The Latest Across the Plains

Unused Feed

"I believe in the future of agriculture, with a faith born not of words but of deeds." -E.M. Tiffany

Save Money $$$ Test Your Feeds

Tests are relatively inexpensive, usually costing less than $18 for the information derived. Contact our office to set up an appointment to have us pull feed samples if we have not done so yet.

Beef Facts

- A cows average estrus (heat) cycle is 17 to 24 days.

Timely Reminders

- USDA is accepting CFAP Applications now through August 8, 2020. It appears all aspects of beef production are included. Non-specialty crops such as corn and soybeans are also included.
- Use at least two methods of fly control.
- Deworm cows and bulls with an injectable or drench de-wormer.
- Semen test bulls and make sure they have an adequate ration including mineral.
- Review your heat synchronization program and time-line.
- Put up shades.
- Make sure that waterers have enough space, recharge rate, and are cleaned weekly.
- Review your implant program with us.
- Review rations with current feed costs.
- Keep pens scraped.
- Implant suckling calves going to pasture.

The Great Plains News Feed

Navigating Protein Nutrition and By-Products for Beef Cattle

By: Matt Luebbe, Ph.D. and Jeremy Martin, Ph.D.

The Truth About Urea

Many people have heard negative comments about including urea in rations due to either toxicity issues or that it is simply not a natural source of protein. Non-Protein Nitrogen (NPN) is common in many supplements as a low-cost alternative compared to "true, organic, or feed" protein. The most common and least expensive form of NPN is urea. Some people are feeding urea and do not know that many lick tubs and other protein supplements have urea as an ingredient. With commercial protein supplements, the guarantee on the tag often has a statement such as "Not more than 10% Crude Protein from Non-Protein Nitrogen". Take a look at some of your feed tags and focus your attention at the list of ingredients towards the bottom, urea is much more common than you think.

Before corn-based byproducts were available, many cattle in backgrounding and finishing yards were fed a high-quality roughage like alfalfa hay and the remainder of the protein needs were met using a urea-based supplement, soybean meal or cottonseed meal. When urea is degraded in the rumen, we are left with ammonia (NH_3) that can be used by microbes. Similarly, when protein from common hay, soybean meal or cottonseed meal are degraded in the rumen we are left with metabolites that are not actually protein. The protein from hay or other feedstuffs are degraded in the rumen into peptides (chains of amino acids), some true amino acids, and mostly NH_3 as nitrogen sources for microbes. This means that it does not matter if you feed urea or "natural" protein sources, there is still NH_3 and urea in the animal. Some of the most important fiber degrading bacteria in the rumen have a preference using NH_3 as their nitrogen source to build proteins later available to the animal.

Metabolizable Protein

When balancing rations for cattle, you are not only formulating to meet the needs of the animal but the bacteria living within the rumen as well. Since rumen microbes are living organisms themselves, they need a constant supply of both protein and energy to survive. The metabolizable protein (MP) system separates protein or nitrogen requirements of the animal from that of the rumen microbes. In the past, most rations were evaluated based on the crude protein system

(CP), and perhaps some estimate of degradability to meet requirements. On your farm or feedlot, we can easily calculate total CP of a ration and get close to requirements. This situation works well when byproducts are cheap and the focus is more on a cost of energy compared with protein.

The MP system uses the actual amount (in grams) of each protein fraction in a ration to predict protein supply- then we compare that with animal growth or production requirements. Protein from feed ingredients that does not breakdown in the rumen and is digested in the small intestine is rumen undegradable protein (RUP). Table 1 shows the crude protein along with the proportions that are undegradable and degradable in the rumen of common feedstuffs. As a generalization, RUP can be expensive to include in the ration without wet or dry milling byproducts. It has been easy in the past to meet RUP needs using corn-based byproducts such as distillers grains and gluten feed as a cheap source of protein.

Another RUP source actually comes from the microbes in the rumen. Protein that is degraded in the rumen and available to microbes is rumen degradable protein (RDP). The microbes use RDP for growth, reproduction and feed degradation. The animal benefits from this because the microbes use NH_3 and/or urea as their nitrogen source to make protein. Microbial crude protein (MCP) can amount to a more than half of the animals MP needs. In some finishing rations we can meet MP needs with simply corn, high quality forage and urea. Microbes are constantly passing from the rumen during digestion and supply protein to the small intestine where it can be digested similar to RUP from feed. Microbial protein may seem like a small or insignificant amount when we compare them to the size of the animal. However, there are 1.25 to 3.5 lbs of microbes (dry-matter) that pass from the rumen every day which are available to the animal as both an energy and protein source. Ruminal bacteria average 50% crude protein on a dry-matter basis while other microbes average between 20 and 60% protein. Ruminal microbes provide essential amino acids to the animal that are often needed as separate ingredients for other species. For beef cattle, we can estimate requirements based on stage of production and determine the amount of RUP and MCP supplied by rations after we meet the rumen microbe protein needs with RDP.

Table 1. Crude Protein (CP), Rumen Degradable Protein (RDP) and Rumen Undegradable Protein (RUP) on a Dry-matter Basis.

	CP, %DM	RDP, % of CP	RUP, % of CP
Corn	8.3	36.0	64.0
Distillers grains	30.0	32.0	68.0
Gluten feed	21.0	66.0	34.0
Whole soybeans	40.0	71.0	29.0
Soybean meal	48.0	55.0	45.0
Alfalfa hay (2nd cutting)	20.0	72.0	28.0
Urea	282	100	-

The Intersection of Protein and Energy

As nutritionists, we often say that protein and energy interact and changing one has an impact on the other. At different stages of production there are different requirements for MP. The requirements for a gestating cow, growing, or finishing animal are all different. Similarly, the type of feed used in gestation cow rations are often different compared to growing and finishing animals. Because microbes need both energy and protein, we need to account for the amount of energy in the ration (i.e. hay compared with grain) and then determine the amount of RDP or MP needed for maintenance, growth, gestation, lactation, reproduction, etc. In high energy or high concentrate rations, we can use a greater amount of RDP (i.e. urea) because the microbes have adequate energy to use NH_3 efficiently and also provide the animal with both energy and MCP. The amount of urea in finishing rations can go up to 0.30 lbs or 1.5% on a dry-matter basis without the risk of toxicity. In lower energy rations for cows or growing calves, less RDP is needed to support microbes degrading more forage or less digestible feedstuffs. If we change to a more digestible or higher energy ration using corn silage, urea is an option for these animals to meet protein needs.

Protein Recycling

In some rations we cannot always price in the ingredients needed to meet the MP requirements when looking at RUP and RDP separately. In the case of cheap distillers grains, we typically see a positive MP balance and negative RDP balance (Table 2). This does not cause a concern because ruminants are able to recycle the nitrogen back to the rumen through the bloodstream or via saliva. Most of the recycling uses urea as the intermediate to move the NH3 throughout the body efficiently. Some NH_3 is absorbed by the ruminal wall while other proteins from MCP are digested and recycled in the small intestine. This recycling comes with a cost but it allows the animals to move nutrients when needed for animals fed once daily. Recycling also supplies microbes with nitrogen as NH_3 to degrade lower quality feedstuffs. The estimate of recycling is 64% of the original amount of MP in excess of requirements (Table 2).

Ration Formulation and Byproducts

Due to drought, energy prices, or other factors, corn-based byproducts may become in short supply or simply high-priced. When we look at distillers grains as the primary protein source we can meet MP needs without adding urea due to recycling of urea within the animal (Table 2). When distillers grains are high priced it is tempting to remove all of the distillers grains and simply feed urea as a cheap protein source. However, a summary of experiments determined that a small inclusion of distillers grains or gluten in the ration (10% on dry-matter basis) has the largest return on investment when combined with urea. When

we remove distillers or gluten from the ration, there is typically a reduction in average daily gain. This reduction of gain is approximately 0.35 lbs when we switch from a distillers ration to a corn plus urea ration in finishing diets. The reduction in average daily gain is not as large when we keep a small proportion of distillers grains in the ration at 10% (dry-matter) and include some urea (0.15 lbs average daily gain reduction). When profitability and animal performance are considered, that small amount of distillers more than pays for itself, even at high prices. These examples are specific to finishing cattle and there is typically a greater need for RUP in growing rations. We will help you to evaluate these changes in your operation for protein and also discuss some important management adjustments when feeding less byproducts.

Table 2. Example Finishing Rations and Protein Balance (Dry-matter basis)

	Distiller Grains	Combination of Distillers and Urea	Urea Only
Corn	62.0	69.5	79.0
Corn Silage	18.0	18.0	18.0
Distillers	18.0	10.0	-
Urea	-	0.5	1.0
Balancer	2.0	2.0	2.0
Protein Balance g/d			
MP	272	180	66
RDP	-178	-95	-27
RDP from RUP	174	115	42
RDP corrected	-4	20	15

Practical Application of Finishing Rations Without By-Product Feeds

Many of us have recently faced a situation where using by-product feeds is simply not an option, regardless of economics. As a result, many of our clients have shifted back to using urea-based supplements, soybean meal, whole soybeans, or other protein sources. Ration composition changed dramatically, mostly over the course of a few steps, and has reminded many cattle feeders of some other factors one must consider when feeding without by-products.

First, roughage quality becomes a much larger factor in rations without wet by-products. In the past, many of us relied on corn stover, wheat straw, or other low-quality forage sources because of the availability of wet by-products. In drier rations, our options are more limited; and high-quality forages are needed. We have been able to maintain 1-2% corn stover (dry matter basis) in many of these finishing rations, and slightly more in some of the grower and cow rations, but we must have a more palatable roughage source to round out the ration. Alfalfa hay or silage fits these rations well because of the protein it provides. Corn silage is a good option, as are small-grain silages. However, in step-up, growing, or cow rations you simply have to have greater palatability and quality of forage that we often utilized with wet by-products. To that end, we are encouraging people to really focus on harvesting quality forages this summer to provide versatility in rations for fall and winter of 2020-2021.

Second, and perhaps more important in finishing rations, is that removing by-product feeds results in higher corn inclusion, thus a greater proportion of energy in those rations is fermented at a similar rate. This results in more potential for acidosis and bloat in rations lacking by-products, assuming similar roughage inclusion. Rations containing mostly high moisture corn can be especially problematic because it is fermented rapidly and to a great extent in the rumen. Practically speaking, it makes the most sense to utilize a combination of corn processing methods and perhaps more roughage in rations without by-products.

Bunk management is more important, and requires greater precision in rations that do not include by-products. Because bloat is more common, an increase in moisture in hay or silage piles due to rain or variability in source results in a greater likelihood of losing cattle. Furthermore, cattle tend to give the bunk reader less “warning” when they are nearing peak intake and it is easier to surpass their desired level of feed. Consistency of feeding time, accuracy of ingredient loading, correctly mixing, and uniformly delivering feed become even more important in rations with no by-products.

Feeding cattle in the absence of by-products may be a reality at your operation now, and will likely become a reality for most of us at some point in the future. While it is different, it is not new, and should not be scary. Understand what kind of protein you need, focus on high-quality roughage sources and dial in your bunk management to ensure your cost of gain is competitive. If we can be of assistance, please get in contact with us.

In Summary

- In lower energy (growing) rations less RDP is needed to support microbes degrading forage, however higher energy (finishing) rations, urea is an option to meet protein needs.
- Focus on forage quality this season to be prepared for lower by-product inclusion.
- Ration management with high starch, low by-product rations is crucial. Bunk management and mixing accuracy are more important than ever.

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