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Animal Health
Fact Sheet

TOXIC CONTAMINANTS IN HARVESTED FORAGES

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Harvested forages are vitally important and commonly used for beef production. But contamination can occur which results in reduced forage quality and palatability or may even result in animal illness and death. Outlined below are some of the common problems that should be considered.

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.

1. Mold

Moldy forage is caused by growth of microscopic fungal organisms. Excessive moisture is always involved. The feed quality is reduced because fungal growth uses up the forage nutrients for its own growth requirements. The actual toxins produced vary depending on the moisture, temperature, forage involved, and nutrients present.

Abortion may be caused by forage molds and is referred to as "mycotic abortion." It is usually sporadic in a herd, causing a 3-10% abortion rate. 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 on years when there were 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. That presented major problems for newborn calves trying to nurse.

2. Spoilage versus 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 5.0. The toxin produced by the bacteria Clostridium botulinum is one of the most potent toxins known. This

bacteria is very 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 special conditions. The characteristic signs of botulism are cows which are weak, develop a flaccid paralysis (can't get up) and die within 1–3 days. One diagnostic aid is to pull on their tongue so it is extended out of their mouth; cows affected with botulism will usually have difficulty retracting their tongue back into the mouth.

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

NITRATE TOXICITY

Cropped plants such as oats, corn, millet, sorghum and sudangrass may contain high nitrate levels under heavy fertilization, frost or drought conditions. Weeds which 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 above or the specific examples below.

1. 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 would usually not graze it, but will eat it in 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 was eaten. So, an animal may eat contaminated hay, survive until 4–6 months later and then when stressed with illness or calving, may 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.

2. 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 cows eat it during early pregnancy, it may also cause the "crooked calf" syndrome. It is toxic even after drying. It should be eradicated from hayfields.

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.

FESCUE ENDOPHYTE TOXICITY

Tall Fescue is a popular forage grass throughout the United States. It is very 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 non-specific but include reduced weight gains (40–65%), decreased milk production (37%), heat intolerance, excess salivation, diarrhea and lowered reproductive rates (20-30%).

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% contaminated.

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 five minutes and are often repeated at 20–30 minute intervals. Affected animals resume eating between attacks and show no signs. Hay should not be exposed to greater than 2% 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

1. Insecticides

Cattle and horse deaths have been caused by insecticides such as carbamates (e.g. carbofuran) and organophosphates (e.g. parathion). Apparently 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 prior to harvest are followed. Insecticide residues may cause longterm delay in slaughter of affected cattle for meat.

2. 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 causes 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 which have not been properly defluorinated.

BLISTER BEETLES

There are several species of an insect, called a "Blister Beetle", which contains an irritant chemical (cantharidin) in its body. The adult stage of the beetle is attracted to alfalfa blossoms and if they are killed during hay swathing and crimping, they may be eaten along with the hay. The cantharidin has a very irritant effect on the gastrointestinal tract. 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, they are crushed and killed so they are much more likely to remain in the hay. The irritant chemical in the beetle body is very stable and will remain in the cured hay indefinitely. The Blister Beetle is especially toxic for horses and ingestion of only one or two will result in severe colic.

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