ANGUS BEEF BULLETIN

"The Commercial Cattleman's Angus Connection"

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Synchronize Nutrients

In an era fraught with change, it takes more than one approach to realize the potential of an industry in transition.

Story & photo by
ED HAAG

Achieving nutrient synchrony in ruminants might not offer a solution to all the challenges facing cattle producers during the next couple of decades, but Matt Hersom, beef specialist with the University of Florida–Gainsville, says this emerging line of inquiry will provide us valuable insights into at least two of the major issues the industry faces today and in the future.

"There is a growing need for optimized nutrient utilization to address increasing costs of production and environmental considerations," he says. "These two areas of concern will necessitate opportunities to improve nutrient synchrony."

For those unfamiliar with the term, nutrient synchronization is the balancing of nutrients within the rumen for the purpose of optimizing feed utilization and ultimately improving animal performance. The criteria normally used to evaluate nutrient synchrony are an increase in microbial yield, microbial efficiency, nutrient utilization and, in some instances, animal performance.

"When synchronization is achieved, we should see an increase in ruminal metabolism indicated by ruminal ammonia concentration, volatile fatty acid (VFA) concentration, microbial efficiency and microbial flow," Hersom says. "This increase in microbial activity, which manipulates the ruminal degradation, should cause an increase in intake and digestibility. This, in turn, should lead to better animal performance through an increase in nutrient extraction and supply of the products of fermentation to the animal."

Hersom notes that while the term and process might be unfamiliar to a large number of cattle producers, it is no less important to their future. Recently, the cost of production has risen dramatically. Most of this rise can be attributed to higher feed costs. In several beef-producing states the price of feeder hay has literally doubled during the last four years, jumping from $65 per ton in 2003 to $125 per ton this year.

"As we face higher feeding costs, achieving nutrient synchrony is becoming increasingly important to a beef producer's bottom line," Hersom says, adding that getting the optimum nutritional value out of every mouthful of feed could mean the difference between a profit and a loss in tomorrow's volatile beef production environment.

Similarly, he believes that nutrient synchrony could play an increasingly important role in helping beef producers respond to a range of nutrient management issues linked to the environment.

"In optimizing the use of the feed going into our cattle we can minimize the outputs that are coming out of the back end of the animal," Hersom says. "The more efficiently our cattle use their nutrients, the less impact they will have on the environment."

Andy Cole, beef researcher at the U.S. Department of Agriculture's (USDA's) ARS (Agricultural Research Service) Conservation and Production Research Laboratory research center in Bushland, Texas, agrees that having a better

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[PHOTO BY SHAUNA ROSE HERMEL]

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Synchronize Nutrients *(from cover)*

understanding of the role nutrient synchrony plays in an animal's utilization of minerals, like nitrogen (N) and phosphorous (P), could lead to better ways of controlling the flow of these minerals back into the environment via feces and urine. "We are looking at nutrient synchrony from an environmental standpoint," Cole says.

"We want to know how it is affecting our ammonia emissions and the excretion of phosphorous."

Supplementation as a synchrony tool

One of the biggest challenges facing those involved in studying nutrient synchrony is its complexity. Hersom points out that earlier attempts at monitoring synchrony in ruminants, particularly in cattle consuming high-forage diets, have ended with mixed results.

"There are enough complicating issues in the process to see a response consistently," he says. "We can pick out specific instances where it will work, but on a general basis I think it is harder to quantify."

Some of the problems associated with evaluating nutrient synchrony in a research environment are accurately measuring forage intake and determining the actual chemical composition of forage consumed. He adds that this is particularly difficult to quantify and qualify as it applies to grazing cattle.

In spite of the complexities that contribute to inconsistent research results, Hersom feels there are some established general principles that can be followed to achieve nutrient synchrony. "We are talking about matching energy and protein ratios as well as degradable protein and TDN (total digestible nutrient) ratios," he says.

Hersom adds that because it has been determined that the process of supplementing specific feedstuffs and nutrients in a forage diet can have a profound effect on synchrony, he, and many of his colleagues in the field, view supplementation as potentially one of the most effective ways to attain synchrony in ruminants.

This applies to the quality of the forage being supplemented and the frequency the supplements are made available to the cattle as well as to what and how much is supplemented.

Forage quality affects response

For Hersom, one of the interesting aspects of using nutritional supplementation to influence synchrony is the fact that low-quality forage that is supplemented with protein is more likely to exhibit a positive synchronistic response than high-quality forage supplemented with the same protein. He points out that one explanation for this could be that high-quality forages already have sufficient nitrogen, and by adding a protein supplement, an asynchronous imbalance is inadvertently created with excess nitrogen and a potential deficiency of energy.

This premise is supported by the research. Hersom refers to a study conducted jointly by the Division of Animal and Veterinary Sciences and the Division of Plant and Soil Science at West Virginia University, in which

Having a better understanding of the role nutrient synchrony plays in an animal's utilization of minerals could lead to better ways of controlling the flow of these minerals back into the environment via feces and urine.

the lower-quality forage responded more consistently to a protein supplement than did the higher-quality forage.

"In ruminants fed low-quality forages, the supplementation of protein has repeatedly improved animal performance," Hersom says. "The improvement in performance in general has occurred because of correcting a protein deficiency in the diet, thereby better synchronizing the supply of energy and protein in the rumen."

Besides the quality of the forage being supplemented, another variable known to affect synchrony is frequency. Hersom notes that in a frequency of supplementation trial conducted by participating Texas Agricultural Experiment Stations, grazing beef cows were supplemented cottonseed meal at three different frequencies (daily, three times a week, once a week) compared to a control.

While it was found that the grazing cows that received no cottonseed meal (the control group), lost more body weight and dropped in body condition score (BSC) to a greater degree than the grazing cows that received cottonseed meal, considerably less variability was observed in weight and condition between those animals that received the supplementation on a daily basis and those that received it less frequently.

Hersom sees these findings as significant because even the periodic introduction of the appropriate supplemental feed can have a positive effect on rumen synchrony. From a practical standpoint this means that, under some conditions, supplements do not have to be fed every day to see benefits from nutrient synchrony. For some cattle producers this translates into reduced labor and supplementation costs.

Practical applications for synchrony

For Hersom there are other practical reasons for understanding nutrient synchrony. "One of the beef

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Table 1: Utilization of feed delivery to affect nutrient synchrony, animal performance

	Treatment				
Item	**Control**	**Daily**	**3 days/week**	**1 day/week**	**SE**
Experiment 1:					
Body weight change, %	-18.2[a]	-12.2[b]	-11.5[b]	-15.1[b]	1.67
Body condition score change	-1.3	-0.8	-0.9	-1.2	0.23
Experiment 2:					
Body weight change, %	-19.1[a]	-11.0[b,c]	-14.1[b,d]	-13.1[b,d]	0.68
Body condition score change	-1.5[w]	-0.9[x,y]	-1.2[x,z]	-1.3[x,z]	0.11

[a,b,c,d]Means with different superscripts differ $P < 0.05$.

[w,x,y,z] Means with different superscripts differ $P < 0.1$.

Source: Huston et al., University of Florida, 1999.

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