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DFM products may be tool for managing stressed animal

As dairy producers look for effective ways to improve herd health and limit animal stress, direct-fed microbial products can have effect. A recent study confirms that these products can be a viable, effective tool for managing the stressed animal by helping improve dry matter intake and boosting milk production.

By Dwain Bunting and John Lopez

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A new study published in January by the *Journal of Dairy Science* indicated that feeding direct fed microbial (DFM) products to cows 21 days prepartum and continuing through day 70 of lactation can have a significant impact on dry matter intake (DMI), milk production and milk protein.

The study, by Dr. Elliot Block of the department of animal sciences at McGill University, also showed that feeding DFMs helped improve cows' metabolic status with regard to glucose, insulin, beta-hydroxybutyric acid (BHBA) and non-esterified fatty acids (NEFA).

Around the country, dairy producers are seeing similar results in their dairy operations using DFMs. They're expanding their use of DFMs as a new "natural" tool to help improve herd health and to help improve performance of cows during times of stress, especially during the transition period.

Ironically, however, many producers -- and even some feed consultants -- still don't have a complete working knowledge of DFMs. For example, in one recent survey, producers indicated that they lacked sufficient understanding of how DFMs work.

As producers lean more heavily toward these products, which rely on live organisms that can sometimes be used as a substitute for antibiotics, they'll find it increasingly more important to grasp a broader knowledge of how to evaluate, select and utilize the hundreds of DFM products now on the market.

The road to better understanding of these products has been a rocky one. There is a lot of confusion -- and a lot of misinformation -- about the products. There are many different products on the market, and they work in different ways. Some are more effective than others. All are reasons that adoption of DFMs has been steady but not rapid.

Compounding the problem is that the U.S. Food & Drug Administration ruled in 1989 that these products could not be called "probiotics" nor could they make therapeutic claims. Also, DFMs cannot claim to colonize in the animal's gut or directly claim to affect animal performance. The term "DFM" was created to clearly identify these products as "sources of live (viable), naturally occurring microorganisms." There are three basic categories of DFM:

* **Bacillus**. These are gram-positive bacteria that form spores that are very stable to environmental extremes of heat, moisture and pH. The spores germinate into active vegetative cells when consumed by the animal.

* **Lactic acid bacteria**. These gram-positive cocci or rods are highly useful because pathogenic organisms cannot survive in the lactic acid that they produce. There are three types of these organisms: *Lactobacillus*, *Bifidobacterium* and *Streptococcus*.

* **Yeasts**. These organisms are actually fungi and have different effects on the gastrointestinal ecosystem than bacteria. This is particularly true with respect to effects on rumen fermentation. (The Table contains the six different types of dried yeast products that the American Association of Feed Control Officials [AAFCO] has defined as ingredients for use in animal feeds.)

Summary of dehydrated yeast products defined by AAFCO				
Product Name	Species of yeast	Contains live cells	Contains growth medium	Feeding value
Primary dried yeast	Saccharomyces	No	No	Nutrient Content
Active dried yeast	Saccharomyces	Yes	No	Fermentative action Digestive aid
Irradiated dried yeast	Saccharomyces	No	No	Vitamin D ₂
Brewers dried yeast	Saccharomyces	No	No	Nutrient content
Torula or Candida dried yeast	Torulopsis or Candida	No	No	Nutrient content
Yeast Culture	Saccharomyces	Some	Yes	Digestive aid

However, the real confusion lies with this simple fact: The effectiveness of DFMs often depend on when they are used -- and how they are used. They're no substitute for poorly managed cows. They won't "cure" a cow that is sick or poorly performing. What DFMs can do is assist in improving cows' ability to deal with stress, especially during transition, by bolstering DMI and key blood indicators.

When they're used is most critical. The best response can be observed during the following situations:

* Very young growing animals -- A newborn animal acquires beneficial bacteria from its environment. It is desirable to establish early colonization of the gut with beneficial bacteria, as soon as possible.

* Periods of stress -- Handling, shipping, vaccination, weaning, heat stress and other situations can put stress on the animal, resulting in reduced appetite, feed intake and weight loss. The McGill University Study showed that DFMs are an excellent tool to help manage cows in transition.

* In conjunction with antibiotic therapy -- Antibiotic treatments can lower the number and growth of lactobacillus and other beneficial microbes in the digestive tract. DFMs can promote the rapid recolonization of the intestinal tract.

Animals under stress clearly respond more readily to DFM products than healthy, non-stressed animals. Therefore, DFM products should be seriously considered for feeding programs for lactation and parturition, neonatal animals and during disease or environmental challenges.

Intestinal ecosystem, DFMs

Since the 1950s, scientists have theorized that the intestinal microbial population played an important nutritional role in the performance of the animal. In recent

years, research has showed that the intestinal tract of even healthy animals was populated by both good and harmful organisms coexisting. Maintaining the healthy balance of these organisms is very important to the general health of the animal.

Under healthy, non-stressful conditions, good or beneficial microbials dominate the rumen and lower gut, preventing harmful organisms from getting a foothold. Beneficial organisms also aid in digestion and supply critical nutrients to the animal.

During stressful events, however, the growth of beneficial microbials is often disrupted allowing pathogenic microbials to prosper. During these stressful times, many DFM products can help realign that healthy balance, although different DFM products (live organisms versus metabolites) may function using different mechanisms.

Several explanations have been used to define the benefits of DFMs on animal performance. Here are some proposed methods explaining how DFMs work:

- * Production of organic acids -- DFMs have been found to produce a number of organic acids. The most common are lactic, acetic and formic acids. All of these acids have been found to inhibit intestinal pathogens to some extent. Organic acids also serve as energy sources to the animal or to other beneficial bacteria.

- * Production of antimicrobials -- There is evidence that certain strains of bacteria produce bacteriocins, antibiotics, hydrogen peroxide and other compounds that inhibit intestinal pathogens.

- * Competitive exclusion -- The basic idea behind this concept is that the beneficial DFM organisms colonize the intestinal attachment sites normally occupied by pathogenic bacteria, thereby preventing them from establishing in the intestinal tract.

- * Stimulation of immune responses -- There is evidence that the immune system is stimulated when animals are fed certain types of DFMs.

- * Reductions of toxic amines -- Some pathogenic intestinal microbes produce specific amines that irritate the gut wall and may produce diarrhea. Lactic acid-producing bacteria have been found to reduce the level of these amines in the gut and to neutralize enterotoxins.

In turn, there are also several theories explaining how DFMs can improve rumen fermentation. The rumen changes as inputs, such as diet and supplements, change. Measuring a production response, such as feed intake or milk production are important in determining the results of DFMs on rumen fermentation.

- * Increased supply of growth factors for key bacterial species -- Increased fiber digestion is frequently observed with yeast culture products and fungal extracts of aspergillus. The growth factors contained in these products may supply key nutrients directly to cellulolytic rumen bacteria or to fiber-degrading rumen fungi.

- * Moderation of rumen pH -- The inclusion of fungal extracts and yeast products does not consistently alter average rumen pH. However, these products may prevent the rumen from reaching its most extreme lows in rumen pH. Moderated rumen pH should have beneficial effects on fiber digestion in the rumen.

- * Enzyme activity -- Fungal extracts and yeast products may either contain or stimulate increased levels of cellulases, amylases or esterase enzymes in the rumen and may increase fiber digestion.

* Oxygen scavenging -- It has been proposed that live yeast products may help eliminate oxygen from the rumen helping to create a more optimal environment for anaerobic rumen bacteria

Considerations

Storing and handling the products is also important. Poorly handled, improperly packaged and incorrectly stored products affect how they perform -- and in some cases can even render them useless. The reason is simple. Many of these products are live organisms, so the handling procedures must be followed fairly carefully to keep them alive and effective.

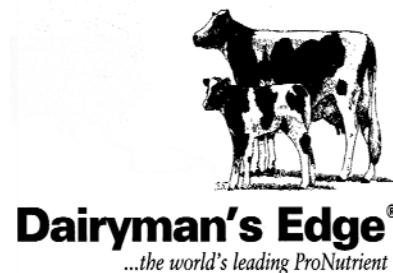
The biggest challenge, however, is selecting products that producers know will work -- and that they're comfortable with. The effectiveness and usefulness of these products ranges almost as widely as the number of products on the market.

The easiest recommendation is that producers select products from reputable companies with a track record of quality. Be sure the company conducts extensive strain research and development. It's also important to determine whether the company has modern manufacturing facilities that follow FDA's good manufacturing practices guidelines, part of the code of federal regulations.

The DFM products producers evaluate should have fast growth rates and metabolic cycles and resist inhibition from other intestinal organisms. It is important the products come in quality packaging and that the package is airtight, is resealable and includes directions for product use that are absolutely clear.

As producers look for effective ways to improve herd health and limit animal stress, DFM products can be helpful. As mentioned earlier, using DFMs won't cure poor management practices. As the Block study confirms, DFM products are a viable, effective tool for managing the stressed animal by helping improve DMI intake and boosting milk production.

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