Poultry production
How probiotics can play a role

Michaela Mohnl
Director Competence Center Microbials
A large and diverse range of bacteria are living in the gastrointestinal (GI) tract of our animals, and most of these bacteria form a symbiotic relationship with the host. The important role of GI microflora in health and disease of animals and humans is increasingly recognized. Nutrition is the most important factor influencing the composition and metabolic activity of the intestinal microflora.

Feeding errors, substantial dietary changes, low-quality feed components and inadequate feed hygiene all compromise the microflora. It should be a goal when formulating diets to favourably influence the microbial community in the gut, and to keep up a state called Eubiosis. In this situation, the host and the microflora live together in symbiosis, meaning with mutual benefit.

Probiotics to achieve Eubiosis

Since the importance of a well-balanced gut microflora for adequate health and high performance has been recognised, feeding strategies have been directed to control the microbial GI environment by nutritional means. Especially, the use of probiotics has been shown to be an effective means of manipulating or managing the composition of the microbial population in the GI tract of animals to achieve or re-establish the state of Eubiosis.

Intake of probiotics should result in the creation of gut microecology conditions that suppress harmful microorganisms and favour beneficial microorganisms, and ultimately enhance gut health. This is also necessary for a well-functioning and effective digestion of nutrients, resulting in good growth performance. Besides nutrient absorption, the intestine plays an important role as the biggest immune organ of the body. It is hence part of the body’s defense system and represents an important barrier against invading pathogens.

New scientific insights about probiotics

The scientific community is changing its way of looking at the mode of actions of probiotics. Since probiotics have been commercially available, they have been expected to exert their benefits derived from their ability to multiply, produce certain metabolites and colonize the surface of the intestinal epithelium. Today (and for the last 10 years), researchers are challenging the “classic” mode of actions of probiotics with novel ones. So far,
there is a good bulk of evidence suggesting that some of the effects of probiotics like the anti-inflammatory effect are mediated by fingerprints (structural molecules) rather than by the whole organisms or their ability to colonize the intestine.

In case probiotics are also partly inactivated in the course of feed processing or antibiotic treatment at therapeutic doses; there are beneficial mechanisms that do not depend on live bacteria and which will remain unaltered. As long as the effector molecules within the probiotics remain with the appropriate structure, a biological effect should be expected.

Commonly used probiotic bacteria in animal feeding are lactic acid-producing strains like Enterococcus, Pediococcus, Lactobacillus and Bifidobacterium, which are also genera commonly found in the poultry gut. Several scientific studies have shown that they have a beneficial effect on performance, pathogen inhibition, modulation of intestinal microflora and immunomodulation, especially during critical times in the production cycle when a protective gut microflora is not yet established or a disrupted probiotic application exerts its benefits.

Probiotics to protect newly hatched chicks

Under normal conditions (i.e. in the wild), animals pick up their microflora from adult animals and from the environment very quickly, but under conditions of modern animal production, things are different. Commercial broiler chicks hatch in extremely clean conditions and don't have contact with adult animals. Then they are transferred in houses previously cleaned and disinfected. For them, to build up and establish a well-balanced microflora is difficult. During that time, the chicks are not protected against the colonization with pathogenic microbes. For the chicks, it is crucial to develop a protecting microflora as early and fast as possible, which can be supported by the application of probiotics. Probiotic products can be sprayed onto the chicks already in the hatchery or be applied via the drinking water during the first days of life. They provide conditions in the chicks’ intestines that favour the colonization by beneficial microbes.

Probiotics and antibiotic therapy

Antibiotics are useful tools to eliminate undesired pathogens. However, they also eliminate a large proportion of the beneficial microflora which needs to be re-established after the antibiotic treatments end to avoid fast growth of opportunistic pathogens. Antibiotics may eliminate the pathogens, but they often do not sufficiently control inflammation. In many cases of pathogenic invasion, an
exaggerated response of the immune system may cause even more damage than the pathogen itself.

Probiotics can help modulate the immune system. It is very common in the field to see the severe inflammation of the intestinal mucosa regardless of the ongoing antibiotic therapy. Intestinal inflammation is related to increased velocity of the intestinal content. As a consequence, feces with increased amount of humidity, gas, excess of indigested feed particles or fragments of intestinal mucosa may be a common finding derived from intestinal inflammation. Confirmation of intestinal inflammation can be obtained from necropsied animals.

The use of probiotics is recommended to fight side effects of diseases that will not be improved by the use of antibiotics. In this scenario, antibiotics in therapeutic doses should be taking care of pathogens; however, the intestinal inflammation often remains unattended. Even inactivated probiotics exert a beneficial effect reducing inflammation by means of their cellular structure and particularly their intact DNA molecules and receptors, which are unique to every probiotic strain.

### Probiotics and Necrotic enteritis

Necrotic enteritis is one of the world’s most common and financially crippling poultry diseases, which when triggered can cause mortality rates of up to 50%. A team of USDA research scientist has investigated if the use of a multi-species probiotic may be beneficial in the control of poultry diseases, which are related to *Clostridium perfringens*. In conclusion, the data of these studies suggest that the probiotic was able to control poultry diseases like *Necrotic enteritis* and *Gangrenous dermatitis*.

The use of probiotic products can provide the poultry industry with an alternative management tool that has the potential to promote better intestinal health by managing the composition of the microbial population in the GI tract, to protect poultry flocks from infections with pathogenic bacteria and to decrease monetary losses due to pathogens.