



# Cattle Producer's Handbook

Animal Health Section

619

## Toxic Contaminants in Harvested Forages

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Harvested forages are vitally important and commonly used for beef production. But contamination can occur in these forages, reducing their quality and palatability, or may even result in animal illness and death. Outlined below are some of the common problems that should be considered. References are made to other fact sheets in the "Guide" that give more specific details on that particular contaminant.

### Quality

Forage quality is affected primarily by moisture damage, maturity at harvest, and contamination with other plants. The effect is reduced protein, energy, and vitamin content. Under some conditions, toxins or poisons may also be produced.

### Mold

(see 632, "Mycotoxins")

Moldy forage is caused by growth of microscopic fungal organisms. Excessive moisture is always involved. The feed quality is reduced because the fungal organism uses the forage nutrients for its own growth requirements. The actual toxins produced, if any, vary depending on moisture, temperature, forage involved, and nutrients present. The presence or absence of visible mold does not indicate the presence or absence of a mycotoxin.

Abortion may be caused by forage molds and is referred to as "mycotic abortion." It is usually sporadic in a herd, causing a 3 to 10 percent abortion rate. Mycotic abortion is due to an infection, not a mycointoxication, and may come from sources other than moldy hay. The color and other characteristics of the mold growth are not of much value in predicting the potential for abortions

from moldy forage. It is a worthwhile reason to work toward producing and storing better quality forages.

"Strawpile Disease" resulted when cattle were wintered on straw captured in a holder behind the grain combine. The straw was dumped in piles throughout the field. The disease only occurred in years having higher levels of fall precipitation and when the cows were forced to eat the moldy portions of the straw. The mycotoxins present in the moldy straw caused liver damage and resulted in severe photosensitization, with sunburn-like skin lesions on the legs, face, and udder. The sore teats presented major problems for newborn calves trying to nurse.

### Spoilage vs. Ensilage

The ensiling process is a means of preserving forage through fermentation. However, if the conditions are not well controlled, it may result in "spoilage" rather than silage.

Botulism is a potential problem whenever the pH of the silage rises over 4.6. The toxins produced by the bacteria *Clostridium botulinum* are the most potent toxins known. This bacteria is common in soil, survives indefinitely, and then will grow when conditions are favorable.

In recent years there have been several outbreaks where "balage" was fed. The large round bales are rolled up green and placed into silage bags for fermentation. Most of these cases have involved punctures of the plastic bags, which allowed entrance of air and improper fermentation of portions of the "balage." It has also occurred in other types of silos, under certain conditions, and in baled alfalfa and alfalfa cubes.

The characteristic signs of botulism are cows that are weak, develop a flaccid paralysis (can't get up), and

die within 1 to 3 days. One diagnostic aid is to pull on the cow's tongue so it is extended out of its mouth. A cow affected with botulism will usually have difficulty retracting the tongue back into the mouth. But this can also be typical of paralytic rabies, so proper precautions should be taken to avoid exposure.

Listeriosis is usually related to poor quality silage that allows this bacteria to multiply. Some animals that eat the silage develop a brain infection, resulting in signs of dysfunction of the central nervous system, such as circling, etc.

## Nitrate Toxicity

(See 355, "Nitrates in Livestock Feed," and 970, "Supplementation During Drought")

Cropped plants such as oats, corn, millet, sorghum, and sudangrass may contain high nitrate levels under heavy fertilization, frost, or drought conditions. Weeds that are most likely to cause nitrate toxicity are kochia, pigweed, and lambsquarter.

## Weeds

Forages contaminated with weeds are reduced in quality, nutritive value, and palatability, but may also be toxic, such as with nitrate toxicity described above, or the specific examples below.

### Houndstongue (*Cynoglossum officinale*)

The weed commonly known as "houndstongue" often grows along ditch banks and fence rows. However, it also grows out into some hayfields and may be harvested with the hay. Cattle will not usually graze it, but will eat it along with the harvested hay. The toxin contained is a pyrrolizidine alkaloid that causes liver damage and prevents generation of new liver cells. A threshold level is required before damage occurs, but each time the threshold is exceeded, damage results and repeated insults are cumulative.

The clinical signs of the liver damage may not become evident until several months after the contaminated forage is eaten. So an animal may eat contaminated hay, survive 4 to 6 months, and then when stressed with illness or calving, die suddenly.

Both cattle and horses have been killed with hay contaminated by houndstongue. It should be eradicated from the hayfield before harvest, or the hay from that area of the field should be discarded.

### Poison Hemlock (*Conium maculatum*)

This tall weed is common along many ditches and waterways and is quite often seen growing in alfalfa fields. It is not as toxic as "Water Hemlock," but can cause illness and death of cattle if large amounts are eaten. If cows eat it during early pregnancy, it may also cause the "crooked calf" syndrome. It is toxic even after drying, and should be eradicated from hay fields.

## Sweet Clover Hay

Sweet clover poisoning was first described in 1924 as a fatal hemorrhagic anemia caused by feeding spoiled sweet clover hay or silage. The toxic problems from sweet clover have been rare in recent years because it is seldom used for hay. Sweet clover contains coumarin, which is changed to dicoumarol by fungal action after harvest. Dicoumarol is a potent anti-clotting compound. The fibrous stems of the plant make it difficult to harvest without getting some fungal growth.

Obvious spoilage does not guarantee that the toxin is present, and lack of visible signs of spoilage doesn't rule out its presence. Dicoumarol toxicosis of newborn calves occurs secondary to ingestion of moldy sweet clover hay by the cow. Neonatal calves are especially susceptible to its effects, although older animals, even adults, may also be affected. The calves may die from the toxin, while the cows who ingested it may or may not show ill effects.

## Fescue Endophyte Toxicity

Tall fescue is a popular forage grass throughout the United States. It is commonly grown in the South Central U.S. and has been associated there with a toxicological problem in cattle, horses, and sheep. The clinical condition is referred to as "fescue toxicity," "summer slump," "summer syndrome," and "fescue toxicosis." It is characterized by poor performance of animals grazing on fescue pastures or fed fescue hay. The clinical signs are nonspecific but include reduced weight gains (40 to 60 percent), decreased milk production (37 percent), heat intolerance, excess salivation, diarrhea, and lowered reproductive rates (20 to 30 percent).

Fescue toxicosis is caused by a mycotoxin, produced by an endophyte (a fungus that grows **within** the plant tissue) of tall fescue. The only known means of transmission is from infected seed, and many states now recommend planting only seed that is less than 5 percent contaminated. The endophyte-free fescue is not as hardy as the infected varieties. Mowing or cropping before seed production reduces the toxin content.

There is no known treatment for fescue endophyte toxicity. Clinically affected cattle should be removed to an alternate forage. In hot weather, don't stress affected cattle until they have recovered. Stands of toxic fescue should be replaced with endophyte-free fescue and/or renovated with legumes to reduce toxic effects.

## Ammoniated Forage Toxicosis

Grass hay and straw have been treated with anhydrous ammonia to improve the quality and digestibility. Some cattle fed ammoniated forages and calves nursing cows on ammoniated forages have developed a nervous disorder called "cattle bonkers" or "crazy cattle." Signs include restlessness, rapid blinking, dilation of the pupils, impaired vision, ear twitching,

trembling, staggering, frequent urinating and defecating, rapid respiration, salivation, frothing at the mouth, bellowing, sweating, and stampeding. Signs last for up to 5 minutes and are often repeated at 20- to 30-minute intervals. Affected animals resume eating between attacks and show no signs of a problem.

Hay should not be exposed to greater than 2 percent ammonia. High quality forages should not be ammoniated. Ammoniated hay should not be fed to beef cows nursing young calves. The toxin is thought to be concentrated in the milk, or calves may be more sensitive to the toxin.

## **Pesticides**

### **Insecticides**

Cattle and horse deaths have been caused by insecticides such as carbamates (e.g. carbofuran) and organophosphates (e.g. parathion), when there was an error in the rate of application or in the time from hay treatment to harvest. Be sure that proper rates of application and of time before harvest are followed. Insecticide residues may cause long term delay in slaughter of affected cattle for meat.

### **Herbicides**

These products are usually much less toxic to animals than are the insecticides. But when any of these products are to be used on forages, the label directions must be read, understood, and properly followed. Shortcuts can be hazardous.

## **Fluorosis**

Animals normally ingest low levels of fluorides throughout their lives with no detrimental effects. Prolonged ingestion of fluoride above the tolerance level may result in fluoride toxicosis or fluorosis, which cause chronic debilitation.

There are several sources of elevated fluoride levels for animals, including irrigation water (especially from warm springs and wells); crops grown on soils high in fluoride and contaminated by soil from rain splash or wind; industrial contamination of forage crops; and dietary phosphate supplements that have not been properly defluorinated.

## **Blister Beetles**

Several species of an insect called “Blister Beetle” contain an irritant chemical (cantharidin) in their bodies. The adult stage of the beetle is attracted to alfalfa blossoms, and if the beetles are killed during hay swathing and crimping, they may be eaten along with the hay. The cantharidin has an irritant effect on the gastrointestinal tract and is toxic to the kidneys.

If the hay is just cut with a swather, most of the blister beetles will leave the cut hay before it is baled or chopped. However, if a crimper is used, the beetles are crushed and killed so they are much more likely to remain in the hay.

The irritant chemical in the beetle body is stable and will remain in the cured hay indefinitely. The blister beetle is especially toxic for horses, and ingestion of only one or two insects will result in severe colic.



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