. USDA spends less than $160 thousand on pesticide safety.

The fact that no research in the U.S. is currently conducted into the occupational health hazards of agricultural chemicals is indicative of the lack of concern in regulatory agencies for workers interests.

Almost all of the research that is being done is chemical research. And almost all of the research is done by the pesticide industry and/or the government. Tax payers money is used by the Department of Agriculture to do the initial work on development of new pesticides and then when it looks marketable it is turned over to the chemical company. Much of the research money is of course channeled into university projects. And the scientists who work on the projects know where the money is coming from. It is remarkable to note the pronouncements coming from governments witnesses at pesticide hearings on the safety of pesticides. In fact this is a large part of the problem —the evading of the issue by government agencies and their manipulation of scientists. It is very difficult for a scientist who wants to research alternatives to pesticides to find money for his projects. But if he wants to research a new and more lethal chemical poison he will have no difficulty in finding funds. And the research that is done is on how many bugs it kills and how dead it kills them. DDT's effect on human health was not tested until it had been on the market for 13 years. See exhibit 13.

14. RESISTANCE

The irony of the pesticide situation is that they are not working anymore. The bugs are developing resistance. When insects are sprayed with pesticides most of them are killed, but not all. The few that survive are resistant and they breed a generation that is also resistant to the amount they were sprayed with. In order to kill the new generation there are two possibilities: use more of the same chemical, or use a more toxic one. Again not all the bugs will be killed and a few who survive will be resistant and breed a generation that is also resistant. In order to kill them you again have the two alternatives. This goes on and on until you have developed superbug. There are many species of insects that are now totally resistant to DDT and other pesticides. The World Health Organization is very concerned about this problem and in fact have devoted much time and research to the problem. But there is another factor to be considered. Not only do the pesticides kill the pest but they kill the good bugs too. They kill the natural predator. Not only that fish and birds which also eat insects are being killed by pesticides. Lady bugs, and honey bees and innumerable other beneficial insects are being killed by pesticides. So consider the situation—we have created superbug, we have killed off his natural predator and other species in the environment which would keep him in check, and we give him thousands of acres of his favorite crop—and then we wonder why we have a pest control problem. Another aspect of this problem is that insects which were never considered pest before are now becoming pests and the irony is that the more pesticides we use the more we have to use. The more pests we kill the more pests we have. What we have done, of course, is to interfere with and disrupt the ecological balance of nature. We have tried to beat nature into



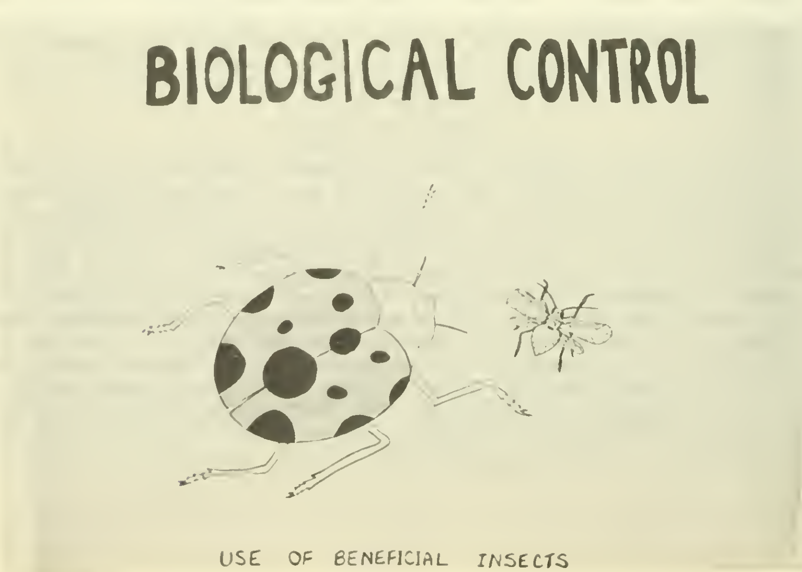
submission. The more difficulty we get into by the use of poisons the more we attempt to deal with the problem by using more poisons. The cost is that we have seriously compromised ourselves and our environment. Sooner or later we are going to have to heed warning signs—nature is trying to tell us something. If we do not, we are going to pay the price and it won't be only in ourselves it will be in our children and in future generations. See exhibit 14.

15. BIOLOGICAL CONTROL

Do we have to have pesticides? What will happen if we don't use pesticides. How can we get along without them. How can we continue to produce enough food to feed the world without pesticides. It is becoming increasingly clear that the problem is not we have to have pesticides to eat, but that if we don't do something about pesticides we won't eat. An alternative must be found—and if we give the problem the priority and the money for research it deserves a solution will be found. In the interim until safe alternatives to pesticides are found (and the answers will no doubt be found in ecological solutions using biological controls among other methods) compounds that have been clearly demonstrated to be hazardous to man and/or the environment should be banned. An integrated approach using pesticides sensibly and sparingly along with other control methods should be used. Some of the millions of dollars being spent on poisons should be spend on the problem of how we are going to

grow food without poison. The question is no longer how much will kill this or that bug or how much will make a man sick, but what are the long term effects on a population of animals (including us) in which very small amounts of pesticides are known to be active biologically.

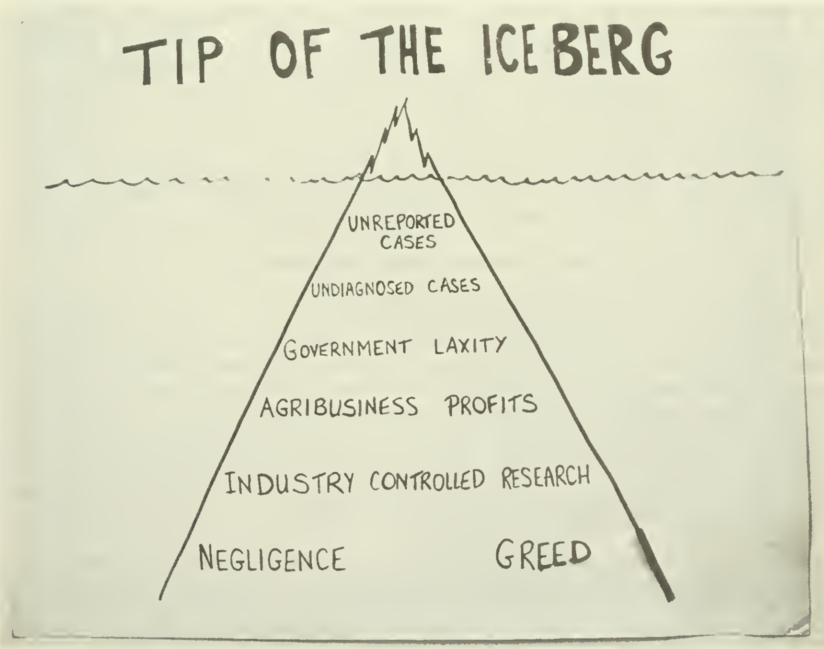
Use of natural predators, sterile male techniques, simply changes in planting and harvesting have all been tried and found successful in varying situations. The serious depletion of our soils and use of hybrid varieties have also according to some authorities added to our pest control problems. By making yield and quantity the only criterion for success in farming, the quality of our food and our soil have seriously suffered leading to a situation where crops are more prey to infestations by pests. See exhibit 15.



16. TIP OF THE ICEBERG

As we can see, we know very little about the long term effects of pesticides —we know practically nothing about their effects on human health—yet we use them as if we knew everything about them. In the San Joaquin valley grape vineyards where we have a lot of experience and knowledge of the problem, the evidence is clear that workers are being harmed. But there has been so much official apathy and refusal to consider the problem that the farm workers have had to take it upon themselves to force recognition of the problem. The grape growers have refused to bargain with the workers or even negotiate the issue of pesticides. When U.F.W.O.C. attorney Jerry Cohen attempted to gain access to public records regarding the pesticides used on grapes he was denied the records by court injunction. The table grape growers have made is very clear that they have no concern for the perishability of the workers they are only concerned with protecting their industry. In the recent negotiations in which the union proposed a very strong worker protection clause involving banning of DDT, Aldrin, Endrin and Dieldrin and setting up a health and safety committee to safeguard the workers from hazards of pesticides the growers made the following proposal: They proposed that the union refuse to engage in any pesticide campaign that could in any way be harmful to the industry in which the employer belongs.

So far we have managed to survive mistakes in which small groups of people and fish and wildlife have been damaged and killed. We cannot afford to make mistakes that involve the whole population. We must learn to recognize our mistakes and accept the fact that unforeseen, irrevocable and undesirable side effects have arisen on a large scale from uncontrolled and unintelligent use of pesticides. Assuming an unknown risk cannot be justified when the guinea pigs are men, women and children. We have no choice about it—all of us are being slowly poisoned—and farm workers quicker than the consumer. The burden of proof can no longer be put on the public to prove that a substance is harmful. The manufacturer of pesticides must be able to prove that it is safe. See exhibit 16.



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Occupational Disease of Farm Workers

By Irma West, M.D., Berkeley, Calif.

In California, the agricultural industry experiences the highest occupational disease rate—over 50% higher than the industry in second place, and almost three times as high as the average rate of all industries.

A number of converging circumstances may explain this experience. First are the formidable hazards both new and old on the farm. Second, it is much more difficult to control hazards in orchards and fields than within the four walls of industrial plants. Third, agricultural workers, becausee of migrant status, seasonal work, language barriers, substandard education, marginal health, and poor hygiene, are the least able of any group to protect themselves against occupational hazards so require more safety supervision than other categories of workers. Fourth, the rapidly advancing technological changes in agriculture have left the industry behind in dealing with occupational hazards, particularly with agricultural chemicals. Concepts in industrial hygiene and industrial medicine commonly used for many years in other industries have not been employed or adapted to the agricultural setting. Such commonplace needs as clean drinking water, wash water, and sanitary facilities are rarely available in the fields and are notably deficient in many living quarters of farm laborers. Yet, both water and soap are vital to the prevention of the most prevalent and most serious occupational diseases occurring on the farm.

In California, in 1962, about 230,000 farm workers were employed*; 83 of them died from occupational causes (*1*). In seven instances, the death was attributed to an occupational disease, in the remainder, to a work injury. From 1955 to 1962 inclusive, 29 deaths from occupational disease among farm workers were recorded. Eleven were attributed to heat stroke, four to poisoning from organic phosphate pesticides, and four to tetanus. The remainder were due to miscellaneous causes.

In 1962, there were 2,696 reports of nonfatal occupational disease (*2*) among agricultural workers, most in farm laborers. Dermatitis, pesticide poisoning, food poisoning, and heat stroke or exhaustion were reported most frequently. Judging from the number and seriousness of fatal and nonfatal occupational disease, heat stroke and pesticide poisoning should be considered the most formidable occupational diseases occurring in agriculture in California. Of the pesticides, it is the highly toxic group of phosphate esters, such as parathion, (O,O-diethyl O-[p-nitrophenyl] phosphorothioate). Thimet (O,O-diethyl-S [methylthioethyl] phosphorodithioate), Phosdrin (alpha isomer of 2-carbomethoxy-1-methyl-vinyldimethyl phosphate), Demeton (O,O-diethyl O-[2-(ethylthio)ethyl]-phosphorothioate and O,O-diethyl S-[2-(ethylthio)ethyl] phosphorothioate in 2:1 ratio), and tetraethyl pyrophosphate (TEPP) which present the greatest hazard. Their toxic effects are due to cholinesterase inhibition.

EXAMPLES OF OCCUPATIONAL DISEASES OCCURRING IN CALIFORNIA

Example 1.—A young sprayer was found dead in the field in the tractor which had been pulling his spray-rig. He had been pouring and mixing parathion concentrate into the spray-rig tank. Parathion is the most commonly used of the highly toxic phosphate ester pesticides. The estimated fatal dose is about 9 drops orally and 32 drops dermally. In the process of mixing the concentrate, the worker contaminated his gloves inside and out. He rested his gloved hands on his trousers as he pulled the rig to apply the spray. Parathion was absorbed through the skin of his hands and thighs. He began to vomit, an early symptom of parathion poisoning. He could not remove his respirator and he aspirated the vomitus. The diagnosis of poisoning was confirmed by postmortem cholinesterase tests.

NOTES.—Read before the 23rd Annual American Medical Association Congress on Occupational Health, San Francisco, Sept. 25-26, 1963.

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* Self-employed farm workers who make up about one third of the total persons working on farms are not included. Their occupational injuries and occupational diseases are not reported and, therefore, not included here.

Example 2.—About 50 agricultural laborers were picking grapes. In the afternoon, about the same time, all suffered a sudden acute attack of nausea, vomiting, acute abdominal cramps, diarrhea, and about half went into shock. They recovered rapidly and were well in a few days. The physician who first saw them thought that phosphate ester pesticide poisoning was the most likely cause of the outbreak. However, subsequent investigation revealed that no pesticide had been applied to grapes, but luncheon sandwiches had been left in the field in the hot sun for sometime before eating. Unfortunately, no food was available for examination nor were cholinesterase tests determined for the workers, so that the diagnosis will never be confirmed. However, the clinical course of events is more suggestive of staphylococcal food poisoning. All who ate the sandwiches experienced the same acute symptoms at the same short interval after eating. The kind of phosphate ester poisoning occurring among pickers is not so abrupt in onset, usually does not find the total crew sick in the same degree at the same time, and symptoms and signs of cholinesterase inhibition, in addition to those referable to the gastrointestinal tract, are in evidence—headache, giddiness, blurred vision, sweating, difficult breathing, pinpoint pupils, and muscle twitching, for example.

Example 3.—A 22-year-old field laborer was harvesting seed. In the process, he lacerated his finger in the seed separating machine; ten days later he died of tetanus shortly after admission to a hospital where he was taken because of seizures.

Example 4.—A 16-year-old and a 21-year-old farm laborer were hired to apply a pesticide dust consisting of a 1.5% phosphate ester and a 10% sulfur mixture to strawberries. The estimated adult fatal dose for this phosphate ester pesticide is five drops orally and six drops dermally. The workers used knapsack dusters, starting work at 7:30 AM. At noon, the 21-year-old worker became ill and remained at the side of the field in his car and vomited. After a while, he felt better and drove home. Fortunately, he did not have an auto accident. Workers with phosphate ester poisoning are poor risks with any moving machinery. The 16-year-old worked until 4 PM when he vomited and went home. At 8 PM, he complained of weakness and giddiness and was taken to a physician's office. The boy's clothing was reported to have been covered with sulfur. The physician called the Poison Information Center for information about sulfur which is relatively nontoxic. The boy was sent home with a prescription. At 9:30 PM, the boy became worse and was taken to the local hospital. This time, the label from the pesticide container was brought with the patient. The boy was again sent home although he was unable to walk. At 7:30 AM the boy was found moribund in his bed, still in his contaminated work clothing. He died in the ambulance en route to the hospital. Death due to phosphate ester poisoning was confirmed by post-mortem cholinesterase tests.

The 21-year-old worker, although asymptomatic, reported the next day for a cholinesterase test which confirmed that he had been poisoned by a phosphate ester chemical. He had not worked with phosphate ester pesticides before. The 16-year-old had applied the same pesticide on one occasion two months before.

There were a number of errors committed in the series of events leading to this death: The permit to purchase and apply the pesticide had expired so that it was purchased and applied illegally. The highly toxic phosphate ester was applied by hand duster, a primitive and entirely unsafe method of application. The container label was not read until after the second illness. No medical supervision was provided. No advance arrangements were made with a physician for prompt adequate care in an emergency. The two workers were not instructed about hazards and precautions for using the pesticide. They were not provided with protective clothing. No medical attention was sought for the worker who quit at noon because of illness, and no medical examination was considered for the younger employee who kept on working. The victim was not told to bathe, wash his hair, and change into clean clothes after work. When the boy was taken to a physician, no one could provide information about the pesticide which the workers had applied.

On first visit, the physician released the victim as only mildly ill without ruling out serious poisoning. He should have insisted on seeing a label from the pesticide container. On second visit, the physician was furnished the label but did not follow the medical treatment recommended on it. He may have been confused by entirely different doses of atropine prescribed. The label listed the large doses which should have been administered, but also listed the conventional dose of atropine by tablet for first aid (the practice of recommending tablets for first aid should be discontinued for reasons demonstrated here and in example 6 which follows). The physician did not call a consultant or the Poison Information Center for information about the pesticide mixture listed on the label. The boy was not kept under close medical observation for 24 hours. He was not decontaminated, and no cholinesterase determination was made.

The supplier of the pesticide did not check the number of permit given by the purchaser to assure that the permit was valid. The product was also misbranded, it contained two to four times the phosphate ester pesticide specified on the label.

This case is something of a classic in that just about every error possible occurred; and avoidance of any one of the more serious errors could have saved the boy.

Example 5.—A farm tractor driver was hospitalized with critical burns of both eyes when ammonia under pressure escaped from a leaky valve on a fertilizer applicator.

Example 6.—A young man came to work as a swamper for an agricultural aircraft operator, and the first day, was put to work steam-cleaning and washing a crop-dusting aircraft. It was reported that he was not informed of any hazard nor was he given any protective clothing or equipment. His clothing was observed to have been thoroughly wet while he was working. In the early afternoon, he complained of not feeling well. His employer gave him two atropine tablets and the swamper returned to work. Not long afterwards, he was found unconscious. He was admitted to the hospital and died several hours later. Apparently, the aircraft he was cleaning had been used to make several applications of one of the highly toxic phosphate ester pesticides. The diagnosis of phosphate ester pesticide poisoning was confirmed by postmortem cholinesterase tests.

Example 7.—Because of engine trouble, an agricultural aircraft pilot attempted a forced landing in an unplanted field. The plane rolled into a fence and turned over. The hopper of the airplane contained a dust formulation of TEPP, another of the phosphate ester pesticides. The estimated adult fatal dose for TEPP concentrate is one drop orally or dermally. The pilot was not injured but was covered with dust. He walked a distance of 50 ft to a field worker, stated he felt fine, and asked for a drink of water. After drinking the water, he began to vomit and almost immediately became unconscious. By the time the ambulance arrived, the pilot was dead and the ambulance driver, the pathologist, and the mortician became ill from handling the body (*3*)

Example 8.—Although this example is not an occupational disease, it is included to illustrate that poisoning of children can result from the same mistakes in handling farm chemicals that lead to occupational disease. An 18-month-old child of an agricultural aircraft pilot was found at home in a state of acute respiratory distress, semiconscious, and with pinpoint pupils. In the hospital, she was placed in a resuscitator and treated by a skilled physician for severe organic phosphate poisoning from which she recovered. On the morning of the illness, her father had come home after applying a highly toxic phosphate ester pesticide. He was reported to have cleaned his boots with paper towels and then threw the towels in the wastebasket and placed his boots in the bathroom. The child either contacted the boots or the paper in the wastebasket.

In connection with these three examples of poisoning arising from the agricultural aircraft operations, it is of interest to note that there is no group inside or outside agriculture which has experienced a more formidable record of occupational injury and disease than the agricultural aircraft industry. This group has taken the brunt of the technological demands of agriculture in the application of pesticides. Pesticides are applied by air to about half the acreage treated for pest control in California. Since this state uses over 20% of the nation's pesticides, its agricultural aircraft pilots apply about 10% to 15% of the nation's pesticides, but at a price. One pilot is killed in an air accident for each million acres treated (53 pilots killed and 54 million acres treated in California, 1950 to 1964, inclusive. The number of licensed agricultural pilots rose from just over 300 in 1950 to 700 in 1961). In addition to the highest fatal injury rate of any occupation on record in California, agricultural aircraft is unique in another respect—over half its disabling work injuries are due to pesticide poisoning. For most industries, occupational disease accounts for 5% or less of total work injuries. However, considering the amount of pesticides and other agricultural chemicals applied by this industry, the cost in occupational disease is considerably less than among farmers and ground applicators who apply the other half of these chemicals.

Example 9.—Two young milkers in a dairy became ill with brucellosis within two months of each other. Both workers complained of gradual onset of fatigue, fever, headache, and overwhelming fatigue. Lymphadenopathy was prominent in the younger victim who was not as ill as the second worker who was hospitalized for several weeks.

Example 10.—Beginning in 1949, there have been at least six sizable episodes reported where outbreaks of parathion poisoning occurred among farm workers picking fruit (oranges, peaches, pears, grapefruit, grapes, olives). In 1959, about 275 orange pickers were poisoned in a series of outbreaks. The interval between application of pesticides and the harvest of edible crops is predicated on the time when the pesticide residue on the crop will be below legal tolerance (1 ppm for parathion) and thus considered safe for market. It had been assumed that by this time, the parathion would have declined sufficiently to make the orchards safe for the workers. This assumption was obviously incorrect under certain circumstances not understood until recently. In August of 1963, over 90 peach pickers became sufficiently ill with parathion poisoning over a period of several days to seek medical attention. Although most of the 90 cases were mild or moderate, about one third were hospitalized and there was one death. Of the approximately 5,000–6,000 pickers in the area, 70 were selected at random and tested during the outbreak. About half of the 70 workers showed significant reduction of cholinesterase levels but were either asymptomatic or had not sought medical aid for symptoms. Leaf and fruit samples and spray schedules were obtained, both in the dozen orchards involved in the outbreak and in orchards not involved. It became obvious that the unusually heavy spraying with parathion during the spring and summer to combat the oriental fruit moth has resulted in a heavy deposit on the leaves in the orchards producing illness. Because the leaves had a greater surface area, they had collected more pesticide than the fruit. This study confirmed the earlier contention of Quinby and Lemmon (*4*) and others that dermal exposure from the leaves of the heavy foliage was the most likely source of the problem. However, the heavy spraying schedules were the clue to why there was excessive residue on the leaves, but the amount of residue did not account sufficiently for the occurrence of poisonings. The presence of more toxic breakdown products of parathion, such as Paraoxon (diethyl *p*-nitrophenyl phosphate), is strongly suspected.

Example 11.—A young farm worker fainted in a bar after one glass of beer. Because of the peculiar bluish-red color of his face and neck, a physician was called who hospitalized the victim. He recovered in about four hours. Inquiries were made to determine the nature of the black powder which covered the workman's clothing. It was found to be a fertilizer, calcium cyanamide. When it is inhaled or taken orally at the same time as alcohol, sudden systemic effects, manifest by headache, shivering, staggering, and dyspnea become evident. If enough alcohol is taken, seriouss pulmonary complications may develop, otherwise, the victim recovers in a few hours. The peculiar color of the skin is apparently due to cyanhemoglobin or cyanhematin.

Example 12.—Twenty-five farm laborers planting cotton in the hot San Joaquin Valley became suddenly ill with the nausea, headaches, giddiness, blurred vision, sweating, and other symptoms typical of phosphate ester poisoning. They had been unloading bags of Thimet-treated cotton seeds from trucks, loading the planters, and piling and burning the empty bags. No washing facilities or protective clothing were available to these workers. Protective clothing to prevent skin absorption of this highly toxic pesticide mut be air cooled to be feasible in 105 F weather. The estimated adult fatal dose of Thimet is three drops orally and nine drops dermally. Here is a situation which calls for industrial hygeiene engineering controls to alter the work processes to make feasible a safer handling procedure.

Example 13.—A 15-year-old farm laborer was tipping grape vines on a 105 F July day in the San Joaquin Valley. He complained of nausea, dizziness, headache, excessive sweating, and numbness of both arms. He developed severe muscle cramps and fell to the ground. He was taken to the emergency room of a nearby hospital where extreme pallor, and elevation of temperature, respiration, and pulse were noted. The patient responded well to ice packs, fluids, and bed rest. This worker had suffered a heat stroke. He had no water or salt provided in the field.

Many other examples of occupational disease on the farm could be presented to illustrate the variety of serious and growing problems facing the farmer, his employees, and their physicians. It is important to emphasize the new and growing occupational and rural health problems arising from the use of pesticides and other agricultural chemicals. Health hazards which have been a problem on the farm for hundreds of years are also present today—heat stroke and tetanus, for example. These problems require that physicians serving agricultural areas possess skills in toxicology and occupational medicine to serve their communities adequately. These demands are formidable enough without the addition of several hundred different farm chemicals calling for expert knowledge in industrial toxicology. However, four suggestions should be of considerable assistance in facing this task. First, every physician in an agricultural area should have on his desk the *Clinical Handbook on Economic Poisons, Emergency Information for Treating Poisons* (*5*).

Second, each physician should be prepared to recognize and treat adequately poisoning from the phosphate ester anticholinesterase pesticides mentioned above. Poisoning from this group of chemicals is by far the most prevalent and most serious, accounting for over 70% of pesticide poisonings among farm workers. The effectiveness of the antidotes and other treatment is such that medicine has much to offer in treatment. Victims who have absorbed several times the fatal dose can be saved with prompt and adequate medical management.

Third, the physician must know how to identify a pesticide properly. Inadequate identification of chemicals to which workers have been exposed is the most common difficulty noted in reviewing the physicians' reports of occupational disease from chemicals in California. Several hundred commonly used pesticides have markedly different effects which require different kinds of treatment. The important initial distinction is whether or not a pesticide is a phosphate ester anticholinesterase agent. If it is, treatment is specific and very effective and the cholinesterase test for red cells and plasma should be carried out. For almost all other kinds of farm chemicals, treatment of poisoning is largely symptomatic and there are few laboratory tests available to assist in diagnosis. The treatment for phosphate ester pesticide poisoning is of little or no value for poisoning from other kinds of chemicals and is contraindicated for some (example: atropine sulfate is contraindicated in pentachlorophenol poisoning). A common mistake is to assume that a farm chemical is a phosphate ester when it is not.

Identification of a chemical to which a worker has been exposed often requires considerable ingenuity on the part of the physician. Taking the worker's word for it can be misleading. Checking with the employer and obtaining the label from the pesticide container, as well as finding out exactly how and when the exposure took place, is the basis for a valid diagnosis. The label on the original container will list the chemical ingredients in the formulation which can then be checked for toxicological data with the Poison Information Center, in a text such as *Clinical Toxicology of Commercial Products, Acute Poisoning, Home and Farm* (*6*), or the handbook previously recommended. Medical consultants in agricultural toxicology are rare but available through the larger companies manufacturing farm chemicals. It is important to consider all of the ingredients in a pesticide formulation. Sometimes, the solvent in which the pesticide is mixed is also a toxicological consideration. When the label is not available, sources of help include farm and health agencies such as the Agricultural Commissioner, state or local health or labor departments, and farm advisers. Physicians should learn what hazardous pesticides are used in the community and where and when exposures to these chemicals may be occurring so that they are better prepared to deal with poisoning emergencies as well as offer advice about prevention.

Fourth, physicians should recognize that the most important service they can perform is in the prevention of occupational disease from farm chemicals. There are several different methods. Physicians can provide good medical supervision for groups of farm workers. For example, in California agriculture, all workers regularly using the toxic group of phosphate ester pesticides must be medically supervised (*7*). The minimal legal requirement for medical supervision consists of: (*a*) advance planning for prompt care of any emergency, (*b*) arranging for and interpreting the baseline and periodic cholinesterase tests so that excessive exposure is detected and corrected before illness occurs, and (*c*) deciding when workers must be removed from exposure to phosphate ester pesticides and when they may return to work after a poisoning episode or after a significant reduction in cholinesterase activity.

Physicians can provide educational information for farmers who are their patients. Physicians can speak to various community groups on farm safety, and physicians can cooperate with the appropriate local agricultural, safety, and health agencies so that adequate health considerations are taken into account in educational and regulatory affairs of agencies concerned with the use and control of pesticides.

SUMMARY

In California, agriculture experiences the highest occupational disease rate of any industry—three times as high as the average of all industries. A number of converging circumstances may explain this. First, there are formidable hazards both new and old on the farm. Second, it is much more difficult to control hazards in orchards and fields than within an industrial plant. Third, agricultural workers need more safety supervision than other categories of workers. Because of migrant status, seasonal work, language barriers, substandard education, marginal health, and poor hygiene, they are the least able of any group to protect themselves against occupational hazards, particularly agricultural chemicals. Concepts in industrial hygiene and industrial medicine commonly used for many years in other industries have not been employed nor adapted to the agricultural setting. Such commonplace needs as clean drinking water, wash water, and sanitary facilities are rarely available in the fields, and are notably deficient in many of the living quarters of farm laborers. Yet, water and soap are vital to the prevention of the most serious occupational diseases occurring on the farm.

In 1962, in California, there were about 2,700 reports of nonfatal occupational disease coming from 230,000 farm employees. Dermatitis, pesticide poisoning, food poisoning, and heat stroke were most frequently reported. From 1955 to 1962, a total of 29 cases of fatal occupational disease were reported—11 attributed to heat stroke, 4 attributed to pesticide poisoning, and 4 from tetanus. The remainder were attributed to miscellaneous causes. Judging from the seriousness and number of reports, heat stroke and pesticide poisoning are the most formidable occupation diseases in California agriculture.

Examples of various occupational diseases occurring on the farm are presented to illustrate the serious and complex health problems entailed in the production of food and fiber.

Physicians in farm areas can become the industrial physicians for agriculture and help prevent occupational disease and injury. Four specific suggestions are offered to the rural physician to assist him with pesticide poisoning problems: he should possess the *Clinical Handbook on Economic Poisons* (*5*); he should know how to identify the offending pesticide when confronted with a poisoning emergency; he should become skilled in the recognition and treatment of phosphate ester poisoning; and he should be prepared to provide good medical supervision for employees working with pesticides.

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THE USE OF AGRICULTURAL CHEMICALS

By Irma West, M.D.

Anyone who applies, stores, transports, disposes of, formulates, mixes or manufactures agricultural chemicals has assumed a particularly important obligation with respect to the safety of his operations. He must have special knowledge, adequate training, proper equipment, and sources of technical help and information to call upon when special problems or emergencies arise.

There are several fundamental "facts of life" which should be understood at the outset by persons responsible for safe use of agricultural chemicals. First, there are tremendous differences in the degree and kind of hazard they may present to people. A number of chemicals are of very little hazard, even when misused. However, it is practically never safe to say any are harmless. Pesticides, for example, would not be of much use if they did not have some adverse effect on plant and animal life. There are a few agricultural chemicals which are among the most dangerous materials ever used by man. Examples are TEPP (tetraethyl pyrophosphate), parathion, Phosdrin, Thimet (phorate), and Demeton (Systox). Therefore, the prospective user must find out before he buys or uses any chemical just what the hazards are, and how to protect himself, his employees and the public. Furthermore, in order to make an accurate estimate of the cost of using any chemical, the hazard must be known because a sizeable part of the expense can be in the time, equipment and services necessary to assure safety.

Second, it should be understood what the term "hazard" means. It is not the same as toxicity (poisoning ability), although toxicity is often a very important part of the overall hazard. The hazard is the summation of all of the potentially harmful effects which could occur during a particular use of a particular pesticide. There are a number of factors in addition to acute and chronic toxicity which can contribute to the hazard. Among them are: 1) flammability, 2) explosibility, 3) ability to cause chemical burns or irritation of the eyes (conjunctivitis), skin (dermatitis or rashes), and breaking passages (including chemical pneumonia), and less frequently 4) ability to cause allergic responses such as hives, hay fever, and asthma. Any chemical can present one or more of these dangers from a very mild to a severe form.

Factors greatly increasing the hazard are 1) the ability of a substance to enter the body readily through the intact skin, and 2) the ability to easily emit vapor into the air (a liquid with high vapor pressure or a gas). Any highly toxic chemical which is a gas or a liquid with a relatively high vapor pressure and which can easily be absorbed through the skin is particularly hazardous to humans. Examples are-tetraethyl pyrophosphate (TEPP) and cyanide gas.

The third "fact of life" is that technical information about health and safety in the use of chemicals does not come from the same group of experts who advise on how to use chemicals effectively. The applicator, extension service man, various fieldmen, and the entomologist are among those called upon to advise on the selection of a pesticide to destroy a specific pest. The group technically qualified to advise on health and safety come from entirely different fields. They are industrial medicine, human toxicology, industrial hygiene, public health and related health fields. For advice on safety with respect to wildlife, still another technical group must be called upon, such as the biolgist, the ecologist, and the conservation expert. It is important to seek advice from the group technically equipped to provide it.

Experience has shown that more children under five years dies of accidental pesticide poisoning than any other group of people, and that arsenic and phosphate ester pesticides (such as parathion and TEPP) are the most serious offenders. Children will find almost anything that is left accessible, and because of their small size and increased suceptibility, it takes a very small dose to be lethal.

Examples

Case 1. A group of families with their children were picking berries on a berry farm. They were followed by a spray rig. On the spray rig was a five-gallon can of TEPP concentrate. A four-year-old-girl put her finger in the can which her older brother had opened. She died within twenty mintes.

Case 2. A three-year-old boy was admitted to the hospital in a serious condition. He had been nauseated and vomiting during the previous night. The child's shirt was found to be a stained with an oily substance. The child had been playing in a shed on a ranch near where a container of parathion, which had been left on a shelf seven years before, had spilled on the floor. The child recovered.

The greatest number of poisoning deaths from pesticides are the result of suicide. At least some of these deaths could have been prevented if toxic pesticides had not been left within the reach of emotionally upset persons. Persons who have a history of attempted suicide or are emotionally upset are not good candidates for employment in any job where toxic chemicals are easily available.

Of growing concern are the increasing number of incidents where toxic pesticides are spilled during transportation or storage, and neighboring cargo such as food and clothing and bedding becomes contaminated (see Table). It cannot be emphasized too often that spills of concentrates of toxic chemicals wherever they occur are an emergency requiring immediate and expert attention. The chemical or common name of the chemical must be immediately available in order to know what the hazard is, how to decontaminate, and to inform the physician to whom anyone is taken who has been exposed to the spill. Each operation where toxic pesticides are stored, transported or used should make advance plans for exactly how to handle spills of each chemical on the premises. (See chapters on Safe Transportation and Storage of Pesticides in "Safe Use of Pesticides," listed in the references at the end of this paper.)

Another group at special risk where pesticides are manufactured, formulated, transported, stored, or applied are the workers, particularly farm workers. In California, over half of the cases of occupational disease from agricultural chemicals occurs in the farm worker. Fatal poisoning is fortunately not a frequent occurrence but completely preventable deaths occur each year. Parathion, Phosdrin, Demeton (Systox), TEPP, methyl bromide, arsenic, paraquat and ammonia have been the agricultural chemicals involved in fatal cases among workers in California. Most of the serious nonfatal cases were attributed to the phosphate esters, parathion, Phosdrin, Thimet. (For further information see Occupational Disease in California Attributed to Pesticides and Other Agricultural Chemicals. . . . 1965, listed with references at the end of this paper.)

Example:

Case 3. Mr. X came to work for Mr. C., a California seed grower. Mr. X was handed a large shake of gray powder and told where to apply it. The shaker of 10% phorate (Thimet) was not labeled. The worker was not given any information about the hazards involved in using this highly toxic pesticide. He was not provided with protective clothing, such as gloves, goggles, and impervious coveralls, to prevent skin contact. He was not provided with an approved, clean respirator to prevent breathing the dust. He was not provided with washing facilities so he could shower and change to clean clothing before going home, thus avoiding bringing home contaminated clothing which could endanger him and his family, particularly young children. No one on this ranch knew the proper first aid to administer when Mr. X became ill. No prearrangements had been made with a local physician so that poisoning would receive prompt and adequate care. There was considerable delay in identifying the pesticide, since there was no label on the shaker and the original container could not be found. Since medical treatment for pesticide poisoning is quite different depending on the particular material, any delay in providing the physician with the name of the pesticide can mean a serious delay in proper treatment. This case of poisoning was entirely unnecessary. It could have been so easily prevented. No one comes equipped with the knowledge he needs to use hazardous chemicals safely. He must first be taught exactly what to do and why. If the boss doesn't have the knowledge, training, or equipment, he cannot pass it on to others who work for him.

SUMMARY—BASIC RULES FOR SAFETY

A review of the serious to fatal agricultural chemical poisoning cases reveal that one or more of these basic safety rules were broken.

1. Before opening any container of an agricultural chemical, workers should be informed if there are risks to themselves and others, and they should receive instructions and equipment for safe handling. Read the Label Each Time Before Use.

2. Whenever there is a choice, the less hazardous chemical should be used and no more than is necessary.

POISONING EPISODES CAUSED BY CARGO CONTAMINATED BY A PESTICIDE SPILL IN STORAGE OR TRANSIT

Place	Year	Pesticide	Commodity contaminated	Where contaminated	Persons harmed
England [1]	1956	Endrin	Flour	Railway cart	59 ill.
Singapore [2]	1959	Parathion	Barley	Boat from Europe	9 dead, 26 ill.
Fresno,[3] California	1961	Phosdrin	Blue jeans	Truck	6 ill.
Vancouver,[4] British Columbia, Canada.	1964	Parathion	Bed sheets	Boat from San Francisco.	2 very ill, repeatedly.
San Diego,[5] California	1965	Diazinon	Doughnut mix	Bakery	28 ill.
Report not released [6]	1967	Endrin	Flour	Boat	Many dead and ill.
Tijuana,[7] Mexico	1967	Parathion	Sugar	Truck	17 dead, 300 ill.
Colombia,[8] South America	1967	Parathion	Flour	Truck	77 dead, 146 hospitalized, 600 (?) ill.

[1] Davies, G. M., and Lewis, I.: "Outbreak of Food-Poisoning from Bread Made of Chemically Contaminated Flour." Brit Med J 2:393 (Aug. 18) 1956.
[2] Kanagaratnam, K., Boon, W. H., and Hoh, T. K.: "Parathion Poisoning from Contaminated Barley." Lancet 1:538 (Mar. 5) 1960.
[3] Warren, M. C., et al: "Clothing-Borne Epidemic." JAMA 184:266, 1963.
[4] Anderson, L. S., et al: "Parathion Poisoning from Flannelette Sheets." Canad Med Assn. J 92:809 (Apr.) 1965.
[5] West, I.: "Public Health Problems are Created by Pesticides." California's Health, July 1965.
[6] Report confidential and not yet released. Information for official agencies only. Occurred outside United States.
[7],[8] Widely publicized in newspapers.

Prepared by: Bureau of Occupational Health, California State Department of Public Health, 2151 Berkeley Way, Berkeley, Calif. 94704.

3. There should be on-the-job safety supervision. New employees and those not trained in handling chemicals need constant supervision. No one should work alone with a hazardous chemical.

4. Pest control equipment should be of proper design, well maintained and regularly cleaned so as to minimize spills or other pesticide exposure to operators or maintenance personnel. The mouth should never be used to siphon. Cross-connections or siphons which could contaminate wells and water supplies should be avoided.

5. Washing facilities should be readily available and any spills or splashes of chemicals should be immediately washed from the skin and the clothing changed. Hands should be washed before smoking or eating. Lunches, drinking water, and tobacco should be kept away from farm chemicals. A shower followed by a change of clothing after each day's work is mandatory. Work clothes should be cleaned separately and not taken home for laundering. Contaminated boots, tools or other items should not be taken home. They can be a hazard to the family.

6. The employer should provide, maintain and clean whatever protective clothing or equipment (gloves, respirators, etc.) is needed for safe work with chemicals. Different pesticides may require different kinds of protective equipment.

7. Special care is necessary in handling concentrated pesticides. It is at this point that the greatest hazards lie, particularly if the chemical is toxic and readily absorbed through the skin. In the transferring of concentrates from drums, either threaded taps or drum pumps should be used. Measuring and pouring from jars and cans is asking for trouble.

8. Pesticides must be properly labeled and stored in original containers. All toxic chemicals should be stored separately under lock and key away from foodstuffs, medicines, clothing, toys and the like. They should never stored in

containers which can be confused with food, beverages or medicines. No pesticide containers, empty or otherwise, should be left where children, pets, livestock, or irresponsible persons have access. Empty container should be burned, or decontaminated and buried preferably at an authorized dump, right away.

9. Toxic chemicals or any items contaminated by toxic chemicals must not be transported in passenger sections of vehicles, nor with foodstuffs or other commodities which could be a hazard if contaminated in a spill.

10. Persons who have been accidentally overexposed to a toxic chemical or have symptoms of poisoning, should never operate an auto, truck, aircraft or any other vehicles. They should be taken promptly to the doctor. Plans for handling emergencies must be made in advance with the doctor. Medical supervision should be provided for all work with hazardous materials.

11. Workers should know basic first aid for chemical injuries as follows: a) give mouth-to-mouth artificial respiration if breathing has stopped, wash face and use handkerchief if face is contaminated; b) decontaminate skin by washing, remove contaminated clothing, use gloves; c) if chemical splashes in the eyes wash for 15 minutes with clean water; d) if chemical swallowed and victim fully conscious give water, induce vomiting by gagging only if victim is conscious and no solvents or corrosives are in the formulation; e) take victim to a physician or nearest emergency hospital as soon as possible and bring the container and label.

REFERENCES ON AGRICULTURAL CHEMICAL SAFETY

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3. ———: Methyl Bromide Poisoning, 1964.

4. ———: Occupational Disease in California Attributed to Pesticides and Other Agricultural Chemicals, 1965.

5. National Agricultural Chemicals Association: Decontamination and Disposal of Empty Pesticide Containers. 1155 Fifteenth Street, N.W., Washington, D.C. 20005, 1965.

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Pesticide Safety Book

A 92-page, soft-cover handbook, "Safe Use of Pesticides," edited by Irma West, M.D., M.P.H., is available from the American Public Health Service, 1740 Broadway, New York, NY 10019. Price is $3.00.

Sections are included on safe use, transportation, storage, disposal, manufacture and packaging of pesticides; first aid for pesticide injury or illness, medical supervision of workers, diagnosis and treatment of poisoning; and pesticides in water, air and soil. Fifteen specialists contributed to the manual, which is intended as a practical guide for the average, non-specialized person.

Orangeworms in Almonds

Old nuts (sticktights) left in almond trees after harvest serve as overwintering sites and also as the only source of food for the spring generation of the navel orangeworm. L. E. Caltagirone and coworkers at University of California, Riverside, reporting on studies begun in 1963, said that larvae develop during the winter and early spring, then emerge as moths. Egg laying begins in late March or early April. Eggs are deposited only on the old nuts; eggs have never been found on the new crop before the hulls begin to split and dry. Egg laying continues throughout the season, reaching peaks in May-June and August-September.

At present, there is no economically feasible method of controlling navel orangeworms with insecticides, the researchers said. Complete removal of the old nuts would mean the destruction of the within-the-orchard source of infestations, and economic feasibility of this must be weighed against the role of the sticktights as a food source for an increasing population of navel orangeworm in early spring.

The navel orangeworm can live in a wide variety of fruits, Caltagirone pointed out, and to be effective, sound crop management must be extended to other fruits in the vicinity of almond orchards as well as to other almond orchards in the area.

Annual Bluegrass Control

Thirty pounds per acre of bensulide produced leaf discoloration and root length reduction of established annual bluegrass plants without injuring creeping bentgrass in tests conducted at Oregon State University.

Terbacil at 0.2 pounds per acre and bromacil at 0.4 pound per acre gave highly selective control of annual bluegrass in Merion and Newport Kentucky bluegrasses when applied preemergence. Postemergence applications of these compounds gave moderate selective control of annual bluegrass.

Elm Leaf Beetle

Although many insecticides will kill the adult and larvae of the elm leaf beetle, the major problem is thorough coverage of infested trees, according to John Durkin, New Mexico State University. Trees often have to be sprayed several times, because there are at least three generations a year. High pressure, high volume sprayers are necessary. Durkin recommends that long-residual chemicals such as DDT be used to treat tree trunks to kill larvae.

Pesticide-Induced Illness—Public Health Aspects of Diagnosis and Treatment

(By Irma West, M.D., Berkeley, Calif.)

Over the past 25 years there has been a remarkable proliferation of new chemicals into our environment, among them the 57,000 different tradenamed pesticide formulations now for sale in the United States. With them have come many new problems to physicians needing up-to-the minute toxocologic information, and also sizable problems in public health. Technology must be harnessed to bring to physicians, when they need it, help in the diagnosis and treatment of poisoning and other adverse effects from modern chemicals, for at present it is impossible for the practicing physician to keep up with what is known and unknown about the toxicology of all of these chemicals.

Man has manipulated his environment on so large a scale that he has inadvertently invented and produced a multitude of the most complicated new problems ever to confront the health professions. Unfortunately, we have been slow to realize that plans for health and safety should be built into technologic advances in the planning stages. By the time technical tools are in operation and their use results in undesirable and unexpected effects upon people and their environment, the best opportunity to minimize these effects efficiently and humanely is largely lost. So it is with many of our new environmental health problems whether they are air pollution or other environmental contamination with modern chemicals, including pesticides.

Pesticides are materials which mitigate or kill unwanted animal or plant life. About 650 have been invented in the last 25 years. These new chemicals, plus a few older ones, are formulated into over 57,000 trade name products registered for sale in the United States. Never before have hundreds of new chemicals possessing such varying degrees and kinds of potential for good and harm been introduced into the environment in so short a time.

It is important that problems in environmental medicine be viewed in context. With the possible exception of drugs, pesticides have been the first great experiment in the mass use of chemical technology. About one hundred million pounds of pesticides are now applied annually in California. Ten years ago about half that amount was applied and 20 years ago use of the new synthetic pesticides was just beginning. By far the greatest portion of pesticides is used in agriculture. Only 1 per cent is applied for control of disease vectors. About 59 per cent of the pesticides used are insecticides, 15 per cent fungicides, 15 per cent defoliants and herbicides, 10 per cent fumigants and 1 per cent rodenticides.

Pesticides have brought great benefits—and, with them, disturbing adverse side effects which are summarizied in Table 1.

A question which naturally arises is, do the benefits outweigh the adverse side effects? The answer depends, of course, on what values one assigns to the items listed. The food technologist, the agriculturist and the chemical manufacturer will point to the sizable benefits as the more important—the food surpluses, the economic importance of the commodities where pesticides play a significant role in production or preservation. On the other hand, the biologist, the conversationist and the wildlife expert will look with alarm at the chain of events arising from the worldwide contamination of the environment with the persistent chlorinated hydrocarbon pesticides, including the insidious build-up of these chemicals in the food chains. Medicine and public health have interests in both sides of the picture. Worldwide, pesticides have been one of the methods used in successfully combating malaria and other vector-borne diseases. Millions of lives have been saved. In California the threat of Western and St. Louis Equine viral encephalitis is held in check by the mosquito abatement activities. On the other hand, deaths and serious illness from acute pesticide poisoning and other recognized adverse effects upon California citizens which occur regularly are a tragic and unnecessary waste of human health and life (See Tables 2 and 3). Further, the uncertainties about long-term effects upon people arising from a contaminated environment and from the storage of chlorinated hydrocarbon in human fat, are reason for considerable uneasiness in the medical profession and among public health workers. There is, of course, no objective answer to the question of the relative value of the benefits versus the adverse side effects from pesticides. Information on which to make such a judgment is far from complete and may never be available. However, as time goes on the relative importance of these benefits and side effects may become more obvious.

A question of greater significance from the standpoint of public health and environmental medicine is, can we have the benefits of pesticides without the undesirable side effects? It is technically feasible and well within the realm of possibility to use pesticides in a manner which will reduce undesirable side effects to almost zero. However, such a program would call for revolutionary changes in our standards for research and field testing, and in our control over developing technology. We can obtain as much protection against the adverse side effects as we are willing to insist upon and pay for.

The prevention of untoward effects upon the health of the population arising out of our technology is emerging as a most important and difficult public health function. Our society has never really faced the issue of what would be necessary to prevent the undesirable side effects arising from the use of pesticides and still enjoy their benefits. First, before a pesticide was put into general use it would be necessary to know, through research and field tests, what all of the potential undesirable effects, are. Second, these chemicals must really be controlled so that they will not be used in a manner producing adverse effects. Third, because methods for predicting adverse effects cannot be expected to be perfect, they must be continually evaluated and a monitoring system for human health must be established with built-in power to stop and revise uses of pesticides when they become suspect of producing undesirable effects.

This kind of system may seem insurmountably difficult, but that is because our administrative vision has never been big enough for our environmental health problems. A good control program is technically feasible. It has been routine, for example, in the development of our space program. However, when

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From the Bureau of Occupational Health, State of California Department of Public Health, Berkeley.

Reprint requests to: Bureau of Occupational Health, 2151 Berkeley Way, Berkeley 94704.

TABLE 1.—BENEFITS AND UNDESIRABLE SIDE EFFECTS ARISING FROM THE USE OF PESTICIDES

Benefits	Undesirable side effects
Enhance production of food and fiber.	Human poisoning and other diseases from pesticides.
Help preserve stored food and other commodities.	Contamination of the environment with destruction of beneficial plant and animal life such as bees and wildlife; concentration of chlorinated hydrocarbons in food chains.
Help control vector-borne disease.	Pesticide residues on food.
Help control nuisance pests.	Storage of chlorinated hydrocarbon pesticides in human and animal fat.
Protect economically and aesthetically valuable resources (forests, parks, trees, lumber, flowers, gardens, etc.).	Development of resistance to chemicals by pests.

it comes to down-to-earth matters involving the general population, too little too late is more often the case. Air pollution is another example of a situation in which our administrative imagination and machinery has never been big enough to catch up and come to grips with the problem.

Using hindsight in analyzing the genesis of undesirable and often unexpected side effects from pesticides, it is apparent that considerable research and control went into some aspects of pesticide usage and very little into others. A great deal of research and attention was paid to establishing tolerances for pesticides on crops in which pesticides were applied. Applications of pesticides were carefully prescribed and the crops monitored. Crops with more than the legal tolerances were condemned. However, pesticide poisoning among workers applying these materials and contamination of the environment for example, received very little if any research attention or effective control. It is also apparent that the skills and technical knowledge employed in the development of pesticides were in fields related to the intended uses of pesticides. Technical skills related to the adverse side effects were often not included.

It should be stated at this point that there are very distinguished scientists who are not optimistic about our ability to control unwanted side effects arising from our technological tools. For example Dr. Rene Dubos (15 April 1965 *Journal of Occupational Medicine*) is quoted as follows:

"Present programs for controlling potential threats to health from new substances and technologic innovations are doomed to failure because we lack the scientific knowledge to provide a sound basis for control.

"Current testing techniques have been developed almost exclusively for the study of acute, direct toxic effects.

"In contrast, most untoward effects of the technological environment are delayed and indirect. . . . Yet little is being done in schools of medicine and public health or in research institutes of government laboratories to develop the kind of knowledge that is needed for evaluating the long-range effects on man of modern ways of life.

"The dangers associated with ionizing radiation, or with cigarette smoking should have sensitized the public as well as scientists to the importance of delayed effects. But, surprisingly, this knowledge has not increased awareness of the fact that most other technological innovations also have delayed effects.

"The slow evolution of chronic bronchitis from air pollutants, the late ocular lesions following use of chloroquine, the accumulation of the tetracyclines in the fetus, and of course all the carcinogenic effects, are but a few of the countless objectionable results of new substances or technologies which appeared at first essentially safe."

The same scientist spoke to the same point in a statement appearing in *Bioscience*, 14:11, January 1964:

"There is no need to belabor the obvious truth that, while modern science has been highly productive of isolated fragments of knowledge, it has been far less successful in dealing with the complexity of natural phenomena, especially those involving life. In order to deal with problems of organized complexity, it is therefore essential to investigate situations in which several interrelated systems function in an integrated manner. Multifactorial investigations will naturally demand entirely new conceptual and experimental methods, very different from those involving only one variable, which have been the stock in trade of experimental science during the past 300 years and to which there is an increasing tendency to limit biological research."

The time has come to state that the medical profession has been placed in a difficult position with respect to the recognition and treatment of untoward effects upon human health from pesticides and other modern chemicals. Since the field is one of growing potential for liability, it is somewhat surprising that so little protest has been heard from physicians. The present mechanisms for bringing information and education to physicians are not geared to meet today's rapid introduction of hundreds of new chemicals of potentially dangerous effect. It is entirely unrealistic to expect every physician in general practice to keep up with what is known and unknown about the toxicologic properties of modern chemicals. Since technology produced this urgent problem, it is only fair to expect it should be used to devise imaginative new procedures to bring to the physician, when he needs it, effective help and up-to-date information of poisoning and other conditions resulting from exposure to pesticides.

TABLE 2.—ACCIDENTAL DEATHS ATTRIBUTED TO POISONING FROM PESTICIDES AND OTHER AGRICULTURAL CHEMICALS, CALIFORNIA 1951–1965[1]

	Number of deaths											
		Children				Workers				Others		
Year	Total	Total	Arsenic	Organic phosphates	Other	Total	Organic phosphates	Methyl bromide	Other	Total	Arsenic	Other
1951–65 total	128	76	44	13	19	29	12	7	10	23	0	13
1965[1]	5	2	1	1	0	1	0	1	0	2	0	2
1964	2	1	1	0	0	1	1	0	0	0	0	0
1963	6	3	1	1	1	1	1	0	0	2	0	2
1962	5	4	1	2	1	1	1	0	0	0	0	0
1961	6	3	2	0	1	3	2	0	1	0	0	0
1960	4	4	4	0	0	0	0	0	0	0	0	0
1959	18	10	4	2	4	5	1	2	2	3	1	2
1958	13	6	2	0	4	3	1	1	1	4	3	1
1957	12	8	5	1	2	2	1	0	1	2	1	1
1956	18	11	9	1	1	4	0	2	2	3	2	1
1955	6	3	1	0	2	1	0	0	1	2	2	0
1954	12	9	3	4	2	2	1	0	1	1	1	0
1953	10	4	3	1	0	4	3	0	1	2	0	2
1952	6	5	4	0	1	1	0	1	0	0	0	0
1951	5	3	3	0	0	0	0	0	0	2	0	2

[1] All 1965 data preliminary, a small number of death certificates yet to be processed.

Source: State of California, Department of Agriculture, Annual Reports, Bureau of Chemistry, 1951–1960; State of California, Department of Public Health, Death Records and Occupational Disease Attributed to Agricultural Chemicals, 1951–1963 by Bureau of Occupational Health.

Note: Suicides now outnumber accidental deaths from pesticides (13 in 1964, 19 in 1965).

Also urgently needed is the development of many more clinical chemical laboratory tests to help the physician confirm a diagnosis. For many chemicals, such tests either do not exist or are not available locally. Circumstantial and clinical evidence alone are often quite inadequate to arrive at a sound diagnosis. As a result there are probably more unsound diagnoses and missed diagnoses in chemical poisoning than in most other areas of medicine.

One of the most immediate problems in public health is the lack of information about what effects pesticides and other modern chemicals are having in the population. Only a part of this information is available through death certificates, the Doctor's First Report of Work Injury (See Tables 2 and 3) and an occasional research project.

These problems of the practicing physician and public health suggest the possibility of a joint solution. A state or national center to provide medical

TABLE 3.—REPORTS OF OCCUPATIONAL DISEASE ATTRIBUTED TO PESTICIDES AND OTHER AGRICULTURAL CHEMICALS FOR ALL CONDITIONS AND SYSTEMIC POISONING, CALIFORNIA 1953 1964

	Reports of occupational disease				
		Systemic poisoning			
	Total	Total	Attributed to organic phosphates (phosphate esters)	Attributed to chlorinated hydrocarbons	Attributed to other agricultural chemicals
Total	9,894	3,296	2,412	141	743
1964	1,328	230	135	24	71
1963	1,013	345	267	14	64
1962	827	219	140	21	58
1961	911	268	194	14	60
1960	975	368	283	7	78
1959	1,093	499	407	10	82
1958	910	328	227	14	87
1957	749	252	189	12	51
1956	789	281	197	11	73
1955	531	183	126	[1] 4	53
1954	391	122	101	[1] 1	20
1953	377	201	146	[1] 9	46

[1] DDT only.

Source: State of California, Department of Industrial Relations, "Doctor's First Report of Work Injury." Statistics compiled by Bureau of Occupational Health, Department of Public Health.

and toxicological consultation to physicians with diagnostic and treatment problems could, at the same time, record, mechanize and analyze case data for study and dissemination. Any number of benefits to physicians, their patients and the public could arise from such a center. For example, unexpected effects upon health could be picked up and documented much earlier and appropriate preventive measures taken; the physician would have help in obtaining and interpreting laboratory tests; and liability problems would be minimized. This proposal is for an advanced stage in the development of the Poison Information Centers now in use. It is time we recognized the value of augmenting a valuable service of this kind to meet the needs of the day.

[From the Texas Health Bulletin, Austin, Tex., August 1968, Vol. XX, No. 8]

The Hidalgo County Incident

Poisoning of 23 farm workers northwest of Santa Rosa in Hidalgo County was reported in June following aerial spraying of a cotton field.

Twenty-two farm workers (eight males and 14 females) were working in the field, while the 23rd was involved in irrigating near the cotton field. Ages ranged from 12 to 67.

The field was sprayed from the air in late afternoon of the day before the acute poisoning occurred. It was the fourth spraying of the 145-acre field with ethyl and methyl parathion, an organophosphate insecticide.

The night of the spraying was warm, with little wind movement. During the early morning hours afterward a dew fell and the plants were quite wet the following morning when the weeding crew went into the field around 7 a.m. Growth of the plants was good. They stood three to three and a half feet tall and obscured the ground between the rows.

As a result of the dew and dense foliage, when the weeding crew entered the field the next morning the workers couldn't avoid getting wet as they made their way through the dense growth chopping weeds.

It was the habit of workers to skip breakfast but to take food with them and snack as they worked, usually starting about an hour after going into the fields. Some carried drinking water with them. There was reason to believe that on the morning of the incident some members of the crew put weed stems in their mouths and several of the younger ones may have sucked the nectar from morning glory flowers in the field. Most worked barehanded.

A 15-year-old boy got sick around 11 a.m., reporting dizziness to the wife of a foreman. The boy's 14-year-old brother went home about 15 minutes later. The foreman's wife took lunch to two of her own sons and found one complaining of nausea. The farm owner was called, quickly recognized the symptoms of dizziness, nausea, sweating and trembling and rushed the sick ones to the Poison Control Center at Valley Baptist Hospital in Harlingen.

Others were taken to the hospital by private cars as they became ill, and two were taken by ambulance dispatched by the farm owner. The first two boys who became ill were in critical condition for awhile.

Twenty-two of the 23 involved were taken to the hospital on the same day, June 13. Another reported the next day. Of the 22, 13 received emergency treatment and were hospitalized. Nine were released after treatment. Twelve of the 13 retained were released early the afternoon of June 14. One female thought to be pregnant was released the following day. All were seen by the physician who originally treated them, Dr. G. L. Gallaher, director of the Poison Control Center, following their dismissal. All were recovering satisfactorily.

Wholehearted cooperation with Texas community studies was given by all parties involed in outlining details of the incident, including the farm owner, Ben Bearden, the pilot, Elwood Schwarz, and Mrs. Amelia Salas, wife of the foreman.

OLIVER BRYK,

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PUBLICATION 281, PESTICIDES PROGRAM, NATIONAL COMMUNICABLE DISEASE CENTER

CHARACTERISTICS OF PESTICIDE POISONING IN SOUTH TEXAS

(By G. A. Reich, M.D., G. L. Gallaher, M.D., and J. S. Wiseman, Ph.D.)

Certain areas in the United States where urban communities lie in or near agricultural sections have reported many cases of pesticide poisoning.[1] [2] One such area is the Lower Rio Grande Valley of Texas where large amounts of organophosphate pesticides are used.[3] Gallaher has stated that about 275 acute pesticide poisoning cases occurred in the Lower Rio Grande Valley from 1960 through 1966, 25 percent of which took place during the first four years of that period. In 1964 there was a striking increase in the number of cases; the total (70) was approximately equal to the number of cases observed during the previous four years combined. This rise coincides with the introduction of certain organophosphate insecticides used to control crop pests, especially insects attacking cotton. The number of cases of poisoning observed in 1965 and 1966 was about the same, near 70 each year.[4]

Hospital records of 129 fully documented cases of pesticide poisoning which occurred in the area were reviewed in an effort to define their epidemiological and clinical characteristics. Poison Control Center data for the years 1964, 1965, and 1966 for Cameron County were also reviewed so that pesticide poisoning could be compared with other types of poisoning.

DISTRIBUTION

June, July, and August are peak months for pesticide intoxication in the Lower Rio Grande Valley; 93 percent of the cases occurred during this period when pesticides, particularly the organophosphates, are most abundantly applied. Patients ranged from six months to 58 years of age in this group of 126 adult men, 1 adult woman, and 2 children less than 10 years old. Nearly three-fourths of the cases involved men aged 10 to 29 years, with a preponderance in the 16-to-19-year-old group. In this area it is common for teenage boys to work during the summer months as loaders, mixers, or row flagmen for aerial applicators. Their exposure probably results either from ignorance of the hazards involved

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[1] Davis, J. H.: Clinical, Epidemiological and Forensic Aspects of Pesticide Poisonings, Fifth Inter-American Conference on Toxicology and Occupational Medicine, Miami, Fla., (Aug.) 1966.

[2] Davies, J. E, et al.: Disturbances of Metabolism in Organophosphate Poisoning, Industr. Med. Surg. 361 : 58 (Jan.) 1967.

[3] Gallaher, G. L.; Agricultural Poisons, Texas State J. Med. 61 : 336 (April) 1965.

[4] Gallaher, G. L.: "Low Volume" Ins Control and Parathion Poisoning, Texas Med. 63 : 39 (Oct.) 1967.

or their disdainful attitude toward these hazards. This may be a reflection of the attitudes of their employers. However, a decline in the incidence of poisoning cases beginning in 1967 may indicate that workers are becoming better informed, and attitudes toward safety precautions are changing. The two occupational groups most endangered by pesticides are those employed by spray pilots and those who work on farms. These two made up 87 percent of all cases.

Of the 108 patients (83 percent) who were hospitalized, the mean in-patient stay was 2.3 days with a range of 1 to 16 days; however, 68 percent spent 2 days or less in the hospital.

SYMPTOMS

Table 1 lists signs and symptoms recorded in the medical records, ranked in order of frequency. For the most part, they are what one would expect in cholinergic crises with the exception of tachycardia (19 cases) and mydriasis (2 cases). However, these exceptions have been noted in cases in south Florida.[2] The tachycardia may be associated with a stress reaction with varying blood pressure and perhaps circulating pressor amines. Amino acid disturbances, amino-aciduria, and impaired renal function have been noted elsewhere.[2, 5] Mydriasis has been noted in severe cases,[2] and it is suggested that as the brain stem fails, the Edinger-Westphal nucleus becomes depressed leaving the cervical sympathetics dominant. In severe cases presenting with mydriasis, it has been observed that atropine may initially convert mydriasis to miosis, probably through restoration of brain stem function, and then as the atropine is continued the mydriasis recurs, but at this point it represents adequate atropinization rather than an agonal sign. This list indicates that many tissues, organs, and systems are affected by pesticide poisoning.

The route of exposure was dermal in greater than 98 percent of these cases; 123 of the 129 were poisoned by ethyl and/or methyl parathion, both of which have low LD^{50}'s (3.6 mg./kg. and 14.0 mg./kg. respectively[6]).*

TABLE 1.—SIGNS AND SYMPTOMS OF PESTICIDE POISONING IN SOUTH TEXAS

Signs and symptoms	Patients	
	Number	Percent
1. Vomiting	95	74
2. Nausea	77	60
3. Miosis	74	58
4. Weakness	66	51
5. Abdominal pain	39	30
6. Dizziness	30	23
7. Diaphoresis	21	16
8–9. Increased salivation	20	15
8–9. Headache	20	15
10. Tachycardia (100 or greater)	19	14
11. Hypertension (systolic 140 or greater and/or diastolic of 90 or greater)	18	14
12–13. Blurred vision	16	12
12–13. Fasciculations	16	12
14. Aberration of consciousness	14	11
15. Rales—Ronchi	11	
16. Shortness of breath	9	
17. Muscle cramps	8	
18. Hypotension (systolic less than 100)	7	
19. Diarrhea	6	
20–21. Elevated temperature (100° F. or greater)	5	
20–21. Chest pain	5	
22–23. Bradycardia (60 or less)	4	
22–23. Tachypnea (as stated)	4	
24–25–26. Convulsions	3	
24–25–26. Cough	3	
24–25–26. Conjunctivitis	3	
27–28. Mydriasis (prior to atropine therapy)	2	
27–28. Nystagmus	2	
29. Hypopnea	1	

[5] Mann, J. B., et al.: Chronic Pesticide Exposure with Renal Tubular Dysfunction, Aminoacidemia, and Aminoaciduria, J. Clin. Invest. 45: 1044 (June) 1966.
[6] Hayes, W. J.: Clinical Handbook on Economic Poisons, Washington, D.C., PHS Publication No. 476, 1963.

*The total amounts of organophosphate pesticides used, alone or in combination with certain chlorinated hydrocarbons, is estimated to have been 1,030,000 gallons in 1963, 480,000 gallons in 1966, and 580,000 gallons in 1967. The decrease in total gallons in 1966–67 as compared to 1965 reflects the use of the ultra low volume method for aerial application of undiluted toxicant.

DIAGNOSIS

The most valuable laboratory aid in the diagnosis of acute organophosphate intoxication is the cholinesterase determination. This value can be particularly useful when it can be compared to values determined several days to a week or even longer prior to the onset of symptoms. The rate of decline in enzyme activity is an important factor in assessing the patient's symptomaology. Fewer symptoms may be present in the patient with a low cholinesterase value if he has had frequent minimal pesticide exposures over a period of time with a gradual depression of enzyme activity.

Cholinesterase was determined by either the Caraway or Michel method in 115 of the 129 patients in this series, and recorded below normal in greater than 90 percent. Althought both methods are considered reliable, the Michel method is more specific in determining cholinesterase depression due to organophosphate poisoning as it measures red blood cell cholinesterase. Plasma, serum, and whole blood cholineserase can be depressed by liver disease and he phenothiazines, for example, in addition to pesticides.

Table 2 summarizes the results of some other laboratory tests. The findings of albuminuria in 13 percent, ketonuria in 9 percent and leukocytosis in 24 percent exceed what might be expected in a sampling of the general population, and suggest a definite relationship between these conditions and the occurrence of organophosphate poisoning. It appears that these toxicants have an effect on renal function, amino acid, fat, and carbohydrate metabolism, and hematological response, and that a number of physiologic and biochemical functions are altered.

Treament: Atropine alone was used in the treatment of 80 cases, and atropine plus 2-PAM in 38 cases. No record of therapy was available on 10 cases.

Poison Control Center data indicated that there is much poisoning which is not reported. When all cases of reported poisoning were examined, it was found that 62 percent were due to pesticides. Poisoning had steadily increased each year. Pesticides were the number two cause of poisoning among children; salicylates ranked first. These data are presented in Fig. 1.

TABLE 2.—ABNORMAL RESULTS OF ROUTINE LABORATORY TESTS

	Patients	
	Percent	Number
Urine:		
Albuminuria (trace to 2+)	16	13
Glycosuria without intravenous administration of dextrose (trace to 4+)	6	5
Pyuria	4	3
Ketonuria (trace to 4+)	12	9
WBC:		
Leukocytosis (10,000) 10,300–25,300	31	24
Leukopenia (6,000) 3,900–5,700	4	3

SUMMARY

Review of hospital and Poison Control Center records in one area of South Texas revealed the occurrence of 129 well-documented cases of acute pesticide intoxication between 1961 and 1967. The majority of these cases occurred during the summer months and principally involved teen-age boys occupationally exposed by the dermal route. The signs and symptoms are those usually seen in a cholinergic crisis although tachyeardia and mydriasis are not uncommon. Cholinesterase determinations are valuable laboratory aids in substantiating the clinical impression. Most patients received prompt medical attention including atropine sulfate and/or 2-PAM and recovered.

Although data for 1967 are incomplete, indications are that the number of cases of pesticide intoxication in this area will be significantly less than the number in each of the preceding three years, despite the fact that organophosphate insecticides were used in about the same quanties as in 1965 and 1966. To mid-November, only six acute pesticide poisoning cases had occurred in the Lower Rio Grande Valley in 1967. All involved male workmen exposed dermally while handling organophosphate insecticides (methyl parathion, 5 cases; Bidrin, 1 case), and all patients recovered. Additional tabular data concerning these cases are available on request.

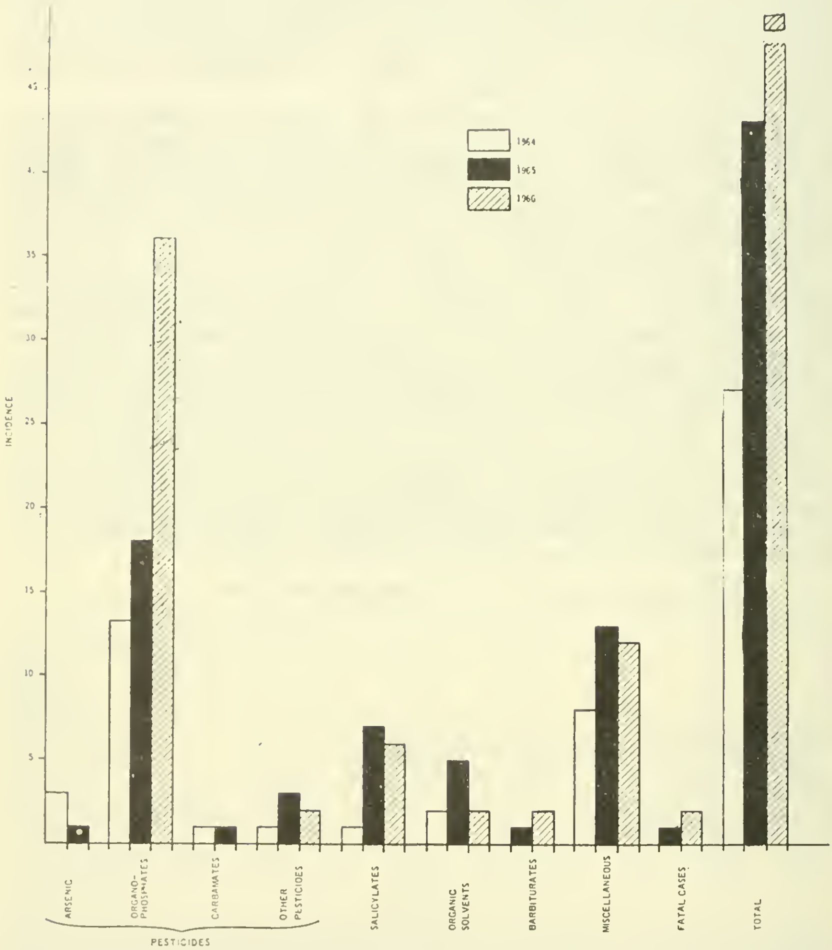

Fig. 1. Distribution of cases by agent and year, Poison Control Center, Harlingen.

Dr. Reich, Dept. of HEW, National Communicable Disease Center, Atlanta, Ga. 30333.

Dr. Gallaher, Poison Control Center, Harlingen, Texas 78550.

Dr. Wiseman, Texas State Department of Health, 1100 W. 49th St., Austin, Texas 78785.

Bethesda, Md., August 1, 1969.

Hon. WALTER F. MONDALE,
Chairman, Subcommittee on Migratory Labor,
U.S. Senate, Washington, D.C.

DEAR SENATOR MONDALE: As a follow-up to discussions with your counsel, Mr. Chertkov, and Mr. J. B. Gordon, I am forwarding a summary of defensive measures against chemical warfare that are standard operating practice for the military. No classified information has been used to prepare the notes that follow. I should like to emphasize that I am neither discussing risks to the population that may arise from the storage, transportation, or testing of chemical or biological weapons, nor the pros and cons of their development or deployment in the United States or other countries. My comments are solely intended to illustrate what can be done to protect the health and life of individuals and to carry on the work of the organization when the presence of poisonous substances is known or suspected. I should also like to emphasize that I am not a chemical or biological scientist but a systems analyst who is concerned with the subject of your hearings. My purpose in forwarding this description is to let you compare the military preparations for working in a hazardous environment with the precautions taken to protect the health and life of those workers and their families who are exposed to toxic substances defined by the statute as economic poisons. I assume that the similarity between nerve gases and such organic phosphorous insecticides which can enter the body through the skin as TEPP or Parathion is known; see references Nachmansohn, *Chemical and Molecular Basis of Nerve Activity* and TM 8–285, *Treatment of Chemical Agent Casualties.*

Chemical warfare defense is best viewed as a system. A simple but adequate definition of a system is, "human, material and information resources, organized for a purpose." The human resources include the skills to utilize information, i.e., procedures. A basic principle of chemical defense is the training of the individual and the unit, including instruction, exercises, and testing for required proficiency. Such training includes the effects of chemical agents, their employment, detection and identification; precautionary measures, first aid and casualty treatment, decontamination, and control. Control is an important element of preparedness because compliance with established procedures is essential for the minimization of risk. Control includes policing of contaminated areas. Emphasis is placed on the establishing of proper safeguards for friendly troops when offensive chemical operations are to be undertaken, and compliance is assured by a system of standard procedures for preventive action, standard items of information to be acted upon, and carefully designed methods and effective means for making that information available as rapidly and accurately as possible. Elements of information include safe downwind distance and safe time, based on meteorological observations and calculations, weapons and delivery system error, and agent characteristics.

The various items of individual protection equipment, chemical detection devices, specialized first aid and other treatment, and skills to use them are maintained in a state of readiness, and are double-checked when a need to use them is anticipated. Training is commensurate with the scope of responsibility, i.e., everyone should know how to protect himself and to aid himself; unit protection and defense is taught to unit leaders, etc. A relatively small number of specialists perform functions that require fulltime activity and special training. Training and proficiency emphasize the need to know what to do and how to sense and identify chemical agents without warning and what to do when a chemical attack warning is communicated. This reduces the risks to health, life and operational effectiveness that arise out of a failure to act as prescribed, i.e., to have been surprised or made a mistake.

Planning for chemical defense emphasizes the need to be prepared for the worst that could occur in a given local situation. This does not mean that operations will be carried out under this assumption but that it represents a baseline from which protective measures will be *relaxed* as the actual situation, as measured, permits—not the other way around. Planning for chemical defense assumes that water and food supplies will be exposed to contaminants, and makes provisions for testing for contamination, posting and control, and decontamination or disposal. Special precautions are prescribed when the presence of nerve gas is known or suspected. and the safe distance and safe time criteria (two to four days) are more stringent than for other agents. Special attention is given to the *cumulative* effects of exposure to nerve gases, and to methods and procedures to minimize total exposure over time.

I would like to offer a few suggestions for action with respect to health hazards created by economic poisons. Their ecological effects should not be overlooked, and some attention is already directed at this subject. There should be a complete overhaul and change of the process by which these substances are licensed, distributed. and used; the very notion of an economic poison is nonsense to begin with. Congress or the President should designate a single point of responsibility as the executive agent for all matters involving poison and hazardous substances, and to assure that human and environmental protection is made a reality. In this regard I suggest that legislation be introduced and hearings be held to transfer the administration of the Federal Insecticide, Fungicide and Rodenticide Act from the Secretary of Agriculture to the Secretary of Health, Education and Welfare; such legislation should also provide for the appropriate environmental responsibility. The elements of the Department of Defense which have expertise in chemical warfare could make a contribution by developing, in cooperation with the U.S. Public Health Service, procedures for testing, training, licensing, monitoring, control, and compliance in the area of poisonous substances and their use.

I understand that the National Academy of Sciences recently completed a study of FDA on the efficacy of drugs that had been approved, found that a substantial proportion was not effective as claimed, and recommended that their registrations be withdrawn. I suggest that a similar review be made for all economic poisons, and that there be established a fixed ceiling on the number of poisons that can be registered at any one time. Proliferation defeats compliance and multiplies the potential of detrimental secondary or synergistic effects. Further I suggest that a congressional analysis be made in a manner similar to the studies made of the pharmaceutical industries, of those industries that produce, blend, market or apply these poisons, to determine the net benefits to the public arising from their activities, to compare expenditures on research with expenditures on advertising, and to determine whether research is directed at safer methods of pest control or merely at product proliferation. Finally, I suggest that organic phosphorous poisons be banned in the U.S., and that the U.S. ask the U.N. to call an internatioanl conference on ways to increase food supply that allow the reduction of worldwide pesticide consumption.

Sincerely yours,

Oliver Bryk.

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A petition to: The Ministers of Health and Welfare and of Agriculture in the Government of Canada requesting an immediate ban on the further manufacture, sale or use of *DDT* and related pesticides in Canada with information proving the following points:

1. *DDT* upsets the organisms in the human ecosystem and threatens the survival of a vast number of species of wildlife.
2. *DDT* constitutes a direct threat to human health and wellbeing in Canada: it has been shown conlusively to cause cancer of the liver of laboratory animals such as mice, fish and birds; and it has been linked with liver cancer, cirrhosis of the liver and hypertension in humans.
3. *DDT* has been linked to behavioural distrubances and inhibition of learing in humans and other animals.
4. Acceptable alternative pesticides are now available for all the major and economically significant insect pests of agriculture and forestry in Canada.

D. A. CHANT,
Professor and Chairman, Department of Zoology, University of Toronto, on behalf of Pollution Probe at the University of Toronto.

SEPTEMBER 25, 1969.

A petition to: The Honourable John Munro, Minister of Health and Welfare, The Honourable H. A. Olson, Minister of Agriculture.

In respect to: The Pesticides *DDT*, dichloro dipenyl trichloro-ethane; Aldrin, hexachlorohexahydro-endo, exodemethano-napthalene: Dieldrin, hexacloroepoxyoctahydro-endo, exo-demethanonapthalene; and Heptachlor, hexachloro-tetrahydro-endomethyl-eneindene.

GENTLEMEN: 1. Whereas The pesticides DDT, and related chlorinated hydrocarbons have been used in Canada for approximately 25 years, and

2. Whereas Other less harmful pesticides can now provide effective controls for all major insect pests in Canada and

3. Whereas *DDT* and related pesticides are NERVE POISONS with the capacity to kill all forms of animal life with nervous systems, and

4. Whereas *DDT* as a chemical has a number of characteristics that render its presence in the human environment particularly undesirable, such as:

a) a redisual half life of more than 15 YEARS, which means that it is extremely persistent and does not disappear rapidly from our environment following application, 2, 3, 4

b) *DDT* codistills with water, which means that when water is evaporated to form clouds and subsequently rainfall, *DDT* rises with the water particles and eventually reaches new areas in rain that may never have received direct applications of this poison, 5, 6, 7, 8, 9, 10, 11, 12

c) *DDT*, although extremely insoluble in water, is highly soluble in lipids or fat and therefore tends to move from the non-living elements of our environment to the LIVING ORGANISMS, all of which contain lipids and there to become concentrated and retained over long periods of time, 13, 14, 15, 16, 17, and

5. Whereas *DDT* and related pesticides have conclusively and unarguably been shown to have the following harmful effects on other organisms and wildlife in our environment:

a) more than 150 species of BIRDS are in danger of becoming regionally EXTINCT in North America due to direct mortality caused by *DDT* and other related pesticides, or to having reproductive cycles disturbed by these chemicals either through the upset of calcium metabolism with consequent failure to form normal eggshells, or through the creation of imbalances in sexual hormones, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28

b) in many parts of the world, including Canada, high residues in FISH have been found to cause mortality of fry shortly following hatching, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

c) In Ontario, Lake Trout in Muskoka and Lake Simcoe have been shown by officials of the Ontario Department of Lands and Forests and the Ontario Water Resources Commission to contain residues in excess of 110 parts per million, to be incapable of normal reproduction and to be UNFIT for human consumption by any standards applied by developed nations, 41 and

6. Whereas man's continued existence depends absolutely on the health and well-being of all the organisms that represent the ecosystem in which he lives, and the above findings indicate a serious harmful effect on these organisms and

7. Whereas *DDT*, although usually present in only minute amounts in the WATER systems of Canada, has the property of becoming concentrated in ecological food chains by many millions of times to the point where residues in organisms at the top of the food chains such as lake trout, sea gulls and peregrine falcons, reach dangerous levels of 50–100 parts per million (see above references), and

8. Whereas The average concentration of *DDT* in the fatty tissues of humans in Canada has been shown to be 12 parts per million 46 and

9. Whereas Levels of *DDT* in human milk sometimes exceed those considered safe in dairy products 42, 43 and

10. Whereas *DDT* and related compounds conclusively have been shown to create behavioral upsets, including hypertension and to inhibit learning processes in laboratory animals 44, 45 and

11. Whereas *DDT* has been shown conclusively to cause various kinds of CANCER in laboratory mice, birds and fish 46, 47, 48 and

12. Whereas The amount of *DDT* in human bodies has been positively related to the incidence of cancer, especially of the liver, and to other fatal disorders such as cirrhosis of the liver, 49, 50 and

13. Whereas The above disorders have directly been linked to the household use of *DDT* and other direct contact through application with this poison and

14. Whereas The Government of Ontario on September 24, 1969, announced an almost complete ban on the sale and use of *DDT* in Ontario, effective January 1, 1970, and

15. Whereas The following states governments in the United States and European countries have recently imposed partial or complete bans on further use of *DDT*: Michigan, California, Arizona, Denmark, Sweden, Finland and Hungary and

16. Whereas The following states in the United States, Washington, Massachusetts and Wisconsin, are currently contemplating such bans, and

17. Whereas Notice of motion has been given in both Houses of Congress in the United States to BAN further use of *DDT* on the nationwide scale and

18. Whereas The Canadian Wildlife Service of the Canadian Department of Indian Affairs and Northern Resources officially supports a total ban on further manufacture, sale or use of *DDT* in Canada, and

19. Whereas Both the Ontario Department of Lands and Forests and the Toronto Metro Parks Board have Prohibited the use of *DDT* by their own employees since 1968 and

20. Whereas The commercial use of *DDT* for mosquito and blackfly control in the Muskoka resort area on Ontario has recently been BANNED and

21. Whereas Many citizen groups across Canada such as Pollution Probe are now strongly advocating and supporting an absolute ban on the manufacture, sale or use of *DDT* in Ontario and

22. Whereas The public communications media of radio, television, newspapers and magazines, in Canada mostly, strongly support such a ban and

23. Whereas The Government of Canada has an enlightened and progressive record of legislation to control environmental pollution and

24. Whereas Former Minister of Health of Ontario, Dr. Matthew Dymond, on June 2, 1969, imposed a complete ban on the following pesticides closely related to *DDT*: Aldrin (hexachlorohexahydro-endo, exo-dimenthano-napthalene), Dieldrin (hexa-chloroepoxyoctahydro-endo, exo-dimenthanonapthalene) and Heptachlor (hexachloro-tetrahydro-endomethyl-eneidene):

The Minister of Health and Welfare of Canada and the Minister of Agriculture of Canada are respectfully urged in the strongest terms to use the powers made available to them by the Pest Control Products Act, 1939, with subsequent amendments and Orders-in-Council to impose an absolute ban on the further manufacture, sale or use of *DDT*, Aldrin, Dieldrin, and Heptachlor in Canada, effective January 1, 1970. The pest Control Products Act, 1939, empowers the Minister of Agriculture of Canada to prescribe pest control products that are generally detrimental or seriously injurious to vegetation, domestic animals, or public health when used according to directions (2(d)).

The critical nature of the environmental and human health hazard posed by these chemicals makes this matter of the utmost urgency and not one which can be delayed even a few additional months.

D. A. Chant,
Professor and Chairman, Department of Zoloogy, University of Toronto, on behalf of Pollution Probe at the University of Toronto.

September 25, 1969.

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Relationship Between Pesticides and Nerve Gases [1]

The Organophosphate pesticides are esters of phosphoric acid and were first developed in Germany as war gases. They were introduced into the United States after World War II. All members of this class of compounds are nervous system poisons and some of the insecticides in this class, under certain circumstances, are nearly as toxic to man as the war gases. The scientific literature of about a decade ago discussed the chemical, metabolic and toxic properties of the organic phosphorus insecticides along with those compounds which are called nerve gases. The latter includes those stockpiles of war chemicals which the U.S. Army now plans to dispose of for safety reasons and for other reasons.

The chlorinated hydrocarbon insecticides, on the whole, are not as toxic to man as the organophosphates, but they are more persistent in nature. They also act on the nervous system to produce their toxic or lethal effect. One of these compounds (endosulfan) was reported to be the cause of the recent massive fishkill in the Rhine River. Statements attributed to West German officials and the Dutch Public Health Dept. that the insecticide in question "was not harmful to human life" or "harmless to man" may or may not have been made by such officials. But if they were, they are not true. A single paper by four physicians in Canada, New York, Oregon and California reported 9 cases of convulsions in workers exposed to this insecticide.[2] Most of these workers used or were supposed to use protective clothing, masks, goggles, and rubber gloves.

The toxicity of pesticides to man, as well as other economic poisons, depends on a variety of factors, including the route by which they enter the body, the solvent, the time and level of exposure, the state of the individual's health, and the presence of other insecticides or other poisons. For example, the accidental sheep-kill at the Dugway Proving Ground from an organophosphate nerve gas released during the spring of 1968 is believed by some to have been due to sensitisation from prior exposure to a similar or identical compound or to potentiation from exposure to other toxic compounds of the insecticide class.

HAZARDS RELATED TO—

Chlorinated Hydrocarbons	Organopohosphates
1. The mechanism of action of CH, even on insects, is not known. It is known of course that they kill insects, fish, and birds; and some of the CHs produce convulsions in individuals occupationally exposed.	1. Organophosphates act on the nervous system to depress chclinesterase activity. The blocking of this enzyme prevents the breakdown of the biochemical (acetycholine) which transmits impulses between nerves. The accumulation of this chemical results generally in the continued transmission of nerve impulses and the body's nervous system goes wild. Exposure to these organophosphates can cause nausea, vomiting, muscular fibrillation, convulsions, respiratory paralysis, long-term psychological effects and death depending on the exposure dosage.
2. Known toxicity to certain forms of noninsect life due to occupational or natural concentrations of the chemicals.	2. Acute toxicity generally greater per unit than CH. Produce acute reactions when absorbed into the body via the lungs, skin or digestive system. Organophosphate insecticides are in the same class of compounds as nerve gases, and produce their effects through the same physiological mechanisms.
3. Mobility, so that they do not remain only where applied, but are carried about by currents of air and water.	3. Mobility, so that they do not remain only where applied, but are carried about by currents of air and water.
4. Solubility properties that cause them to be accumulated in organisms. These chemicals thereby enter food chains at various levels and are then passed up the food chain, becoming more concentrated each step of the way.	4. Unknown solubilities and therefore unknown persistance and accumulation in the food chain.
5. Persistence, so that they remain in toxic form for long periods of time and accumulate in soil, air and water.	5. Organophosphates are generally much less persistent than the CHs.

[1] This report was prepared with the assistance of the Library of Congress.
[2] "Convulsions in Thiodan Workers" by Thomas S. Ely et al. *Journal of Occupational Medicine*, February 1967, pp. 35–37.

Summary of Research of Possible Effects of Pesticides on Man

Research on the long-term effects of specific pesticides is virtually impossible; and it is extremely difficult to extrapolate research results from animals to humans. So while there is no direct evidence that low levels of pesticides seriously damage man, neither is there proof that they do not. In fact, there are omnious signs that some long-term threats lie ahead. In the material which follows, only a sampling of the literature has been conducted. Hence, this is not a definitive analysis, but is only indicative of what a more thorough literature review might reveal:

Early studies on DDT, the most widely used chlorinated hydrocarbon, have long indicated the possible toxic effects of this pesticide on animals other than the insect pests for which its use was intended. Telford and Guthrie (1945) (1) showed that in rats, part of the DDT administered is excreted with the milk, and that the milk of such animals may contain enought DDT to cause *toxic symptoms in young and mature animals*. It has also been shown that dairy animals fed fodder which has been treated with DDT produced milk which contains DDT, and that DDT may still be present in the milk as late as 4 months after the feeding of such hay was discontinued.

The chief manifestation of DDT poisoning is its effect on the nervous system. Under the influence of DDT animals become apprehensive, excited, they develop locomotor disturbances, tremors and finally convulsions. (2) Numerous cases of convulsions in workers exposed to other chlorinated hydrocarbons establish the hazard of these compounds to man. (22)

More recent studies into the effects of pesticides have revealed links between pesticides and other chemical compounds with cancer. Early last April the American Cancer Institute reported that preliminary analysis of a large-scale study of 130 compounds (including pesticides,) indicates that they are carcinogenic to mice when administered in very high doses. (3)

Other reports suggest that pesticides are a genetic hazard to man, capable of producing mutations, which are usually harmful. Dr. James F. Crow of the University of Wisconsin says "there is reason to fear that some chemicals (including pesticides) may constitute as important a (mutagenic) risk as radiation, possibly a more serious one." (4)

Dr. Osmy G. Fahmy of the Chester Beatty Research Institute in London says, "The amount of pesticide chemicals man is now absorbing from his environment is enough to double the normal mutation rate." He says they are capable of disrupting the DNA molecule; the effects are cumulative; and the mutations may not show up for generations. (5)

Medical World News has reported that a great many genetic experts are concerned about mutagenic chemicals "as either a proved or at least a potential menace to human health. . . . Most believe that direct evidence of a chemical's deleterious effect on man could be difficult or impossible to obtain—and incalcuable damage could already have been done before it became apparent." (6)

Another important area which is significant in evaluation of public health consideration on the use of pesticides is the interaction of drugs with pesticides and of pesticides with other pesticides:

John P. Frowley cites two types of interaction of pesticides which have been reported in the last ten years. (7)

The first type involves potentiation (additive toxicity) between two organophosphates, and the second type which involves antagonism and potentiation between chlorinated hydrocarbons and organophosphates, (8) between chlorinated hydrocarbons and drugs (9) and between drugs and organic phosphates. (10)

The significance of the first type of additive toxicity is obvious. Tests have shown that a pair of chemical compounds in tandem may be significantly more toxic than either one alone. (11) Since the symptoms of pesticide poisoning are likely to be common to other diseases, diagnosis is difficult.

The second type of synergism and antogonism which is troubling is the effect of pesticides on enzymes and in turn the effect of these enzymes on the metabolism of the same or other chemicals. (12)

Although all these interactions have been demonstrated in experimental animals, evidence (13) has also revealed that at least some of these occur in humans.

As Dr. Richard M. Welch testified in hearings conducted by the Wisconsin Department of Natural Resources, fat residue of DDT of 10 ppm in rats cause a change in the pharmacologic action of phentobarbital, a commonly used drug in man. He indicated that this change in pharmacologic activity is correlated with an increase in the ability of the liver of rats to metabolize phentobarbital. This shortens the duration of action of Phentobarbital because DDT increases the level of the enzyme in the liver responsible for the breakdown of this drug. Dr. Welch stated that if one can extrapolate data from animals to man, then one would say that a change in these enzymes probably do occur in man. (14)

It is obvious from available data that some acutely poisoned animals possess altered sensitivity to drugs and other chemicals after exposure to pesticides. We can only speculate whether low subacute and chronic exposures also significantly alter the activity of important enzymes, thereby increasing their ability to metabolize natural hormones and other steroids as well as drugs. These effects are significant in the light of possibilities of occupational exposure.

Reports from Russia indicate that Soviet workers who are exposed to DDT and other organ-chlorine pesticides have turned up with stomach and liver disturbances. The degree of disturbance seems to increase with exposure. (15)

Human sex organs may be another area imperiled by extensive use of pesticides. Dr. Richard Welch, again in testimony before a Wisconsin hearing, reported on experiments showing that DDT produced marked alteration in the sexual mechanisms of rats. In females, there were increases in the weight of the uterus and in the deposition of dextrose there, and the production of the estrogen hormone was stimulated. (14) Dr. Welch believes that the evidence suggests that similar changes may take place in humans. (14)

In terms of acute toxicity the organophosphorus compounds represent the most serious problem among agricultural workers. (16) Workers who have handled these organophosphates extensively have been studied for brain-wave changes. (17) Men with histories of multiple or severe exposure complain directly and give evidence of being slowed down and less energetic and of having increasing memory difficulties and greater irritability than the minimally exposed groups. (17)

In a recently published annals of the New York Academy of Science the proceedings of a symposium on Biological effects of pesticides in mammalian systems includes several studies on the biochemical and pathological effects of pesticides.

Dr. Ian J. Tinsley has noted that changes in fatty acid metabolism is another manifestation of the increased activity of those enzymes which are stimulated by chemicals such a dieldrin. Observations "would suggest that dieldrin is inhibiting the transformation of 18:2 [Linoleic acid] to its derivative acids." (18)

Harry Hays of the U.S. Department of Agriculture says, in discussing studies on human population of chronic exposure to pesticides and their possible effects on kidney function, that "this is a matter that needs to be watched carefully from the point of view of chronic exposure . . . these effects are extremely important." (19)

Dr. Marvin Legator of the Food and Drug Administration says the widely used and relatively nontoxic fungicide, captan, breaks chromosomes in mammalian cell cultures and may be capable of inducing mutations in man. (20) And Dr. M. J. Verret, also of FDA, says such chemicals can cause birth deformities in chickens. (The chemical structure of some of these fungicides is similar to that of thalidomide, she notes.) (19)

None of these scientists claims to have proved any mass dire effects on man due to pesticides. But they are warning that we not be blind to the potential risks.

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Interpretation of Toxicity

Any compound may be toxic if it is absorbed to an excessive degree. The simplest way of expressing the toxicity of a compound is by means of an LD_{50}-value. Such a value is a statistical estimate of the dosage necessary to kill 50 percent of a very large population of the test species under stated conditions (e.g., single oral dose of aqueous solution).

Caution is necessary in the interpretation of LD_{50}-values.

First, hazards presented by any compound depend more on how it is used than on how toxic it is. In this country, the majority of the fatal and nonfatal accidents caused by solid or liquid substances involve relatively nonpoisonous materials, available to a great number of people and sometimes used with reckless carelessnes. This fact does not reduce the tragedy of needless injury. Also, highly toxic substances do present a relatively greater hazard if used under comparable conditions.

Second, it is known that toxicity may vary with species, age, sex, nutritional state, and formulation of poison, as well as with the route of administration. By necessity, LD_{50}-values are given for animals. They can be applied only with reservation to man.

Third, an LD_{50}-value is a statistic which, in itself, gives no information on the dosage that will be fatal to a very small proportion of a large group of animals. Although values such as the LD_5 or LD_1 may be determined for laboratory animals, they are (for statistical reasons) less precise than the corresponding LD_{50}-value and, therefore, even more difficult to apply to man.

Fourth, LD_{50}-values are usually expressed in terms of single dosages only. Thus, these values give little or no information about the possible cumulative effects of a compound.

In spite of these necessary qualifications, LD_{50}-values are useful in making an objective comparison of the inherent toxicity of different compounds. Some materials are so poisonous that known exposure to a few drops on the skin is reasonable justification for diagnosing consistent illness as poisoning. On the contrary, other compounds are so relatively harmless that a small dose may be ingested without causing any harm. As a very general guide, the probable lethal oral dose for a grown person may be estimated as follows:

Acute oral LD_{50} for any animal (mg./kg.); and probable lethal oral dose of technical material for a human adult: Less than 5, a few drops; 5 to 50, "a pinch" to 1 teaspoonful; 50 to 500, 1 teaspoonful to 2 teaspoonsful; 500 to 5,000, 1 ounce to 1 pint (1 pound); 5,000 to 15,000, 1 pint to 1 quart (2 pounds).

It has been found that occupational poisoning with nonfumigant pesticides shows a very much closer correlation with acute dermal LD_{50}-values than with oral toxicity.

ACUTE ORAL AND DERMAL LD_{50}-VALUES OF ORGANIC PHOSPHORUS INSECTICIDES FOR MALE AND FEMALE WHITE RATS[1]

Compound	Oral LD_{50} (MG./KG.)		Dermal LD_{50} (MG./KG.)	
	Males	Females	Males	Females
Carbophenothion	30	10.0	54	27
Chlorthion	880	980	<4500	4100
Co-Ral	41	15.5	860	
DDVP	80	56	107	75
Delnav	43	23	235	63
Demeton	6.2	2.5	14	8.2
Diazinon	108	76	900	455
Dicapthon	400	330	790	1250
Dimethoate	215		400	
Di-Syston	6.8	2.3	15	6
EPN	36	7.7	230	25
Ethion	65	27	245	62
Fenthion	215	245	330	330
Guthion	13	11	220	220
Malathion	1375	1000	>4444	>4444
Methyl parathion	14	24	67	67
Methyl Trithion	98	120	215	190
NPD			2100	1800
Parathion	13	3.6	21	6.8
Phorate	2.3	1.1	6.2	2.5
Phosdrin	6.1	3.7	4.7	4.2
Phosphamidon	23.5	23.5	143	107
Ronnel	1250	2630		
Schradan	9.1	42	15	44
TEPP	1.05		2.4	
Trichlorofon	630	560	>2000	>2000

[1] With the exception of the dermal LD_{50} for dimethoate, these values were determined by the Toxicology Section under standardized conditions.

ACUTE ORAL AND DERMAL LD_{50} VALUES OF CHLORINATED HYDROCARBON INSECTICIDES FOR MALE AND FEMALE WHITE RATS

Compound	Oral LD_{50} (MG./KG.)		Dermal LD_{50} (MG./KG.)	
	Males	Females	Males	Females
Aldrin	[1] 39	[1] 60	[1] 98	[1] 98
Chlordane	[1] 335	[1] 430	[1] 830	[1] 690
Chlorobenzilate	[1] 1040	1220		
DDA [3]	[1] 740	600		
DDE [3]	[1] 880	[1] 1240		
DDT	[1] 113	118		[1] 2510
Dieldrin	[1] 46	[1] 46	[1] 90	[1] 60
Dilan			[1] 6900	[1] 5900
Endrin	[1] 17.8	[1] 7.5		[1] 15
Heptachlor	100	162	195	250
Isodrin	[1] 15.5	[1] 7.0	[1] 35	[1] 23
Kelthane	[1] 1100	[1] 1000	[1] 1230	[1] 1000
Lindane	88	91	1000	900
Methoxychlor	[2] (6000.0)			[1] >6000
Perthane	[1] >4000	[1] >4000		
TDE (DDD)	[2] (3400)			
Thiodan	43	18	130	74
Toxaphene	[1] 90	[1] 80	1075	780

[1] These values were determined by the toxicology section under standardized conditions.
[2] Sex not specified.
[3] Metabolite of DDT.

DIELDRIN

CHEMICAL NAME

1, 2, 3, 4, 10, 10-hexachloro-67-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-*endo,exo*-5,8-dimethanonaphthalene.

FORMULATIONS

Dieldrin formulations are available as wettable powers (26% to 75%), dust concentrates (25% to 50%), emulsifiable concentrates (18%), solutions (0.5%), impregnated pellets (1% to 15%) and as low percentage dusts (alone or in combination with other insecticides).

USES

Dieldrin has been used extensively since 1952 for the control of a variety of agricultural insects and forest pests, especially in situations where a long-lasting residual effect is advantageous. It also has been used in several foreign countries as a residual house spray for control of disease vectors, but has been registered for limited treatment only of homes in this country to control some household pests. Dieldrin also is of value in the control of several species of mosquitoes, ticks, chiggers, and sand flies.

ROUTES OF ABSORPTION

Dieldrin is absorbed readily through the skin as well as through other portals.

PHARMACOLOGIC ACTION

Dieldrin like many other chlorinated hydrocarbons acts as a stimulant to the central nervous system. Three syndromes (determined largely by the size and number of doses) may be recognized: (1) A few large doses produce increasing stimulation of the central nervous system culminating, if the dosage is sufficiently high, in one or more convulsions. If death does not occur, there is relatively prompt recovery without significant weight loss or other permanent injury. (2) A larger number of moderate-sized doses may produce without warning a condition marked by complete loss of appetite, weight loss, and convulsions. Without treatment, death is apparently inevitable. (3) Many relatively small doses may produce one or a few convulsions with lesser accompanying symptoms that may recur even though exposure is discontined. Types 1 and 3 have been observed repeatedly in man; the occurrence of type 2 in man is unconfirmed, although it is easily produced in animals. Electroencephalograms indicate injury to the brain stem.

DANGEROUS SINGLE DOSE TO MAN

Those persons with the greatest opportunity for exposure to dieldrin may also have contact with related compounds, notably aldrin. The effects of dieldrin and aldrin are similar both quantitatively and qualitatively in animals, and this appears to be true for man also. Persons exposed to oral dosages which exceed 10 mg./kg. frequently become acutely ill. A dosage of about 44 mg./kg. led to convulsions in a child. Symptoms may appear within 20 minutes, and in no instance has a latent period of more than 12 hours been confirmed in connection with a single exposure.

The most thoroughly described related case involved an attempted suicide by ingesting aldrin at an estimated dosage of 25.6 mg./kg. There have been at least two deaths caused by the ingestion of undissolved dieldrin and several caused by drinking emulsions or solutions. The dosage in these cases is unknown.

In animals, the acute dermal toxicity of dieldrin in xylene is roughly 40 times that of DDT. Tests with certain other solvents indicate a factor of only about six. An important difference is that undissolved DDT is not absorbed from the skin but undissolved dieldrin is readily absorbed.

DANGEROUS REPEATED DOSE TO MAN

Little is known quantitatively about the toxicity of repeated doses of dieldrin for man. However, in different countries 2% to 40% of men applying 0.5% to 2.5% suspensions or emulsions at the rate of about 1 g./m^2 have developed poisoning within 2 weeks to 24 months after first exposure. Most of the cases were not complicated by contact with insecticides closely related to dieldrin. Some of the men were exposed to no other insecticide while some were previously exposed to DDT, BHC, or chlordane. However, no relevant disease has been reported following similar exposure to these latter three compounds alone or in combination.

Animals have shown convulsions as much as 120 days following the last dermal dose of dieldrin, indicating that dieldrin or its derivatives and/or residual toxicant-induced injury may persist in the body for a long time once severe poisoning has occured. Entirely similar recurrent illness has been observed repeatedly in man.

The threshold limit values for aldrin and dieldrin in air are each 0.25 mg./M^3.

SIGNS AND SYMPTOMS OF POISONING IN MAN

Early symptoms of acute poisoning include headache, nausea, vomiting, general malaise, and dizziness. With more severe poisoning, clonic and tonic convulsions ensue or they may appear without the premonitory symptoms just mentioned. Coma may or may not follow the convulsions. Hyperexcitability and hyperirritability are common findings. Following repeated exposure some spraymen developed a condition indistinguishable from epilepsy—the number of cases being much greater than could be explained on the basis of idiopathic disease. Seizures recurred in some men even though they were removed from exposure. Poisoning characterized by a combination of convulsions, complete loss of appetite, and severe weight loss has not been confirmed in man but would probably occur under certain conditions of exposure. About 6 hours after ingesting dieldrin, a baby suddenly lost consciousness, became dyspneic and then convulsed. Finally the convulsions were stopped by treatment, but she remained unconscious; the temperature rose to 104° F., cyanosis and tachycardia increased, and the child died 20 hours after exposure.

Aldrin is reported to have caused erythemato-bullous dermatitis in a single case.

PARATHION

CHEMICAL NAME

O,O-diethyl O-(*p*-nitrophenyl) phosphorothioate.

FORMULATIONS

Parathion is currently used as dilute sprays, which are prepared by the operator from 15% to 25% wettable powders or from emulsifiable concentrates of

50% or less. Dusts are used also. They may be purchased ready mixed in concentrations of 5% or less. Technical parathion, which is a deep brown to yellow liquid and approximately 98% pure, may be encountered under industrial conditions and in formulating establishments. Aerosol formulations containing up to 10% parathion may be used in greenhouses. Cords impregnated with parathion for fly control contain about 100 mg. per linear foot.

USES

Parathion finds almost its entire use in agriculture including nurseries, greenhouses, etc. Persons exposed occupationally to parathion may be engaged in synthesizing the compound, formulating and packaging it, applying it, or working among residues. Even those workers whose only contact has been with fresh residues have occasionally been poisoned. This has been noted among such crop workers as thinners, harvesters, and irrigators. Accidental exposure of children to open or even "empty" containers has been a major and dramatic source of fatal poisonings.

Under practical field conditions, agricultural workers may have approximately concurrent exposure to two or more organic phosphorus pesticides. The patient may recall only the most recent use of the most advertised formulation; a careful history is necessary to reveal the facts.

ROUTES OF ABSORPTION

Absorption takes places readily through any portal. Fatal human poisoning has followed ingestion, skin exposure, and also inhalation with varying degrees of skin exposure. The vapor pressure of parathion is so low that respiratory exposure alone is not considered important as a cause of serious poisoning from wet sprays. Respiratory exposure to finely particulate dust is hazardous; complete respiratory protection has reduce illness among formulating plant workers. Aerosol preparations are known to be highly dangerous.

DANGEROUS SINGLE AND REPEATED DOSES TO MAN

Death has followed splashing of the body and clothing of one worker with technical parathion (approximately 95% pure). The amount was sufficiently small that the worker was not soaked or at any rate did not follow the simple instructions for changing clothes and bathing. Several operators have died after rather extensive skin contact with dilute agricultural sprays or dusts. Children 7 to 9 years old were killed by bathing in a tub in a house that had been sprayed several days earlier with 10% parathion intended for ornamental plants in a greenhouse. Other children died after swinging on a parathion contaminated bag suspended by a rope. Both children and adults have been poisoned by parathion applied with the intention of controlling head lice or other lice.

In a number of fatal cases of human poisoning by parathion, the dosage which the victim received orally was known to be exactly 900 mg. In one carefully studied case, the ingestion of 120 mg. led rapidly to death of a man. Children 5 to 6 years old were killed by eating 2 mg. of parathion, a dosage of about 0.1 mg./kg. In instances in which parathion contaminated food eaten by people of different ages, death occurred mainly or exclusively among children.

A daily oral dose of 7.2 mg. produced a 33% fall in whole blood cholinesterase of adult volunteers in 42 days. A dose of 3 mg./day produced no effect. The established threshold limit for parathion in air is 0.1 mg./M^3.

LABORATORY FINDINGS

Under certain circumstances, parathion may be isolated from exhumed bodies as well as fresh necropsy specimens.

HOW POISONOUS ARE PESTICIDES?

L. M. Vasvary and Fred C. Swift
Rutgers, The State University

Before a new insecticide is marketed, careful tests of its toxicity to warm-blooded animals are made to determine the precautions necessary during spraying and dusting operations. Following is a summary of the toxicity of certain insecticides to test animals based on the acute oral LD_{50}'s. Assuming that humans would be affected by the chemical in the same manner as the test animals, the amounts which would kill the average 150-pound man are listed in the third column. Acute oral toxicity refers to the amount of chemical that would need to be eaten at one time to cause death.

Insecticide	Acute oral LD_{50} to rats (mg/kg) of body weight[1]	Probable amount of undiluted chemical needed to be eaten to cause death to 150-pound man
(TEPP)	1.2	
parathion	3	
phorate - Thimet*	3.7	
(mevinphos) - Phosdrin*	7	1/70 to 1/5 teaspoonful
demeton - Systox*	8	
endrin	10	
(azinphosmethyl) - Guthion*	15	
phosphamidon	17	
calcium arsenate	20	
(carbophenothion) - Trithion*	28	1/5 to 1/2 teaspoonful
nicotine	50	
aldrin	67	
toxaphene	69	1/2 to 1 1/2 teaspoonfuls
(dichlorvos) - DDVP* or Vapona*	80	
dieldrin	87	
heptachlor	90	
ethion	96	
endosulfan - Thiodan*	100	1 1/2 to 3 teaspoonfuls
lead arsenate	100	
lindane	125	
(diazinon)	125	

Insecticide	Acute oral LD_{50} to rats (mg/kg) of body weight[1]	Probable amount of undiluted chemical needed to be eaten to cause death to 150-pound man
dimethoate - Cygon*	245	
(DDT)	250	
naled - Dibrom*	430	3 to 9 teaspoonfuls
chlordane	457	
carbaryl - Sevin*	540	
(dicofol) - Kelthane*	809	
none - Genite 923*	1400	
malathion	1500	
ovex	2050	
none - Pentac*	3200	1/4 to 1 cup
dichloro diphenyl dichloroethane - TDE or DDD	3400	
Aramite*	3900	
methoxychlor	6,000	
(chlorbenside) - Mitox*	10,000	1 1/2 to over 3 cups
tetradifon - Tedion*	14,000	

Chemicals can also gain entry to the body by way of inhalation or absorption through the skin. Toxicity by these routes of entry varies with the type of chemical. However, some of the insecticides which are most toxic orally are also highly dangerous if inhaled or spilled on the skin.

Many other factors contribute to the overall toxicity of insecticides. Some are rapidly changed to non-toxic chemicals within the body, whereas others are more resistant to breakdown. The concentration of the mixture ordinarily used for spraying or dusting is also an important consideration.

How are those who use insecticides protected against accidentally poisoning themselves or others? By carefully reading the warnings and precautions on the label. Every container of insecticide must bear a label which provides concise, easily-understood warnings as to the hazards, if any, associated with the use of the product, together with instructions to be followed to insure adequate protection.

Therefore, before you buy or use an insecticide, read the label. If you are unable or unwilling to follow all precautionary statements, buy a safer substitute.

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1 These are the figures commonly encountered in the literature. Generally the test conditions are standarized, but these values are subject to considerable variation with the species, age, and sex of the test animal, and with carrier in which the toxicant is administered.

* Trade Names

FEDERAL INSECTICIDE FUNGICIDE AND RODENTICIDE ACT - CATEGORIES OF TOXICITY

		ROUTE OF ADMINISTRATION			
		LD_{50}			LC_{50}
CATEGORY	SIGNAL WORD ON THE LABEL	ORAL (mg/kg)[1]	Probable Oral Dose for a 150 lb. man	DERMAL (mg/kg)[1] 24 hr. exposure	INHALATION (µg/1)[2]
I (HIGHLY TOXIC)	DANGER - skull and crossbones - POISON	0 to 50	a few drops to a teaspoonful	0 to 200	0 to 2,000
II (MODERATELY TOXIC)	WARNING	over 50 to 500	over one teaspoonful to one ounce	over 200 to 2,000	over 2,000 to 20,000
III (SLIGHTLY TOXIC)	CAUTION	over 500 to 5,000	over one ounce to one pint or one pound	over 2,000 to 20,000	
VI (RELATIVELY NONTOXIC)	none*	over 5,000	over one pint or one pound	over 20,000	

NOTE: *None required based on acute toxicity; however, nature of product and use pattern may require appropriate precautionary statements.

LD_{50} - the dose level which will kill 50% of test animals. Minimum of 14 days observation. Animals fasted for oral studies.

LC_{50} - the air concentration which will kill 50% of test animals exposed for a period of 1 hour. Minimum of 14 days observation. Vapor or gas may be expressed in ppm.

1 Equivalents: 1000 milligrams (mg) = 1 gram (g); 28.3 grams = 1 ounce; 1 kilogram (kg) = 2.2 pounds (lb)

2 Equivalents: 1 liter (l) = 1.06 quarts; 1000 micrograms (µg) = 1 milligram (mg)

WARNING CONCERNING OUT-OF-DATE SOURCES OF PESTICIDE INFORMATION

J. Lincoln Pearson
University of Rhode Island

Accepting information about pesticides from unreliable sources is the surest way to create problems for yourself and others. One mistake can not be overcome by a hundred good recommendations.

It will be sufficient to list common sources of poor information so that you will constantly be on guard against them.

1. Friends mean well but often cannot remember exactly the name of a product, or in fact, they may know very little about the problem or the product.

2. Don't be oversold by personnel in sales or others who recommend pesticides. The best source of information is from specialists who work directly with the class of chemical under consideration.

3. Interested bystanders may often offer suggestions, but if not from an authoritative source the suggestions should be disregarded.

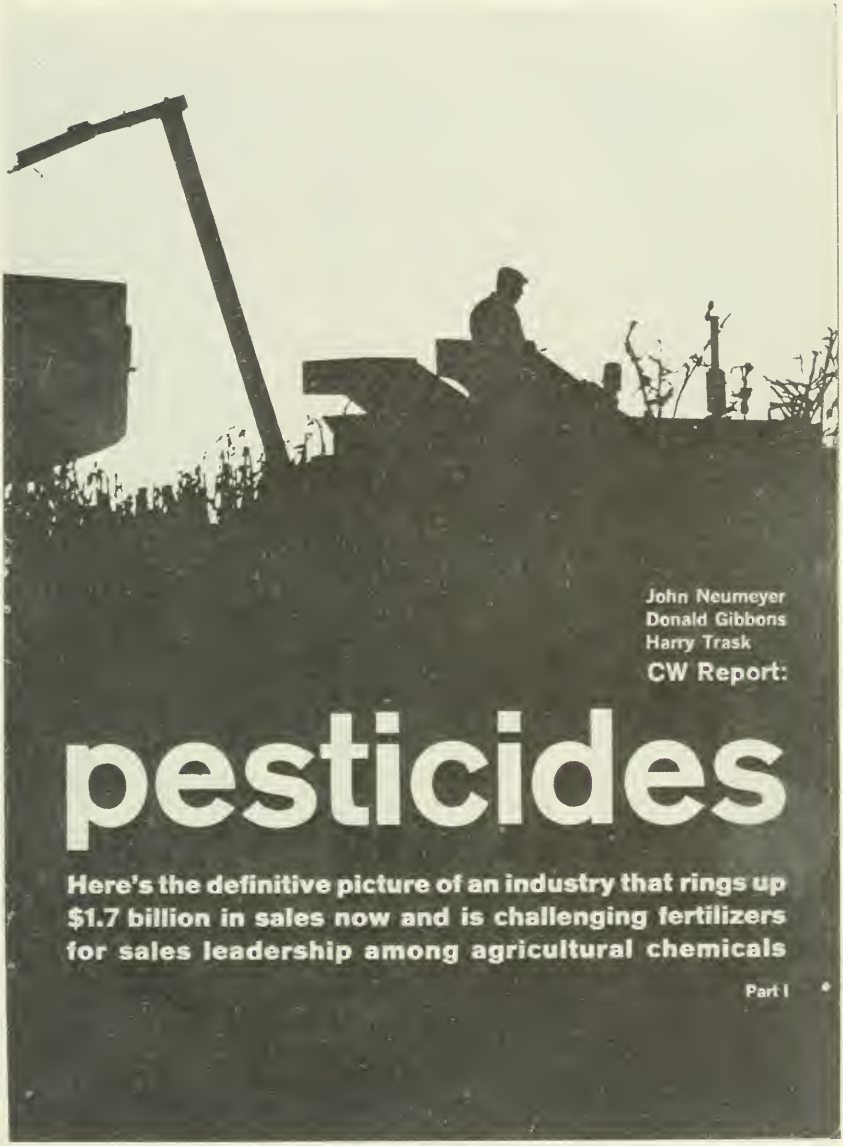
4. Old bulletins, circulars and mimeographed information from state or federal sources should be disregarded. Only recommendations of a current year should be accepted as valid.

5. Sales catalogs may contain incomplete or out-of-date information. Doubtful recommendations should be checked against up-to-date information.

6. Memories should never be trusted. Too many pesticide chemical names sound so nearly alike.

7. Trade names may not be consistent with the actual chemical ingredient.

8. Recommendations from other states may or may not apply in your state. Never accept recommendations on any pesticide without knowledge of the source and the validity of the source.



John Neumeyer
Donald Gibbons
Harry Trask

CW Report:

pesticides

Here's the definitive picture of an industry that rings up $1.7 billion in sales now and is challenging fertilizers for sales leadership among agricultural chemicals

Part I

Sales of pesticides will top $3 billion by '75

Chemical pesticides production has been growing at a 16% /year clip recently, and projections of market growth and price patterns indicate that pesticides will pull ahead of fertilizers in total sales by '75.

Manufacturing value of pesticides production topped $1 billion in '68, sales at consumer prices can only be estimated, but they probably were close to $1.7 billion last year, including exports of about $200 million. Fertilizer sales (on the same basis) now are about $2.7 billion, but pesticides should close that $1-billion gap by the mid-'70s.

By '70, pesticides sales at consumer prices should reach $2 billion, and by '75 they are expected to top $3 billion—or slightly more than projected fertilizer sales at that time. Pesticides sales at manufacturers' price levels should exceed $2 billion in '75 (*see chart on opposite page*).

Farmers' outlays for pesticides have grown at a 15% /year rate since '50, jumping from $87 million to more than $1 billion in '68. At the same time, farm value of crop production has grown only 2%, and the number of harvested acres has decreased from 340,000 to 294,000. In '50 farmers spent 25¢/acre for pesticides (0.5% of the value of farm production); last year they spent $3.65/acre (4.6% of production value). By '75 the figure will be closer to $8-9/acre (*see table on opposite page*).

The reason for the expected continued increase in pesticides use by farmers is a basic one. The most recent estimates place crop losses due to pests at about $11.2 billion/year; an additional $2-billion loss occurs during crop storage.

Crops are grown in an environment in which they must compete with 50,000 species of fungi that cause more than 1,500 plant diseases, with 30,000 species of weeds (more than 1,800 of which cause serious economic losses), with 15,000 species of nematodes (1,500 of which damage important crops), and with more than 10,000 species of pest insects.

Chemical pesticides are the backbone of farmers' efforts to reduce these losses. Manufacturers have spent extensive amounts of time and money to develop new products needed in this battle and have succeeded in getting across their message to farmers. The sales data underscore the farmers' willingness to spend more per acre to win their fight against pests.

About 390 chemicals are used to control weeds, insects, nematodes, rodents and plant diseases. Most of the major products are listed in the tables starting on p. 43. This product list will be completed in the second part of this report, scheduled for the Apr. 26 issue.

Herbicides Hottest: Beyond any question, herbicides have played the biggest role in the pesticides boom—with production value increases in excess of 20% /year.

Until '64 insecticides were the sales leader among unformulated pesticides; but since then herbicides have taken over as the pacesetter and widened their lead (*upper table on p. 41*). Fungicides, on the other hand, have shown relatively little growth in the '60s—most likely because crops that can benefit from fungicides have been heavily treated for some time, leaving less room for additional use.

Formulated pesticides (those that are diluted or otherwise modified before they go to the farmer) are also chalking up sales gains, although not as fast as unformulated products. Still, sales of agricultural and commercial formulations amounted to $673 million in '66 and an estimated $880 million in '68 (*lower table on p. 41*).

Sales of household pesticides probably will grow at a rate of only 5-6% /year through '75. But since they are such a small part of the total formulated pesticides market, this lower rate of increase will not appreciably influence the over-all trend—which is likely to result in 14% /year growth for formulations.

Proprietaries Do Better: Many of the organic pesticides now marketed are protected by patents, but not all. And those that are patented sell better. Sales of nonproprietary products have increased at a rate of only 11% /year in recent years—well below the industry average of 16% /year.

One reason for the slowdown: when patents expire or otherwise become invalid and products enter the commodity category, prices drop, thus cutting revenues. Also, manufacturers faced with the loss of a proprietary position usually turn their attention toward developing replacements.

Significantly, some of the main nonaromatic chlorinated hydrocarbon pesticides (such as Chlordane) and some of the organophosphates (such as malathion) shortly will lose their proprietary status.

Rapid Product Shifts: In recent years there have been dramatic changes in the types of pesticides used by farmers and in the degree of saturation (percentage of total acres treated) for major croplands.

According to a U.S. Dept. of Agriculture survey of consumption in '64 (the most recent year for which complete figures are available), U.S. farmers used about 458 million lbs. of technical pesticide chemicals. Fungicides accounted for 170 million lbs. (85% inorganic); insecticides, 156 million lbs. (5% inorganic); the remainder consisted of rodenticides, fumigants and defoliants.

Among the herbicides, 2,4-D accounted for 40% of the organics, and 15% consisted of the triazines (principally Geigy's atrazine and Simazine). These two types accounted for about 70% of the crop acreage treated with herbicides.

Insecticide use in '64 was heavily oriented toward the chlorinated hydrocarbons, which made up 65% of the total used; phosphates added 22%. Carbaryl (Union Carbide's Sevin) accounted for about 11%, a good deal less than industry marketers had thought. Cotton was by far the largest insecticide application.

In '64 sulfur made up more than 80% of all fungicides used. Other inorganics, including copper and zinc compounds, added about 5%. Among the organics, the dithiocarbamates accounted for about 8% of the total fungicides, and captan, dichlone and dodine were the other major products.

D-D was the leader among fumigants, which made up half of the miscellaneous category. Defoliants and desiccants (mostly inorganics) were second

About the authors: John Neumeyer, Donald Gibbons and Harry Trask are members of the staff of Arthur D. Little, Inc. They specialize in research and development, marketing and economic studies of bioregulant agricultural and pharmaceutical chemicals.

in importance in this group, while miticides made up less than 10%.

Many Changes: Thanks to good communication between producers and farmers, plus well-developed distribution systems, changes in the industry's product mix have been swift, as illustrated by some estimates of the '68 picture.

In the corn market, triazines have taken over first place from the phenoxies (such as 2,4-D and MCP) in dollar sales. In terms of treated acres, however, the phenoxies probably are still slightly ahead.

Trifluralin (Elanco's Treflan), which was relatively unknown in '64, accounted for at least half of the treated cotton acreage and 20% of the soybean acreage last year.

Third most important in '68 was the benzoic acid group, including Amiben and dicamba (Velsicol's Banvel B), which were used on at least 6 million acres of soybeans and 5 million acres of small grains in addition to other minor applications.

The phenoxies also have shown substantial growth in production in recent years. And while much of the additional output was scheduled for use in southeast Asia, there have been additional domestic applications, particularly for brush control.

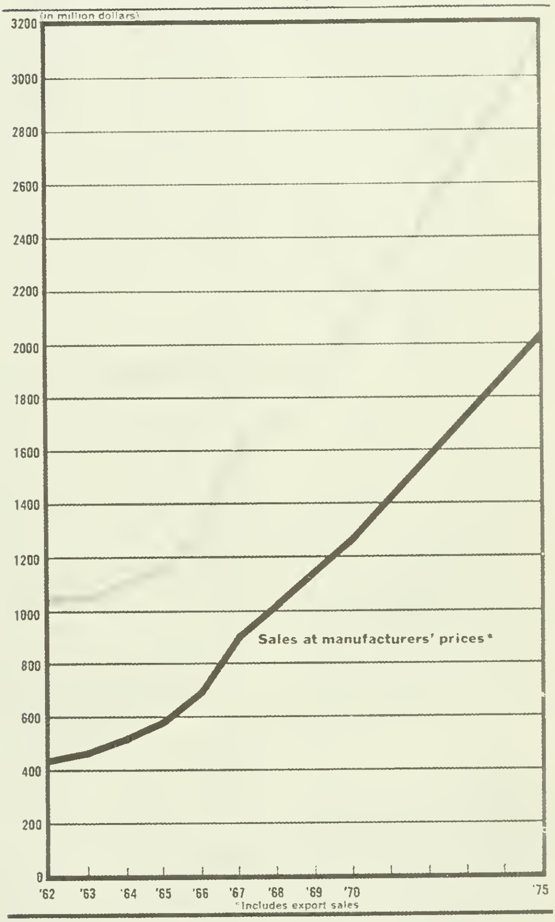
Upper Limits? One guide to potential growth of markets for agricultural pesticides is the percentage of total acres now being treated.

The corn herbicide market, for example, may be reaching the saturation point. About 75% of the acreage was treated in '68, and many authorities doubt that more than 85% will ever be treated—although there may be room for some increase in the amount farmers spend for the acres that are treated.

Soybeans, on the other hand, are much more promising as a market: only 55% of the acreage was treated in '68. In addition, soybean yields have been increased significantly by better fertilization and management practices, so farmers may be willing to pay much more than the $3-4/acre they now spend for herbicides.

The cotton herbicide market seems to be saturated in terms of acres treated (80% in '68) and cost per acre ($8 and more for pre-emergence-type trifluralin). With cotton acreage decreasing and cotton prices declining, it seems unlikely that herbicides will

Pesticides sales will top $3 billion by '75



Sales to farmers have tripled since '60

	'55	'60	'64	'68
Farmers' pesticide purchases (millions)	$184	$292	$500	$1,065
Harvested acreage (million acres)	335	319	292	294
Purchases/acre	$0.55	$0.91	$1.70	$3.65
Purchases vs. farm production value	1.0%	1.5%	2.3%	4.6%

Sources: U.S. Dept. of Agriculture; Arthur D. Little, Inc.

be able to break the 90% treatment barrier.

The dramatic increase in herbicides use in recent years shows up in the gains in treated acreage for major crops. In '68, 80% of all cotton acreage was treated; in '58, only 7%. Corn acreage has jumped from 11% to 75% since '52. Soybeans, now 55% treated, received little or no herbicides as late as '58.

Insecticides Slower: The percentage of acreage treated with insecticides and fungicides, on the other hand, has remained fairly constant in recent years, with the exception of treatment of corn, which jumped from 10% in '64 to 50% in '68, as farmers paid more attention to control of soil insects. Latest percentages for some other major crops: potatoes, 90%; tobacco, fruit and nuts, 80%; other vegetables, 65%; cotton, 65%; soybeans, 10%.

Only in the field crops (corn, soybeans, and possibly hay and pasture) is there room for substantial growth in the use of insecticides and fungicides. While only a small portion of hay and pasture land is now treated, producers are talking of increased treatment of alfalfa for alfalfa weevil control as a promising growth area.

Hard Core: Several thousand products have been cleared and registered for pesticide use in the U.S., but many are a mixture of two or more chemicals or different formulations of the same basic chemical. Actually, there are fewer than 400 important basic ingredients, most of which are detailed in the product list starting on p. 43.

Of these basic ingredients, 32 account for an estimated $500 million in sales at the basic manufacturers' level —about 55% of total '68 sales of unformulated pesticides (*see table on p. 67*).

All of the "glamor" products are herbicides. Atrazine is the sales leader now ($50 million/year at manufacturers' prices), but it may not hold top spot much longer. Trifluralin, a pre-emergence type used for cotton, soybeans and other crops, is challenging for the lead; sales projections indicate it will pass atrazine in about five years.

These two leaders, in turn, are being pressed by two other pre-emergence herbicides, amiben and nitralin (Shell's Planavin).

Some Declines: Only a few of the major pesticides are likely to show sales declines. One is DDT, which is under fire because of its persistence in soil and water and because DDT residues have been found to accumulate in animal tissues (*CW, Mar. 15, p. 27*). Nevertheless, DDT production was increased significantly in '68 to meet large export demands for use in malaria-mosquito control.

Chlordane and heptachlor for pest control should continue to grow rapidly, but heptachlor for crops may decline because of its persistence and residues. (Persistence is an advantage for commercial pest control, but a drawback in crop use because of the long-term effects on all soil life in addition to pests.)

Newer, more-specific products will compete with the other chlorinated hydrocarbons (including aldrin and endrin), and there should be little growth in the latter group for crop applications.

One of the old standbys, 2,4,5-T, appears to be taking on new life because of increased use in brush control, particularly along rights-of-way. Power companies, railroads, highway departments and others have found that control with 2,4,5-T and some of the newer herbicides is substantially cheaper than hand tillage.

Products Compete: Many of the pesticide best-sellers are structurally similar, and there is sharp competition between producers whose products are designed for the same use on certain crops.

Case in point: pre-emergence herbicides for soybeans. About $80 million was spent for this application last year. Amiben accounted for an estimated one-third of that total, closely followed by trifluralin with about one-quarter. Monsanto's CDAA (Randox) and propachlor (Ramrod) followed with 10-15%. Monsanto could boost its share of this market if it is successful in introducing Lasso.

Even where competition is not now intense, some new products could change the picture. For example, among corn herbicides, atrazine is the runaway leader. But there have been reports that continued annual use of atrazine, which is quite persistent, can interfere with other crops that follow corn in a program of crop rotation. Thus, a new herbicide with comparable effectiveness but a different chemical structure could be introduced successfully. Geigy is trying to do so with a new herbicide, Primazine (a combination of Ametryne and Prometryne), developed specifically for control of a variety of weeds in corn grown in rotation programs.

In the cotton herbicide market, trifluralin commands about half the total, but competition from nitralin is strong. Older products, such as diuron and monuron (Du Pont's Karmex and Telvar), have dropped back after accounting for 50% of the acreage treated as recently as '64.

There is also strong product competition among insecticides. Since many of the leading compounds are broad-spectrum insecticides, purchasing decisions usually hinge on farmers' evaluation of cost-effectiveness ratios. The degree of acute toxicity and the buildup of resistance by insects also enter into the choice.

In the future, there will be competition between insecticides applied to the foliage and those applied to the soil and designed for systemic use. The latter method appears to be ideal for protecting the plants, since the product can be applied at planting time, giving protection under any weather condition. So far the promise of systemic insecticides that will control harmful insects has not been fully realized; but the picture may well change in the next few years.

Shifts in Distribution: In recent years there have been substantial changes in the traditional channels of pesticides distribution. The big trend has been toward more direct paths from producers to ultimate markets. This gives producers a better feel for the market and more control over product sales while also trimming distribution costs—all essential elements in this highly competitive industry.

Formulators are steadily being taken over by the technical chemical producers. Wholesalers and distributors are losing out because of their lack of initiative and adaptability to changing markets. Instead, manufacturers are setting up branch offices and warehouses that support independent dealers with sales, inventory and technical service. Frequently producers sell directly to users—especially large farms.

Cooperatives sell large quantities of established products, generally under considerable price concessions, but they are not of much help generally in introducing and developing new markets for new products.

Many companies, particularly those

Leading pesticide producers and addresses

Company	Abbreviation	Address
Alco Chemical	Alco	19220 Pioneer Blvd., Artesia, Calif. 90600
Allied Chemical	Allied	40 Rector St., New York 10006
Amdal Division, Abbott Laboratories	Amdal	Abbott Park, North Chicago, Ill. 60064
American Potash & Chemical	Amer. Potash	3000 West 6th St., Los Angeles 90054
American Smelting and Refining	Asarco	120 Broadway New York 10005
Ansul	Ansul	1 Stanton St., Marinette, Wis. 54143
Atomic Basic Chemical	Atomic	P.O. Box 146, Eighty Four, Pa. 15330
BASF Colors & Chemicals	BASF	866 Third Ave., New York 10022
Farbenfabriken Bayer*	Bayer	P.O. Box 4913, Kansas City, Mo. 64120
Calumet Division, Calumet & Hecla	Calumet	1 Calumet Ave., Calumet, Mich. 49913
Celanese Chemical	Celanese	245 Park Ave., New York 10017
Chemagro	Chemagro	P.O. Box 4913, Kansas City, Mo. 64120
Chemical Formulators	Chem. Form.	P.O. Box 26, Nitro, W. Va. 25143
Chemical Insecticide	Chem. Ins.	30 Whitman Ave., Edison, N.J. 08817
Chevron Chemical	Chevron	200 Bush St., San Francisco 94120
Chipman Division, Rhodie Inc.	Chipman	120 Jersey Ave., New Brunswick, N.J. 08903
Ciba Agrochemical Division, Ciba	Ciba	556 Morris Ave., Summit, N.J. 07901
W. A. Cleary	Cleary	P.O. Box 749, New Brunswick, N.J. 08903
Commercial Solvents	Comm. Solv	245 Park Ave., New York 10017
Diamond Shamrock Chemical	Diamond	300 Union Commerce Bldg., Cleveland 44115
Dow Chemical	Dow	Midland, Mich. 48640
Du Pont	Du Pont	Wilmington, Del. 19898
Eastern Chemical	Eastern	Industrial Road, Pequannock, N.J. 07440
Elanco Products Division, Eli Lilly	Elanco	2801 North Meridian St., Indianapolis, Ind. 46206
Fisher Gamma Chemicals	Fisher	90 Park Ave., New York 10016
Fisons	Fisons	51 Eames St., Wilmington, Mass. 01887
FMC, Niagara Chemical Division	FMC	100 Niagara St., Middleport, N.Y. 14105
Geigy Chemical	Geigy	Ardsley, N.Y. 10502
Glenn Chemical	Glenn	2735 North Ashland Ave., Chicago 60614
W. R. Grace	Grace	3 Hanover Sq., New York 10004
Great Lakes Chemical	Great Lakes	P.O. Box 2200, W. Lafayette, Ind. 47906
Guard Chemical	Guard	North Water St., Ossining, N.Y. 10562
Gulf Oil	Gulf	P.O. Box 8200, Kansas City, Mo. 54105
Harshaw Chemical Division, Kewanee Oil	Harshaw	1945 East 97th St., Cleveland 44106
Hercules	Hercules	910 Market St., Wilmington, Del. 19899
Hollywood Termite Control	Hollywood	2221 Poplar Blvd., Alhambra, Calif. 91801
Hooker Farm Chemicals	Hooker	277 Park Ave., New York 10017
Humble Oil & Refining	Humble	P.O. Box 2180, Houston 77001
International Minerals & Chemical	IMC	P.O. Bin 8, Wasco, Calif. 93280
Jefferson Chemical	Jefferson	P.O. Box 4128, Austin, Tex. 78751
Johnson & Johnson	J & J	501 George St., New Brunswick, N.J. 08903
Koppers	Koppers	1501 Koppers Bldg., Pittsburgh 15219
Lebanon Chemical	Lebanon	P.O. Box 180, Lebanon, Pa. 17042
Los Angeles Chemical	L.A. Chem.	4545 Ardine St., South Gate, Calif. 90280
Mallinckrodt Chemical Works	Mallinckrodt	3600 North 2nd St., St. Louis 63160
May & Baker Ltd.	May & Baker	Dagenham, Essex, England
McLaughlin Gormley King	MGK	1715 Southeast 5th St., Minneapolis 55414
Merck & Co.	Merck	Rahway, N.J. 07065
Michigan Chemical	Michigan	2 North Riverside Plaza, Chicago 60606
Miller Chemical & Fertilizer	Miller	3006 West Cold Spring Lane, Baltimore 21215
Millmaster Chemical	Millmaster	99 Park Ave., New York 10016
Mobil Chemical	Mobil	401 East Main St., Richmond, Va. 23208
Monsanto	Monsanto	800 North Lindbergh Blvd., St. Louis 63166
Montrose Chemical Division, Baldwin-Montrose Chemical	Montrose	100 Liester Ave., Newark, N.J. 07105
Morton Chemical	Morton	110 North Wacker Dr., Chicago 60606
Motomco	Motomco	89 Terminal Ave., Clark, N.J. 07066
Murphy Chemical	Murphy	Wheathempstead St., St. Albins, Hertsfordshire, England
Nease Chemical	Nease	P.O. Box 221, State College, Pa. 16801
Niklor Chemical	Niklor	17102 South Broadway, Gardena, Calif. 90247
Olin Mathieson Chemical	Olin	P.O. Box 991, Little Rock, Ark. 72203
S. B. Penick Division, Corn Products Co.	Penick	100 Church St., New York 10007
Pennsalt Chemicals	Pennsalt	2901 Taylor Way, Tacoma, Wash. 94801
Pest Control Chemicals	Pest Control	5852 Western Ave., Los Angeles 90047
Chas. Pfizer	Pfizer	116 Commerce St., Fort Worth, Tex. 76102
Phelps Dodge Refining	Phelps Dodge	300 Park Ave., New York 10022
Plant Protection, Ltd.	Plant Prot.	Fernhurst, Haslemere, Surrey, England
PPG Industries	PPG	1 Gateway Ctr., Pittsburgh 15222
Prentiss Drug & Chemical	Prentiss	101 West 31st St., New York 10001
Reichhold Chemicals	Reichhold	RCI Bldg., White Plains, N.Y. 10602
Reilly Tar & Chemical	Reilly	11 South Meridian St., Indianapolis, Ind. 46204
Riverdale Chemical	Riverdale	220 East 17th St., Chicago Hts., Ill. 60411
Roberts Chemicals	Roberts	P.O. Box 546, Nitro, W. Va. 24143
Rohm and Haas	Rohm & Haas	Independence Mall West, Philadelphia 19105
Rorer-Amchem	Amchem	Fort Washington, Pa. 19034
Shell Chemical	Shell	110 West 51st St., New York 10020
Sherwin-Williams	Sherwin-Wms.	11541 South Champlain Ave., Chicago 60628
Stauffer Chemical	Stauffer	299 Park Ave., New York 10017
Sumitomo Chemical	Sumitomo	15, 5 Chome Kitahama Higashi-ku, Osaka, Japan
Tennessee Corp.	Tenneco	55 Marietta St., N.W., Atlanta, Ga. 30301
Thompson-Hayward Chemical	Thompson-Hayward	P.O. Box 2383, Kansas City, Kan. 66110
Tuco Products Division, Upjohn	Tuco	7171 Portage Rd., Kalamazoo, Mich. 49001
Tull Chemical	Tull	130 Burton St., Oxford, Ala. 36203
Union Carbide Corp.	Carbide	270 Park Ave., New York 10017
Uniroyal Chemical Division, Uniroyal	Uniroyal	Elm St., Naugatuck, Conn. 06771
United Chemical	United	P.O. Box 51506, New Orleans, La. 70150
U.S. Borax & Chemical	U.S. Borax	3075 Wilshire Blvd., Los Angeles 90005
R. T. Vanderbilt	Vanderbilt	230 Park Ave., New York 10017
Velsicol Chemical	Velsicol	341 East Ohio St., Chicago 60611
Vineland Chemical	Vineland	P.O. Box 745, Vineland, N.J. 08360
Vulcan Materials	Vulcan	P.O. Box 545 Wichita, Kan. 67201
Winthrop Laboratories	Winthrop	90 Park Ave., New York 10016
Wisconsin Alumni Research Foundation	WARF	506 Walnut St., Madison, Wis. 53705
Witco Chemical	Witco	277 Park Ave., New York 10017
Wood Ridge Chemical	Wood Ridge	Park Place East, Wood Ridge, N.J. 07075
Wyandotte Chemicals	Wyandotte	Wyandotte, Mich. 48192

*Bayer products are distributed in the U.S. by its subsidiary, Chemagro Corp.

also in the fertilizer business, have gone a step further and acquired their own dealerships, staffing them with salaried personnel. Most producer-owned retail outlets are concerned primarily with fertilizer sales, carrying pesticides and other agricultural chemicals to cover overhead and to help flatten out seasonal sales cycles.

Results to date with such outlets for pesticides have not been outstanding. Good people are hard to find and keep, and salaried proprietors have less incentive to work long hours than independent dealers. Furthermore, there are substantial differences between selling fertilizers (tonnage products with well established technology and little innovation) and selling pesticides (high-unit-value products with high technical content, which face stiff competition from newer, more effective specialties).

There are strong indications that the increased profits producers realize by selling directly through independent dealers are often more than offset by the higher overhead involved, which is spread out over fewer products than with proprietor-owned retail outlets.

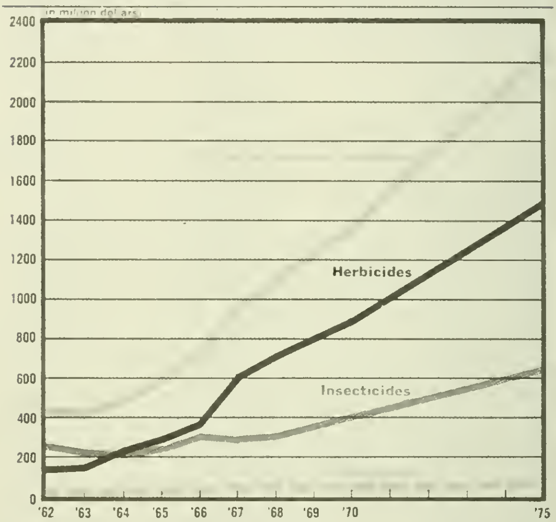
Emerging Pattern: As companies continue to seek the most effective way of introducing new products, while maintaining the sales and prices of established products and preserving over-all profits, it seems likely that a new pattern of distribution will emerge.

Basic producers will complete integration of the formulation function. They will also own more of their own distributors through regional branch offices and warehouses and handle retail sales through independents, giving these dealers and the farmers technical support needed to assure proper use and results of their proprietary materials in selected target markets.

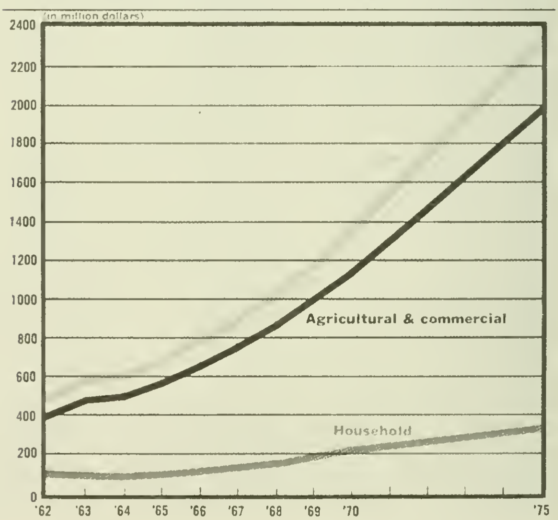
As farms continue to consolidate and grow larger, there will be some further modifications. The biggest farms will buy directly from producers and get dealer prices; but the vast

(Text continued on p. 67)

Herbicides pace unformulated pesticides boom*



Formulated pesticides sales are surging**



majority of pesticides still will move through retailers. Cooperatives will continue to move large volumes of established products, particularly those whose patents have expired and whose prices have dropped.

With farmers eager to reduce their costs and increase their yields through pesticides use, the key to successful introduction of new materials will hinge on the soundness and flexibility of producers' marketing systems.

Exports on the Rise: The value of pesticides exported from the U.S. has increased steadily through the '60s at a rate of about 10% year. In '68, value of exports (at consumer levels) reached $224 million, up from $106 million in '60. If this rate of increase continues, as seems likely, total exports will hit $420 million by '75.

Formulated and unformulated insecticides are the biggest export sellers; and while herbicides exports will show the greatest percentage increase through '75, insecticides will still hold the top spot by a comfortable margin.

Insecticides exports in '68 amounted to $125 million, or about 56%. Totals for other categories: herbicides, $62 million (28%); fungicides, $19 million (8%) and other product types, $18 million (8%). By '75, insecticides exports will reach $225 million (54% of the total); herbicides, $140 million (33%); fungicides, $30 million (7%); all others, $25 million (6%).

Canada is the leading importer of U.S. pesticides. In '67, latest year for which totals are available, Canada imported more than $20 million worth, about half of which was herbicides. The United Arab Republic and Japan were next in line with about $11 million each.

World pesticides use for '68 is estimated at about $2.7 billion at consumer price levels, of which the U.S. accounts for about $1.7 billion. That leaves about $1 billion for the rest of the world, which means that U.S. exports accounted for 20% of the consumption overseas.

There is substantial room for growth in pesticides exports. Europe takes about 25% of the U.S. export total, but it could use more. A farmer in Europe spends less than half as much for pesticides as U.S. farmers do, based on farm value of crop production.

Growing in Europe: Although the extent of pesticides use on European farms is far below that of U.S. farms, there has been a rapid upswing in the use of pesticides by farmers on the Continent. Originally, they were primarily interested in fungicides and insecticides to cut down crop losses.

More recently, as a growing number of farm laborers have gone into industry, European farmers have developed an interest in herbicides to help maintain and increase levels of farm production. Nevertheless, the emphasis in Western Europe is still on increasing production per unit area and not, as in the U.S., on greater production per farm worker.

Pesticides sales at manufacturers' price levels reached about $330 million in Western Europe in '65, the latest year for which complete figures are available. By '75, estimates are that the total will top $600 million. Fungicides were the biggest sellers in '65, with about 36% of the total. Herbicides were next with 33%, followed

32 products dominate pesticides sales

Products and annual sales	Projected annual sales growth through '75	Type and main use
$25 million and over		
Atrazine	5-10%	Pre-emergence corn herbicide
Treflan	15-20%	Pre-emergence cotton and soybean herbicide
Sevin	5-10%	Broad-spectrum insecticide
Amiben and related products	15-20%	Pre-emergence soybean herbicide
Malathion	10-15%	Broad-spectrum insecticide
2,4-D	5-10%	Postemergence corn, wheat herbicide
$10-25 million		
Aldrin	0-5%	Corn soil insecticide
Ramrod, Randox and related products	10-15%	Pre-emergence corn, rice herbicide
Diazinon	5-10%	Corn soil insecticide
Toxaphene	0-5%	Cotton foilage insecticide
DDT	Decline	Cotton foilage insecticide
Methyl parathion	0-5%	Cotton foilage insecticide
Parathion	Decline	Broad-spectrum insecticide
Guthion	10-15%	Broad-spectrum insecticide — cotton & fruit
Planavin	20% +	Pre-emergence cotton, soybeans herbicide
Endrin	0-5%	Cotton foliage insecticide
Dithiocarbamates	0-5%	Potato, tomato foliage insecticide
Captan	5-10%	Apple foliage insecticide
Chlordane	10-15%	Insecticide used by pest control operators
Heptachlor	Decline	Cotton insecticide
$5-10 million		
2,4,5-T	10-15%	Brush control, pasture herbicide
Tordon	15-20%	Brush control, right-of-way herbicide
Methyl bromide	Decline	Tobacco soil insect fumigant
Knoxweed (EPTC, 2,4-D)	10-15%	Pre-emergence corn herbicide
Disyston	10-15%	Cotton, potato soil insecticide
Thimet	10-15%	Cotton, corn soil insecticide
Pentachlorophenol	0-5%	Wood preservative fungicide
Methyoxychlor	5-10%	Cattle insecticide
Kelthane	0-5%	Fruit, vegetable foliage insecticide
Bux-Ten	15-20%	Corn soil insecticide
Cyprex	10-15%	Apple foliage fungicide
Paraquat	0-5%	Cotton, potato defoliant
Banvel	15-20%	Postemergence small grains herbicide

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by insecticides at 26% and other products (including harvesting aids and rodenticides) at 5%.

Different Patterns: This heavy emphasis on fungicides differs from the pattern in pesticides use by U.S. farmers. The relatively cool, damp climate of Western Europe and the importance of potatoes and vineyards in European agriculture account for the importance of fungicides.

Copper fungicides are still used to a much greater degree in Europe than they are in the U.S., but the more common fungicides, such as the thiocarbamates, captan, and the tin-based fungicides, are taking over much of the European market from copper products.

In Europe, as in the U.S., herbicides are the fastest-growing class of pesticides. They now rank second to fungicides, and they are expected to increase their present 33% of the total market to 42% by '75.

Herbicides play an important role in the agriculture of the Northern European countries. The long summer days and moist soil conditions make weeds a major problem. And with farm labor costs higher than average in Northern Europe, farmers are finding it more economical to turn to herbicides instead of hand labor in removing weeds.

In Southern Europe, the situation is much different. Rainfall is lower and labor is cheaper. As a result, insecticides sales are strong and herbicides sales relatively light. Nevertheless, it is expected that much of the predicted 9-10% increase in herbicides use in Western Europe will take place in Central and Southern Europe. As far as products go, MCPA has played a much bigger role in European agriculture than 2,4-D.

Distribution Differs: The marketing of agricultural chemicals in Western Europe is in less of a state of transition than in the U.S. The methods and efficiency of pesticides distribution vary from country to country in Western Europe, but there are some common patterns.

The usual path is from manufacturer to formulator to one or more middlemen and then to the farmer. In some countries such as Spain, the number of middlemen is excessive; in others, particularly Great Britain, a number of agricultural merchants acting as wholesaler-dealers effectively reach and serve the farmer.

Price structures are relatively stable in the majority of European countries, although there has been some erosion in the prices of the traditional MCPA and the chlorinated hydrocarbon insecticides.

For the most part, the special, patent-protected products play a significant role, as they do in the U.S. And the list of new products coming from European research laboratories is as least as impressive as that of U.S. producers. Among the more important new European pesticides are phosphate insecticides, dipyridyls, and tin fungicides.

Government regulation of pesticides in Western Europe is in many cases more strict than it is in the U.S. Tolerances are often lower by a factor of 2-5; but they are evaluated on the consumed foodstuffs involved, not on the raw agricultural products, as they are in the U.S.

U.S. Restrictions: In the U.S., chemical pesticides are regulated at both the state and federal levels. State laws generally are more concerned with purity of product, while federal laws control label registration and establish residue levels deemed to be safe. (The whole subject of federal pesticides regulations will be presented in detail in Part II of this report.)

There has been a significant increase in government regulatory activity since the Congressional hearings on pesticides in '64-'65 and federal agencies have improved coordination of their efforts. Getting a new product cleared for use now is more difficult and is likely to become tougher.

Producers may be required to test a product over a wide area under practical operating conditions before a label is granted. As the government has required new pesticides to be less persistent, producers have been required to submit more data on metabolites and breakdown products. Getting such information puts an extra burden on the manufacturer and increases his costs, although it does not necessarily delay the preparation of a new chemical for marketing. Eventually persistent pesticides will be phased out of use on food crops, but not until replacements with comparable cost-effectiveness are found.

John Neumeyer
Donald Gibbons
Harry Trask

CW Report:

pesticides

The second part of this in-depth CW study pinpoints new trends in products, outlines what's ahead in research and development, examines the role of government regulations

Part II Including 22 more pages of product data and a complete cross-index

Competition is hot in race for new, better

In addition to a keen understanding of the needs of the marketplace, success in the highly competitive pesticides industry requires heavy outlays for research and development.

If, for example, a company wants to introduce at least one new product per year, it must spend $3-6 million a year for R&D. Each year the industry puts an estimated $60 million into this effort.

Researchers synthesize many thousands of compounds and examine them for biological activity; most of them are rejected. The estimates in the table below show how costs mount up along the tenuous road to commercial production of a successful new pesticide.

Studying Basics: While the main line of R&D in the pesticides industry is still at least partly empirical, basic research is likely to provide some shortcuts in the next few years. Studies by companies, universities and government agencies are providing a greater understanding of the comparative chemistry of insects and mammals, crop plants and weeds. This work is likely to yield new products that will interfere with processes that are vital to one species but not another.

Such research into selective insecticides led to the development of specific organophosphates and carbamates, which affect biological reactions and processes that are common in insects and rare in mammals.

Synthetic juvenile hormone also has shown promise. Natural juvenile hormone regulates insects' maturation. Applying synthetic hormone to insect eggs upsets normal development, produces adults that cannot reproduce.

The recent development of *Cecropia* juvenile hormone has made this selective method of insect control a commercial possibility. Now, Zoecon Corp., a new Syntex subsidiary, will direct its efforts to bringing out new synthetic hormone products.

Promising research also has been done with chemicals produced by an organism to influence the behavior of others of the same species—e.g., sex attractants produced by virgin females to lure males. Response to these attractants is usually specific, the ultimate in selectivity.

There has been intense study on such attractants, especially by the U.S. Dept. of Agriculture; results with the cabbage looper and pink bollworm have been especially encouraging.

Biological Controls: Because of continuing government concern about damaging side effects of chemical pesticides, there has been increased interest in developing biological methods of controlling pest damage. So far, however, these methods have not produced controls that are as effective as chemicals.

Biological controls, like any other control procedure, have advantages and disadvantages; but the advantages, few as they are at present, have not been generally accepted by farmers.

There have been successful field tests with various types of microbial agents for pest control, including bacteria, viruses, fungi and nematodes. Ladybugs also have shown good potential as insect controllers.

The best known commercially used microbial agent is *Bacillus thuringiensis*. While it's far from being a smashing success, it has set the stage for control of many lepidopterous pests. Also, the control of Japanese beetles with bacteria-caused milky disease has paved the way for development of similar methods.

Biological methods also can be used in conjunction with chemical pesticides. For example, releasing laboratory-reared sterilized male insects in areas where insect population has been reduced by chemicals has been successful in eradication of pests such as the screwworm in the Southeast.

Despite these successes, it is unlikely that biological controls will replace chemical controls in the foreseeable future. The major emphasis in pesticide producers' research efforts for many years to come will be directed toward development of less persistent, less hazardous and more specific pesticides.

Increasing the efficiency of pesticides application is another area due for greater research activity. Most of today's systems of applying materials are wasteful—in many cases 50-75% of the pesticide that is sprayed doesn't hit the target.

Among the problems are wind drift of light particles and evaporation of droplets of materials in volatile bases. Researchers are looking for small, heavy-particle formulations that won't evaporate during spraying. New products in this area, such as ultralow-volume materials, have brought substantial economies.

What's Ahead: The expected dynamic growth in pesticides production and application in the next 5-10 years will result from greater use of today's standbys. New products will be a bonus. Here is a summary of the products in each of the major categories that will predominate in the marketing scene.

Herbicides: The most significant development in pesticides in recent years, of course, has been the pre-emergence herbicides. Led by atrazine, which was introduced in the mid-'50s, the field

Pesticides research: big outlays, heavy odds

Step	Average cost per compound	Chance of reaching next step	Cumulative odds	Total R&D cost
Synthesis and initial screening	$ 400	1:100	1:100	400,000
Toxicity testing	100,000	1:10	1:1,000	1,000,000
Field evaluation	400,000	1:4	1:4,000	1,600,000
Product development	200,000	1:2	1:8,000	400,000
Process development and pilot plant	200,000	1:1.5	1:12,000	300,000
Test marketing	200,000	1:1.5	1:18,000	300,000
Commercialization	1,000,000*	1:2	1:36,000	2,000,000
Totals	$2,100,400			$6,000,000
Sales over $5 million/year		1:10	1:360,000	

*This assumes no marketing organization has been established. Otherwise, the commercialization step would be reduced to $200,000. Source: Arthur D. Little. Figures are for '64, latest year for which they are available.

products

has continued to grow at a rapid pace, with the introduction of trifluralin, Amiben and a wide range of other new products.

On the other hand, 2,4-D reached its peak in the early '60s. Although demand for it in southeast Asia has kept its production at high levels, it seems unlikely 2,4-D production will increase more than slightly. Nonetheless, its price is lower than that of other herbicides, and it is still an effective product that can be applied post-emergence to weed foliage to kill weeds by systemic action.

Moreover, 2,4-D also seems to have a good future in brush control and weed control in pasture lands, especially in combination with other materials. A number of mixtures of 2,4-D and other herbicides are being marketed, such as EPTC with 2,4-D (Stauffer's Knoxweed), fenal with 2,4-D (Amchem's Fenac plus) and dicamba with 2,4-D.

The table on page 40 shows production patterns for some of the major herbicides. Atrazine was the sales leader in '68, but its sales are not expected to continue to grow rapidly. Trifluralin, on the other hand, will continue its upward swing, but will face increasing competition from Amiben, nitralen and other newer products.

Insecticides: For years, DDT dominated the insecticides market, along with the other chlorinated hydrocarbons. More recently, phosphates, particularly parathion and methyl parathion, have moved up to challenge for the lead. Also lately, Sevin and the systemic phosphates have started to move.

Malathion, which was introduced in the early '50s, has continued to gain in sales and will likely score further gains because of its lower toxicity and because its patent protection expires soon, which should make its cost more competitive with that of the parathions. Production comparisons for the major insecticides are shown in the table on page 40.

Significantly, the systemics, which accounted for about $20 million in sales in '68, are expected to register

Farmers beset by pest-caused crop losses will have more controls as the result of intensive pesticides research.

a fivefold increase by '75. Many industry observers believe that the systemics offer the most economical and effective method of controlling insects and that they will be the leaders among insecticides.

Right now, the systemics are designed chiefly for control of so-called "light" insects—aphids, thrips and leafhoppers. What's needed now are systemics that can control heavier insects (such as the boll weevil) without remaining with undue persistence in plant tissues.

While pesticides producers are aiming at developing new products having low toxicity, high specificity and low persistence, there is some question of the acceptability of high specificity. The most successful commercial products have been those with a wide range of activity against a broad spectrum of insects.

In recent years, however, only a few products have been highly specific. Examples: Chevron's BuxTen, Chemagro's Dasanit and Stauffer's Dyfonate. All have been developed for corn insect control, although researchers recently reported they may also be effective against nematodes.

Nematocides: The control of nematodes is gaining increased attention. Just a few years ago tobacco was the only crop that was treated, but now farmers are beginning to recognize the threat of nematodes to crops such as field corn and soybeans, and they may be forced to use nematocides to keep their fields in production. Possibly, combination products to control soil insects and nematodes will catch on. Several are being test marketed, including prophos (Mobil's Mocap), carbofuran (FMC's Furadan), fensulfothion (Chemagro's Dasanit) and Stauffer's Dyfonate.

Growth regulators: Gibberellic acid, maleic hydrazide and other plant growth regulators have been marketed for over a decade, but they have not been widely used in field crops. Several new products are on the market, however, and they could boost total sales. One is TIBA, which may be useful in increasing soybean yields by reversing the tendency of plants to become top-heavy, thereby exposing more foliage to the sun. Other new entries prevent apples from dropping off trees, increase the protein content of soybeans and other plants, promote flowering and maturation.

Fungicides: New systemic compounds have revived interest in the fungicides market, which has grown relatively little over the years. Uniroyal's Vitavex is designed to control loose smut and *Rhizoctonia* in wheat and barley and may be effective as a seed treatment. Du Pont's Benlate is registered for use on turf, but it may be effective for other applications as well.

There is a market for products that can be applied to seed and furnish systemic protection against fungi in major crops such as corn and wheat. So far, farmers have been willing to gamble that the disease losses will be less than the cost of effective fungicides, but as costs of investment in land and crops rise, more farmers will start hedging their bets with at least partial use of fungicides.

Rodenticides: Anticoagulant-type rodenticides still dominate the market, with warfarin (a coumarin derivative) the sales leader. These products have the advantage of being relatively safe for humans, pets and domestic animals. The indandione type of anticoagulant—diphacinone and pindone (Motomco's Pival)—have not yet been as successful as the coumarin types in that respect.

Resistance to anticoagulants is becoming a problem in the control of certain rodents. Up to '60, resistance was mainly acquired and not transferred to offspring. More recently, inherited resistance has shown up; however, it has been confined to the indirect anticoagulants and only with the brown rat and the house mouse. A new nonanticoagulant product, norbormide (Tavolek's Raticate), could be effective if resistance becomes more of a problem. However, this product has been removed from the U.S. market because of "bait shyness" attributed to the formulation.

Many Hurdles: Before any new pesticide product can be marketed, it must meet increasingly stringent government regulations—often involving more than one agency. Congress has given the U.S. Dept. of Agriculture responsibility for registration of pesticides and pest control materials. The Food and Drug Administration has control over establishing tolerances for pesticides in or on human food and animal feeds. If the product is proposed for use in a way in which there may be residues in or on food or feed, USDA will not register it until FDA has established a tolerance or granted an exception.

To satisfy USDA, the producer must furnish proof to support claims made for the product. Toxicity data must include safety information supported by acute and subacute mammalian studies. Other studies may be required to show that the directed use of the product would not injure humans or

(Text continued on p. 68)

What's ahead for today's major products

	Relative production rates ('68 = 100)			
	'60	'64	'68	'75
Herbicides				
Trifluralin	0	10	100	260
Atrazine	15	40	100	140
Amiben	0	0	100	260
2,4-D	45	70	100	140
Insecticides				
DDT	120	90	100	0-50
Malathion	30	50	100	200
Systemics*	0	25	100	500
Parathion	30	50	100	125

*Includes demeton, dimethoate, disulfoton, methyl demeton, phorate, phosphamidon. Source: Arthur D. Little, Inc.

pesticides

Tetrachlorothiophene see: **TCTP**
Tetradifon
0 0,0',0 -Tetraethyl S. S'-methylene hinphosphorodithioate see **Ethion**
Tetraethyl pyrophosphate see **TEPP**
Tetrahydro-3,5-dimethyl-2H-1,3 5-thiadiazine-2-thione see: **Dazomet**
Tetramethyl phosphorodiamidic fluoride see **Dimefox**
0,0,0 0'-Tetramethyl 0,0'-thiodi p-phenylene phosphorothiate see **Abate***
0,0,0,0-Tetrapropyl dithiopyrophosphate see: **Aspon***
Tetron* see: **TEPP**
Thallium sulfate
Thanite*
Thimerosal* see: **Elcide* 73**
Thimet* see: **Phorate**
Thiodan* see. **Endosulfan**
Thiodemeton see: **Disulfoton**
Thiodiphenylamine see: **Phenothiazine**
Thiophal see: **Folpet**
Thiophos* see: **Parathion***
Thioquinox see: **Eradex**
Thiram
Thitrol* see **MCPB**
Thuricide* see. **Bacillus Thuringiensis**
Thylate* see: **Thiram**
TIBA
Tiguvon* see: **Fenthlon**
Tillam* see: **Pebulate**
TMTDS see **Thiram**
TOK E 25 see **Nitrofen**
Topane* see: **Orthophenylphenol**
Tordon* see **Picloram**
Toxaphene
Toxakil* see: **Toxaphene**
Treflan* see: **Trifluralin**
Triallate
Triazine* see: **Dyrene***
Tri-ban* see: **Pival***
Tributyl 2,4-dichlorobenzyl-phosphonium chloride see: **Phosfon***
S,S,S-Tributyl phosphorotrithioate see: **Def***
S,S,S-Tributyl phosphorotrithioite see: **Folex***
Tricamba
Trichloracetic acid see: **TCA**
Trichlorfon
S-2,3,3-Trichloroallyl diisopropylthiolcarbamate see **Triallate**
3,5,6-Trichloro-o-anisic acid see: **Tricamba**
Trichlorobenzylchloride see: **TCBC**
Trichlorobenzoic acid see: **2,3,6 TBA**
2,3,6-Trichlorobenzyloxypropanol see: **TBP**
1,1,1-Trichloro-2,2-bis (p-chlorophenyl)ethane see: **DDT**
N-Trichloromethylthio 4-cyclohexene 1 2-dicarboximide see: **Captan***
N-(Trichloromethylthio)-phthalimide see: **Folpet**
Trichloronitromethane see: **Chloropicrin**
2-(2,4,5 Trichlorophenoxy)ethyl 2,2-dichloropropionate see. **Erbon**
2,4,5 Trichlorophenoxyacetic acid see: **2,4,5-T**
2-(2,4,5-trichlorophenoxy) propionic acid see: **Silvex**
2,3,6-Trichlorophenylacetic acid or sodium salt see: **Fenac***
Tridex see: **EXD**
Tri-Fene* see: **Fenac***
Trifenson* see: **Fenson***
α,α,α.-Trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine see **Trifluralin**
Trifluralin
2,3,5-Triiodobenzoic acid see: **TIBA**
2,3,5-Trimethylphenyl methylcarbamate 3,4,5-Trimethylphenyl methylcarbamate see: **Landrin**
Triphenyltin hydroxide
Tris[2,4-dichlorophenoxy)-ethyl] phosphite see: **2,4-DEP**
Tritac* see: **TBP**
Trithion* see: **Carbophenothion**
Trolene* see: **Ronnel**
Trona see: **Borax***
Tronabor* see: **Borax***
Tropital*
Tropotox* see: **MCPB**
Tumbleaf* see: **Sodium chlorate**
Tumex* see: **8-Quinolinol**
Tupersan* see: **Siduron**
UC21149 see: **Temik***
Unden* see: **Beygon***
Urab* see: **Fenuron TCA**
Ureabor* see: **2,3,6 TBA**
Urginea maritima extract see: **Red squill**
Vancide FE-95 see: **Ferbam**
Vancide MZ-96 see: **Ziram**
Vancide TM 95 see: **Thiram**
Vapam* see **Metham**
Vapatone* see: **TEPP**
Vapona* see **Dichlorvos**
V-C 9-104 see: **Prophos**
V-C-13* see: **Nemacide**
Vegadex* see: **CDEC**
Venzar* see: **Lenacil**
Veratrine see: **Sabadilla**
Verbigen see: **Amiben***
Vernam* see: **Vernolate**
Vernolate
Verton* D see: **2,4-D**
Vidden D see: **D-D***
Vikane* see: **Sulfuryl fluoride**
Viozenc* see: **Ronnel**
Vitavex*
Vorlex*
Vorlex 201 see: **Vorlex***
VPM see: **Metham**
Warfarin
WEEDAR* see. **2,4-D**
Weedazol* see **Amitrole**
Weed-E-Rad* see: **DSMA**
Yomesan see **Bayluscide***
Zerlate* see: **Ziram**
Zinc and manganese ethylene bisdithiocarbamate, coordination product of see **Dithane M-45***
Zinc dimethyl dithiocarbamate see: **Ziram**
Zinc ethylene bisdithiocarbamate see: **Zineb**
Zinc phosphide
Zineb
Zinophos*
ZIP* see: **Ziram**
Ziram
Zobar* see **PBA**
6-12* see: **Ethyl hexanediol**
1080 see: **Sodium fluoroacetate**

beneficial animals. Physical and chemical properties must be listed, and added data must be supplied to show that the product will control the pests named on the label without causing significant adverse effects to the crops or property being treated.

Labels must show the product name, manufacturer's address, net contents, ingredients, necessary warning and caution statements, the product's registration number and directions for use. Label claims must be backed by supporting data.

Cross-Checks: Petitions for registration filed with USDA are reviewed by other agencies as well. The Interior Dept. reviews all petitions for registration of products that could affect fish and wildlife. Public Health Service reviews all petitions from the standpoint of human safety.

When suggested use patterns will result in residues on food or feed, the registrant must submit a suitable analytical method for enforcement purposes. In its review, FDA considers residues of the parent chemical metabolites and the conversion products that may be formed. Residues in plant parts other than the main raw agricultural commodity also are considered.

Residue data sent to FDA must indicate the identity and amount of residues and show that under suggested use conditions the proposed tolerance is suitable. If the product has more than negligible residues, extensive data are required, including an LD_{50} test for at least two species; a description of the signs of toxicity; 90-day tests at three dosage levels in at least two species (one nonrodent); two-year tests at three dosage levels in at least two species (one nonrodent).

Some Changes: In the past, when a pesticide was registered for use on a food or feed crop on a zero-tolerance basis, it meant that directed use could not leave residues that could be detected by chemical analysis. Development of better test methods often invalidated such a clearance. This has now been changed so that finite tolerances now are spelled out in the case of food or feed pesticides.

Government regulations may well be tightened under pressure from state governments. For example, Michigan recently banned all DDT use because of the threat to its fishing industry. And developments overseas also could add to the pressure. Sweden has taken steps to restrict DDT use and may be able to get other Scandinavian countries to go along. This growing pressure is likely to increase the producers' efforts to come up with new products that are more acceptable.

THE PESTICIDE REVIEW 1968

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Stabilization and Conservation Service
Washington, D. C.

The Pesticide Review - 1968

General Situation

United States production of pesticides continues to grow apace to meet the rising use by U.S. consumers and the vigorous export demand. Production figures available are limited mostly to synthetic organic pesticides. As these chemicals constitute all pesticides except a few of inorganic and botanical origin, the statistics for synthetic organic pesticides provide a real indication of overall trends.

The production of synthetic organic pesticides increased more than 37 percent over the five-year period 1963-1967 ranging from 2.5 percent in 1964 to 15.5 percent in 1966 (table 1).

The tonnage of pesticides exported in the 1963-1967 period increased an average of about 5 percent annually. These export data include quantities of formulations and are not strictly comparable. A better measure of growth here is the dollar value which rose in 1967 to more than 61 percent above 1963. During this same period, tonnage imports by the U.S. of benzenoid organic pesticides increased more than 425 percent. Even so, imports of these pesticides in 1967 amounted to less than 12 million pounds compared to U.S. production of over a billion pounds.

The demand for herbicides continued in 1967 to increase more rapidly than that for either fungicides or insecticides. Herbicide sales have risen 271 percent in value since 1963, which is more than double the rate of increase for all pesticides together. All pesticides rose 113 percent for the same period. The herbicide share of the market continued to grow at the expense of the other groups. The dollar gap between insecticides and herbicides has been closing rapidly in recent years and in 1967 the value of herbicide sales moved ahead of insecticide sales. Herbicide sales in 1967 were nearly 55 percent of the value of all sales of synthetic organic pesticides. This level was due in large part to the faster rise in average value per pound of herbicides over other pesticides.

Foreign demand for pesticides, judging by U.S. exports, also continues to expand to meet world food needs. The United States produces from 50 to 75 percent of all pesticides manufactured in the world, but this share is likely to become smaller as other countries develop capacity or increase existing capacity to make these chemicals. Insecticides and fungicides will for some years probably be dominant over herbicides in the foreign market. The growth of herbicide demand in the United States is related to the rapid advances here in the mechanization of agriculture.

Production and Sales. -- The value of synthetic organic pesticides produced in 1967 was 26 percent and of producer's sales 35 percent above 1966.

Table 1. -- Production and sales of synthetic organic pesticides: United States, 1962-67 1/

Calendar year	Quantity	Increase over previous year	Value	Increase over previous year
	1,000 pounds	Percent	1,000 dollars	Percent
Production				
1962	729,718	4.3	427,373 2/	18.1
1963	763,477	4.6	456,068 2/	6.7
1964	782,749	2.5	481,955 2/	5.7
1965	877,197	12.1	582,899 2/	20.9
1966 3/	1,013,110	15.5	727,772 2/	24.9
1967 4/	1,049,663	3.6	914,018 2/	25.6
Sales (domestic & export)				
1962	633,962	3.6	346,301	14.3
1963	651,471	2.8	369,140	6.6
1964	692,355	6.3	427,111	15.7
1965	763,905	10.3	497,066	16.4
1966 3/	822,256	7.6	583,802	17.4
1967 4/	897,363	9.1	787,043	34.8

1/ Includes a small quantity of soil conditioners.
2/ Calculated from production and unit sales value, manufacturers' level.
3/ Revised.
4/ Preliminary.

Tariff Commission, Chemical Division, "Synthetic Organic Chemicals, United States Production and Sales," except calculated values of production.

Except for minor reversals the present rapid upward trend in production and sales began with DDT and a few other early organic pesticides following World War II. Since 1963, even the rate of increase has been higher each year than the previous one (table 1). Production in 1967 was 37 percent and sales value 113 percent over 1963. The annual growth rate in total sales value for this period has averaged about 15 percent.

Production and sales figures for specific pesticides are published annually by the U.S. Tariff Commission (tables 1, 2, and 3). They are "presented in as great detail as is possible without revealing the operations of individual producers." This will explain why fumigants

Table 2. -- Production of pesticidal chemicals: United States, 1965-67

Chemical	1965	1966	1967 1/
	1,000 pounds	1,000 pounds	1,000 pounds
Fungicides:			
Copper naphthenate	3,268	3,211 2/	3,473
Copper sulfate 3/	47,272	41,504	33,992
Ferbam	2,384	1,379	2,331
Mercury fungicides	1,602	1,035	912
Nabam	2,489	2,053	1,361
Pentachlorophenol (PCP) 4/	39,965	43,262	44,239
2,4,5-Trichlorophenol and salts 5/	4,003	5,958	14,008
Zineb	5,075	4,721	3,055
Other organic fungicides	44,969	63,818	63,269
Total 6/	151,027	166,941 2/	166,640
Herbicides:			
2,4-D acid 7/	(63,320)	(68,182)	(77,139)
2,4-D acid esters and salts	63,360	72,522	83,750
DNBP	4,619	8/	8/
DNBP, ammonium salt	59	85	58
Phenyl mercuric acetate (PMA) 9/	588	502	518
Sodium chlorate 10/	32,000	32,000	30,000
2,4,5-T acid 7/	(11,601)	(15,489)	(14,552)
2,4,5-T acid esters and salts	13,516	18,059	27,189
Other organic herbicides	105,861	148,765	206,759
Total	220,003	271,933	348,274
Insecticides, fumigants, rodenticides: 11/			
Aldrin-toxaphene group 12/	118,832	130,470	120,183
Calcium arsenate	4,192	2,890 2/	2,500 13/
DDT	140,785	141,349	103,411
Dibromochloropropane	3,433	8,722	5,240
Lead arsenate	7,098	7,328 2/	6,000 13/
Methyl bromide 14/	14,303	16,345	19,665
Methyl parathion	29,111	35,862	33,344
Parathion	16,607	19,444	11,361
Other organics	167,368	199,404	202,600
Total	501,729	561,814	504,304
Grand total	872,759	1,000,688 2/	1,019,218

1/ Preliminary.
2/ Revised.
3/ Shipments by producers to agriculture (including for use as minor plant nutrient).
4/ Not only a wood preservative for wood rot control but a herbicide and desiccant.
5/ Requirement as a 2,4,5-T intermediate is subtracted from Tariff Commission figures.
6/ Sulfur not included may amount to 150 million pounds (see also table 10, footnote 6).
7/ Figures in parentheses, because of duplication, are not included in totals.
8/ Separate figure not available.
9/ Also a fungicide.
10/ Estimated shipments to producers of herbicides and defoliants.
11/ Includes a small quantity of synthetic soil conditioners; does not include the fumigants, carbon tetrachloride, carbon disulfide, ethylene dibromide and ethylene dichloride, which have many other uses; nor does it include paradichlorobenzene (classed by Tariff as an intermediate) or inorganic rodenticides.
12/ Includes aldrin, chlordane, dieldrin, endrin, heptachlor, Strobane, and toxaphene.
13/ Estimated.
14/ Fumigant for control of both insects and weeds.

Tariff Commission, Bureau of the Census, Bureau of Mines, communications from chemical industry.

and rodenticides must be included with the data for insecticides in Table 2. Totals in Table 1, which represent only organic pesticides, include some duplication of quantities. This duplication has been largely excluded in Table 2, while some figures for inorganic pesticides have been included. Production figures, as reported by the Tariff Commission, generally exceed sales figures because production of a pesticide represents its total output, including the quantity produced for interplant transfer to undergo further manufacture as well as that for direct domestic and foreign sale.

Table 3. -- Sales of synthetic organic pesticides by type of use, volume and value: United States, 1965-67 1/

Type of usage	1965 Amount	1965 Percentage of year	1966 2/ Amount	1966 2/ Percentage of year	1967 3/ Amount	1967 3/ Percentage of year
	1,000 pounds	Percent	1,000 pounds	Percent	1,000 pounds	Percent
Volume of sales:						
Fungicides	106,342	13.9	118,397	14.4	120,413	13.4
Herbicides and plant hormones	182,869	23.9	221,502	26.9	287,582	32.1
Insecticides, fumigants, rodenticides and soil conditioners 4/	474,694	62.2	482,357	58.7	489,368	54.5
Total	763,905	100.0	822,256	100.0	897,363	100.0
	1,000 dollars	Percent	1,000 dollars	Percent	1,000 dollars	Percent
Value of sales:						
Fungicides	50,151	10.1	53,275	9.1	56,333	7.2
Herbicides and plant hormones	207,276	41,7	257,635	44.1	429,980	54.6
Insecticides, fumigants, rodenticides and soil conditioners 4/	239,639	48.2	272,892	46.8	300,730	38.2
Total	497,066	100.0	583,802	100.0	787,043	100.0

1/ Classified by Tariff Commission according to the most important use; many chemicals actually have uses in more than one major category; the herbicides involve some repetition (see table 2).
2/ Revised.
3/ Preliminary.
4/ A grouping required by the Tariff Commission to meet its need for separate data on cyclic chemicals; fumigants included may be fungicidal, nematocidal, and/or herbicidal as well as insecticidal.

Tariff Commission, Chemical Division.

Manufacturers' shipments of pesticides and related chemicals, another indication of growth, continued to climb in 1966, the latest year for which figures are available (table 4). Shipments of agricultural preparations containing pesticides increased nearly 16 percent over 1965.

Table 4. -- Manufacturers' shipments of pesticides and related chemicals: United States, 1958-66 1/

Year	Pesticides and other agricultural chemicals not formulated (Product code 28184)	Household insecticides and repellents (preparations) (Product code 28421)	Agricultural pesticides and similar chemical preparations (Product code 28790)
	1,000 dollars	1,000 dollars	1,000 dollars
1958	96,186	85,918	347,628
1959	122,718	86,421	342,187
1960	147,484	86,709	356,040
1961	164,980	93,903	372,787
1962	220,476	115,021	398,522
1963	223,381	110,841	488,749
1964	245,541	111,916	508,487
1965 2/	260,862	122,164	581,555
1966	292,534	135,114	672,788

1/ Includes interplant transfers.
2/ Revised figures.

Bureau of the Census, 1962 Annual Survey of Manufactures, M62(AS)-2, "Value of Shipments of Selected Classes of Products"; 1963 Census of Manufactures, MC63(2)-28A, -28D, and -28F; and Annual Survey of Manufactures - 1966, M66(AS)-2, "Value of Shipments by Classes of Products."

Imports. -- The value of U.S. pesticide imports in 1967, insofar as reported, was $16.3 million, primarily benzenoid organic chemicals and botanical products. The benzenoid pesticide imports (table 5), valued at $8.9 million, were up 43 percent from the previous year. Netherlands and France contributed most heavily to the increase. The United Kingdom and West Germany also added to the rise in U.S. imports but their combined share of total imports of benzenoids fell in 1967 to 41 percent from 52 percent in 1966.

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
KANSAS	1. Agricultural Chemical Act (1947) 2. Livestock Remedy Law	1. Kansas Aerial Spraying Law (1953, as amended) 2. Kansas Pest Control Act (1953, as amended) with regulations 3. Kansas Chemical Spray Law (1963)
KENTUCKY	1. Economic Poisons Law (1956) 2. Food, Drug and Cosmetic Law	Kentucky Termite and Pest Control Industry Law (1960) (Kentucky Structural Pest Control Act)
LOUISIANA	Pesticide Act (1952)	1. Louisiana Herbicide Law (1954) with regulations 2. Custom Applications of Pesticides (1964) 3. Ornamental Spraying Law (1965) 4. Structural Pest Control Law (1960)
MAINE	Economic Poisons Law (1952)	Regulation of Pesticides (1963)
MARYLAND	Pesticide Law (1958)	-----------------------
MASSACHUSETTS	1. Pesticide Law (1961) 2. Labeling of DDT Preparations (1947)	1. Law Licensing Persons Applying Chemicals to Waters (1960) 2. Pesticide Board Rules and Regulations (1962)
MICHIGAN	Insecticide, Fungicide and Rodenticide Act (1949)	1. Michigan 2,4-D Act (1959) 2. Michigan Custom Applicators Law (1959) 3. Equipment Operator's Act (1959)
MINNESOTA	Economic Poisons and Devices Law (1945)	Minnesota Custom Applicators Law (1953, as amended) (revised 1966)
MISSISSIPPI	Economic Poisons Act (1950)	1. Law Regulating Application of Hormone type Herbicides by Aircraft (1952, as amended) with regulations 2. Professional Pest Control Operators Law (1938) with regulations

STATE	REGISTRATION LAWS	USE AND APPLICATION LAWS
MISSOURI	Economic Poisons Act (1955)	----------------------------
MONTANA	Economic Poisons Act (1947, as amended)	----------------------------
NEBRASKA	Economic Poison Law (1961)	----------------------------
NEVADA	Economic Poison Law (1955) with regulations	Nevada Custom Pest Control Operators Law (1955) with regulations
NEW HAMPSHIRE	Economic Poisons Law (1949)	Pesticide Control Law (1966)
NEW JERSEY	Economic Poison Act (1951)	----------------------------
NEW MEXICO	Economic Poison Act (1951)	Pesticide Applicators Law (1965)
NEW YORK	Pesticide Law (1960)	1. Water Quality Standards Law 2. Pesticides in Grape Vineyards Law (1963, as amended)
NORTH CAROLINA	Insecticide, Fungicide and Rodenticide Act (1947)	1. North Carolina Aerial Crop-Dusting Law (1953) with regulations 2. North Carolina Structural Pest Control Act (1955)
NORTH DAKOTA	1. Insecticide, Fungicide and Rodenticide Act (1947) 2. Livestock Medicine Law (1943)	1. North Dakota Pesticides Damage Claim Act (1955) 2. Aerial Spraying, Dusting, Fertilizing & Insect Control Law (1957) 3. Regulations of the Aeronautics Commission (1957)
OHIO	1. Economic Poisons Act (1966) 2. Livestock Remedies Law (1949)	Ohio 2,4-D Law 1961
OKLAHOMA	Pesticides Law (1955)	1. Oklahoma Pesticide Applicators Law 1961 with regulations 2. Ornamental Spraying or Pruning (1965) 3. Phenoxy Herbicides (1965) 4. Structural Pest and Termite Control Law (1955) with regulations

Table 7. -- Exports of Pesticides: United States, 1966-67 1/

Material	Value 1966	Value 1967	Volume 1967
	1,000 dollars	1,000 dollars	1,000 pounds
Fungicides:			
Inorganic fungicides, tech. 2/	1,725	776	1,958
Organic fungicides, tech.	4,834	4,510	4,950
Fungicide formulations 3/	15,751	15,584	31,580
Total	22,310	20,870	38,488
Herbicides:			
Inorganic herbicides, tech. 4/	362	342	1,000
2,4-D and 2,4,5-T tech. acid basis 5/	2,810	1,893	4,410
Other organic herbicides, tech.	11,734	15,076	19,184
Herbicide formulations 6/	22,166	28,202	37,342
Total	37,072	45,513	61,936
Insecticides:			
Inorganic insecticides, tech. 7/	805	898	1,580
DDT, tech.	6,124	5,894	35,771
DDT, 20-74%, 100% basis	2,116	982	4,077
DDT, 75%, plus, 100% basis	10,656	9,148	41,980
Other polychlor insecticides, tech. 8/	19,299	24,844	65,089
Other polychlor formulations	2,330	2,029	6,633
Organic phosphorus insecticides, tech.	25,173	36,623	47,983
Organic phosphorus formulations	7,907	9,008	30,010
Other organic insecticides, tech.	16,607	13,997	23,781
Other organic formulations	4,465	6,100	12,895
Household & industrial formulations 9/	5,527	5,448	10,523
Total	101,009	114,971	280,322
Other:			
Organic rodenticides, tech.	712	435	741
Disinfectants, tech.	2,691	3,196	2,919
Disinfectant formulations	2,347	2,496	4,802
Dips, growth regulators	2,917	3,728	5,685
Organic fumigants	4,575	4,514	16,038
Total	13,242	14,369	30,185
Grand total	173,633	195,723	410,921

1/ A new classification of exports replaced that in use prior to 1965.
2/ Includes copper sulfate, sulfur, etc.; see next footnote.
3/ Includes conditioned sulfur dust and sulfur pastes; precipitated, colloidal, and flowers of sulfur are not shown.
4/ Includes sodium arsenite.
5/ Includes technical salts and esters on acid basis.
6/ Includes calcium cyanamide for weed control and defoliation.
7/ Includes calcium arsenate and lead arsenate; also inorganic fumigants and rodenticides.
8/ Includes technical BHC and paradichlorobenzene.
9/ Includes repellents and rodenticide preparations.

Bureau of the Census Report FT 410.

Notable shifts in 1967 were the lower DDT exports and the large increases in exports of other polychlor insecticides (technical), organophosphorus insecticides (technical), and organic herbicides (technical and preparations) except 2,4-D and 2,4,5-T. Military shipments of the latter are not classed as exports.

Shipments to 22 countries accounted for nearly 78 percent of the total value of U.S. pesticide exports in 1967 (table 8). Over 27 percent went to countries in North America outside the United States (table 9). Shipments to Europe in 1967 increased 31 percent over 1966 and accounted for 26 percent of the total pesticide export value.

Canada, Egypt, Japan, and France led in that order in the value of pesticides received from the United States in 1967. The four leading countries the previous year were Canada, Egypt, Mexico, and Colombia. Exports to Mexico and Colombia in 1967 were down 25 and 61 percent respectively from 1966. Exports to Japan and France, on the other hand, were up 21 and 45 percent respectively.

Sizeable quantities of pesticides continued to be shipped from the United States to eastern European countries in 1967, the largest share going to the Soviet Union. The following figures show how the value of U.S. shipments in 1967 compared with those of 1966.

Countries	1966	1967
U.S.S.R.	$1,293,670	$1,442,454
Rumania	110,599	849,422
Yugoslavia	712,316	817,214
Bulgaria	0	243,717
Hungary	234,815	69,461
Poland	0	14,928
Czechoslovakia	944	3,485
	$2,352,344	$3,440,681

U.S. exports of pesticides to South Vietnam in 1967 had a value of $852,527, up 107 percent from 1966. Insecticides, mostly organophosphorus and polychlor, made up 59 percent and fungicides 22 percent.

Requirements for pesticides differ substantially in different countries. Fifty-two percent of U.S. fungicide exports in 1967 went to five countries -- Japan, Canada, Republic of South Africa, Brazil, and Australia in that order. Fungicides accounted for over 40 percent of the pesticides which went to Costa Rica, Panama, and Japan, but less than one percent of the pesticides that went to Egypt and Nicaragua. Insecticides accounted for over 90 percent of the pesticides shipped to Egypt, Nicaragua, and Pakistan but less than 30 percent of those shipped to Canada, Costa Rica, and Panama. Herbicides accounted for 50 percent of all pesticides shipped to Canada.

Table 8. -- Value of pesticide exports by major market: United States, 1964-67 1/

Country 1/	1964	1965	1966	1967	Change in 1967 from 1966
	Dollars	Dollars	Dollars	Dollars	Percent
Canada	12,862,595	15,448,926	15,833,483	20,401,003	28.8
U.A.R. Egypt	5,597,239	7,227,930	11,794,277	10,968,220	- 7.0
Japan	7,424,892	5,655,664	8,912,643	10,799,285	21.2
France	1,694,390	2,373,331	6,331,005	9,206,058	45.4
Nicaragua	4,045,651	5,148,183	5,419,728	8,952,399	65.2
Mexico	10,332,057	10,415,749	11,415,421	8,542,890	- 25.2
Netherlands	4,556,985	3,349,185	9,079,452	8,322,380	- 8.3
Belgium-Luxembourg	4,749,728	4,740,469	5,775,053	7,808,767	35.2
Pakistan	1,698,279	4,751,087	5,960,061	7,343,446	23.2
Australia	3,059,757	4,410,481	5,558,665	6,721,827	20.9
Brazil	4,980,807	6,171,432	8,968,591	6,046,143	- 32.6
United Kingdom	2,443,059	2,510,970	5,027,170	5,601,820	11.4
India	4,725,541	5,163,248	5,852,243	5,612,370	- 4.1
Italy	2,759,398	2,078,550	2,701,689	5,531,352	104.7
Rep. of South Africa	4,047,331	3,746,228	4,422,858	5,210,998	17.8
Venezuela	3,656,199	4,262,029	3,698,064	4,106,068	11.0
Colombia	7,419,458	4,572,099	9,813,908	3,850,568	- 60.8
El Salvador	3,342,399	2,554,747	2,838,750	3,559,957	25.4
Thailand	1,231,751	1,999,117	1,581,768	3,470,734	119.4
Iran	718,235	1,803,005	1,424,478	3,400,909	138.7
Guatamala	3,358,317	3,894,552	3,138,930	3,286,467	4.7
Switzerland	512,084	1,077,037	1,258,569	3,275,029	160.2
Total	95,216,152	103,354,019	136,806,806	152,018,690	11.1

1/ Arranged in descending order based on 1967 exports valued at $3 million or more to any one country.

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Table 9. -- Value of pesticide exports by continent, United States, 1964-67

Continent	1964	1965	1966	1967	Change in 1967 from 1966	Percentage of total in 1967
	Dollars	Dollars	Dollars	Dollars	Percent	Percent
North America	42,581,265	44,154,341	46,577,524	53,610,283	15.1	27.4
South America	23,111,947	20,878,204	28,543,051	20,496,822	-28.2	10.5
Europe	25,954,506	21,813,748	39,002,636	51,053,782	30.9	26.1
Asia	24,921,954	25,426,989	31,461,144	40,399,941	28.4	20.6
Australia & Oceania	4,867,744	6,490,504	7,311,620	8,273,124	13.2	4.2
Africa	13,089,487	14,440,021	20,737,243	21,888,755	5.6	11.2
Total	134,526,903	133,203,807	173,633,218	195,722,707	12.7	100.0

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Usage in the United States. -- Weather conditions in 1967 were adverse in many sections, with early prolonged periods of excessive rainfall in the West and Midwest, a late spring in the Northeast, and drought in Florida. The cold, late spring reduced the need for early season applications of insecticides and may have reduced total 1967 consumption.

Soil insecticides and pre-emergence herbicides were in heavy demand in the Midwest. However, the excessive rainfall in the Midwest during the spring had a serious effect on planned applications of herbicides and soil insecticides in some States. Many corn farmers could not get into their fields for pre-emergence treatments and had to resort to post-emergence treatments by plane.

Within recent years, the use of pesticides has increased on corn more rapidly than on any other crop. Fifty-seven percent of the corn acreage in 1966 was treated with herbicides, 33 percent with insecticides. Corresponding percentages in 1958 were 28 percent and 6 percent. The total value of herbicides used on corn is estimated by the trade to be over $70 million annually.

A reduced cotton acreage no doubt curtailed total use of cotton insecticides in 1967 despite greater than normal weevil and bollworm infestations. Although curtailed, a larger quantity of insecticides still is applied to cotton than to any other crop since the treated acres, much fewer than with several other crops, receive a larger number of applications. Any reduction in total sales of insecticides may have been offset to some extent by heavier use against soil insects infesting corn fields.

Poor weather was a significant factor in reducing the 1967 cotton crop to the smallest since 1895. The 1968 program called for increased acreage. The acreage of cotton in 1968 is about 11 million acres, up 1.5 million acres from 1967. The rice acreage is about 2.4 million acres, or about 20 percent above last year. On the other hand, the wheat acreage and the feed grain acreage are expected to be down about 3 million acres each and the corn acreage down about 4.5 million.

The latest published survey figures of the U.S. Department of Agriculture which show overall farmer usage of pesticides are those for 1964. That year 457.5 million pounds of pesticides (active ingredient basis), valued at about $500 million were used in agriculture (table 10). This represented 42 percent of all pesticides produced in the country that year. The remainder went for export and for domestic nonagricultural purposes. Approximately 93 percent of the volume was used for treating crops, 3 percent for treating livestock, and 4 percent for other uses. In addition, farmers used 313 million pounds of petroleum in pest control, including some as a carrier in pesticide formulations.

Table 10. -- Farm usage of pesticides (active ingredient basis): United States, 1964 1/

Pesticide class 2/	Area of use			
	crops 3/	livestock 4/	other 5/	total
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
Fungicides	165,943	2,824	1,312	170,079 6/
Insecticides	143,184	10,554	2,258	155,996 7/
Herbicides	76,314	---	7,724	84,038 7/
Fumigants	23,665	---	1,202	24,867
Defoliants & desiccants	11,906	---	4,223	16,129
Miticides	3,059	10	24	3,093
Growth Regulators	2,566	---	---	2,566
Repellents	---	656	---	656
Rodenticides	---	---	76	76
Total	426,637	14,044	16,819	457,500

1/ Includes only the 48 contiguous States.
2/ Ingredients included in major use category only.
3/ Includes all crops, pasture, rangeland, and land in summer fallow.
4/ Includes livestock buildings.
5/ Includes all other uses except for treating seeds, stored crops, or storage buildings.
6/ Includes 136,823,000 pounds of sulfur.
7/ Excludes 313,411,000 pounds of petroleum used primarily in insecticidal and herbicidal formulations.

Adapted from U.S. Department of Agriculture, Economic Research Service, Agricultural Economic Report No. 131, "Quantities of Pesticides Used by Farmers in 1964".

The demand increases for aerial application services which often use equipment developed especially for pesticide treatment of crops. Large acreages of commercial crops can receive the needed coverage of pesticides from the air quickly when weather and pest conditions limit the time for making the application. Over 65 million acres were treated from the air in 1966. A total of 5,200 agricultural aircraft flew a million hours. Sixty-four percent of the aircraft were of new types, the remaining 36 percent surplus types.

Major improvements in the efficient and economical application of pesticides have occurred in recent years. Outstanding is the development and growth of ultra-low-volume (ULV) spraying largely from the air but to some extent with ground equipment. A primary advantage is the more economical use of equipment and chemicals. Little or no water is carried, thus increasing the effective load of pesticide per trip. ULV is defined as the application of one-half gallon or less of liquid concentrate per acre. The fact that less pesticide may thus often be applied per acre-treatment does not appear to affect the overall U.S. growth of agricultural pesticide consumption.

The calculated domestic disappearance of several pesticides during the crop year which ended September 30, 1967, is shown in Table 11. DDT continued its general decline from the peak year of 1959 when domestic use reached a record high of almost 79 million pounds. Consumption for the 1966-67 crop year was down to around 40 million pounds, amounting to only about half that which was exported. Total copper sulfate disappearance declined 18 percent from last year and was also down somewhat from 1965, but still higher than for any other year since 1952 (see table 25). Consumption of the aldrin-toxaphene group of insecticides was essentially the same in 1966-67 as the previous crop year which was the highest of all time.

Table 16. -- Pesticide purchases financed by the Agency for International Development, fiscal years 1964-67

Region	1964	1965	1966	1967
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
Latin America	3,480	3,176	4,053	5,359
Near East & South Asia 1/	14,215	4,220	13,268	4,775
Far East 2/	10,826	2,392	2,936	1,163
Africa (except Egypt)	977	481	605	778
Total	29,498	10,269	20,862	12,075

1/ Includes Afghanistan, Ceylon, India, Israel, Jordan, Pakistan, Turkey, and UAR (Egypt).
2/ Includes Republic of China, Korea, Laos, Thailand, and Vietnam.

Agency for International Development, Operations Report W-129.

Table 18. -- Wholesale prices of selected pesticidal materials: Average weekly quotations, 1965-67 and Jan.-June, 1968 1/

Material	Price per pound			
	1965	1966	1967	(Jan.-June) 1968
	Dollars	Dollars	Dollars	Dollars
Aldrin	.990	.990	.992	1.025
Chlordane	.650	.650	.602	.590
Copper sulfate, pentahydrate	.153	.172	.185	.192
Copper sulfate, tribasic	.325	.365	.389	.400
Cube (root)	.178	.192	.227	.232
2,4-D acid	.339	.325	.332	.355
2,4-D, isopropyl ester	.350	.331	.357	.375
DDT	.170	.180	.179	.175
Dichlorvos	3.684	3.617	3.750	3.750
Dieldrin	1.850	1.850	1.665	1.650
Endrin	2.700	2.700	2.469	2.450
Ethylene dibromide	.305	.305	.305	.305
Heptachlor	.960	.960	.973	.980
Lead arsenate	.278	.290	.300	.310
Lindane	1.850	1.850	1.406	1.300
Malathion	.900	.900	.900	.900
Methoxychlor, 50 percent	.660	.660	.660	.660
Methyl bromide	.670	.670	.606	.605
Methyl parathion	.880	.880	.780	.652
Parathion	.880	.880	.780	.652
Pyrethrum flowers, 1.3%	.749	.790	.810	.810
2,4,5-T	.954	.975	1.018	1.082
TDE	.450	.450	.450	.450
Toxaphene	.220	.220	.220	.220

1/ Computed from weekly quotations in "Oil, Paint, and Drug Reporter."

Table 30. -- Twelve leading insecticides (active ingredient basis): Consumption by product, United States, 1964 1/

Product	Area of use			
	Crops 2/	Livestock 3/	Other 4/	Total
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
Toxaphene	34,189	4,703	19	38,911
DDT	31,835	640	1,068	33,543
Carbaryl	14,824	115	7	14,946
Aldrin	11,119	---	27	11,146
Methyl parathion	9,981	---	4	9,985
Parathion	6,138	---	288	6,426
Malathion	4,066	602	100	4,768
TDE	3,375	3	9	3,387
Strobane 5/	2,706	---	9	2,715
Diazinon	2,277	31	2	2,310
Azinphos methyl	2,245	---	28	2,273
Endrin	2,151	---	18	2,169

1/ Includes only the 48 contiguous States.
2/ Includes all crops, pasture, rangeland, and land in summer fallow.
3/ Includes livestock buildings.
4/ Includes all other uses except treating seed, stored crops, and storage buildings.
5/ Trade name.

Adapted from U.S. Department of Agriculture, Economic Research Service, Agricultural Economic Report No. 131, "Quantities of Pesticides Used by Farmers in 1964."

[From THE NATIONAL JOURNAL, Sept. 29, 1969]

CPR Report/Renewed debate over DDT: should the government restrict its use? by James Singer

DDT, the anti-malaria hero of World War II and subsequent panacea for pest control, is once more the center of public controversy.

Since the early 1960s, DDT has stirred argument; today, it stands accused by legislators and scientists of permanently polluting the environment and endangering the health of man.

Chances of major federal action to control the 40 million pounds of DDT used annually by U.S. farmers and others, however, seem slim. Key Members of Congress, manufacturers, farmers, the Agriculture Department—all support its continued use and point to its relatively low toxicity to man.

Yet, conservationists and medical authorities believe that recent events are shifting the controversy from a conservation issue to a health issue. And if the health issue develops fully, they believe, it could result in a change in U.S. pesticide policy.

Touching off the current debate were two—unrelated—developments in government:

• Seizures last spring by the Food and Drug Administration (FDA) of interstate shipments of Lake Michigan salmon containing high levels of DDT residue.

• Charges last fall and winter by the General Accounting Office (GAO) that the Agriculture Department is lax in regulating the use of pesticides.

Since then:

• HEW Secretary Robert H. Finch has appointed a new commission to study the health aspects of DDT and other pesticides.

• A Senate Commerce subcommittee has opened a series of hearings on pollution by pesticides, particularly DDT.

• The National Academy of Sciences has released a report recommending more careful use of pesticides such as DDT.

• A House Government Operations subcommittee has held hearings that pinpointed specific weaknesses in the Agriculture Department's regulation of pesticide safety.

• Various actions have been taken by the FDA and the Agriculture and Interior departments that have added to the DDT controversy.

HEW commission

In March and April, the FDA seized about 34,000 pounds of frozen Lake Michigan coho salmon with high DDT-residue levels. The coho seizures were unusual in one respect: the FDA had not established a formal DDT-residue level for fish before the seizure. Hence, the shipper—Black Port Packing Co., of Grand Rapids—was without guidelines to indicate how much residue would be allowed for fish in interstate commerce; FDA guidelines for red meat allow 7 ppm (7 parts DDT per million parts fatty tissue). The residues found by the FDA in the coho salmon ran as high as 19 ppm.

Reaction: House Minority leader Gerald R. Ford, R-Mich., who represents the district that includes Grand Rapids and Black Port Packing Co., protested strongly to HEW Secretary Finch that the FDA should have set tolerance levels before it seized the fish, not after. On April 20, the governors (all Republicans) of five Great Lakes states—Illinois, Indiana, Michigan, Minnesota and Wisconsin—urged Finch not to act hastily in setting maximum limits on pesticide residues in Great Lakes fish.

New commission: The next day, in response to Ford and the governors, Finch appointed a Commission on Pesticides and their Relationship to Environmental Health. Named chairman of the commission was Emil M. Mrak, retiring chancellor of the University of California at Davis.

Mrak had supported the use of pesticides during Senate anti-pollution hearings in 1963. Also named to the commission, however, were outspoken foes of pollution, including Lamont C. Cole, of Cornell University, and L. Eugene Cronin, of the University of Maryland.

At a press conference announcing the new commission, as one former HEW aide put it: "The reporters were really angry. I don't think they've ever given (Finch) a harder time." Typical of the questions asked the Secretary was this: "I fail to understand why we need still another study when as far back as 1963 a government commission said that DDT should be restricted and we should cut it down; the elimination of...pesticides should be the goal."

Finch responded by saying that the data were too uneven to set a national standard, that a lot more needs to be known before a firm policy regarding DDT levels could be set and that, in any case, it would be up to the Agriculture Department to decide whether DDT would be pulled off the market.

"There is no question but that DDT, which has been used in great quantities since the early '40s, persists in the environment," Finch said. "Our present estimates are that—and the FDA said flatly—that each American has an average of 12 ppm DDT in the fatty tissue of (his) body.... We don't have direct evidence what the effect of this is. We don't know that it is not harmless. We get to the point where down the road someplace we will have to be performing autopsies of bodies to be...able to make that kind of flat statement."

Interim standard: On April 22—the day after the press conference—Finch's FDA Commissioner, Dr. Herbert L. Ley Jr., announced that residues in fish shipped in interstate commerce would be limited to 5 ppm under an interim guideline. The 5-ppm limit, Ley said, could be changed later as a result of further study.

Academy report

Another response to the seizures of the Lake Michigan salmon came from the Senate Commerce Energy, Natural Resources and Environment Subcommittee, which opened pesticide hearings May 19. During the hearings, two important announcements were made:

• Ned D. Bayley, Science and Education Director of the Agriculture Department, disclosed that in 1967 the department had requested the National Academy of Sciences-National Research Council to make an intensive study of the impact of pesticides on the environment.

• Leslie L. Glasgow, Assistant Interior Secretary for Fish and Wildlife, said that it was time to replace DDT with less hazardous pesticides. By his statement, Glasgow broke the Interior Department's long-standing public silence on the issue.

Report's findings: The study of pesticides by the National Academy of Sciences was released June 4. The report, addressed to Agriculture Secretary Clifford M. Hardin, concluded:

• Persistent pesticide residues threaten the existence of some wildlife species.

• Present levels of pesticide residues in man's food are not known to be a health hazard.

• Long-term environmental effects of persistent pesticides are unknown, but uncontrolled usage should be discouraged.

Hardin termed the report "reasonable and balanced" and indicated that the Agriculture Department would make a full evaluation of it. On July 9, the department announced that its use of DDT and eight other persistent pesticides in departmental pest-control programs was being suspended pending a review of the programs. On Aug. 14, the department announced that it was resuming some of its control programs, but was substituting less persistent pesticides for those previously used. *(See p. 0097.)*

DDT and health

Whether DDT is harmful to man is still open to some debate. As Secretary Finch noted, practically every U.S. citizen has accumulated, in his body fat, residual DDT at about 12 parts DDT per million parts fat, but what this may mean in long-term effects is difficult to document. A number of medical authorities and scientists, including Dr. Roger O. Egeberg, Assistant HEW Secretary for Health, have expressed concern about the possible effects of such accumulations. Egeberg told a television audience July 17 that DDT is "harmful in the same way as radioactive substances."

Agreement: Other recent expressions of concern:

- Dr. Richard M. Welch, a pharmacologist with the drug firm of Burroughs Wellcome & Co., told the Wisconsin Department of Natural Resources in December 1968 that sex hormones in rats are affected by enzymes activated by DDT, and the same hormones are found in man, whose residual of DDT is "within a range" to produce the same effect. "If one can extrapolate data from animals to man, then one would say that the changes in these enzymes probably do occur in man," Welch said.
- In May 1969, S. Goran Lofroth, a University of Stockholm scientist, also testifying before the Wisconsin department, reported that babies who are breast fed sometimes get twice as much DDT in their systems as the maximum level recommended as safe for humans by the World Health Organization.
- In *The Pesticide Problem*, a book published by Johns Hopkins University in 1967, Chicago pharmacologist Kenneth P. DuBois warned that pesticides interfere with drug metabolism and that because of this, they can have a marked effect on patients. DuBois cited DDT in particular, which he says counteracts barbiturates.
- An interim report by the HEW Department's National Cancer Institute, made public May 1, states that mice that were fed DDT as a part of their regular diet developed significantly more tumors of the liver than did mice who were not fed DDT. The report stresses, however, that the dose of DDT received by the mice was "far in excess of that likely to be consumed by humans," and that more research was needed to establish a link between human cancer and DDT.

Disagreement: Not all medical researchers are agreed, however, that DDT or other pesticides present a health hazard to man. One outspoken defender of DDT is Dr. Wayland Hayes Jr., former chief toxicologist for the Public Health Service.

Toxicity of any chemical, including DDT, Hayes contends, must be measured in relation to its dosage. Appearing before the Wisconsin department in April of this year, Hayes recounted Public Health Service experiments on prison volunteers were were exposed to large amounts of DDT—in some cases as much as 1,000 times the amount normally consumed by the average person. "In each of the studies," Hayes said, "we could find no chemical effect on the men."

Critics of the studies cited by Hayes—such as the Environmental Clearinghouse, Inc., a Washington-based, nonprofit organization—point out that these studies and similar ones made in DDT-manufacturing plants, were made only on certain types of adults. The effects DDT might have on children, pregnant women or the aged have not been adequately investigated.

Regulation issue

Federal consumer protection efforts concerning the pesticide industry are administered under the Federal Insecticide, Fungicide and Rodenticide Act (7 USC 135-135k) and a 1964 interdepartmental agreement. Basically, the act provides that before pesticides can be sold in interstate commerce a manufacturer must register his product, attesting to its safety and efficacy, with the Agriculture Department. The act also gives the department procedures for enforcing the registration requirement.

Registration: According to the department, more than 60,000 pesticide formulations, based on more than 900 individual chemical compounds, have been registered during the last two years. Registration is valid for a period of five years, after which manufacturers are required to re-register their products.

DDT Use

(thousands of pounds)

	1964	1966	1968
Total production	135,749	142,329	126,936
Total domestic use	50,542	46,672	32,753
Total farm use	32,000	27,000	*
Cotton	23,600	19,200	*
Tobacco	1,200	800	*
Soybeans	500	700	*
Vegetables (including potatoes)	1,700	1,400	*
Fruits	1,900	1,500	*
Other crops	2,300	2,700	*
Livestock and buildings	800	700	*
Total non-farm use (mosquito control, municipal parks, dry cleaning plants, household use)	18,542	19,672	*
Exports	77,178	94,867	92,915

**Breakdown not available for 1968*

SOURCE: Agriculture Department

The interdepartmental agreement was promulgated by the Agriculture Department in 1964, after the 1963 President's Science Advisory Committee report urged legislation to give the HEW Department greater authority in registering pesticides. Under the agreement, data supplied by the manufacturers are evaluated by three departments—Interior, HEW and Agriculture—before a decision is made on the proposed registration:

• *Interior*—The Fish and Wildlife Service assesses the effects of the pesticides on wild birds, mammals and fish, and their habitat.

• *HEW*—The FDA, which is part of the department's Public Health Service, establishes residue tolerances in raw and processed foods and other agricultural commodities and assesses the effects the pesticide may have on the health of man.

• *Agriculture*—The Agricultural Research Service assesses the safety and effectiveness of the pesticide for controlling pests when it is used as directed on the label.

Except for the Agriculture Department, only FDA has the power to block approval—and only then if it finds that the proposed use is likely to result in residues exceeding the tolerance level. Assessments of the dangers of pesticides to human and animal health by the FDA and Interior Department are not binding on the Agriculture Department during registration.

Attempts to give FDA and Interior more authority and to require the Agricultural Research Service to accept their assessments have consistently failed. A bill containing such a provision passed the House in April 1968 but failed to emerge from the Senate Commerce Committee. It was opposed by both the National Agricultural Chemicals Association and the Agriculture Department.

Enforcement: The Agricultural Research Service is also responsible for enforcing the registration requirements. Procedures for enforcement include criminal prosecution, product seizure, and cancellation of registration for mislabeled products. How well the Agricultural Research Service has pursued this responsibility has become a controversy in itself.

GAO audits: After auditing the pesticide regulatory activities of the Agricultural Research Service, the General Accounting Office (GAO) reported Sept. 10, 1968, to Congress:

• That the service, while acting against misbranded, adulterated or unregistered products at one location, did not determine, in most cases, whether shipments of the same products were available to the public in other locations.

• That in its operating guidelines, the service did not include procedures for determining when shippers who had violated the law would be reported to the Justice Department for prosecution.

• That in 13 years, the service had not reported violators for prosecution. This was true, GAO said, even of firms who were repeatedly major violators.

In a second audit on Feb. 29, the GAO reported that the service continued to permit the use of lindane pesticide vaporizers in food-handling establishments—despite the fact that the Public Health Service and other federal, state and private organizations, including the American Medical Association, had long contended lindane is dangerous to health and that its use in vaporizers could contaminate food. On April 29, the service cancelled registration for lindane in food-handling establishments—almost 16 years after its safety was first seriously questioned by the Public Health Service.

Interagency friction: Rep. L. H. Fountain, D-N.C., chairman of the House Government Operations Subcommittee on Intergovernmental Relations, held hearings in May and June based on the two GAO audits. The hearings revealed that over the years, a good deal of friction has existed between the Public Health Service and the Agricultural Research Service over the health aspects of pesticide registration.

Deputy Associate FDA Commissioner Reo E. Duggan indicated in the hearings that in fiscal 1969, the Agricultural Research Service had registered or re-registered 185 products over the Public Health Service's objections.

Thomas H. Harris, director of the FDA's pesticide registration division, further underlined the conflict between the two agencies. His division, he said, had objected to registering a product that was a proven carcinogen (cancer producer) for laboratory animals. The Agriculture Department, Harris said, told the FDA "that until we could produce evidence that this product produced cancers in human beings from skin contact, that they would continue to register the product."

The key issue here, Harris told the *National Journal*, is whether the FDA should have the responsibility for producing evidence of injury, or whether the manufacturer should have the responsibility for producing evidence of safety. Other health officials agree with Harris that the responsibility should lie with the manufacturer. One, who preferred not to be named, added that as an assurance of human health, the interdepartmental agreement "is not worth the paper it's written on."

Interest groups

The origins of the current debate go back at least to 1962, when Rachel Carson's *Silent Spring* was published and created a public outcry against pesticides. The book spurred the Senate Government Operations Committee to hold hearings in 1963 on the role of DDT and other persistent pesticides in the environment.

The day before the hearings opened, the White House released a report by the President's Science Advisory Committee which called for an orderly phasing out of the use of DDT and other persistent pesticides.

Since then, conservation organizations, such as the Conservation Foundation, the National Audubon Society and the Izaak Walton League, have continuously tried to make the public more aware of the potential dangers of pesticides, such as DDT, which do not readily degrade and remain unchanged in the environment for many years. Consumer groups, such as the Consumer Federation of America, which has 136 member-organizations, also have called for stricter controls on pesticide usage.

The efforts of these organizations, however, has thus far been largely ineffective in bringing about significant changes by Congress or the administrative agencies. More effective have been the efforts of the friends and users of pesticides—farmers, government officials, legislators, and pesticide manufacturers and distributors—to resist further restrictions on pesticide use.

Producer organizations: Representing the producers of the two agricultural commodities on which most DDT is used *(see box)* are the National Cotton Council, which has its headquarters in Memphis, Tenn., and the Tobacco

Growers' Information Committee, of Raleigh, N.C. At its annual meeting in January, the National Cotton Council, which represents both producers and manufacturers, passed a resolution opposing "legislation that restricts the sound development and use of agricultural chemicals." According to a council spokesman, this resolution "has been interpreted" as a stand opposing further restrictions on DDT. The council did not, however, actively oppose a recent Arizona ban on DDT, although Arizona is a major cotton-producing state.

According to William H.W. Anderson, spokesman for the tobacco growers, DDT use is "fading out along with the mule." Anderson points out that there are other, safer pesticides for tobacco that are rapidly gaining acceptance by the growers and that restricting DDT is not likely to be an issue with most growers.

General farmer organizations—such as the 1.7-million-member American Farm Bureau Federation and the National Farmers Union with a membership of 250,000 farm families—have as yet taken no formal position on the DDT controversy. Spokesmen for each indicated, however, that their respective organizations generally hold the view that:

- If DDT adversely affects the environment, its unrestricted use should be carefully evaluated
- Use of agricultural chemicals should not be restricted unless there is sufficient scientific evidence that they are harmful.

Industry representation: The $1.7-billion-a-year pesticide industry is represented in Washington by the National Agricultural Chemicals Association. Within the association is a special task force on DDT, comprised of representatives of the five domestic DDT manufacturers: Allied Chemical Corp., Diamond Shamrock Corp., Lebanon Chemical Corp., Montrose Chemical Corp. and Olin Mathieson Chemical Corp.

The association's position concerning not only DDT but all pesticides is simply that there is nothing wrong with any of them if they are used and handled correctly. "Our basic philosophy," says association president Parke C. Brinkley, "is that there are some safe uses for all the products and some unsafe ones. We don't think a total ban on a product is a very smart way of doing it. It would not be in the public interest."

Congressional support: In agreement with the association's position is Rep. Jamie L. Whitten, D-Miss., chairman of the House Appropriations Agriculture Subcommittee. Whitten, whose 1966 book defending pesticides, *That We May Live*, was largely researched by the Agriculture Department, summed up his philosophy on the DDT-residue controversy during the March 1968 appropriations hearings: "The worst residue problem we have to face today," Whitten said, "is the residue of public opinion left by Rachel Carson's *Silent Spring*."

Whitten and other cotton-belt Members of Congress, who largely control the agriculture committees in both houses through subcommittee chairmanships, represent a constituency that used about 70 per cent of the 40.3 million pounds of DDT applied to U.S. crops during the 1966-1967 season *(See box)*.

In committees dominated by farm-oriented Members, a bill to regulate further the manufacture or application of pesticides usually receives a chilly welcome. Sen. Abraham A. Ribicoff, D-Conn., introduced a bill in the 90th Congress that would require the Agriculture Department to inspect pesticide manufacturers to see if proper precautions and controls were being followed. But the bill died after referral to the Senate Agriculture and Forestry Subcommittee on Agricultural Research and General Legislation. Reflecting on the fate of this bill, Brinkley, told his chemicals association members: "Through the understanding of Congress, and particularly Sen. (B. Everett) Jordan, (D-N.C., subcommittee chairman), we have been given some time to see if the situation might be improved without the necessity of federal intervention."

Administrative defense: The Agriculture Department comes to the defense of farmers and other pesticide users whenever the issue of further regulation arises—and Congress expects as much. Whitten made this clear during the 1968 appropriation hearings when he said: "If the department does not appear on behalf of the farm producers at hearings (on pesticide residues) as to whether it is essential on one side and to question whether it does any injury on the other side, we are in a bad way."

Outlook

Commission agenda: The Mrak commission staff director, Dr. Albert C. Kolbye Jr., is reluctant to discuss the commission's work until its final report is issued in early November. He concedes, however, that the commission's principal concern mirrors that of other key health officials in the HEW Department—the FDA's lack of legislative authority under the Federal Insecticide, Fungicide and Rodenticide Act.

At minimum, these officials contend, evaluations regarding the potential human health hazards of pesticides by the FDA should be binding on the Agriculture Department. As one key HEW official, who did not wish to be named, put it: "If you want us to protect the public health, give us the authority to do it."

One of the issues confronting the commission is the implementation of the Delaney amendment. This provision, named for its author, Rep. James J. Delaney, D-N.Y., is formally known as the Food Additives Amendment of 1958 (PL 85-929) to the Food, Drug and Cosmetic Act (21 USC 301-392). It prohibits the interstate commerce of food with any additive—including pesticides—that has been found to produce cancer in laboratory animals.

On the basis of the Delaney amendment and the National Cancer Institute finding that DDT caused cancer in mice, the FDA apparently could prohibit interstate shipment of food with even the most minute DDT residue. Such a move, however, would remove a substantial amount of food from the U.S. market—according to the FDA's ongoing surveillance program, for example, 20 per cent of all domestically produced canned and frozen food in fiscal 1969 contained some trace of DDT.

Congressional action: While a number of bills have been introduced in both the House and Senate to ban DDT, there is no optimism about getting such bills out of the agriculture committees. An aide to Senate Agriculture Committee Chairman Allen J. Ellender, D-La., summed up the prospects for one bill to ban DDT: "This is hardly the most pressing matter before the committee at this time."

At present, Congressional foes of DDT are attempting flanking maneuvers to by-pass the agriculture committees by amending legislation that has been reported out of committee.

Hart amendment—On July 7, when the Agriculture Department's appropriations bill (HR 11612) passed the Senate, Philip A. Hart, D-Mich., successfully amended the bill to prohibit the department from using in its pest control programs, such as those in national forests, any pesticide that has been banned by the state in which the control program was located. A similar attempt by Rep. Richard L. Ottinger, D-N.Y., to amend the bill in the House May 27 failed, 25-75.

Chances that the Hart amendment will survive a House-Senate conference on the appropriations bill seem slim. But in the view of some DDT opponents, the amendment is a symbolic indication that legislation to reform pesticide policy may be gaining congressional support.

Nelson amendment—Sen. Gaylord Nelson, D-Wis., who has inserted in the *Congressional Record* more than 50 articles on the dangers of pesticides, plans to amend the proposed Water Quality Improvement Act (S 7), sponsored by Sen. Edmund S. Muskie, D-Maine, when it reaches the Senate floor this month.

Nelson's amendment, which is given an excellent chance of survival, would require the Interior Department to establish pesticide residue tolerances as part of the department's water pollution control activities. The tolerances would then become mandatory on states for controlling pollution of interstate rivers, streams and lakes.

States: Two states—Arizona and Michigan—already have banned DDT. California has banned it for home use. Other states, such as Maryland and Wisconsin, are considering banning or greatly restricting its use.

A Senate aide points out that should state bans and restrictions on DDT usage continue, they can be expected to build up considerable pressure in Congress for federal legislation, particularly with regard to residues that may be carried by interstate rivers and to crop spraying that may carry the pesticide across state lines.

White House: Balancing recent state actions, however, was a June 20 statement by Presidential Science Adviser Lee A. DuBridge. At a press briefing before the first meeting of the President's Environmental Quality Council, DuBridge appeared to side with the Agriculture Department and other defenders of DDT: "How can we balance the values of DDT against the dangers? That is the problem and it is not one that is solved easily just by wholesale banning. Every environmental problem has a price....If there is something to replace DDT it may be far more expensive. Who is going to pay the bill?"

Health issue: The questions of human health, raised in the salmon seizures, and of deficiencies in the Agriculture Department's protection of the public, raised by the GAO audits, suggest that the arena for the controversy is shifting from an issue of conservation to one of human health.

Should this shift continue, it is likely that enterprising DDT foes will propose legislation based on health issues rather than on pesticide regulations. Such legislation would be referred to House and Senate health committees, rather than agriculture committees; in the health committees, it would undoubtedly fare better than it has in the agriculture committees.

Even without legislation, however, the use of DDT is declining as more effective pesticides become available. The Agriculture Department reports a 48-per cent decline in the domestic consumption of DDT (although it is still, worldwide, the most-used pesticide) from 78.6 million pounds in 1958-59 to 40.3 million pounds in 1966-67. This trend has carried to the use of DDT by the federal government on public lands. Three years ago, then Interior Secretary Stewart L. Udall banned DDT from Interior Department lands. The Agriculture Department, which sprayed 4.9 million acres of national forest in 1957 at a rate of about one pound of DDT per acre, used only 81 pounds last year.

These trends raise the possibility that, with or without further federal action, one congressional aide may be right when he says: "DDT's days are numbered."

(Whereupon, at 12:15 p.m. the committee was recessed subject to call.)