

# Prime Cuts: Nitrates

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Nitrates are normally used by plants for metabolism and growth. However, when the growing season is adverse (drought or freeze), nitrates can accumulate within the plant. Some plants are better at utilizing these nitrates than others. Those that do not metabolize nitrates efficiently are cause for concern. Small grain hays (oats, barley, rye, wheat) are notorious for nitrate problems, with oat hay leading the pack. Corn is another crop to watch when nitrate issues are expected. Within the plant, nitrates are not stored evenly throughout. The grain portion contains very little, leaves slightly more, and the stalk containing the majority of the nitrates.

Interestingly, when ensiled, the nitrate concentration decreases in the feed. This is not the case in dried and baled hays. Either way, feeds expected to be high in nitrates should be tested no matter how they are stored or processed. There is no guarantee on the extent of the decrease in nitrate concentration of the ensiled feed. It is better to test and have definite numbers to refer to especially when feed is intended for pregnant animals. Please refer to the table below for a quick guide to nitrate levels and feeding recommendations.

Feeding Recommendations Based On Varying Nitrate Levels		
Nitrate-Nitrogen PPM	Nitrate Ion PPM	Outcome
< 1,000	< 4,400	Nitrate level is safe under all conditions.
1,000 – 1,500	4,400 – 6,600	Nitrate level is safe for open (non-pregnant) animals – no restriction required. Limit this feed to 50% of the total ration for pregnant animals.
1,500 – 2,000	6,600 – 8,800	Safe for all animals if limited to 50% of the dry matter intake.
2,000 – 3,500	8,800 – 15,400	Do NOT feed to pregnant animals. For non-pregnant animals – limit to 35-40% of the total dry matter intake.
3,500 – 4,000	15,400 – 17,700	Do NOT feed to pregnant animals. For non-pregnant animals, limit to 25% of dry matter intake.
> 4,000	> 17,700	DO NOT FEED.

While we often discuss nitrate content in reference to stored forages, attention must also be paid to grazed pastures, as well. Small grain forages as well as weeds like kochia, pigweed, and lambs-quarters can all accumulate nitrates. This can be dangerous during a dry summer or fall as weeds may be the only green plant around making them practically irresistible to cattle. Testing the nitrate levels on a drought-stressed pasture before turnout is recommended to prevent nitrate poisoning.

## Nitrate Poisoning

When cattle ingest plants the nitrate is converted to nitrite in the rumen. Nitrite is then converted to ammonia which is used in the synthesis of amino acids and proteins. When high levels of nitrate are present the conversion to nitrite occurs too rapidly and cannot be converted to ammonia fast enough. As the nitrite levels build in the rumen, the body will absorb it into the bloodstream. Nitrites then interact with the iron on red blood cells (RBCs) causing the RBCs to lose their ability to bind with oxygen. With the RBCs unable to carry oxygen, the animal's tissues become starved of oxygen and the animal essentially suffocates. Post-mortem exams show the blood turns from red in color to brown.

Symptoms of nitrate poisoning include: abdominal pain, scours, weakness, muscle tremors, drooling, blue tinge to the mouth, mouth breathing, collapse, coma, and ultimately, death. If suspected, contact your veterinarian immediately.