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HOG CHOLERA AND ANTI-HOG CHOLERA SERUM.

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The importance of "Hog Cholera" and the production of anti-hog cholera serum to the live stock interests of the State will be readily seen when one considers that according to the year book of the United States Department of Agriculture for 1910, there were 656,000 hogs in the State with a value of \$7,544,000. There has always been doubt as to whether the highly infectious disease hog cholera existed in the State or whether the reported outbreaks of cholera were not caused by some dietary condition as, for instance, Moore has pointed out in the case of feeding swill which contained large quantities of powdered soap.

However, after the discovery that a filterable virus is the cause of the epizootic disease and not the bacillus of hog cholera, it was suggested that some of the outbreaks of apparently infectious diseases of swine from which this latter organism could not be isolated might be due to the filterable virus. With this in view, several inoculations were made with the filtered blood of animals which had died of supposed hog cholera. The result of this work proves conclusively that hog cholera exists in four counties of the State and there is good evidence that it is present in other localities.

Historically it is interesting to note that hog cholera has existed in this country for a long time. It was first reported from Ohio in 1833 and was thought by American authorities to have been imported from Europe. Scientists on that continent, however, denied its existence in Europe until long after its appearance here. The absence of positive diagnosis at that time failed to make clear in which country it originated. It is reasonably certain, however, that Ohio was the first state to be infected. During the next twenty years after its first appearance there were over ninety outbreaks divided among several states and furnishing centers from which the infection has been carried to practically every state in the Union.

Dr. Geo. Sutton of Aurora, Ind., made the first report upon the disease in 1853. This was followed by reports by E. M. Snow of Providence, R. I., in 1861, Dr. James Law, Ithaca, N. Y., in 1875, and Dr. Detmers in 1877. Dr. Law's report contains the

first fairly accurate and complete description of the disease. The work of these men covered the symptoms of the disease and the post-mortem appearance of the organs of animals that had died of it, in fact all that could be learned from field observation alone.

In 1878, Congress made an appropriation for the investigation of swine diseases. Nine men were appointed for the investigation of 1878, and these for a period of two months only. Consequently little was accomplished. The researches of these men were to be made in the field and various measures applicable to the control of epizootic diseases were tried. The results of these investigations were summed up as follows in a publication of the Bureau of Animal Industry, 1889, Hog Cholera:

1. Swine diseases were found destructive in the most widely separated districts of the country.

2. The symptoms and post-mortem lesions were similar to those described by Sutton, Snow, Law, and others.

3. No evidence was discovered to show that there was more than one disease which prevailed as an epizootic.

4. It was believed that the outbreaks were due to a contagion and that the disease was communicable.

5. The remedies tested were either without effect or of doubtful value in the treatment of affected animals or guarding against the contagion.

Of the nine investigators only Law and Detmers retained their appointment longer than two months. These men did considerable laboratory work. Law made inoculations into rabbits, rats and sheep and seemed to establish the communicability of the disease he investigated. Detmers, by the aid of the microscope, thought he had discovered the cause of the disease and named the organism *Bacillus suis*. Both of these conclusions were in error but pointed out the need of bacteriological research and careful laboratory work as the only means of determining the cause and prevention of the disease. Law and Detmers continued their investigation for the Department of Agriculture in 1879. In 1880 Salmon was added. Law devoted much of his time to the production of a vaccine by attenuation of the virus or cause of the disease. In this he was unsuccessful. During this time Detmers continued his investigation with the microscope. During the next four years little was done in investigation because it was understood that it had been carried about as far as possible under the methods then employed and because of a lack of facilities for and clear methods of bacteriological research.

In 1885 it was announced that Salmon and Smith had discovered the cause of the disease. This was determined as due to a motile rod, to which the name has been given *Bacillus cholerae suis* or hog cholera bacillus. These investigators showed that this organism was found in the organs of most of the animals which they had examined that died of cholera. Further, they could produce symptoms similar to hog cholera and lesions, in many cases, indistinguishable from those of animals that had contracted the disease naturally. They were also able to recover the bacillus from the animals which had died as the result of the inoculation.

In 1886, Smith described an entirely different infectious disease of swine due to an organism belonging to the present Septicaemia Haemorrhagica group. Accordingly, it was considered that there were two distinct infectious diseases: hog cholera in which the lesions were largely in the digestive tract, and swine plague in which the lungs were mostly involved. In many outbreaks they were able to find both diseases present and to recover both organisms from the same animal.

The results of Salmon and Smith were confirmed by scientists of this and other countries and it was generally conceded that there were two contagious diseases of swine, namely hog cholera and swine plague.

Since *Bacillus cholerae suis* was announced as being the cause of hog cholera, the work has been largely to find a vaccine or serum which would serve as a preventive for the disease. Various vaccines and sera were tried but none of the preparations gave satisfactory or practical results. It was not until about twenty years later that de Schweinitz was led to the suspicion that *B. cholerae suis* was not the cause of the epizootic form of the disease. He noticed that although hog cholera is very contagious and spreads readily to other members of the herd when once it is introduced, yet when an animal was injected with pure cultures of *B. cholerae suis*, in many cases the animal would become sick and die from the effects of the injection, but other animals associating with it would remain well. He also found that it was difficult to produce hog cholera by subcutaneous injections of cultures of the hog cholera bacillus, while the injection of some of the blood of a sick animal subcutaneously into a sound one would produce the disease. Other reasons were that although made immune to pure cultures of the hog cholera bacillus, animals

were by no means immune when exposed to animals sick with cholera.

These facts led to further investigation. In 1903 de Schweinitz and Dorset (Circular 41, B. A. I.) reported that *B. cholerae suis* was not the specific cause of the epizootic disease, but that the cause was a filterable virus or one so small that it could be passed through the finest porcelain filter. It might be well to add a word relative to the term "filterable virus." There are certain diseases, for instance rinderpest and foot-and-mouth disease, that are highly contagious, and which are due to invisible organisms or viruses present in the blood and fluids of the body. These viruses are so small that they can be passed through the finest porcelain filter and are invisible even with our strongest microscopes.

As a result of experiments published in 1895 (B. A. I. Bulletin No. 72), it was determined that the filterable virus is the real cause of the epizootic disease of swine; that the hog cholera and swine plague bacteria are, so far as the epizootics are concerned, secondary invaders. The fact, however, must not be lost sight of that *Bacillus cholerae suis* and *Bacterium septicaemia haemorrhagica* are the cause of certain diseases of swine, and in many outbreaks they exert considerable influence as to the manifestations of the disease.

Means by which the infection is spread. Hog cholera may be spread from a single center of infection in many ways. One of the most prevalent is the purchase of a hog from an infected herd and placing it in a sound one. It is also spread to some extent by taking the sows from a sound herd to an infected herd for service. This has occurred once in our experience in which we had a clear history. The infection may also be carried from one farm to another upon the attendant's shoes or upon the wheels of wagons driven through an infected territory. Horses and cattle though not capable of contracting the disease may carry the infection from one place to another upon their feet. This also holds good in the case of dogs feeding upon carcasses dead of the disease. Furthermore, it may be carried down a stream of water from pollution higher up.

Period of incubation. The period of incubation varies from a few days to two or even three weeks. This depends a great deal upon the method of exposure, virulence of the virus, and resistance of the animals exposed. Young and pampered animals are usually more susceptible and have the more acute form of the

disease. A short period of incubation usually means a virulent type of the disease. As in the case of most infections, the virus of hog cholera is more virulent in the earlier part of an outbreak of the disease and may become so weak that the resistant animals may not become affected at all.

Symptoms. The symptoms of hog cholera are not very characteristic. Fever is usually present and in animals that are coming down with the disease, which have not as yet shown any symptoms of sickness, the temperature may be several degrees above normal. Frequently it is subnormal in the last stages of the disease. Soon after being attacked the animal loses appetite, becomes weak and may have convulsions. In the early part of an outbreak, the young and very fat animals may succumb without showing any symptoms of sickness. Diarrhoea may be present and usually follows constipation, although constipation sometimes persists throughout the disease.

The symptoms vary somewhat with the virulence of the outbreak and the resistance of the animals attacked. If the virulence is high and the resistance low the acute form is seen. In this type of the disease, the animal shows fever, dullness, stiffness, soreness, tremors, weakness, and loss of appetite. It does not move unless made to do so; in general there is great depression. The eyes are inflamed and the lids gummed with the secretions. Red patches usually appear upon the skin, especially in the region of the ears, lower jaw, abdomen and inside of the legs. Sometimes the redness is duffuse, covering the entire regions mentioned. Before death this may turn to a purplish color. Coughing, rapid breathing, and other symptoms of respiratory derangement may be present but usually these symptoms are not pronounced until shortly before death.

In the chronic type of the disease about the same symptoms are exhibited as in the acute except that the illness may last several weeks or months, during which there is the usual weakness, loss of appetite, inflammation of the eyes, and usually profuse diarrhoea. If these cases recover they are rarely of any value to the owner. It will be noticed from the above description that there are no symptoms characteristic of the disease. However, if an animal or two have died and then after an interval of a week or ten days others become affected in a similar manner, there is sufficient grounds for suspecting the presence of hog cholera.

Post mortem appearances. There may be reddish or purplish spots upon the skin or the entire region mentioned under symptoms may be colored. Petechiae may be present upon the surface of the heart and occasionally on the pericardium and lungs. Frequently pneumonia is present but is not so characteristic as the small hemorrhages. In acute cases the spleen is usually enlarged, dark colored, soft, filled with blood, and may show hemorrhages beneath its capsule. In chronic cases this enlargement is not noticed and the color is often lighter than normal.

The lymph glands in the inguinal region are swollen and red or even dark in color in the acute form of the disease. Those in other parts of the body, mesenteric, angles of the jaw, etc., may be affected in a similar manner. These lesions are not often found in chronic cases. The kidneys in the acute disease are usually the seat of small hemorrhages. To observe the condition of the kidneys it is necessary to remove the capsule. If the kidneys are slit open hemorrhages of a similar nature may be seen on their inner surfaces. The color of the kidneys is usually darker than normal and the hemorrhages may vary in size from a mere point up to the size of a pin head.

Sometimes petechiae are found on the serous side of the stomach and small intestine. The mucosae of these organs may also show hemorrhages. The large intestine, however, is usually the seat of extensive lesions. In the acute form of the disease hemorrhages may be present on both surfaces of this organ. Erosion of the mucous membrane is also common. The mucosa may be blood stained and the contents of the bowel blood stained from the extravasation of blood. In the chronic form of the disease, the so-called "button ulcers" may be found. These ulcers are usually found in the caecum upon or near the ileo-caecal valve and are quite characteristic of the disease. They are circular, hard, yellow in color, with a darker greenish yellow center, raised distinctly above the healthy mucous membrane. They vary in size from mere points to an inch in diameter and are so numerous in some cases that large portions of the organ are destroyed. If the ulcers are found diagnosis can be made fairly accurately, although there is no other disease in this country in which the petechiae are found in the heart, lungs, kidneys and other organs.

Any or all of the above described lesions may be found in an animal dead of cholera, but only an occasional animal exhibits all the lesions. For instance, it is practically impossible to find

the button-like ulcers in the acute form of the disease and but rarely are the hemorrhages seen in the chronic type.

Diagnosis. Before diagnosing a disease as hog cholera there are a few important factors one should bear in mind. In the first place, is the disease contagious? That is, can it be spread from one animal to another? Then the symptoms and post-mortem lesions should be considered. It is possible to get a fairly good idea relative to the disease from these observations but in order to prove conclusively that the disease is hog cholera, it is necessary to produce the disease in a sound animal by inoculating it with some of the filtered blood of a dead or very sick animal.

The disease must be distinguished from sickness due to improper feeding, especially in case of swill or garbage fed animals, as it has been shown by Moore that powdered soaps used in washing dishes may cause a disease which resembles cholera. Of course disorders due to dietary conditions would not spread as an epizootic, while hog cholera would most likely spread throughout the neighborhood. There are so very few other diseases which might be confused with cholera that time will not be taken to discuss them.

Treatment and prevention. There is no successful treatment for hogs sick with cholera. Various products have been recommended for this purpose but are of no practical value. The only rational method of dealing with an epizootic is to prevent the spread of the infection instead of attempting to cure those animals already sick. Since there can be no cholera without the filterable virus, every precaution should be taken to prevent its being carried to sound herds. After the disease has appeared in a herd, the only known remedy that will prevent its spread is the Dorset-Niles *anti-hog cholera serum*. This preparation will prevent the infection of other members of the herd if used in the early part of an epizootic. Besides administering serum the pens, troughs, and yards should be thoroughly cleaned and disinfected, so that the infection will not be carried to other places.

Production of the serum. Since the filterable virus could not be grown artificially, it was necessary to resort to the blood of hogs sick with cholera for any protective agent. On this account many attempts were made to produce a vaccine by attenuating the blood of sick animals. The results obtained by such attenuation were too uncertain for general use. While endeavoring to

produce a vaccine, it was noticed that by injecting an immune animal with large amounts of virulent blood, a serum of high protective powers could be obtained. (B. A. I. Bulletin No. 102, Dorset, McBride, Niles.)

In order to produce anti-hog cholera serum it is necessary to have an immune animal. For this purpose a pig is immunized by inoculation with a few centimeters of virulent blood and an injection of anti-hog cholera serum in opposite sides of the body. Then the immune is hyperimmunized by the injection of large quantities of virulent blood. The large amounts of virulent blood required are obtained as follows: A few centimeters of virulent blood are injected into susceptible pigs. When these animals are in the last stages of the disease, they are bled under antiseptic conditions, the blood defibrinated by shaking with glass beads, and strained through sterile gauze. To produce potent serum a strong virus is necessary, that is, one that kills quickly. Otherwise the serum produced would be weak in protective properties. We may hyperimmunize in any of the following ways:

1. *Slow subcutaneous.* Inject the immune animal subcutaneously with 1 cc. per pound of body weight. In from seven to ten days repeat the injection using $2\frac{1}{2}$ cc. per pound. Then after the same interval inject 5 cc. per pound.

2. *Quick subcutaneous.* Inject 10 cc. per pound of body weight.

3. *Intravenous.* Inject intravenously 5 cc. per pound.

4. *Intra-abdominal.* Inject intra-abdominally 10 cc. per pound of body weight.

As soon as the animal has recovered from the effects of the injection or the last injection, if the slow subcutaneous method has been used, it is ready to begin bleeding from the tail. This is usually within ten days. The bleeding is repeated at intervals of a week for three or four bleedings. The animal is then killed and all its blood used, or it may be rehyperimmunized. In rehyperimmunizing the animal usually receives half the previous dose of virulent blood. Four or five cubic centimeters of blood per pound of body weight are usually taken at each bleeding. Sometimes an animal will not bleed so much and occasionally it is possible to take more. A two hundred pound hog will, in most cases, give 800 to 1,000 cc. of blood at each bleeding.

Treatment of the blood. The blood is drawn from the tail under as antiseptic precautions as possible. It is then defibrinated or the

clots broken up by shaking with glass beads, then strained through sterile gauze to remove the clots. One half per cent. of phenol is added and the serum is ready for use. The blood of each animal is kept separate and that of each bleeding added. The mixed blood of several animals is tested before using.

Testing the serum. The following methods of standardizing hog cholera virus and testing the potency of the serum were adopted at a conference of the federal and State officials, in December, 1909:

1. *The standardization of hog cholera virus which is used for hyperimmunization.*

a. Inject at least two pigs intramuscularly, giving each 2 cc. of the defibrinated diseased blood which is to be tested. The blood should not be more than 24 hours old and should have been kept at a temperature not higher than 55° F.

b. The test pigs should not weigh less than 50 pounds each. After injection they should be placed in a small disinfected pen with at least one susceptible uninoculated pig of the same weight and preferably of the same litter.

c. The virus shall not be considered suitable for use unless the inoculated pigs become visibly ill within eight days and die within fifteen days after inoculation. The carcasses of these pigs must show undoubted lesions of hog cholera. Furthermore, the communicability of the disease induced by the blood inoculations must be demonstrated by the contraction of the disease by the check pig within 12 days after the appearance of the disease in the inoculated pigs.

2. *Handling the blood used for hyperimmunization.* The diseased blood should be collected and manipulated under strict antiseptic precautions, stored at a temperature not higher than 55° F. and used within 24 hours after drawing. It is recommended that defibrination be postponed until immediately before use of the blood.

3. *Testing the potency of the hyperimmune serum.*

a. If the plan of testing the mixed bleedings of each hyperimmune be adopted by the producer, then we recommend that the test be carried out as follows:

Inoculate three hogs, each weighing from 50 to 100 pounds, with 2 cc. each of virulent blood. Inject two of these simultaneously with 15 cc. each of the serum to be tested. If the hog receiving virulent blood only sickens with hog cholera within

eight days and is apparently ready to die in fifteen days, while the two receiving immunizing serum continue in good health, then the serum may be considered suitable for field use in doses of 20 cc. for hogs weighing from 50 to 100 pounds.

b. If the plan of testing the mixed sera of several hyper-immunes be adopted by the producer, then inject intra-muscularly nine similar pigs weighing between 50 and 100 pounds each with 2 cc. each of virulent blood. Give each of three of these 15 cc. of the immunizing serum to be tested. Give each of three others 20 cc. of the serum to be tested. If all of those receiving immunizing serum remain in good health and two or more of the checks become ill of cholera within eight days and are apparently going to die in fifteen days, the serum shall be considered suitable for field use in doses of 20 cc. for hogs weighing from 50 to 100 pounds. If one or more of the pigs receiving 15 cc. of serum become obviously sick of cholera and the three pigs receiving 20 cc. each of immunizing serum all continue to remain in good health, then the serum may be used in field work in increased doses.

Methods of using the serum. There are two methods of using the serum. By the simultaneous method a dose of serum and a small amount of virulent blood are injected in opposite sides of the body. This method of vaccination is said to produce an immunity that will last for life. It is to be preferred in cases of well herds or in those that will not be exposed to the disease for several months. This involves the use of virulent blood which if handled carelessly may furnish the source of infection to sound herds.

Serum only is injected in the other method. This serum will produce an immunity that will last for several weeks or months, but if the animals are not exposed to cholera within a few weeks after receiving the serum, the immunity lessens and the animal may again be susceptible to cholera. If, however, the animals are exposed to the infection within a few weeks after receiving the serum, the immunity is believed to be of a lasting duration. In either case the injection is usually made in the inside of the thigh. Serum will be supplied from this college for use in the latter method only, since in most cases it will not be applied for unless cholera exists in a herd. In this case all the well animals may be treated. Natural exposure to the infection takes place in these cases and the virus is not needed. The serum should be ad-

ministered by a competent veterinarian under strict antiseptic precautions.

Dose and cost of serum. Animals weighing from 50 to 100 pounds are taken as the standard. The dose for such animals is 20 cc. Suckling pigs should receive from 10 to 15 cc. Older and heavier animals may receive as much as 30, 40 or even 60 cc. in case of very large animals. If the herd is badly infected the dose can be increased somewhat. It is a good plan to take the temperatures of the animals treated and give a larger dose to those having fever.

The cost of the serum will be \$.25 per dose of 20 cc. This amount partially covers the cost of production.

How to order serum. In ordering serum the following information should be given: Number of animals, weight, length of time the disease has been in the herd, number of animals that have died, number of those sick at the present time. Before ordering serum, it should be always considered that anti-hog cholera serum is not regarded as a curative agent but as a preventive and if used in the early part of an epizootic it will prevent the infection of the well animals. The serum will be of absolutely no benefit in any other disease than that caused by the filterable virus. Consequently to avoid useless expense and disappointment, it is necessary to have the disease diagnosed by a competent veterinarian. We would much prefer that the name of the veterinarian who diagnosed the disease and who will administer the serum accompany the order.

Outbreaks of hog cholera in the State. The following outbreaks of cholera were studied and will be named simply from the county in which they occurred.

No. 1. Broome county. Early in the fall of 1909 attention was called to a disease among hogs in Broome county. This herd had consisted of about 200 animals. Of these, fifty or sixty had died during the first four weeks of the epizootic. It was impossible to trace the source of the infection, as no animals had been brought into the herd recently nor had any disease been reported in the neighborhood. About fourteen years previously, there had been a similar disease among the animals but no trouble since. This outbreak was finally controlled by proper sanitary measures, including the removal of the well animals to new quarters, disinfection of the old quarters and proper disposal of the dead animals.

Blood from a pig that had died at this place was filtered and injected into a sound pig. This animal developed hog cholera and

died within a few days. Filtered blood from this animal was injected into another sound one and in like manner caused sickness and death. Blood from this animal caused sickness and death in a third and in like manner filtered blood from the third caused death of the fourth. All the inoculated animals showed symptoms and lesions of hog cholera.

No. 2. Cayuga county. November 28, 1909, a sick hog was received from Cayuga county. It was in a dying condition when received. It was killed and the autopsy showed lesions of hog cholera. Before it was killed, blood was drawn from its tail, filtered and used to inoculate another animal. The inoculated animal died as a result of the inoculation with lesions of cholera.

No. 3. Tompkins county, No. 1. October 17, 1910, a sow weighing about 200 pounds was brought to the clinic for examination. She was exhibiting symptoms of cholera (purplish discolorations of the skin, difficult breathing, weakness, and chills). This animal grew rapidly worse and died during the morning of the 19th. Autopsy gave lesions typical of cholera. Cultures were made from most of the organs of the body but no growth took place except in those made from the kidneys, liver and lung from which pure cultures of a streptococcus were obtained. Blood from this animal was filtered and injected into two susceptible pigs. Both of these animals died as a result of the inoculation, showing typical symptoms and lesions of hog cholera.

The history of the outbreak on this particular farm is very clear. October 3d, the sow referred to above, together with two others, were taken to a neighboring farm to be bred. One of them was taken home immediately, the other two were left until October 8th, when they were returned and placed with the herd of sixteen animals. October 16th, the sow was first noticed to be ill. Within a day or two, the other animal which had remained the longer time became ill. This herd was treated with serum and the results will be given later. It was learned after the animals became ill that there was a fatal disease among the hogs on the farm where these animals were taken for service.

No. 4. Onondaga county. October 29, 1910, two dead pigs were received from Onondaga county. These animals had been killed when in a dying condition. On this account enough blood could not be obtained for inoculation purposes. However, a few cc. of abdominal fluid were obtained. This was diluted, filtered and used to inoculate a pig but it did not produce the disease in this animal. Of the two animals received, one exhibited typical

lesions of cholera while the organs of the other did not show any pathological changes.

No. 5. *Tompkins county, No. 2.* December 5th, two pigs were brought for diagnosis. One was already dead and the other in bad condition. Autopsy of the dead animal gave typical lesions of cholera. The second pig did not die until December 13th. On autopsy this animal showed a few lesions in the kidneys and mesenteric lymph glands with typical button ulcers in the large intestine. Another pig from this place was presented December 11th, and upon autopsy exhibited typical lesions of the disease. No inoculations were made, as the autopsies revealed characteristic lesions.

Hog cholera has also been reported from Oneida county. Serum has been sent to this place and the reports of the results obtained tend to confirm the correctness of the report.

In all eight animals were inoculated with the filtered blood from suspected outbreaks of the disease. Seven autopsies were made of animals from infected herds. From the investigation of the disease of swine, hog cholera has been positively identified in six herds distributed in five counties: Broome, Cayuga, Oneida, Onondaga, Tompkins (2).

The following table gives the result of the inoculations of filtered blood from suspected outbreaks of the disease:

TABLE NO. 1.—TABLE OF INOCULATIONS.

No.	Date.	Dose.	Source of infection.	Results.	Lesions.	Remarks.
1	1909. Sept. 28	10cc.	Broome county..	Died Nov. 3....	Lungs, mesenteric lymph glands, kidneys, bladder.	Abscess at point of inoculation.
2	Nov. 3.	3cc..	Pig No. 1.....	Died Nov. 12...	Lungs, mesenteric lymph glands, kidneys.	
3	Nov. 12	3cc..	Pig No. 2.....	Killed in dying condition. Nov. 27	Kidneys, mesenteric lymph glands.	
4	Nov. 30	5cc..	Pig No. 3.....	Died Dec. 7....	Kidneys, lungs, mesenteric lymph glands.	
5	Nov. 30	5cc..	Cayuga county..	Died Dec. 15....	Skin, pleura, lungs, heart, kidneys, lymph glands.	
6	1910. Oct. 22	3cc..	Tompkins No. 1.	Died Nov. 10...	Kidneys, bladder, small intestine.	
7	Oct. 22	3cc..	Tompkins No. 1.	Died Nov. 15...	Kidneys, bladder, spleen, mesenteric glands.	
8	Oct. 31	3cc..	Onondaga county	Survived.....	Filtered abdominal fluid used.

Table No. 2 shows the lesions found in animals sent in for diagnosis.

TABLE NO. 2.—LESIONS.

No.	Date received.	Source.	Organs showing lesions.	Remarks.
1	Nov. 28, 1909	Cayuga Co. . .	Kidneys, lungs, mesenteric lymph glands.	
2	Oct. 17, 1910	Tompkins Co. No. 1.	Kidneys, lungs, heart, skin, lymph glands.	
3	Oct. 29, 1910	Onondaga Co.	No lesions found.	
4	Oct. 29, 1910	Onondaga Co.	Kidneys, lymph glands, bladder, lungs	
5	Dec. 5, 1910	Tompkins Co. No. 2.	Kidneys, skin, heart, lungs, lymph glands, intestines, bladder.	
6	Dec. 5, 1910	Tompkins Co. No. 2.	Lungs, mesenteric glands, intestines..	Ulcers in large intestine.
7	Dec. 11, 1910	Tompkins Co. No. 2.	Kidneys, lungs, intestines.....	Numerous ulcers in large intest.

After it was determined without doubt that hog cholera existed in the State and after a favorable expression from many prominent swine breeders of the State, the production of the anti-hog cholera serum was undertaken. The serum has been produced upon a limited basis only, since it was impossible to ascertain any idea of the extent of the disease or demand for the serum. Ten hundred and ninety-five doses, or 21,900 cc., of serum have been produced. At times the demand has been so great that it could not be supplied promptly. Four hundred doses, or 8,100 cc., have been sent out, leaving 695 doses, or 13,800 cc., on hand. It seems reasonable to suppose that the demand will be much greater when it is widely known that serum can be obtained at the college. It is impossible to ascertain from our work an approximate cost of serum. Simply calculating the number of pigs required to produce a certain amount of serum, for instance sufficient to immunize 150 pigs, will require by the quick subcutaneous, slow subcutaneous, or intra-abdominal method, one 100-pound pig and two 50-pound pigs; by the intravenous method, one 100-pound pig and one 50-pound pig. This does not make allowance for unavoidable loss of pigs by death in the process of preparing the serum. A fair estimate would seem to be that to produce enough serum to immunize 150 pigs would require four animals of the above size.

Results of the use of the serum. The first herd treated was the one described as Tompkins county No. 1. The eighteen animals

of this herd were treated October 19, three days after appearance of disease among the animals and eleven days after the exposed animals had been brought home. On the day of treatment the sow that had remained upon the infected farm for five days was sick. She had a temperature of 104° F. and was very stupid. Serum was administered in the following doses: For the small pigs, 15 cc.; for the shoats weighing about 150 pounds, 30 cc.; for the old sows weighing about 200 pounds, 50 cc.

The sow that was so well advanced with the disease died after a few days. None of the other animals have shown any symptoms of cholera since the immunizing treatment.

Onondaga county. The origin of this outbreak cannot be traced, although the trouble started soon after the purchase of several rough looking animals and adding them to the herd. The herd consisted of 280 hogs when the disease first appeared. The first deaths were in August when eight died. A number of veterinarians were called but they were unable to control the disease. The animals continued to die and were still dying up to November 14, when the remaining animals were treated with serum. At this time there were eighty of the original herd left. Two pigs died the night previous to the treatment.

Serum was administered in the following doses: Four pigs, two weeks old, received 8 cc. each; eighteen pigs, two to four weeks old, received 8 to 12 cc. each; twenty pigs, weight about sixty pounds, received 15 to 18 cc.; thirteen hogs, weight 200 to 400 pounds, received 40 to 60 cc.

Several of the animals described as weighing 100 pounds did not appear to be well at the time of the treatment. One of these is reported to have died later. One of the pigs, weighing about thirty-five pounds, was reported sick at the time of treatment, but recovered. Although two animals died the night previous to the treatment only one died after the serum was administered.

Oneida county. In this herd twenty animals had died before the serum was administered. Thirty-five doses were sent to this place on November 10. In a letter dated December 3, the owner of the animals reported that the pigs showing symptoms of cholera at the time of treatment died. None of the others have, as yet, taken the disease.

Tompkins county outbreak No. 2. Serum was given as follows: Five pigs, weight about 35 pounds, 20 cc.; one shoat,

weight about 125 pounds, *40 cc. Two animals died shortly after the treatment. One of them was very sick at the time and the other exhibited lesions of the chronic type of the disease on post-mortem.

TABLE GIVING THE RESULTS OF THE TREATMENT WITH SERUM.

No. of herd.	No. treated.	No. of animals that died before treatment.	Interval between first death and treatment.	No. of deaths after treatment.	Remarks.
1	18	1	2 days	1	The animal that died after treatment was sick when treated.
2	80	200	3 months	1	
3	100	20	Several weeks	Report not clear. All well animals at time of treatment remained well.	
4	6	3	2 to 3 weeks	2	Of the animals that died after treatment, one was very sick at time of treatment, the other showed lesions of chronic type of the disease.

* This animal was in a very unthrifty condition. The large amount of serum was administered on this account.

