



# Cow Calf Technical Bulletin

## PUTTING NPN TO WORK FOR YOU

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**N**on-Protein Nitrogen (NPN) — usually in the form of urea — has been used as a source of crude protein in ruminant diets for more than a century. But because the concerns related to mismanaged feed urea have been widely discussed, some producers and members of the feed industry question the value of urea in their protein supplements, particularly for cattle on high forage diets.

### THERE ARE GOOD REASONS TO UTILIZE UREA IN BEEF CATTLE SUPPLEMENTS

UREA is a highly concentrated source of nitrogen; in fact, it contains the equivalent of 287% crude protein! Since the most critical supplemental need in most forage-based diets is protein, urea brings key nutrition to the supplement formulation.

FORAGE-BASED diets often cannot provide enough nitrogen for the rumen microbes. Because virtually 100% of dietary urea is degraded in the rumen, it helps meet this need.

BECAUSE urea provides crude protein in such a concentrated form, lower inclusion rates are required to bring a supplement up to the desired CP level. That leaves space in the formulation for higher levels of other ingredients, which can provide energy or other nutrients.

PRICE is always a consideration, and urea is an economical source of dietary crude protein.

### How NPN Contributes to Overall Nutrition

The rumen microbes must take in all the nutrients they need, including nitrogen and energy, to grow and reproduce. In the process, the feeds consumed by the animal are subject to microbial fermentation. Volatile fatty acids (VFA) are produced, which the cow or steer can absorb and utilize as their primary energy supply.

Dietary NPN sources—as well as urea from saliva and the bloodstream—are readily broken down by the ruminal bacteria and protein to yield ammonia. Rumen-degradable ‘true’ protein also releases ammonia into the rumen environment. The microbes then use this ammonia as a key nitrogen source, incorporating the ammonia-N into their single-celled body structures as “microbial cell protein.”

The net benefit to the host animal comes when millions of these bacterial and protozoal cells flow with the digesta to the small intestine, where the high-quality microbial protein is digested, and its amino acids and peptides absorbed.

Conditions favorable to microbial growth lead to increasing microbe populations and enhanced fermentation. This allows more feed to be processed (i.e., increased feed intake), with greater volumes of VFA being produced and absorbed, and more microbial cell bodies providing protein to the animal.

In forage-based diets, rumen-available nitrogen is typically the microbial nutrient in shortest supply. As dietary NPN provides ammonia-N, the entire fermentation process is enhanced - and the host animal benefits from an increased supply of both energy and protein.

### COMPARISON OF ISONITROGENOUS DIETS WITH VARYING PROTEIN SOURCES

	HIGH BYPASS PROTEIN		HIGH DEGRADABLE PROTEIN	
	NO UREA	WITH UREA	NO UREA	WITH UREA
Microbial N, g/day	1.10	1.54	1.92	2.31
Fiber (ADF) digestibility, %	38.7	41.1	46.0	46.8
Diet (DM) digestibility, %	42.7	47.9	57.7	60.4
VFA concentration, mM	73.0	80.5	97.5	100.1

Griswold et al., 2003 The Ohio State University



Nutrition and More . . .

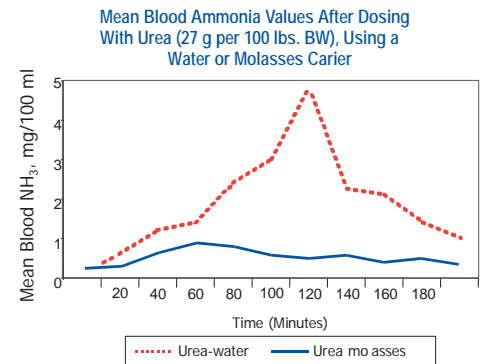
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As important as an ammonia-N supply is to the microbes in the rumen, too much of a good thing can lead to inefficient use (or, in extremely mismanaged situations, to toxicity concerns). If microbial uptake of ammonia lags behind supply, rumen ammonia concentration obviously rises. Excess ammonia may move into the blood, where it is transported to the liver for conversion back to urea, which may be excreted or recycled. Optimal efficiency of NPN utilization occurs when the ammonia supply equals microbial ammonia use.

## QLF LIQUID SUPPLEMENTS WORK TO OPTIMIZE UREA USE 3 WAYS:

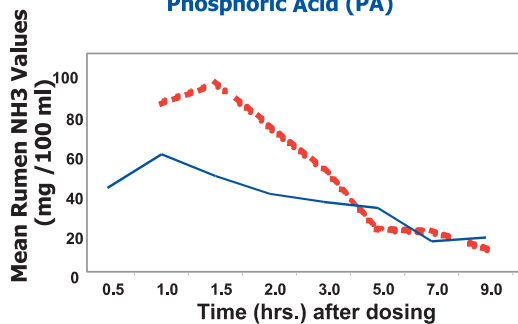
### 1 QLF provides a balance of nutrients to enhance microbial activity

Like all living creatures, the rumen's bacteria and protozoa need a balanced diet to grow and reproduce. QLF feeds provide a combination of nutrients needed to boost microbial growth (and thus fermentation) including: NPN for ammonia, sugar for readily-available energy, essential macro and trace minerals, and base levels of natural protein to provide specific microbial growth factors. Special consideration is given to N:S ratios. Note how dramatically ammonia movement to the bloodstream is stopped when molasses is provided along with supplemental urea.



Lichtenwalner and McClain, 1978  
Texas A&M University

Mean Rumen Ammonia Values after Dosing With Urea (15 g per 100 lbs. BW), With and Without Phosphoric Acid (PA)



Perez et al., 1967  
Cornell University

### 2 QLF spreads the supply of ammonia in the rumen over time

The urea in QLF Timed-Release® products has been bound to phosphoric acid, significantly slowing break-down in the rumen (see chart). This helps match the supply of N to the gradual supply of energy and other nutrients coming from the rest of the diet.

Additionally, when QLF feeds are offered as free-choice supplements in a lick tank, they are consumed via periodic small “meals” over the course of the day, rather than as a single large daily “dose.”

### 3 QLF helps prevent free ammonia from leaving the rumen

The movement of ammonia out of the rumen is significantly slowed by acid conditions (low pH). As fermentation activity increases, and additional VFA are produced, rumen pH is lowered. Because QLF supplements are designed to enhance the utilization of forage diets (i.e., increase intake and digestion) via improved microbial fermentation, feeding QLF encourages optimal rumen pH and minimal ammonia movement to the bloodstream.

#### MANAGEMENT KEYS to offering NPN supplements free-choice:

- Always provide adequate forage
- Ensure an ample, clean water supply
- Offer appropriate dry minerals at all times
- Place lick tanks away from areas where cattle congregate, or where product contamination is likely to occur

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