



Beef Briefs

The Latest Information on Beef Cattle Nutrition



Look Out for Nitrates this Year

Laura Martin, M.Sc

Well, as discussed by many producers the weather this summer has been hot and dry; perfect beach weather but not so great for growing crops. Dry years bring worries other than just not getting enough yield - nitrates in crops can be a serious problem. Crops like corn, small grains, sorghum and even co-product crops like beets, potatoes and carrots are especially susceptible to accumulating high levels of nitrates.

Soil nitrogen is taken up by plants through the roots and transported to the leaves where it is turned into protein. Under normal weather conditions, sunny days promote the turn-over of nitrogen into plant protein, which results in a good quality crop. However, drought, excessive soil nitrogen, and frost or hail damage can lead to a build-up of nitrates in the stems and leaves. High levels of nitrates can be toxic to animals and, when crops are ensiled, can produce gases that are toxic to humans.

There are many factors that can contribute to nitrate accumulation in forages. Excessive nitrogen levels in the soil can cause the plant to absorb too much. Growers using manure on crops should take extra care to not cause an overload of nitrates. Weather also has a big impact on nitrate accumulation in plants. Drought conditions, especially droughts following early rain and good plant



growth, are associated with higher nitrate levels in plants than a sustained drought. Nitrates are taken up readily by plants after a drought-ending rain, so it is recommended to wait at least 5 days after a rain before harvesting, to give these nitrates a chance to be turned into plant protein. Frost and hail damage can lead to nitrate accumulation

Cont. >>

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By: Laura Martin, M.Sc



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as well. The damage to the leaves slows the conversion of nitrates into protein. If the nitrates cannot be made into protein they “back-up” in the stems and roots resulting in the lower, older parts of the plants containing higher nitrates than the leaves and grain.

Feeding high nitrate forages can lead to health issues in ruminants. Nitrates are usually not toxic to animals, and in ruminants they are quickly converted into nitrites by the rumen microbes. Nitrites are then turned into ammonia which is either used by the rumen microbes or is absorbed into the blood and excreted in the urine. Problems can occur when ruminants are given sudden access to high levels of nitrates and it overloads this pathway. The nitrates are still turned into nitrites but the conversion to ammonia is not fast enough to keep up. Both nitrates and nitrites are absorbed into the blood and this is when toxicity can occur.

Nitrites are ten times more toxic to ruminants than nitrates. Nitrites bind to the blood and prevents oxygen from getting to the animal’s tissues, causing oxygen starvation. Some symptoms of acute nitrate poisoning are decreased appetite, labored breathing, frequent urination, blue-grey mucous membranes, excess saliva or tear production, tremors and weakness, staggered gait and blindness. In most acute nitrate poisoning cases, animals are found dead before any symptoms can be observed. In chronic cases of nitrate poisoning, where animals are exposed to elevated levels of nitrates for extended periods of time, the only warning of a problem may be reduced weight gain, depressed milk production or late stage abortions.

There are many different tools to help harvest and manage the feeding of high nitrate forages:

- Avoid over-applying nitrogen. Test the soil for nitrogen levels before applying fertilizer.
- Harvest crops on a warm, sunny afternoon as nitrate levels are lowest under these conditions.
- Wait at least 5 days after a drought-ending rain to give the plant a chance to convert nitrates into protein.
- Nitrate levels are highest in the lower parts of the plants. For corn silage, raise the cutter bar to 10-12 inches and leave more stalks in the field. Research shows leaving 6-8 inches of stubble instead of 2-4 inches can reduce nitrate levels by 20%.
- Ensure any weeds in the field are past the flowering stage as they can also accumulate toxic nitrate levels.
- Don’t graze or feed fresh chopped forages that have been drought stressed.
- Ensiling high nitrate forage crops can decrease the nitrate levels by 30-50%.
- Ensure proper fermentation.
 - Corn silage crops with little grain will pack more like a grass silage.
 - Use a silage preservative to help with the fermentation process.
 - Wait 3 weeks for proper fermentation before feeding.
- Sample feeds that might have high nitrates. Wait and sample after fermentation is complete. Samples should be kept frozen and taken to the lab as soon as possible.
- Check nitrates in the water supply as high nitrates in the water could compound the problem.
- Ruminants can adapt to higher nitrate levels if problem forages are introduced slowly over a 2-3 week period.
- Let silage air out before feeding it. If cows cough when fed silage it may be a good idea to get the silage down a day ahead.
- Dilute high nitrate forages or stop feeding them if animals are affected. Nitrates don’t normally accumulate in grains so feeding a high concentrate diet is a low risk for nitrate toxicity.
- Limit the amount of total urea in the ration. Non-protein nitrogen should not be supplemented with drought stressed corn.
- Consult your veterinarian promptly if animals are affected or you notice symptoms.
- When feeding high nitrate forages, limit intakes as per Table 1.

Table 1: Guidelines for Nitrate Levels in Forages for Cattle

NITRATE/NITROGEN ppm	RECOMMENDATION
<1000	Safe to feed all conditions.
1000-1500	Safe to feed non pregnant animals. Limit feed use in pregnant animals to 50% of total ration on DM basis.
1500-2000	Safely fed if limited to <50% total DM ration.
2000-3000	Limit feeds to 30-40% of total DM in ration. Should not be fed to pregnant animals.
3500-4000	Limit feeds to 25% of DM in ration. Do not feed pregnant animals.
>4000	Potentially toxic, do not feed.

Pioneer Forage Manual; A Nutritional Guide; Pioneer Hi Bred International Inc. Des Moines Iowa 1995

Although ensiling these high nitrate forages can help in reducing the nitrate load it also comes with its own challenges. Fermenting silages produce several kinds of gases, the most dangerous of these is nitrogen dioxide. This gas is toxic to both livestock and humans and can kill quickly. As the crop is fermented, oxygen is used up and the nitrates in the plant are released as nitric oxide. This odourless, non-lethal gas escapes quickly from the silage as it is heavier than air. It quickly combines with oxygen in the air to form toxic nitrogen dioxide. This toxic gas can form whenever silage is made, not just when there is a nitrate problem.

Nitrogen dioxide can be recognized by its yellowish-brown colour and its bleach-like smell. This gas will stain silage, wood or any other material it touches the same yellowish-brown colour. It is heavier than air so it may layer on top of the silage, or may settle down through the chute or drain at the base of the silo. Nitrogen dioxide can collect in silo rooms or near the ground around bunker silos. Dead rodents in or around the bunker or silo room are a warning sign that toxic gas might be present.

Being alert to the problem will go a long way to minimizing the dangers of nitrogen dioxide. The first 12-60 hours after the silo is filled poses the greatest risk. Stay out of or away from silos immediately after filling. Extra caution should be taken around silos and bunkers for up to 3 weeks, or until fermentation is complete. Run the blower for 15-20 minutes before entering upright silos and be careful around the vents in silo bags. Be aware of your surroundings – check for yellowish-brown clouds or bleach-like odours near the silo. Small amounts of nitrogen dioxide may not be obvious to the eye or nose but can still be dangerous. Always have a person nearby when entering the silo so that help can be summoned if needed. Consult your doctor immediately if you think you have been exposed to silo gas. Early treatment can help prevent lung damage and keep pneumonia from developing later.

While a perfect growing season is always the ideal, more often than not there is one challenge or another. From no rain to flash floods, no sun to desert-like conditions, the key to managing any situation is to be aware of the problem and the steps that can be taken to deal with it. If nitrate levels are a concern consult with your nutritionist or veterinarian and put a plan in place for how to deal with it at harvest and feed out. Be careful when ensiling forages and make sure everyone on the farm is aware of the dangers of silo gas.



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Previously, I had experienced the aggravating problem of purchasing a mineral product that the cattle wouldn't eat before it hardened in the bottom of the feeder. I tried other minerals and would find one that would work for a while but then the cattle would go back to not being interested in eating the product. When I questioned this, the common response was "the cattle know when they need the mineral, so just don't worry about it". A dumb answer!

I try to look after the health of my cow herd by following good management practices. I only expose the bull for 60 days and my policy is no "free boarders". If a cow is open at preg check time, it's on to hamburger heaven. I have gone to great lengths to get mineral into the cows during the months close to calving and especially the three months following calving. I would buy molasses licks and put the mineral on top of the product. That was one way of getting the mineral into them, but not very scientific!

In 2012, while visiting a farm looking to buy some replacement heifers, I asked the owner if he had any problem getting the cows to eat the mineral and the answer was – "I used to have that problem until I got this product". That night I sent an email to Kenpal Farm Products asking for someone to contact me about delivery. I got a call the next day asking when I needed product and I replied "yesterday". The next day ten bags were delivered to my place and my cows have never had a day without Kenpal Beef Nurse Cow Mineral in front of them since. For the first couple months, I monitored mineral intakes and that told me that monitoring was not necessary.

I have done tests on other mineral products for a friend of mine who works for a large co-operative. He had done work with their supplier to improve the palatability of their product and reduce the "caking of product" in the feeder. I had a series of compartments for the tests and I monitored the quantity of mineral eaten from each compartment daily and watched for the caking problem of their test batch against the Kenpal product. I documented the tests, took pictures, etc. The company did make significant improvements over the series of tests, but they never matched the performance of the Kenpal Beef Nurse Cow Mineral.



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Since switching to Kenpal I don't have to fool around mixing product to get the cattle to eat it. I don't even have to pick up the product! It is delivered to my place when I need it and it is even put in the designated spot, whether I am home or not. All I have to do is just place the order. It is a pleasure to get rid of the hassle and receive a quality product at a competitive price.

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