This has been a unique and difficult growing season to say the least, not only are producers faced with high priced and limited amounts of feed, but there are now reports of some molds within the crop as well. This has generated a number of questions on how to handle molds and mycotoxins when present in feedstuffs. Below are a few suggestions.

1. The best management practice is to NOT feed moldy feed. This may be obvious, but as is with the current situation it is at times beyond producer's control.

2. The old adage “an ounce of prevention is worth a pound of cure” rings true when in regard to molds and mycotoxins. Use practices that have research and reports of success behind them and adhere to the best planting, harvesting, and storage guidelines available. When purchasing grains and other feedstuffs it is wise to always buy from reputable suppliers where you have as much knowledge about the feed before hand as possible. Remember, no one cares about your livestock and profitability as much as you do!

3. If you need to use feedstuffs that contain molds and mycotoxins, carefully review all factors such as the age and class of livestock and what else will be placed into the diet in order to minimize their effect on performance. Animals with higher sensitivity include young animals, breeding animals, and early lactation dairy cattle.

4. It is important to remember “junk in = junk out”. While the effects of feeding moldy feed in some instances are modest (eg. slight decreases in average daily gain) it is unrealistic to expect animals to perform as they would on rations where mold and mycotoxins are not an issue. To be clear, if moldy feed is knowingly being fed do not expect optimal animal performance.

Here is some information on molds that are commonly found in corn. The most common report this year is with Aspergillus mold which produces the mycotoxin commonly referred to as aflatoxin.

**Aspergillus Ear Rot:** Aspergillus produces the well known mycotoxin, aflatoxin. This type of mold is more common in warmer dryer climates. In the Midwest it is more prevalent in years when corn becomes drought stressed particularly where drought is experienced in the latter portion of the growing season. Aflatoxin receives much publicity and discussion because it is extremely toxic and carcinogenic. In ruminants small amounts of aflatoxin can cause wide array of health disorders as well as dramatically reduced performance. Moreover consumption of aflatoxin by dairy cattle can lead to measurable levels in the milk. The FDA restricts levels of aflatoxin in feed ingredients to 20-300 ppb depending on end use. Aspergillus molds are also associated with Hemorrhagic Bowel Syndrome in cattle, however a separate species known as Aspergillus fumigatus is implied.

**Diplodia Ear Rot:** This mold is caused by a fungus that survives on corn stalks and other plant debris over the winter. This mold often occurs when there have been dry weather conditions prior to silking followed by moist conditions afterwards. Diplodia is recognized by a white colored mold which begins at the base of the ear and kernels that turn into a grayish brown color eventually. Another common indication of Diplodia are small black speck referred to as “pycindia” which can be found on the husks, cobs, and sides of kernels. Diplodia usually leads to low test weights and kernels which are more prone to damage. The good news for livestock producers is that Diplodia is not known to produce mycotoxins, so corn infected with Diplodia may be safer than corn infected with other molds in the field.

**Fusarium Ear Rot:** This is the most common type of ear mold found in the Midwest. It is characterized by white, pink, and salmon colored fungi scattered throughout the ear. It is more commonly found in hail and insect damaged kernels. This mold is caused by various species of Fusarium fungi. Like Diplodia the fungus is wintered in trash and debris left on the field. Spores are carried from plant to plant by insects thus the scattered pattern on individual ears. Unlike Diplodia however Fusarium molds can give rise to mycotoxins known as fumonisins, which can cause a variety of serious ailments in non-ruminants, especially horses. Their effects in ruminants are less defined, however they are associated with at least decreased performance.

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Gibberella Ear Rot: This is the second most common form of ear mold found in the Midwest. It is characterized by a red to pinkish colored mold typically found on the kernels at the tip of the ear. Like Fusarium, Gibberella also is caused by a Fusarium fungi although a different specie. The main difference between Gibberella and Fusarium is not only in their appearance, but also the type mycotoxins they produce. Gibberella is known to produce both DON/vomitoxin and zearalenone. Zearalenone can be associated with decreased reproductive efficiency exhibited by low fertility, increased abortion rates, and reproductive tract infections. It has been demonstrated to cause decreased feed intake resulting in decreased production. DON/vomitoxin causes vomiting in swine, hence the name vomitoxin. While it does not yield the same symptoms in cattle it is implicated in decreased performance either through altered rumen fermentation or through diminishing levels of protein bypassing the rumen.

Following are some guidelines for handling and feeding grains containing molds found in the field.

1. Scout fields for ear molds. If greater than 10% of scouted ears show sign of ear mold consider the following:
   A.) Harvest as early as possible. This will reduce the amount of time molds have to grow.
   B.) Make sure storage structures are sealed properly and are clean and free of mold and moisture themselves.
   C.) If harvesting the grain as dry corn, consider the following:
      i.) Screen grains to reduce the amount of molds present in the stored grain. DO NOT feed these screenings to livestock as they will potentially contain very high levels of molds and mycotoxins.
      i.) Dry grains to 15% moisture to stabilize the grain for storage and minimize the likelihood of mold and mycotoxin formation in storage. Note that drying will limit further mold growth, but will not reduce the amount of mycotoxins present.
      ii.) Defender is a granular buffered organic acid product that can be applied to dry corn up to 18% moisture to assist with limiting further mold growth during storage of the grain.
   D). If harvesting the grain as high moisture corn or snaplage, consider the following:
      i.) Harvest grains at the appropriate moisture (26-32% for HM corn and 34-38% for snaplage) and as rapidly as possible. Pack as densely as possible and make sure structures are air tight to ensure that feeds ferment rapidly and properly.
      ii.) Add an inoculant such as Sil-All® or a preservative such as Silo Guard® or BULLETPROOF® to aid in proper fermentation of the high moisture corn or snaplage to limit further mold growth during storage.
      iii.) Buffered propionic acid or blended organic acid products can be utilized to help preserve high moisture grain feeds during storage.
   E.) If possible, store grain from contaminated fields separately from grain from “clean” fields.

2. Test the feeds for mycotoxins. Even though molds are present in the field it is impossible to quantify and identify them in feeds without testing.
3. Keep in mind that in order to minimize their impact on performance and profits, mold contaminated feeds may need to be fed at reduced levels and to classes of livestock that are less susceptible to their negative impacts.

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# Mycotoxins and their Effects

<table>
<thead>
<tr>
<th>Mycotoxin</th>
<th>Main producing molds</th>
<th>Major concerns</th>
<th>Main crops</th>
<th>Warning levelsb,c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deoxynivalenol (DON, vomitoxin)</td>
<td><em>Fusarium graminearum; F. culmorum</em></td>
<td>↓ feed intake; feed refusal; vomiting; ↓ gain</td>
<td>Corn; wheat; feed refusal; vomiting</td>
<td>1.0 ppm</td>
</tr>
<tr>
<td>Zearalanone</td>
<td><em>F. graminearum; F. culmorum; F. tricinctum</em></td>
<td>Estrogen-like effects; ↓ reproduction; infertility</td>
<td>Corn; wheat; barley; rye</td>
<td>500 ppb</td>
</tr>
<tr>
<td>Fumonisin</td>
<td><em>Fumonisin moniliforme; F. proliferatum</em></td>
<td>↓ gain &amp; feed intake; liver &amp; lung problems; hemorrhages</td>
<td>Corn</td>
<td>5.0 ppm</td>
</tr>
<tr>
<td>Aflatoxin</td>
<td><em>Aspergillus flavus; A. parasiticus; A. nominus</em></td>
<td>↓ gain &amp; feed intake; liver damage; ↓ immunity</td>
<td>Corn; peanuts; cottonseed</td>
<td>0.02 ppm (20 ppb)</td>
</tr>
<tr>
<td>T-2</td>
<td><em>F. sporotrichoides; F. tricinctum; F. poae</em></td>
<td>↓ gain &amp; feed intake; ↓ sow fertility</td>
<td>Wheat; barley</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Ochratoxin</td>
<td><em>A. ochraceus; Penicillium verrucosum</em></td>
<td>↓ gain &amp; feed intake; ↑ water intake; kidney problems</td>
<td>Barley; oilseeds</td>
<td>0.20 ppm</td>
</tr>
</tbody>
</table>

Adapted from van Heugten, 2001.

Levels are guidelines, the min level where mycotoxins will affect swine performance depends on many factors (ex. age, reproductive function, etc.).

cppm = parts per million; ppb = parts per billion

## Maximum allowable levels of aflatoxin in food and feed as determined by the FDA

<table>
<thead>
<tr>
<th>For</th>
<th>Level</th>
<th>Commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humans</td>
<td>20 ppb</td>
<td>All food except milk</td>
</tr>
<tr>
<td>All animal species</td>
<td>20 ppb</td>
<td>All feed (exceptions below)</td>
</tr>
<tr>
<td><strong>Exceptions:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breeding cattle, breeding swine, mature poultry</td>
<td>100 ppb</td>
<td>Corn</td>
</tr>
<tr>
<td>Finishing swine (&gt;100 lbs.)</td>
<td>200 ppb</td>
<td>Corn</td>
</tr>
<tr>
<td>Finishing beef cattle</td>
<td>300 ppb</td>
<td>Corn</td>
</tr>
<tr>
<td>All animal species</td>
<td>300 ppb</td>
<td>Cottonseed meal used in feed</td>
</tr>
<tr>
<td>Milk</td>
<td>&lt;0.5ppb</td>
<td></td>
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</tbody>
</table>

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Strategies for Managing Feeds Containing Molds and Mycotoxins

Hubbard Feeds has access to a number of products that can be used when molds and mycotoxins may be present. Since each product has a different composition, it’s best to check with your Hubbard Feeds nutritionist to find out which one would work best for your situation. Please note that not all products are available at every plant.

- OmniGen-AF®
- AB20®
- Integral™
- Select GH™
- T-Bind
- Kal-Sil
- Sodium bentonite
- ETX Farm Pack
- Mold Zap citrus powder
- Defender®
- Silo Guard®
- BULETPROOF®
- Sil-All®

For more information on molds and mycotoxins or to get specific information relative to your situation, please contact a member of the Hubbard Feeds Technical Support Staff.

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