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Anthrax in Iowa

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Central Iowa was the scene of a recent outbreak of anthrax which, up to the present time, involved four herds of cattle and one person. The following cases outline the recent outbreak which is typical of such enzootic diseases.

Case Reports

Case No. 1. On Aug. 6, 1943, a steer died suddenly and circumstantial evidence supported a diagnosis of death due to lightning. It was not confirmed, however, with a bacteriological examination. Within the next 8 days, 6 more animals succumbed and bacteriological examinations consisting of smears, animal inoculation and cultures revealed the presence of Bacillus anthracis. Anti-anthrax serum was administered to all of the exposed animals and anthrax bacterin was given to all other animals on the farm. Two more steers died following this treatment. Animals which were given serum were reinjected 15 days later with anthrax bacterin and no other fatalities occurred.

Of the animals that died, 3 were sent to one rendering plant and 5 to another. After the positive diagnosis of anthrax was made, the rendering plants were thoroughly cleaned and disinfected and the infected hides were burned.

One employee of the rendering plant became affected with cutaneous form of anthrax (malignant carbuncle) through a cut on his hand. Typical swelling, redness, and a developing pustule or carbuncle were symptoms exhibited. Complete recovery was effected by use of anti-serum and rest for 2 weeks. As a prophylactic measure, all employees of the rendering plant were given serum.

Case No. 2. Aug. 19, 1943. A cow died suddenly and the autopsy findings were symptomatic of anthrax. In this case, the diagnosis was immediately confirmed by smears, animal inoculation, and cultures. The herd was treated with anti-anthrax serum and, later, with anthrax bacterin. The farm on which this case was diagnosed was near the same farm mentioned in the first case and in the same drainage area.

Case No. 3. Aug. 20, 1943. A cow showing symptoms of anthrax died and with the history of that disease on neighboring farms, bacteriologic examinations were made. The diagnosis of anthrax was confirmed and the herd was treated in the same manner as in the first two cases.

Case No. 4. This case occurred quite a distance from the others and no direct relationship involving such factors as drainage or movement of animals was known. Diagnosis was made on the post mortem findings and the remaining animals were treated routinely.

Immunization

Several herds in the vicinity of the outbreak were given anthrax bacterin and no other cases were diagnosed. All animals in the last 3 cases were burned at the site of death rather than being sent to the rendering plant.

Anthrax is usually limited to certain localities which are frequently called “anthrax districts.” The disease is most prevalent in the warmer months when the animals are grazing on short pasture and occurs enzootically in cycles of several years. The usual anthrax district in Iowa is the area along the Missouri river, par-
particularly in the northwestern part of the state.

**Animal Susceptibility**

Most livestock, including cattle, sheep, horses, swine, and carnivora, are susceptible to anthrax. Young animals have an increased susceptibility. Nothing definite is known about the susceptibility of wild animals, but indications are that many species contract the disease. In poultry, it is a sporadic condition and affects a flock only after blood or flesh of diseased animals is ingested. Other predisposing factors of anthrax are fatigue, hunger, heat, cold, and nutritional deficiencies. Cattle are usually affected through ingested spores which are present in the pasture or hay grown on contaminated soil. Anthrax bacilli deposited with blood and feces can remain alive in the superficial layers of the soil for several months and, in the presence of suitable physical conditions, will sporulate. These spores are resistant to desiccation, moisture, cold, and heat. When ingested, the moisture and warmth will cause the spores to germinate, form bacilli, multiply, and complete the cycle by again forming spores. Thus, soil once infected will remain a constant source of infection.

**Contamination**

Soil may be contaminated by spores carried in water or dust, and by insect vectors. Some workers have incriminated the earthworm which might bring the spores to the surface from an infected carcass which has not been buried deeply enough. Feces of infected or non-infected animals are dangerous as it provides a good medium in which the bacilli can sporulate. Spontaneous infection as the result of consuming milk from an infected cow has not been reported but infected cows have been known to excrete virulent organisms in the milk before death.

Symptoms of anthrax are somewhat variable and the condition may be confused with several other septicemic diseases. The incubation period is usually considered to be quite long and is dependent on the number of spores ingested. In the peracute cases, which are most frequently observed at the beginning of an enzootic, apparently healthy animals suddenly fall down. Blood stained foam will often be noted at the mouth and whole blood exudes from the anus. Convulsions, asphyxia, and death usually result in a very short time. In acute or sub-acute cases the disease begins with a rapid rise of temperature which remains high until shortly before death. Rigors and muscular tremors are often observed during the rise of temperature and some cases are restless while others become excited. Auscultation reveals a small, rapid pulse and metallic heart sounds. Respiration is accelerated due to inefficient oxidation of the blood and death may be the result of asphyxia. Digestive disturbances are common with constipation early and a fetid diarrhea containing blood observed as the condition progresses. The cutaneous infection so often found in man is seldom seen in domestic animals. It is to be noted that milk secretion is markedly reduced and abortions are common in pregnant animals.

**Symptoms in Horses**

Symptoms may be manifested in equine as a severe colic and edema of the neck, chest, and pharyngeal region. Occasional lameness without apparent cause is sometimes present. Sheep and goats are attacked quite suddenly by vertigo, staggering, and grinding of the teeth with death occurring in a few minutes. A febrile pharyngitis with marked swelling of the sub-parotid and laryngeal region will be observed in affected swine. The usual course of the disease is 7 to 9 days, but some animals die a few hours after the first symptoms are manifest.

Lesions of anthrax are quite specific if an autopsy is performed immediately after death. The carcasses, however, undergo rapid decomposition due to tissue changes caused by the organism. Rigor mortis is incomplete and dark red blood exudes from the natural body openings. Post-mortem examination reveals lesions of asphyxia with cyanosis present in the mucous membranes. Diffuse hemorrhages in subcutaneous and intramuscular connective (Continued on page 97)
one of the factors accounting for this condition. Undoubtedly streptococcus infection was the immediate cause of death in many of our anemic pigs. On the other hand, the pigs would not have succumbed to streptococci if they had not been anemic and thus more than normally susceptible to infection. It has been shown that the active agent, which is tentatively identified as an influenza virus, can kill baby pigs without the aid of bacteria. When associated with this agent, the streptococci are either secondary invaders or they behave like Hemophilus influenzae suis as shown by Lewis and Shope, or like Pasteurella as demonstrated by Scott, when in association with swine influenza virus. With one exception, all the cases of streptococcal meningo-encephalitis occurred in the winter and early spring. It is thought that these infections are not necessarily seasonal but rather that the pigs are most apt to suffer from a lowered resistance at these times of year making them more susceptible to streptococcic infection. The one exception mentioned above occurred in the summer. No evidence of other infection or lowered resistance from any cause could be demonstrated in this instance.

Conclusion

1. A streptococcic meningo-encephalitis of swine is described which is usually associated with lowered resistance.
2. A study of the cultures of streptococci isolated from cases of meningo-encephalitis shows that no individual species is involved but rather that several species may be associated with this condition.
3. None of the strains appear to belong to any of the recognized pathogenic species of streptococci.

REFERENCES

The current graduating class subscribed 100 per cent to The Veterinary Student.
confused with acute hyperemia, acute pulmonary edema, and sunstroke. Hemorrhagic septicemia resembles the less acute stage of anthrax in that edematous swellings, hemorrhagic feces, and hematuria are observed. Splenic enlargement is always absent in hemorrhagic septicemia. Edema caused by anthrax is not cold and crepitating as is that found in gas gangrene and malignant edema. Symptoms found on post-mortem as described above are important in establishing the diagnosis.

Positive diagnosis may be made by bacteriological examination using smears, animal inoculation, and cultures.

Differential diagnosis is largely concerned with hemorrhagic septicemia because of the swellings of the neck; and with piroplasmosis, due to enlargement of the spleen. Since death may occur before symptoms are observed, death due to lightning has been mistaken for anthrax but the post mortem lesions are absent in the former.

To send a sample of blood for laboratory diagnosis a pledget of cotton is twisted onto the end of a wire. The wire is pushed into a cork fitting a small vial, making a swab. The swab is dipped into a drop of blood and placed in the vial which is packed in an unbreakable mailing tube. The old method of removing an ear is quite unsatisfactory. Two pieces of glass with a blood smear on the inner surface of one is quite good providing the surfaces have not been contaminated.

Prognosis

The prognosis is unfavorable in peracute cases and somewhat more favorable in sub-acute cases. The formation of edematous swellings and the presence of hemorrhage are unfavorable.

For treatment of anthrax, immune serum is the only therapeutic agent of value. It produces good results if the case is not too far advanced.

In anthrax areas prophylactic measures must be used to prevent sporadic outbreaks. Susceptible animals should be kept away from infected pastures and forage from such areas should not be fed. Such pastures may be rendered harmless by drainage and yearly cultivation. In areas where anthrax is present or suspected all dogs should be tied and stray dogs kept from the premises to prevent carrying of organisms to healthy animals. Wild animals are another means of spreading infection in these areas as are birds which may eat the infected meat and regurgitate a portion of it at another farm.

State regulations require that outbreaks of anthrax be reported at once. State officials will then institute proper quarantines so that control will be effective.

Prophylactic Measures

Recognized practices during an outbreak should be enforced by the proper official. Healthy animals should be separated from the infected animals and moved to higher ground. Carcasses cannot be skinned but must be buried 6 feet below the surface of the ground and treated with a proper disinfectant such as quicklime or preferably burned. The most successful method of cremation consists of digging two trenches approximately 2 feet wide and 18 inches deep crossing each other at right angles. Green posts or an old implement wheel is laid at the junction of the trenches so as to provide a grating upon which the carcass can be placed. Straw and old crank case oil are used to start a good fire which must be maintained until the carcass is completely destroyed. If possible, the carcass should always be buried or burned at the site of death.

For disinfecting hands, boots, and shoes of the operator, mercury bichloride 1-1000 may be used. A 5 per cent solution of commercial lye is recommended for disinfecting premises against anthrax. All places should be thoroughly soaked with the solution and allowed to remain for 24 hours and then washed with clear water.

Preventive vaccination consists of injecting any of the following immunizing agents: anti-anthrax serum, anthrax agressin, anthrax antigen, anthrax bacterin, or spore vaccine. With the exception of the spore vaccines, all of the biologics mentioned can be used in Iowa.

Regulations governing the control of anthrax may be obtained from the state veterinarian. Iowa regulations require
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Fall, 1943
that contagious and infectious diseases be reported to the Chief of the Division of Animal Industry.

Quarantine shall mean perfect isolation of all diseased or suspected animals as well as the exclusion of other animals from yards, stable enclosures, or grounds where suspected or diseased animals are or have been kept. State sanitary officials are reluctant to introduce spore vaccines unless they are essential in the control of the disease.

Iowa regulation No. 22 states that all carcasses of anthrax-infected animals must be burned within 24 hours intact without removal of the hide. All contaminated flooring, mangers, feed racks, watering troughs, buckets, litter, soil and miscellaneous utensils must be burned if possible. In case equipment such as flooring, mangers, and feed racks that have been contaminated are constructed of metal, cement, or fireproof material, they shall be disinfected thoroughly with Cresolis Compound, U.S.P., or any reliable disinfectant recommended by the Bureau of Animal Industry, Chief of the Division of Animal Industry, or a regularly qualified veterinarian.

RETROSPECTION

(Continued from page 74)

years, until his death on April 26, 1936. During his tenure the Veterinary Quadrangle was completed and occupied in January, 1912. In 1913, the State Biological Laboratory for the production of anti-hog-cholera serum was established. The plant stood on the present site of the Stange Memorial Clinic. It continued operation until 1926, when it was torn down and the suitable salvaged material was used in the construction of the Veterinary Research Laboratory on Beech Avenue, south of the campus.

During the last two years of his life Dean Stange completed plans for the Clinic Building. Bids were taken by the Board of Education, but the cost exceeded the estimate, and the plans had to be revised. Construction was completed in 1938, and the building was put to use on January 3, 1939.

Perhaps the comparison of clinical facilities and the number of clinic cases handled per annum in 1942 with those of 60 years ago best measures the growth of the Institution. As stated before, Doctor Stalker’s report of 60 years ago indicated a small barn in poor condition and practically no equipment with 50 boarding cases and 300 others presented to the clinic in 1 year. In 1942 there is a building which cost $180,000, with equipment valued at $28,000, to which were presented 8958 cases, with an additional 15,157 served by ambulatory clinic.

Educational Policy

Facilities alone do not measure the efficiency of a school. Unless the educational policy of an Institution is sound, its success is limited and its reputation suffers. The policy of the Iowa State Veterinary College has always been for high standards, and in many instances it has been first to adopt programs looking toward a higher standard of education.

Beginning with a program which involved only 1 year of professional work in the curriculum and with only meager entrance requirements, it soon increased the time to 2 years and made more rigid the qualifications for admission. Nine years after inauguration of the veterinary curriculum (1887), the required course was lengthened to 3 years. This was the first three-year course offered in America. In 1902 Dean McNeil asked the Board of Trustees for authorization to increase the curriculum to 4 years, and in 1903 the first four-year course to be offered in America was adopted. In 1911 Iowa State became the first school in America to require matriculants to be graduates of accredited high schools. The final stiffening of requirements for admission came in 1931, when again Iowa State was the first American school to require a minimum of 1 year of collegiate work for admission. As in all previous actions of the kind, there was considerable temerity on the part of other veterinary colleges to adopt the programs in effect here, but eventually uniform requirements were adopted by all.