

Probiotics and direct-fed microbials

By: Lark Burnham, Ph.D. • Ruminant Nutrition

Probiotics, or direct-fed microbials (DFM), are live microbial feed supplements which beneficially affect the host animal by improving its microbial balance (Fuller, 1989). Although the first use of the term “probiotic” was by Parker in 1974, Metchnikoff initially proposed the concept in 1907 (Cole and Fuller, 1984). Since then, a multitude of microbial cocktails have been sold to livestock producers.

Many of these early versions often did not improve livestock performance. This was mainly due to either ignorance of the fragile nature of bacterial viability outside of the host, or desire to make a quick buck. This earned probiotics a poor reputation that they are still struggling over today. Probiotic effectiveness depends on several factors:

1. Viability - Many of the modes of action listed below depend on live microorganisms. Viability is reduced by exposure to sunlight and/or heat. Proper storage is required to insure microbial viability up to or beyond the stated expiration date. Refrigeration or storage in a cool place away from sunlight is recommended.

2. Selection of proven effective strains - Bacteria can be good, bad, and indifferent. Careful research is required to identify which is which. Several species have already been demonstrated to be effective, including *Lactobacillus* sp., *Streptococcus faecium*, yeast (*Saccharomyces cerevisiae*), and certain species of fungus (*Aspergillus* sp.).

3. Concentration - Most probiotics on the market contain from 10^7 to 10^8 viable microorganisms/gram. Generally speaking, the higher the concentration, the more effective the product.

Probiotic microorganisms must survive several

hazards, including low pH in the stomach and digestive enzymes in the small intestine. A large number of initial microorganisms must be fed to insure enough remain viable by the time they reach their target. The effectiveness of probiotic microorganisms is often attributed to the enzymes they secrete. However, this is just one mode of action. Others include:

1. Decreasing pH by production of volatile fatty acids (VFA)
2. Competition of nutrients
3. Production of substances toxic to pathogens
4. Production of antibiotic-like substances
5. Competition for adhesion sites

Some of the modes of action described above involve competition. For this reason, the probiotic

mechanism is often called “competitive exclusion.” Pathogens would be able to dominate the digestive micro flora under normal, healthy conditions if they were better competitors. In many cases, opportunistic pathogens, as they are called, wait in small numbers for disaster to

strike. Usually, the only time they can gain the upper hand is when the animal is stressed (Tannock, 1983).

Probiotics are usually available in two concentrations. The lower concentration is meant to be fed to healthy animals on a daily basis, and is often mixed with feed. Probiotics with greater numbers of viable microorganisms are designed to be fed preventatively before major stresses or to treat animals that are already sick. This latter concentration is usually available either as a paste or liquid.

The best way to protect livestock is to use prevention. This means the daily and preventive use of

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probiotics and quarantining sick animals. There are other, more severe prevention methods such as foot baths, showers and clothing change, but they may be a little extreme for exotic livestock production.

Be aware of what causes stress, this includes biological events such as birth and weaning; production activities such as shearing, transport, and showing; and weather, especially extremes and alternations in temperature. Probiotics can protect against stress if the right strains and numbers of viable microorganisms are used.

Literature cited

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Lark Burnham received a B.S. in Animal Science (1979), from Kansas State University and a M.S. in non-ruminant nutrition (1995) from Kansas State University, Manhattan, and a Ph.D. Doctorate in ruminant nutrition (2004) from Texas Tech University, Lubbock. Her special interests are comparative nutrition, the role of the micro flora in all mammals, fiber digestion, and probiotics. Lark currently works for Natur's Way, Inc., Horton, KS, which produces MSE probiotics.



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