

## Nitrate Poisoning from Drought Stressed Plants: An Update

Limin Kung, Jr., Ph.D.  
 Dept. of Animal & Food Sciences  
 University of Delaware, Newark  
 September 2003

Many plants can accumulate nitrate under stressful conditions (excessive fertilization or water stress from rain after a drought). Sunflowers, corn, wheat, barley, rape, brome grass, and sweet clover are some of the more common plants that can accumulate high levels of nitrates. Nitrates are converted to nitrite and ammonia in the rumen. However, when there are excessive nitrates, nitrite accumulates and is absorbed into the blood stream. There, nitrite binds to hemoglobin and reduces the oxygen carrying capacity of the blood. Acute poisoning can be observed within 6 hours of forage consumption and is characterized by dark-brown blood, labored breathing, tremors, and weakness. The ensiling process can decrease nitrate levels in plants by about 50% but in some instances, the remaining nitrate is still too high to be safely fed to ruminants. Thus, suspect samples should be tested before being fed to animals.

Problems with nitrates are dictated by two factors, 1) total nitrate consumed and 2) the amount of nitrate consumed in a single meal. Reviewing the published information on nitrate toxicity from various universities can often leave one very confused because 1) nitrate can be presented as nitrate-nitrogen (nitrate-N) or nitrate ion (nitrate), 2) safe levels of nitrate to feed are sometimes on a “forage basis” and other times are on a total DM intake basis, and 3) nitrates concentrations are listed as ppm (on a DM basis) or directly on a % DM basis. I suggest you look at total nitrate intake (based on nitrate consumption from forages and in some instances concentrates and water) to calculate what levels are safe to feed (see table below).

Don't forget that sometimes, water can contain high levels of nitrates that may add to a problem. Get your suspect forage and water tested if need be. Although it is a bit complicated, the Pennsylvania State University fact sheet on nitrate toxicity is a good source of information (<http://www.das.psu.edu/dcn/catforg/DAS/pdf/nitrate.pdf>).

For safety reasons, calculate the entire potential intake of nitrate.

Total NO <sub>3</sub> -N intake		Total NO <sub>3</sub> <sup>-</sup> intake		Comments
ppm	%	ppm	%	
up to 400	up to 0.04	up to 1700	up to 0.17	Safe to feed under most conditions.
>400 to 1300	>0.04 to 0.13	>170 to 5700	>0.17 to 0.57	May see reduced fertility (increase services, repeat breeding).
>1300 to 1700	>0.13 to 0.17	>570 to 7500	>0.57 to 0.75	May see reduced gains and increased abortions.
> 1700	> 0.17	> 7500	> 0.75	Clinical symptoms (respiratory distress).