

TECH REPORT | Poultry

Volume 3 | Issue 2 | Apr. 1, 2010



ANIMAL HEALTH & NUTRITION

Resistance, *Lactobacilli*, & Spores

CALSPORIN® and Resistance

Recently we were asked by a poultry veterinarian whether or not bacteria found in the gut of a chicken can develop resistance to CALSPORIN®, we presume much in the same way that pathogenic bacteria can develop resistance to antibiotics.

It is an interesting question. In order for microbial resistance to an additive to develop, that additive must be lethal to some of the population of bacteria under consideration, leaving survivors to proliferate. Based on all the tests that have been conducted on CALSPORIN® – and these have been extensive – there has never been any evidence that any bacteria has developed such a resistance. The primary mode of action of CALSPORIN® within the intestinal tract is believed to be an indirect one; by consuming oxygen and making the conditions within the digesta more anaerobic, feeding CALSPORIN® tends to favor the proliferation of lactic acid producing bacteria such as *Lactobacilli*. Over a period of time (days), we start to see a shift to more beneficial bacteria, and as a consequence a reduction in populations of *Clostridia perfringens* and *Salmonella*.

If you would like further information about this topic, please contact QTI at calsporininfo@qtitech.com and request our Technical Bulletin: CALSPORIN® and Resistance.

Improving Production Performance by Increasing *Lactobacilli*

For companies that are using or evaluating our products, QTI and Calpis USA offer fecal assaying as a service. Although there are several important and interesting measurements that come from these assays, one of the most important is the ratio of total *Lactobacilli* to total anaerobic bacteria (expressed as a percent.) It has been our experience that when we see this ratio go up generally, we typically see a flock or herd's performance, health, and safety rise also. One poultry producer, in evaluating CALSPORIN®, requested that we do fecal assays for each of the 10 large pens (10,000 birds per pen) in the trial. They then related bird performance to *Lactobacilli*/total anaerobic counts and found almost a 70% correlation. Just recently Dr. Danny Hooge, Hooge Consulting, did a statistical analysis of a controlled pen trial and

correlated pen performance to the fecal assay results. His analysis corroborated the results reported by the cooperating integrator.

Are All Spore Counts the Same? What is Too Much or Not Enough?

When determining which direct fed microbial to use, one important factor in the equation is the spore count. Spore counts are determined by CFU per gram. CFU stands for "Colony Forming Units." Quite simply, this is how many spores are mixed in when fed to your animals. These dosages can vary per brand, it's common to see dosages vary from thousands to a million per gram of feed. So what does this all mean and how much do you need?

Minimum Dosages

Most microbiologists tend to agree that a common dosage rate should be in a range of $\log_{10} 5$ per gram of feed. Reputable companies put in larger doses than required in order to build a cushion for losses from pelleting, variations during mixing, feed storage, poor activity, etc.

If you don't reach that minimum dosage, the performance could drop off providing inconsistent results depending on environmental pressure. A level below $\log_{10} 5$ per gram of feed is likely to even compromise the effectiveness.

What can create confusion is if more than one strain of microbial are in the mix. In order to work, each strain must meet its own minimum level of units per gram of feed.

So a problem arises if you compare total doses (adding the units together from each strain) as opposed to looking at units from each individual strain.

In other words, is it okay to have 50,000 units of one strain and 50,000 units of another strain since they add up to 100,000 total? Not necessarily. It's like having a ladder to reach the top level of a building. If you need a 20 foot ladder, having two separate 10 foot ladders isn't going to help. You may have the same total amount



of rungs, but that just means you're going to fall short with two different items. The same is true with the dosages of DFMs. A minimum amount of each strain is needed to have any effect, and the dosages are not necessarily cumulative in order to reach the desired effect.

Vigor in Spore Counts

There is another factor in the equation. Going back to our counts above, what we didn't mention is that for most companies the ratio of robust, active spores to total spores is typically between 40 and 60%. So more than half of them could be less active. It just makes sense that the spores have to have vigor in order to have any positive effect.

So activity rates are important. If you have a strain of DFMs that has a higher activity rate, you can actually have a smaller CFU per gram count in total but deliver a higher CFU per gram count with more active spores. (Which is obviously better.) So comparing active spores is much more important than simply comparing spore count.

The Last Factor

The final factor in effectiveness for DFMs is how well the spores are utilized in the animal's body. The positive effects of DFMs are not created because they are ingested into the system, but because they help establish a positive environment in the digestive tract of the animal. The CFU counts are important in order to get enough active spores into the body and get the process started, but the ability to flourish in that environment is equally important. Some strains have a better ability to survive and flourish in that environment.

All of these factors are important in determining which brand to select when using DFMs. CALSPORIN® has a very stable dose rate of 300,000 CFUs per gram. What makes Calpis unique however, is that its proprietary production methods provide a higher active form of spores, in the 80-100% range. This delivers a much higher count of active spores, which is more important than simple spore count. In addition, CALSPORIN® has been a world-leading direct fed microbial that flourishes in the digestive tract of the animals, making it a top selection for producers wanting to incorporate DFMs into their animal health program.

If you would like further information about this topic, please contact QTI at calsporininfo@qtitech.com and request our Technical Bulletin: Importance of *Bacillus subtilis* Spore Counts and Characteristics.

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QTI TR v3:i2-2/17



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