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QTI™ ANIMAL HEALTH & NUTRITION

The Count is In: 640 Different Bacteria

Key Points:

- Bacteria species interact with each other in the gut
- Field, along with lab studies, are important for a clear "snapshot"
- Continual supplementation is essential to maximum beneficial effects

Did you know there can be up to 640 different bacterial species inhabiting a chicken's gastrointestinal tract at one time? That count comes from microbial community phylogenetic analysis, a field of study that has advanced significantly over the last 20 years. Yet, there is still much to be learned.

For instance, we know that different bacteria within a chicken's gut can be interdependent on each other. As one bacteria species proliferates, a second one may also grow where a third one may decrease in numbers proportionately. This interdependency, and the sheer number of different bacterias, offer such a variety of interactions that the scientific community won't be out of a job anytime soon.

The interrelations of bacteria also become quite evident when we try to isolate the bacteria and grow it in the lab. Conditions in the lab environment create different results compared to the habitats of the synergistic bacteria species living within the live animal. So it is important to do studies in the field as well as in the lab because lab results alone may not be conclusive.

Due to the high number of bacteria in the gut, we sometimes know bottom line results without knowing completely all of the reasons why we get those results. For instance, we know that *Bacillus subtilis* C-3102 (name brand CALSPORIN®), a naturally occurring organism, can improve weight gain, mortality rates and overall animal health when added to a chicken's diet. We also know from assaying fecal samples that good bacteria proliferates when CALSPORIN is added, while harmful bacteria counts are lowered. Because of our understanding of how oxygen levels affect aerobic and anaerobic bacteria, we believe we have a good understanding of why CALSPORIN® has such quality results. However, when you take into account 640 different bacteria and how they interact, there may be other factors at play that are yet to be discovered.

Mt. Prospect Lab Identifying *Clostridium Perfringens* and *Salmonella*

To get a "snapshot" of the bacteria within your poultry operation, you can assay fresh fecal samples. Calpis USA, Inc. has a microbiology laboratory in Mt. Prospect, IL set up to create microbial profiles from such samples. These profiles are helpful in identifying potential disease situations, in quantifying changes in the gut microflora following changes in feed ingredients or growth-promoting additives, and for food safety purposes.

For example, high levels of *Clostridium perfringens* in fresh fecal samples may be detected, and if not acted upon, a problem could result with necrotic enteritis. In addition, knowing *Salmonella* incidence and population levels in fresh fecal samples has direct bearing on *Salmonella* control efforts and their effectiveness on the farm and in the processing plant.

See Table 1 for typical results from a fresh fecal sample assay report. Contact a QTI representative to see how you can get an assay profile for your operation.

Table 1. Typical Microbial Profiles from Broiler Fresh Fecal Samples

Species of bacteria	*Range, log_{10} cfu/g*
Enterobacteriaceae	7 – 8
Clostridium perfringens	2.3 – 5.0
Salmonella (typed by groups)	2.3 – 5.0
Bacillus (CALSPORIN®)	5.0 – 6.0
Lactobacilli	8.3 – 9.5
Total anaerobes	9.0 – 9.9
Lactobacillus/Total anaerobes	50% target

Bacillus Subtilis C-3102 Proliferation

Bacillus subtilis C-3102, the strain known as CALSPORIN®, is a non-attaching microorganism. Based on our recent research with germ-free chickens, the numbers of this *subtilis* strain do proliferate in the GI tract. However, like all *subtilis* strains, they don't colonize the intestinal tract. So a "one and done" approach means the strain will eventually be removed from the system through natural digestive and expulsion processes. To continue the maximum beneficial effects of the spores within the gut, it is essential to continually supplement the feed with the *subtilis* strain. *Bacillus subtilis* C-3102 can be used alone, with antibiotics, and/or with a yeast cell wall prebiotic product to reduce pathogen loads in broiler chickens and in their environment.

Fritts et al. (2000) at the University of Arkansas reported in the Journal of Applied Poultry Research that dietary *Bacillus subtilis* C-3102 spores (300,000 cfu/g feed) reduced aerobic plate counts, coliforms (non-*E. coli*), and *Campylobacter* on processed broiler carcasses. All (100%) of pre-chill (dry) carcasses of control birds were *Salmonella* positive compared to a 57% reduction in the CALSPORIN® treated group.

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