

AGRICULTURAL EXPERIMENT STATION

KANSAS STATE COLLEGE OF AGRICULTURE
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DEPARTMENT OF VETERINARY MEDICINE

INFECTIOUS ABORTION OF CATTLE¹

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INTRODUCTION

This circular is offered to the live-stock interests of Kansas to fulfill a need which is felt to be widespread, and has for its purpose the presentation, in a practical form, of the essential facts now available regarding infectious abortion of cattle.

The material is presented in the form of a list of questions, many of which are asked daily in correspondence received at this institution, and answers to them.

Infectious abortion has been recognized for many years and is prevalent throughout the world wherever cattle are raised. Many drugs have been used together with different lines of treatment and because of the nature of the disease, some success was thought to be attained; however, but little, if any, value followed their use. To the cattle industry of Kansas this disease is a serious and ever increasing menace. Many breeding herds of beef cattle in pasture and on range have been hard hit, the losses frequently amounting to nearly the entire calf crop. The dairy herds have likewise suffered. Large numbers of dairy cattle are being imported from the so-called dairy states, where the disease is rampant, with scant attention to the danger involved. The nature, cause, symptoms, and treatment of this disease will be presented in the form of a series of questions and answers.

QUESTIONS AND ANSWERS

Question 1.—What is the nature of infectious abortion disease in cattle?

Answer.—This disease differs from most others in that the general health and condition of the mother are not usually affected. The germ gains entrance to the pregnant uterus, and there sets up an inflammation which causes a separation between the mother and

1. Contribution No. 54 from the Department of Veterinary Medicine.

offspring. Usually no previous warning is given and the expulsion of the fetus is the first indication that the owner has of the existing disease.

Question 2.—What are the causes of abortion?

Answer.—Professor Bang of Denmark isolated a germ which is now considered to be the causative factor in the majority of abortions in cattle and is called, after him, *Bacillus abortus* (Bang) or Bang's organism.

Experiments conducted at the Kansas Agricultural Experiment Station have convinced the writer that there are other germs which may be contributing factors in many cases of abortion, at least in many of those investigated in this locality. Many other investigators are inclined to take the same view regarding germs which heretofore have been considered incapable alone of causing abortion in cattle. That invasion by the tubercle bacillus can and does cause abortion has been proved by recent work done in this country and Europe.

Restricted rations and a diet deficient in certain elements, such as calcium and phosphorus, as well as the lack of abundant vitamins, may also cause abortions. Falls, blows, and other accidents, while probably not responsible for as many abortions as is sometimes claimed, may certainly be the causative agency in some instances.

Question 3.—Is there any connection between the common beliefs with regard to the causes of abortion and the true cause?

Answer.—This question is designed to include those cases of abortion commonly attributed to fall, kicks, crowding at the feed trough or watering tank, eating moldy feed, drinking large quantities of cold water, and the like. That a certain per cent of abortions are due to these causes is certainly probable, but when a series of abortions occur during the same season some other cause must be sought and the infectious nature of the disease should be suspected.

Question 4.—What are the characteristics of the disease?

Answer.—The common terms used throughout the country to name the disease are in part descriptive. Such terms as slinking the calf, and premature calving are examples. When a hairless or premature calf is found or when a cow thought to be safely in calf for several months suddenly comes in heat again, then suspicion should be aroused and infectious abortion suspected.

Question 5.—What are some of the complications associated with the disease in cattle?

Answer.—Besides the main feature of the disease, that is, the loss of the offspring and consequently a considerable falling off or decrease in milk flow, the membranes are frequently retained and if not removed will cause toxic or poisonous symptoms to develop in the cow and possibly her death. A cow may fail to again conceive

and so become a total loss as a breeder. A chronic vaginal discharge may soil the udder and render the milk unfit for food.

Question 6.—Is the bull a factor in the spread or production of abortion in cattle?

Answer.—The bull may, under exceptional conditions, spread the disease either mechanically, that is, by carrying the germs from an infected cow after service to a susceptible cow during the act of breeding (this is only probable when two cows are bred at close intervals), or by direct expulsion of germs in the vital fluid—the semen. It has been found experimentally that Bang's organism when injected into the sheath of a bull will die in a very short time, that is, under an hour. This would indicate that the mechanical transfer of the germs would be rare. Statistics show that much less than one per cent of the males are infected, indicating that transfer of the germs in the semen is also rare.

Question 7.—How can the cause of abortions be determined?

Answer.—By bacteriological examination of the aborted offspring, the membranes, or the vaginal discharge. This examination should be made as soon after the abortion as possible, and the suspected material, after being properly packed, should be rushed to the laboratory for examination. Such an examination in many instances is impossible, either because of the distance to the laboratory and poor transportation facilities, or because the products were decomposed before being found. If the material has become badly soiled or decomposed, it is frequently difficult or even impossible to isolate the true cause of the abortion. The common germs found in the soil, air, and water are hardier and grow more rapidly in the products of the abortion than Bang's organism and soon outgrow these latter germs.

Blood tests are specific in determining the presence of Bang's organism infection in the herd. There are two tests that can be applied to the blood, namely, the complement fixation test and the agglutination test. The complement fixation test is too technical for the average routine laboratory and requires more skill and, therefore, is more liable to error. In this paper the term blood test will be used to designate what is technically known as the agglutination test. The blood test is the test commonly used and, when the results are properly interpreted, is a valuable means in determining the presence of infection in a herd.

Question 8.—What constitutes a reaction to the blood test?

Answer.—It has been shown that certain disease germs upon entering an animal's body cause a marked or measurably increased production of substances in that animal's blood which aid in combating the disease. These are called anti-bodies and when the agglutination test is used in the laboratory to measure their concentration, it is those anti-bodies called agglutinins that are measured.

Since the blood of a non-infected animal does not show this reaction in a dilution higher than one part serum to 20 parts germ emulsion, while an infected animal's serum will usually react in dilutions greater than one part of serum to 50 parts of germ emulsion, the reaction of one part serum to 80 parts germ emulsion has arbitrarily been taken as the line dividing a positive from a negative test. When an animal reacts at 1 to 40 or 1 to 50 it is called suspicious and a retest advised in from four to six weeks.

Question 9.—Does the fact that a cow shows a positive reaction to the blood test mean that she will abort?

Answer.—No; some cows carry a positive reaction for years and never abort, others do not show a positive reaction for several weeks after the abortion. It must be remembered that the blood test only determines the presence of Bang's organism and not other germs.

Question 10.—Of what value is the blood test?

Answer.—Where the history of a herd shows a number of abortions and the blood test is positive, it is reasonable to consider Bang's organism as the causative factor. If abortions occur and the blood test is negative some cause other than Bang's organism should be sought. It is, of course, unsafe to buy a cow carrying a positive reaction for Bang's organism on the assumption that there are cows which never abort although they carry a positive blood reaction. Positive reactors should always be considered as possible spreaders of infection.

Question 11.—Will one or more abortions tend toward increasing the resistance of an animal to further abortions?

Answer.—The experience of many breeders points to the fact that many cows abort once or twice and then become good breeders. It has been determined that such animals, while very resistant to their own infection, may be very susceptible to an infection brought in by newly purchased animals. Other animals after one or more abortions become hopelessly barren.

Question 12.—What disposition should be made of a cow which repeatedly aborts her calf?

Answer.—In answering this question several points must be kept in mind. The cow may be from a very valuable blood line and the expense of keeping her a number of years in the hope of getting an offspring may warrant keeping and treating her. A positive reaction may become negative and *vice versa*. The bull should be tested and his sexual organs examined by a qualified veterinarian. Under ordinary dairy conditions or where the animal is a grade cow it is not economical to keep such an individual.

Question 13.—What should be done with a cow which will not conceive?

Answer.—There are instances where virgin heifers have difficulty in conceiving. The trouble is usually found in the organs of reproduction. In older animals failure to conceive frequently follows abortion. In either instance the owner should secure the services of a skilled veterinarian.

Question 14.—Is difficulty often encountered in getting a recent aborter again with calf due to the infection causing the abortion?

Answer.—Ordinarily, the abortion infection paves the way for subsequent infections of other germs. It very often happens that the first or primary infection lowers the resistance of the animal so that a secondary infection can readily take place. It is possible that secondary infections are responsible for the majority of cases of chronic vaginal discharge and also for shy breeders or barren animals.

Question 15.—What significance do retained membranes or afterbirths bear to abortion diseases?

Answer.—This condition is abnormal and is usually due to an infection and should be so considered. It frequently follows an abortion, particularly if the abortion is that of an eight or nine months old fetus. The retention of the membranes may be the only evidence of infection. It is a mistake to dismiss a case of retained membranes or afterbirths without considering that this phase of the animal's breeding life is probably one of utmost importance, and that poor care or treatment by an inexperienced herdsman may so damage the animal as to render her incapable of again carrying a normal healthy calf. This is one time where an experienced veterinarian can be of inestimable value and if possible should be consulted.

Question 16.—If cow shows impending abortion how could she be handled?

Answer.—Isolate such an animal at once as far from the main herd as possible until she has aborted or calved normally and completely "cleaned up." It must be remembered that the coat of the fetus or offspring, the membranes, and the fluid all contain many millions of germs which can readily infect all susceptible animals coming in contact with this material.

Question 17.—How should the products of the abortion be handled?

Answer.—Either burn or bury deep in the ground and cover with quick lime. Do not let other animals drag the membranes or fetus around and so spread the infection.

Question 18.—Will a calf suckling an infected cow become infected?

Answer.—Yes, but not necessarily permanently

Question 19.—Should a calf be allowed to suckle an infected dam?

Answer.—The calf will certainly become infected by drinking infected milk from an infected cow, but if weaned before sexual maturity it will usually become blood-negative provided certain conditions are observed: (1) That any milk fed the calf after weaning be from clean cows. (2) That the calf be placed on clean ground away from all infection. (3) That the calf be weaned early. The sooner the calf is weaned from infected milk, the better are its chances to become blood-negative.

Question 20.—Can the calf spread Bang's disease during the period immediately following weaning from infected cow's milk?

Answer.—Yes, the excretions of the calf will be carriers of Bang's disease and as such are a source of danger.

Question 21.—Does any relationship exist between the age of the calf at weaning and the time required for that calf to lose its reaction?

Answer.—Under four months there does not seem to be any appreciable difference but each month of age over this period makes it more difficult for the calf to throw off infection. At 10 months of age the chances are greatly decreased and the animal may carry the infection permanently.

Question 22.—Can swine become infected by contact with germs of cattle abortion?

Answer.—There is some evidence indicating that swine can become infected by eating the products of abortion of cattle, therefore, do not throw this material to the hogs.

Question 23.—Can cattle become infected from contact with germs of swine abortion?

Answer.—The evidence that under natural conditions cattle can become infected and abort from swine infection is not conclusive, although it has been demonstrated that a pregnant cow can be made to abort by injecting her with swine abortion germs; therefore, guard against the possibility of such a condition's happening.

Question 24.—How widespread is the Bang germ in nature?

Answer.—This germ has been recovered from chickens, turkeys, horses, goats, cattle, and hogs.

Question 25.—Is it advisable to purchase nurse cows for beef heifer or bull calves?

Answer.—No, unless the nurse cow is first blood-tested, because of the danger of infecting the calf permanently. Of course if it is a steer calf, no danger exists except the added danger of the calf's spreading the germ through its excretions around the premises.

Question 26.—How can infected buildings and lots be cleaned up and how soon can the premises be restocked with clean susceptible animals?

Answer.—In cleaning up the buildings and premises pay particular attention to the water tank and feed bunks or mangers. These should be scrubbed with disinfectant. All manure should be hauled away and if practicable the buildings should be white-washed, using a white-wash to which 3 per cent of compound solution or cresol has been added. A frame building used for a number of years as an isolation stable and in which half the cattle had aborted was cleaned up as recommended above and left unoccupied during the three summer months. Pregnant nonreacting heifers were placed on these premises early in the fall and after more than two years occupation no reactors or abortions have occurred.

Question 27.—How long will the infection live in an infected pasture?

Answer.—Since direct sunlight will kill the germ in a few hours at the longest, it is believed that infected pasture grass will lose the infective germ in a very short time. The germ, if covered with dried manure or bedding, is quite resistant to both sunlight and freezing, therefore, clean up the premises and give the elements a chance to kill any germs not reached by the disinfectant.

Question 28.—How does the disease spread from one animal to another?

Answer.—In the majority of cases by the susceptible animal's eating or drinking food and water contaminated by the germ, or in other words, the disease gains entrance through the digestive tract.

Question 29.—Can the germ be carried by the drainage water from an infected pasture to a lower pasture?

Answer.—Undoubtedly there is a possibility of this happening, and where practical the infected animals should not have access to the hilly pasture as the drainage might spread the infection.

Question 30.—Is it advisable to use a community bull?

Answer.—No. The danger of spreading breeding troubles is too great and this practice should not be continued if possible to avoid it. The practice of douching or flushing the sheath of the bull before and after service is of questionable value and is fast falling out of use. The practice of having the act of breeding take place on neutral ground, that is ground used only for this purpose and to which no cattle have access at any other time, is to be encouraged.

Question 31.—What relationship exists between the Bang germ and undulant fever of man?

Answer.—Undulant fever, a disease resembling typhoid fever, has been traced to handling hogs and their products affected with Bang's

disease. The danger existing in the consumption of raw milk from abortion-infected cows is seemingly slight. It must, however, be remembered that hogs, if infected, can transmit this germ to cattle and the cows in turn can transmit it in their milk even though they do not abort.

Question 32.—Does heating abortion-infected cow's milk kill the Bang germ?

Answer.—Heating such milk at 145 degrees F. for 30 minutes will kill the germ.

Question 33.—How should replacement cows be obtained and handled?

Answer.—These cows should be purchased subject to the blood test. They should be isolated for a period depending upon the physical facilities of the particular farm, preferably until they have passed through a successful pregnancy, and have given birth to a healthy calf. Where this is not practical isolate for at least 30 days and retest before placing in contact with the clean herd.

Question 34.—What biological products are used at the present time and are they of any value?

Answer.—The biologics in use at the present time are divided into two classes: (1) Those consisting of dead germs and (2) those consisting of living germs.

The first class, the so-called bacterins, have a very temporary, if any, immunizing value, all trace of the injection being lost in a few months if measured by the blood test. It is claimed by some that a bacterin is of value in preventing abortion in the latter stages of pregnancy. However, the majority of authorities are not advocating this product in the control of abortion in cattle. The use of the second class, the living germ vaccine, is attended with some danger, because if the herd is not already saturated with the germ (Bang's organism) before vaccination, it certainly is soon afterwards. If open cows and virgin heifers are vaccinated several months before breeding some good results might be expected, but the animals may harbor the germ somewhere in their systems and thus be infected when bred. If a pregnant animal is vaccinated with the living organism the condition is similar to that of natural infection and the possibility of abortion is very great. It is, therefore, recommended that the use of the living vaccine be confined to herds already saturated with abortion, as shown by repeated abortions and positive blood tests. It should be remembered that for some time after either the bacterin or living germ vaccine has been injected an animal will react to the blood test exactly as though natural infection were present.

Question 35.—Are there any drugs having a distinct value in the treatment and control of this disease?

Answer.—There are several drugs which are used by injection directly into the blood stream. These drugs are being tried by several experiment stations in this country, but no results based upon sufficient data to determine their value have so far been reported. The fact that they are still in the experimental stage, together with the additional fact that considerable skill is required in injecting them, forbids their use except in an experimental herd.

Question 36.—What can be said of the flood of abortion remedies now on the American market?

Answer.—When the nature of this disease is considered as set forth in this circular, it is readily seen why the disease may seem to disappear, either without any drugs or vaccines being used or following their use, only to rise again in a storm of abortions when new susceptible animals are raised or purchased and added to the herd. To date, no patent feeding compound, mineral mixture, or vaccine has been discovered which will prevent or cure infectious abortion in cattle.

Question 37.—Should the live-stock owner ignore the disease and let it run its own course, hoping that it will make many of his cows immune by actual abortions?

Answer.—When one considers that in the majority of herds financial ruin would inevitably result from such a procedure because of the complications of the disease, it is obvious that some rational plan of herd management should be followed. Such a plan is appended to this circular and is identical in detail to that already followed successfully by many breeders in other states. There is no doubt but that a faithful adherence to such a plan will give good results. This laboratory will test all blood samples received, by the blood test, for a nominal charge to cover the actual cost. It is the height of folly to attempt to control and eradicate infectious abortion in cattle without the advice and supervision of a qualified veterinarian, who should be trusted to give the best available service in the many emergencies that arise in connection with this disease.

Question 38.—If I wish to have my herd tested by the blood test for infectious abortion of cattle, how should I proceed?

Answer.—Obtain a clean, dry bottle and number it to correspond to the number on the animal from which the sample of blood is to be taken. Have a qualified veterinarian draw the blood. Pack the samples and ship them immediately to the laboratory. The caution to be observed is to be certain that the bottle is dry. No preservative should be added to the blood sample.

PRACTICAL ABORTION CONTROL PLAN²

1. Provide a separate stable, one easily disinfected, as a maternity barn for cows at calving time.
2. Place every cow in this barn at calving time. Cows showing symptoms of abortion should be placed in this barn or in a hospital stable, if one is available. Keep all cows in the maternity barn until all discharges cease.
3. Burn or bury all aborted or dead fetuses and the membranes.
4. Keep the maternity stalls well cleaned and disinfect thoroughly before placing other cows in them.
5. Keep all cows under close daily observation and remove all suspicious animals from the herd at once.
6. In case an abortion has occurred in a stable, the cow should be immediately isolated, the fetus and membranes should be carried in a proper container to a suitable place and burned or buried, and the stable should be cleaned and disinfected. If the abortion occurred in a pasture, handle in the same way. Cover the area with three or four inches of lime or treat with a strong disinfectant.
7. Consider every abortion to be an infectious abortion until it has positively been proved otherwise.
8. Feed should be obtained from such sources and so handled that it will be absolutely free from contamination with disease producing germs.
9. Keep manure piles in such a manner that no cows will have access to them, or better yet, eliminate the manure piles.
10. Do not use a community bull or your neighbor's bull.
11. Know the history of the herd from which you purchase cows and particularly the individual animal's history,
12. If a pregnant animal is purchased keep in isolation until it gives birth to a calf and has passed a satisfactory blood test not earlier than three weeks after calving and until there is no discharge.
13. The blood test should be applied at frequent intervals and all reactors, both male and female, immediately removed until all animals have passed satisfactorily several consecutive tests.
14. Every reactor should be considered a carrier and every carrier a spreader.
15. Every cow in an infected herd should be considered a spreader at calving time, until no reactors have been found in the herd for at least one year.
16. Reactors possessing little value from a breeding standpoint should be sold for slaughter.
17. It is much easier to keep herds free from bovine infectious abortion than to establish free herds from those which have once aborted or become infected.
18. Prevention of disease is much more economical and more effective than cures.

2. General Reference: Barnes, M. F. Bovine Abortion, Prevention, and Control. Journ. Amer. Vet. Med. Assoc., Vol. 21, No. 2, pp. 436-442.

19. Breeders and herdsmen should not be easily discouraged when attempting by proper measures to eliminate abortion infection from the herd.

20. Remember that it took some of our most modern live-stock owners almost 30 years to understand that it is more profitable to maintain herds free from tuberculosis by the adoption of proper preventive and control measures than to maintain diseased herds. So it will take time for them to understand that it is more economical to keep herds free from bovine infectious abortion.

METHODS USED TO COMBAT BANG DISEASE

1. Repeated blood testing with the immediate sale of all reactors.
2. Repeated blood testing with the isolation of all reactors—dual herd system.

3. Semiannual blood testing with the establishment of dual maternity stables, one group to be used only for the blood-clean cows and the other for the use of the reacting cows. These stables should be as far apart as possible from each other and those stalls to be used for the reactors as far from the herd stable and yards as possible. All reacting cows should be retained in their respective maternity stalls as long as a discharge persists and before release the tail-head, thighs, udder, hocks, and feet should be carefully sponged off with a mild disinfectant solution. This system will gradually overcome the infection and after a few years make the adoption of either method 1 or 2 economically practicable.

4. Feeding heifer calves only clean milk, and after they have passed a clean test, maintaining them as a clean unit. After these heifers have calved the old reacting cows can be sold, the stable thoroughly cleaned, and the mature cows replaced by the fresh young blood-negative heifers. This plan is practicable in herds having a large per cent of reactors or where the use of live-germ abortion vaccine has made many cows reactors although the calving per cent is relatively good.

5. A method to be followed in beef herds is to test the herd when it comes off grass and to isolate the reactors during the winter months. Test again just before turning out to grass and put the reactors on one range and the clean cows on another. A necessary precaution to be observed is to be sure that any cattle sharing the same range be tested before mingling with the blood-negative herd; also be sure that a tight fence, or, better, a double fence, be used to separate the two ranges.

