# Strategy for enhanced performance and reduced medication

***by Stephan Bauwens, Innovad SA/NV, Belgium.***

Modern animal production is known for its high genetic potential, which is often not able to be achieved due to different and complex challenges during their lifecycle. One of the major challenges is situated at the border of the intestinal tube. This area carries an important responsibility in selecting what can be absorbed and what should remain outside the body of the animal. To put this into perspective, it needs to be stated that the surface of the intestinal tract is 300 times as big as the surface of the skin. At the same time, it should give the similar level of protection against invaders, while being highly permeable to absorb nutrients. Intestinal health pops up as a very popular term for one of the most important but one of the most complex actions related to animal nutrition.

When the use of Antibiotic Growth Promoters (AGPs) gained in popularity in 1950, this was considered as a panacea, a universal remedy to improve (intestinal) health status, performance and economics on the farm.

With increasing use of antibiotics in animal nutrition (of which 60-80% is used to treat intestinal disorders), in 1990, both scientists and public opinion opened the debate on increased bacterial resistance against antibiotics and its eventual transfer to humans. This milestone lead to a full ban of AGPs since January 2006 and a significant reduction of antibiotic use in animal feed in many EU countries, now being followed by many other countries.

## Intestinal microbiota

In order to obtain a high intestinal health status, eventually in combination with a reduced use of antibiotics, it is first of all important to understand the intestinal system.

The intestinal barrier is composed of different types of cells, of which the enterocytes are the most abundant ones. These enterocytes are cells which are 'bound' to one another by complex protein structures called 'tight junctions'.

This structure has a major task to close the cell lines and to avoid paracellular passage of bacteria, toxins and other undesired substances from the lumen to the inside of the body.

Several stress factors will have a negative impact on the quality of the tight junctions, leading to the syndrome 'leaking gut' by which big sized molecules, such as toxins and aggressive radicals, are able to pass in between, resulting in cell damage, production of 'Reactive Oxygen Species' (ROS) and activation of the immune system.

The latter is automatically paired to the production of inflammatory cytokines. The neutralisation of these inflammatory components will consume significant amounts of nutrients, which will lead to reduced growth and increased feed conversion rates.

Subclinical inflammation can cost up to 30% of the energy requirements. Although the mode of action of AGPs has not yet been fully understood, there is evidence to believe that, besides regulation of the microflora, AGPs also play an important role in reducing the level of inflammatory cytokines, which results in substantial energy savings and improved performance.

Host defence peptides (HDPs), also known as antimicrobial peptides, are present in virtually all species of life and constitute a critical component of the innate immunity. Defensins and cathelicidins represent two major families of HDPs in vertebrates. They are produced and secreted at the level of the intestinal epithelium.

These HDPs have a broad spectrum of antimicrobial activity against bacteria, protozoa, fungi and even viruses. Due to the complexity of the mode of action against microbes, there is a low chance of resistance, which makes them a number one candidate for alternatives to antibiotics.

As research is ongoing and will take some more years before such molecules can be applied in feed or drinking water, there is currently an interesting approach to increase the synthesis of endogenous HDPs within the intestinal tract.

The intestinal microbiota is composed of more than 500 different species, which live in direct symbiosis with the host.

They provide energy to the intestinal wall, prevent colonisation by pathogenic bacteria and help to maintain the intestinal immune system.

It has been demonstrated many times that the status of the immune system is (partly) defined by the presence and the type of microbiota in the intestine.

Based on the above, we can conclude that a high status of intestinal health is based on a balanced microflora, strong tight junctions, healthy, long and slender villi, secretion of HDPs and low levels of ROS and inflammatory cytokines.

## A single molecule has its limits

One can easily understand the complexity of the intestinal system. Many scientists and veterinarians agree that one single non-antibiotic molecule will have its limits in order to control the overall situation.

Therefore a concept and a synergistic approach to ensure a high intestinal health status should be recommended. Such strategy lies in combining active ingredients, slow release effects and precision technologies.

This know-how ensures that acids, medium chain fatty acids, butyrate, essential oils, anti-inflammatory compounds and polyphenols are delivered in a 'gut-active way' for a powerful and effective antibacterial control and enteric support and protection.

The high genetic potential of today's production animals, combined with a clear and inevitable tendency to reduce the use of antibiotics, resulting in an increased risk of enteric problems, is a complex situation to manage.

Obviously, a one single molecule approach is not dealing with all aspects of intestinal health management and will never be able to compete with conventional use of antibiotics.

A well balanced synergistic concept has shown to be a valid alternative for reduced use of antibiotics. Besides, both in layer and broiler diets, such combination has proven to be a valid performance enhancer, even in the absence of an intestinal challenging situation. ■