by Steve Martin

Sustainability – cooking oil, beer and cows.

I HAD a good high school chemistry teacher. I look back at that class and realize that learning some building-block type concepts prepared me to soon add information on biochemistry, microbiology and even economics.

Somewhere along the way the importance of carbon became clear too – it's the fuel that makes everything go. No matter whether it's a human athlete burning carbons to make muscles move, your car burning carbons to make pistons move, or a dairy cow making milk, carbon makes things go.

Humans and other non-ruminant species get the vast majority of this valuable fuel from certain types of nutrients: simple carbohydrates and fat. Chief among the carbohydrates are starch and sugar. If a person is on a high-protein, low-carb diet it's still the carbons in the protein from meat, egg, milk or beans that gives them energy. There is just no energy without carbon!

As the world's population moves from 7 billion to 9 billion in coming years, it is incumbent upon agriculture to find ways to feed those hungry mouths. Picture a group of scientists, policy makers, government officials, and activists from all over the world in a meeting trying to solve the problem of how to feed that many people. And imagine a herd of cows in view outside a window from such a meeting. As the participants argue about everything from GMOs to climate change and efficient use of water, one gazes out the windows at the cows and sees at least part of the answer: the rumen!

As mentioned above, humans gain most of their needed energy from simple carbohydrates like starch and sugar. Most food ingredients, though, contain only a portion of the nutrient-rich carbohydrates that are needed. The remaining portion contains some protein, ash, fat and yes, fiber!

We humans need some fiber in our diets to maintain a healthy gastrointestinal tract, but we can't digest it. Here's where the magic happens. Cows have a microbial population in their rumens that can harvest valuable carbons and convert them into nutrients that humans can use.

So, back to the human on a high-protein, low-carb diet. This person is gaining energy from two main sources. One is the fat that comes along with protein. The other is the carbons that are in the protein portion of whatever they consume. And where did many of those carbons come from? Fiber! Fiber that was previously unusable for human food energy digestion.

So what does all of this have to do with cooking oil and beer?

In last month's column I discussed the use of by-products from corn sweeteners, wheat flour and ethanol as valuable cattle feed. Now let's consider the brewing and vegetable oil industries. They also provide high volumes of fiber-rich by-products that have either no or limited value as human food ingredients.

Take a look on the back of the vegetable oil label in your pantry, or on the back of a potato chip bag. You will see references to things like soybean oil, canola oil, sunflower oil, cottonseed oil, etc. It is the seeds of these plants from which the oil was collected. They contain between 20 and 35 percent oil.

Once oil is removed from the seeds, an enormous pile of "the rest" remains. Since the seeds are naturally high in protein, the protein level is concentrated even higher after you remove the oil.

Major protein sources

Soybean meal, cottonseed meal, canola meal, etc. are major suppliers of protein in animal diets. When those animals are ruminants, like dairy cows, both the protein and fiber portions are converted to high quality human-ready protein, fat, and sugar. Feeding characteristics of these meals vary among seed type, processing style, etc. The fiber portion of the various protein meals also varies widely in digestibility. Through the use of lab analysis and strong nutrition modeling, these high-protein by-products can be combined with forages and other feed ingredients to make milk and beef.

The brewing industry and its by-products might have been a better fit in last month's column about dried distillers grain (DDG), gluten, and wheat midds. However, brewers by-products differe from those. The main reason is they are usually more fibrous. Here is how it works:

The brewery takes in various grain ingredients that are usually from cool-season annuals like barley. Compared to corn, barley has much more fiber and it retains more structure after brewing. Once starch has been fermented out of the grain, the spent grains are ready for animal diets. They are referred to as wet brewers grain or WBG. This by-product is a great source of digestible fiber, contains as much as 30 percent protein, and adds ration palatability and some roughage.

Product variability between different breweries must be monitored, though, as nutrient and moisture content will change. The majority of WBG used in cattle feed comes from large commercial breweries where potential variability is less, but frequent moisture checks are a must.

The protein in WBG has lower rumen availability and thus a higher bypass level. So amino acid content must be modeled in the ration. The vast majority of WBG is sold at 25 percent dry matter and 75 percent water, so hauling cost is an issue. WBG use in dairy rations tends to be limited to farms within 100 miles from a brewery.

As mentioned earlier, ration variability is a risk to consistent milk production, so building dairy diets to minimize that risk is important. But managing cost is important too.

Products vary widely

When considering soybean meal, which is probably the protein ingredient with the least variability, and WBG, which may have the highest nutrient variability, the formulator must weigh both the pluses and minuses. In this example, knowing that WBG almost always saves feed cost, the decision can be a challenge.

I noticed recently during the same week that I wanted corn gluten to be added to a lactation ration at one dairy, but taken out at another. This should prompt the question of why?

At dairy number one there was significant pressure to reduce cost. The price of gluten allowed for around 10

cents per head of feed cost savings. Commitments were made to only buy gluten from a reputable supplier, not simply look for the best deal each week. There were also no other by-products in the ration, so I felt that 3 to 5 pounds per head of gluten would be a low risk opportunity to increase income over feed cost.

Dairy number two was a different story. In that case we were struggling to get over the hump on milk and were trying to remove potential variables – back to the basics, we called it. In addition, this ration option showed 7 cents extra cost per cow to remove the gluten. Since DDG was already in that diet, I felt our risk exposure using two by-product ingredients that approached a combined 7 to 8 pounds was maybe too high. Every situation does not have the same potential by-product nutrient value.

Cost savings need to be compared to potential risk. If including WBG saves around 5 cents per cow, maybe it's not worth the risk of one pound of milk worth 16 cents. But if a sampling protocol is used to send routine samples to the lab, including on-farm moisture checks, saving 5 cents might be the better choice. And the savings could be more than 5 cents. Don't forget, by-products may bring other values to the ration, like moisture or palatability.

Using risk versus value assessments, good management, and wisely using by-products is a great way to be sure that you are truly feeding for the bottom line. *WEST*

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