University of Idaho Extension

Moldy Hay[1]

Haymaking conditions this spring have been poor. Much hay has been rained on or left lying in the field for prolonged time periods due to cool and humid conditions which reduced drying rates. The long drying periods with high humidity allowed field growth of mold on the hay.

Poor drying weather has also meant that some hay was put up wetter than usual and mold growth occurred in storage. With wet weather and high humidity, normal drying in storage may not occur and hay can retain elevated levels of moisture allowing mold growth. Mold will grow on hay without preservative at moisture levels above 14% to 15%. The mold growth produces heat and can result in large amounts of dry matter and TDN (total digestible nutrient) loss – a loss of carbohydrates and binding of proteins. In some cases, heating can be great enough to cause spontaneous combustion and hay fires. Drying of stored hay (moisture loss) is enhanced by ventilation, creation of air spaces between bales, allowing ample head space above a stack of bales in a barn for moisture to evaporate since moisture tends to move up and out the top of a stack of bales, avoidance of other wet products in the same area (if enclosed storage), reduced size of stacks, alternated direction of stacking, and not placing tarp directly over a stack in the field because that traps.

Molds commonly found in hay include *Alternaria*, *Aspergillus*, *Cladosporum, Fusarium*, *Mucor*, *Penicillium*, and *Rhizopus*. These molds **can produce spores that cause respiratory problems**, especially in horses or other animals fed in poorly ventilated areas and, **under some conditions, will produce mycotoxins**. There is much confusion about mycotoxins in forages because several mycotoxins may be present, diagnostic methods are not consistent, and treatment and control recommendations lack needed research. 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.

Mycotoxins effects on animals:

1) intake reduction or feed refusal;

2) reduced nutrient absorption and impaired metabolism, including altered rumen fermentation and microbial growth, diarrhea, intestinal irritation, reduced production, lower fertility, lethargy, and increased morbidity;

3) alterations in the endocrine and exocrine systems;

4) suppression of the immune system which predisposes livestock to many diseases and may increase milk somatic cell count. A suppressed immune system may also cause lack of response to medications and failure of vaccine programs;

5) cellular death causing organ damage.

Mycotoxins may cause acute (immediate) health or production problems which are most common in horses and other non-ruminants. In cattle, mycotoxins more likely will contribute to chronic problems including a higher incidence of disease, poor reproductive performance, or suboptimal milk production. Ruminants are somewhat protected from acute toxicity because the rumen destroys a large portion of most

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mycotoxins. However, rumen degradation of mycotoxins may hide the acute symptoms resulting in undetected chronic problems including reduced feed consumption, altered rumen fermentation, reduced production, lower fertility, lethargy, and increased morbidity.

The mycotoxins of greatest concern are those produced by *Aspergillus* (aflatoxin, gliotoxin, fumitremorgens, fumigaclavines), *Fusarium* (deoxynivalenol, zearalenone, T-2 toxin), and *Penicillium* (PR toxin, mycophenolic acid, roquefortine C, patulin), but other mycotoxins can be present. There are about 400 different known mycotoxins.

Increased attention to field and storage management may help reduce the incidence and concentration of mycotoxins in forage. Heavily contaminated forage may need to be discarded. Lightly contaminated feed can be diluted and used for animals under less stress. Dry cows and transition cows should receive clean feed because they are exposed to or are soon to be exposed to greater stress.

A therapy that has been effective is the use of mycotoxin adsorbents that bind with mycotoxins in the feed and reduce their absorption by the animal. This effectively reduces, but does not eliminate, mycotoxin exposure to the animal. In cattle, a robust rumen fermentation can help maximize mycotoxin detoxification. Therefore, the use of sufficient effective fiber, buffers and microbial products to stimulate rumen function can be helpful. Because many nutrients interact with mycotoxins to modify their toxicity, optimal levels of nutrients can be helpful to reduce mycotoxin effects. In particular, antioxidants (selenium, vitamin E, synthetic antioxidants, etc.) can help protect the animal against increased oxidative stress caused by mycotoxin exposure.

If you have mold in hay, watch for the symptoms mentioned above. If hay is dusty (from mold spores) take care in feeding to sensitive animals and those in areas with poor ventilation. If mycotoxin symptoms are observed, check with a nutritionist to make sure the ration is properly balanced and possibly with a veterinarian to eliminate other disease/health problems. Quick test kits (ELISA kits) are available (listing at http://www.ces.ncsu.edu/gaston/Agriculture/mycotoxins/mycotest.html) to determine presence of a limited number mycotoxins but they can give false positives. Some forage testing laboratories will provide other mycotoxin tests. Often, the best strategy is to remove a suspected mycotoxin-contaminated feedstuff from the diet and see if symptoms disappear. If mycotoxins are present, the feedstuff can often be fed at a diluted rate and/or with approved feed additives.

In summary:

- Most molds are harmless - not producing known mycotoxins.
- Many of the commonly diagnosed mycotoxins are produced in the field prior to harvest.
- While vomitoxin (DON, deoxynivalenol) is a toxic mycotoxin, its presence has been used as a "marker" for the potential presence of other more toxic mycotoxins. Therefore the observed responses to vomitoxin are highly variable.
- Positive ELISA tests should be retested by laboratory analysis (e.g. HPLC or GC tests) since current ELISA tests can give false positives.
- If a mycotoxin problem is suspected, a comprehensive review of herd nutrition and health is essential - e.g. herd problems blamed on mycotoxins may be other disorders or nutritional issues. Diagnosing a mycotoxin problem is difficult and often involves the elimination of other possible factors.
- Certain feed additives have proved to be helpful in treatment.
- The physical dust problem associated with moldy forage can be reduced by ensiling, mixing with a high moisture feed or wetting the hay, but these will not reduce mycotoxins if present.