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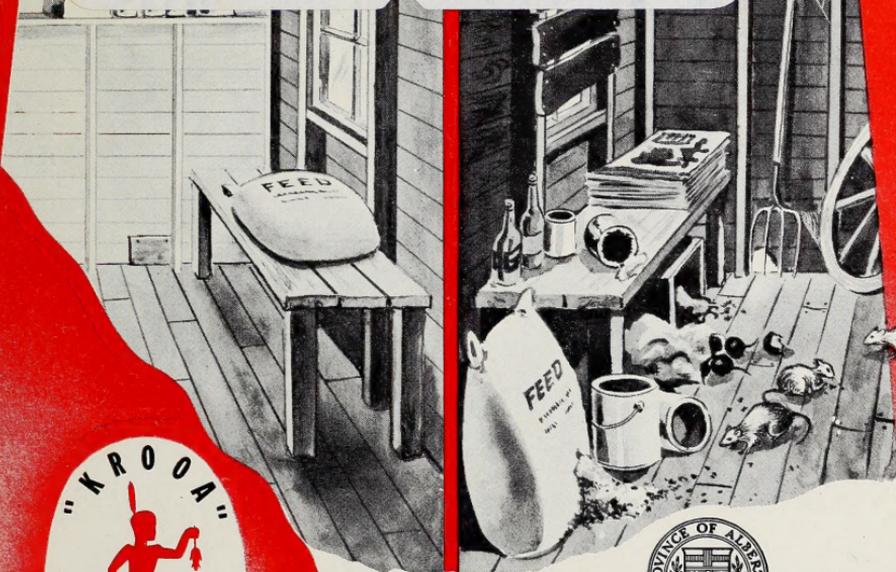
RAT CONTROL IN ALBERTA

PREPARED BY

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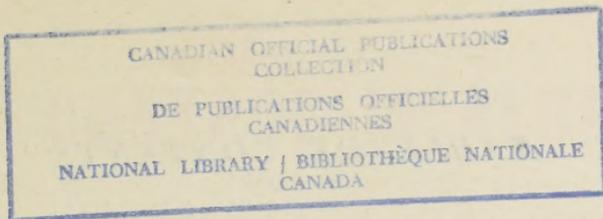
~~RECEIVED ALBERTA PEST CONTROL SERVICE~~



FIELD CROPS BRANCH
Published by Direction of
HON. L. C. HALMRAST
Minister of Agriculture



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Foreword

There is no other rodent in the world which is so widespread and which has so outwitted man to exterminate it, as the rat. While a small group of persons are devoting their time to control rats, a large percentage of the population are at the same time, providing the rat with comfortable shelter and plenty of food. If such conditions are allowed to continue, then the most ingenious methods and the best poisons will never exterminate rats. Rat control is everybody's job. All persons, rural and urban, must become rat conscious and assume their share of responsibility. The important thing that must be done is to deprive the rat of its food and shelter and thus threaten its very existence. This means the rat-proofing of buildings, careful and proper disposal of garbage and the utilization of modern and approved agents for destruction.

To the best of our knowledge, Alberta was the only Province or State on the North American continent, prior to 1950, that was considered rat free, when a few rat colonies were discovered in a narrow strip paralleling the eastern border. The Department of Agriculture was charged with the responsibility of resisting this invasion. A program to deal with this threat to the Province has been organized in an attempt to get our citizens to take positive action against this pest.

This bulletin deals briefly with the organization of the rat control program in the province and with some aspects of the various rat control methods which could be used in Alberta. It is intended that this bulletin will provide useful information for farmers and others on how to prevent rat infestations as well as how to cope with any established rat colonies.

O. S. LONGMAN,
Deputy Minister.

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CROP PROTECTION SERVICE AND
PEST CONTROL

A. M. WILSON

FIELD CROPS COMMISSIONER

PART 1 — ADMINISTRATION AND POLICY

GENERAL



The brown or the Norway rat is one of the worst pests in the world. It destroys property and consumes the food of man. It is a serious menace to:

- (1) Agriculture — destroys grain, poultry, eggs, undermines farm buildings.
- (2) Home — can live in basements, raid the pantry.
- (3) Industry — does untold destruction to stored merchandise.
- (4) Health — spreads bubonic plague, intestinal diseases, trichinosis, other diseases.

Many authorities estimate that the damage done by one rat amounts to \$20.00 per annum. At a rapid rate of reproduction (one pair of rats may equal up to 50 or more in a year) the damage

and financial loss can soon build up to the million dollar mark. In the U.S. alone rats damage 200 million bushels of grain yearly — the annual rat bill in that country is over 2 billion dollars. It can be calculated that when rats become established in Alberta the annual loss will be in the neighborhood of 25 million dollars. Without a doubt, the rat is a most expensive boarder wherever it is present.



RATS IN ALBERTA — A Brief History



A colony of rats was located on a farm near Alsask in the summer of 1950 by fieldmen of the Department of Health, Division of Entomology. This colony was quickly eradicated. It was claimed that this was the first evidence of rats actually established in Alberta. In the fall of 1950, rat control in the province was transferred to the Department of Agriculture,

Field Crops Branch. Immediate rat surveys conducted by the Department revealed that by the spring of 1952 there were 39 colonies of rats established in Alberta in the area between Empress and Consort in Ranges 1 and 2. Even early in 1951 it was already recognized that the rat threat to our province was a reality.

Under the authority of the Agricultural Pests Act it became the legal responsibility of every person in this province to destroy Norway rats on his premises. Every municipality, city, town and village was asked to appoint a local pest control officer to be responsible for rat control in his area. There are over 200 pest control officers appointed now, working closely with the Department. Most of these are actively engaged checking various reports on rats in their areas and encouraging the local authorities to clean up potential rat harborages and to maintain sanitary conditions. Much remains to be done in this regard.



To aid local authorities to destroy rat colonies along the 4th Meridian, the Department employed the services of rat exterminating crews to eradicate existing colonies and prevent further rat infestation in infested areas. This work was commenced in June of 1952 and completed in July, 1953. During that time over 140,000 lbs. of special rat contact powder was placed under all buildings where rats were present or could become established readily in the area between Medicine Hat and Provost, covering Ranges 1, 2, 3, 4 and in some instances, Ranges 5 and 6. This contact powder was placed on some 2,700 farmsteads involving over 8,000 buildings. It should be mentioned that in the work done by the exterminators many old buildings were torn down, while others were lifted up, etc., in a manner that rats could not establish themselves under them.



To acquaint Alberta citizens with what the rat looks like, the Department has prepared over 50 mounted rat specimens. These have been placed in the offices of all District Agriculturists, the Schools of Agriculture and at other places where the public can make a first hand inspection of the rodent. Specimens are presently displayed at all Agricultural meetings and short courses.

ORGANIZATION

Because rat invasion is threatening Alberta, we need to be properly organized and know what to do, in order to fight the battle successfully. Here are a few "musts" if timely action is to be taken and establishment of rat colonies prevented:

(1) Every Municipal District, County, Special Area, Village, Town and City must appoint a local pest control officer, if not done already, to be on the lookout for rats. The name and address of this officer should be mailed to the Field Crops Commissioner, Alberta Department of Agriculture, Edmonton.

(2) This local pest control officer should become acquainted with his District Agriculturist and work closely with him.

(3) No person should spare any effort to kill every Norway rat he sees. Any person who kills a rat or suspects the presence of rats must report this information to his local pest officer or the District Agriculturist in that area.

(4) There are various methods of controlling rats. Some methods are more effective than others depending on the particular case and situation. The local Pest Control Officer, together with the District Agriculturist where possible, will provide instruction on the proper use of approved methods, and supervise and/or apply such methods, as in their opinion, are warranted.

(5) The Department of Agriculture employs provincial pest officers to aid in the co-ordination and supervision of any approved rat control program in the province, and assists in any local program which may be undertaken by any organization. It also issues timely posters, pamphlets and other vital information to aid in any campaign.

RAT CONTROL POLICY

The following is the present provincial rat control policy under which rat control is undertaken and approved poisons supplied. It is

understood, of course, that this policy is subject to change where a change would be more effective in controlling rats. Every municipality, etc., will be immediately notified if any change occurs:

(1) Every person shall take active measures to prevent the establishment of rats upon any lands or premises, owned, occupied or controlled by him.

(2) Every person shall take active measures to destroy any rats which may be found upon any land or other premises owned, occupied or controlled by him.

(3) Any municipality, upon application to the Field Crops Branch of the Department of Agriculture will be supplied with Warfarin and/or other approved poisons for rat control.

(4) Warfarin will be supplied free of charge to any municipality on condition that the municipality appoints one or more Pest Control Officers and complies with other requirements of the Agricultural Pests Act and regulations made thereunder.

(5) The Municipality shall issue to the owner or occupier of land or premises, such quantity of this rodenticide as the Pest Control Officer may consider necessary for the prevention and/or extermination of rats.

(6) Any person to whom the approved rodenticide is issued shall use it in a manner as directed by the officer.

(7) The Department of Agriculture will supervise and assist local Pest Control Officers in co-ordinating and administering the control program in their area.

PART II — RAT CONTROL METHODS

Permanent control and final eradication must be the objective of any effective rat control program. Once started there can be no slackening off. Sporadic campaigns will only reduce temporarily the number of rats which will soon grow up to their original numbers.

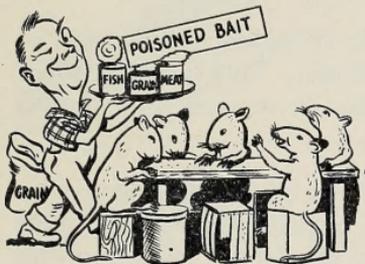
To be effective any program must incorporate four major phases of control:

- (1) Destruction of rats.
- (2) Elimination of rat harborages.
- (3) Elimination of food supply of rats.
- (4) Rat-proofing of buildings.

Such a program should receive attention at all times of the year and must have the whole-hearted co-operation of all concerned.

1. Destruction of Rats

The most efficient means of destruction of rats is by the use of poisons or rodenticides. Various poisons have been found to be effective — Red Squill, Antu, Barium Carbonate, Zinc phosphide, 1080, Thallium sulphate, Arsenic, Strychnine alkaloid and others. Very recently two new compounds have been added to this list; one known as Warfarin and the other as Pival. Of these only Red Squill, Warfarin, Antu and Pival can be recommended for the less experienced operator since the remaining ones are extremely poisonous and very dangerous to humans and livestock.



Poisons for Rat Control

(a) RED SQUILL.

Mix red squill with bait material in the proportion of one to nine; that is, the resulting mixture should contain 10% red squill. Any of the following foods can be used as baits:

Meats — hamburger steak, sausage, salmon, sardines, fresh fish (meats to be thoroughly ground in a meat chopper.

Cereals — bread, cornmeal, rolled oats, — should have milk or water added, and stirred to a mushy consistency.

Fruits and Vegetables — apples, melons, carrots, etc., to be cut into small pieces (an average apple into 24 parts) and poison dusted over.

When dry cereal is used as the base, red squill should be added to the dry ingredients and mixture stirred thoroughly before water is added. When meat or fish is used, a thin paste of red squill and water is prepared (avoid lumping) and this is then blended with bait material.

REMEMBER :

- (1) Use 1 oz. red squill to about 1 lb. bait material.
- (2) Fruit and vegetable should be cut into $\frac{1}{2}$ -inch cubes.
- (3) One cube of fruit or a small teaspoonful of mixed bait is sufficient for the average rat.
- (4) Offer a choice of foods for bait — greater chance for the bait being taken by the rat.
- (5) Red squill may kill from 60% to 90% of the rats in from 48 to 96 hours

(b) ANTU (ALPHA NAPHTHYLTHIOUREA)

This poison kills the rat by causing an accumulation of body fluids within the chest cavity thereby drowning the animal. Dogs, pigs and young chicks are easily killed by Antu. Other domestic animals are

somewhat resistant to this poison — nevertheless it should always be handled as a poison.

Use the same food baits as for red squill. Only 1½% concentration is required in baits. Mix it with ground food, or dust over fruit and vegetable cubes. It may also be placed in drinking water.

Rats receiving less than a lethal dose of Antu build up a resistance and a strong dislike for it. If tolerance has been built up, Antu should not be used again for a period of about 3 months.

(c) **WARFARIN***

This poison belongs to a class of anti-coagulant compounds, of which, basically dicumarol is the active agent. This material when taken internally, produces painless deaths to animals by causing internal bleeding.



Warfarin is an effective poison for the control of Norway rats and house mice. Baits appear to be readily accepted by these rodents. More than a single dose is necessary for effective control. It must be ingested about 4 or 5 times within a 10-day interval. Experiments further indicate that intervals between feedings should not be longer than 48 hours.

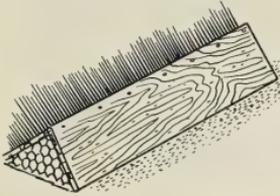
Hence ample quantities of bait should be available at all times during the baiting program. Further experiments show that a marked reduction in bait consumption and damage, occurs after the third day of treatment.

A 0.025% Warfarin concentration in baits is recommended for rat and mouse control. This is so low that there appears to be a minimum of danger to other animals. Cereal-type baits can be used effectively, and since this is not very attractive to most flesh eating animals, the danger to such animals is further reduced. Poultry have been found to be very resistant to this chemical. Baits containing Warfarin should be at least as attractive as other food which is available to the rats. Equal parts of yellow cornmeal (preferably coarsely ground) and rolled oats are excellent cereal type baits.

* In case of Warfarin poisoning, vomiting should be induced at once and a physician called immediately. Manufacturer's recommendations state that the doctor's treatment should include transfusion with whole blood and intravenous and oral administration of Vitamin K preparations as in the case of hemorrhage caused by dicumarol.

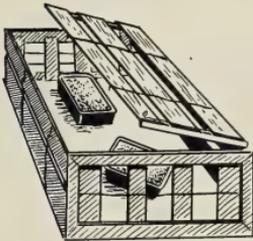


Warfarin is sold as a 0.5% concentrate. Hence use one part by weight of Warfarin to 19 parts by weight of bait to get a 0.025% poison concentration. Sometimes a small quantity of mineral oil is added to prevent excessive dusting of the cereal bait. This poison is only slightly water soluble, hence is not satisfactory as a water bait. There is, however, an attempt being made to have a desirable water soluble warfarin on the market. Ready-to-Use Warfarin Bait Mixture requires no addition of bait and can be set out as packaged.



If possible all baits should be placed where domestic animals and children can be excluded. Simple feeding stations or bait boxes (see diagrams, page 16) may be constructed to cover the bait, particularly where exposed bait may be a hazard.

It is suggested that from 2 oz. to 1 lb. (depending on the suspected rat population) of prepared bait be placed in each location where rats are present. Feeding stations or places should be inspected every few days at first to replenish bait and check on amount consumed. Thereafter inspections can be made at periodic intervals.



Warfarin is promising to be one of the most effective rodenticides for rat control. Pre-baiting is not necessary when using this poison.

d) PIVAL

Pival is another anti-coagulant rodenticide similar to Warfarin in its action. In addition to its anti-coagulant action against rats and mice, it also has insecticidal and mold deterrent values. This is an important factor in its favour as it will prevent the introduction of cereal infesting insects such as the rusty grain beetle and others into insect-free grain storages, bakeries, retail stores, etc., where baits may be stored or set out.



Like Warfarin, Pival is available in 0.5% concentration, and should be prepared to a 0.025% concentration for actual use. The recommendations for preparation are the same as that for Warfarin, namely, one part (by weight) of 0.5% Pival concentrate to 19 parts of a cereal mixture.

A water solution prepared from a sodium salt Pival compound (0.005% Pival water solution) has been tested and shows promise of becoming another valuable medium for the control of Norway rats.

Pival has been recently tested by government institutions in many areas in the United States with satisfactory results. It has only recently been made available in Alberta and it is expected that Pival along with Warfarin, will be used more extensively in Alberta in the future.



A Word About Baits

Baits must be mixed just right — not too little nor too much poison. Bait materials should be fresh and should be changed about every 24 hours as they are most acceptable when fresh.

Baits should be placed in rat travelways and harborages. They should be placed undercover — a board or box can be leaned against the wall where there is an entrance directly into an open space (see samples of suggested feeding stations). It is better to put out more bait than may be deemed strictly necessary. Baits should be small — $\frac{1}{2}$ -inch cubes, size of marble, etc. The odor of the human hands on baits is undesirable. There are instances, however, where human scent was not a factor in bait consumption by the rat. Rats are familiar with human scent and will not touch handled bait.



FUMIGATION

Baiting may be supplemented by fumigation with calcium cyanide or carbon monoxide (car exhaust gas). Among other fumigants these two are highly recommended. Fumigation is most successful in burrows, where gas concentrations can be built up rapidly.

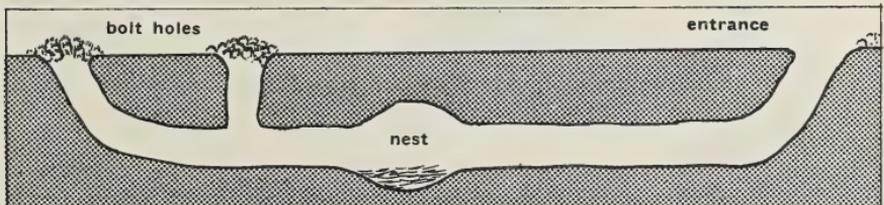
Calcium Cyanide* dust, upon contact with moisture in the air or soil, forms a very poisonous gas (hydrocyanic or prussic acid) which kills rats in a few minutes. The dust is forced into burrows with a regular hand or

pump type dust gun. It should be used out of doors and away from buildings that house people or livestock. **Calcium cyanide is a deadly poison and should only be applied by trained persons.**

Calcium cyanide when exposed to the air leaves a non-poisonous residue. The gas created is soon dissipated in the surrounding air, so hay and other crops are not rendered poisonous by its use if they are well exposed to the air for two days.

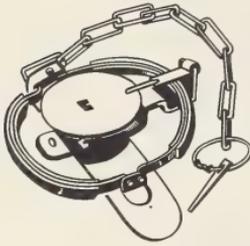
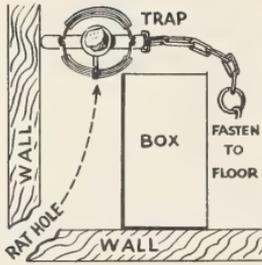
Carbon monoxide gas (car exhaust) is effective at high and low temperatures. An adapter to fit any car or tractor can be easily made with little expense from some cylindrical connection, a male connection such as is used on common garden hose, and a hose clamp. With tight hose connections to the exhaust pipe at least 100 feet of hose may be used without much loss of gas. The gas motor should be adjusted to operate a "rich" gasoline and air mixture and run at moderate speed for about 10 minutes for each burrow. All exit holes should be blocked to prevent dissipation of gas. This method of gassing is far less dangerous to the inexperienced operator than the use of calcium cyanide.

*Regulations made under the Public Health Act prohibit the use of calcium cyanide in or under any buildings except where fumigation is carried out by a licensed fumigator in possession of a permit issued by the Provincial Board of Health.



SIDE VIEW OF RAT BURROW

TRAPPING



In trapping rats, placing the baits properly is far more important than the selecting of a bait for the trap. Rats shun open spaces. Their instinct for stealth and protection causes them to run behind any object that is placed or leaning against the wall. It is in such places that traps should be set. Baits on traps —bacon strips, fresh fish, or other baits mentioned should be tied firmly to the trigger to prevent them being easily taken away without springing the trap. Traps that had dead rats in them for some time or rat blood adhering to them may be scalded with boiling water before using again — at least the blood should be scraped off.

Trapping is difficult where there is an abundance of food within easy reach of the rat. All food, but baits should be removed. Change the baits on traps frequently and keep traps clean. The mature rat is wise to much that is going on around him. Watch his movements and use your ingenuity to outwit him.

2. Elimination of Rat Harborages



The brown rat lives underground, beneath stored materials, within double walls and in similar enclosed places. Unless these places are destroyed or eliminated, so that the rat will not have a place to live, any extensive baiting or trapping program will only be partly effective. After a thorough poisoning program, all such harborages should be eliminated. All burrows should be broken up. Stored materials should be placed on racks 12 to 18 inches off the ground. If materials are worth keeping, they are worth storing properly.



Piles of trash with weeds around them offer excellent harborages. Remove these at once! Buildings should be placed off the ground or on concrete foundations (see "Rat Proofing"). Fence posts, lumber, etc., should be piled on sawhorses off the ground — at least 12 inches — so that there will be light present underneath. Rats don't like light. Rip up dead spaces where rats can hide, or seal them permanently.

3. Elimination of Food Supply for Rats



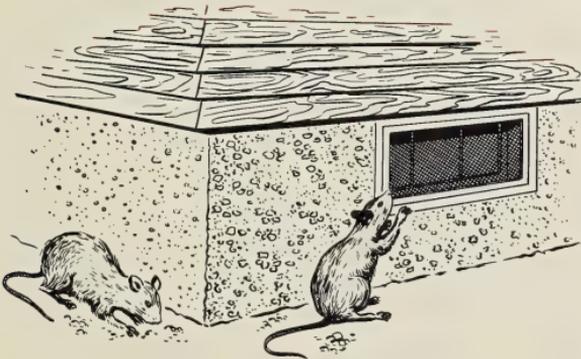
Rats can't live without food and shelter. Eliminate these two and the premises lose their appeal for rats. Open garbage and trash heaps should not be permitted. No food or garbage should be spilled on the ground. Don't give the rat a free meal — put waste into garbage cans and cover with a well fitting lid. In cities and towns unsightly dumps should be eliminated. If complete burning is

not possible, the debris should be buried about 3 feet deep. Local Pest Control Officers should make it a point to encourage everyone to :

- (a) put away waste food where rats can't get at it.
- (b) provide good garbage cans with lids that will fit properly and can be kept in place.
- (c) burn or bury properly dump piles in cities, towns, villages and hamlets.

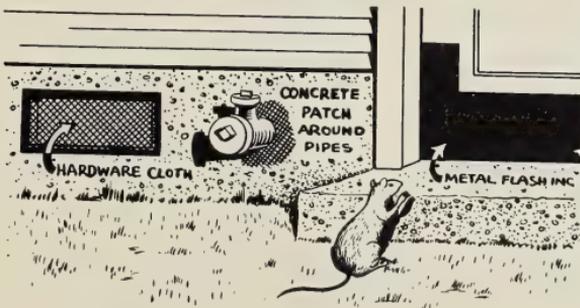


4. Rat-proofing Buildings



Rat-proofing buildings is one of the major factors in rat control. Once the bulk of the rat population is destroyed and harbors eliminated, buildings should be made rat-proof to prevent reinfestation.

If possible all foundations in new buildings should be concrete and extend at least 2 feet below ground as well as at least 18 inches above the ground. All openings must be tightly sealed where utility lines enter the building, around drains and where conduits penetrate the foundation wall. Ventilation grids and louvres should have no



opening greater than one-half inch. Rats will squeeze through anything larger than that.

Outside walls at the junction with the foundation will afford access to rats if there is space between the beam and studding. Spaces here should be sealed with concrete or brick. Tops of foundations should be at least 18 inches above ground to protect the wood structure resting on it from rats chewing through.

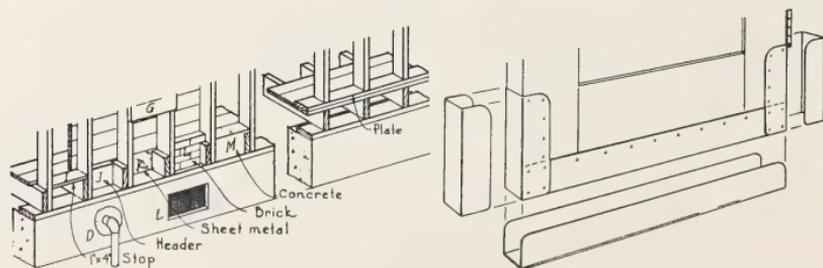
Hardware cloth of $\frac{1}{4}$ -inch or $\frac{1}{2}$ -inch mesh (at most) is useful in excluding rats from openings that cannot be closed with brick, or cement. Edges of doors or other openings where rats gnaw should be protected with metal sheathing. Sheet metal of 26 gauge is good rat-proofing material.

Farm buildings such as a granary on piers or skids, should be at least 18 inches above ground to allow good lighting, ventilation, and easy access by dogs and cats. Rats do not like light.

Old floors a few inches above ground should be replaced and laid directly upon well drained, well packed soil, or upon a base of compacted cinders, gravel or stone. Concrete floors are best. Treating wood floors with creosote may aid in preventing rat damage.

Often poultry houses offer quite a problem. Avoid the following when planning a poultry house: Wooden floors, floors close to the ground, double walls, and the placing of fixtures in such a way as to shelter rats. Hollow walls or spaces between studs are dangerous as these afford harborages. Ventilators should be covered with wire netting and the doors sheathed with metal. Walls in barns or poultry houses should be protected from rats by filling the wall above the sill to a height of at least 10 inches with concrete or bricks, or a strip of $\frac{1}{2}$ -inch hardware cloth or galvanized sheet metal 18 inches wide be placed under the inside wall lining.

Doors should fit closely to the frame. If more than $\frac{3}{8}$ inch from the frame they should be rat-proofed by proper use of metal channels.



Basement windows should have no broken panes and should fit tightly.

It is questionable whether rats can be effectively held out by a wire wall. If this is attempted, such wire should be sunk into the ground at least 2 feet and installed in the ground in the form of an "L" so that 1 foot of the wire is extended outside the enclosure. The top of such wire should also protrude about 1 foot outside and then bend down vertically again. If possible some obstruction should be placed on the top end of the wire. Rats are extremely agile; difficulty may be experienced to hold them out by wiring. Any wire must have a mesh not greater than $\frac{1}{2}$ inch and the quality must be equal at least to that of the hardware cloth.

ANTIDOTE FOR POISON

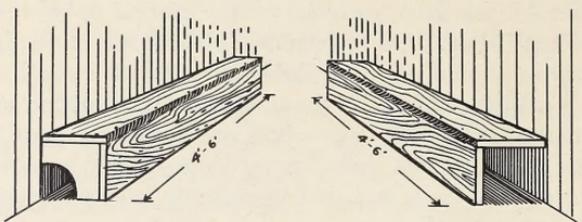


For poisons like Red Squill and Antu induce vomiting by inserting finger in the back of the throat, or by giving an emetic of either mustard or salt dissolved in warm water. Follow vomiting with a liberal dose of Epsom salts. Call a physician immediately.

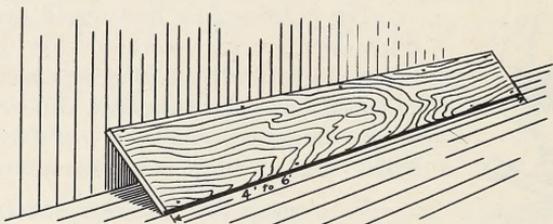
For poisons like Warfarin and Pival induce vomiting as above and call a doctor immediately. Treatment should include transfusions of whole blood and intravenous and oral administration of Vitamin K preparations as in an overdose of dicumarol.



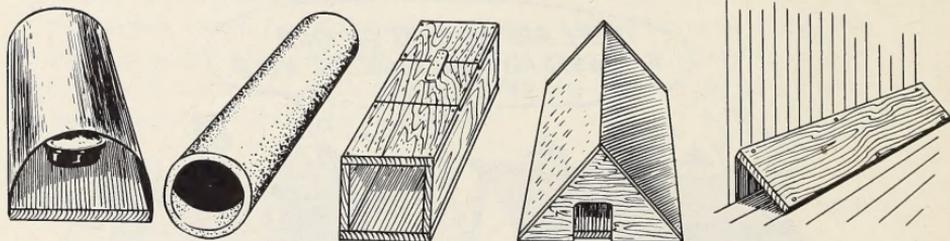
EXAMPLES OF PROTECTED FEEDING STATIONS



Simple bait stations for temporary bait placement. Use 1" x 8" lumber, preferably 4 to 6 feet long. Fasten securely.



Baits can be placed behind boards leaned against walls. Use 1" x 8" or 1" x 10" boards, preferably 4 to 6 feet long. Fasten securely.



Sample forms of other bait boxes.

ACKNOWLEDGMENT

Valuable assistance in the preparation of this bulletin by J. B. Gurba, Assistant Supervisor, Pest Control, and in editing by E. B. Swindlehurst, Research Information Editor, is hereby gratefully acknowledged.

OTHER AVAILABLE PUBLICATIONS ON PEST CONTROL

Baits, Sprays and Dusts for Grasshopper Control	Bulletin No. 85
Grasshopper Bait Spreader	Blue Print
Grasshopper Forecast Map for Alberta.	
Sweet Clover Weevil Control	Mimeograph
Insects Infesting Stored Grain	Mimeographs
Ergot in Seed and Feed	Mimeograph
Directions and Precautions for Using Coyote Getters	Leaflet
Poisons for Coyote Control	Bulletin No. 3
Kill Rats with Warfarin	Leaflet
Information Concerning Pocket Gophers	Mimeograph
Magpie and Crow Trap	Mimeograph

See your District Agriculturist
or Write
FIELD CROPS BRANCH
Alberta Department of Agriculture
EDMONTON, ALBERTA



"KROOA"



**KEEP RATS
OUT OF
ALBERTA**

ALBERTA DEPARTMENT OF AGRICULTURE