INFECTIOUS ABORTIONS IN DAIRY COWS

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Introduction

Infectious diseases due to bacteria, viruses and protozoa are still causing reproductive problems in the form of abortions for dairymen all over the world. These abortions have a great impact on the economic performance of a dairy. Abortions during early pregnancy result in increased days open at a cost of at least US$2.00 to $5.00 per day. An early pregnancy loss causing an increase of 45 days open may result in a loss of between $90 and $225. If 20% of a 200 cow herd abort, the loss could be as much as $4500. Following late term abortions, there is a loss of potential replacement heifers which in the US are always valued at between $1000 and $1500. These late term abortions often result in early culling of productive cows accompanied by a salvage loss of $500 to $750. Moreover, extended calving intervals reduce production. Increasing the calving interval from 12 to 13 months may result in a loss of 2-5% of the herd's potential calf production. Calving intervals over 14 months will produce loss of greater than 10% in average producing dairy herds. Often the causes of these abortions are very difficult to determine resulting in a lot of frustration for the dairymen and their veterinarians. Expect that only 30-50% of submissions to veterinary diagnostic laboratories will yield a definitive diagnosis. Keep in mind that most dairies experience an observable abortion rate of from 2-5% yearly. Common causes of abortions in dairy cows are Bovine Virus Diarrhea (BVD), Infectious Bovine Rhinotracheitis (IBR), Neospora, Leptospirosis and Trichomoniasis. The purpose of this article is to review the common causes of abortions, when they usually occur, how they can be diagnosed, and preventive measures.

Bovine Virus Diarrhea (BVD)

BVD occurs worldwide based on serological evidence. Beyond clinical disease such as diarrhea, BVD has been reported to be responsible for 2-7% of dairy abortions. BVD is caused by a virus which attacks both the cow and the fetus the cow is carrying. The results of the infection with BVD depend on when the infections occur. Infections occurring early in the first 3 months after breeding cause embryonic death when the virus prevents conception. It may also cause fetal resorptions. In either case, the results are may appear as a history of repeat breeders and with an increased interval between heat

periods. In addition, mummifications may occur. However, it is becoming a rare event when an abortion storm takes place.

Abnormalities may occur in the developing fetus when BVD infections occur between 75 to 150 days after breeding. These anomalies often involve the brain (hydrocephalus or water head, cerebellar hypoplasis leading neurological signs at birth) and may result in cataracts. After 150 days of pregnancy, the fetus can respond to the BVD virus with an immune respond and fight off the virus. In this case, a normal calf may be born with a titer to BVD. Additional abortions may occur at anytime during pregnancy following severe infections in the cows. However, it should be kept in mind that most BVD infections are subclinical resulting in no observed disease in the cows except of development of blood titers. In the US over 70% of dairy cows have positive BVD blood titers due to vaccination and exposure. BVD infections have no permanent effect on fertility. Remember that bulls can also be infected with BVD.

Diagnosis of BVD infections can be made in the fetus or the cow. The fetus can become mummified, autolyzed or be delivered fresh following infections. The fetus should be submitted to the diagnostic laboratory for examination. Paired blood samples can also be checked for changing titers. However, often the abortion is noted long after the infection occurred making blood titers difficult to interpret. The presence of BVD can also be detected by screening unvaccinated calves older than about 4 months of age. Blood samples should be tested for both type 1 and type 2. Other test methods are available such as micro-titer ELISA, antigen capture ELISA, ear notch skin test and PCR assay. The herd veterinarian should confer with the local veterinary diagnostic laboratory on the current testing methods.

Prevention involves increased attention to biosecurity and enhanced immunity following vaccination. The source of BVD infections are infected cows shedding the virus. Many of these shedding cows are persistently infected cows which became infected as a fetus (42-145 days of pregnancy), survived the infection to be born and begin shedding large amounts of virus. The closed herd concept or quarantine of newly purchased animals can prevent infections. The most common protection is by vaccination. Modified live virus vaccines can provide long term protection; however, they should not be used in pregnant cows. Calves vaccinated before 6 months of age should be revaccinated prior to breeding. Killed BVD vaccines are also used and are safe to use in pregnant cows. These killed vaccines required annual boosters.

Most large dairies are on very aggressive vaccination programs to prevent the economic effects of BVD as a clinical disease and as a cause of abortion. These vaccination programs utilize both killed and modified live BVD vaccinations. To control abortions, vaccinations are given to both heifers prior to their first breedings and the milking cows during the dry period. This provides maximum protection during these highly vulnerable periods. When killed or inactivated vaccines are used, it is very important to follow the manufacture's instructions which usually include the need for 2 injections 2-3 weeks apart. A single injection with killed BVD products will not provide satisfactory protection. Many modified live vaccines should not be used on pregnant cattle. Recently

a combination killed-modified live vaccine for BVD and IBR became available that when use as directed can be used to protect pregnant cows.

Infectious Bovine Rhinotracheitis

IBR is responsible for sporadic abortions in dairy herds. While it causes a variety of clinical diseases, early embryonic deaths and abortions are common. The abortions are commonly found after the 4th months of pregnancy but may occur up to 100 days after systemic infections occur. The fetus is commonly autolyzed when delivered. Stillbirths and weak calves may also results from IBR infections. In any case, no permanent damage to fertility occurs.

Diagnoses can be made in about 1/3 of fetuses submitted to the diagnostic laboratory by examination of the lungs or placenta for virus. Blood titers can also be examined in the aborting cows. Interpretation is difficult as the abortions are commonly found so long after the IBR infections occurred.

Prevention involved biosecurity measures and vaccination. Many vaccination options are available for IBR. MLV intramuscular vaccines provide lifetime immunity when given after 6-7 months of age. These vaccines can not be used in pregnant cows especially after the 5^{th} month of pregnancy. When given close to heat periods, there may be a reduction in pregnancy rates. Nasal vaccination sprays are also used and can be used in pregnant cows to provide quick immunity. Killed IBR vaccines can be used in pregnant cows. These vaccines require two doses given 14-28 days apart. Annual vaccines are suggested to provide long term immunity. Chemically altered IBR vaccines can also be used in pregnant cows.

Neospora

These abortions are caused by Neospora caninum, a protozoon. The protozoa have recently been found to be carried by dogs and probably coyotes. The dogs are thought to transmit the protozoan eggs or oocyts in their feces. Eating the dog feces with the oocyts infects cows. Once a cow becomes infected, they pass the infections on to the fetuses they are carrying through the placenta. Most abortions (80%) are seen during the 4-6th month of pregnancy. The fetus is usually autolyzed. This route of transmission from dam to fetus is thought to be responsible for outbreak storms of abortions. Some infected calves may be born with neurological disorders.

However, most infections are thought to occur by transplacental infections of the Neospora parasite from infected cows to their calves *in utero* or during pregnancy. This route of transfer is felt to result in sporadic but continuing abortions within dairy herds. Sero-positive cows are 2-3 times more likely to abort than sero-negative cows. The occasional abortion storms result from massive infections from ingestion of infective dog feces.

Diagnosis can be made from distinctive brain and heart lesions in aborted fetus or blood titers in cows. Prevention of abortions can be aided by restriction of dogs on dairies from the stored feed and feeding areas. Sero-positive, infected cows will continue to have sero-positive, infected calves. These seropositive cows have also been found to have reduced milk production and earlier culling than seronegative cows. Some consideration should be given to culling seropositive cows. Recent evidence indicates that herds with high prevalence of Neospora will have an increased number of abortions for other causes as well.

Control of Neospora may involves detection and elimination of sero-positive cows, excluding wild animals and dogs from access to cattle feed and vaccination.

Leptospirosis

The primary Leptospira serovars causing abortions are L. hardjo-bovis (scientifically known as Leptospira borgpetersenii serovar hardjo and previously simply called L. hardjo) and L pomona. Hardjo has become adapted to cattle. Persistently infected cows are the main reservoirs of infections on dairies. Abortions are usually limited to less than 10% of the herd. Hardjo abortion usually occurs as late term abortions (4-9 month). Its primary reproductive effect may be infertility and early embryonic deaths. Calves may also be born alive but weak. Pomona infections are maintained in rodents and other animals. Third term abortions occur with pomona and may affect up to 50% of the herd in storms. Clinical disease often precedes abortions. The clinical signs in calves may include fever, anemia, red urine and deaths. In cows, mastitis (yellow milk) and lack of milk may be seen. These animals may shed the lepto in their urine for several weeks following clinical disease.

Diagnosis in the past has been usually based on blood titers, however, it as with other serological diagnosis, it may be difficult to make the interpretation. This procedure is probably adequate for all the serovar or types of Leptospirosis except L. hardjo-bovis. For this serovar, experts now recommend stimulating urination by using injections of diuretics such as Lasix. After 10 minutes collect mid-stream urine rather than the first streams of urine. This will provide urine from the kidneys than may contain the organisms rather than stale urine from the bladder.

Control of infections relies on vaccinations prior to breeding with multivalent vaccines. Recent findings suggest that for maximum protection particularly in herds with L. hardjo-bovis, it is necessary to use a vaccine that is specifically designed to provide protection against this serovar. When Leptospirosis is a true problem, at least 2 vaccinations per year will be necessary to prevent clinical disease. Additionally, management practices to reduce exposure to infectious urine are suggested such as elimination of standing water.

Trichomoniasis

Trich is a venereal disease caused by a protozoon, which is seen in natural service dairy herds. It is transmitted during breeding from infected bulls to susceptible cows. Older

bulls are more likely to be infected and remain infected than virgin or young bulls. Infections may result in early embryonic deaths or abortion during the first 5 months of pregnancy. About 5% of the infected cows develop pyometra after breeding. There are no systemic signs of infections.

Diagnosis is made by examination of preputial washing from the sheath of infected bulls using special isolation media. Cervical mucus or pyometrial fluid from cows can also be checked for infectious organisms. Control of trich within known infected herd is to begin artificial insemination. When AI is not possible, vaccination can be used to control infections. Even a switch in bull breeding to AI for 6 months will greatly reduce the effects of trich.

Vibriosis (Campylobacter)

Vibrio is a venereal, bacterial disease spread by infected bulls during breeding of cows. There are usually no clinical signs of disease in infected cows. The primary sign is early embryonic death resulting in repeat breedings. Occasional mid-term abortions are seen.

Diagnosis is by examination of preputial washing from suspected infected bulls. Repeated cultures are often needed for a certain diagnosis. Three cultures can be assured to diagnosis 1 infected bull from a group of 1000 bulls. When aborted calves are found a diagnosis can sometimes be made from culture of abomasal fluids.

Control is through AI breeding and vaccination. To be effective, vaccinations should be given prior to breeding each year. If bulls are to be used, they should be young, virgin bulls.

Other Causes

It should be borne in mind that all causative agents for abortions have not been covered exhaustively in this article. These pertain primarily to those agents found in the major dairy areas of the US. Other causes that might occur on a herd basis in other locations are Brucellosis, Bluetongue, and Foothills Abortion. Sporadic abortions may also be caused by other bacteria, fungi such as Aspergillus spp. or Sarcocystis. Any severe systemic infection such as Salmonellosis, coliform mastitis or Haemophilus may also result in abortions. Indeed, early embryonic deaths have been documented to result following cases of mild or subclinical mastitis during the early breeding period.

Conclusion

It must be stressed that in unvaccinated herds or in herds which fail to vaccinate properly (i.e., fail to give boosters as required), abortion diseases can have very pronounced economic effects. A single abortion may cost a dairyman at least $200 by extending the days open for that animal while an abortion storm may greatly increase the calving interval and thus reduce overall herd production. All abortion diseases can be controlled by vaccination and biosecurity to the point that no serious economic effect should occur

in a dairy herd. It is vitally important to follow the vaccine manufacture's instructions to insure maximum protection against clinical disease and abortions. For control of abortion diseases, vaccinations should be given pre-breeding. Surveillance is based primarily on submission of aborted fetuses, tissue samples and paired blood samples from suspect cows to a veterinary diagnostic laboratory. In bull bred herds, bulls should be examined when poor reproductive performance happens. Assistance in developing a comprehensive vaccination and prevention program by the attending herd veterinarian can be a great asset for the dairymen.