

Don't Mess With Mold

Palatability isn't the only thing that should be of concern when feeding moldy hay.

Story & photos by
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The technicians manning the bull test station at the AI Cooperative, Sisämaan Jalostus, in Hollola, Finland, were more than a little perplexed by the sudden drop in semen quality in fall 1998. The daily quality control regimen, based on subjective motility and sperm morphology of all young bulls entering the semen collection program, had been in place long enough for staff to recognize that something external was influencing the semen quality. During the next five months, the number of rejected ejaculates and discarded frozen semen batches due to poor motility increased, as did the number of all forms of abnormal spermatozoa.

All investigations pointed to a single likely cause. After a very wet summer in Finland the forage hay fed at the artificial insemination (AI) station was visibly moldy. When it was tested using immunoassay and gas chromatography-mass spectrometry (GC-MS), *Fusarium* mycotoxins HT-2 and T-2 were detected.

The official case report on the event stated that the occurrence of mycotoxins such as T-2 and HT-2 in the moldy hay coincided with, and may have been responsible for, the impaired semen quality in AI bulls.

While these comments are based on nonscientific observations, they do raise one more question about feeding moldy forage to cattle and its accumulative effect on the bottom line.

This and other such questions are particularly relevant in 2008, when hay and feedgrain prices are at historic highs and availability of quality forage is so tight. Under these extraordinary circumstances it is not unreasonable to think that beef producers could be tempted to feed moldy, flood-damaged forage that might otherwise have been relegated to the compost heap.

Not all molds the same

The question of what will happen to cattle that are fed moldy hay is not

easily answered, says Larry Hollis, Extension beef veterinarian at Kansas State University (K-State).



Cattle will fight over quality hay. Moldy hay is a different story.

“It depends upon what molds are present on the forage as to what the negative effects will be,” he says. “And they can range from diminished feed intake all the way to abortion and even death of the cow.”

He adds that livestock producers should understand they are not just dealing with a couple of types of mold when they see it on their forage. Instead, they are facing a wide range of possibilities.

Gordon Hutton, forage specialist for Alberta Ag-Info Centre, a North American clearinghouse for information on a wide range of farming- and ranching-related topics, concurs. “All homegrown forage and feeds contain some fungal spores. They are everywhere,” he says. “When the temperature and humidity are right, these spores will grow and multiply to create mold.”

Of the thousands of molds that commonly grow on stored grains and forages, Hutton notes, only a handful produce mycotoxins, those harmful byproducts known to negatively affect the health and productivity of livestock. He adds that one of the most common major physical responses in cows to a high dose of mycotoxins is abortion.

“Unfortunately there is no way to identify what kind of mold you have on your hay without sending away a sample for testing,” he says. “Without knowing, you are always at risk.”

While cattle and sheep have microbes in their rumen that act to naturally detoxify mycotoxins, these rumen microflora can be overwhelmed in high-producing animals whose increased rumen passage rate prevents them from denaturing all the toxins.

“Quantifying what kind of volume of mycotoxins it takes to get a clinical response remains an inexact science,” Hutton says, pointing out that even the variables involved in the toxin denaturing process — from the specific type of mycotoxin involved to digestion rate of the animal — defies normal research procedures.

Too many variables

Hutton admits that in many ways, mycotoxins are a moving target for the research scientist trying to measure its effect on livestock.

“You can't really feed and test for these toxins,” he says. “They are never uniform in what you are feeding, so even the labs can't tell you the appropriate levels. Our generic advice is just don't put moldy forage or feed through a pregnant animal if you can at all help it.”

Some of what we do know about mycotoxins and the disorders they cause are that they cannot be transmitted from one animal to another, and treatment with drugs or antibiotics has little effect on the toxins or their victims.

As seen in Finland, outbreaks are often accompanied by weather patterns that favor fungal growth and toxin production. Because there are so many mold-producing fungi spores in existence, and only a handful that produce toxins, seeing mold growth on hay or grain does not necessarily mean that mycotoxin production has occurred.

Hutton notes that one of the real problems associated with diagnosing Mycotic diseases (caused by mycotoxins) is that symptoms do not always surface immediately. Feeding

can continue for days and even weeks without any hint of an emerging problem.

Often the first real indicator of trouble is a decrease in dry-matter (DM) consumption and an accompanying reduction in nutrient intake and weight gain. This can be followed by ketosis, displaced abomasums, diarrhea or signs of hemorrhaging. While the reproductive system is less likely to be affected by mycotoxins in moldy forage, reduced fertility or high rates of abortion are always a major concern.

Other paths, other toxins

As noted by both Hutton and Hollis, producers are faced with not one but several different toxin-producing fungi and nonfungi associated with moldy hay and moldy feed. For most, the primary means of infection is ingestion, but this isn't the only way these potentially destructive agents find their way inside livestock. Toxins passing through a lesion in the rumen wall or inhaled into the lungs in the form of mold dust are two other means of entry common in cattle.

Through these routes, mycotoxins enter the bloodstream and spread to the pregnant uterus, often resulting in a severely compromised placenta. It is estimated by scientists at Alberta Agriculture that 3% to 10% of all abortions in cows can be attributed to this type of infection.

Inhaling a concentrated level of fungal spores can also lead to a respiratory allergy or bovine interstitial pneumonia, a condition that reduces the flow of oxygen into

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the bloodstream. Infected animals can be found gasping for breath. Fetal death and abortion are common with this disorder.

While *Listeria monocytogenes* is a bacteria and not a fungus, it is often present in moldy forages or silages with a high pH. After being ingested or inhaled, the bacteria can find its way into the cow's reproductive system via the bloodstream. A large dose of monocytogenes can kill a fetus outright. More often, the bacteria will remain as a low-grade infection in the placenta and cause abortion if the animal is stressed during pregnancy.

One forage plant that can be particularly nasty in a molded state is sweet clover. When exposed to fungal action, coumarol, a normally nontoxic substance found in sweet clover, is transformed into dicoumarol — a dangerous anti-clotting compound commonly used in rat poisons. Consuming forage tainted with dicoumarol can cause abortion in pregnant cows and the death of newborn calves.

When feeding older, lower-quality hay, one problem that can sneak up on a producer is vitamin A deficiency, Hutton says. Alberta Agriculture researchers report it is common for lower-quality hay that is moldy or has been stored for prolonged periods to be deficient in vitamin A. Vitamin A deficiency is known to cause reproductive problems in both males and females.

Watch the grains

With the cost of feed going through the roof, cattle producers might be tempted to augment hard-to-find forage with grains that did not make the moisture cut at the elevator. While this might make good economic sense, molds that appear on grains can cause serious problems in a cattle herd.

Aflatoxin, for instance, a fungus commonly found on moist corn and cereal grains, produces a naturally occurring animal carcinogen that is known to cause abortions, as well as being linked to the birth of weak, deformed calves. Beyond diminishing reproductive functions, aflatoxin inhibits muscle development, feed conversion and, in some situations, suppresses natural immunity and causes vaccines to fail.

Hutton points out that like forage-oriented molds, toxic grain molds appear in many forms. Equally diverse are their individual effects on livestock. Molds of the *Fusarium* family are known to produce estrogenic substances that promote development of feminine characteristics in bulls, while those from the *Claviceps* family are known to produce ergot toxins that cause lameness and the loss of extremities in cattle.

A strategy for molded hay

Both Hutton and Hollis agree that in light of the complexities and risks associated with feeding moldy hay and grain, the first line of defense should always be to avoid the practice if it is at all possible.

To those who have no alternatives, Hollis has the following advice:

"If you have moldy hay that you are thinking of feeding, you can send samples into the state veterinary diagnostic lab and ask them to do a mycotoxin screen," he says. "They will check for most of the routine mycotoxins."

This is far from being a foolproof solution, Hollis adds. "The big risk with

this kind of test is in what is selected as a sample. You need to make sure that the molds that are most widespread in the hay are included in the sample."

Once the results of the tests are in-hand, Hollis suggests consulting with the local veterinarian to make a final determination on whether the hay must be discarded or if it can be diluted with a higher-quality forage or grain and fed.

Mixing will also improve the palatability of the molded feed.

"The secret to managing moldy hay is not having it be your only source of feed," he says. "Cattle instinctively will pick through and select what is good and the rest ends up [as] bedding."



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