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# Urea for Dairy Cows

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Urea is gaining importance in dairy cattle feeding because of an increased interest in finding a less expensive source of protein.

Urea is an organic compound containing nitrogen and is made synthetically from ammonia and carbon dioxide. In original form it is not a protein and is known as a non-protein nitrogen compound.

Urea can be used only by ruminants, since microorganisms in the rumen convert the non-protein nitrogen into protein and make it available to the animal.

Feed grade urea contains 42 to 45 percent nitrogen. A 42 percent nitrogen urea is equivalent to 262 percent crude protein, or 1 pound of urea is equivalent to 2.62 pounds of crude protein, more than six times as much as provided by a 41 percent protein meal.

Urea can serve no useful purpose in any ration that already has adequate protein except possibly to provide a less costly source of protein.

An acceptable rule is that 1 pound of urea and 6 pounds of grain or molasses can be used to replace 7 pounds of cottonseed meal or its equivalent feed value. Prices of these ingredients would then determine the economy of using urea.

On the basis of present research, urea can replace up to about one-third of the protein content of the total ration. Urea usually is fed at 1 to 2 percent of the grain ration or added to field corn silage at the rate of 10 to 12 pounds per ton at the time of ensiling. When urea is derived from several sources in the ration and varying amounts of feed are consumed, care must be taken to insure that the total urea daily intake is within the limits suggested.

From these data we can conclude that 88 pounds of barley plus 12 pounds of urea has about the same crude protein and net energy value as 100 pounds of 41 percent crude protein cottonseed meal. Research indicates that equal production may be obtained from either source when properly balanced in the ration. Price then should determine the use of one or the other.

There are some problems in feeding urea. First, it is not palatable. Second, it must be mixed with the grain or silage carefully to insure an even distribution. Third, cows must be gradually adjusted to eating feeds containing urea. Fourth, urea feeds should not be fed to young stock under six months of age. This adjustment period in introducing urea into the ration is important to both the animals and the rumen microorganisms. Two or three weeks may be needed for cows to adjust from non-urea to urea feeds, depending in part on the level of urea being fed. Likewise, a period of time is needed for rumen microorganisms to adjust and more efficiently convert urea to crude protein.

Any value in the use of urea in dairy feeds is not clear or above question. Continued research is needed. At the present time there is some conflict in research results. This is due in part to the amount of urea used and the mixture of feeds it is used with, plus the level of production being supported.

Herd averages of more than 17,000 pounds of milk have been maintained, with urea constituting one-fourth to one-third of the total protein of the feed ration.

Science has developed some new urea products, such as Starea and Dehy-100, that release urea ammonia in a manner that increases conversion efficiency. This may lead to the use of larger amounts of urea per animal per day, where economical. Some research with high producing cows fed twice the amount of urea usually recommended has proved successful when carbohydrates, especially starch, were readily available.

There is much we do not know about urea and nitrate feeding. Missouri reported successful feed-

Replacement Value of Urea

Feed	Crude protein	Net energy (Therms)
Barley, 88 lbs. ....	8.8%	71.4
Urea, 12 lbs. (262 percent).....	31.4% (protein equivalent)	0.0
100 lbs. cottonseed meal (41% crude protein, Texas analysis)	41.0%	69.1



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ing of a 2 percent urea grain mix, plus 1 ounce potassium nitrate ( $\text{KNO}_3$ ) per 100 pounds of sudangrass hay.

Results at a number of research stations indicate that adding 10 to 12 pounds of urea per ton of corn silage at ensiling time provides a good response from high producing dairy cows. Urea can be wasted if applied to high moisture (75%) corn silage. Very little, if any, loss will occur when the dry matter of the silage is 35 to 40 percent. If cows are fed about 20 pounds of alfalfa per day, urea is not needed in the corn silage making up the rest of the roughage feed.

### Precautions and Recommendations in Feeding Urea

Dr. J. W. Crowley of the University of Wisconsin gives the following warning, including four suggestions on how to make better use of urea.

Too much, poor mixing, low energy rations, sudden changes to maximum urea, and lack of minerals are common problems.

1. No more than one-third of the total protein of the total ration should be from urea. Thumb rules to follow are: Urea should not form more than 1 percent of the dry matter in the total ration. When grain is fed at a heavy rate (25 to 30 pounds daily) limit urea to 2 percent of the grain mix. When the grain containing urea is limited to less than 20 pounds per day, 3 percent is safe. When urea is fed in several different feeds, the total urea should not exceed 1 percent of the total dry matter.

Cows will consume about 50 pounds of dry matter daily. Therefore, the total urea fed should not exceed about one-half pound daily.

2. Urea must be well mixed into the ration. Poor mixing originally or settling of excessive urea into the feed that one cow eats may be toxic to her. The other cow that should have received part of the urea will be short of protein. Using 5 to 10 percent molasses in the grain mix helps prevent settling and sifting of the urea. When balancers containing urea are used, mixing usually is not difficult. If you use pure urea, first mix it with a few hundred pounds of feed and then add this "premix" to the total batch. If mixing facilities are poor, using supplements containing urea is safer.

3. Fewer problems with consumption and palatability occur when urea is added to good-quality, palatable feeds. Introduce urea gradually and allow time for the cow and rumen organisms to adapt to the urea. *Urea is effective only if more protein is needed and adequate energy is fed.*

4. Be sure to provide adequate minerals with urea. Urea is used to replace a complete protein feed, but it supplies only nitrogen. The complete protein feed also contains energy and minerals, especially phosphorus and trace minerals. Add 1 percent high-phosphorus mineral, such as dicalcium phosphate, and 1 percent trace mineral salt to grain mix. Also give extra mineral free choice. Commercial supplements containing urea are usually fortified with minerals.