Hidden Dangers

Some stored feed supplies could carry toxins.

Story & photos by
CRYSTAL ALBERS

An invisible danger lurking in stored corn could put the cattle feeding on the grain at risk, university experts warn.

The danger lies in the fungal family *Aspergillus*, specifically *Aspergillus flavus*. While difficult to detect, the common mold grows on various grains, like cottonseed and peanut, but it is mostly known for its effects on corn — and the harsh outcome for cattle producers feeding the infected grain.

As John Reagor, toxicologist at the Texas Veterinary Medical Diagnostic Lab, explains, the mold produces a toxic byproduct known as aflatoxin. Poisonous to humans, poultry and livestock, the toxin, once ingested, has detrimental effects on production numbers and herd health.

The Food and Drug Administration (FDA) has strictly regulated the toxin in dairy cattle for years, since aflatoxin can be passed to milk products and, therefore, to humans. But less stringent regulations exist for beef cattle feed, Reagor says, primarily because the toxin isn't typically found in the meatcase. "The main danger is the effects it has on the live animal and the producer's bottom line."

While other animals like poultry and swine may be more sensitive to aflatoxicosis than beef cattle, Reagor says, it remains a principal concern.

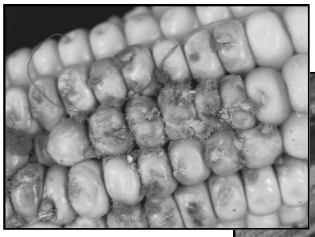
"There are probably more problems in beef herds than people recognize, simply because of what it does in those herds. It causes reduced performance primarily in that it suppresses the immune system, making animals more susceptible to common diseases," he says. "Aflatoxicosis may be an underlying cause of disease that no one realizes."

Growth of a toxin

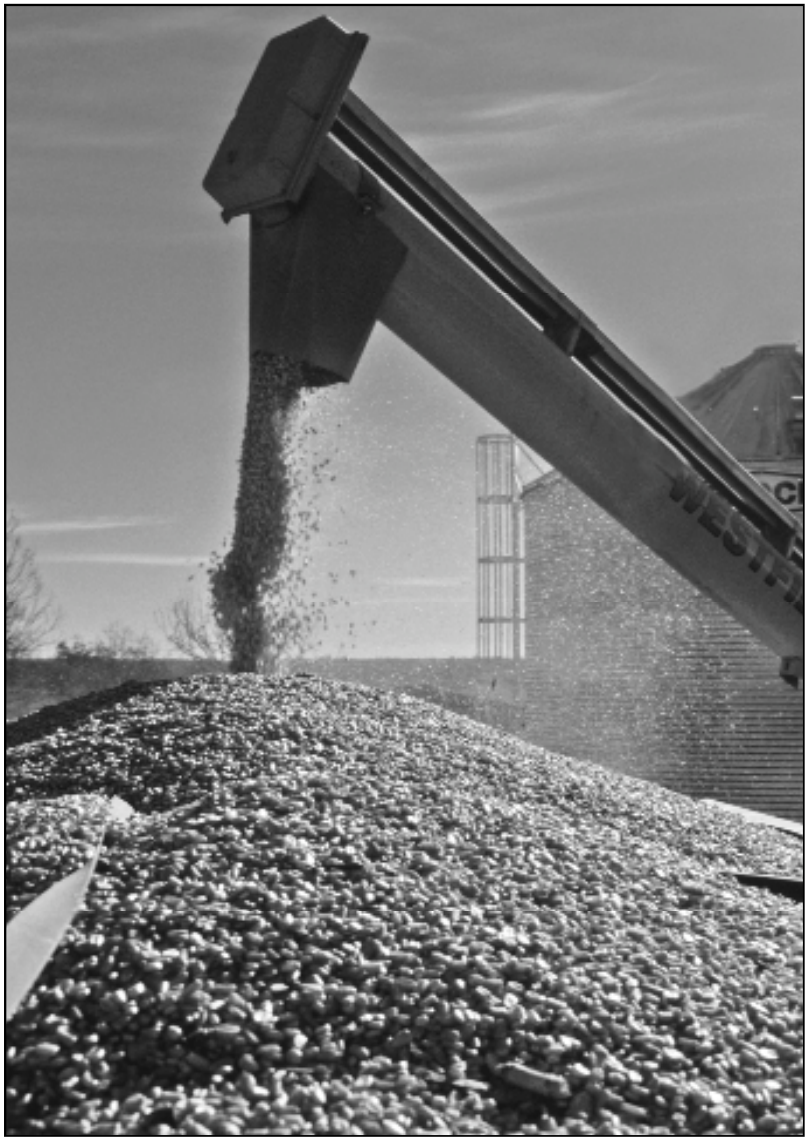
The widespread fungus thrives during drought, high temperatures and high humidity and is, therefore, more prone to areas exhibiting such environmental conditions as found in the South, Southeast and parts of the Corn Belt.

Joseph Krausz, Texas A&M Extension plant pathologist, says when drought stress occurs during pollination, plants become more susceptible to *Aspergillus* spores.

"If the corn plant is physiologically growing well and vigorously, the fungus can't get established well and, therefore, isn't able to produce the toxin," he says. "But once the plant becomes stressed, many of its natural defenses aren't quite up to par. We see some of these pathogens, like *Aspergillus flavus*, attack the corn plant and become established. It's just like in humans; if we become stressed or we're not getting essential nutrients, we're more prone to illness."



The toxin-producing *Aspergillus flavus* grows on ears of corn as a yellowish-green felt like or powdery growth, Texas A&M's Joseph Krausz says. [PHOTOS COURTESY OF IOWA STATE UNIVERSITY EXTENSION]



Scott Barao, University of Maryland animal scientist, says he mostly sees aflatoxin problems among integrated grain and livestock operations. These operations will often feed livestock the byproducts of the grain side of the operation.

Insects also play a role in aflatoxin infestations, he notes. Insects can damage ears of corn and break through seed coats, making the plant more susceptible to the mold. Plus, insects can carry spores to silks and kernels. "Insect damage can definitely increase the frequency and amount of aflatoxin problems," Krausz says. "But the drought stress and hot temperatures usually have to be there for high aflatoxin levels to develop."

University publications show temperatures ranging from 80° F to 100° F and a relative humidity of 85%, or about 18% grain moisture, are optimum for the mold's growth and aflatoxin production. The mold also develops or continues to develop in stored corn, depending on moisture content, temperature and condition of grain going into storage.

"If grain moisture is allowed to rise much above 13% to 14% grain moisture in storage, then the fungus can start to develop, and we can begin to see these hot spots within a bin or silo where the aflatoxin can build up as the fungus grows," Krausz says.

Fortunately, last year's growing season exhibited unusually moist conditions and calm temperatures in many parts of the nation normally affected. Although experts like Krausz aren't expecting many problems with stored grain this year, cattlemen shouldn't disregard aflatoxin just yet. It remains an elusive problem.

"You can go many years and never suspect a problem," says Scott Barao, University of Maryland animal scientist. "Then, we'll have a drought or some other stress on the corn crop, and you start hearing about aflatoxin concerns."

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Once the mold is produced, it becomes stable, making it difficult for heat, cold or light to affect it, one University of Missouri publication reports. The mold can withstand temperatures up to boiling, and although toxin levels in corn may decline, traces of the toxin may be present for years.

Barao says he mostly sees aflatoxin problems among integrated grain and livestock operations.

"A lot of times, when you have a grain and livestock operation, the livestock will be fed byproducts from the grain side of the operation. Low-quality corn and broken kernels can often be fed in these situations," he says. "Guys that like to feed byproducts like that should be very careful in a year that's prone to aflatoxin production."

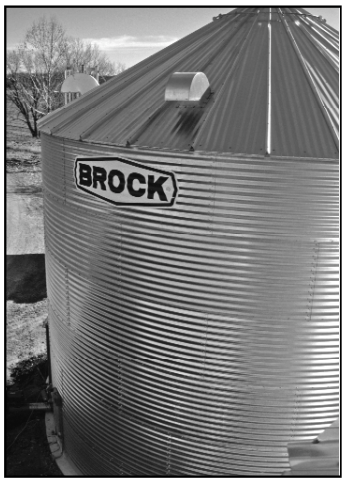
Producers who purchase grain from mills or large feed facilities aren't off the hook, either, Barao notes, although they normally have less of a chance of purchasing infected corn.

"The mills usually watch it more closely. They can't risk an aflatoxin outbreak, but that doesn't mean it can't happen there, too," he says. "If a feedmill or storage facility isn't watching moisture content and drying the grain down well, you can have problems, but you generally see it with guys who are harvesting their own feed or marketing their grain to others."

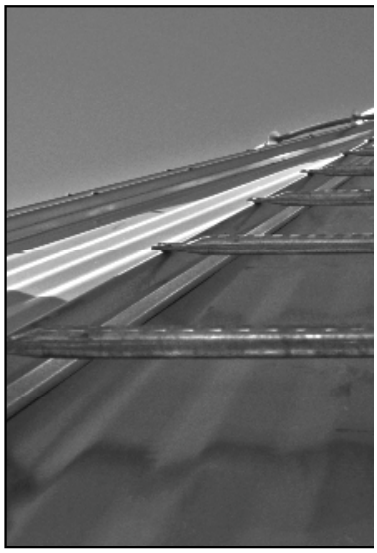
An elusive problem

Cattle feeding on aflatoxin-infected corn may experience reduced feed efficiency, reduced feed intake, reproductive failures, increased susceptibility to stress and disease, and lower milk production. Depending on the level of contamination, continued aflatoxin intake can result in anemia, rectal prolapse, liver and kidney damage, and even death. Calves and any animals under stress, like weaning calves or bred heifers, are more prone to the effects of the toxin.

"Older animals can tolerate the toxin better than younger animals or those with a lot of stress," Barao says. "In lactating beef cows, it gets passed on through the milk, and it can influence



"One of the weaknesses in testing is that aflatoxin usually doesn't occur uniformly in grain," says Krausz, referring to toxin-prone hot spots located haphazardly throughout stored grain supplies.

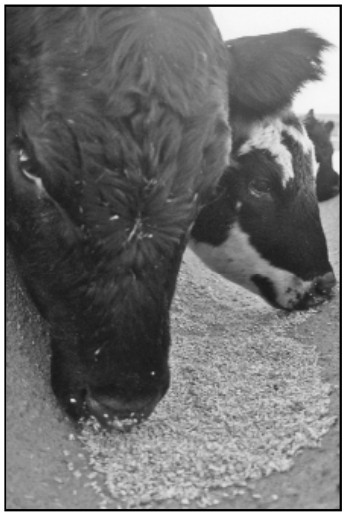


baby calves, too. Calves will begin to display the symptoms more seriously than it might be affecting the cow at the moment."

The difficulty, Reagor says, is linking such common symptoms to the root of the problem.

"A whole gamut of things — poor nutrition, parasites, etc. — could cause these symptoms and poor performance in cattle. They're such common symptoms to a number of different diseases," he says. "That's the number one problem in identifying the cause as aflatoxin. Testing is the only way to do it."

However, producers can't just examine a handful of kernels to detect the mold. Krausz says it's usually invisible to the eye. "If you have a field badly infected, you can peel back the husk and sometimes see the fungus as a yellowish-green, feltlike or powdery growth," he says. "Once that combine goes through, though, and it's all harvested, the visual aspects just aren't there."



"Older animals can tolerate the toxin better than younger animals or those with a lot of stress," Barao says.

"It's deceiving," Barao acknowledges. "You can find moldy kernels and have no aflatoxin, and you can find normal-looking kernels and have high levels of aflatoxin. So, mold on kernels may get you thinking about it, but testing will be required to know for sure whether you have aflatoxin."

Although the toxin is normally undetectable to the eye, Reagor says producers feeding whole corn should be wary of smaller-than-normal kernels.

"If they have corn with a lot of little bitty kernels in it, it may have grown under droughty conditions," he says. "If they're half the size they should normally be, that's a clue to me that it should be checked for aflatoxin."

A lot of broken and discolored kernels can also indicate potential problems, Krausz says, but "really, the ultimate test will have to be using some of the methods for detecting the amount of aflatoxin using some of the serological kits that are available."

Testing for toxins

Once a producer suspects aflatoxicosis, Barao, Krausz and Reagor suggest he or

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she take a sample of feed for testing. However, taking an accurate feed sample poses its own set of difficulties.

"One of the weaknesses in testing is that aflatoxin usually doesn't occur uniformly in grain," Krausz says, referring to toxin-prone hot spots located haphazardly throughout stored grain supplies. "Getting a proper sample can be a real hit-and-miss. One time a probe may hit a couple hot spots, and they may get a high amount of aflatoxin. If they do it again 10 minutes later, they may find the number isn't quite as high because they didn't hit the hot spots."

A South Dakota State University publication suggests producers take 10 pounds (lb.) of corn from each feed source, consisting of several smaller subsamples taken from different spots and mixed together. Samples should be placed in cloth or paper containers and submitted to a feedmill, local elevator or university lab for testing.

Reagor, who conducts tests at a Texas A&M lab and makes subsequent recommendations to producers, says several testing procedures, like the ELISA serological test, have replaced past, less-reliable testing and can detect small quantities of specific contaminants in grain samples. "The ELISA test is relatively quick and cheap," he says. "Tests can run anywhere from $15 to $30, depending on who is performing them."

Such tests will determine the severity of infected feed and how it should be used next. The FDA recommends aflatoxin levels in corn or other grains not exceed 100 parts per billion (ppb) if the feed is intended for breeding cattle, or 300 ppb if the feed is intended for finishing cattle.

If results show high levels of the toxin, Reagor recommends getting rid of contaminated corn altogether and replacing it with clean, noninfected grain. But lower levels of aflatoxin can be managed — with certain precautions. Some producers blend aflatoxin-infected corn with noninfected grain to lessen the toxin's effects. "If you're blending, you want to leave plenty of room for error," he says. "You wouldn't want to take a set amount of corn infected at 200 ppb and blend it with the same amount of corn at 0 ppb aflatoxin to come up with 100 ppb. Instead, shoot for 50 ppb to allow for any levels of aflatoxin that weren't detected earlier."

Aflatoxin prevention

Preventing aflatoxin-infected corn is difficult to manage since environmental conditions control the mold's growth. A South Dakota State University publication, *Aflatoxins: Hazards in Grain/Aflatoxicosis and Livestock,* provides a few tips for integrated grain and livestock producers to minimize contamination of corn products in the field and during storage.

- **Reduce plant stress.** Use recommended production practices to minimize plant stress and maximize yields. These include insect, weed and disease control practices, as well as plant population and fertility practices. Irrigation during pollination can decrease predisposition of the crop to aflatoxin. Plant corn as early as possible, and plant several different hybrids with different pollination periods. Care should be taken to store uncontaminated hybrids away from those that are contaminated.
- **Harvest corn early and dry it immediately.** Harvesting corn when it is above the 20% moisture content and drying it

Barao says contaminated corn becomes an alternative source of feed when blended, but "you have to be careful with it and strategically manage the feeding of it. The easiest place to use blended feed is in open cows, mature cows, or early- to mid-pregnancy cows or feedlot steers that are less susceptible." With time and a good feed source, the toxin will eventually flush out of animals' systems, unless severe contamination has caused liver damage. In that case, animals may never regain adequate production levels.

Prevention

To prevent problems with aflatoxicosis, Barao says producers should monitor corn or other potentially affected grain if growing conditions have been suitable for aflatoxin development.

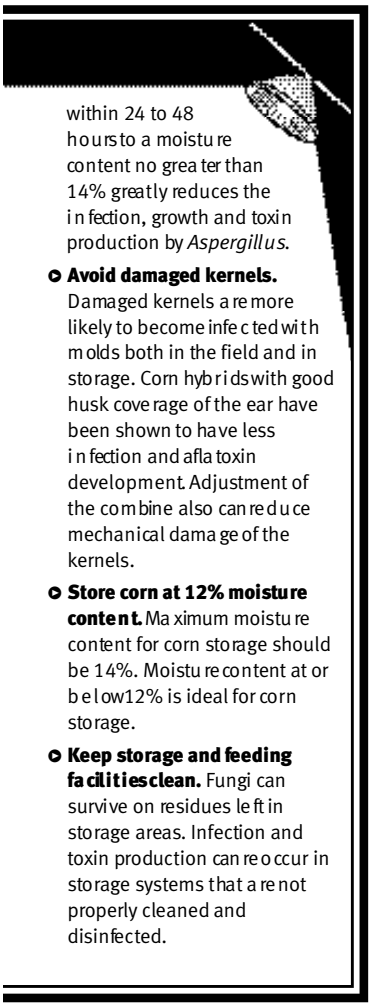
"If you're growing corn in drought conditions or you've bought corn that grew in drought conditions, you need to be on the lookout," he says.

For cattlemen producing their own feed, Krausz suggests using corn hybrids well-adapted to the environment and planting in soil that isn't marginal or prone to drought stress. Also, excessive plant populations can increase susceptibility to drought, and harvesting time plays a role.

If buying corn or a commercially prepared feed, Reagor says, "buy it from a recognized, established company that is going to be doing testing. If you're buying from a 'mom and pop' feed-mixing operation, ask them if they are testing or if they're buying corn or cottonseed meal that has been tested. The local feedmill can be selling just as good a feed, but you need to ask if it has been tested, especially during drought years."

While little can be done to control environmental factors causing mold growth, researchers and Extension professionals like Krausz will continue to monitor aflatoxin levels and work with producers in recognizing a problem.

"We've requested funding to continue to work on aflatoxin control and genetic resistance to the pathogen," he says. "Ultimately, I think the solution will be corn hybrids that are resistant to the pathogen or are in at least some way not able to produce aflatoxin. We'll continue to work on it, and hopefully, there will be a breakthrough in the not-too-distant future."



within 24 to 48 hours to a moisture content no greater than 14% greatly reduces the infection, growth and toxin production by *Aspergillus*.

- **Avoid damaged kernels.** Damaged kernels are more likely to become infected with molds both in the field and in storage. Corn hybrids with good husk coverage of the ear have been shown to have less infection and aflatoxin development. Adjustment of the combine also can reduce mechanical damage of the kernels.
- **Store corn at 12% moisture content.** Maximum moisture content for corn storage should be 14%. Moisture content at or below 12% is ideal for corn storage.
- **Keep storage and feeding facilities clean.** Fungi can survive on residues left in storage areas. Infection and toxin production can reoccur in storage systems that are not properly cleaned and disinfected.