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EXTENSION

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Toxic Forage: Nitrate and Prussic Acid Toxicity

With extremely dry conditions and having the first real frost this week, producers are looking at all the possible available forages to feed their cattle. But they need to be careful as the conditions are right for nitrate and prussic acid toxicity in forages. Both can be deadly to cattle.

Nitrate toxicity appears in forages who have absorbed nitrogen and then become stressed due to conditions such as drought, hail damage and frost damage. Nitrate toxicity happens when the plant was growing and absorbing nitrogen through the roots. As the nitrogen is moving up the stems or in the leaves, the plants become stressed from conditions such as drought, frost or freezing. Nitrogen in the form of nitrates, then becomes trapped in the plants and not synthesized into the carbohydrates as normal. The plants now have toxic levels of nitrate. Nitrate poisoning then occurs when cattle eat forages high in nitrate and it turns into nitrite in the rumen. Nitrite bonds with hemoglobin in the blood and limits the capacity to carry oxygen. High enough levels of nitrite lead to low blood oxygen and animals succumb to oxygen deprivation. Signs of animals with nitrate poisoning may include stumbling, rapid pulse, labored breathing and frequent urination then collapse, coma and death. Plants known for having high nitrates include sorghum-sudangrass, oats, wheat, rye, barley and millet. Some perennial grasses like fescue and johnsongrass, as well as weeds including pigweed, kochia, mustard, nightshade and lamb's quarters can have high nitrate levels.

Prussic acid toxicity, also called hydrocyanic acid, is similar. Like nitrate toxicity, some plants can accumulate cyanogenetic glycoside in the plant and when the plant becomes stressed, the glycoside degrades. This releases high levels of hydrocyanic acid in the plant making it toxic. When ingested, the hydrocyanic acid then

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interferes with the release of oxygen from oxyhemoglobin to body cells. Again, animals succumb to oxygen deprivation. Once a lethal amount is ingested, prussic acid poisoning is very rapid. Symptoms include excitement, muscle tremors, rapid and difficult breathing followed by the animal going down, gasping for breath and may convulse before finally asphyxiating. These symptoms occur so quickly most producers only find the deceased animal. In Colorado, plants known for possible prussic acid toxicity are sorghum-sudangrass, white clover, vetch seed and chokecherry.

Fortunately, there are qualitative tests to evaluate forages (hay, pasture, and silage) for prussic acid and nitrate toxicity. These tests take less than 10 minutes to complete and can determine if there is a presence of prussic acid or elevated nitrates. Prussic acid and nitrate qualitative tests can be completed at some Colorado State University (CSU) Extension offices. If tested forages do indicate the presence of either of these, a sample can be sent to a qualified lab for further testing to determine the levels of prussic acid or nitrates.

If you are concerned about the possibility of prussic acid or nitrate toxicity, contact your county CSU Extension office for more information and to see if testing is available.

References:

Whittier, J.C. (2011) *Nitrate Poisoning*. [Fact Sheet No. 1.610]. Colorado State University Extension. https://extension.colostate.edu/topic-areas/agriculture/nitrate-poisoning-1-610/

Whittier, J.C. (2011) *Prussic Acid Poisoning*. [Fact Sheet No. 1.612]. Colorado State University Extension. https://extension.colostate.edu/topic-areas/agriculture/prussic-acid-poisoning-1-612/

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