



The Myths About NPN

By Jackie Nix

Within the goat industry there are many misconceptions, myths and outright untruths floating around concerning the use of non-protein nitrogen (NPN) in goat diets. The practice of utilizing NPN sources in ruminant feed supplements is long established and has been highly successful over the years. Research has documented that proper use of NPN in feed supplements will maintain production or actually increase production in cases where protein deficiency is present. The purpose of this article is to explore the science behind the use of NPN in ruminant rations. Additionally I will list some of the advantages and disadvantages of this practice so that goat producers may form an informed opinion on the practice. Before we discuss NPN, it is necessary to understand some basics about how the rumen functions in order to understand how NPN fits in.

Rumen Physiology

The rumen (the first compartment of the ruminant stomach) is essentially a fermentation vat at the beginning of the ruminant digestive system. The rumen houses many species of microbes that feed on the rumen contents. It is important to remember that when you feed a goat you are essentially feeding the rumen microbes. Fatty acids (used as a primary energy source by the goat) and B-vitamins are by-products of the fermentation of rumen contents. Enzymes produced by these rumen microbes break down most of the protein consumed by the animal. One of the resulting by-products from this protein digestion process is ammonia. Ammonia can be utilized in one of two ways. The microbes can use it to manufacture microbial protein or, if the ammonia level exceeds the microbes' ability to utilize it, the ammonia is absorbed through the rumen wall into the blood stream where it is carried to the liver. The liver then detoxifies ammonia and converts it into urea to be excreted into the urine. A portion of the urea is recycled back to the rumen through saliva. Enzymes similar to those that break down proteins rapidly break down urea into carbon dioxide and ammonia in the rumen. This ammonia may also be utilized by the rumen microbes or may pass into the blood stream just as the ammonia resulting from protein digestion.

Rumen microbes use ammonia released from the breakdown of proteins and non-nitrogen sources as a part of their diet. Other necessary nutrients for microbial growth are carbohydrates and minerals. It is essential that ammonia be released simultaneously with available energy for ammonia to be converted into microbial protein. Also, phosphorus, sulfur and trace minerals must be present within the rumen environment in order for microbes to manufacture essential amino acids. The goat receives beneficial protein for its own needs when the bacteria and protozoa pass from the rumen to the abomasum and intestines where the microbes themselves are digested.

What is NPN?

NPN or non-protein nitrogen refers to a source of nitrogen that is not derived from protein. Urea is the most common source of NPN in livestock feeds and supplements. The urea utilized in livestock feeds is a synthetic compound manufactured specifically for feed and fertilizer use. It is

not harvested from the urine of slaughtered animals. Synthetically manufactured urea functions in the same way within the rumen as naturally occurring urea.

Advantages NPN

The primary advantage for use of NPN in ruminant supplements is cost savings. Addition of urea or other NPN sources to a feed supplement allows the effective crude protein level to increase for relatively low cost. Because microbial protein actually utilized by the ruminant animal is the same whether NPN or true protein is utilized, animal performance is maintained. Research has documented that proper use of urea or other NPN sources in healthy, mature ruminants does not result in a decrease in production and in cases of protein deficiency, production is actually increased. Therefore, it makes economic sense to replace a portion of the true protein within the supplement with NPN for cost savings. Depending upon the price of the true protein source being substituted (for example: soybean meal or cottonseed meal), the savings may be substantial. As an example let's compare two similar protein supplements. The cost per head per day for the Sweetlix[®] 38% Cotton Classic Supplement block, which contains urea, is \$0.03 to \$0.06. The cost of a similar all natural protein supplement, the Sweetlix[®] Meat Maker[™] 20% Pressed Block, is \$0.04 to \$0.08 per head per day. What is more telling though is that the cost per pound of crude protein is \$0.63 for the 38% Cotton Classic Supplement Block while the cost per pound of crude protein is \$1.65 for the Sweetlix[®] Meat Maker[™] 20% Pressed Block. The addition of urea to the 38% Cotton Classic block resulted in a savings of \$1.02 per pound of crude protein provided!

Disadvantages of NPN

While NPN-containing protein supplements can be a great tool for maximizing profitability in commercial goat operations there are some disadvantages to consider.

NPN should not be utilized with young kids, as their populations of rumen microbes may not be adequate to properly utilize the NPN. Also, the quality of the microbial protein formed may be inadequate for the high requirements of growing ruminants. It also goes without saying that non-ruminants such as horses, donkeys, pigs, etc. should not be allowed access to feeds or supplements containing NPN. Because these animals lack a rumen and the microbial population necessary to utilize the NPN, toxicity can result. For these reasons, NPN-containing supplements are recommended for mature ruminants only.

If fed incorrectly, NPN can be toxic. Toxicity results when the ammonia released from the NPN exceeds the rumen microbes' ability to convert it into protein. Excessive amounts of ammonia enter the blood stream, thus overloading the liver's ability to detoxify. The rumen pH will rise and normal rumen function will eventually cease altogether. Symptoms of ammonia toxicity include nervousness, excessive salivation, muscular tremors, respiratory difficulty and titanic spasms. Death usually occurs within ½ to 2 ½ hours. Contact a veterinarian immediately to treat cases of ammonia toxicity. As an emergency measure until the vet arrives, you can drench the affected animal(s) with household vinegar. The acetic acid in the vinegar will neutralize the ammonia and lower rumen pH levels, thus preventing additional ammonia from entering the bloodstream.

Using NPN Properly

Commercial supplements containing NPN can offer an economical solution to the problem of poor quality forages. NPN allows you to offer higher levels of effective protein to your goats to help maintain or increase productivity for less cost than "natural protein" supplements. When fed

properly, there is very little risk for toxicity. These NPN feeding tips will help avoid the possibility of toxicity.

- For simplicity sake, only use one type of commercial protein supplement containing urea at a time. If you must use more than one kind supplement that contains NPN, be sure to balance the ration so that no more than 25 % of the total crude protein in the entire diet comes from NPN sources to avoid possible toxicity problems.
- Urea or other NPN sources are best utilized when consumed in small amounts over a constant period rather than slug feeding. Slow release of ammonia is preferred to a rapid release. When choosing among free choice protein supplements containing urea make sure that consumption is regular and controlled so that goats are unlikely to over-consume NPN.
- Do not feed urea-containing supplements to horses, non-ruminants or ruminants without a mature functioning rumen (pre-weaning). Refrain from feeding urea-containing feed supplements to sick goats that have impaired rumen function (for instance an animal recovering from acidosis or bloat). Also avoid feeding urea-containing supplements to kids less than one year old for maximum productivity.
- Do not feed supplements containing NPN to starved goats, especially starved does nursing kids. Starved does will try to consume greater than recommended levels of the supplement, plus since their milk production will be poor their kids may be forced to consume supplement before they develop a functioning rumen. Mature goats in good flesh receiving adequate forages can safely and effectively utilize NPN-containing supplements, even with kids at their side. Does with adequate nutrition will provide enough milk so that kids will be very unlikely to consume enough of the supplement to cause problems.
- Do not feed urea-containing supplements to goats recently purchased at a livestock auction or that have been shipped long distances as they may have been starved for several days. Give them a chance to overcome the stress of shipping and fill up on “all natural protein” supplements before introducing NPN-containing supplements.

In summary, use of NPN-containing feeds or protein supplements can be an economically smart alternative for healthy, mature ruminants. When formulated and fed properly, these NPN-containing feed supplements help to raise effective protein levels in the total diet to maintain or increase production but at a substantially lower cost than products containing 100% true protein. Sweetlix[®] supplement products containing urea are carefully formulated to provide safe levels of NPN. Just follow the simple guidelines on the product labels for safe and economical supplementation of low quality forages. For more information about the Sweetlix[®] line of protein supplement products for goats, cattle or sheep and information to help you decide how they fit into your management situation, visit your local Sweetlix[®] dealer location or call 1-87SWEETLIX or visit www.sweetlix.com.

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