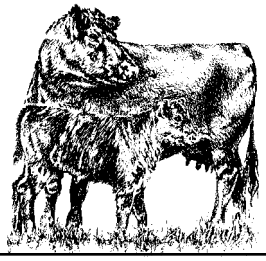

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Nutrition Section 322

Urea in Range Cattle Supplements

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Rangeland beef production systems require cattle to harvest energy from range forages and convert that energy into a marketable beef product. As range forages mature, they become lower in nutritive value. When the forage protein content in cattle diets declines to less than about 7 percent, both forage intake and digestion are suppressed, and animal performance is reduced. Beef producers may provide supplemental protein to mediate deficiencies in the forage, so that forage intake and use are optimized.

According to the Standardized Performance Analysis summary for New Mexico cow-calf operations from 1991 to 2001, supplemental feed for grazing beef cows averages about $60 per cow each year, representing a substantial variable cost. Stocker cattle grazing dormant winter range usually are provided a protein supplement as well. The primary protein sources in these supplements are plant proteins, such as cottonseed meal and soybean meal.

Cattle producers may possibly reduce the cost of range supplements by replacing a portion of the plant protein with urea or other nonprotein nitrogen (NPN) sources. However, excessive NPN levels in the diet can impair animal performance, so NPN should be incorporated in moderation into range cattle supplements.

The objective of this fact sheet is to discuss the inclusion of urea and other NPN sources in protein supplements fed to grazing beef cattle. The paper also provides general recommendations regarding the level of NPN supplementation and the frequency of NPN-containing supplement delivery.

Nonprotein Nitrogen: How It Works

Beef cattle and other ruminant animals rely on ruminal microorganisms to break down fiber in forages into useful end products. These microorganisms require energy, protein, and other nutrients to grow and function properly. In addition to digesting forage, microorganisms use nitrogen from the animal's diet to produce protein. This microbial protein eventually flows out of the rumen to the small intestine where it can be absorbed and used by the animal as true protein.

The nitrogen used by the microbes to produce protein does not have to come from true protein; it can come from many nitrogen-containing compounds. For many types of microbes, especially those that digest fiber, ammonia is the preferred form of nitrogen. This ammonia may come from digesting true protein or from other ingredients that release ammonia in the rumen.

When cattle consume low-quality forages, nitrogen in the form of ammonia often is in limited supply. If the protein content of the forage diet is less than 7 percent, it is likely that the ammonia supply is inadequate for maximum microbial function. Protein supplements are fed to improve ammonia supply. Ammonia can come from "natural" protein sources, such as cottonseed meal and soybean meal, or from NPN sources that are converted to ammonia in the rumen.

The microbial need for ammonia is related to the amount of energy available from the diet. In order for ruminal microbes to effectively use ammonia, adequate energy must be available. Therefore, if the energy content of the diet is low, then ruminal ammonia requirements are low. If the ammonia concentration in the rumen exceeds the amount of energy available, microbes cannot use it efficiently, and the excess ammonia is absorbed across the rumen wall into the blood stream and transported to the liver.

Free ammonia in the blood is detoxified in the liver by converting it into urea and then excreting it in urine. If ammonia is absorbed from the rumen too rapidly and exceeds the liver's detoxification capacity, it passes into the main blood system and can cause death. The potential to oversupply ammonia is the chief concern when using