

## Healthy Rumen Key to Higher Components

Since Multiple Component Pricing (MCP) was implemented five years ago, there has been heightened interest in milk components, especially milk protein. But when it comes to increasing component yields, many dairy producers wonder whether it is better to breed for components or feed for components.

The answer is both. That is because half of the variations in milk fat and protein are due to genetics and half are due to environment.

And when it comes to the environmental part of the package, Jersey breeders that balance their rations for protein, energy and fiber and practice sound bunk management can increase milk yield and component percentages and boost profits from milk check premiums.

### Feeding for Components

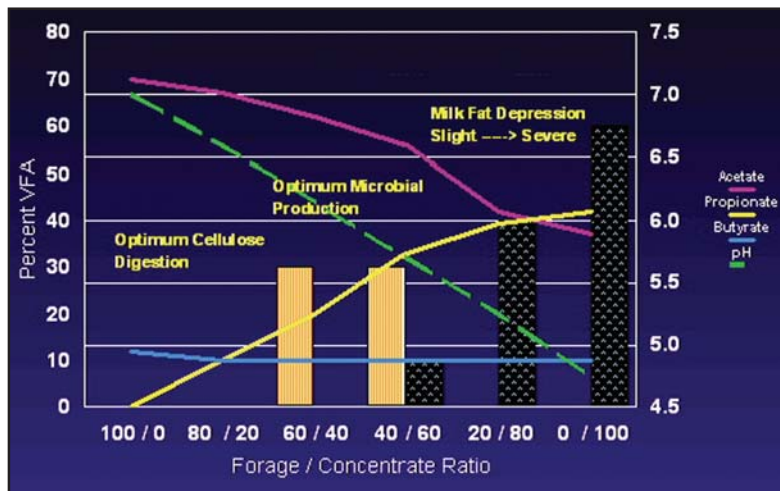
So just how much can a dairy producer influence components by diet alone? In a study done at Pennsylvania State University on Holstein and Jersey herds in the Mideast Federal Milk Marketing Order, researchers Bailey, Jones and Heinrichs found that nutritional changes can be expected to alter milk fat by about 1 percentage point. Changes in milk protein are limited to 0.1 to 0.3 percentage points.

The study also revealed that there were large variations in milk composition among herds in the region. The wide range in component percentages indicates that there is opportunity for many to improve component production since herd management impacts component production and dairy producers have options for changing components.

To evaluate your herd, look at milk yields and compare components to the breed average. Calculate your protein-to-fat ratio and if it falls below 77%, take a closer look at your rations. A higher ratio indicates an opportunity to increase milk production. Jersey averages reported in the

August 10, 2004 issue of *Hoard's Dairyman* are 3.53% protein and 4.58% fat. The ratio of protein-to-fat is 77%.

The key to getting maximum components is to focus on rumen health.



The chart above illustrates how forage-to-concentrate ratios in the diet impact the volatile fatty acids (VFA) in the rumen and rumen pH. Generally, as forage levels decrease and concentrates increase, propionate levels increase and rumen pH and acetate levels decrease.

“Make sure the rumen is healthy and getting fed high-quality, digestible forages with reasonable grain levels,” advised Cargill Nutritionist Tim VonSanden, who balances the ration for Den-Kel Jerseys, owned by Kip Keller and Robin Denniston-Keller, in Byron, N.Y.

Fiber is one of the first ration ingredients a dairy producer should evaluate, both in terms of quantity and quality. It is recommended that at least 45% of dry matter come from forages and forage substitutes. If forage quality is good, forages can be increased to 50-55%.

The Den-Kel Jersey herd is fed a very high-fiber diet. The couple and Von Sanden have experimented with the forage-to-concentrate ratio, having fed as little as 58% and as much as 66% forage on a dry matter basis. The ration works for the couple as their herd is ranked ninth in the nation for milk and protein production, with a 2004 AJCA lactation average of 22,461 lbs. milk, 1,029 lbs. fat and 806 lbs. protein on 66 lactations.

Because they feed so much forage, the Kellers are mindful of forage quality, feeding only the best in order to avoid energy deficiencies, which lower milk protein. “We have custom harvesting done

and are aggressive about getting the best forage we can,” remarked Kip Keller. “We start cutting around May 15 and then again every 28-32 days thereafter.” Quality comes from harvesting at the proper state of maturity and moisture and cutting to ideal particle length.

Evaluating forages for quality and quantity is often not enough, remarked Dr. Doug Waterman, Shur-Gain, Inc.

“The industry needs to differentiate between digestible fiber and effective fiber,” he told dairy producers attending the Bottom Line 5 management series this past August. “Too many times we throw it into the same gamut and say we’re going to feed fiber.”

“Digestible fiber provides rumen microbes with another source of

fermentable carbohydrates (besides starch, sugar and pectin), which is needed to synthesize volatile fatty acids,” explained Waterman. Volatile fatty acids are the true energy sources of the cow and include propionate, acetate, butyrate and lactate.

“Effective fiber helps to form and maintain the rumen mat and stimulates cud chewing,” he continued. If the diet is providing enough effective fiber, 50% or more of the herd will be laying down chewing cud at 70-80 chews per cud.

Currently, the dairy industry is using the Penn State-Nasco shaker box to measure particle size and predict the amount of effective neutral detergent fiber in forages.

### Fat Versus Protein

One of the best methods for altering the composition of components is by changing the forage-to-concentrate ratio.

“To get fat production, we have to have more acetate and the best way to get that is to have a high-forage diet with high levels of effective and digestible fiber,” Waterman noted. “Propionate, which is generally driven by grain, is going to help us on the protein side.”

“As we feed more forage, we get more

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## Key to Components

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acetate (and fat) and generally have a healthier rumen because we have a higher rumen pH,” summed Waterman. “As we feed more concentrate and get more propionate, we’re going to get more milk protein.”

This is generally due to the fact that there is increased microbial protein synthesis from higher levels of fermentable carbohydrates in the rumen.

And while it might be tempting to feed high-concentrate diets to improve protein levels, the cow and her rumen are not healthy. A lack of effective fiber and excess starch can cause poor rumen function, which can lead to increased health issues and suppressed fat levels.

The cow’s ability to synthesize protein is also affected by dietary protein intake, supplemental fat intake and her amino acid profile.

“We have to have the right amount of protein in the ration, maximize microbial protein and balance for amino acids,” explained Waterman. “We want large supplies of glucose to drive propionate production and large amounts of microbial protein, so we need rumen available carbohydrates to drive that. Then we need to make sure we have the appropriate balance of metabolizable amino acids.”

Metabolizable amino acids come from two sources: microbial protein (amino acids synthesized by rumen microbes) and amino acids from dietary protein that is not degraded in the rumen and is then bypassed to the small intestine. These sources are absorbed in the small intestine and used to produce milk and milk protein. Because it has the best amino acid profile, microbial protein is important to maximize.

The amino acids lysine and methionine are typically limiting and have been shown to increase milk protein percentage by as much as 0.2 without affecting milk yield. Sources of these amino acids are high-quality by-pass protein supplements and rumen-protected amino acids.

Von Sanden routinely evaluates the Den-Kel ration to make sure key amino acids, including lysine and methionine, are readily available. “We find that when we cut out the amino acids to reduce costs, we loose milk and components,”

commented Keller.

While the supplements may be expensive, they may also be justified in protein-premium markets.

### Other Considerations

Dairy producers should also consider harvest practices and bunk management to improve the components in their milk.

For Dale Smith, Hamburg, Minn., whose family raises all its own feed for Smith Haven Dairy, attention to these details has paid handsomely. “We reached \$6.50 per hundredweight above the base price when milk was at its peak, and now

are around \$4.00-4.50 above the base.” The herd’s 2004 A J C A lactation average stands at 22,637 lbs. milk, 1,064 lbs. fat and 814 lbs. protein on 73 lactations,

which ranks the herd eighth in the nation for protein and milk.

“We grind high moisture corn fine and cut haylage to the proper length,” he explained. “We put everything through the shaker box so that it’s the right length and try not to over mix.”

It is recommended that haylage be chopped 1-2 inches in length and corn silage be chopped 5/8-3/4 inches in length. Moisture for both haylage and corn silage should be 65-70%. For total mixed rations (TMR), particle length should be .5 inches or longer, with one-fourth of the particles greater than one inch in length and moisture in the 45-55% range.

To slow feed through the rumen and drive cud chewing, some dairy producers, including Smith Haven Dairy, add straw to the diet. Smith remarked, “We feed 1.00-1.25 pounds of wheat straw in the TMR to keep a good feed mat in the rumen year round. In the winter, though, we may drop this to .75-1.00 pounds per cow per day.”

Processing methods can impact milk composition as well. To enhance rumen starch digestion and improve milk yield and protein percentage, process grains by cracking, rolling or steam-flaking. Pelleting has a similar effect. Be careful though, as processed grain causes acidosis more easily than whole or very coarse-textured grains.

Keep the feed bunks clean and shaded during hot weather and provide adequate space to encourage feed intake. Increased

feeding frequency increases fat test, especially for herds given low-fiber, high-grain diets. When a TMR is fed, frequency is not as important, as long as feed remains palatable and is fed at least once a day. Keep the diet consistent, especially with the base forage.

Carefully evaluate the use of supplemental fats. “If you’re going to feed dietary fats, make sure you’ve got the right fats and are feeding them in the right amounts,” cautioned Waterman. “You don’t want too much rumen-active fat, which can suppress rumen fermentation and depress milk protein.”

Without question, formulating a diet for the dairy cow that results in volumes of milk and components is one of the dairy producer’s greatest challenges. And with a variety of forages, supplements and energy sources at varying prices and availability, there is no single solution for every herd.

In the end, the dairy producer who remembers to keep the rumen healthy is the one most likely to win the dietary half of the battle to improve components.

### Influence of Particle Size on Eating and Rumination

	Fine	Medium	Course
Total Chewing Time (24 hours)	9.5	11.2	12.3
Rumen pH	5.3	5.9	6.0
Acetate to Propionate Ratio	72:28	75:25	76:24

Grant et al, 1990