Nutrition P+L+U+S

Volume 10, Issue 3 July 2013

IN THIS ISSUE:

Successfully Incorporating Non-Forage Fiber Sources Into Dairy Rations

Both cereal grains and forages are at record or near-record high prices, and their supplies are tight throughout most of the United States. As a result, dairy producers and their nutritionists are being challenged to identify and incorporate cost-effective alternatives into dairy total mixed rations (TMRs). At the same time, the availability high-fiber byproduct feeds has increased, creating both opportunities and challenges for new ration formulations. Barry Bradford, PhD, Associate Professor in the Department of Animal Sciences at Kansas State University, says this shift in feedstuff availability has led to the utilization of more non-forage fiber sources (NFFS), including wet corn gluten feed, distillers grains, soy hulls, wet brewers grain, wheat middlings, citrus pulp, cottonseed (whole or portions) and beet pulp. While the availability and affordability of these feed sources has brought some welcome relief to dairies, each NFFS comes with its own unique set of nutritional properties.

“A temptation when using an alternative feed source is to simply plug it in to replace another ingredient,” says Bradford. “In most cases, that’s not advisable with NFFS. Because many of them provide a high level of protein in addition to digestible fiber, they may replace a portion of both cereal grains and oilseed meals — in addition to fiber — in rations.”

Nutrition consultant Don Deetz, PhD, with GPS Dairy Consulting, Sioux Falls, S.D., says most herds that have included NFFS have used the alternative feed sources to replace some, but not all of the traditional forage fiber in their rations.

“Because the NFFS often ferment more quickly than most traditional forages, rumen acidosis would be a serious concern if they replaced traditional forage completely,” he says. “But because they usually ferment less quickly than traditional concentrates, their inclusion in rations to replace a portion of both categories often works quite well. The key is to navigate the delicate balance between too much and too little digestibility in the total ration.”

Bradford concurs, and says incorporating NFFS requires tearing out some pages from the old nutritional playbook. “Traditionally, we have formulated dairy rations based on forage:concentrate ratio as a starting point. With NFFS, that’s a fairly meaningless metric, because NFFS are high in fiber like traditional forages, yet pass rapidly through the rumen like concentrates,” he explains. “More reliable results will be achieved when rations are based on targeted concentrations of energy, neutral detergent fiber (NDF), protein and micronutrients.”

He suggests the following approach to successfully formulating TMRs with high NFFS inclusion rates:

- Determine a minimum effective fiber concentration to maintain rumen health and milk fat yield. Include forages necessary to meet this requirement, with an adequate safety margin.
- Incorporate a combination of NFFS and concentrates to provide at least 34 percent non-fiber carbohydrate (NFC), allowing total NDF to rise with increasing NFFS incorporation.
- Evaluate ruminally available unsaturated fatty acid supply and adjust inclusion rates to limit the risk of milk-fat depression.
- Evaluate protein supply, including rumen undegraded protein, metabolizable lysine, and metabolizable methionine supply predictions. Adjust ingredient proportions or add bypass amino acid sources to balance protein supplies.
- Re-evaluate targets for steps (1) through (3), then balance for micronutrients.

The result may be much higher NDF concentrations than in a typical diet, but the high digestibility of the non-forage NDF provides adequate ruminally fermentable organic matter to support high production of microbial protein and volatile fatty acids (VFAs). Deetz views this as a welcome shift from focusing on energy needs of the cow to catering to the energy needs of the rumen. ”I think we have long overlooked the importance of providing rumen bacteria the energy they need to grow and produce protein toward the nutrition of the cow,” he states. Dry-matter intake (DMI) also can vary with the inclusion of NFFS. These products often make rations more concentrated, and, in some cases, cows do not find them as palatable. Both factors can decrease DMI, although Bradford cites a recent study in which incorporation of a milling product similar to wet corn gluten actually decreased dry matter with no impact on milk yield, thereby improving feed efficiency.

Attention also must be paid to the physically effective NDF (peNDF) of rations incorporating NFFS, because a substitution for forage can greatly decrease mean particle size in the diet. Bradford notes that using wet NFFS can be helpful in ensuring adequate fiber intake, because they help to bind ration components together and prevent cows form sorting against longer forage particles.

Deetz predicts that, even if cereal grain prices settle down and forage supplies are restored, NFFS will retain an active role in the dairy nutrition picture going forward. He says NFFS are particularly useful in maintaining a favorable environment for rumen bacteria when dairies have an abundance of high-quality forage. Bradford agrees, noting that the nutritional lessons learned by necessity could continue to propel the industry forward.

"There is a growing body of information that indicates that optimal feeding of NFFS can not only lower feed costs, but also improve productivity of dairy cattle," he says.

CONSULTANT'S CORNER

Helping Herds Utilize NFFS

By Don Deetz, PhD
Independent Dairy Consultant
GPS Dairy Consulting, Sioux Falls, S.D.

The feed supply and price challenges of the past few years have caused those of us in the dairy nutrition industry to shift our attitude from a mindset of, "conventional wisdom indicates we can't do that," to, "how can we make this work?" I can say with confidence that, after more than 20 years in dairy nutrition, I have done things in the past few years that I never read about in a nutrition textbook, but with positive outcomes.

Non-forage fiber sources (NFFS) have helped us navigate the nutritional shortfalls that most herds have experienced, and we've learned many lessons along the way. One of them is that the cost, variability and composition of NFFS can vary widely. It is our job, of course, to help create rations that accommodate the chemical and physical characteristics of the NFFS. But helping producers ascertain a fair price for the feedstuff is another important service we can provide.

Assisting producers in managing the variability of the products they procure is another valuable offering. Because many of these feeds are by-products of other manufacturing processes, the quality and consistency of the "leftovers" is not of high priority to the processors. I advise clients to test loads periodically and to steer away from sources or suppliers that don't provide the desired quality or consistency. Easing the transition between batches by temporarily combining old and new also can reduce intake and performance variability.

Two tools that I have found useful in incorporating NFFS into rations are the Ohio State University's SESAME program, and the Cornell Net Carbohydrate Protein System (CNCPS). SESAME is a Windows-based program that estimates the break-even price of up to 140 feedstuffs based on their nutrient content, including ME, RDP and NDF, among others. Each feedstuff receives a valuation based from current market prices, which the user can adjust as needed.

The CNCPS is a nutrition model that helps predict the requirements, feed utilization, animal performance and nutrient excretion for dairy (and beef) cattle using information about feed composition, digestion and metabolism in supplying nutrients to meet requirements. More important to the incorporation of NFFS into dairy diets, CNCPS has been very useful for estimating the way in which the rumen bacteria might respond, given inclusion of a wide variety of NFFS into the diet alongside other feedstuffs.

One positive outcome of the "ration roulette" that we've been forced to play in recent years is the broader and stronger relationships that I have developed with the entire "feeding team" on many of the dairies with which I consult. What the future holds in terms of feed supplies and prices is anybody's guess, but the one advantage we have is that ruminant has a tremendous advantage of being able to utilize a wide variety of feedstuffs. The key to our success as nutritionists will be to continually develop possibilities thatconventional wisdom would suggest are not possible.

MATERNITY PEN

Hypocalcemia: Recent Findings, Modern Approaches

Hypocalcemia, or low blood calcium, often referred to as “milk fever,” remains a significant disease challenge for U.S. dairy herds. Garrett Oetzel, DVM, MS, Professor of Veterinary Medicine at the University of Wisconsin, says that both clinical and subclinical manifestations of the disease can trigger further events in the fresh-cow disease complex. Oetzel’s review of his own and others’ recent studies examining the current status of hypocalcemia on dairies shows that half or more of second-and-greater-lactation cows experience a temporary period of hypocalcemia around the time of calving, even if they do not exhibit clinical signs.

He describes several prepartum dietary approaches to preventing milk fever, including:

- Restricting prepartum dietary calcium to less than 20 grams daily for two to three weeks prior to parturition, followed by a high-calcium diet immediately after freshening. Although it may be difficult to achieve calcium intakes this low using common feed ingredients, the “low calcium” strategy can be effective where low-calcium ingredients are available, and dry matter intakes are low.
- Providing two doses of oral calcium supplementation, one at calving and one 12 to 24 hours later.
- Lowering cation-anion difference (DCAD) in the prefresh ration. A recent evaluation of data on this subject showed that lowering prefresh DCAD to 0 meq/kg of dry matter (a reduction from +300 meq/kg in this meta-analysis) reduced urinary pH from 8.1 to 7.0; reduced the odds of clinical milk fever by 5.1-fold; and reduced DMI by 11 percent (but DMI rebounded soon after calving).
- Increasing dietary magnesium to about 0.30 to 0.45 percent of total dry-matter intake.

BEYOND BYPASS

How Nutrition and Metabolism Affect Dairy Cow Fertility

Rapid re-breeding of cows after calving is an important dairy efficiency factor, yet often a difficult one to achieve. University of Florida dairy science researcher Jose Santos, PhD, says that whether or not a cow achieves pregnancy efficiently is a multi-factorial scenario.

He cites a number of factors related to calving and early lactation that can postpone cows’ return to ovarian cyclicity and fertility and prevent them from achieving or retaining pregnancy, including:

Low circulating concentrations of glucose and insulin associated with elevated concentrations of non-esterified fatty acids and ketone bodies early postpartum have disruptive and detrimental effects on the oocyte, granulosa and immune cells.

Negative nutrient balance can change the pattern of ovarian follicle growth, which can indirectly affect oocyte quality.

Cows experiencing negative energy balance may have extended periods of anovulation.

Extensive lipolysis and products from fat metabolism may be detrimental to oocyte quality and/or embryonic development.

Uterine health may be compromised because reductions in circulating concentrations of calcium and antioxidant vitamins in the days following calving can suppress immunity and leave cows more susceptible to uterine infections.

Calving-related disorders and diseases of the reproductive tract such as dystocia, metritis and clinical endometritis can delay ovulation resumption, interfere with conception, and contribute to early embryonic death.

Some dietary ingredients, such as gossypol, may negatively impact embryo quality and pregnancy maintenance when fed at high levels.

Santos says efforts to improve the nutritional status of close-up dry cows and limit the extent and duration of negative nutrient balance in early lactation should improve fertility as well as metabolic health. He emphasizes that one of the most important points is to improve intake in early lactation. Supplementing diets with unsaturated fatty acids from the n-3 and n-6 families have been shown to benefit lactation and improve embryo quality and survival. Furthermore, he recommends working to improve calcium homeostasis, and exploring supplementing diets with organic sources of selenium (although the response to this appears to be dependent on the selenium concentrations in dietary ingredients). Finally, Santos advises against feeding excessive amounts of gossypol that might result in plasma concentrations in excess of 5 ug/mL, which has been linked to impaired embryo quality and reduced pregnancy rates.

QUALITY CORNER

Non-Forage Fiber Sources Contribute More Than Fiber

Dr. Barry Bradford and Dr. Don Deetz offer many good, practical suggestions in their articles on non-forage fiber sources (NFFS). Although the focus of their subject is directed toward fiber, we must remember that these products contain other nutrients too, and many of the NFFS can contribute substantial amounts of protein to dairy diets. Dr. Deetz commented about some of these NFFS products being “leftovers” from other manufacturing processes, and subject to variability in quality. The content and quality of protein in NFFS can be extremely variable. This brings to mind how there is sometimes the temptation to use the cow’s rumen as a recycling tool for feeds that are not of high nutritive quality. It happens all the time with forages, when we have hay or silage that is poorer than we want, but we feed it anyway. Maybe we don’t have much choice with home grown forages, but we have a choice with purchased feeds. We should not use the cow or the rumen as a repurposing vessel for feed ingredients that will not support optimum milk production. The old adage that “you can’t make a silk purse out of a sow’s ear” surely applies here. In the feed ingredient selection process, especially for major contributors of protein, we need to identify and use products of high and consistent quality. This is often what separates the profitable herds from the struggling herds. When unsure of the quality of the ingredients that contribute lots of protein to the diet, Dr. Deetz’s recommendations for regular laboratory testing and rejection of inferior ingredients are some of the best recommendations we can follow.

HAPPENINGS

West Central Stays Current on Dairy Nutrition

Transition cow management and protein nutrition for lactating cows continue to be hot research topics. There was plenty to learn at the Joint Annual Meeting (JAM) of the American Dairy Science Association and the American Society of Animal Science, which West Central's sales team attended July 8-12 in Indianapolis.

Meetings like the JAM are important outlets for results from new and developing research, notes Tim Brown, Ph.D., director of technical support for SoyPLUS/SoyChlor at West Central. "With products like SoyChor and SoyPLUS, which have been borne of and proven by university research, each sales team member is always eager to see what is new and emerging in dairy nutrition," he says.

WEST CENTRAL®
406 First Street
Ralston, IA 51459
(800) 843-4769
www.west-central.com