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The “Do’s” and “Don’ts” of Non-Protein Nitrogen Use

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Crude protein is comprised of both true protein and non-protein nitrogen. True protein is sometimes called “natural protein”. Not all nitrogen-containing compounds are true proteins. Urea is an example of a non-protein nitrogen (NPN) source. Many NPN compounds can supply nitrogen to the rumen microbes that then build microbial protein in the rumen using this nitrogen. This microbial protein supplies the animal with protein built from the nitrogen in NPN sources.

Urea is a form of NPN that can be fed to beef cattle. Producers may consider its use due to economics. However, use caution when including urea in beef cattle diets. It can be toxic if improperly used. Urea is quickly converted to ammonia upon entering the rumen. This ammonia can either be used by bacteria along with a readily available energy source to produce proteins or enter the bloodstream. If energy sources are limited in the rumen or if too much urea is consumed, then large amounts of urea can enter the circulatory system. When the amount of urea entering the bloodstream exceeds the capacity of the liver to remove it, cattle can suffer from ammonia toxicity or urea poisoning with death resulting in less than 30 minutes.

Prevention of urea toxicity is always better than having to treat the condition. Instances of urea poisoning are commonly due to improper weighing or poor mixing of urea into cattle feeds. Overconsumption of liquid or solid molasses-based supplements containing urea by hungry cattle can also lead to urea toxicity. Feed range cubes containing NPN on a daily basis rather than feeding larger amounts infrequently a few times a week. Fill cattle up on hay before placing liquid supplements or “lick tanks” containing urea in pastures. Once cattle are acclimated and start consuming liquid supplements, do not let them run dry. If dry lick tanks are suddenly filled, cattle may overconsume NPN.

Never feed raw whole soybeans and urea together. Soybeans contain an enzyme called urease which breaks down urea into ammonia. This combination can be deadly, so avoid feeding NPN sources and soybeans together. This includes soybean stubble and NPN sources offered or fed jointly.

Signs of toxicity include excessive salivation, rapid breathing, tremors, tetany and eventually death. Drenching with a gallon of vinegar may be useful if signs are detected early to neutralize the ammonia and prevent more from absorbing into the bloodstream. Consult with a veterinarian on the best course of action for treating affected cattle.

Urea works best with high-energy diets that contain crude protein levels below 12 percent. When using poor quality forages, cattle performance can be reduced if urea is supplemented in place of a higher quality protein supplement such as soybean meal or cottonseed meal. This is likely the result of insufficient UIP in the diet rather than the

faster rate of ammonia release in the rumen. Even slow-release forms of urea (biuret) are usually not effective in improving urea use on forage-based diets due to nitrogen recycling of the rumen and liver for secretion in the saliva. Thus, urea is generally a poor supplemental nitrogen source on forage-based diets. This includes forage and grain combination diets commonly used as “step up” rations during the introductory stages of cattle finishing. There is a need for rumen degradable protein other than NPN on these diets.

Rumen bacteria must have sufficient carbohydrate levels (energy sources) available to them if the nitrogen in urea is to be effectively utilized. Urea generally works best with high grain diets that are rapidly fermented in the rumen. Forage-based diets are digested too slowly for urea to be used efficiently. In grain-based diets, urea feeding levels should not exceed 0.25 pounds per day or no more than one percent of the diet. With such small quantities, it is often difficult or impossible to effectively mix urea into mixed feeds on the ranch. Precise mixing equipment is required to do this properly. The best option is usually to purchase a urea-containing supplement from a reputable feed supplier. Never topdress urea over feed offered to cattle.

Lightweight, young calves less than 400 pounds or 120 days old should not be fed urea. Cattle that are large enough and old enough to consume urea should be managed on feed for a few days prior to adding urea to the diet. Urea should also not be fed to newly received cattle that have been off of feed for a few days.

Non-protein nitrogen (urea) feeding checklist

1) Closely read all feed tags checking for urea content in range cubes, protein blocks, and liquid supplements.
2) Always weigh urea accurately and mix feeds thoroughly with proper equipment
3) Feed only in combination with sufficient readily available energy sources such as feed grains. Do not feed urea on poor-quality forage diets.
4) Feed no more than 0.25 pounds of urea per day or one percent of the diet.
5) Never feed to calves under 400 pounds or 120 days of age.
6) Avoid offering urea to starving cattle or newly received calves.
7) Never feed urea and raw soybeans together.

Protein supplements are available in many forms. High-quality forages, commodity co-product feedstuffs, range cubes, protein blocks, and liquid supplements are some examples. Product labels indicate the protein percentage and how much protein is in the form of non-protein nitrogen. Convenience products often contain NPN and are generally higher in price per unit of protein. Be sure to read all feed tags checking for NPN content in range cubes, protein blocks, and liquid supplements in particular. The molasses content of liquid supplements is usually not high enough for proper NPN utilization when supplementing low quality forages.

Use caution when feeding urea-based supplements. There are several situations where NPN use is not appropriate including low quality forage diets and when feeding lightweight calves. For more information on beef cattle nutrition or related topics visit a local office of the Mississippi State University Extension Service.