

## **MYCOTOXIN ALERT!**

### **Mary-Howell Martens, Lakeview Organic Grain**

Mycotoxins are toxic chemicals produced by certain types of fungi that grow on plant material, both in the field or in storage. Mycotoxins are a common problem worldwide, indeed, it is estimated that globally, over 25% of field crops are affected annually with mycotoxins. In Europe, Napoleon's defeat in Russia may not have been due as much to cold or military skill but rather to mycotoxin-contaminated grain fed to their animals which resulted in a catastrophic loss in horses.

Here in the northeast, we often are not conscious of mycotoxin-related issues, although a recent study from Vermont estimates that over a 10 year period, nearly all dairy farms in that state will experience mycotoxin-related issues, even though most will not connect symptoms to actual cause. Recent erratic weather that has caused significant crop stress has made it difficult for many of American farmers to not notice mycotoxins - serious animal health problems, poor quality forage and rejected grain has brought the issue front-and-center for many people. The severe drought in the Midwest this year has resulted in significant mycotoxin-contaminated grain that is now moving 'through the system' and requires dairy farmers to be ever more alert to this issue.

**Many types of feedstuffs can develop fungal toxins, or mycotoxins, including grains, haylage, baleage, silage, dry hay, and high moisture corn.** Infection is most common on plants grown under stress, especially when damaged by insects, birds, mites, hail, early frost, heat and drought stress, windstorms, and other unfavorable weather. Mycotoxins can also form or increase when grains and forages are harvested and stored at undesirably high moisture levels, when grains are put into storage dirty, if plastic ag bags get torn or damaged, or if storage facilities leak.

Experts estimate there are over 300 fungal toxins can contaminate crops, but several are distressingly common and damaging. In the Northeast, the common soil fungus, **Fusarium**, causes ear-rot in corn and scab or head blight in wheat, barley, oats, and rye and produces several mycotoxins, including vomitoxin (DON), fumiosin, and zearalenone. **Fusarium** can also infect ensiled/bagged forage and silage. The risk increases when corn/forage is harvested late (especially after frost), gets moldy or lodged in the field, is rained on or sours in the windrow, or is not adequately packed to exclude oxygen. Silage corn cut after a frost or late in the season is often too dry to pack well, impairing normal fermentation and allowing **Fusarium**, already present on the corn, to proliferate. Several species of the **Aspergillus** fungus produce aflatoxin, which is most commonly seen in hotter, dryer areas of the South and southern Midwest. Greenish-colored **Penicillium** is most commonly seen in silage and can produce several different toxins. Ergot toxins (from the mushroom fungus **Claviceps**) have also caused problems mostly on rye (St. Anthony's Fire). Byproducts can also contain mycotoxins, with products containing peanuts being notorious for aflatoxin problems.

**How do you know whether your grain/forage contains mycotoxins?** If feed is visibly moldy, that is a pretty good clue –just as you wouldn't eat moldy food, neither should your animals. However, it usually isn't that simple. Not all molds you can see produce toxins, and not all grain/forage containing toxins looks moldy. For that reason, although we rarely see moldy grain, we do often test often for mycotoxins. There are accurate lab tests available – Dairy One does a nice 6 mycotoxin scan for \$65, but this are expensive and slow, and tests are only as accurate and representative as the sample was, so they are usually not done unless there is good reason to suspect a problem.

**What makes us suspicious?** We generally test grain that is light test weight, poorly matured, off-color, musty, dusty, harvested excessively late, has many broken or damaged kernels, or just doesn't look/smell/feel right. We also randomly test other samples of each grain during the season to get a baseline and to check our assumptions. A slight pink coloration to the grain can indicate the presence of Fusarium. We usually recommend testing all on-farm feed supplies if a farmer complains of 'typical' mycotoxin symptoms in their animals. We also recommend that, if you must feed forages that are moldy, slimy, off-smelling, or otherwise not quite right, you test them first. Traditionally, aflatoxins have been detected by placing grain under a 'black light', but that is not a reliable test for the Fusarium toxins.

**At high levels, mycotoxins can cause liver damage, internal hemorrhaging, cancer, abortion, and reproductive failure in animals,** but even a fairly low levels, they can strongly suppress an animal's immune system, resulting in other opportunistic infections, such as salmonella, clostridia, and E coli to 'break through', causing diarrhea, mastitis, and other production/health problems. Some mycotoxins are estrogen-like, interfering with cycling, conception and fetal development.

Often before clinical symptoms are seen, feed with mycotoxins can result in reduced feed intake, impaired rumen functioning, elevated SCC, poor vaccine take, reduced milk yield and butterfat, reduced weight gain, and impaired reproductive function in both females and males. The problem here, of course, is that other factors can cause similar low-grade symptoms, which is why farmers may not connect symptoms to cause. But, if you see such symptoms, mycotoxins in feed are one of the first things to address. Animals under stress for other reasons tolerate lower levels of mycotoxins than healthy animals.

**There are 'threshold' levels of concern for different mycotoxins depending on the animal species being fed.** According Dairy One, ruminants can tolerate a total toxin level of around 5 parts per million (ppm) of vomatoxin while other experts caution not to exceed 1-2 ppm. Pigs and chickens are much more sensitive. The acceptable threshold for organic human food grains is essentially zero. Other mycotoxins are of concern at a much lower tolerance level. New York State has just issued an official warning regarding aflatoxin levels in feed, stating that, according to FDA law, feeding dairy animals grain testing over 20 parts per billion is technically illegal. One reason for this lower tolerance level is that aflatoxin can be present in the milk of a cow fed contaminated feed. For more information on New York's recent communication on mycotoxins, please see - [www.agriculture.ny.gov/aflatoxin\\_letter\\_to\\_feed\\_manufacturers.pdf](http://www.agriculture.ny.gov/aflatoxin_letter_to_feed_manufacturers.pdf)

It is important for livestock farmers to recognize that as far as the animal is concerned, **it is the total cumulative intake level of all mycotoxin-infected feed that counts.** Even if each individual feed/forage item tests 'below threshold levels' (including baleage, silage, grain, ground feed, high moisture corn etc), if eaten together by one animal, the overall level may exceed the threshold and adverse effects will be seen. Also, frequently contaminated feed/forage contains more than one toxin, further complicating the decision of whether you have reached a level for concern.

While there are products available to 'bind' or adsorb toxins, none are 100% reliable, so it is best to avoid feeding suspect feed whenever possible. **If you need to use a toxin binder,** try to match the correct binder to the toxin present. In the feed industry, mycotoxin binders are often termed 'flow or anti-caking agents' to avoid making actual efficacy claims.

**Those allowed under organic standards fall into 2 primary categories** - the clay (or

silicate/montmorillonite)-based products (Desert Dynamine, Redmond Conditioner, bentonite etc) which are most effective against aflatoxins; and the newer lower-inclusion rate oligosaccharide/beta-glucan yeast cell-wall products (Check M, Immunowall, FloMatrix, Fuse 207, Mycotex, BioMos etc) which are much more effective against the Fusarium toxins. If you suspect a mycotoxin problem and can't avoid using the feed/forage, the best approach would probably be to use a 'combination' type product (i.e. FloMatrix) or use a couple of products with different efficacy (i.e. Fuse 207 + Mycotex) .

### **Steps to minimize mycotoxin levels in grain and feed**

- 1.** Always use cleaned, high quality seed that is not carrying seedborne diseases. If you plant back your own seed, make sure it was not infected with scab or head blight (Fusarium) the previous year. Even if seedborne diseases that do not produce mycotoxins can weaken the plant, making it more vulnerable to mycotoxin-causing fungi. Whenever possible, use scab resistant varieties.
- 2.** Harvest at maturity , as soon as the moisture content allows minimum grain damage. This means harvesting shelled corn at 23 - 25% moisture, ear corn at 25-30%, small grains at 12-17%, and soybeans at 11-15%. The longer grain is left in the field after maturity, the higher the likelihood of fungal contamination. Dry suspected grain to at least 14% moisture as rapidly as possible, at least within 24 - 48 hours after harvest. Safe, long-term storage can only be achieved at a moisture level of 13.5% or below. Cool grain after drying so hot grain doesn't absorb moisture from the air.
- 3.** Adjust the harvesting equipment for minimum grain damage and maximum cleaning. Especially where scab/head blight is evident in the field, the combine should be set for maximum cleaning, with higher blower speeds to remove the small shriveled diseased kernels and broken grain.
- 4.** If harvested grain contains wet weed or plant material, run it through a rotary cleaner soon after harvest so the moisture doesn't migrate into the grain. Rotary cleaning also will remove broken and diseased kernels and fines which are more vulnerable to insect and mold damage in storage, and removal of chaff and debris will reduce the possibility of dryer fires. During harvest, we routinely use the rotary cleaner between truck/wagon and grain bin to make sure that grain goes into storage as clean as possible.
- 5.** Roasting does NOT deactivate mycotoxins, but it may reduce the level by blowing off surface mold. If you roast moldy grain, make sure you run a mycotoxin test after roasting to check if the level is safely reduced.
- 6.** Thoroughly clean all bins before storage to remove dirt, dust, and old grain. Store in water-, insect-, and rodent-tight structures. Keep grain well-aerated and monitor regularly.
- 7.** For ensiled forages in bags or silos, make sure forage is at the right moisture level, is tightly packed, that oxygen is excluded and the 'package' is kept sealed since mycotoxin-causing fungi require oxygen to live. Be prepared to discard forage from around torn areas of ag bags, as it are more likely to be contaminated. Avoid harvesting dead or moldy plant material in the field.
- 8.** Use extra care and watch more closely when you harvest grain or forage that you know grew under stress, including grain that is low test weight, frost, insect or flood damaged, harvested immature or at high moisture, or forage or silage that may have been harvested too wet or too dry, dirty or containing significant levels of dead material, or that may not have fermented correctly. Or any feed that just doesn't look or smell right!

**9.** If you have reason to suspect mycotoxin problems, contact a forage testing lab and test before feeding it or representing it to a buyer as sound grain. If you must feed contaminated grain, identifying the toxins present will help you choose the most effective toxin binder.