PROPER FEEDING OF UREA CAN LOWER FEED COSTS WITHOUT HURTING PRODUCTION

Why has urea gotten a tarnished reputation in dairy diets?

Urea use has had a tarnished reputation because it has been overfed and utilized inefficiently. It has been used inefficiently because of a failure to provide enough fermentable carbohydrate in the diet. It is perceived that urea will work only in low protein diets. Yet, when it is used properly urea can serve as a source of economical protein in dairy cattle diets. A misconception about urea is that it is not needed in the dairy diet. This misconception was based on believing that a rumen ammonia concentration of 5 mg/dL was all that was needed for efficient ruminal digestion. **This is incorrect.** The value of 5 mg/dL came from an in vitro trial (Satter and Slyter, 1974). It has been well documented that the composition of the microbial ecosystem in the animal is very different compared to an in vitro environment (Olde and Schaefer, 1987). The rumen ammonia concentration required for optimal microbial protein synthesis (MPS) was higher in in vivo compared to in vitro studies (Reynal and Broderick, 2005). Reynal and Broderick (2005) reported that a minimum rumen ammonia concentration of 11.8 mg/dL was required to maximize MPS. The ammonia concentration necessary for optimal microbial growth in the rumen is linked to fermentability of the diet. A higher rumen ammonia concentration (12.5 vs. 6.1 mg/dL) was required on a barley based diet with a faster rate of fermentability compared to a corn based diet with a slower rate of fermentability (Olde and Schaefer, 1987). Erdman (1986) reported that up to 50% of the variation in the amount of ammonia nitrogen required for maximum ruminal dry matter digestion was due to the fermentability of feeds. Here is the take home message; diets with greater rumen fermentability will require more NPN to optimize microbialprotein synthesis. **Application: Molasses is an excellent carrier for urea because it supplies readily fermentable carbohydrate that enhances the efficiency of urea utilization.**

How much urea can be fed without depressing feed intake?

You can feed 136 grams (0.30 pounds) of urea without depressing the feed intake of dairy cattle (Kertz, 2010). This is a general recommendation for a wide variety of diets. There will be specific situations where you can feed more than 136 grams of urea. For example, feeding 173 grams (0.38 pounds) of urea did not depress feed intake when diets contained 34% starch (Kertz, 2010). **Application: You can feed 5 pounds of a 20% CP liquid feed or 3.5 pounds of a 30% CP liquid and not exceed the recommended amounts of urea.**

How much dietary protein can be replaced by urea without a loss in production?

A general recommendation applicable across a wide range of diets is that you can replace 20% of the dietary protein with NPN (Kertz, 2010). There will be situations where you can exceed this amount. For example, when diets contained 55% corn silage that was treated with ammonia, 33% of the dietary protein was replaced by NPN from the corn silage plus urea without a loss of production (Huber et al. 1980a). This was possible because 40%

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of the NPN was converted to true protein in the ammonia-treated corn silage (Huber et al. 1980b). Urea contains 287% crude protein equivalent, and feeding 0.33 pounds will replace 0.95 pounds of protein. If we are feeding 8.5 pounds of protein, and replace 0.95 pounds of protein with urea, only 11.2% of the total protein would come from urea. This is well below the conservative estimate of replacing 20% of the dietary protein with NPN. **Application: Replace 0.95 pounds of dietary protein with 3.2 pounds of OLF TMR 30 or Dairy Select 30.**

What about diets that contain high quality alfalfa hay or alfalfa green chop?

Urea is perceived to have little value in diets containing high quality alfalfa hay or alfalfa green chop because these feeds supply adequate amounts of RDP for digestion in the rumen. This assumption assumes that the amount of RDP required in the diet is a fixed amount. ***This is incorrect***. The amount of RDP required in the diet is a function of the fermentability of the diet. The more fermentable the diet, the more RDP will be required. For example, in highly fermentable diets containing barley silage (31%) and barley grain (29%), an RDP content of 12% resulted in more milk (6.6 pounds) and greater feed efficiency (1.5 versus 1.4) compared to a diet with an RDP content of 9.9% (Echibisa, 2013). If you are feeding steam-flaked or finely ground corn and a molasses-based liquid feed, there would be opportunity to use urea because of the high fermentability of the diet. **Application: Formulate diets to contain 11% RDP and monitor MUN. If MUN is below 10 then increase the RDP of the diet.**

How to implement this strategy when using QLF Liquid Feeds?

On the nutrient profile of a QLF liquid feed that contains urea, there is an estimate of the NPN content of the liquid supplement. This will be listed as ECP from NPN, which is the equivalent crude protein from NPN. Assume you are feeding 4 pounds of a 20% crude protein QLF product and 73% of the protein comes from NPN. Use the following formula to calculate how much urea is being fed.

(Feeding rate X Crude protein percent) X (Percent ECP from NPN) divided by 287%

Using our example, (4 pounds X 20% CP) X (73%) divided by 287% = (0.584 divided by 287%) = 0.203 pounds of urea being fed through the QLF supplement. **Application 4 pounds of a 20% CP liquid supplement can be used across a wide range of diets to deliver NPN efficiently.**

What are the economics of using urea in the dairy diet?

If urea is $600 a ton, 0.30 pounds of urea will cost 9 cents and supply 0.86 pounds of protein. To supply this same amount of protein from soybean meal at $420/ton will require 1.8 pounds of meal at cost of 37.8 cents. **Application: 3 pounds of QLF TMR 30 will replace 1.9 pounds of soybean meal or 2.5 pounds of canola meal. Make sure the diets formulated for greater than 85 pounds of milk supply 180 grams of lysine and 60 – 62 grams of methionine.**

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