Mold and Mycotoxins in Horse Hay

Hay with a high moisture content is at risk for developing mold. There are a variety of health risks for horses that consume moldy hay. Be kind to your hay producer – especially this year. Saying that hay-making conditions have been challenging is a huge understatement. Many areas of Pennsylvania saw record levels of rainfall and many locations failed to experience more than 3 days in a row without rain. The following information summarizes some of the conditions that can occur when hay is produced during wet and humid conditions, as well as tips on feeding hay that has been treated with propionic acid to prevent mold growth.

What Causes Mold to Grow on Hay?

Much hay has been rained on or left lying in the field for prolonged periods of time due to excessively wet and humid conditions. The long drying periods with high humidity can allow mold to grow on the hay in the field.

Rain and poor drying weather has caused some hay to be baled wetter than desired. With high humidity, normal drying in storage may not occur and hay can retain elevated levels of moisture allowing mold growth. Mold and bacteria will grow on hay (without preservative added) at moisture levels above 14% to 15%. The mold growth produces heat, carbon dioxide and water, which further damages the hay. Moldy hay can result in dry matter and nutrient loss and produce spores and dust. Drying of stored hay is enhanced by increasing ventilation, creating air spaces between bales, reducing stack size, and stacking in alternating directions. Since moisture tends to move up and out the top of a stack of bales, ample headspace should be provided above a stack in a barn, allowing moisture to evaporate.

Molds commonly found in hay include *Alternaria*, *Aspergillus*, *Cladosporium*, *Fusarium*, *Mucor*, *Penicillium*, and *Rhizopus*. These molds can produce spores that cause respiratory problems, especially in horses and, under some conditions, will produce mycotoxins.

Horses are particularly sensitive to dust from mold spores and can develop a respiratory disease like asthma in humans called Recurrent Airway Obstruction (RAO), commonly referred to as heaves. A horse with RAO will have a normal temperature and a good appetite, but will often have decreased exercise tolerance, coughing and nasal discharge. Labored breathing occurs during exercise and, in some cases, while at rest. Hypertrophy of the abdominal oblique muscle used for expiration creates the characteristic 'heave line' seen on horses with RAO. Some horses are highly allergic to certain mold spores while others seem to be minimally affected. Strategies to reduce dust exposure are as follows:

- Do not feed dusty and moldy hay and grains.
- Keep horses outside as much as possible.
- Place feed at a lower level so particles are not inhaled through the nostrils.
- Feed hay outside to minimize dust problems.
- In severe cases, hay cubes may replace hay.
- Soak dusty hay for 5 to 30 minutes before feeding. This will help minimize respiratory problems associated with dust and mold spores but will not reduce the threat of mycotoxin contamination.
- Store hay away from your horse as much as possible and ensure any hay in the vicinity is kept dry to reduce mold.
- If the horse is housed indoors, ensure that there is good, draft-free ventilation.

Table 1 contains classification of risks at various mold spore counts. While most molds do not produce mycotoxins, the presence of mold indicates the possibility of mycotoxin
presence and animals being fed moldy hay should be watched carefully for mycotoxin symptoms.

**Table 1. Feeding Risks* at Various Mold Spore Counts**

<table>
<thead>
<tr>
<th>Mold Spore count per gram</th>
<th>Feeding Risk and Cautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 500,000</td>
<td>Relatively Low Risk</td>
</tr>
<tr>
<td>½ to 1 million</td>
<td>Relatively Safe</td>
</tr>
<tr>
<td>1 to 2 million</td>
<td>Feed with Caution</td>
</tr>
<tr>
<td>2 to 3 million</td>
<td>Closely observe animals and performance</td>
</tr>
<tr>
<td>3 to 5 million</td>
<td>Dilute with other feeds</td>
</tr>
<tr>
<td>Over 5 million</td>
<td>Discontinue feeding</td>
</tr>
</tbody>
</table>

*Risks refer primarily to effect of mold without regard to possible mycotoxin content. Dust may also reduce feed consumption.


**What are Mycotoxins and How Can They Affect My Horse?**

High moisture hay can also lead to the proliferation of bacteria, molds and fungus that can produce mycotoxins that are dangerous to horses and other livestock species. Some forage laboratories will test for the presence of mold and mycotoxins. If hay is moldy, do not feed it.

Although the effects of mycotoxins on horses are not well documented in scientific literature, in field situations apparently mycotoxin problems appear to be significant. Mycotoxins have been implicated in a variety of health problems including colic, neurological disorders, paralysis, hypersensitivity, and brain lesions. The cumulative effect of feeding low levels of mycotoxins may also contribute to a gradual deterioration of organ functions. Other symptoms of mycotoxins in forages include:

1. Intake reduction or feed refusal.
2. Reduced nutrient absorption and impaired metabolism, including altered digestion and microbial growth, diarrhea, intestinal irritation, reduced production, lower fertility, abortions, lethargy, and increased morbidity.
3. Alterations in the endocrine and exocrine systems.
4. Suppression of the immune system, which predisposes horses to many diseases.
5. Cellular death causing organ damage.

**What is Propionic Acid and Why is it Used on Hay?**

Some hay growers apply preservatives (organic acids, yeast cultures, enzymes, etc.) to prevent the growth of the bacteria and fungi that sometimes cause heat, musty odor and mold in inadequately dried hay. Most preservatives applied to horse hay contain organic acids that are the same as those found in the horse’s gastrointestinal tract. Propionic and acetic acid, the most common organic acids in hay preservatives, are produced naturally in the cecum and colon of the horse because of microbial digestion of fibrous feeds. These organic acids can be used as mold inhibitors and applied when hay is not yet dry enough to bale safely, but rain is coming, and the crop may be lost if not baled early. Studies have shown a decrease in the heating and molding of hay during storage with the use of preservatives.

A study conducted at the University of Illinois found that yearlings receiving hay treated with a mixture of propionic and acetic acids consumed just as much hay and gained just as much weight over a one-month feeding trial as yearlings’ consuming untreated hay. Clinical measures of the horses’ wellbeing were not affected by consumption of preservative-treated hay, indicating that the hay had no negative effects on the horses. A study conducted at Cornell University showed that when given a choice, horses preferred untreated alfalfa to alfalfa that was treated with a mixture of propionic and acetic acid. However, when only given the choice of acid treated hay, the horses readily consumed it. Thus, after a short conditioning period, horses will consume acid-treated hay.

However, caution should be used when feeding hay that was baled at very high moisture levels, using higher levels of propionic acid. It is important to let that hay cure for several weeks so that the acid has time to dissipate and the hay has a chance to cure. This is especially true when feeding large round and square bales. There have been suspected cases of colic when horses were fed hay baled at very high moisture levels (29%) containing high levels of acid. Hay that is baled at high moisture levels should not be stored beneath or next to hay that was baled at appropriate moisture levels without the addition of an acid preservative. The moisture dissipating from the acid treated hay can move into the dry hay and cause it to mold.

**How Can I Determine If my Hay Contains Harmful Levels of Mold and Mycotoxins?**

Many forage laboratories provide an analysis of the nutritional value of hay. Some laboratories will also test hay and grain samples for molds and mycotoxins:

- Pennsylvania Animal Diagnostic Laboratory System (PADLS)
- Cumberland Valley Ag Analytical Services
References:


Vough, L., E. Peterson. Horse Hay Quality and Selection – Sorting out the truth from the fiction. University of Maryland Extension.

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