Acid based eubiotics support gut health for optimal performance

Why is it important to support a healthy gut? The gastrointestinal tract (GIT) of a broiler is resident to trillions of bacteria, fungi and protozoa. The vast majority of these micro-organisms are beneficial, such as Lactobacilli and Bifidobacteria. Collectively, a well-balanced microbiota can help with nutrient digestion, control of pathogens, immune modulation, gut integrity, and vitamin production.

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The gut wall itself is lined with many villi which possess microvilli on their surface. These finger-like projections increase the surface area available for nutrient absorption and thus help support optimal digestive performance and feed efficiency.

When populations of potentially pathogenic bacteria, such as salmonella and Escherichia coli (E. coli) within the gut increase or an imbalance occurs, this can result in damage, reducing villi length and villi to crypt ratio. This lowers the surface area available for nutrient absorption and as a result, salmonella infection is associated with a reduced body weight gain and a negative impact on broiler performance.

Approximately 70% of the immune cells reside within the gut and around 30% of all nutrients in the bloodstream are present as a direct result of microbial digestion.

Therefore, ensuring a balanced and diverse population of the gut micro-organisms, whilst limiting presence of potentially pathogenic bacteria, is very important for supporting gut health and optimising growth and lifetime performance.

How can acid based eubiotics (ABEs) help?

One way in which poultry gut health can be supported is through the supplementation of an acid based eubiotic (ABE) in feed and drinking water. A common misconception surrounding acid-based feed additives is that they are able to 'clean' the feed by lowering the pH.

This however is not the case, as feed is generally too buffered for acid addition to have a significant impact on the pH. Typically, around 30kg of strong liquid acid such as hydrochloric acid would be required to acidify feed to a pH of three, at which the growth of potentially harmful bacteria is inhibited.

However, these levels would not be cost-effective and instead we should look to help the animal to help itself.

Ensuring a well-developed gut with optimal microbial populations, known as a state of eubiosis, helps to reduce the chances of potentially harmful bacteria overpopulating the gut. An ABE capable of supporting beneficial bacteria is the most viable and efficient option.

What makes an effective ABE?

Formic and propionic acid are two of the most potent acids permitted for use in animal feed. Formic acid is a registered bacterial decontaminating agent (1K236) and has a direct effect on Gram negative bacteria. It has also been shown to be effective in inactivating enveloped viruses, such as avian influenza within 24 hours.

Propionic acid is beneficial in increasing the permeability of the bacterial cell wall to formic acid and so these acids work in synergy. As a result, using a combination of formic and propionic acid helps to ensure a cost-effective inclusion and helps to increase the speed of activity within the feed.

In addition to the synergistic action of the liquid acid formulation, the carrier on which these acids are blended is of equal importance in supporting optimal poultry performance. The main benefit a carrier must offer is that it must enable controlled acid release throughout the entire length of the gastrointestinal tract to support normal gut function and colonisation of beneficial bacteria, such as Lactobacillus, Bifidobacteria and Butyrivibrio.

This helps to limit the proliferation of pathogenic bacteria. In addition, the carrier should be inert to protect the ABEs' active components and to

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Fig. 1. Caecal concentrations of propionate and butyrate of E. coli challenged broilers at 35 days of age (Emami et al., 2017). Different letters (a-b) denote significant differences (p<0.001).

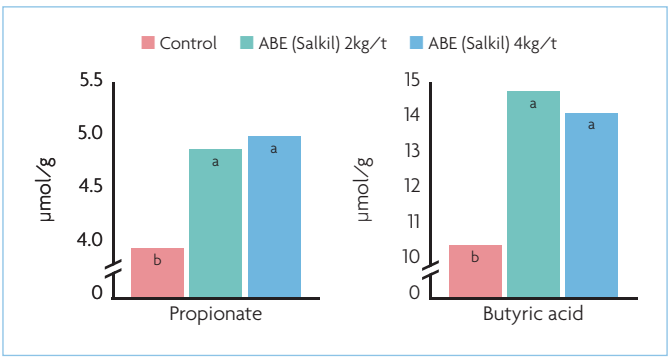
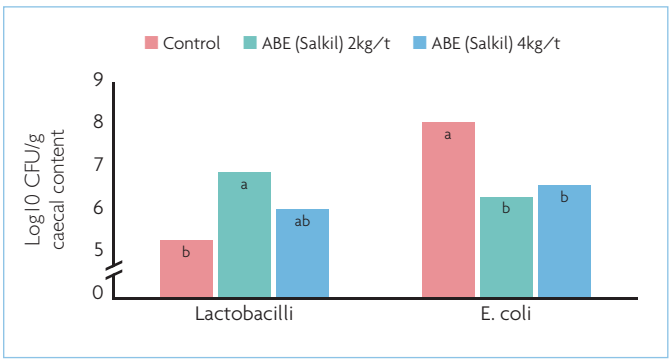


Fig. 2. Caecal Lactobacilli and E. coli counts in E. coli challenged broilers at 35 days of age (Emami et al., 2017). Different letters (a-b) denote significant differences (p<0.05).



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reduce unwanted binding with dietary vitamins and minerals. An inert mineral carrier with a high surface area should protect the acids from damage during the feed manufacturing process as it is heat resistant and following ingestion, does not require digestion by the animal in order for the active components of the ABE to be released in the gut.

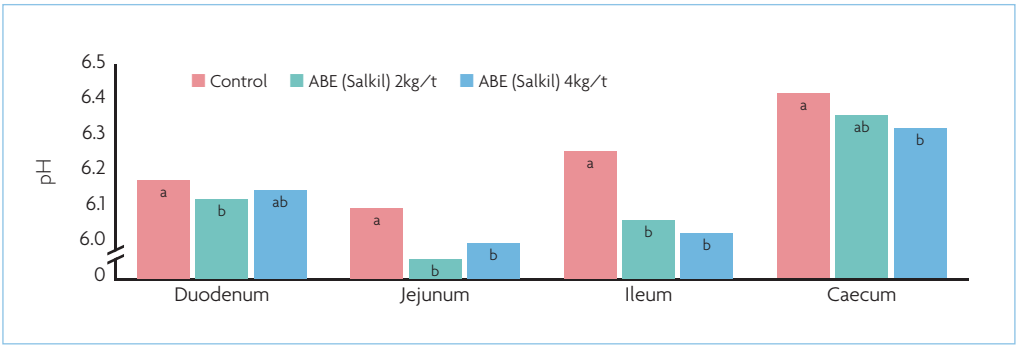

Fig. 3. Digesta pH of each intestinal region of E. coli challenged broilers at 35 days of age (Emami et al., 2017). Different letters (a-b) denote significant differences (p<0.05).

ABEs support a healthy gut microbiota

In a recent study conducted by the Department of Animal Science at the University of Mashhad, 750 Ross 308 broilers were randomly assigned to one of three treatments; control (with no additives), ABE at 2kg/tonne of feed and ABE at 4kg/tonne of feed.

The ABE supplemented in the study was Salkil, a blend of formic and propionic acid manufactured by Anpario.

The broilers were orally challenged with E. coli, inducing a sub-clinical disease and performance was monitored. Intestinal pH, caecal microbial populations and concentration of caecal short chain fatty acids (SCFA) were measured.

ABE supplementation in broiler diets increased caecal concentrations of SCFA; propionate and butyrate (Fig. 1). Butyrate and propionate are produced by beneficial bacteria in the GIT and are well documented to have advantageous effects in the animal, with the ability to be utilised by the bird as carbon and energy sources.

Additionally, an increase in propionate and butyrate concentrations is negatively correlated with populations of E. coli.

Analysis of caecal microbial populations in this study validated this, with ABE supplementation in broilers demonstrating an increased population of beneficial Lactobacilli and reduced levels of potentially pathogenic E. coli even following challenge (Fig. 2).

An ABE does not lower the gut pH directly, instead it supports the growth of bacteria that prefer a lower digesta pH, such as Lactobacilli.

These bacteria then digest feed carbohydrates to produce beneficial SCFA, including propionate and butyrate which further reduces the pH throughout the intestinal lumen (Fig. 3).

A small change in pH can therefore have a large effect on the gut microbiota and bird health. ABEs offer an effective, natural solution, helping to maintain optimal gut health and integrity to support lifetime bird performance.

The addition of ABEs, such as Anpario's Salkil, to poultry feed, helps to create a beneficial shift in the microbiota of the gut and helps to support the development and maintenance of a well-balanced and diverse microbial population.

It is well recognised that a healthy gut has a profound impact on regulation of poultry metabolic and immune functions, thus positively influencing both bird health and performance. ■

References are available from the author on request