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A Comprehensive Review on Reproductive Tract Infections Causing Fetal Deaths and Abortions in Large Ruminants

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ABSTRACT

Abortion in dairy cattle is commonly defined as a loss of the fetus between the age of 42 days and approximately 260 days. Pregnancies lost before 42 days are usually referred to as early embryonic deaths, whereas a calf that is born dead between 260 days and full term is defined a stillbirth Each abortion leads to significant economic loss depending on such factors as the current value of replacement stock, feed and milk prices, and the stage of gestation when the abortion occurs. The diagnosis of abortions often presents a challenge to the herd owner and the herd veterinarian. Although a gradual increase in the abortion rate in a herd may be noted over a period of many years, a sudden and dramatic increase is more commonly seen. For this reason, prompt and thorough action is required when abortions do occur. Well kept records will often be of benefit during the investigation of abortion problems. With the increased use of natural service in many dairy herds, the potential exists for venereal diseases to affect reproductive performance. These diseases have generally been of very minor concern to the dairy industry because of the widespread adoption of artificial insemination. The bacteria may not cause disease symptoms in the cow, the fetus appears to be more susceptible, in large part because of its immature immune system. The resulting growth of bacteria can cause the death of the fetus, which in turn results in it being expelled (aborted) from the uterus. Some laboratory data suggests that these bacteria are the most commonly identified cause of bacterial abortions in dairy cattle.

Keywords: Inguinal, obesity, laparoscope

Introduction

The diagnosis of abortions often presents a challenge to the herd owner and the herd veterinarian. Although a gradual increase in the abortion rate in a herd may be noted over a period of many years, a sudden and dramatic increase is more commonly seen. For this reason, prompt and thorough action is required when abortions do occur. Well kept records will often be of benefit during the investigation of abortion problems [1].

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The diagnosis of abortions often presents a challenge to the herd owner and the herd veterinarian. Although a gradual increase in the abortion rate in a herd may be noted over a period of many years, a sudden and dramatic increase is more commonly seen. For this reason, prompt and thorough action is required when abortions do occur. Well kept records will often be of benefit during the investigation of abortion problems [1, 2].The infectious agents represent the most commonly diagnosed cause of abortions in many laboratories. These etiologies are perhaps the most frequently thought of cause of bovine abortion [3].*Trichomonas foetus* (Genital trichomoniasis) and *Campylobacter fetus ss.* venerealis (Vibrio) are the two organisms that are most often associated with venereal disease in cattle. Trichomonas

and Campylobacter infections can cause early embryonic death or first trimester abortions. Young bulls usually 'clear' the organisms quite rapidly, but become reinfected upon breeding a cow that is carrying an infection [4]. Once the organisms are present in the herd, they can be passed from cow to cow by the herd bull(s) or by contaminated breeding equipment. Older bulls (4-5+ yrs) are more often chronically infected. A 'dirty' white vaginal discharge can occur 1-2 weeks after becoming infected at breeding time. Cows are able to develop immunity to these organisms, although they can still be infected for up to 3 weeks before the infection is cleared. Campylobacter is occasionally associated with abortion during months 4-7 of gestation [3, 4].The infectious agents represent the most commonly diagnosed cause of abortions in many laboratories. These etiologies are perhaps the most frequently thought of cause of bovine abortion.

Causes of abortion [1]

The infectious agents represent the most commonly diagnosed cause of abortions in many laboratories. These etiologies are perhaps the most frequently thought of cause of bovine abortion.Reports of abortions associated with aflatoxin appear to be situations where the health of the cow was also severely compromised by the toxin. Some experimental studies have shown that **mycotoxins** such as zearalenone in very high levels can cause abortions in cattle, although these levels are not normally found in naturally contaminated feedstuff. Ergot alkaloids are toxins produced by the *Claviceps* fungus, which grows in the seeds of various grasses and small grains such as brome grass, wheat, oat, rye and fescue. These toxins have been associated with abortions in dairy cattle as well as other health problems.There is some evidence to suggest that a very sudden increase in environmental temperature may result in abortions, there is little evidence to support heat stress as a common cause of abortions. Heat stress can affect reproductive performance in a dairy herd, although it will generally cause conception problems rather than abortions. Similarly, on rare occasions a cow that develops a very high fever due to an infection may abort her fetus. Genetic abnormalities in the fetus that may result in abortion are not very frequently diagnosed, and these usually occur as an individual cow problem rather than as a herd outbreak. Genetic abnormalities may also cause obvious physical changes in the fetus, just as other infectious agents may .These abnormalities, which may not cause a change in the outward appearance of the fetus, may result in abortion because of the growing fetus' inability to develop properly in the uterus.Cattle are susceptible to fertilizer nitrites and nitrates or the nitrates found in plants under certain conditions (e.g. drought-stress). Toxic agents may also cause abortions or early embryonic deaths. If a cow is exposed to sufficiently high levels of nitrates/nitrites (~.55 % or greater nitrate in forage), abortions may occur, especially in late gestation (Forar *et al*., 1996).

Bacterial etiological agents of concern [2]

Actinomyces pyogenes, *Bacillus*, *Streptococcus spp.* and other common bacteria found in the environment can be the cause of sporadic abortions in a dairy herd. These organisms usually get to the placenta and fetus by way of the cow's circulatory system.

Brucella abortus (Brucellosis, Bang's disease) Whereas this bacteria once caused very significant reproductive problems on dairy farms, brucellosis is now a disease that is primarily of historical significance. Effective *Brucella abortus* vaccines are available, although wide-scale use of the vaccine is decreasing in many parts of the country.

Haemophilus somnus is not considered to be an important cause of abortion in cattle, although there are reports of abortions following experimental infection. It is also reported to cause infertility, although some controversy exists about its importance. *Leptospira spp. viz., L. hardjo (hardjo-bovis)* and *L. pomona* are the two serovars of Leptospira that are the most important in North America. Cattle, however, are the main host for *L. hardjo (hardjo-bovis)* and the organisms can establish as a chronic infection in the kidneys or reproductive tract of cows. Subsequently they can be shed intermittently during the life of the animal. These chronic infections can cause early embryonic death, abortions, stillbirths, or the birth of premature, weak calves. *L. pomona* is usually associated with abortion outbreaks in the last trimester of gestation. These occur sporadically since the cow is not its main host, and it is introduced to the herd from infected wildlife or swine - usually by means of water that becomes contaminated with the urine of these animals. Aborted fetuses are often severely autolysed. *Leptospira hardjo* organisms can be passed from cow to cow or cow to calf by contact with infected urine, milk or placental fluids, or directly to the calf across the placenta before birth. Vaccines are available against many different serovars of Leptospira; however, it appears that the protection offered is not very long-lasting and twice yearly boosters are usually recommended in high risk herds.Listeria can be prevalent in many places in the environment on dairy farms, although disease outbreaks are often associated with high bacterial numbers found in poor-quality or spoiled silage. *Listeria monocytogenes* can cause abortions in addition to some of the common diseases seen due to infection

with this bacteria (eg. circling disease). Abortions occur approximately one week after exposure, and occur most commonly during the last trimester of pregnancy, although they may occur as early as the 4th month of gestation. The aborted fetus is often autolyzed. The cows may show clinical signs of disease as well, although once returned to health appears to resist reinfection. This organism may be the most common bacterial cause of multiple abortions in herds.*Ureaplasm diversum* and *Mycoplasma bovigenitalium* are generally thought to be relatively uncommon causes of abortions, although *Ureaplasm* can cause an outbreak of abortions if it is introduced into a 'clean' herd. However, it is often difficult to determine if one of these agents is the cause of an abortion or infertility problem since they can also be found in the reproductive tract of normal healthy cows. These organisms have also been implicated as infectious causes of infertility.

Viral etiological agents and causative factors [3]

Infectious Bovine Rhinotracheitis virus (IBR) is a serious contagious herpes virus disease of cattle which remains the most commonly diagnosed viral cause of abortions in cattle. Abortions most commonly occur from 4 months to term, and may occur weeks after the disease has gone through the herd. The use of effective IBR vaccines should be a routine part of a herd disease prevention program Bovine Viral Diarrhea virus (BVD) can cause a whole range of disease syndromes in cows. When the virus circulates in the cow, it is able to reach the growing fetus through the placenta. Generally if a calf is exposed in the uterus during the last trimester, the virus will have no effect on the calf, except that it will be born with antibodies to BVD in its blood. Occasionally a late-gestation abortion may result from a BVD virus infection. While immunity in the cow (by exposure or vaccination) should help to protect the developing fetus, the protection offered is not 100% since there are different strains of BVD virus and only a few virus particles need to get to the fetus to cause an infection. If a cow not immune is exposed to the BVD virus in the first trimester, an early embryonic death or abortion may occur, and if the calf is not expelled from the uterus, it may become mummified. However, if the calf is exposed to the BVD virus between 42 and 125 days of gestation, and if it does not die, it may be born as a "persistently infected" calf. During the second 3 months of gestation, an infection may result in an abortion, or a calf which will be born with birth defects. The use of an effective BVD vaccine should be a routine part of a herd disease prevention program. A cow can also abort if she develops an infectious condition that does not directly affect the fetus. Some recent research from the University of Florida has shown that cows with clinical mastitis were almost 2 times as likely to abort as cows that had not experienced any clinical mastitis.An acute case of coliform mastitis caused by the *Escherichia coli (E. coli)* bacteria can cause a massive release of endotoxins into the udder and bloodstream of the cow. This endotoxin may result in the release of prostaglandins or other hormones in the cow that can in turn result in the occurrence of an abortion. This endotoxin is largely responsible for the clinical signs observed, such as the depressed attitude, the lack of rumen motility, and the high temperature. Vaccination with modified live vaccines during pregnancy can also cause cows to abort. Modified live vaccines contain live viruses or bacteria that are 'altered' to prevent them from causing clinical disease while still stimulating the immune system. It appears that this is very occasionally observed in herds that are vaccinating more than twice a year. In these situations the vaccine itself may not be causing the abortion, but the cows reaction to the frequent vaccination. Similarly, various veterinarians have observed side-effects of administering too many "gram-negative" bacterial vaccines (eg. *E. coli*, *Salmonella*) at one time.

Mycotic causes of abortion [4]

Fungi can also cause abortions in dairy cattle, most often in the last 2 months of gestation, although they have been observed to occur as early as 60 days. The mold spores are thought to reach the placenta and fetus through the blood supply of the cow, although the way that they gain access to the circulatory system is not well understood. These usually occur during the winter and spring months, since this is when cows are often kept in total confinement and can be exposed to moldy hay or silage. Fungal abortions tend to occur sporadically although on some occasions a significant percentage (10-20 %) of the pregnant animals in a herd may be affected. Rarely, before or after an abortion due to *Mortierella wolfii*, the cow may develop a severe pneumonia.
Neospora caninum is a protozoal parasite that does not appear to cause any disease in mature cattle, except for abortions. Abortions due to Neospora usually occur sporadically in a herd in the middle of gestation (4-5 months), although they can occur anywhere from about 3 months onward. A commercially-produced Neospora vaccine has recently become available. There is not yet enough information to decide if and when it's economically advantageous for herds to use this product.

Conclusion

Low rate of abortions is usually observed on farms and 3 to 5 abortions per 100 pregnancies per year is often considered as normal. However, the loss of any pregnancy can represent a significant loss of (potential) income to the producer and appropriate action should abortions do not present as an abortion storm, although this does occasionally occur. Many cows in a herd can be infected with Neospora and not abort, although they are more likely to do so than their uninfected herdmates. However, there is clinical evidence that using these therefore be taken to prevent abortions and to investigate the cause of abortions that may occur. Also, animals that have aborted once due to Neospora are at increased risk of doing so again if they remain in the herd and become pregnant again. Fetuses that are not aborted, while usually appearing to be normal calves, are often infected with the protozoa for life. Usually,*Neospora*-caused

vaccines in pregnant animals can cause abortions and vaccine manufacturers do not recommend that they be used in this fashion. Recently there has been some discussion about abortions occurring after vaccination with Leptospira vaccines.

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