by John Goeser

# Fat and fatty acid analysis is evolving

FEED and forage analysis interpretation in most cases begins and ends with a focus on protein and carbohydrate measures. The prior two articles in this series centered upon improving your ability to understand these two nutrient content sections on the feed analysis report.

In each of these previous two categories, there are historic crude measures and also more current detailed and accurate measures. For example, amino acid measures are more accurate and precise than crude protein measures. Or, in the carbohydrate category, sucrose and fructose measures are more definitive than the crude water-soluble carbohydrate sugar measure.

Animal nutrition is advancing with more accurate laboratory measures in support of more precise and efficient nutrition programs on dairy or beef farms. Over the past five to 10 years, the fat analysis section on your feed analysis report has evolved in a similar fashion. This energy dense section of the feed analysis reports crude fat measures as well as more precise and accurate total and individual fatty acid amounts.

Prior to describing the fat measures, we need to differentiate fat's nutritional impact from protein or carbohydrates to better interpret the fat feed analysis report section. Protein provides usable amino acids for growth and development. Carbohydrates provide digestible energy, which kick off a nutrient digestion and metabolism cascade in the rumen. Protein and carbohydrates are somewhat co-dependent with one another, but fat is different.

## Packed with energy value

Fat is energy dense, containing roughly twice the caloric value of starch and sugars and substantially more energy than protein. Traditional nutrition programs have balanced fat in diets to ensure adequate calories and energy are available, with an emphasis on maintaining body condition or supporting high dairy cow performance. Crude fat, also known as ether extract, has done a great job of accounting for fat's caloric value on your feed analysis report.

Mike Rankin

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In the laboratory, this fat extraction technique uses an ether reagent to extract fat and fatty acid like compounds, and then reports total fat content by difference. For example, if a laboratory technician starts with 100 grams, and extracts 3 grams with the ether extraction technique, the fat by ether extract value is reported as 3% of dry matter.

As dairy nutrition and research has evolved, more accurate and precise measures have led the way. Similar to the other feed analysis sections, more current and precise measures for fat are now reported. Individual and total fatty acid measures have become common on your feed analysis report. These measures have become a focal point in nutrition, recognizing that fat in dairy and beef diets has brought more than just energy to the diet.

The specific fatty acid effects can be positive or negative. For example, a mere 2 grams of trans-10, cis-12 C18:2 fatty acid bypassing the rumen will crash milkfat in dairy cows. This fatty acid is derived from unsaturated fatty acids in the diet, and corn oil is rich in unsaturated fatty acids. Do not worry about the biochemistry involved here, but recognize that nutritionists are beginning to account for specific fatty acids in diet formulation while also balancing total fat. Hence, feed analysis reports today list myristic, palmitic, stearic, oleic, linoleic, and linolenic fatty acids.

These fatty acids are 14 to 18 carbon chains long. Palmitic and stearic acids are predominant fatty acids in animal fat, or lard. These are saturated fatty acids and are fairly inert within the rumen. The oleic, linoleic, and linolenic fatty acid concentrations are unsaturated fats. These unsaturated fatty acids are known to have different effects in animal nutrition.

## Not all are equal

Nutritionists will feed fatty acid supplements that are rich in these different fatty acids to achieve different goals. They will also sum up the oleic, linoleic, and linolenic acid values to define rumen unsaturated fatty acid load, or RUFAL. Nutritionists monitor the total diet RUFAL amount as a risk factor with milkfat depression. Oleic acid is a focal point with dietary fatty acid digestibility and is also a predominant fatty acid in Plenish soybeans. The RUFAL focus or Plenish soybeans represent two examples where specific fatty acid measures are relevant.

There are not well-recognized benchmarks for forages to consider at this point. In the future, we will continue to explore varieties or hybrids with unique, specific fatty acid characteristics. We will also further move away from crude fat measures as we balance dietary fatty acids much like we do when balancing for amino acids.

The fat section on the feed analysis report is relatively brief compared to protein or carbohydrate categories. However, this energy dense section of the report has evolved in complexity much like protein and carbohydrate measures have become more specific. Future animal nutrition efforts will continue to emphasize both the total caloric value from fat as well as targeting specific fatty acids to improve animal health and performance. ●

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