

Bacillus coagulans: Upping gut health and performance

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Poultry thrive and perform at their best when their gastrointestinal tract, commonly called 'the gut,' is healthy and full of beneficial microbes. Based on *Bacillus coagulans* DSM 32016, a novel EU-approved probiotic is doing just that.

In monogastric animals like poultry, a healthy intestinal system is key for proper digestion of feed, good performance, and growth, and the prevention of several digestive disorders such as necrotic enteritis in poultry. The gut is a very dynamic and intelligent ecosystem on its own, colonized by a complex community of highly diverse microbes: the gut microbiota. This microbiota helps protect the animal against inappropriate overgrowth of pathogenic and non-pathogenic bacteria and viruses and is essential for digestion, immunity, and overall health.

Gut balance and protection

Stress, age, and the diet, influence the intestinal microbiome. If the microorganisms colonizing the intestine are in equilibrium, we speak of eubiosis. In that state, not only is the feed digested well. Also, harmful germs have a limited chance to overgrow the gut and trigger diseases. If this balance is disturbed in the state of dysbiosis, reduced performance or increased susceptibility to infections are frequent consequences. For example, if the intestinal barrier becomes permeable (leaky gut syndrome), toxins and bacteria penetrate the bloodstream and can cause diseases and even death. Therefore, it is crucial to support and modulate the microbiota so that eubiosis is maintained and pathogenic bacteria such as *Salmonella* and *C. perfringens* do not have a chance to damage the intestinal barrier or become dominant.

The rise of probiotics

An effective way to positively modulate the microbiota is to use feed additives. The number of products on the market today has been growing since the EU-wide ban on antibiotic growth promoters in animal feed in 2006. And this is especially the case for probiotics. Probiotics are live microorganisms that beneficially affect the host upon ingestion by improving the balance of animals' intestinal microbiota. The main objectives of probiotics in animal nutrition are to maintain or restore eubiosis and prevent intestinal dysbiosis, especially during periods of stress such as change of feed, antibiotic treatment, or weaning, and increase zootechnical performance, such as weight gain and feed conversion. They are known to be some of the most successful groups of gut health-promoting supplements. In animal nutrition, three

different probiotics types are available: (a) Spore-forming bacteria, e.g., *Bacillus*, (b) lactic acid bacteria (LAB), e.g., *Lactobacilli* and *Enterococcus* and (c) live yeasts, mainly *Saccharomyces cerevisiae*. LAB are known to positively modulate the intestinal microbiota by inhibiting pathogens in the gut and maintaining the intestinal barrier function. Also, spore-forming strains are known to have a strong beneficial effect on poultry's gut health and create a favorable environment for LAB and other health-beneficial bacteria. An additional benefit is that *Bacillus*-based probiotics are resistant to heat, pressure, or acid. Since *Bacillus* has the property of forming stable spores, *Bacillus*-based probiotics are particularly suitable for pelleted feed, which is often used in monogastric species.

TechnoSpore®: An innovative probiotic

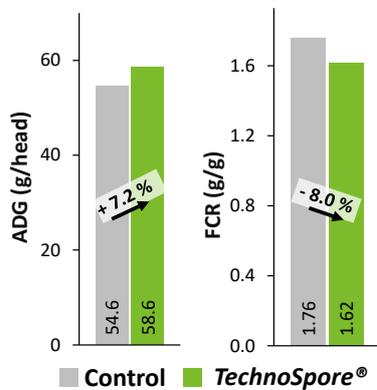
The development of effective probiotics and unraveling their mode of action is a continuous topic of research. Recent studies showed that the microbiota thrives and performance is enhanced when animals are fed with a combination of lactic-acid producing and spore-forming bacteria. This has led to the development of the novel probiotic TechnoSpore®. Based on *Bacillus coagulans* DSM 32016, this novel feed additive is the first *Bacillus coagulans*-based probiotic for animals, approved by the EU under the Feed Additives Regulation (Regulation [EC] No 1831/2003). This innovation was developed by a global team of Biochem scientists and nutritionists and builds on Biochem's 30+ years of experience with probiotics and gut health management. Several studies with this novel probiotic indicate that the administration of TechnoSpore® results in a better overall performance and health of broilers, even under high performing and challenging conditions.

Necrotic enteritis prevention in poultry

Necrotic enteritis (NE) caused by *Clostridium perfringens* has emerged as an important disease associated with major economic losses in the poultry industry worldwide. NE in chickens leads to sudden death, with mortality rates up to 50%. Subclinical infections are also associated with chronic damage of the intestinal mucosal layer that cause severe gut health issues that lower performance and reduce weight gain. *C. perfringens* is also a foodborne pathogen (such as *Salmonella* and *Campylobacter jejuni*) and is therefore a critical bacterium from both a human food as veterinary point of view. Trials showed that TechnoSpore® increased ADG with or without *C. perfringens* challenge, which finally results in an improvement of final body weight (FBW) and FCR. Total mortality rate decreased numerically. The histomorphometric analysis of duodenum and jejunum of experimentally induced NE in broiler chickens revealed significant increase in villi height/crypt depth ratios in the probiotics-supplemented groups. This increases the surface area for a successful nutrient utilisation. In another study, the economic benefit of using TechnoSpore® clearly came across. A broiler farm trial in South-East Europe with 640 one-day-old broilers (ROSS 308)

demonstrated that animals fed with feed containing TechnoSpore® had a higher FBW and increased ADG. During the whole trial period, TechnoSpore® administration was also able to reduce the feed conversion ratio (Figure 2).

Figure 2. Effect of TechnoSpore® on average daily weight gain (ADG) and feed conversion ratio (FCR) in broiler^a.



^aAverage of entire trial period; *Indicating significant differences ($p \leq 0.05$)

Conclusion

TechnoSpore® has been shown effective in positive modulation of the microbiota, prevention of infections of the gastrointestinal tract (e.g., *C. perfringens*), and increase of production parameters in poultry. All these factors increase the economic viability of the farm. The combination of these properties is unique and currently not known from other probiotics in the EU. The large number of trials done with TechnoSpore® reinforces the reliability and efficiency of this outstanding probiotic.