

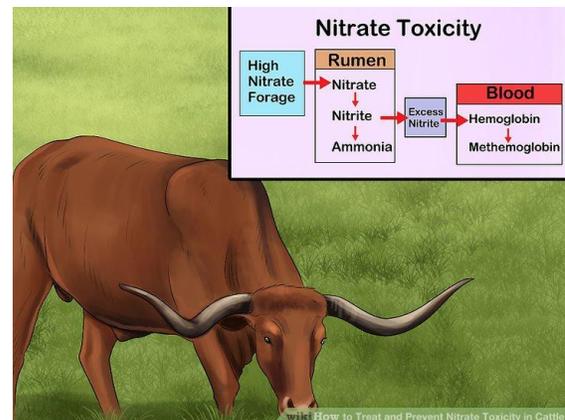
Nitrate Poisoning

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In Manitoba the percentage of animals affected by acute nitrate poisoning is usually low; but when death losses do occur, it happens suddenly and can be devastating for the individual or the herd. Nitrate poisoning is usually associated with frost but the drought conditions this year across Manitoba could be one of the stress conditions that increase nitrate levels in some forage.

Under normal conditions, cattle convert the nitrates in forage to nitrite. Nitrite is then converted to ammonia and used by rumen microbes to make protein. The problem arises when nitrate converts to nitrite faster than nitrite converts to ammonia causing nitrate poisoning.

Nitrate poisoning is a condition where an animal dies due to lack of oxygen. When they consume forages that contain an excessive amount of nitrate, the resulting nitrite is absorbed into the bloodstream where it binds to hemoglobin. This reduces the oxygen carrying capacity of the blood and the animal suffocates.



Plants normally take up nitrogen from the soil in the form of nitrate; regardless of the form of nitrogen fertilizer (including manure) applied. However, little nitrate accumulates in plants when growth is normal because the plant stem and leaves rapidly convert nitrate to plant amino acids and protein. The nitrate-to-protein cycle in a plant is dependent on three factors:

- Adequate water
- Energy from sunlight
- A temperature conducive to rapid chemical reactions

Under certain conditions, however, this balance can be disrupted so that the roots will take up nitrate faster than the plant can convert the nitrate to protein storing it unchanged in the stalk and lower parts of the leaves. The occurrence of nitrate poisoning is difficult to predict because nitrate levels can change rapidly in plants. So why is 2018 different than other years? Normally we watch for nitrate poisoning in years when we have a frost that affects forages. Excess nitrates can accumulate in plants when they are stressed by frost or hail. These events impair photosynthesis. After frost or hail; the roots are usually unaffected and are able to supply the same

amount of nitrate to the upper plant as prior to the injury. The upper plant is not able to use the nitrate as efficiently and it accumulates in the stem and leaves, resulting in excess nitrates.

In 2018 we experienced dry (or drought) conditions that put forages in a water stress situation. The nitrates absorbed by plant roots are normally incorporated into plant tissue as amino acids, proteins, and other nitrogenous compounds. This keeps the concentration of nitrates in the plant low. As the primary site for converting nitrates to these products is in growing green leaves, drought conditions retard this conversion process, causing the nitrate to accumulate in the stalks, stems, and other conductive tissue. If conditions improve and the plant starts actively growing, some of the accumulated nitrates may be used up in a few days. This usually occurs only in the top leaves which are exposed to sunlight. The bottom leaves, which are shaded, may still contain high levels of nitrates.

Not all drought conditions cause high nitrate concentrations in plants. Some moisture must be present in the soil along with the nitrate to permit absorption and accumulation. If the major supply of nitrate for the plant is in the dry surface soil, very little nitrate will be absorbed by plant roots. Unfortunately, this is difficult to predict.

High levels of nitrates need not be a problem as long as the feeding program is managed correctly. For information on managing and feeding feeds with nitrates click on [Nitrate Poisoning and Feeding Nitrate Feeds to Livestock](#).

Test your feed for nitrates. Nitrate concentration in hay bales does not change appreciably over time. Ensiling may result in a 40-60% reduction in nitrate level.

Nitrates in forages can be detected only by chemical analysis. If you suspect a problem call your local Manitoba Ag office to see if they can do a spot test. This will determine if nitrates are present. If you get a positive test for nitrates a feed testing laboratories such as [CTL](#) can determine the actual level of nitrate. They charge \$40 for the nitrate test or if you add it to your forage test it is only an additional \$12.

As mentioned, the percentage of animals affected by acute nitrate poisoning is usually low. But, when death losses do occur, they occur suddenly and can be devastating for the individual or the herd. Symptoms of lethal nitrate poisoning include labored breathing, frothing at the mouth, rapid pulse, weakness, diarrhea, frequent urination, and convulsions. Death may occur in three to four hours. Post-mortem examination reveals dark, chocolate-colored blood. Sub lethal doses may result in loss of appetite, lowered milk production, slow growth and abortions.

There are some treatments for nitrate poisoning but knowing what you are feeding and managing that feed may be the best preventative practices.

Additional reading:

[Nitrate Poisoning and Feeding Nitrate Feeds to Livestock](#)
[Nitrate Toxicity](#)