Cattle Business in Mississippi – May 2006
"Stocker Cents" article

Avoiding Nitrate Poisoning

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Cause

Nitrate toxicity is sometimes a lethal problem for all classes of cattle including stocker cattle. Even when death losses are not experienced, production losses such as reduced milk production, lower weigh gains, and reproductive problems can occur with moderate levels of nitrates in the diet. Nitrates are generally present in grazing cattle diets at levels that are not normally toxic, but at high dietary levels nitrates can cause nitrate poisoning. Nitrates normally found in forages are converted to nitrites, then to ammonia, and then to protein by bacteria in the rumen.

Nitrate poisoning in cattle results from excessive consumption of nitrates from grazed forage, hay, silage, weeds, water, or other sources. If cattle rapidly ingest large amounts of plants containing high levels of nitrates, nitrites will accumulate in the rumen. Although rare, there have also been cased reported of cattle experiencing nitrate poisoning from drinking water contaminated with water containing nitrogen-based fertilizer. Nitrite is absorbed into red blood cells and combines with hemoglobin to produce methemoglobin, a type of hemoglobin which cannot carry oxygen in the blood. Lack of sufficient oxygen transport to tissues may result in severe problems including abortions and possibly death.

Clinical Signs

Signs of nitrate poisoning include bluish discoloration of the skin, bluish-brown mucous membranes, labored or rapid breathing, muscle tremors, lack of muscle control, staggering, weakness, diarrhea, frequent urination, dark- to chocolate-colored blood, rapid pulse, possible coma, and eventual suffocation. Necropsy results often reveal brown-colored and badly coagulated blood. Pregnant females that survive nitrate poisoning may abort due to lack of oxygen to the fetus. Abortions generally occur 10 to 14 days after exposure to excess nitrates.

Plant Factors

Certain forages and weeds pose higher risks of accumulating potentially dangerous levels of nitrates. Forages known to have considerable potential for accumulation of toxic nitrate levels include sudangrass, sorghum-sudan hybrids, pearl millet, corn, wheat, oats, soybeans, tall fescue, and bermudagrass. Weeds that pose a threat include pigweed (carelessweed), smartweed, ragweed,

lambsquarter, goldenrod, nightshades, bindweed, Canada thistle, and bull or horse (stinging) nettle. Pigweed and the summer annual grasses are typically the more likely culprits in most nitrate poisoning cases in Mississippi.

Abnormally high levels of nitrates in plants are caused by various stress factors such as moisture conditions, low temperature, and soil conditions. Plants will take up very little nitrate from dry soils. Nitrates are often at very high levels in plants (as the plant grows following drought conditions) for several days following a rain. Frost and low temperature interfere with normal plant growth and can cause accumulation of nitrates in plants. Frost can cause leaf damage and reduce photosynthetic activity in the plant. Nitrates absorbed by the roots are not converted to plant protein but are accumulated in the stem and stalk. Deficiencies of essential nutrients such as phosphorus can lead to plant stress as well and cause a build up of nitrates in plants.

Nitrate levels tend to decrease as plants mature. Young plants have higher concentrations of nitrates than more mature plants. Mature plants can still have excess nitrate levels if environmental and soil conditions are favorable for accumulation. Water nitrate levels should also be considered. Nitrate levels (unlike prussic acid levels) in stored forages do not significantly decrease over time, so storing hay containing high nitrate levels is not an effective method of preventing nitrate poisoning. In addition, ensiling is not considered an effective way to reduce nitrate levels in forages.

Management Guidelines

Avoid grazing livestock on heavily nitrogen fertilized pastures of suspect species during drought or wet conditions during cool, cloudy weather. If animals are grazed on potentially toxic pastures, they should be observed carefully for signs of nitrate poisoning. Forages of concern should be tested for nitrate nitrogen levels. Nitrate nitrogen levels below 700 ppm are generally considered safe for cattle. Levels between 700 and 1400 ppm are potentially hazardous to pregnant or very young animals. However, because nitrate effects on cattle can be variable, these general guidelines may not be applicable in all situations.

Cattle in poor health and condition are more susceptible to nitrate poisoning. Feeding non-protein nitrogen (urea) with hay containing high nitrate levels can also increase the risk of nitrate poisoning. Yet high energy levels in the diet can help to increase the rate of detoxification of nitrate to ammonia in the rumen. Therefore, cattle in good condition and with higher energy levels in the diet are at less risk of suffering from nitrate toxicity.

Do not allow hungry cattle to graze high nitrate forages or consume high nitrate hay. Starved cattle may consume excessive amounts of high nitrate forages putting them at increased risk of developing nitrate poisoning. Supplement cattle grazing high nitrate forages with feed grains or byproducts before grazing high

nitrate forages. Dilution with low nitrate forage can be a good option when utilizing high nitrate forages. Overstocking and strip grazing increases the amount of high nitrate plant parts (stalks and stems) that cattle consume. Avoid these grazing practices if there is a chance for nitrate toxicity. If possible, limit graze cattle on high nitrate pastures during the day for the first week. This will reduce the amount of high nitrate forage consumed and help acclimate cattle to high nitrate levels.

Treatment

A local veterinarian can provide advice and assistance in treating nitrate poisoning cases. For acute cases, contact a veterinarian immediately. Prompt intravenous injection of a 4% solution of methylene blue at a rate of 100 cc per 1,000 pounds of body weight is often the recommended treatment. This treatment may be repeated in 20 to 30 minutes if the initial treatment is not effective. Methylene blue is a reducing agent that converts methemoglobin to oxyhemoglobin, reversing the effect of the nitrites by restoring the ability for adequate oxygen levels to be carried in the blood. In chronic cases, forage containing high levels of nitrates should be eliminated or at least diluted with other forage and feeds to reduce nitrate intake.

Source Verification Short Course

A Beef Cattle Age and Source Verification short course that may be of interest to many Mississippi stocker cattle operators is scheduled for Friday, May 19, 2006 at Extension distance education sites across Mississippi, Louisiana, and Alabama. The program runs from 9:00 a.m. to 3:00 p.m. and covers topics such as animal identification, source verification, the Southeastern Livestock Network, breed association commercial marketing programs, and other marketing services. Speakers from USDA, Superior Livestock Auction, the University of Kentucky, Premium Beef Network, Decatur County Feedyard, the American Angus Association, and eMerge Interactive will be on hand to provide up to date information on beef cattle marketing alternatives, services, and industry trends. Registration is $15 per person. Contact Jane Parish or Blair McKinley in MSU Extension Animal and Dairy Sciences at 662-325-3516 to sign-up or visit with your local county Extension office. For more information on nitrate poisoning, stocker cattle production, or the upcoming beef short course, contact your local Extension office.