

Drought Can Result in Cattle Nitrate Toxicity

Sept 23, 2011

Adam Speir – Madison County Cooperative Extension Agent – Agriculture and Natural Resources

The drought that has plagued us during spring and summer can also impact the health of cattle due to something known as nitrate toxicity. Plants take up nitrogen primarily in the form of nitrates and convert it to amino acids and proteins. When plant growth slows, or plants are stressed from drought, plants continue to take up nitrates but do not convert them into amino acids or proteins. If cattle ingest forages that have this buildup of nitrates, severe health complications can occur due to the animal's inability to carry oxygen in their bloodstream. Symptoms can include bluish color of the mucous membranes, rapid breathing, tremors, staggering, collapse, and blood that is a very dark brown color. Unfortunately, acute or severe nitrate toxicity often appears suddenly, even one to two hours after ingesting toxic nitrate levels and can often result in the animal's death. Due to the difficult nature of treating the results of severe nitrate toxicity, prevention is the primary means of combating nitrate toxicity in cattle.

Several steps can be taken to decrease the risk of nitrate toxicity, including fertilization, harvest, and feeding practices. Although nitrogen fertilization can be critical to forage yields, it can also greatly contribute to nitrate buildup in plants and nitrate toxicity in cattle. Splitting nitrogen applications throughout the growing season rather than applying the full rate at the beginning reduces risk of high nitrate concentrations. Plants may also have higher nitrate concentration when soils are deficient in other major nutrients such as phosphorus or potassium.

Harvest techniques also play a role in lowering the risk associated with nitrate toxicity. The highest nitrate concentrations typically occur in the lower stems and leaves of plants, so raising the cutting height will reduce nitrate concentrations. However this will obviously result in significant yield reductions. One of the greatest management strategies is harvest timing related to rainfall. In any drought situation, a drought-ending rainfall will result in a rapid uptake of nitrates by plants. Therefore it is not advisable to harvest immediately after one of these rains. It is advised to wait seven or more days before harvesting after one of these rain events. Ensiling (silage) is one way to help reduce nitrates in forages, sometimes by up to 60 percent. However, forage that is too dry, poorly packed, or fed too early may not have sufficiently reduced nitrate levels. Storing forage as hay will not result in any significant reduction in nitrate concentrations.

Grazing and feeding practices can reduce risk of nitrate toxicity. As mentioned earlier with regard to rainfall's effects on nitrate levels, cattle should be limited in access to pastures after a drought-ending rainfall. Overstocking can result in cattle grazing too closely and eating lower parts of the plants. Cattle should be limited to 3 or 4 hours of access to high-nitrate hay per day so that their intake is approximately 50 percent of normal.

Cattle and other livestock can tolerate high-nitrate forage to varying degrees. For beef cattle, nitrate levels less than 4,500 parts per million (ppm) can safely be fed. In contrast, dairy cattle can begin exhibiting symptoms at nitrate concentrations above 1,000 ppm while horses can tolerate forages with nitrate concentrations above 10,000 ppm. Cattle that aren't lactating or gestating can become acclimated to higher nitrate levels by slowly increasing the proportion of higher nitrate feed, but this should not be done with lactating, pregnant, or sick animals. With beef cattle, feed with nitrate levels above 4,500 ppm should be reduced and mixed with grain, grain byproducts, or forage that is low in nitrates. Feed that is above 18,000 ppm can be potentially lethal for beef cattle. Providing plenty of fresh water will help dilute nitrate concentrations.

You can submit forage samples to the Extension office for nitrate analysis for a small fee, so contact our office for information on how to do so. We also have publications with more information on nitrate toxicity, forage management during drought, and various other subjects.