Vet Call

► by **Bob Larson,** *professor of production medicine, Kansas State University*

Toxicity problems associated with feed

Occasionally, human activities or natural conditions can cause the introduction or concentration of toxic substances in cattle feed. When this happens, a large number of animals can become sick at one time, and death losses can be high. Feed toxicities that can occur include excess ammonia, ionophore, gossypol, salt, nitrate or mycotoxin.

Ammonia, ionophores and gossypol

A very economically rewarding practice to lower feed costs in wintering rations of brood cows is to replace more-expensive feeds such as grass hays with less-expensive feeds such as crop residues (wheat straw, cornstalks) that have been treated with anhydrous ammonia. The anhydrous ammonia increases their nutrient content by making poor-quality forages more digestible, more palatable and higher in protein.

Make sure feed processing and additives are administered properly and that feeds and forages are monitored for any naturally occurring toxins to ensure good herd health.

Toxicity problems are most likely to occur if ammonia treatment is done when it is hot or excess ammonia is applied, or if higher-quality grass hays such as brome, fescue, small grains, forage sorghum or Sudan are treated with ammonia. The high carbohydrate content of these forages combines with ammonia to produce compounds that cause hyperactivity, convulsions and even death, especially when treated forage makes up most or all of the ration.

Ionophores are compounds included in diets of cattle to improve average daily gain, feed efficiency and animal health. Monensin (Rumensin®) and lasalocid (Bovatec®) are ionophores that are available in the U.S. to use in cattle feed.

Despite their many benefits, ionophores can be toxic to cattle if they are included in the diet at very high levels due to a mixing or formulation error. Horses are much more sensitive to ionophores than cattle, and doses that are safe for cattle can be deadly for horses.

Cottonseeds, a byproduct of cotton fiber production, can provide an attractive supplement for beef cattle. Brown pigments (called gossypol) present in cottonseed are very toxic to young chicks, pigs, dogs and other simple-stomach animals. Because of the ability of the rumen environment to bind and inactivate gossypol, cattle are much more resistant to gossypol toxicity than nonruminants. However, problems can become apparent if large amounts are fed for several weeks.

The effects of gossypol toxicosis appear to worsen if high environmental temperatures or other stressors are present. Gossypol content of cottonseed meal is influenced by the species of cotton plant, the temperature, rainfall during the growing season and method of oil extraction. Whole cottonseeds do not appear to be as likely to cause problems as cottonseed meal, and cottonseed hulls should not cause gossypol toxicity.

Most reported cases of gossypol toxicity in cattle have been either in calves before their rumen is functioning or in cattle fed high-concentrate rations with a high percentage of cottonseed meal. Severe gossypol toxicity causing death is rare in cattle. However, fertility can be reduced in bulls and probably in cows with no signs of illness or reduced production.

Beware of salt, nitrates

Salt is required in cattle diets, but if cattle are fed a diet that is extremely high in salt or if water is restricted to cattle consuming a typical diet, signs of toxicity can be seen. Anything that limits water consumption — such as frozen water pipes, a malfunctioning automatic watering system, or failure to supply water — can cause cattle to have nervous system problems such as blindness, muscle spasms, seizures, or diarrhea and abdominal pain. Cattle that have salt toxicity due to water restriction should not be allowed free access to water, but instead should be allowed to consume only small amounts of water every hour until they are rehydrated. Rapid water intake by cattle with salt toxicity will increase the severity of the problem — not make it better.

Nearly all plants contain nitrate, but some plants used for cattle feed are more likely to accumulate nitrate to dangerous levels than others. Forage sorghum, grain sorghum, Sudan grass and pearl millet are notorious nitrate accumulators. Under certain environmental conditions, wheat, corn, soybeans, Johnson grass and other plants accumulate toxic levels of nitrate. Nitrate will accumulate in plants due to excessive nitrogen (N) fertilization or if the plants are stressed due to drought, frost, hail or disease. Nitrates accumulate at night, on cloudy days and when environmental temperatures are cool. Rain following a drought will also cause a rapid buildup of nitrate levels.

After a drought-ending rain, one to two weeks are required for nitrate concentrations to be reduced to safe levels. If forages contain nitrate at a level of more than 6,000 ppm (parts per million), they should be considered potentially toxic.

A simple test is to gather several plants from around the field, make a cut in the lower 6 inches (in.) of the stem and place a drop of a sulfuric acid solution on the cut surface (most veterinary clinics will have this solution). The cut surface of plants with high levels of nitrate will turn purple in color. A more accurate determination of nitrate levels can be obtained by sending a sample of the suspected forage to a reliable laboratory.

Nitrate levels of hay will not change once the hay is cut, but grazed forages will change concentrations on a daily basis.

Monitor mycotoxins

Grains such as corn, as well as peanuts and cottonseed, can become infested with a family of chemicals called mycotoxins produced by certain types of fungi (not all molds produce mycotoxins). During hot, humid weather, mycotoxin-producing fungi can grow rapidly, especially when grain has been drought-stressed, infested with insects or damaged by harvesting equipment. While mycotoxins can be produced on grain in the field, they will produce much more in wet, warm grain in storage for even a few days.

Nonruminant livestock are generally more susceptible to the effects of mycotoxins than ruminant livestock. Similarly, young animals are more sensitive than mature animals.

The signs of disease will vary depending on the specific fungus and toxin that is present. Symptoms may include reduced feed intake, decreased milk production, decreased weight gains, liver damage, compromised immune function, reduced reproductive performance and, in instances of extremely high exposure, death.

Toxic levels of mycotoxins can occur over a wide geographic area in certain years when growing conditions increase the risk of fungus contamination of crops. Grain can be tested for mycotoxins by sending samples into a laboratory. Grain with high concentrations of toxins can be diluted with clean grain and/or mixed with a clay-type product that can partially bind the toxins.

Cattle producers and veterinarians occasionally encounter health problems related to feed. Making sure that feed processing and additives are administered properly and that feeds and forages are monitored for any naturally occurring toxins is important for ensuring good herd health.

E-MAIL: rlarson@vet.ksu.edu