MANAGEMENT

Ridin' Herd

►by **Rick Rasby,** *Extension beef specialist, University of Nebraska*

Understanding a feed analysis

With summer hay harvest under way, it may be a good time to discuss an analysis of a forage or feed.

Introduction

Feed costs represent the largest annual operating cost for most commercial cow-calf enterprises. In the cow-calf enterprise, the more days during the year that a cow can graze, the greater the profit potential. However, in most areas of the United States there is a need for some harvested forages for emergency purposes or as a feed resource until cows can graze again.

In order to maintain an optimum balance between feed costs and production, feeds must be analyzed, and these analyses must be used to formulate rations and/or supplements.

Feedstuffs vary widely in nutrient concentration due to location, harvest date (maturity), year and other management practices. Tabular values may be used if necessary, but it is important to remember that they are average values and that significant variation exists. On a dry-matter (DM) basis, energy can easily vary ±10%, crude protein (CP) ±15%, and minerals by a much greater margin.

Table 1: Feed ingredients and their units of measure

Nutrient	Common Units
Moisture	%
Crude protein	%
Total digestible nutrients	%
Neutral detergent fiber	%
Acid detergent fiber	%
Net energy	Mcal/lb.
Calcium	%
Phosphorus	%
Copper	ppm
Zinc	ppm
Vitamins	IU/lb.

The *1996 Nutrient Requirements for Beef Cattle* published by the National Research Council (NRC) has a feed list and reports the standard variation in nutrients listed for each feedstuff. Not all feeds and forages are average; some are less than average and some are better than average.

Terminology

Once a feed sample has been collected properly, it can be analyzed for nutrients. Most commercial laboratories offer standard feed tests for forages, grains or total mixed rations. Analyzing cattle feeds for moisture, protein and energy is recommended. Furthermore, you may wish to identify key minerals or minor nutrients of interest.

Typically, results are reported on an as-is and DM basis. Nutrients should always be balanced on a DM basis because nutrient requirements for beef cattle are reported on a DM basis.

After formulation on a DM basis, values can be converted to an as-is basis (using the moisture content of the feed) to determine the actual amount of feed (as-is) that should be fed.

Feedstuffs can be analyzed using traditional wet chemistry technique or near infrared reflectance (NIR) spectroscopy. Samples can be analyzed more quickly, and usually more economically, using NIR. However, NIR is only useful for feedstuffs and ingredients that have been well-characterized using wet chemistry. Therefore, be sure to ask the laboratory if their database for your particular sample is extensive enough to ensure accurate results, particularly if you are analyzing less common feedstuffs.

The primary focus is on understanding and applying the results from a commercial feed analysis. Table 1 lists common nutrients and the units in which they are reported. The following explanations are categorized by nutrient and define terminology that a producer will receive on a feed analysis.

Moisture

Dry matter (DM): Dry matter is the moisture-free content of the sample. Because moisture dilutes the concentration of nutrients but does not have a major influence on intake (aside from severe deprivation), it is important to always balance and evaluate rations on a dry-matter basis.

Digestible dry matter (DDM): Calculated from acid detergent fiber, DDM is the proportion of a forage that is digestible.

Protein

Crude protein (CP): Crude protein measures the nitrogen content of a feedstuff, including both true protein and nonprotein nitrogen. In ruminants, evaluation of the fraction that is degradable in the rumen vs. the rumen-undegradable fraction is also important. However, the rumen degradability of protein is not measured in most commercial labs. Therefore, it is recommended that rations be formulated using analyzed CP values and average values for degradable intake protein (DIP) and undegradable intake protein (UIP) that can be found in NRC's *1996 Nutrient Requirements of Beef Cattle.*

DIP: The fraction of the crude protein that is degradable in the rumen and provides nitrogen for rumen microorganisms to synthesize bacterial crude protein (BCP), which is protein supplied to the animal by rumen microbes. DIP also includes nonprotein nitrogen found in feeds or ingredients.

UIP: The rumen-undegradable portion of an animal's crude protein intake. Commonly called "bypass protein" because it bypasses rumen breakdown and is mainly digested in the small intestine. Bypass protein is utilized directly by the animal because it is absorbed as small proteins and amino acids.

Metabolizable protein (MP): MP is protein that is available to the animal, including BCP synthesized by the rumen microorganisms and UIP.

Heat-damaged protein or insoluble crude protein (ICP): ICP is nitrogen that has become chemically linked to carbohydrates and thus does not contribute

to either DIP or UIP supply. This linkage is mainly due to overheating when hay is baled or stacked with greater than 20% moisture, or when silage is harvested at less than 65% moisture.

Feedstuffs with high ICP are often discolored and have distinctly sweet odors in many cases. When the ratio of ICP:CP is 0.1 or greater, meaning more than 10% of the CP is unavailable, the crude protein value is adjusted. Adjusted crude protein (ACP; see below) values should be used for ration formulation.

Adjusted crude protein (ACP): This is crude protein corrected for ICP. In most nutrient analysis reports, when ACP >10% of CP, the adjusted value is reported. This value should be used in formulating rations when ICP:CP >0.1.

Digestible protein (DP): Reported by some laboratories, do not use DP values without the guidance of a nutritionist. They are not needed for most ration formulation because nutrient requirements and most formulation tools are already adjusted for protein digestibility. Furthermore, protein digestibility is influenced by external factors.

Final thoughts

I'll discuss the rest of the terms on a forage analysis next month. There are three primary factors that determine forage quality:

1. maturity at harvest;
2. maturity at harvest; and
3. maturity at harvest.

The less mature the forage, the higher the quality at harvest. Also, the less mature the forage, the lower the tonnage harvested. For the cow-calf enterprise, these need to be balanced.

E-MAIL: rrasby@unlnotes.unl.edu

Editor's Note: *"Ridin' Herd" is a monthly column written by Rick Rasby, professor of animal science at the University of Nebraska. The column focuses on beef nutrition and its effects on performance and profitability.*

INDUSTRY NEWS

Research Update

►**Summaries** of current **beef cattle** research

Animal ID system: Survey indicates no clear majority favors or opposes

A national survey conducted in spring 2006 indicated no large majority in favor of or opposed to the implementation of a national animal identification system (NAIS).

The survey, conducted as a joint project between Kansas State University (K-State) and *BEEF*® magazine, included participants selected from a mailing list of cow-calf producers with more than 100 cows, said Dale Blasi, K-State Research and Extension beef specialist.

A random sample of 1,000 producers was selected from the magazine's mailing list. The survey gathered the thoughts and opinions of 522 cow-calf producers from 41 states. Data were collected by Prism Business Media Inc. and analyzed by both Prism Business Media and K-State.

"The bottom line," Blasi said, "is that these data provide us with a better understanding of producer attitudes toward the implementation of a national animal identification (ID) system. The data ultimately indicates that there is no large majority in favor of or opposed to such a system."

More information about the survey is available by contacting Blasi at 785-532-5427 or dblasi@ksu.edu; or K-State Research and Extension veterinarian Larry Hollis at 785-532-1246 or lhollis@ksu.edu.

Study shows vaccine reduces prevalence of *E. coli* O157 in cattle

K-State researchers are conducting a series of studies to test a vaccine, which may reduce the presence of *E. coli* O157 in feedlot cattle, said T.G. Nagaraja, professor of microbiology in the College of Veterinary Medicine.

E. coli O157, a pathogen commonly found in the feces of beef cattle, can enter the food chain during harvest and cause foodborne illnesses in humans, as well as economic implications for producers, Nagaraja said.

The researchers, who are part of K-State Research and Extension, recently completed the third study in a series of experiments, which included 60 feedlot calves that all tested positive for *E. coli* O157, said Daniel Thomson, who is the Jones professor of production medicine and epidemiology for the K-State College of Veterinary Medicine.

The calves were divided into one of three treatment groups that each received different doses of the vaccine (*Escherichia coli* O157 Siderophore Receptor Porin) on days 0 and 21 of the eight-week experiment. Group 1, the control group, received a placebo vaccine; Group 2 was administered 2 cc of the vaccine; and Group 3 was given 3 cc.

The study showed that the total prevalence of *E. coli* O157 in cattle that received 3 cc of the vaccine decreased by 15% when compared to cattle that received a placebo, Nagaraja said. The overall prevalence for each treatment group was 33.7% for the placebo group; 29.1% for Group 2 (2 cc); and 17.7% for Group 3 (3cc).

This study was the third in a series of studies in which the first two also showed promising results, Thomson said. The first study was conducted as a challenge study. Cattle were administered the vaccine and then challenged with *E. coli* O157 bacteria.

"In the first study we saw a significant decrease in animals with *E. coli,* and it appeared to be a very promising vaccine to take into the field to study," Thomson said. "The second study was conducted on 20 lots of cattle in a commercial feedlot in Nebraska."

The results of the second study showed a 60% reduction in the number of cattle shedding *E. coli* O157 relative to the cattle that were given a placebo vaccine, he said.

K-State will conduct another study this summer in a feedlot setting and may look at the effects of different doses, said Thomson.

— Story by Leah Bond, lbond@ksu.edu, K-State Research and Extension