Nutritional Benefit:

QLF QUALITY LIQUID FEEDS

Urea & Degradable Protein vs Un-degradable Protein

Microbial protein is the highest quality and most economical protein source. Thus, taking care of the bugs first to produce a maximum number of bacteria should be the first consideration to meet protein requirements.
Growth rate of rumen microbes is dependent on:

- The rate and extent of carbohydrate fermentation.
- An adequate supply of ammonia from urea or natural protein, amino acids and peptides from natural protein.

Table 1 shows that high RDP diets support DMI and production of fat corrected milk better than low RDP diets.

The artificial rumen results in Table 2 show that by adding urea to a low RDP diet enhances rumen function resulting in more total energy being extracted from the diet and more microbial protein production. Even in a high RDP diet, adding urea increased the DM, ADF, NDF and protein digestibility and resulted in the greatest conversion of nitrogen to microbial protein.

Table 1 — Effect of Rumen Degradable Protein on DMI and Milk Production

	Rumen Degradable Protein, % CP			
	57	**61**	**65**	**68**
DMI, kg / day	20.4	20.9	20.9	21.0
Milk, kg / day	31.8	32.4	33.0	33.5
FCM, kg / day	32.8	34.1	34.4	35.1
MUN, mg/dl	4.3	5.2	6.3	7.4

Milk and 3.5 % FCM yield (P<.05); MUN (P<.01))

Source: Kalscheur et al. 2000. Proc. Maryland Nutrition Conference

Table 2 — Effect of RDP & Urea on Nutrient Digestibility

	LOW RDP		HIGH RDP	
	Urea	**No Urea**	**Urea**	**No Urea**
DM Digestibility, %	57.7	42.7	60.4	47.9
NDF Digestibility, %	52.7	47.5	52.5	53.2
ADF Digestibility, %	46.0	38.7	46.8	41.1
Total VFA, mM	97.5	73.0	100.1	80.5
Nitrogen Efficiency,%*	69.4	39.7	84.8	56.7

*Nitrogen efficiency: % of dietary N intake converted to microbial N

Source: Griswold et al. 2003. J. Anim. Sci. 81:329

CONCLUSION

The benefit of feeding urea to the animal is to get the ammonia converted to microbial protein in the rumen. Optimal microbial protein production was achieved by adding molasses to provide 7% sugars of DMI in the diet.

Feeding sugar from liquid feeds containing molasses increases the energy extracted from the diet and utilization of nitrogen for microbial protein production as shown in Table 3. Providing sugar as a readily available carbohydrate to match urea's degradation rate and/or other NPN sources stimulates microbial utilization of ammonia and produces more microbial protein. Utilising urea to meet ammonia requirement results in less peptides from natural protein being degraded to ammonia leaving them available to meet the microbe peptide and amino acid needs. This efficiency is maximised when all other required microbial nutrients are provided.

Table 3 — Effect of Adding Molasses on Nitrogen Utilisation

	Diet Total Sugar, % DM		
	2.6	**4.9**	**7.4**
Rumen Ammonia, mg/dl	20.9	20.9	21.0
Total VFA, mM	32.4	33.0	33.5
Milk Urea - N, mg/dl	34.1	34.4	35.1
Purine derivatives mmol/d	5.2	6.3	7.4

Addition of sugar from liquid molasses increased nitrogen utilisation for microbial protein production.

Source: Broderick and Randloff. 2004. J. Dairy Sci. 87:2997.