

Mycotoxins in Dairy Cattle

What are mycotoxins?

Mycotoxins are carcinogenic and/or toxic compounds produced from various fungi species. These fungi often grow on commodities commonly used as feedstuffs in the dairy industry. Most commonly, mycotoxins are produced by species of *Aspergillus*, *Fusarium*, and *Penicillium*. The presence of mold does not mean the toxin is present but it does mean that conditions are favorable for mycotoxin production.

When does contamination occur?

Molds can be produced both before (*Fusarium sp.*) and after harvesting (*Aspergillus* and *Penicillium sp.*). The absence of mold (on visual observation) is also not a guarantee that mycotoxins are not present, as mycotoxins may remain after the mold dies. Mycotoxins produced before the crop is harvested may remain stable during preservation, but species may also grow on commodities during storage. Stress makes the feedstuff more susceptible to mold growth. Stress may be caused by:

- drought
- excess moisture
- elevated temperature
- humidity
- insect damage

What does mycotoxicosis look like?

General symptoms of mycotoxicosis may include:

- increased SCC
- feed refusal
- reduced lactation and reproductive performance
- rough hair coat
- lameness
- diarrhea

These symptoms may be general across multiple toxins but may also vary based on age, stage of production, environment, interaction with other mycotoxins or diseases, incidence of stress, and dose or length of exposure. Mycotoxins often affect immune and organ function, so symptoms may be indicative of a much larger concern, however diagnosing mycotoxicosis is difficult. Mycotoxins also affect species very differently. For example, vomitoxin (or DON) may result in reduced intake in dairy cattle, but beef cattle and sheep appear to be more resistant to its effects. This combined with a lack of research on the sensitivities among species, inaccurate sampling and analysis, the large number of mycotoxins and their interactions with other factors makes it very difficult to diagnose. Often, the only form of “treatment” is removal of

Quick Summary

- Mycotoxins are toxic compounds produced by molds
- Mycotoxins are found in feedstuffs commonly used in dairy cow diets
- Extreme environmental conditions can increase risk for mycotoxin production
- Mycotoxicosis can lead to poor performance and animal health
- Feed should be sampled often for mycotoxin analysis

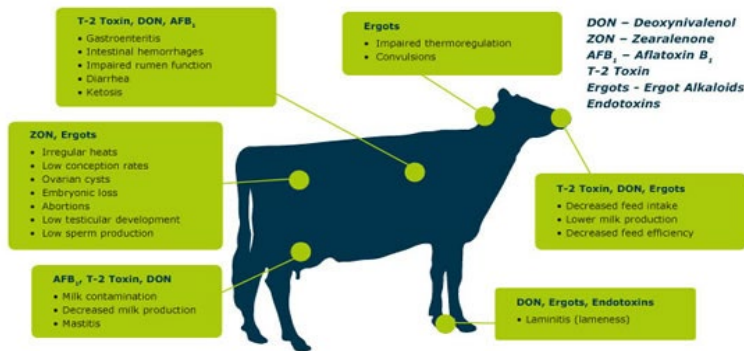


Figure 1. Impact of mycotoxins on cattle performance.¹

mycotoxicosis is caused by naturally occurring mycotoxins, multiple mycotoxins may be present causing interactions that increase the severity. Although ruminants are typically more resistant to mycotoxicosis, they are still susceptible. Dairy cattle appear to be more susceptible, particularly during early lactation when their immune system is already suppressed.

How should you sample for mycotoxins?

Both long duration of minimal concentrations and acute, severe concentrations may cause mycotoxicosis, making it important to consistently sample and test feed for mycotoxins. However, obtaining a representative and accurate feed sample is difficult. The majority of error in mycotoxin determination is due to sampling error. Mold, and thus mycotoxin production, may occur in “hot spots”, and is not uniformly distributed throughout the silo or grain bin. This can cause inaccurate reports of uncontaminated feed.



Figure 2. Aflatoxin contaminated corn².

Some keys to taking good samples for analysis:

- Take core samples in multiple locations throughout the stored feed rather than taking a singular grab sample
- Preserve the sample by freezing or drying prior to shipment to the laboratory. This will prevent mold from growing and producing mycotoxins after the sample is collected.

It is important to remember that a sample may be inaccurate. If feed is reported to be negative for mycotoxin but clinical symptoms are still present, do not rule out mycotoxin contamination.

What can you do if you have mycotoxin contaminated feed?

Mycotoxin binders have been evaluated for years, however many are not available for purchase in the U. S. and there is limited information on the required dosage needed. Clay binders often come in the form of bentonites, zeolites, or hydrated sodium calcium aluminosilicate (HSCAS) clays. While most clays appear to be effective, research varies on how well they work. This may be due to the variety of mycotoxin and clay used in each study. Additionally, while some binders may be effective for numerous mycotoxins, some are only effective for a specific toxin. For example, HSCAS is known to be sensitive to aflatoxin, but not other mycotoxins.

Additionally, some mycotoxins (such as zearalenone and ergot alkaloids) do not bind to these clays and the only real treatment is removal of the contaminated feed. If contamination occurs, diluting with uncontaminated feedstuffs is also an option unless the mycotoxin is above FDA action limits.

Sources

Jouany, J-P. and D. Diaz. 2005. Effects of mycotoxins in ruminants. Pages 295-323 in The Mycotoxin Blue Book. D. E. Diaz, ed. Nottingham University Press, Nottingham, UK.

Phillips, T.D., L.F. Kubena., R.B. Harvey., D.R. Taylor, and N.D. Heidelbaugh. 1988. Hydrated sodium calcium aluminosilicate: A high affinity sorbent for aflatoxin. *Poult. Sci.* 67:253-260.

Santin E. 2005. Mould growth and mycotoxin production. Pages 225-234 in The Mycotoxin Blue Book. D. E. Diaz, ed. Nottingham University Press, Nottingham, UK.

Whitlow, L. W. and W. M. Hagler, Jr. 2019. Mold and mycotoxin issues in dairy cattle: effects, prevention and treatment. Extension.

Figures

1. Mycotoxins: Symptoms in Ruminants.
<http://www.thecattlesite.com/focus/biomin/2080/biomin-mycotoxins-symptoms>
2. Adapted from Adisseo mycotoxin analysis: US corn crop of medium quality. *Feed Strategy*, Jan 24, 2019.

Author(s):

Dr. Sarah Allen, Graduate Assistant, Department of Animal Science, NC State University¹

Dr. Stephanie Ward, Assistant Professor and Dairy Extension Specialist, Department of Animal Science, NC State University

Rose Vaughn, Undergraduate Assistant, Department of Animal Science, NC State University