Series *Number 2*

BULLETIN

United States Live Stock Sanitary Association

Foot-and-Mouth Disease

DR. A. D. MELVIN
DR. JOHN R. MOHLER

PRESENTED BEFORE THE 18TH ANNUAL MEETING
AT CHICAGO

PRICE 25 CENTS

February 16, 1915

Foot-and-Mouth Disease

By A. D. Melvin and J. R. Mohler, Washington, D. C.

Like a bomb from an aeroplane the 1914 outbreak of foot-and-mouth disease was precipitated upon the live stock industry of the United States with almost an explosion-like effect. How it was introduced, or whence it came remains as deep a mystery today as at the beginning of the outbreak, although many suggestive clues have been thoroughly investigated and disproved. Theory after theory has been exploded, and there remain but two lines of investigation to be completed before we exhaust all evidence at present available relative to the introduction of the disease.

It would be useless to go into the history of these negative investigations, but suffice it to say that the Department has traced the possible origin of the disease all the way from imported biological serums and antitoxins to irresponsible stories which indicated that infection had been accidentally brought to this country by Belgium refugees in the vicinity of Niles, or had been intentionally disseminated by men equipped with hypodermic syringes, hoping to interfere with the exportation of meat to the warring countries in Europe.

It seems probable that the first appearance of the disease in this outbreak was among the hogs of a farmer living two miles west of Niles, Michigan, about the middle of August, 1914. These hogs had never been vaccinated for hog-cholera, nor fed on milk from any creamery, as the owner separated the milk from his own cows on the premises.

Three possibilities as to the method of their infection have been developed. The first is in connection with the return of the farmer's wife from a visit to New Orleans where her granddaughter had been recently vaccinated against smallpox. This possibility is rather remote, but is nevertheless under investigation at present.

The second is in connection with the purchase by the farmer of merchandise from a Chicago firm, including two pairs of lisle gloves imported from Germany. The paper used in packing and wrapping these goods was thrown into the hog lot about ten days before the hogs began to show the disease which subsequently proved to be foot-and-mouth disease.

The third possibility is in connection with the stealing of chickens from the farm a short time before the appearance of the affection among the hogs. The farmer suspected that the chickens were stolen by foreigners employed in a neighboring tannery, though he has no evidence upon which to base this suspicion. He thought that possibly the disease may have been brought to his premises by one of these suspected men, who might have become contaminated with the virus from some imported article used in the tannery. Diligent inquiry has been made at this tannery, and it is evident that imported hides can not be even remotely incriminated, as the last importation was made more than eighteen months before the outbreak.

The plausibility of the above suggestion, however, lies in the fact that certain tanning materials are imported in large quantities monthly from Argentine and Japan, where foot-and-mouth disease constantly prevails. These products are brought into the tannery covered with matting or small burlap bags, which articles are frequently taken home by the tannery employees for household purposes. Our investigations along this line are still in progress, but thus far without definite results.

Within two weeks after the first hogs became sick, the disease spread to the cattle on the premises, and simultaneously the cattle belonging to a neighbor developed peculiar symptoms. Each of the farmers called in a different local practitioner, one of whom several days later notified the State authorities of

the conditions present, and requested assistance. The first information that reached Washington was a telegram from an assistant inspector at Detroit on September 3, stating he intended to visit Niles, Michigan, to investigate a possible outbreak of aphthous fever at the request of the State Veterinarian. The following day a telegram was received stating that no foot-and-mouth disease in Niles, Michigan. Characteristic lesions of necrotic stomatitis present. On September 4 a letter confirming the telegram was sent to Washington, which contained a very good description of the retrogressive character of the pathological lesions in the two herds of cattle, but this description could be applied to a number of conditions in no way related to foot-and-mouth disease. It was stated that the ulcers had been replaced by new tissue, and the external ulcers about the lips and feet exhibited the scab formation characteristic of lip-and-leg ulceration with new epithelium replacing the granulating surfaces. Not a suspicion was incorporated in either telegram or letter. Had more attention been given to the history of the disease, and less consideration given to pathological phraseology, or had the statements been made of existing conditions to the effect that 50 of the 50 cows in one herd, and 20 of the 21 cattle in the other herd were affected with these peculiar lesions, some suggestion of the character of the infection would have been implied.

Nothing further was heard from the disease in Michigan until the afternoon of October 10, when a letter arrived from the inspector in charge of the Detroit force, to the effect that the disease had spread during the interval from the original two herds to six additional herds in the neighborhood. While this letter contained reasons why the lesions resembled foot-and-mouth disease, and other reasons why they did not, nevertheless the history of the various herds was so completely described that no affection other than foot-and-mouth disease could suggest itself. Therefore, Dr. Eichorn was sent on the next train to investingate and report. The three specimens from the lesions of the affected animals, forwarded in glycerine, were turned over to Dr. Mohler, who immediately proceeded to the experiment station at Bethesda, Maryland, and that evening inoculated three calves, each receiving an intravenous injection, as well as inoculation of the dental pad. On October 12, Dr. Eichhorn wired: "Clinical diagnosis positive. Advisable Mohler leave tonight via Buffalo directly to Niles." The following reply was sent by Dr. Melvin: "Calves inoculated with Schaffter specimens being closely observed by Mohler. If don't develop symptoms next forty-eight hours Mohler will leave for Niles. You should inoculate calf to confirm diagnosis." On the same date, October 12, the state veterinarian of Michigan was sent the following telegram: "Advisable that farms where animals now show symptoms of foot-and-mouth disease be placed in temporary quarantine until time for experiments on other animals." As inoculated calves showed no lesions within the forty-eight hours mentioned, Dr. Mohler was directed to proceed to Niles to confirm the diagnosis, and took with him Dr. Houck who was to be left in charge of the eradication work, as well as Drs. Gallagher and Smith of Washington. They arrived at Niles at 6:30 p. m. on October 15, and immediately were piloted by Dr. Eichhorn in an automobile to see some of the infected animals. By means of a pocket flashlight, the lesions of the natural cases, as well as the calf which Dr. Eichhorn had inoculated in the meantime were examined, and the following night-telegram was immediately sent by Mohler to Washington: "Lesions of inoculated calf slight but typical. Examined tonight number infected cattle. Indisputably European disease. Reports just received indicate 39 Michigan farms infected. Seven in Indiana. Need fifteen additional men." Thus the campaign of eradication was launched.

That the glycerinated specimens were reduced in virulence was evident by the results of inoculation at Washington, for while the Eichhorn calf with only a scarified dental pad developed lesions of the disease in three days, the infection in the first Washington calf had a period of incubation of seven days, the second case nine days, while the third calf never developed any symptoms whatsoever. In this connection, it should be remembered that the intravenous inoculation of foot-and-mouth disease virus is supposed to be the most rapid and certain method of inoculation with a period of incubation of from six hours to five days. The virus of the disease at the beginning was evidently low in virulence, and the dissemination of the infection was consequently very slow as indicated by the small number of herds to which the disease had spread from August to October.

During the forty-eight hours following the confirmation of the diagnosis, much scouting was done to ascertain approximately the boundaries of the infection, and as a result the Secretary of Agriculture issued an order on October 19 quarantining Berrien and Cass counties, Michigan, and Laporte and St. Joseph counties, Indiana. In the meantime, the co-operation with the State authorities was effected, and measures instituted for tracing, checking and stamping out the disease. While the quarantined territory was believed at first to circumscribe the centers of infection in that section, the disquieting information was disclosed that a mixed shipment containing 28 hogs, 3 cows and 54 sheep had been sent on October 6 from the vicinity of Niles to Chicago. Almost simultaneously it was discovered that the milk from an infected herd had been taken to a creamery daily for the previous two weeks, and the return of the infected skimmed milk to the patrons of this creamery resulted in the rapid spread and almost spontaneous appearance of the disease on thirty-six farms, which number increased to over one hundred before the creamery could be closed. The hogs in the Chicago shipment were among the first to receive this contaminated skimmed milk, and their shipment to Chicago before the development of the disease probably infected the cows and sheep in the car as well as the Union Stock Yards of Chicago. From this point infection was carried by various shipments of live stock, especially the classes of cattle known as stockers and feeders from the Chicago stock yards to various parts of the country north, east, south and west.

About this time the products of a certain hog cholera serum company in Chicago became infected with the virus of foot-and-mouth disease. A careful investigation developed the fact that no serum shipped out from the plant of this company was contaminated with foot-and-mouth disease. One lot of virus, however, was so contaminated. This lot of virus was comparatively small, it being composed of 3400 c. c. of blood obtained from four pigs. These pigs were not purchased sick in the stock yards, but were well at the time they entered the establishment on October 16. They were then inoculated with hog cholera virus with the intention of using their blood in connection with administering the serum-simultaneous treatment. On October 26 these hogs were killed to furnish hog cholera virus.

The lesions found in these four pigs were only those of acute hog cholera, but evidently they were also in the incubative stage of foot-and-mouth disease. It is a well-known fact that the virus of foot-and-mouth disease is present in the blood only in diluted quantities and then only at the beginning of the fever, before the vesicular eruptions appear. The blood will carry the virus of foot-and-mouth disease without possibility of detection except by animal inoculations, when the hogs are killed at this stage. The blood from these pigs was mixed and most of it was shipped out to customers of the concern in Ohio, Indiana, Illinois and Iowa. On November 3, the inspector in charge of the plant had his suspicions aroused by sickness appearing in certain hyperimmunized hogs. This was late in the day and he visited the plant at daylight on November 4. He immediately quarantined the plant for foot-and-mouth disease, because the hogs noticed sick the evening before were worse and showed lesions of foot-and-mouth disease. All of the employees and the entire establishmnt were disinfected, and the plant still remains under quarantine. The infection of the plant was due either to the promiscuous passing of the owners and employees of the company to and from the infected Chicago stock yards, or to the purchase of hogs exposed in those yards.

The disease has so far been found in the following twenty states, namely: Connecticut, Delaware, Indiana, Iowa, Illinois, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Montana, New Jersey, New Hampshire, New York, Ohio, Pennsylvania, Rhode Island, Virginia, Washington and Wisconsin; in addition two herds were found infected in the District of Columbia. The Secretary of Agriculture has quarantined all or portions of each of these states, and local quarantines have been imposed by the State authorities.

As an illustration of the manner in which the disease was disseminated, it may be interesting to refer to the feeders which went from Chicago to Montana, a very unusual occurrence, and were held up at Glendive, Montana, on account of showing symptoms of foot-and-mouth disease. These cattle had passed through several public stock yards enroute, and before it was known that they

had become infected, a shipment of dairy cattle from clean territory in Wisconsin was unloaded for feed, rest and water in the contaminated yards. When the dairy cattle reached Spokane, Washington, the disease manifested itself, and the cows as well as the pens where they were yarded were cremated without giving rise to any secondary centers of infection.

Since the reinfection of the Chicago yards during the middle of January, another consignment of twenty-six dairy cows from clean farms and free territory in Wisconsin has likewise carried infection to a distant point, but this time the state infected was Kansas. These cows were held outside the Chicago stock yards for thirty-four hours owing to the failure of the owner to request a health certificate from Dr. Eliason. While the mails were carrying the correspondence to and fro, the owner of the cattle visited the Union Stock Yards, and evidently carried the virus back to his Holstein cows. When they arrived at their destination the herd was divided and placed on two farms. About eight days later symptoms of foot-and-mouth disease developed, causing four counties in Kansas to be placed under quarantine as recently as February 1.

Instances of this nature showing the intensely infectious character of the disease could be recorded indefinitely, but this feature will probably be dwelt upon by some of the other speakers this afternoon.

The first three outbreaks, in 1870 in western Massachusetts and eastern New York, about 1880 in several lots of imported animals, and in 1884 in the vicinity of the quarantine station at Portland, Maine, were comparatively insignificant; those in 1902 and 1908 were more grave; while the present infection is by far the most serious and extensive of all.

The type of the disease in 1870 appears to have been quite mild, which, together with the restricted movement of both live stock and persons which obtained at that time, accounts for its failure to become more disseminated.

The other outbreaks in the 80's were likewise mild, and restricted to only a few herds, so that the dissemination of the virus was quite easily controlled.

In the 1902 outbreak, cases were found on 205 premises in twelve counties of four states, while in the 1908 outbreak the infection was located on 157 premises, distributed over a much larger territory comprising twenty-three counties in four states. However, a larger number of animals were slaughtered during the former outbreak, namely, 4,461 against 3,636 in 1908. This latter outbreak was also a much greater menace to the live stock interests of the country, as it reached as far west as Michigan, and came closer to the great stock-raising region. The present outbreak has reached this region, and native range cattle have contracted the disease in Montana, but fortunately only three known infected herds now exist west of the Mississippi river.

The vastness of the prevailing outbreak as compared to other visitations may be realized from the following table, which shows that already 2,245 premises have become infected in 223 counties of twenty states and the District of Columbia. These figures mean little, except by comparison, and for this reason it is thought desirable to show the proportion of infected farms and infected live stock to the total number of farms and live stock in one of the most extensively infected states. For purposes of illustration, it may be stated that in Illinois 19,630 cattle out of approximately 2,233,000 cattle have become infected, 24,165 hogs out of probably 4,350,000 hogs, and but 535 sheep out of a total of 935,000 sheep. Of the 150,000 farms in that state, only 568 have been involved. Thus far the number of cattle destroyed in all the states is 32,914, which is less than .08 of 1 per cent of the total number in the United States. In other words, the number of cattle destroyed does not exceed the number killed in two or three days in some of the larger packing-house centers.

STATEMENT SHOWING PROGRESS OF WORK OF ERADICATION OF FOOT-AND-MOUTH DISEASE, FEBRUARY 9, 1915.

State.	No. of counties in entire State.	No. of counties infected.	No. of herds infected.	No. of cattle infected.	No. of sheep infected.	No. of Swine infected.	No. of goats infected.	Total No. of animals infected.	No. of herds awaiting slaughter.	No. of premises to be disinfected.	Remarks.
Connecticut	8	2	24	538	0	105	0	643	0	0	Completed.
Delaware	3	1	12	152	22	49	0	235	0	0	Do.
Dist. of Columbia	..	..	2	23	0	5	0	28	0	0	Do.
Illinois	102	51	568	19,630	535	24,165	12	44,342	25	60	See footnote.
Indiana	92	19	104	2,354	636	3,855	0	6,804	0	3	
Iowa	99	6	39	1,313	32	2,057	0	3,402	5	6	
Kansas	..	2	3	48	6	0	0	48	0	3	
Kentucky	119	9	46	819	0	308	0	1,127	0	9	
Maryland	24	19	29	744	197	531	0	1,472	0	6	Nearly completed.
Massachusetts	14	9	58	1,235	61	3,471	4	4,771	0	3	2 new herds.
Michigan	82	16	240	2,942	879	4,019	0	7,790	0	6	Nearly completed.
Montana	34	3	32	1,408	237	11	0	1,656	0	0	Completed.
New Hampshire	10	1	3	78	0	26	0	104	0	0	Disinfection completed.
New Jersey	21	6	25	791	6	193	0	990	0	1	Nearly completed
New York	61	12	83	3,570	60	267	2	3,974	0	1	Do.
Ohio	88	23	183	3,293	2,648	4,762	1	10,704	0	0	Do.
Pennsylvania	67	28	703	11,575	273	6,637	3	18,488	2	4	See footnote.
Rhode Island	5	3	40	878	1	185	0	964	0	2	Nearly completed.
Virginia	100	1	1	19	0	15	0	34	0	0	Completed.
Washington	39	1	1	102	0	0	0	102	0	0	Do.
Wisconsin	71	10	33	1,859	1,764	1,993	1	4,549	0	0	Disinfection completed.
Totals	..	223	2,245	52,914	7,301	51,734	23	111,868	37	83	

*Number of counties in each State given in order to show approximate area of State involved.

Illinois—All premises where herds have been slaughtered have either been disinfected or are being disinfected. Animals of herds awaiting slaughter not included in total number of animals, as reports on herds awaiting slaughter are not complete.

Pennsylvania—Work of disinfection started as soon as slaughtered animals are buried. Few new herds.

An analogy may be shown between these last three outbreaks. They all started about August or September, with intervals of six years. They were not uncovered in the 1902 or 1908 outbreak until November. In this present visitation the disease was diagnosed about the middle of October, a month earlier than in the two previous outbreaks. The success which followed the eradication of the disease in these two latter outbreaks through slaughter of infected herds, enforcement of rigid quarantine measures, and the prompt and thorough cleaning and disinfection of the infected premises in co-operation with the state authorities, has been generally recognized as the most practical and efficient means of eradication that could be adopted in this country, and such measures have been employed successfully in Denmark, Norway, Sweden, Holland, England and other European countries, as well as Australia. Even in Germany this course was followed for a time in a recent outbreak, but the spread of the disease was so rapid—possibly because of its former widespread appearance in that country—that it soon got beyond the control of the authorities and the slaughter of the infected herds had to be abandoned. The experience gained in those countries where foot-and-mouth disease has become so prevalent and permanently implanted has shown that the existence of such an intensely contagious malady in a country is a constant menace to the live stock industry, and its control solely by quarantine measures and disinfection has proved impossible in those countries where it has been undertaken.

In considering the losses from this disease, the mortality is not the only factor to be mentioned. The death rate in the benign form of the malady may be only 3 per cent, while in the malignant form of the disease it may reach from 30 to 40 per cent and even more of the affected animals. On the other hand, the mortality among calves in the benign form of the infection is considerable.

Although as a rule infected animals respond quickly to medicinal treatment, the Department does not advise such treatment of animals suffering with foot-and-mouth disease. If diseased animals were held for treatment, they would be

a source of infection for some weeks or months, and if this plan were generally followed we should probably never be able to get rid of the disease. The malady is of such a highly contagious character, and the infection is so easily spread, that during the period of treatment one animal might communicate it to hundreds of others. Experience in European countries has shown the futility of attempting to eradicate the disease by curing individual animals. The affected animals that have passed through the disease become a source of further infection as virus carriers for weeks and months, even after they have apparently recovered, and are susceptible to reinfection as one attack does not confer permanent immunity.

It is a known fact that many of the infectious diseases of man such as typhoid fever, cholera, plague and diphtheria are spread by so-called bacillus or virus carriers. Such carriers may also occur in different diseases of animals, although definite data on virus carriers in animals have been established only in foot-and-mouth disease, Malta fever, and equine influenza. The possibility of such carriers existing in other diseases of animals such as hog-cholera has been intimated by Hutyra and other prominent authorities. The occurrence of virus carriers after the recovery of foot-and-mouth disease was first recognized by Loeffler in 1964, and is of special importance in countries where eradication is conducted with only quarantine and veterinary police measures.

The absolute solution of this problem causes many difficulties, because in foot-and-mouth disease, unlike in typhoid fever or diphtheria, the infective agent can not be determined bacteriologically, since in foot-and-mouth disease we have to deal with an ultra-visible virus.

In 1905, Nevermann pointed out in an official report that an animal recovered from foot-and-mouth disease introduced the infection to another herd after a lapse of eight months. Later, the Ministry of Wurtemburg reported two cases in 1907 in which recovered animals acting as virus carriers transmitted the disease. Further, Loeffler mentioned similar cases, and in his report suggested that all animals which are used for experimental work on foot-and-mouth disease should be slaughtered after the conclusion of the experiment. Again, at the Ninth International Veterinary Congress, Loeffler and Nevermann reported further observations on virus carriers of foot-and-mouth disease. The conclusions of Prof. Loeffler are as follows:

> Regular supervision of such farms is indispensably required.
>
> One of the most important results of the researches concerning foot-and-mouth disease is that the fact has been doubtlessly ascertained that, just as in numerous human infectious diseases, some of the recovered animals will remain carriers and continue the spreading of the virus.
>
> It seems that the number of such animals is limited.
>
> How long such animals can spread the virus has not yet been ascertained. According to the experience gathered up to the present moment even seven months after the end of the epizooti new infections have been caused by them.
>
> As yet no method is known to discriminate the virus spreaders.
>
> Infected animals are to be placed under observation during at least seven months. They must not be offered for sale, and should be kept separated from healthy animals.

Nevermann, in his report on foot-and-mouth disease prepared for the Tenth International Veterinary Congress held in London in 1914, attached great importance to the virus carriers in connection with the spread of this infection. He claimed that in the control of foot-and-mouth disease, it is absolutely necessary to give the so-called virus carriers due consideration, as otherwise the results of the measures inaugurated for the eradication of the disease may prove fruitless. He also cited numerous instances in which virus carriers were indisputably the propagators of the disease. Such observations have been made, especially during the last outbreaks in Germany, which afforded the authorities a splendid opportunity for collecting data on this phase of the disease. All the governmental veterinarians received instructions to make close observations relative to each outbreak with a view to tracing its origin. Special reports were required in all instances where the disease could be traced to virus carriers. As a result of these steps, Nevermann was in a position to publish in the last annual report of the veterinary officers of Prussia over one hundred outbreaks reported from different parts of the country in which virus carriers were apparently responsible for the dissemination of the disease. Naturally it was impossible to establish

with positive certainty that in each instance the virus carriers spread the disease, or that other factors might not have been responsible for the outbreaks; nevertheless, in considering the large number of outbreaks reported to be due to such a source of infection, we must accept that the careful observations of the district veterinarians include only such cases as were obviously traceable to virus carriers. The outbreaks in which the infection occurs after the lapse of a prolonged period following the recovery of infected animals may be divided into two groups: The first group would embrace those cases in which susceptible animals are placed into previously infected stables and subsequently become infected—in such cases it might be possible that the virus was still present in some remote places not reached by the disinfectant, the newly introduced animals contracting the disease from such a source. The second group would include the cases in which recovered animals after the disappearance of the disease are introduced into healthy herds, thus infecting them. In these cases the disease usually appears among the animals of the healthy herd only after several weeks, and at times even after months. At the same time, the animals which brought the infection into the herd do not become infected. Investigations which have been conducted in order to determine what part of the recovered animal harbors the infection have not been uniform in their results. Some investigators have found that the saliva of a recovered animal was responsible for the spread of disease. In other cases, the virus is supposed to have been spread from the crevices in the hoof. The recent studies of Zschokke are particularly interesting on this phase of the subject. He undertook the work of establishing to what extent the feet of recovered animals may be responsible for the dissemination of disease, and according to his findings, the vesicles which occur in the skin of the interdigital spaces and the plantar cushion may also extend under the horny capsule forming their furrow-like spaces along the sensitive laminae of the wall and sole, and he also found hidden vesicles in the hoof which did not open to the outside. It therefore appears possible that virulent lymph which is present in these locations penetrates between the horny structure where it becomes enclosed until it is brought to the surface by the natural wearing of the hoof, and is then responsible for the transmission of the disease. The findings of Zschokke would explain the possibility of the occurrence of the disease in localities in which animals harboring the virus in such fashion are introduced into healthy herds, and it is considered possible that the greatest proportion of the virus carriers harbor the infection in this manner. In countries where the eradication of foot-and-mouth disease is conducted by the enforcement of quarantine measures, these so-called virus carriers must therefore be a constant menace to the elimination of the disease, and if for no other reason than this, it appears that whenever the circumstances permit, eradication of the disease should be carried out by slaughtering the infected herd. The fact that recovered animals might transmit the disease for six or seven months to susceptible animals would cause a constant uncertainty, and require a vigilance impossible of enforcement.

In order to demonstrate the extent of the spread of this disease in Germany, and to demonstrate the advisability of controlling the disease by the slaughter of the infected herds in connection with sanitary and quarantine measures, authentic statistical data are given below.

The outbreak which appeared in Germany in 1888 reached its height in 1892, when 1,304,299 cattle, 2,193,187 sheep, and 4,238,262 hogs were affected with the disease. It gradually diminished after this time, but again reached very great proportions in 1899, when 1,885,774 cattle, 1,505,830 sheep, and 814,862 hogs were affected. After that time the disease gradually diminished, although it continued to exist to a greater or less extent. In 1910 it appeared to gain in virulence, and in 1911 the affection was more widely spread than ever before in the history of that country. In that year 3,366,369 cattle, 1,602,627 sheep, 53,674 goats, and 2,555,371 hogs were affected with the disease. Similar statistics could be cited from other European countries in which the policy adopted consisted in endeavors to control the disease by quarantine measures.

The prevention of such widespread epizootics among domestic animals must of necessity have a great influence upon the animal industry of the country. The losses which may be attributed to the disease, outside of the mortality, are heavy. These include the rapid loss in the condition of the animals, especially in fattened stock; the diminution in the milk yield of dairy cows, and the subsequent

appearance of garget in a considerable proportion of the affected animals, with a total destruction of milk secretion in one or more quarters of the udder; likewise, abortions frequently occur in pregnant animals, as well as other complications which are associated with outbreaks of this disease. Furthermore, feet complications are particularly frequent in fat stock and hogs, which not infrequently result in the sloughing of the hoofs.

Various authorities have aimed to establish the depreciation in value of an animal after an attack of foot-and-mouth disease. An English practitioner of wide experience states that it is none too high to place the loss on each animal that becomes affected and that ultimately recovers at $20 when milch cows or feeding cattle that are nearly finished are under consideration. Other eminent authorities state that the deterioration will amount to from 20 to 30 per cent of the value of animals. In Denmark it is figured that the depreciation in value would amount to $8 per head, in Germany $7, and in Holland $10. Allowing the smallest figures to stand as the average, and considering that there are in the United States about 58,000,000 cattle, of which only 50 per cent might become infected, the losses sustained for cattle alone would amount to over $200,000,000, to make no allowance for injury done to swine, sheep, goats and other susceptible animals.

The paralyzing effect upon the traffic in live stock which results from the outbreak, and necessary quarantine which must be established to control the disease, and which must extend over a long period, must also be considerable from an economical standpoint during the prevalence of the contagion. For instance, the disease causes the closure of markets and the prevention of fairs, shows and public sales, interferes with the proper supply of milk and meat, and prevents the exportation of live stock. States not infected refuse admission of animals from the quarantined states, and owners of herds free from disease naturally demand protection from exposed or infected stock. In view of these circumstances it is not surprising that those who have seriously taken part in the struggle against this disease sooner or later possess the conviction that success is to be expected only from energy and resoluteness.

In the previous outbreaks of 1902 and 1908, the expenditure of the United States Government in the eradication of the disease amounted to about $300,000 in each instance. Between the three outbreaks, including the present one, there were six-year intervals, and by distributing this expenditure over the intervening period the total amount per year would be only $50,000, which is very small when compared with the losses which would result if the disease had been allowed to spread over a considerable area of the country.

Experience with the disease in various countries indicates that once the infection has been allowed to spread over large areas, the contagion practically had to wear itself out before it subsides. But even then the virus will remain dormant only during the period of acquired immunity of the animals. A reduced resistance in the animals will again afford an opportunity for the virus to assert its infective action, and outbreaks will start anew with increased force. These facts probably account for the periodical curves which are noted in the presence of the disease throughout continental Europe, and if it were possible for the respective governments to adopt measures by which they could eradicate the disease they would gladly make the financial sacrifices which it would be necessary to incur through the slaughter of infected and exposed animals in newly appearing outbreaks.

In consideration of the above facts, we can readily see the advantages of eradicating the disease by the slaughter and burial of all exposed and affected animals, enforcement of rigid Federal and State quarantine measures, and thorough and prompt cleaning and disinfection of the infected premises, and the experience gained in the former outbreaks substantiates the belief that this is the only effective procedure in the controlling of the disease in this country.

In Europe until a comparatively recent date the disease has been combatted by isolation and quarantine, and the cleaning and disinfection of infected premises, but these measures have not been effective, as is shown by the continuous existence and the wide dissemination of the infection. The results of combatting the disease without the slaughter of infected and exposed animals is shown by the statements of Professor Dammann of Hanover, who said that without absolute quarantine of the infected farms preventing even the movement of persons, the control of foot-and-mouth disease is impossible; but this stringent

measure, he states, cannot be executed in eradicating the disease, and notwithstanding the quarantine of infected stables, reinforced in many instances by the quarantine of communities, and often of a large zone around these communities, and further, the very extended prohibition of animal traffic and the supervision exercised over abattoirs, dealers' stables, and railroad cars, the disease continued to prevail.

Professor Loeffler of Germany says that foot-and-mouth disease is spread more and more every year and every year it costs the German Empire enormous sums. Necessary measures have been taken with the greatest care, suspected premises have been closely quarantined, and these measures have been extended to whole communities, and even to entire districts, but notwithstanding that the disinfection had been carefully carried out, the disease kept spreading.

In regard to the slaughter of infected and exposed animals as one of the measures in the eradication of the disease, Professor Hess of Switzerland has concluded that in order to cope with the disease "the diseased animals should be destroyed completely, including hides and hair, and the exposed animals slaughtered under police supervision."

In England slaughter has been resorted to quite frequently in recent years to stamp out the disease when first introduced. Dr. Cope, speaking of the outbreak in that country while he was the chief veterinary official, said: "It was eventually stamped out in the County of Kent by the purchase, slaughter and burial of several of the affected flocks."

Dr. Fleming of England, speaking of the outbreak in Australia, said, "There was really only one outbreak in Victoria among the cattle on two farms into which it had been introduced by an imported bull. Here the cattle were destroyed and with them the disease."

Dr. Cope refers to a communication which he received from Dr. Bang of Copenhagen, in which Dr. Bang says: "Since 1876 we have had every year, once or twice, cases of foot-and-mouth disease; in all cases we killed the cattle, sheep and swine on the farms even if only one calf was affected." Dr. Cope stated at the International Veterinary Congress at Baden-Baden in 1899: "We have now been free from the disease since 1894, and I can assert that at the present time foot-and-mouth disease is more dreaded by farmers and stock owners of Great Britain than cattle plague or pleuro-pneumonia, and they are willing to put up with whatever restrictions of however drastic a character considered necessary by the central department to stamp it out."

Remmelts, in referring to the struggle against foot-and-mouth disease in the Netherlands, mentions in his report to the International Veterinary Congress at London in 1914 that "preference must by far be given to the immediate removal of virus by slaughtering diseased and suspected animals than to any other measure." By adopting such methods the extermination of existing, as well as the suppression of new virus carriers is accomplished. In his article, special stress is laid upon the necessity of properly pasteurizing all by-products of the creameries including whey, and of stopping the movement of cattle in the infected district.

Mettam, at the same Congress, gave his experience with the disease in Ireland and stated that the animals, both infected and exposed, are slaughtered and their carcasses burned or destroyed without any attempt to salvage any portion of the animal, owing to the danger of spreading the virus far and wide.

Professor Leclainche, a representative of the French Government at this Congress, likewise advocated the slaughter of diseased and exposed animals in countries where the infection has not become firmly implanted, where natural boundaries are present, or when the disease occurs in the benign form.

The above quotations are sufficient to show that the slaughter of diseased animals has been frequently adopted as a means of combatting the disease in Europe, and it has been more successful than any other measure. In fact, the International Veterinary Congress held at Baden-Baden in 1899, stated in one of its resolutions passed with reference to this disease, that it was necessary to authorize slaughter and to establish uniform sanitary regulations in order to arrest and eradicate this burdensome plague.

For Additional Copies Address
JOHN J. FERGUSON, Sec'y-Treas.
UNITED STATES LIVE STOCK SANITARY ASSOCIATION
CHICAGO, ILLINOIS