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Fermentrics™: A New Perspective on Carbohydrates

By Dave Tayson, Dairyland Laboratories, Inc.

The rate of degradation and overall digestibility of feedstuffs plays a large role in the efficiency of milk production and, ultimately, a dairy operation's profitability. Modern ration-balancing software recognizes this fact and attempts to model the kinetics of digestion to predict animal performance. However, until recently, laboratory analyses only provided glimpses of what was happening during a continuous fermentation.

Today feed reports commonly contain lines that read IVSD 2,7 or 8 hours for starch digestion and NDFD 24,30 or 48 hours for fiber digestion. True, these single time point analyses can be used to estimate the digestion rates for the carbohydrate pools, but multiple time point analysis is expensive and still does not answer the question of what is happening between time points.

After 15 years of refining and perfecting a technique for a gas fermentation system, Jay Johnston unveiled a new laboratory system called Fermentrics at the 2010 World Dairy Expo. In conjunction with Dairyland Laboratories, Inc., Jay's company, RFS Technologies, has for the first time provided field nutritionists with ready access to gas fermentation data for use as a diagnostic tool.

So what is Fermentrics and how does it work? As rumen microbes grow, their metabolism produces volatile fatty acids (propionate, acetate and butyrate) and gaseous products (mainly CO₂ and NH₄). Fermentrics measures these gases at hundreds of data points and uses non-linear modeling of curves to estimate the rate of digestion for the various carbohydrate pools. It also measures the amount of microbial growth and organic matter degraded during a 48-hour period.

With this information, nutritionists can make more informed decisions about the amounts and types of carbohydrates to include in the diet. Besides defining just how fast the "fast pool" is and how slow the "slow pool" is, Fermentrics helps to find the total gas produced by a feed sample, the relative pool sizes, the specific rates during each hour of fermentation, and the relative time for the carbohydrate pools to reach their maximum rates.

Like most analyses, time and experience will add to the value and validity of interpretations, but Fermentrics is already a powerful tool for evaluating rations and predicting productive responses. Blummel et al. were able to explain 84 percent of the variation in dry matter intakes of 54 forages using data from a gas fermentation system, and Jay Johnston has created a regression equation using data from Fermentrics that predicts milk production with an R² of 0.79. The graphs of the digestion rates are also a great way to



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show producers data that paints a picture of what is happening in the rumen. When a herd is experiencing production issues it can be a useful way to convince producers that a recommended course of action should be implemented.

The bottom line is that gas fermentation systems provide a new way to evaluate total mixed rations and a unique perspective on the factors that drive feed efficiency and milk production. Applying this and other technologies on today's dairy operations will be key to maintaining a competitive edge and profitability.

Dave Taysom started with Dairyland Laboratories, Inc. in 1986 and currently serves as the director and general manager. Dairyland Laboratories, Inc. is a completely independent laboratory providing extensive analysis of feed, forage, soil and water. You can contact him at dtaysom@dairylandlabs.com.

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