ALL PROBIOTICS ARE NOT THE SAME

The use of probiotics or direct-fed microbials (DFMs) in animal feed to promote gut health has become an area of intense interest for many producers, particularly in light of the continuing movement away from Antibiotic Growth Promoters (AGPs) worldwide. And And DNA sequencing has helped us to significantly increase our understanding of the avian microbiome.

One important outcome of this research is the understanding that, while commonly used *Bacillus*-based DFMs are often applied as a single-strain probiotic, such a solution doesn't provide broad protection. To achieve broader control of highly diverse pathogenic populations, such as *Clostridium perfringens* (Cp) and avian pathogenic *Escherichia coli* (APEC), a multi-strain *Bacillus* DFM is essential (Gebert et al., 2006).

Achieving gut health and the performance benefits that come with it is largely a matter of establishing a balance in the gut microbiota in which beneficial bacteria such as *Bacillus* (normal inhabitants of the avian gastrointestinal tract) keep non-beneficial bacteria in check. However, there are many unique species of *Bacillus*, and within each species are numerous subtypes known as strains, and the effectiveness of each strain against specific genotypes of pathogens (of which there are also many) varies considerably. DFMs really are not all the same and therefore the results achieved can vary substantially.

Adding further complexity is the degree to which levels of Cp and APEC and their various respective genotypes differ between individual operations and farms. It has been shown that subtypes of APEC and Cp vary, not only from facility to facility, but also within a given operation over time (Gebert et al., 2006). Every site's microbial environment is a unique and ever-changing landscape.

Given this high variability, achieving broad spectrum pathogen control requires the application of those specific *Bacillus* strains providing effective inhibition of the widest array of those pathogens of greatest concern. DuPont has screened thousands of gut samples from major poultry companies for over 15 years to develop a unique library of *Bacillus* spp strains with varying activities. Our DFM product, based on three of these strains, has been shown to provide a viable alternative to commonly used in-feed antibiotics in terms of supporting liveability and production efficiency (see Figure 1), and when combined with feed enzymes, can deliver net benefits of 14% in relative cost per pound live weight gain in a necrotic enteritis (NE) challenge model.

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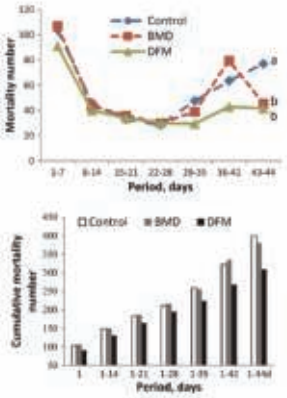

Figure 1 – Effect of using a multi-strain DFM compared to Bacitracin Methylene Disalicylate (BDM), a commonly used in-feed antibiotic, on average mortality numbers (Dersjant-Li et al, 2015)

In determining the optimal DFM solution, it is helpful to consider the attributes of an effective probiotic, since not all solutions are created equal. As described by Patterson and Burkholder (2003), those include: being of host origin and non-pathogenic; resistance to gastric pH, bile and high processing temperatures; stability in storage; adherence to the gut epithelium, persistence in the gastrointestinal tract; production of inhibitory compounds; and a positive influence on microbial balance in the gut. The degree to which specific *Bacillus* strain combinations deliver these benefits – particularly in the presence of specific non-beneficial bacteria – should lead to the most promising solution.

The growing body of evidence elucidating the biological mechanisms supported by probiotics should give producers confidence that an optimal solution for their challenge can be found. The right multi-strain DFM on its own can get similar performance effects to AGPs, or when used in combination with enzymes such as xylanase, amylase and protease, can provide an insurance policy that is proven in challenge situations. Customized solutions that factor in genetics and environment are also available. There is no "one size fits all."

For a copy of Dr. Siragusa's paper on "Modern Probiology," send your request to info@animalnutrition.dupont.com