Bacterial direct fed microbials for transition and lactating dairy cattle

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There is a great deal of interest in finding natural alternatives that can improve rumen and cow health. Bacterial direct fed microbials (DFMs) are one group of several alternatives that are promoted to supply several benefits to the dairy cow in various stage of her life.

There are several DFM brands to choose from. Choosing a DFM brand to use can be very confusing. Which supplier's information is reputable? What are the differences between products? Which DFMs work? What kind of results should the dairy producer expect?

These are all questions that the producer and nutritionist should ask before making a choice.

This article explores areas of differences between DFMs and will help you make an informed choice between products.

What are DFMs?

The United States FDA defines a DFM as a 'source of a live (viable) naturally occurring micro-organism'. Any product that contains DFMs is required to identify the strain of bacteria and the live cell count on the label. Many products promoted as DFMs contain other ingredients besides bacteria including fungal extracts, bacterial extracts, yeast, enzymes, and fermentation by-products.

How Do DFMs work?

Depending on the strain of bacteria, DFMs provide activity and benefits in the developed rumen and the lower intestinal tract. Several DFMs are promoted to alter the rumen fermentation to provide benefits of increased rumen pH, increased fibre digestion, and increased volatile fatty acid production.

By increasing the pH the rumen's fibre digesting bacteria are much more active resulting in the increased fibre digestion and volatile fatty acid production realised from feeding a DFM. Research has demonstrated measurable benefits include improved cow health, increased milk production, increased milk fat and protein production, and improved fibre digestion as evidenced by reduced fibre length and the amount of found in the manure.

Strains from the genii Enterococcus, Lactobacillus, Propionibacterium, and Megasphaera have been proven to demonstrate benefits to rumen health.

The other mode of action is effects on the lower intestinal tract.

These include improved balance of the 'good bacteria'' to pathogenic bacteria such as salmonella, clostridium, and E. coli, production of bacteriocins and organic acids which inhibit certain pathogenic bacteria, association with the mucosal layer of the intestine which prevents pathogenic bacteria from adhering to the gut, stimulation of the immune system, and production of enzymes to enhance nutrient digestibility in the lower GI tract.

There is less known about the effects of DFMs in the lower gut, but genii such as Enterococcus, Lactobacillus, Pediococcus, and Bacillus have demonstrated effects in the lower GI tract.

Their use for dairy cattle

Any DFM that improves the rumen pH or demonstrates effects in the lower intestinal tract will provide a benefit to a cow under stress including the period of transition from pregnancy, calving, to lactation. The main recognised benefit is improved cow health with a reduction in metabolic disorders.

During lactation continuing to feed these same DFMs will continue to provide benefits to rumen health and stimulate improved lower gut health.

The use of drenches, pastes, and gels containing DFMs allow for individual cow treatment during times of stress. Caution should be followed by observing the expiration date on these products to assure the bacteria in the product are viable.

Strains of DFMs in feed

Published research has demonstrated that feeding products containing specific strains of Enterococcus faecium and/or Lactobacillus acidophilus during the transition period resulted in improved rumen health, cow health, dry matter intake, reduction in metabolic problems, and improved production.

Specific strains of Enterococcus faecium, Lactobacillus acidophilus, and Bacillus have demonstrated effects in the lower intestinal tract by promoting improved cow health through pathogen reduction and improved immune function.

Other bacteria strains commonly found in dairy DFMs include Lactobacillus plantarum, Lactobacillus casei, Lactobacillus lactis, Bifidobacterium animalis, Pediococcus cerevisiae, and Propionibacterium freudenreichii.

Combination strains

A product that contains a single strain of bacteria may be as effective as a DFM prod-

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uct that contains multiple strains. Selecting the right single strain or combination of strains requires an extensive research and development program including numerous animal trials to support the selection of the strain(s) for a product.

Thus, selection of a single or multiple strain in a DFM product should be based upon 'sound' science and demonstrate able and reproducible results.

Combinations of bacteria, enzymes, vitamins, minerals, and other 'active' components do not guarantee effectiveness. In fact, some 'active' components can be detrimental to the stability and effectiveness of the bacteria in a combination product.

Ingredient and strain selection should be based upon the dairy cow's needs and the type and level of stress that the dairy cow is subjected to.

When should I feed a DFM?

As mentioned above, published research has demonstrated the benefits of certain bacteria strains when fed through the dairy cow's transition period through the peak dry matter intake.

Dairy cows under stress due to environmental conditions (hot weather), high pathogen loads, due to the presence of feed mycotoxins have shown responses to bacteria DFMs fed through the feed or administered as a drench or gel/paste tube.

How do you apply DFMs?

The preferred method is addition through the feed. Since one of the main benefits to using DFMs is improving rumen and cow health, the dairy cow should receive the recommended dose daily at each feeding.

The indigenous rumen bacteria take several weeks to adjust to a feed change. Thus, longer term feeding of a bacterial DFM will provide the optimum benefit and return on investment.

Although not the preferred method, the use of a drench or gel/paste tube containing DFMs offers an option for treating cows under intense metabolic, disease, or 'off feed' stress.

Water application should be the last resort. Bacteria do not survive for any extended period of time in water systems. In addition, any water chlorination will kill bacteria immediately. Also, there is a high degree of variability in daily water intake between individual cows.

Are DFMs cost effective?

There is a wide range in the cost of products containing DFMs designed for dairy cows. Many commercial products contain enzymes, yeast, fungal products, vitamins, and trace minerals which may or may not complement the activity of the bacterial DFM.

Feed applications are generally lower cost than individual treatment using drenches or gel/paste tubes.

Those DFMs that are cost effective and provide an attractive ROI have peer reviewed, published research data to support the DFMs performance benefits.

Storage and handling

DFM products contain live organisms and keeping them alive is critical to the bacteria's effectiveness. Poor processing, handling, improper packaging, and poor and extended storage conditions will affect the performance and benefits derived from a DFM.

It is most critical to prevent exposure to moisture and humidity which will cause bacteria to activate from their dormant state and die during storage. Although a label states a guarantee of bacterial viability (live cell count), it is not assured that the level of live cells is still present due to poor and extended storage conditions.

Maintaining live bacteria in the package requires special fermentation, processing, drying, cell conditioning, blending, and packaging processes. The use of 'moisture scavenging' technology in a packaged DFM will help assure control of moisture and viability of the bacterial cells. Packaging should be moisture resistant, with heat-sealed, multi-wall foil packaging.

The ultimate goal is to assure that the bacteria are alive, robust, and provided at the correct amount when fed to the dairy cow to provide the optimal benefits.

There are many DFM products that provide benefits and an economic return (ROI) when included in a dairy management program. There are many good reasons to use a DFM. Asking the right questions and understanding some basic criteria for selection of a DFM will help assure the DFM chosen is effective, safe, and provides a return on investment.

The ultimate goal of feeding a DFM is to assure that the bacteria are alive, robust, and provided in the correct amount when fed to the dairy cow to provide the optimal economic benefits. ■

Checklist of questions to ask your microbial suppler

- Is the manufacturer a basic screener and developer of bacteria?
- What are the specific bacterial strains in the product?
- Why was this strain(s) specifically selected?
- Is there credible research to support the strain selection?
- Is the number of live bacterial cells (usually CFU's/gram) guaranteed?
- Can you provide stability data on the DFM product?
- Can you provide credible, published and/or peer reviewed research to support the DFMs benefits?
- Can you provide technical support in the proper use and application of the product?