

HOG CHOLERA AND SWINE PLAGUE.

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MINNESOTA EXPERIMENT STATION,

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The swine interests of Minnesota have been seriously injured during the years 1894 and 1895 by epidemics of swine diseases.

Outbreaks have been reported from St. James, Madelia, Albert Lea, Mapleton, Blue Earth City, Langdon, Cottage Grove and several other places. An outbreak last year in Washington Co., Cottage Grove and Woodbury townships, and an outbreak that has assumed serious features at this writing at Madelia, Watonwan Co., have been especially severe. In an outbreak investigated by the Experiment Station near St. James last fall 700 head, valued at \$5 per head, were found to have been lost within a few miles of the town. The loss from June 20th to Oct. 20th, 1894, in the two townships above mentioned in Washington Co. aggregated at least 550 head, valued at \$5 per head, and the per cent of loss was about 74.8 of the total numbers of invaded herds. The loss in the recent epidemic in progress near Madelia has been especially severe. Conservative estimates made in the midst of the outbreak show a total loss of at least 1,500 head.

All the outbreaks thus far investigated have been traced to hogs shipped in from Sioux City or shipped out from the Minnesota Transfer stock yards.

Investigations made by the Experiment Station show quite plainly that we have a complication of at least two infectious diseases to deal with, and quite commonly there have been mixed infections of these two in each outbreak. Very few typical cases of either swine plague or hog cholera have been seen.

It is barely possible that we have a third infectious swine disease in this state; viz.: "rouget," or swine erysipelas, but this has not been demonstrated, and we are not anxious to accept a third contagious disease until we are forced to do so. The evidences on this latter point thus far are very meager and do not certainly warrant any conclusions. In the Washington Co. epidemic the external lesions, skin and muscle sloughs were very excessive, but not more so than have been found in undoubted outbreaks of the two former diseases. Dr. Smith, of the Bureau of Animal Industry, found germs which he thought might be those of rouget in specimens sent him from this Experiment Station, but there was some uncertainty in the matter and the disease died out before sufficient material could be collected for further study. It is undoubtedly possible to have an unmixed outbreak of either hog cholera or swine plague, although the existence of epidemics of swine plague unmixed with hog cholera, has not been clearly proven. Certainly unmixed infections of hog cholera in which no swine plague lesions appear are more common, and it is a matter of some importance for farmers and stockmen to know which disease they have to deal with or whether both, for while they are equally contagious, spreading rapidly and equally fatal, the swine plague germs are much more easily destroyed and the disease much more easily gotten rid of. Different outbreaks of so called hog cholera vary greatly in virulence. In some epidemics many cases assume the most acute type and die rapidly, in other epidemics the majority of cases show the chronic type; the hogs do not die so rapidly and the percentage of loss is not so large. Various gradations may appear between epidemics of the utmost virulence and those of the milder type.

Two factors are to be considered in explaining this variation. It is shown by Dr. Smith, of the Bureau of Animal Industry, that there are at least six varieties of hog cholera bacillus which differ somewhat in the virulence of the disease they produce, and that each one of these varieties, under uniform conditions, will produce uniformly a certain type of hog cholera.

The other factor to be considered in explaining this variation, is in the differing conditions of food and care under which hogs are kept in different yards and different localities. Where the feeding and care has been such as to secure the best physical strength and vitality, the hogs are naturally less susceptible, the disease does not assume the most virulent type, and the percentage of mortality may not be so high as among hogs kept under less favorable conditions.

The fact must not be lost sight of, in this connection, that frequent outbreaks of swine disease appear and alarm neighborhoods when the trouble is purely endemic and due to local causes. They are usually diseases of the digestive apparatus and due to errors in feeding. All the patients become diseased from the same source and in the same way and the disease spreads no further; several neighbors may make the same mistake at the same time and get similarly bad results. These are the cases which are called hog cholera and which yield to treatment.

It is hoped that the following cuts, with some explanations, will make plain the essential differences between true hog cholera and swine plague.

HOG CHOLERA.

Hog cholera. Post-mortem. The skin on exposed parts of the body where the hair is thin, like the flanks and inside of arms and thighs, may be deep red or purple, and the lungs may also show evidences of pneumonia. Lymphatic glands in the mesentery appear deeply congested when cut open.

Blood stained spots may be usually found in the fatty tissue under the skin and on the internal organs and small bright red spots are found on the surface or through the deeper structure of the kidneys.

When the large intestine is split open, dark spots, more or less blood stained, or even clots of blood are to be seen upon

the lining membrane when the disease has been of the very acute type.

The spleen is frequently enlarged and darker in color than natural.



Fig. 1. Showing ulcers of typical Hog Cholera as seen on inner surfaces of large bowel, near the blind pouch.

The more chronic cases show peculiar and very distinctive ulcers in the lining membrane of the large intestines

and they are usually more numerous near the blind pouch. These ulcers are irregular in outline with yellowish or dark centers and frequently appear as being raised above the surface. Small ulcers may also appear in the back part of the mouth and in the throat.



Fig. 2 Showing section of diseased lung as seen in Swine Plague.

SWINE PLAGUE.

Post mortems of *Swine Plague* show quite different lesions, although typical cases of either swine plague or hog cholera are not common, very many cases being mixed infections. In swine plague, the lung lesions are the most prominent features, the disease being a distinctive and infectious broncho pneumonia; whereas, hog cholera is more distinctively an infectious bowel disease in which the lungs may be involved. In swine plague, the skin may show the same purple spots and areas as hog cholera, the lungs show scattered and sharply defined areas called lobes and lobules which are dark red in color and solid like liver. The lining membrane of the chest may be diseased but is not uniformly so, and when this occurs it usually succeeds disease of the lung tissue. The bowels may show various stages and conditions of congestion and inflammation, but not the typical button ulcers of hog cholera.

Practical Differences for Farmers. Hog cholera germs may live three months and possibly longer under favorable conditions, in the soil and around buildings and remain virulent. They are hardy and difficult to destroy. Swine plague germs live but a few days, perhaps two or three weeks, in the soil and are very easily destroyed by unfavorable conditions. Thus it will be seen that an outbreak of pure hog cholera or a mixed infection is more difficult to get rid of and more serious in every way because the germs will linger for such a long time in the soil and various hiding places. Whereas, in an outbreak of swine plague, the disease must very soon die out of itself when the patients have all died or recovered. The two diseases spread with equal rapidity, are disseminated by the same conditions and in the same ways and, so far as known, are equally fatal.

The Causes of These Diseases: We must not forget that swine plague and hog cholera are both contagious diseases and that each has its prime origin in a specific germ, without which you cannot have the disease. Simple conditions of keep and feed may have much to do with making the animals more susceptible, but mere matters of food and surroundings cannot serve as first cause of either hog cholera or swine plague. We must consider everything except the germs as but predisposing factors at most. Although, if the hog is raised and fed exclusively on corn diet, kept shut up in dark, damp and perhaps filthy pens, or fed from a swill barrel that has been used for years and never scalded or allowed to dry in the sun, it will not be in condition to resist any disease as would one, kept under more favorable conditions. Swine are naturally quite resistant to both hog cholera and swine plague as shown by inoculation experiments with other animals. And the question naturally arises why do these diseases spread almost solely among swine and why is it so fatal with them? The explanation must be, less than normal resistance. That diet alone may affect the susceptibility to disease has been brought out in experiments with rats. It is known, e. g., that rats fed on fleshy diet are less liable to die when inoculated with anthrax germs than rats which have been fed on bread, and it seems that even the addition of salt to bread increases, slightly,

their powers of resistance. If hogs are fed almost exclusively upon corn, or at least upon a carbonaceous diet, it may be that the power of resistance to these disease germs is seriously decreased because the diet contains an excess of carbohydrates with a deficiency of protein compounds, or some other fault of the diet. How much this may lessen the disease resistance we do not know; we do know that on such diet and especially if closely confined with limited exercise that they lose strength and become delicate. With some of the more finely bred hogs the breeding has been carried to such a point that the animals are becoming mere chunks of fat with poor muscular development and with a serious lack of bone, as shown in the fact that some of them can scarcely stand erect.

Good lungs and good digestion must be regarded as the pig's chief barriers against disease. Good digestion aids in the destruction of bacteria in the food, while congestion or catarrhal inflammation of the mucous membrane of stomach and intestines may result in a smaller percentage of acid in the gastric juice and thus lessen the germ killing power of this fluid.

Tissue vitality in the lungs must be regarded as very important when we consider the functions of these organs and realize that increased tissue resistance means increased disease resistance. The laws of hygiene cannot be neglected without rendering animals susceptible and inviting disease. It is evident to all who have given the subject careful attention that swine hygiene should receive far more attention than in the past and that there is a large field for scientific study. These predisposing factors must be given due consideration, but the most important thing to remember is that these diseases are due to specific germs, that they never appear without infection, are contagious and may be carried from one farm to another.

How Scattered. The germs of these diseases may be carried from one farm to another upon shoes or wagons, or by driving stock back and forth or they may be scattered along the roads by driving the hogs.

Running streams and shallow lakes are serious factors in the spread of these disease germs. It must not be forgotten that bowel discharges are very important sources of infection and if the yards or pens drain into streams or lakes they readily become

spreaders of the infection. The available supply of infectious material is indefinitely increased when the dead hogs are thrown into the water or buried in shallow graves near the water edge. In the case of streams the danger, of course, is to hogs on farms down stream.

It has not been thought best to discuss the possibility of diagnosing upon clinical symptoms between hog cholera and swine plague, but simply to describe here the symptoms as seen in the mixed infections that have usually been found in field examinations.

Early Symptoms. The hair is harsh and dry, the eyes may be watery, and later the walk becomes weak and irregular with imperfect control of the hind legs; the skin around the flanks and fore legs may become purple, the skin may crack and large sores appear on the head, neck and back; the sick ones keep apart from the rest of the herd, are inclined to hide around in sheltered places and seem little inclined to move. There is usually a loss of appetite, although in very acute cases they may eat quite heartily and die within a few hours. The chronic cases lose flesh rapidly, and sometimes show extreme disturbance of the nervous system, exhibited in partial or complete paralysis of the hind parts, or they show extreme nervousness. Cough is usually short and hacking. The skin of the ears frequently becomes much inflamed and if the patient lives for several days they assume a scabby appearance, sometimes the tips slough off. Occasionally constipation appears among the earliest symptoms but it is usually not noticed by the owners, and later there appears diarrhea. In some of the very acute cases which appear at the beginning of an outbreak, the animals die very suddenly, sometimes before the owner realized that they were sick. Later in the history of the disease, as it appears in a herd, the cases tend to assume the chronic type. If the swine plague infection is marked, the coughing and shortness of breath are the more prominent symptoms. If the case is more nearly typical hog cholera the bowel symptoms are the more prominent. Sometimes quite large portions of skin and underlying muscular tissues die and slough off, leaving large sores. This ap-

pears more commonly, perhaps, around the head, neck and back than elsewhere.

What to Do When an Outbreak Appears. In case there is a suspicious epidemic among hogs in a neighborhood, the matter should be reported promptly to health officers and this first outbreak should be rigidly quarantined until it is determined by competent veterinary inspection whether the disease is either or a mixed infection of the two recognized contagious diseases of swine and this quarantine should remain in force until efficient action is taken by the health officers. If the epidemic has assumed serious proportions and is widely scattered in the neighborhood the man who owns a large herd of sound hogs should establish a rigid private quarantine and say to all his neighbors "please do not go near my hog pens or yards." He should have one man take care of his hogs and this man should not be allowed to go where there is a possibility of getting the infection. The owner nor any member of his family should go to the farm where an epidemic swine disease has appeared, neither should anyone from the farm where such sickness has appeared, be allowed to walk around the yards of his neighbors until the matter is all cleared up. Dogs should be kept away from the pens for the same reason.

If hog cholera appears during the summer or fall when the weather is pleasant, it is desirable to turn the hogs out into large yards or fields rather than keep them closely confined in pens or stables. Certainly the most dangerous condition that may be had, occurs when the hogs are closely confined in stables or barns, for in that case the germs are so abundant that the hogs simply get a larger dose of the infection. And it appears from experiments carried on by the Bureau of Animal Industry, that larger or smaller doses of infection have much to do with determining the fatality of the disease. If hogs are allowed to run in yards or fields each hog is exposed to the smallest possible amount of infection. With a herd so treated the disease may reasonably be expected to spread less rapidly and be somewhat less fatal. If the herd is large and not yet infected it may be very desirable to divide it into three or four parts and separate them widely on different

portions of the farm. In that case the owner may lose one group, or even two groups, and save the others, in case the disease comes his way.

On the other hand, if the weather is cool or wet a herd where this disease has appeared should be given quarters warm and dry as possible. If they be turned out to shift for themselves under conditions of such exposure the loss is apt to be almost total; whereas, under conditions of careful nursing in warm, dry and well ventilated sheds a reasonable percentage may be saved. But a farmer must not think that because he has kept his herd under favorable conditions, has given them plenty of exercise and good food and kept them well housed he is not liable to get the disease in his herd. Practical experience demonstrates that when hog cholera gets into a neighborhood the hogs which get the nicest care sometimes contract the disease readily and die rapidly. Do not spend money on medicines. For treatment, except laxative food with mild doses of linseed or castor oil, in early stages, is useless and wasted in either true hog cholera or swine plague. Experience demonstrates that it is desirable to separate the sick from the well ones promptly and to place them in temporary sheds that may be burned when the outbreak is over. It is also desirable to keep pens where both sick and healthy hogs are confined thoroughly cleaned and disinfected. For this purpose unslaked lime is quite satisfactory in all respects and easily applied.

The manure should be kept in compact piles and disinfected layer by layer with the lime, or by a corrosive sublimate solution in water in the proportion of 1: 1000, and lime, should be scattered freely over the floor of the pens. Good results have been claimed for sodium hypo-sulphite given in $\frac{1}{2}$ dram to 1 dram doses twice a day in sloppy food. Certainly this remedy would do no harm, is cheap and easily given, but the writer has little confidence in it.

Common Mistakes Made by Farmers. The following story of one very serious outbreak in this state is given as a study and for the purpose of illustrating this topic. A car load of hogs was shipped into a certain town in this state from Sioux City and taken at once to the new owner's farm, turned out with a large herd of swine already on the premises. In about two

weeks, the new hogs began to die and a little later the ones previously on the farm began to die and the subsequent loss to this man was very heavy, something over 200 head in a comparatively short time, and this loss of 200 head was a small item in comparison with the total loss in the neighborhood. Meantime this gentleman had a nice lot of hogs fattening for market and when the new hogs began to die he concluded to ship the others out at once and did so. One of his fat hogs is said to have died in the yards from whence they were being shipped and was left in the stock yards for some time without burial. Shortly after this, a lot of hogs were shipped into the same yards from a distant state where there was no record of hog cholera and these were sold to neighboring farmers in small lots and thus scattered over a wide area. In two or three weeks these new hogs began to die all over the neighborhood, having probably been infected from the yards wherein the Sioux City hogs were unloaded and the fat hog had died. This was the origin of an outbreak which has proven one of the most serious this state has ever seen and what is probably a continuation of this is still killing Minnesota hogs in serious numbers. The obvious lesson is that the hogs first shipped in and taken to the farm should have been quarantined two or three weeks before being turned with the others and thus the whole loss would have been avoided, a loss which will prove a serious blow to the swine industry of Minnesota in one portion of the state at least. A second mistake was made by local health officers when they allowed a dead hog to lie unburied in the stock yards, if it is true that they did so and in their failure to disinfect grounds and fences. Even plowing would have been far preferable to what did occur.

Hogs that have died of hog cholera are sometimes thrown into streams or buried in the sand near the edge of the stream or lake. It is a mistake to bury them at all if it is convenient to burn them. If buried they should be buried deeply with at least four feet of dirt on top.

It is a mistake, and frequently a serious one, for a farmer to ship in a lot of strange hogs, from unknown stock yards and in cars that may have been infected, to his own farm and put them with the stock hogs already on hand. The mere fact that

hogs come from a non-infected district is no argument to the contrary, for the car in which they were shipped may have carried a lot of hog cholera victims for the last load. It is a mistake to ship in hogs and not quarantine them on the farm for at least two weeks and better three, before turning with the other hogs. This gives time for the disease to break out in case the new hogs have come from infected herds or through infected stock yards or in infected cars. It is plainly a mistake to visit your neighbor's hog pens and walk around among the hogs, out of mere curiosity, when he has told you of some peculiar sickness that has appeared in his herd.

It is a mistake to allow the last one or two of the sick hogs, which usually show a very chronic type of the disease, to linger for months on the farm and retain the disease. It is better policy to kill such hogs promptly and have done with the disease, for such hogs do not usually become thrifty and profitable feeders for a long time after recovering; and on the other hand they may remain infectious to the last period of their sickness and thus serve to continue the disease over a much longer period of time keeping the yards and pens infected and a constant supply of infectious material for fresh outbreaks; whereas, if they had been killed and deeply buried, the infection could soon have been gotten rid of.

Methods of Disinfecting and Cleaning Up. In dealing with infectious diseases of swine there are practically but two things for health officers to consider: Quarantine and disinfection. It is a very simple matter to *quarantine* an outbreak of hog cholera in the first yard where it appears and it is extremely difficult, and usually impractical, to quarantine the disease after it has scattered over several townships. Again, quarantine must be rigid to be useful; partial or imperfect quarantine is worse than useless. As for *disinfection*, if the disease is of unmixed swine plague, nature will disinfect in two or three weeks. The germs of swine plague do not live long in the soil or around buildings, as shown by experiments made by the Bureau of Animal Industry. On the contrary, if the disease be genuine hog cholera it is not so easily gotten rid of, for the germs may live three, and perhaps four months in the soil and in buildings under favorable conditions. Sometimes the cheap-

est way to disinfect is to burn the old sheds and pens, where the hogs have been confined. But if these structures are too valuable for that then the matter of other disinfection is to be considered. In this case corrosive sublimate, dissolved in water in the proportion of 1:1,000; or white wash that is made by first slaking the lime with water and then mixing up white wash in the ordinary way, but using instead of plain water, water that contains 4 per cent of pure carbolic acid. All bedding and loose stuff of the sort should be burned. The ground may be disinfected by saturating the surface with corrosive sublimate solution or the danger may be lessened by plowing. Sometimes it is more desirable to tear up the old floors than to attempt to disinfect, but if it is thought desirable to disinfect them, the pens should be thoroughly swept and then saturated with the corrosive sublimate solution above given.

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