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HOG CHOLERA

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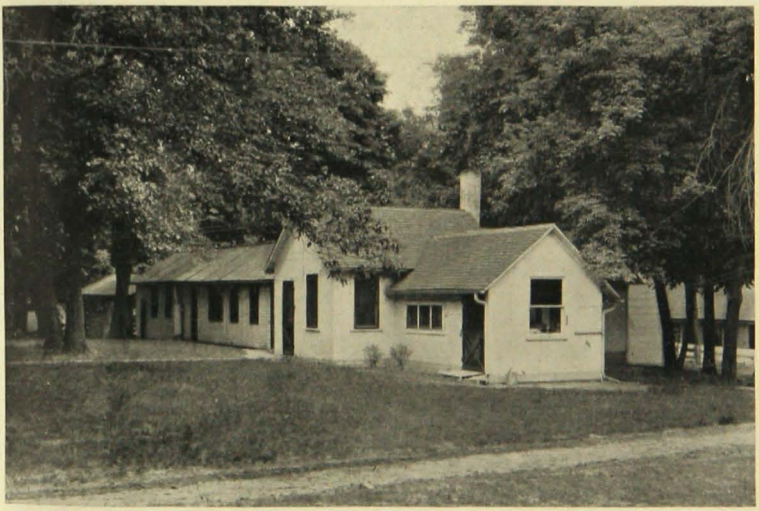

THE CENTRAL BUILDING MARKS THE PLACE WHERE THE FIRST ANTI-HOG CHOLERA SERUM WAS PRODUCED, BUREAU OF ANIMAL INDUSTRY, AGRICULTURAL EXPERIMENT STATION, AMES, IOWA

UNIVERSITY OF MINNESOTA
AGRICULTURAL EXTENSION DIVISION

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INTRODUCTION

The Swine industry of Minnesota has become of great importance. Minnesota ranks as the fifth state in the Union in pork production. Statistics of the United States Department of Agriculture for 1924 to 1928, inclusive, show that swine on the farms of this state averaged 3,018,000 each year. They represent an average yearly monetary value of approximately 53 million dollars. This, together with the amount of money invested in buildings, equipment, and feed for the swine, represents a business of considerable size, large enough to be protected against agencies that might tend to undermine it and cause its breakdown or destruction. Hog cholera is one of these.

WHAT IS HOG CHOLERA?

Hog cholera is a highly contagious and fatal disease of swine. It occurs in all ages and all breeds. The disease spreads rapidly in a drove of susceptible swine. It is characterized by a sudden onset, high temperature, inappetance, and extreme physical weakness. In many instances death results before any marked symptoms have been manifested. The specific or exact cause of the disease is not known.

HISTORY OF ITS OCCURRENCE

The indications are that hog cholera was first recognized in the United States in 1833. It is said to have occurred at that time in southern Ohio and Indiana. Whether or not hog cholera had ever before existed here or in any other place is not known. Birch says that in 1822 an epizootic disease of swine resembling hog cholera is reported to have occurred in France, but is not certain whether it was the same disease observed in America about ten years later.

It was next reported from the New England states. This is of particular interest because these two sections of the country were the chief hog-raising centers at that time and the movement of swine between these sections by trade and exchange is quite reasonable. From these early outbreaks the disease spread more or less to sections of the country where larger numbers of swine were kept. Today hog cholera occurs in every state in the Union.

Hog cholera was first recognized in Minnesota in the early nineties, in Watonwan and Nicollet Counties. At the time of this writing (1929) only one county, Cook County, has apparently always been free from the disease. Some counties in the northern part of the state had no cases in many years, doubtless because there are relatively few swine in these counties and they are distributed over a large area.

Beginning in 1894, the Federal Department of Agriculture has collected statistics relative to certain diseases of livestock. Hog cholera is one disease on which they have fairly complete data. These data show that there have been three periods during the last 33 years when hog cholera was widely distributed over the country and caused the loss of great numbers of swine. The first period began in 1896 and reached its peak in 1897; the second period began in 1912 and reached a peak in 1914; the third reached a peak in 1924. Minnesota was included in all three epizootics. There have been rather extensive outbreaks in other years but not to the extent as in the years mentioned.

CAUSE OF HOG CHOLERA

It has already been stated that the specific or exact cause of hog cholera is not known. This means that no definite micro-organism, germ, or bacterium has been discovered that can be designated as the true cause of this disease. However, certain facts relative to its cause are known. First, the cause of hog cholera is a filterable virus. A filterable virus is a substance capable of producing disease, being so small or of such nature that it will pass through the pores of certain filters. Bacteria, on the other hand, small as they are, are held back by the filter. For example, if a mixture of typhoid fever germs and water were filtered through these porcelain filters, the typhoid germs would be held back by the filter and the water would pass through. If, on the other hand, hog cholera virus and water are mixed and filtered, both will pass through so that the material coming through the filter will cause the disease as readily as before filtration. Such diseases as foot and mouth disease of cattle, pernicious anemia of horses, European fowl pest of chickens, and distemper of dogs are caused by filterable viruses. The discovery that the cause of hog cholera belongs to this group was made by De Schweinitz and Dorset, of the United States Department of Agriculture, in 1903.

A few remarks concerning opinions and ideas relative to the cause of hog cholera are of historical interest. In the early days of this disease it was thought that some mystical force floated about in the air like clouds and that if this happened to pass over a pig sty that was filthy and unsanitary, it was attracted or pulled down into this sty. Wet and damp climatic conditions were believed by some to be the direct cause of hog cholera. The feeding of green or immature corn was considered by many to be a potent source of this disease, even in recent years.

Following the discovery by Pasteur, the eminent French scientist, that bacteria cause disease, various investigators began to look for bacteria as the cause of hog cholera. Notable among these are Salmon

and Smith, who in 1885 reported that hog cholera was caused by a germ, which they called *Bacillus cholera suis (Salmonella suipestifer)*. The germ was isolated from pigs affected with cholera. Whereas this organism is frequently found in cases of hog cholera, it is now considered as only a secondary or associated organism and not the true cause. It, with other germs, may complicate matters when making a diagnosis and applying effective treatment. In 1913, King and Baeslack reported finding in the blood and tissues of a cholera pig a peculiar spiral-shaped micro-organism, which they called *Spirochetae hyos*. In 1917, Proescher and Siel described certain small round organisms occurring in pairs, which they thought were the cause of the disease. They reported finding this germ in the blood and urine of affected pigs. These theories have not been substantiated and the true cause remains to be discovered.

ANIMALS SUSCEPTIBLE TO HOG CHOLERA

Swine are the only animals susceptible to hog cholera. Horses, cows, sheep, dogs, cats, poultry, pigeons, rabbits, mice, and guinea pigs have been inoculated with the virus of this disease but have always been found immune or resistant to it. Human beings are immune or resistant to hog cholera. At one time it was thought that "mule-footed" or single-toed swine were immune to hog cholera, but this is not true. Frequently some swine pass through an outbreak of hog cholera without developing the disease. These are recognized as natural immunes. Unfortunately, there is no way of knowing which swine are the natural immunes without subjecting them to the infection. Attempts have been made to develop strains of immune swine by mating naturally immune males and females but these have met with little success.

TYPES AND FORMS OF HOG CHOLERA

Hog cholera as it occurs under natural conditions on the farm often exists in more than one type and form. The length of time the pig is affected by the disease determines the type of the disease. For example, sometimes pigs die of hog cholera without showing any signs or symptoms. These cases characterize the peracute type of the disease. Pigs sick with acute cholera are usually noticeably ill for one to 3 days before death. At other times they live 4 to 8 days. These are called subacute cases. In the chronic type the animals may live for a considerable time, several weeks in some cases. No definite line can be drawn that will distinguish one type from another and it is not uncommon to find all types of the disease in a herd sick with hog cholera.

The form of hog cholera that may occur depends upon the organs involved or the parts of the body affected. The forms of the disease recognized are: Bowel form, when the stomach and intestines are affected; lung form, when the lungs are affected; skin form, when the skin is affected; septicemic form, when the blood is principally involved; and the mixed form, when any two or more of the above forms are present. The mixed form is by far the most common and the one most often recognized.

SYMPTOMS OF HOG CHOLERA

Usually the first symptoms noticed will be one or more pigs "off feed." They may come to the trough but only nibble at their feed and then turn away. By the next feeding time, they have lost their appetite, but drink great quantities of water, if it is available. Often a sick pig will not get up and come to feed and frequently will not rouse until forced to and then it will move off a little way and stand with its flanks tucked up. The head is allowed to droop, the ears droop, and the tail hangs limp. The hair becomes rough and shabby.

Great muscular weakness is shown by a wabbling and staggering gait. The hind parts sway from one side to the other. The animals stand with their hind legs crossed and sway from side to side. A peculiar jerking of the head may be seen. They frequently stand with their backs arched and their feet drawn close together under them, so that the feet come nearer the center of the body and then the animal sways from side to side or from front to back.

The temperature of a hog affected with cholera is high, not uncommonly 108 degrees F. in an affected pig. More often, however, the temperature varies between 104.5 and 107.8 degrees F. The fever usually lasts from 4 to 7 days and sometimes longer. After the crisis of the disease, when death is coming on, the temperature will go down, frequently below normal. The normal temperature of a pig varies between 100.8 and 102.2 degrees F. A pig should not be chased about before inserting the thermometer, as the exercise may have a marked influence on the temperature. The temperature of pigs in the chronic stages of cholera may not be above normal. Daily temperatures taken of such pigs frequently rise and then drop back to normal. Temperatures of pigs in the incubative stages of cholera will show a gradual rise.

Post-Mortem Findings

The proper time to make a post-mortem examination, or autopsy, of a carcass is as soon after the animal dies as possible. A hog, especially a fat one, decomposes rapidly. It is absolutely useless to make deductions concerning the post-mortem findings on a carcass that has

decomposed. Decomposition takes place most rapidly in the summer and fall. It is also difficult to perform an autopsy on a carcass that has frozen solid. Frozen carcasses should be allowed to thaw.

A definite system should be followed when performing an autopsy on a carcass in order that none of the tissues or organs will be overlooked. Some of the abdominal organs should be removed and put aside to be inspected later. This will prevent stomach and intestines from obstructing the view of other abdominal organs and will facilitate the inspection of them.

Methods of procedure.—The carcass should be removed to a place preferably outside the hog lots. Before making any incisions, examine the carcass for external lesions. Note if there are any discolorations of the skin, nasal secretions, or matty and gummy excretions about the eyes. Note whether the tail and buttocks are soiled with fecal matter.

The carcass should be lying on its side or back. To open the carcass for inspection, it is preferable to make a deep incision in the region of the arm pits, cutting close to the ribs and deep enough to separate the shoulder from the body without cutting through the skin at the withers. If this is done properly both front legs will lie out flat on the ground. Next, separate the hind legs in the same way, starting the incision between the legs and cutting forward and outward close to the abdominal wall, then cutting through the fold of the flank. When this is done, a joint between the pelvis and leg is seen, and this can be separated with a knife. By this time the carcass should lie quite firmly on its back so that it will not roll over.

Next, an incision should be made in the midline of the body from the throat to the hind legs, cutting down to the ribs of the thorax and through the walls of the abdomen. An easy way to open the thorax is to cut from behind forward and about one inch from the midline or center of the body. Then cut between the first and second ribs to the backbone. Now the diaphragm, or muscular partition between the liver and lungs, should be cut. Then by putting pressure on the ends of the ribs you can break them outward.

Remove the spleen, then carefully remove the stomach and intestines and put them aside for examination later. From this stage it is comparatively easy to examine any tissue or organ desired. A description of the lesions noted in cases of cholera and in the order in which the organs are removed for examination follows.

Spleen.—This organ is usually dark in color and soft in acute cases of hog cholera. Frequently dark and soft areas from about the size of a nickel to that of a dollar are raised above the surface. In chronic cases the spleen is often very small, and gray in color.

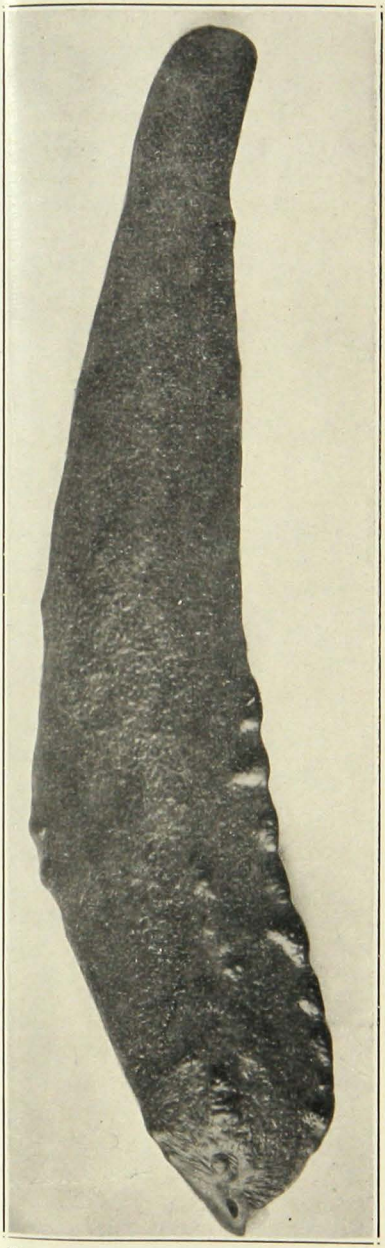

Fig. 1. Spleen from a Case of Hog Cholera

This shows numerous dark, soft, and raised areas along the borders and on the surface of the organ.

Fig. 2. Bladder from a Case of Hog Cholera

The bladder has been turned inside out. Note the spots scattered over the mucous membrane or lining.

Fig. 3. Kidneys from a Cholera Carcass

The outer capsule has been removed and the small pin-point hemorrhages which appear as specks are characteristic of hog cholera.

Bladder.—To examine the bladder for characteristic lesions, it is necessary to open it and inspect the mucous membrane, or inner lining. Usually small red spots will be found on this membrane that will not rub or wash off.

Kidneys.—In order properly to inspect the kidneys the outer thin membrane or capsule must be removed. Small red spots usually show on the surface. In some cases these may be few in number; in others the surface is covered with them. The common expression, "turkey-egged" kidney, comes from the fact that the surface is covered with these specks. If the kidney is cut through, similar spots are often found near the outer edge.

Liver.—No lesions that are particularly characteristic of cholera can be recognized in the liver.

Heart.—The heart, like the liver, does not show signs that are definitely characteristic in all cases of cholera. However, certain lesions, such as hemorrhagic areas (blood spots) on the outer surface of the heart and similar ones on the inner walls are recognized in acute cases of cholera.

Lungs.—Hemorrhagic spots in the form of small blotches are seen on the outer surface of the lungs. Another lesion that is quite frequent involves a small section of the lung known as a lobule. The lobule, or it may be several of them, is completely collapsed and dark red to purplish in color. These lesions are most frequently seen in the lower portions of the lungs.

Larynx.—The larynx is the organ at the beginning of the windpipe, or trachea, and opens into the throat. This should be cut out and opened lengthwise. On the mucous, or inner surface, small red spots resembling rust specks may be seen.

Lymph glands.—The lymph glands are small structures widely distributed in the body. They vary greatly in size, and in shape are more or less like a bean or kidney. Those of most interest to us and accessible, are in relation to the lungs, liver, stomach, and small intestine, and in the region of the groin. In affected carcasses these are swollen and hemorrhagic. They should be cut open. The cut surface shows that the hemorrhagic portion is toward the outer edge of the gland. In appearance an affected gland resembles the cut surface of a strawberry.

Stomach and intestines.—The lining of the stomach and small intestine usually shows no more than a slight reddening. Sometimes the outer coat of the small intestine shows numerous bright red spots. In other instances, numerous small red spots can be seen in the mucous lining of the intestines, particularly in the large intestine. In the caecum and large intestine ulcers are often found. These appear as

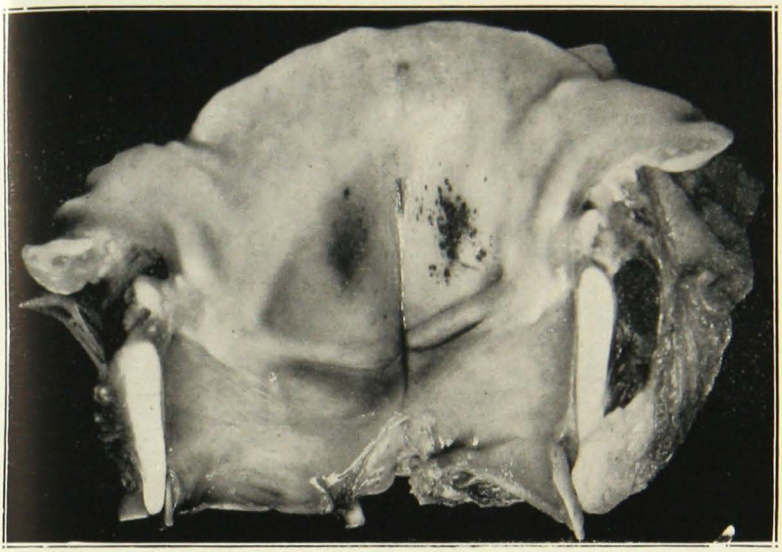

Fig. 4. Piece of the Larynx from a Cholera Carcass

The larynx is cut and spread so that the inner surface is clearly visible. The hemorrhagic spots are readily discernible.

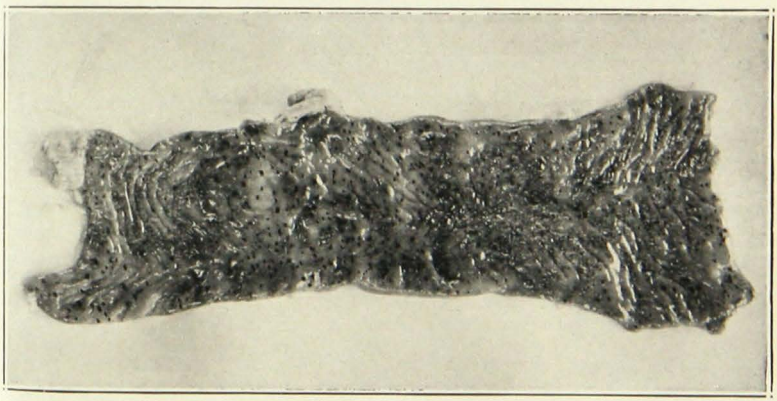

Fig. 5. Portion of Small Intestine from a Case of Hog Cholera

This shows many small hemorrhagic spots in the mucous membrane or lining.

raised yellowish brown, yellowish red, or dirty yellow flaky, crust-like formations and are usually round. They are especially noticed at or near the "ileo-caecal valve." This is where the small intestine enters the large intestine, or caecum. These ulcers vary in size from that of a pea to that of a 25 cent piece or a little larger.

DISPOSITION OF THE CARCASS

It is highly important that the carcass be disposed of so that the chances of cholera being spread by dogs, foxes, birds, etc., are eliminated. Burning is the most satisfactory method of disposition and a swine carcass will burn readily. The proper way to burn a carcass is to place it on top of the fire and not, as has been done, to pile the wood on the carcass. If the entire carcass is not burned at the first burning, the operation must be repeated. Burying is satisfactory providing the carcass is put at least 4 feet under ground and quicklime is scattered over it. Dogs will readily dig out one that is not buried deep and this is almost as bad as not attempting to bury the carcass at all. To throw carcasses in an old ditch, sink-hole, stream, or river is criminal and is a misdemeanor. Such practice will assist in the further spread of the disease. The hauling of dead cholera hogs over a public highway in other than water-tight receptacles is a fertile source of infection and is prohibited by law.

DIAGNOSIS OF HOG CHOLERA

In making a diagnosis of hog cholera, all the above features concerning the symptoms and post-mortem findings must be taken into account. It must be remembered that in every case of hog cholera all these features may not be present, and when variations do occur they make the diagnosis more difficult.

Conditions and circumstances are altered in many cases so that the symptoms and post-mortem lesions are not sufficient for a positive diagnosis. Therefore additional facts must be taken into consideration, i.e., the length of time the disease has been in progress in the herd; the number of animals affected; whether cholera has existed on the premises before; whether any new stock has been introduced into the herd recently, if so, from what source; whether any of the animals have been immunized by the serum-virus method, if so, how long ago; and whether there is cholera in the vicinity. A correct understanding of such facts, coupled with symptoms and lesions suggestive of cholera, serves to establish a diagnosis. Even after all these things have been considered, doubt as to the proper diagnosis may exist. In order to clear this doubt, there is only one way possible, and that is by animal inoculation.

To do this, a sample of blood from the doubtful case must be brought to the laboratory. Here it must be filtered and the filtrate injected into susceptible pigs. If hog cholera is present, the inoculated pigs will begin to show symptoms from the fifth to the twelfth day and should die from the tenth to the twenty-first day. Then, if the

autopsy shows changes characteristic of hog cholera, the diagnosis would be made. This, however, is a long procdeure and is costly because if we must wait from ten to twenty-one days before a diagnosis is made, the animals in the affected herd may all be dead or be in such a weakened condition that serum would be almost worthless.

PREVENTION AND TREATMENT OF HOG CHOLERA

Persons engaged in swine husbandry pursuits need not fear the ravages of hog cholera. It is now more than twenty years since an effective agent was discovered, which, when used at the proper time and under the proper conditions, will render swine immune to this disease. The agent referred to is anti-hog cholera serum. Anti-hog cholera serum or, as it is sometimes called, hog cholera anti-serum, hog cholera serum, or hog cholera vaccine, is the *only* known substance that can be used for checking this disease and for preventing further outbreaks. It is prepared from hogs that have been made hyper-immune to hog cholera virus.

Anti-hog cholera serum has its greatest value when used as a preventive measure. It is *not a cure* for hog cholera. In other words, if swine are allowed to sicken with hog cholera before anti-hog cholera serum is used, great success following its administration can not be expected. The proper time to use it is before hog cholera affects the herd. However, we recognize and advocate the liberal use of anti-hog cholera serum in swine sick from this disease because it does have a curative effect upon many swine, especially in the early stages of the disease.

Anti-hog cholera serum is sometimes used alone, at other times it is used in conjunction with hog cholera virus. When used alone it is known as a serum alone, serum only, or single treatment. When used in conjunction with virus it is known as the serum-virus, simultaneous, or double treatment.

By the serum alone, or single treatment, method a substance is put into the animal's body that will attack or hold in check the causative factor of hog cholera, thus preventing the animal from becoming sick from this cause. Animals so treated are spoken of as having a passive immunity. An immunity of this kind is not lasting. The exact time a pig will remain immune by this method of treatment is not known. It would not be advisable to expect a passive immunity to continue longer than four weeks. Even this may be too long in some cases.

This method of treatment is applicable when cholera breaks out in the herd and it is necessary to check it as soon as possible. All the pigs should be treated except possibly those that are in the advanced stages of the disease. Neighbors whose hogs are likely to contract

the disease can immunize their pigs in this way and prevent the disease from breaking out in their herds. However, the serum-virus method is preferable under these circumstances. Pregnant sows can be treated with serum alone without detrimental effects to them or to their offspring. If cholera is rampant on the farm when pigs are being farrowed by non-immune sows, and the disease starts among the young pigs, they should be treated with serum immediately. The serum treatment should be administered to any newly purchased animals unless it is known that they have been immunized to cholera.

The serum-virus, simultaneous, or double treatment involves the introduction of some of the virulent blood at the same time as the serum. Hogs so treated, if the work is properly done, are immune to cholera as long as they live.

There is some question as to the proper age or weight of a pig to receive the serum-virus inoculation. According to some investigators, the age does not matter. Pigs that were given the serum-virus treatment at one day of age are said to have developed as good immunity as pigs treated at 12 weeks of age. It is of interest to know that pigs can be treated at such an early age, but it is believed best not to treat by this method until they are at least 3 weeks of age. There is no maximum weight at which hogs can be treated. The advantages of treating young pigs are many—they are easily handled, less serum is required, and if one should die the economic loss is not great. Occasionally some pigs die of cholera as the result of the serum-virus treatment, but these cases are less than one per cent of the number treated.

One of the principal factors to be borne in mind when administering the serum-virus treatment is that the pigs must be in good health. Best results can follow only under such circumstances. Pigs suffering from any form of disease should not be treated with anti-hog cholera serum and hog cholera virus unless in the most imminent danger.

If the serum-virus treatment is used on non-infected premises, one is quite likely to introduce hog cholera, as the virus contains the causative agent of hog cholera, some of which may be scattered about the pens and yards. Pigs that have received the double treatment often become sick and have a mild form of the disease so that some of the infective material will be eliminated in the normal excretions and secretions of the body. For this reason, double-treated pigs and susceptible pigs should not be pastured together until at least 21 days after treatment. A longer period is even more desirable.

METHODS OF ADMINISTERING SERUM

It is preferable not to have the pigs that are to be treated on full feed. Pens should be provided where pigs will neither be too crowded nor have too much room to move about. This facilitates catching and prevents too much excitement and motion, with consequent exhaustion. The floor of the pen should be free from dust and preferably covered with shavings or straw. After a pig has been treated, it should not be allowed to run in a muddy or dusty pen for at least 24 hours. This will tend to prevent germs that might cause abscesses or sloughing from entering the wound made by the hypodermic needle.

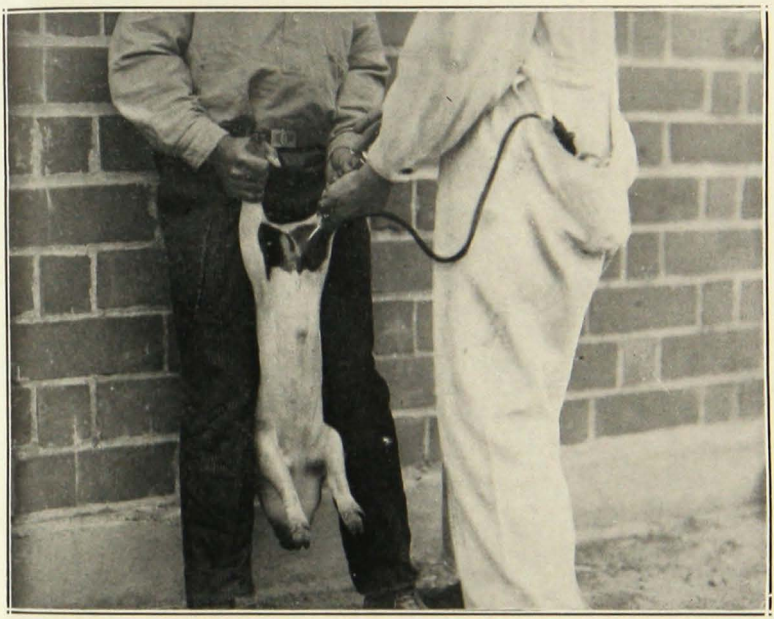

Fig. 6. Methods of Restraint and Site of Inoculation for Injecting into the Inner Surface of the Ham

The point on the body where the injection is to be made is a matter of selection by the operator. There are four principal places where the serum can be injected conveniently. These are: (1) on the inside surface of the ham; (2) in the armpit, or between the front leg and the chest wall; (3) behind the ear; (4) in the fold of the flank. The first two locations are best for pigs weighing up to 150 pounds; and the latter two for heavier hogs, pregnant sows, and large boars.

To inject in the ham of pigs weighing up to 90 pounds, grasp the pig by the hind legs and hold him head down, place his rump in your groin, his back between your legs, and with your knees press against

his shoulders. To inject in the arm-pit, hold the pig up by the front feet, place the back of his head in your groin, his back between your legs, and with your knees press against his hips. Pigs weighing from 90 to 150 pounds should be placed on the back, either on the ground or in a trough, and held by two assistants. The trough can be placed on a trestle about 3 feet from the ground in a horizontal position. Another convenient way is to place the trough in an inclined position, and if the operator chooses the ham as the site of injection, the head of the pig should be down. If the armpit is chosen, the head should be up. To inject behind the ear, put a rope around the upper jaw and behind the tusks and then tie the free end to a post or fence. The hog

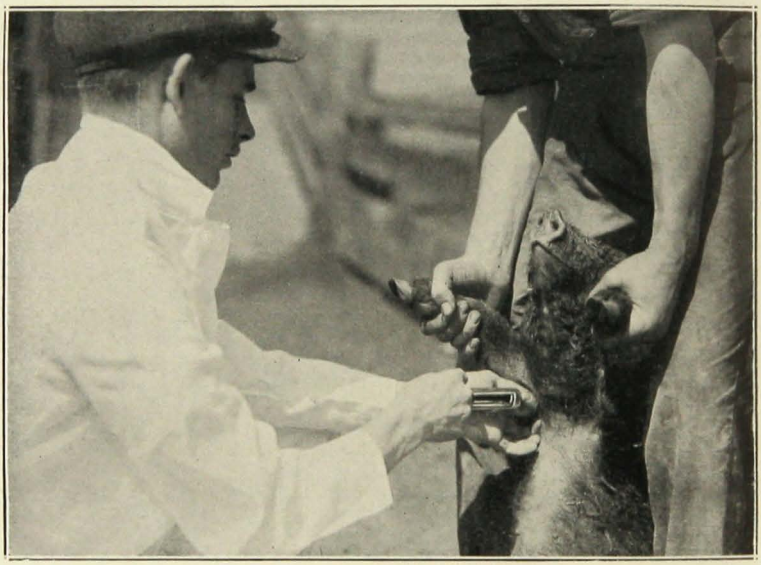

Fig. 7. Method of Restraint and Site of Inoculation for Injecting into the Armpit

will usually pull back on this rope and in this way secure himself quite firmly. The injection into the fold of the flank can also be made by restraining the animal in this way.

At the point where the injection is to be made, the skin should be thoroly cleansed with soap and water, and all excess soap and water wiped off. Any of the coal tar disinfectants in 2 per cent solution, denatured alcohol, or tincture of iodine can be used for disinfecting the point of injection. Tincture of iodine is an excellent agent as it will serve two good purposes: (1) It is a good antiseptic and disinfectant and (2) it stains the tissues and will serve as an identification mark. If one of the treated pigs should get among the untreated ones, the stain would disclose its identity. The pig should be freed of re-

straint as soon after injection as possible. This will allow the skin to close over the needle puncture and thus prevent leakage of serum.

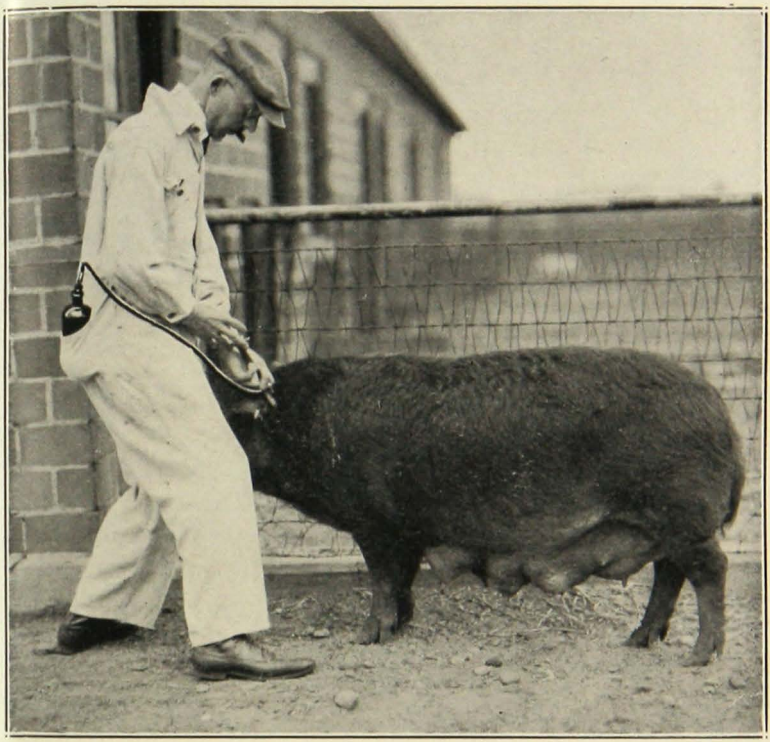

Fig. 8. Method of Restraint and Site of Inoculation for Injecting Behind the Ear

ANTI-HOG CHOLERA SERUM

The progress in the production of anti-hog cholera serum has been rapid. Its value as a preventive agent against hog cholera has been proved many times. Skepticism and doubt regarding its value should be abandoned. It has long passed the experimental stage and has become an article of known value. Nevertheless, investigations and research are constantly being carried on in the attempt to improve it.

Hog cholera serum was discovered less than twenty-five years ago by Doctors Dorset, McBryde, and Niles, of the United States Department of Agriculture. These men are st ll active in the furtherance of the work and have done much toward improving the serum.

In order to produce anti-hog cholera serum, it is necessary to secure an immune pig, one that will not contract the disease, no matter how severely it is subjected to the virus or causative agent of cholera. By injecting this immune p'g with large quantities of a virulent hog chol-

era virus, it is made hyperimmune, or more than immune. Blood extracted from a properly prepared hyperimmune pig will contain enough anti-hog cholera substance, or anti-bodies, to protect a susceptible pig if injected in sufficient dosage. Therefore the blood obtained from the hyperimmune constitutes what is known as anti-hog cholera serum, or hog cholera vaccine. The latter term is a misnomer and should be discarded.

The product obtained in this way is virtually whole blood. Certain technical steps are necessary to remove the fibrin or clot from the blood, and a preservative is added. This product, which has all the outward appearance of whole blood, is known as "bloody" serum, and is not a sterile product.

For many years no other kind of anti-hog cholera serum was available. Through scientific investigation a better "serum" has been produced, which is known as clear, concentrated anti-hog cholera serum. The corpuscles or cellular elements of the blood are removed, leaving only the clear serum portion for use. It has been shown that the cellular portions of the blood are not necessary in the immunizing process. The clear concentrated anti-hog cholera serum has certain advantages over the "bloody" serum—it is absorbed more readily, is free from possible contaminating organisms, and smaller doses can be given.

WILL HOG CHOLERA SERUM INFLUENCE BREED CHARACTERISTICS OR POTENCY?

This question is one of special interest to breeders of purebred swine. Many have been backward about using anti-hog cholera serum because they feared it might influence characteristics in the offspring of serum-treated hogs. Again, others believe that serum-treated sows produce small litters and pigs with weak constitutions.

The answer to this question is **NO.**

The reason for this answer may be briefly stated by saying that individual characteristics are transmitted from parent to offspring only through germ cells. Blood cells and serum are not germ cells and therefore can not influence such characters. Serum and virus treatment will not cause the sow to farrow a small litter. Sows that are serum-virus treated during the latter half of pregnancy often abort or give birth to weak or even undeveloped young. The apparent cause of this is that the sow passed through a mild attack of cholera following immunization and certain inflammatory processes occurred in the uterus.

CONTROL OF HOG CHOLERA

The eradication of hog cholera is the ultimate object. Just how soon the time will come, or whether it will ever come, that hog cholera will be entirely eliminated, no one knows. However, in the light of what is being done with certain other diseases of livestock, as tuberculosis, dourine, foot and mouth disease, and Texas fever, it seems that hog cholera could be dealt with in a similar manner. In order to do this, the honest and whole-hearted co-operation of the federal and state authorities, the veterinarian, the county agent, and the hog raiser himself, is needed.

One of the most important steps in the control of hog cholera is the early diagnosis or recognition of the disease. A correct diagnosis is imperative. As soon as any of the pigs appear sick, a veterinarian should be called, and with him rests the responsibility of a proper diagnosis and the method of procedure to follow. If anti-hog cholera serum is used on swine suffering from some disease other than hog cholera, the results are discouraging.

In outbreaks of hog cholera, anti-hog cholera serum can not be used too soon. Attention is again called to the fact that serum is not a cure but it may be given in large doses to swine in the early stages of the disease. It should be remembered that if only one hog is saved, it will pay for the serum used.

Sanitary measures are equally as important in the control of this disease as is the use of serum. In the first place all sick swine should be removed from the herd and put in a separate pen or enclosure. These animals are extremely dangerous in the herd; they are the greatest source of infection and are active spreaders of the disease. All dead carcasses should be removed from the pens or pastures and disposed of by burning or by burying them deep.

Hog houses should be thoroly cleaned and disinfected. To do a good job requires a considerable amount of effort, but the cost in dollars and cents will be more than compensated. All straw, litter, etc., should be burned or plowed under in a field that will not be used for hog pasture for at least three years. It is important to get all the filth out of the corners and cracks, and also the dried accumulations from the walls, troughs, gates, etc. After all manual cleaning has been done, apply a disinfectant. (See following paragraph.) The feeding troughs and floors should be washed clean of all foodstuffs, etc., and then scalded and exposed to direct sunlight as long as possible. Drinking fountains should be treated in like manner. The litter and muck in the pens and runways should be collected and hauled away. This will allow the sun's rays to reach the surface. The sun is one of nature's most powerful disinfectants. The disinfected pens

should be allowed to dry thoroly before hogs and fresh bedding are put into them.

A disinfectant destroys disease germs or renders them harmless. The causative agent of hog cholera is more or less resistant to certain disinfectants, and therefore only those that will destroy this virus should be employed. Carbolic acid, because of its poisonous properties, is not considered a good disinfectant for this purpose. Also, it is expensive. Cresol or compound solution of cresol, is more effective. A 2 per cent solution of either when made up with warm soft water and applied liberally, serves the purpose admirably. Most of the commercial disinfectants made from coal tar acids are suitable and can be used. Milk of lime, made by thoroly mixing one part of recently

Fig. 9. Hog Cholera Carcasses Piled in an Open Field
A good chance for dogs, crows, buzzards, etc., to carry about the infection.

slaked quick-lime and four parts of water, is very useful and beneficial.

Dogs, cats, crows, hawks, buzzards, birds, and even flies will spread hog cholera. It is very difficult and next to impossible to control all these agencies. One may, however, by observing the sanitary and control measures already mentioned, reduce to a minimum the danger from such sources.

To further the work toward the control of hog cholera, a quarantine should be established. The very name quarantine usually is repulsive. Some seem to think that to have their hogs quarantined is cause for

shame. As a matter of fact it is just the opposite, because the person who has cholera on his farm and does not make it known or resents the quarantine, is the one that should be ashamed. The man who displays a placard on his farm announcing the presence of cholera and lives up to the regulation of the quarantine, is doing his bit to control the scourge.

LAWS AND REGULATIONS PERTAINING TO HOG CHOLERA

The Minnesota State Livestock Sanitary Board, which is the legally constituted agency in the State of Minnesota charged with the control of hog cholera and other contagious and infectious diseases of animals, has the administration of various laws and regulations, some of which are quoted below.

Chapter 30, General Statutes 1923, Section 5399

Every person who knows or has reason to suspect that a contagious or infectious disease exists in any domestic animal shall immediately notify the local Board of Health. Within twenty-four hours after such Board shall receive notice or have knowledge that any such animal is infected with, or has been exposed to such disease, it shall give written notice thereof to the State Board. . . .

Chapter 218, General Statutes 1927, Section 10273

Every person owning or having in charge any domestic animal that has died or been killed on account of disease shall immediately bury the carcass thereof at least three feet deep in the ground or cause the same to be consumed by fire. Provided, however, that the livestock sanitary board, through its secretary and executive officer, may issue a permit to owners of rendering plants, provided such rendering plants are operated and conducted as required by law, to remove carcasses of domestic animals and fowl that have died or have been killed on account of disease, over the public highways to their plants for rendering purposes in accordance with the rules and regulations adopted by the livestock sanitary board relative to transportation, rendering, and all other provisions deemed by said board to be necessary to prevent the spread of disease. No person shall sell or offer to sell, or give away such carcass when the animal died or was killed on account of disease, nor convey the same along any public road or upon any land not his own; unless in accordance with a special permit as hereinbefore provided. Nor shall any person negligently or will-

fully permit diseased animals owned or controlled by him to escape his control or to run at large. Every violation of any provision of this act shall be a misdemeanor.

10450. **Animals with infectious disease**—Every owner or person having charge of any animal, knowing the same to have any infectious or contagious disease, or to have recently been exposed thereto, who shall sell or barter the same, or knowingly permit such animal to run at large or come into contact with any other animal, or with another person without his knowledge and permission, shall be punished by imprisonment in the county jail for not more than thirty days, or by a fine of not less than twenty dollars nor more than one hundred dollars.—(5159) [8962].

Chapter 36, General Statutes 1929, Section 5446

5446. No person shall use or administer virulent blood or hog cholera virus within this state unless he shall have been granted a permit by the board authorizing him to use or administer the same. Such permits shall be in writing and shall be issued only to such persons as in the opinion of the board are qualified to administer the same and shall only be used or administered in infected territory. The area within a radius of six miles from premises whereon hog cholera exists, or has existed within the preceding twelve months, shall constitute infected territory. Qualified licensed veterinarians may administer virulent blood or hog cholera virus in non-infected territory upon receipt of a special permit to administer the same to hogs on an individual farm. All permits shall require the holders thereof to comply with all quarantine regulations of the board and may be cancelled by the board upon it appearing that the holder thereof is no longer a proper person to administer such virulent blood or hog cholera virus.

Persons living in non-infected territory who wish to have their hogs immunized by the serum-virus method, can do so only after receiving special permission from the State Live Stock Sanitary Board, Old Capitol, St. Paul. They require him to accept the following agreement:

STATE OF MINNESOTA

Live Stock Sanitary Board

In accordance with the provisions of Sec. 4691, R. L. 1913, you are hereby ordered to isolate on your premises, the following described animals:

.....

located in Section .....; Township of ....., County of.....
hogs vaccinated with hog cholera serum-virus by.....
(Veterinarian's name)

of....., on..... 19.....
(Address)

You are hereby forbidden to remove or permit to be removed from the said premises any or all of the above described animals or any article or thing that is likely to convey contagion, and you are required to make complete report to the office of the Live Stock Sanitary Board of any unthrifty condition, sickness or death of the above animals, immediately at the time such condition is discovered.

You are further ordered to keep posted in conspicuous places, quarantine placards furnished by the Live Stock Sanitary Board.

This quarantine remains in force for at least twenty-one days, and until such time as all animals are well and there is no danger of infection, and until all hogs have been properly sprayed or dipped in a 3 per cent solution of liquor cresolis compound or any other disinfectant officially approved by the Federal Bureau of Animal Industry, and the yards, pens and houses have been thoroughly cleaned and then disinfected with a similar preparation, when the quarantine will be released by the Live Stock Sanitary Board or the chairman of the local board of health. Your attention is directed to Sec. 2165, R. L. 1913, which provides that any person violating the quarantine is guilty of a misdemeanor and punishable accordingly.

LIVE STOCK SANITARY BOARD.

Per.....

I (the owner or agent).....
(Name)
....., do hereby agree to abide by the above order
(Address)
of quarantine of the Live Stock Sanitary Board, State of Minnesota.

Signed.....

The Division of Veterinary Medicine at University Farm stands ready to co-operate with any agency within the state toward the control and suppression of hog cholera.

Section 5447. **Schools of Instruction**—Provision shall be made by the secretary of the board for instruction in the use of serum and virus in each county not oftener than once each year, and he is hereby authorized and directed to make all necessary arrangements for such instruction at a convenient time and place,

when there are seven (7) or more applicants, who are residents of the county, for such instruction. Persons who desire to avail themselves of such course of instruction shall make application to the county agent.—('23 C. 112 § 16).

Section 5448. **Applications for Instruction**— The county agent, or one of the applicants in case there is no county agent, shall forward such applications to the secretary of the board who shall notify the extension department of the College of Agriculture, University of Minnesota at the University Farm, St. Paul, and said department shall within thirty days send competent instructors to such county to hold a school of instruction. Such instructor or instructors shall give all instructions and demonstrations necessary and conduct reasonable examinations and immediately report to the board the names and addresses of the persons passing the examinations.

Upon receiving such report the board shall, upon the receipt of two dollars, issue a permit to each person having passed examination. This permit shall entitle its holder, to use virulent blood or hog cholera virus on his own hogs, in badly infected counties. This permit shall be good only for one year, but upon the payment of one dollar to the board, the board shall renew this permit for one year at the time without the applicant taking further examination.

Badly infected counties shall be counties that have been so designated by the live stock sanitary board, or counties that have reported to the live stock sanitary board at least five places in said county where hog cholera exists, or has existed during the last twelve months, and which has been diagnosed by a qualified licensed veterinarian.

All funds received under this act shall be placed to the credit of the live stock sanitary board for the purpose of carrying out the provisions of this act.—('23 C. 112 § 17).

NOTICE

STATE LIVE STOCK SANITARY BOARD

HOG CHOLERA

EXISTS ON THESE PREMISES

Regulation requiring the isolation of domestic animals for certain contagious and infectious diseases. Adopted by the Board and approved by Deputy Attorney General on May 18th, 1920.

BE IT RESOLVED by the Live Stock Sanitary Board of the State of Minnesota that the following regulation is deemed expedient and necessary for the proper protection of the domestic animals of the State of Minnesota, and be it further resolved that pursuant to the authority granted by the provisions of Section 4691 the following rule and regulation be and the same is hereby adopted, to-wit:

The owner or person in charge of any domestic animal affected with or which shows symptoms of, or has been exposed to the following diseases: glanders, tuberculosis, actinomycosis (lumpy jaw), infectious anaemia (swamp fever), anthrax, scabies, hog cholera, necro bacillosis, epizootic lymphangitis, black leg, foot and mouth disease, and Texas fever, shall forthwith upon discovery of the existence of such disease or symptoms thereof or upon ascertainment that any such animal has been exposed to any of said diseases, cause each and every animal so affected, exposed or showing symptoms of the existence of such disease to be isolated from all other well or unexposed domestic animals and to thereafter continue to have each such animal isolated, as aforesaid, on the premises of the owner of such animal or of the person in charge thereof until such time as the State Live Stock Sanitary Board, its executive officer or a duly authorized agent or officer of said board, shall certify in writing that such animal is free from any such disease, or that there is no longer any reasonable necessity to keep such animal isolated from other domestic animals

It shall be the duty of local health officers when directed so to do by the executive officer of the Live Stock Sanitary Board or any officer or agent thereof, to place in a conspicuous place, or places on the premises where any such animal may be isolated, as aforesaid, a placard or notice of the existence of such disease. No person except the owner, attendants or medical advisers shall enter any enclosure where any animal so isolated is being kept and upon which a placard shall have been placed, as hereinbefore provided for, during the time such placard is so displayed. No person shall remove, obliterate, mutilate or destroy any such placard so posted until the executive officer or a duly authorized agent or officer of the Live Stock Sanitary Board shall have certified in writing that said isolated animal or animals referred to in the placard, are free from the disease specified in such placard, or that there is no longer any reasonable necessity of keeping the animal or animals referred to in the placard isolated from other domestic animals.

SECTION 4701, STAT. 1913

Provides that every person violating any rule or regulation made by the Live Stock Sanitary Board shall be guilty of a misdemeanor, the minimum punishment whereof shall be a fine of $25 00 or imprisonment for 30 days. Said section also provides that any member of a local Board of Health who shall neglect or refuse to perform any duty imposed upon him by law or by the direction of the State Live Stock Sanitary Board or who refuses or neglects to enforce the regulations of said State Board shall be guilty of a misdemeanor, the punishment whereof shall be a fine of $25.00.

Fig. 10. Poster to Be Displayed when Hog Cholera Exists on the Premises

STATE LIVE STOCK SANITARY BOARD

HOGS QUARANTINED

All persons, excepting the owner, duly authorized attendants, or medical advisers, are forbidden to enter any enclosures where hogs are kept on these premises, until this card has been removed by permission from the State Live Stock Sanitary Board, or Local Board of Health.

Persons living on this place must not go near pens or yards where hogs are kept on other farms.

Hogs must not be removed from these premises.

Keepers of these hogs will be held responsible for the unauthorized removal of this notice, and for allowing any swine hereby quarantined to escape from these pens or yards and run at large.

By order of

Dated.....19.....

.....Health Officer.

CHAPTER 352, LAWS OF 1913.

Sec. 21. Any person violating any provision of this act or any rule or regulation made by the State Live Stock Sanitary Board, or by any Local Board of Health, or any order made by such board under the authority hereof, shall be guilty of a misdemeanor and be punished by a fine of not less than twenty-five (25) or more than one hundred (100) dollars, or by imprisonment for not less than thirty (30) or more than ninety (90) days.