

AGRI-FACTS

Practical Information for Alberta's Agriculture Industry

Revised May 2003

Agdex 666-5

Moldy Feed and Reproductive Failure in Cows

All homegrown feeds contain some fungal spores. When the temperature and humidity are right, these spores will grow and multiply to create mold. Mycotoxins come from these fungal molds and can reduce animal health and productivity.

Many molds found in feeds are not toxic, but some varieties produce substances that can result in disease when they are ingested. Of the thousands of molds that grow on stored grains and forages, only a few will produce mycotoxins.

Background

Forage and cereal contamination often happens in the field (plant-pathogenic), but it can also happen during the processing and storage of harvested products and feed (spoilage). Fortunately, the conditions necessary for mycotoxin production rarely occur in locally produced feeds.

Producers should be aware of these diseases, especially after an unusual year like 2002, and because some feeds imported from other provinces and the United States may contain mycotoxins.

Beef and sheep have microbes in their rumen that act to naturally detoxify mycotoxins. This ability makes these animals somewhat tolerant to these toxins. However, high producing animals have an increased rumen passage rate; this faster processing of contaminated feed may overwhelm the rumen microflora, and they will not be able to denature all the toxins.

Mycotic (caused by mycotoxins) diseases may not be immediately identified in cattle. They are not transmissible from one animal to another, and treatment

with drugs or antibiotics has little effect on the disease. Outbreaks may be seen seasonally because the weather will influence fungal growth and toxin production. When mold is seen, it does not necessarily mean that mycotoxin production has occurred.

Several mycotoxins suppress immunity, which may allow viruses, bacteria or parasites to create a secondary disease that is more obvious than the primary mycotic infection.

Stressed animals are more susceptible to mycotoxins. Sources of animal stress would include:

- poor health
- less than ideal feeding
- overcrowding
- high production

The rapid growth of molds can cause heating of feed, which reduces the energy as well as the vitamins A, D3, E, K and thiamine available to the animal. In addition, moldy feeds tend to be dusty, which reduces their palatability.

After initial feedings of mycotoxin-infected feed, relatively minor problems may develop in the animal; however, within days or weeks of continued feeding, the effects become more obvious.

There may be a decrease in dry matter intake, and therefore nutrient intake and weight gain. In fact, overall performance may be reduced by 5 to 10 per cent. Animals may go off feed, experience ketosis, displaced abomasums, diarrhea or signs of hemorrhaging. The reproductive performance of cattle may remain unaffected by feeding moldy rations, but the incidences of reduced fertility or high rates of abortion may occur.

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Confusion results when people discuss mycotoxins in forages for many reasons:

- several mycotoxins may exist
- diagnostic methods are not consistent
- treatment and control recommendations lack needed research

Abortions

The success rate for accurate bovine abortion diagnosis is only in the range of 25 to 35 per cent. Abortions often result from an event that occurred weeks to months before the actual event, and the cause is probably invisible at the time of abortion itself.

Many causes are never discovered, and most abortions occur in the winter. The key to correcting the problem of abortions is to identify the cause, so abortions can be prevented in the future.

Mycotic abortion

Mycotic infections (caused by mycotoxins) are a common cause of abortion in individual animals, causing some 3 to 10 per cent of all abortions. The infection usually occurs after an episode of grain overload or fungal pneumonia.

The toxins in moldy feeds will enter the bloodstream and the pregnant uterus. Abortions and infertility may result if the toxic elements from the moldy feed enter and infect the placenta. Severe infection of the placenta may result; it is seen as a leathery thickening of areas in between the cotyledons.

In 25 per cent of mycotic abortions, fungus invades the fetus, and red or white rings and worm-like lesions are seen. If the fetus remains in the uterus for any length of time after death, these lesions may no longer be visible. The afterbirth may be retained, causing even more problems. The infection may pass through the placenta and into the fetus, so plaques or crusts of fungus will develop on the skin of the fetus. Culturing the organism from aborted tissues will provide the diagnosis. Abortion can occur any time from the fourth month of pregnancy to full term.

To prevent mycotic abortions, do not suddenly change the diet of pregnant cattle from all forage to one that includes a large amount of grain, and avoid moldy feeds when possible.

Abortion due to *Listeria monocytogenes*

The bacterium *Listeria monocytogenes* has a long history in veterinary medicine as a cause of abortion and is associated with feeding silage. The bacteria are abundant in the environment, in soil, water and on pasture. It is often associated with a dirty environment because it is found in animal, bird and human stool.

Moldy forages or silages with a high pH (improperly cured) can harbor *L. monocytogenes* and are a common source of infection for cattle. Infection occurs primarily by eating or inhaling the organism. The infected cow may have a brief fever and depression, but abortion will only follow after a stressful event, so a long time may pass before an abortion occurs.

After *L. monocytogenes* enters the body, it travels through the bloodstream to the reproductive tract. Once there, the bacteria infect the placenta. If large numbers of *L. monocytogenes* bacteria are present, they may invade the fetus and cause it to die. Abortion usually follows within two to three days.

Aborted tissues often have a fruity or sweet/sour odour. The diagnosis is made when the bacterium is cultured from fetal or placental tissues. Culturing the organism from silage or spoiled forages is often unsuccessful because the bacterium tends to be unevenly distributed within the feed, and the sample collected may not be from the right spot.

Abortion due to *L. monocytogenes* is common in Alberta. Treatment with antibiotics is the usual practice after an abortion has occurred. No vaccine is available for prevention. Cattle owners should be aware that *L. monocytogenes* also causes disease in humans.

Moldy sweet clover

Moldy sweet clover can cause reproductive problems in cattle herds. Sweet clover hay and silage are difficult to make because the moist nature of the plant encourages mold growth. Poisoning caused by moldy sweet clover is occasionally seen in Alberta.

Coumoral is a chemical normally found in sweet clover. However, it changes to dicoumarol by fungal action after harvest. This is the same substance found in rat poisons. Dicoumarol is a potent anti-clotting compound and can result in excessive bleeding.

Newborn calves are especially susceptible to dicoumarol effects, although older animals and even adults may be affected. Symptoms include abortion or death of a calf shortly after birth, extensive bleeding from the genital tract of the dam and hemorrhage into the tissues of the calf.

Gathering several pieces of information allows for a diagnosis. There should be a history of feeding moldy sweet clover, findings of hemorrhage and detection of coumarin toxins in blood samples taken from the calf.

Vitamin A deficiency

Rations made from actively growing hay or well-cured forages generally satisfy the vitamin A requirements of cattle. However, vitamin A levels fall in feeds stored for extended periods. In addition, losses of vitamin A are accelerated by feed spoilage.

Cattle have reserves of vitamin A in the liver. These reserves are usually not depleted until three to six months after vitamin A levels decline in the feed source. This period usually coincides with the last third of pregnancy when the requirement for vitamin A is the greatest.

Vitamin A deficiency may result if moldy or spoiled forages are fed for long periods. Symptoms of a vitamin A deficiency include reproductive problems in both males and females. Pregnant cows may abort, retain their placenta and develop uterine infection or give birth to weak, dead or blind calves. Bulls with a vitamin A deficiency produce semen with low numbers of sperm and high numbers of abnormalities.

A diagnosis of a vitamin A deficiency is made by analysis of blood samples or a post mortem examination. In Alberta, the occurrence of this problem varies from year to year depending on forage quality.

Allergy

Badly molded feeds contain large numbers of fungal spores. Cattle that inhale these spores may develop a respiratory allergy or bovine interstitial pneumonia. This disease prevents oxygen from getting into the bloodstream.

An infected cow will gasp for breath, and the developing fetus may die due to a lack of oxygen. Abortion usually follows in a couple of days. Diagnosis is based on the signs seen in the cow and a history of respiratory distress before abortion. In humans, an allergic reaction to the fungal spores of feedstuffs is called "Farmer's Lung."

Aflatoxins

Aflatoxins are produced by fungi belonging to the family of *Aspergillus*. *Aspergillus spp.* grow well on corn and cereal grains. It is a storage fungus and grows well in conditions of relatively high moisture and temperature, but is very persistent under extreme environmental conditions.

Roasting, ammoniation at ambient temperatures and some microbial treatments may sharply reduce, but will not eliminate, the content of aflatoxins. The ammoniation process is the most effective at reducing aflatoxins while roasting is the least effective.

Aflatoxins are the most potent, naturally occurring animal carcinogen. Cattle eating feed contaminated with aflatoxins will have decreased productivity, flesh growth and feed conversion. Aflatoxins often cause vaccines to fail and suppress natural immunity.

The reproductive effects of aflatoxins include:

- abortion
- the birth of weak, deformed calves
- reduced fertility caused by reduced vitamin A levels

Once the damage has been done, animals can never fully recover from the effects of aflatoxins, even if returned to a toxin-free ration.

Estrogenism

Molds of the *Fusarium* family are known to produce estrogenic substances such as zearalenone. Estrogenism occurs most often after livestock eat field-damaged crops that have been put up during cool, wet weather. Once the fungus is established in the grain, it generally requires a period of relatively low temperatures to produce biologically significant amounts of zearalenone.

The ingestion of infected grains can result in the development of feminine characteristics in males, premature sexual development of young females, infertility in adults, abortion, stillbirth and the birth of deformed offspring. Cattle may have swollen vulvas and nipples while vaginal and rectal prolapse may occur. Also seen is a decrease in feed intake and perhaps feed refusal. The effect is most clearly seen in pigs, but clinical signs can also be observed in cattle.

Vomitoxin or Deoxynivalenol (DON)

Deoxynivalenol (DON) is the proper name for the most often detected Fusarium mycotoxin often referred to as Vomitoxin. Having wet, rainy and humid weather from flowering time on promotes the infection of corn and cereal crops by Fusarium species, resulting in ear rot in corn and scab or head blight in wheat, barley, oats and rye.

DON serves as an indicator for spoilage and the probable presence of unidentified factors more toxic than DON itself. If DON is present, then the conditions exist for the growth of other potential toxin producers. These toxins are present in the highest concentrations two to three weeks before seed maturity. Ensiling will not decrease the levels of DON.

DON in cattle has been associated with reduced feed intake, growth rate and lowered immunity. Also seen are poor feed conversion, general unthriftiness and lower milk production. This mycotoxin is a strong protein inhibitor and may reduce the production of antibodies and cause an anorexic effect. Avoid feeding DON-contaminated feed to pregnant cows and young calves. Try to keep moldy feed for feeder cattle.

Ochratoxins

Fungi such as *Aspergillus ochraceus* and *Penicillium viridicatum* produce ochratoxins. These organisms frequently infest Canadian grain and tissues of animals reared on contaminated feed. Ochratoxins are associated with kidney and liver damage. Abortions have also been reported.

Ergotism

Ergot toxicity is most frequently seen during cool, wet seasons. *Claviceps purpurea*, the offending fungus, infects the seed heads of rye, triticale, wheat, barley, oats and some grasses.

Two forms of disease exist:

- nervous form that results in convulsions and staggers in sheep and horses
- gangrenous form that causes lameness and the loss of extremities in cattle

Both forms result from the consumption of considerable amounts of fungal tissue. Symptoms that follow the consumption of infected plants include poor hair condition, poor performance, lameness and abortions.

Penicillium molds

Penicillium roquefortii is sometimes found on moldy grains and silage. It is associated with abortion, retained placenta and reduced fertility in cattle.

Summary

The abortion and death of newborn calves due to *L. monocytogenes*, fungal invasion of the pregnant uterus and vitamin A deficiency are occasionally seen in Alberta cattle herds. Reproductive failure caused by moldy sweet clover poisoning, allergy and mycotoxicosis are less frequent.

When moldy feeds are suspected in cases of infertility, abortion or the death of calves, a complete history and a toxicological analysis of feed are required to correctly diagnose the problem.

For more information, contact:

Alberta Ag-Info Centre at 1-866-882-7677