

AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE

DEPARTMENT OF VETERINARY MEDICINE

BLACKLEG AND ITS CONTROL

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Blackleg, black-quarter, quarter-ill, or symptomatic anthrax, is an acute infectious disease of cattle. It has also been reported to occur in sheep and hogs. It is characterized by the presence of a rapidly developing swelling which contains gas.

This disease occurs throughout the western half of the United States, but it has occasionally been seen in several of the states east of the Mississippi River. The eastern slopes of the Rocky Mountains are badly infected from Texas on the south into Canada on the north. It frequently occurs in many European countries.

Blackleg is caused by the bacillus *gangren emphysematosæ*, which is an organism highly resistant to heat and disinfectants. It seems to live and grow best in rich, moist soil.

Blackleg is not a contagious disease, as it does not seem to be transmitted directly from one animal to another. It is considered to be an infectious disease. The germs enter the animal's body with the food or water, where they pass by way of the blood to the place where the lesions develop, which is always in muscular tissue. Or, the germs are carried directly from the soil into wounds, such as castration, spaying, and small punctures of the skin, where they develop and produce the lesion. A pasture once infected is very apt to remain so almost indefinitely, as it is thought that the germs multiply in the soil or remain in the form of resistant spores until entering the animal under conditions favorable for their growth.

Cattle contract blackleg mostly between the ages of five months and two years, although it does occur in calves as young as three weeks and in cattle as old as four and even seven years. The season of the year and weather conditions influence its occurrence. It is a well-known fact that it is more prevalent during the fall, winter, and spring, and during the times when pasture is very good, namely, following good rains. Cattle which are making gains are more apt to develop blackleg than animals in fair flesh.

At the Kansas State Agricultural College about 80 to 90 percent of the cattle inoculated with blackleg germs during November, December, January, February, and March, die of blackleg, while only about 10 percent of those which are inoculated during the warmer months, July and August, die.

It has also been noticed that the deaths increase in number after a rainy period during the summer or fall, which was the case during the last of August, 1917.

SYMPTOMS

The symptoms of blackleg develop rapidly. There first occurs a loss of appetite and rumination. The animal stands with back arched and head lowered. Later lameness develops in one quarter, followed by a firm and painful swelling. Sometimes the latter develops in the loin, shoulder, or neck. The swelling increases rapidly and will give out a crackling sound when pressed or rubbed by the hand. This sound is due to the presence of gas which the germs produce as they grow in the muscle. Occasionally the lesion develops so deeply in the muscle that it is not noticeable upon the exterior.

The affected animal has a temperature from 103° to 104° F. and perhaps higher. As the disease progresses the animal goes down and becomes unwilling to arise. By this time the temperature has declined and proceeds to go below normal, frequently going as low as 95° F. before death occurs. The respirations increase in number and the heart beats faster, death resulting from exhaustion, which occurs in 12 to 30 hours after the first symptoms are noticed. After death the carcass bloats rapidly. Reddish colored fluid comes out through the skin in the vicinity of the swelling. Blood frequently comes from the natural body openings.

After the skin is removed, one will notice that the carcass has a rather diffused pink color which is quite characteristic of blackleg. In the vicinity of the swelling there will be a yellow to dark red gelatinous-looking material which contains gas. If the underlying muscles are cut, there will be noticed a crackling sound, a characteristic sweetish odor, and in some places there are numerous dark red to reddish-black spots and gas bubbles, while in others the muscle is lighter in color than normal. If the other organs of the body are examined soon after death, they will appear quite normal. If, however, they are allowed to stand awhile before being examined, it will be noted that all the tissues are stained by the blood to a pinkish color, while the spleen and liver will contain some gas, which will be noticed when they are handled or cut with a knife. If there is much gas, the spleen will be enlarged.

Blackleg might be confused with anthrax, in which condition the spleen is greatly enlarged, semifluid, and contains gas. There is an absence of a crackling swelling in anthrax. As there is little anthrax in Kansas, there is small chance of mistaking it for blackleg in this state.

Blackleg may also be confused with malignant edema, in which there is generally more swelling and an absence of the dark red spots and streaks within the muscle tissue proper, and the odor is different. Malignant edema usually occurs from an injury through the skin, while blackleg only occasionally occurs in this manner.

The definite determination of the disease is best carried out by laboratory examination, which can be conducted if a small piece of the affected part is sent to the laboratory.

TREATMENT

Treatment may be carried out quite successfully if it is attempted in the early stage of the disease, namely, during the fever stage. It consists of the injection of large doses of antiblackleg serum into and around the swelling, or, better, intravenously. The antiblackleg serum should be used in doses of 250 to 500 cubic centimeters. As blackleg is an acute and rapidly developing disease, the curative treatment is of little use. Prevention of the disease has proved to be much more advisable than trying to cure it.

PREVENTION

Prevention has been practiced for many years. For the past 20 years prior to 1915, the preventative measures were the vaccination of calves two or more times a year with a powder or pill vaccine. While these methods have protected many cattle from blackleg, they have not proved to be highly efficient. It is well known by all who have had the opportunity to observe large numbers of cattle which have been vaccinated with vaccines, that at times they fail to protect some of the animals for more than a month or two. At other times they have been known to produce the disease.

Blackleg Aggressin.—On account of these factors, Doctors Schoenleber, Haslam, and Franklin, after considerable research work at the Kansas State Agricultural College, put into practical use the blackleg aggressin, which material was first reported by Schobl.

Blackleg aggressin is made from the juices pressed from the blackleg swellings which develop in the muscle tissue of a calf following its injection with the blackleg germs. This material is filtered until all the germs are removed, after which its injection into susceptible calves will not produce blackleg.

It has been proved beyond a doubt that this material will protect cattle from blackleg after they have been injected with a dose of five cubic centimeters. This material has been used upon several hundred thousand cattle with almost perfect results. It is not curative, nor will it afford much protection against the disease for a period of three to ten days after it is injected into the animal. On the other hand, it cannot produce the disease, because it contains no blackleg germs.

Blackleg Filtrate.—Roux and Nitta produced a blackleg culture filtrate which protected cattle against blackleg. Eichhorn procured Nitta's method and has produced a filtrate. During the spring of 1917 the author began growing the blackleg germs upon a cultural medium, where they were grown for a period of eight to ten days, after which time the medium was passed through filters until it was freed of all blackleg germs. This material, which is called blackleg filtrate, was then tested upon guinea pigs and upon calves. These tests indicated it would protect cattle against blackleg.

After conducting these experiments for more than a year, during which time the tests all indicated that the protection produced was as good as that following the use of blackleg aggressin, it was concluded advisable to place blackleg filtrate on the market,

which was done on July 1, 1918, by the Kansas State Agricultural College. From July 1, 1918 to June 30, 1919, 39,880 doses were sent out. During this time there has not been reported to the college a loss from blackleg of any animal which was vaccinated with the blackleg filtrate.

The action of the filtrate and aggressin are practically the same. As the filtrate can be produced at less cost than the aggressin, it may ultimately displace the aggressin. At the present time it seems advisable to discontinue the use of the powder or pill vaccines, which contain the blackleg germs in more or less attenuated form, and use the blackleg aggressin or the blackleg filtrate. These two products are used in the same manner, as their action is considered to be very similar.

In the use of these products it is advisable to use a syringe capable of holding 30 to 40 cubic centimeters. The syringe and needles should be sterilized, after which the material may be drawn from the bottles by passing the needle through the cork while the former is attached to the syringe.

The injection should be made under the skin on the side of the neck. Before inserting the needle, the site of injection should be sponged off with a disinfectant, then five cubic centimeters of the material should be injected into each animal, regardless of its age. Much larger quantities are harmless, but also seem to be needless.

TIME AND AGE OF TREATMENT

It is advisable to treat calves which are on pasture with their dams, in the early fall before the fall rains make a fresh start of grass, as losses always occur with or following an improvement in the pasture conditions. If calves are in badly infected pastures or lots, it is advisable to treat them as young as three or four weeks of age. Animals treated this young should be treated again when five to eight months old; otherwise one treatment has proved to be sufficient.

SUMMARY

1. Blackleg is an acute disease of such short duration that the curative treatment should not be relied upon.

2. Preventative treatment by early injection of filtrate or aggressin is highly important.

3. Preventative treatment should be given before losses occur, as the saving of one calf will pay for a large number of doses.

4. The treatment should be administered before changes are made to a more nourishing diet.

5. The immunity from the use of filtrate or aggressin does not develop for three to ten days after its injection, but it is of long duration.

6. Should losses take place before the treatment it is then advisable to give all cattle antblackleg serum, following this in 10 to 12 days with a dose of filtrate or aggressin.

7. The antblackleg serum will stop the losses within 24 hours, but its protection will last only ten days to three weeks.

8. The early treatment of all calves with blackleg filtrate or aggressin gives good assurance that there will be no losses from blackleg.