Giving chicks the best possible start to maximise future flock productivity

It is well known that a good chick start is essential for final flock performance. If chicks can achieve their target weight by day seven, final performance should be equal to above target performance.

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When newly hatched chicks are first introduced into the house, there are a number of critical factors that need to be considered to ensure the young bird has the best start. These include water, feed, temperature, ventilation and humidity.

Associated with a number of these is the development of the early gut microbiota, a key factor in ensuring birds will achieve good performance in later life.

Environment

For the first 10-14 days after hatch, the chick is unable to sufficiently regulate body temperature. A one degree decrease in temperature can have a significant effect on performance.

If the chick has to use vital energy resources to stay warm, it increases the risk of compromised immunity, leading to disease.

Consequently, maintaining floor and environmental temperature are critical to avoid chilling. Ventilation is a key tool to help manage temperature, humidity and air quality in the house, ensuring chicks are kept at the ideal temperature and waste gases such as carbon dioxide are removed.

Light intensity should be sufficient to encourage chick activity including feeding and drinking behaviour.

Feed and water

Easy access to good quality, palatable feed is important to get chicks feeding as soon as possible. Feed consumption and water intake are directly related, therefore ensuring feeding and drinking behaviour is not compromised, will benefit feed and water consumption.

Water is often referred to as the 'forgotten nutrient'. Water quality, temperature and availability are essential for chick start. Water restriction in early life can significantly impact later performance; every 1% restriction in water can result in an 8.5g reduction in bodyweight up to 21 days.

If water sanitation is performed incorrectly, drinkers can become contaminated with biofilm and water borne organisms such as pseudomonas.

Remembering that formation of a healthy gut microbiota in the chick is critical for health and performance, avoiding the introduction of unwanted micro-organisms as far as possible should be a priority.

The gut microbiota and intestinal development

The gut microbiota is essential for bird health and performance, with roles in nutrition, gut development and host physiology. Bacterial numbers range from 10^8CFU/g, predominantly Lactobacillus spp. in the foregut to 10^{11}CFU/g in the hindgut, mostly Lactobacillus, Enterococcus, and various Clostridiacea.

Estimates suggest as much as 50-85% of the identity of bacteria in the gut are still unknown.

Development of the microbiota

The newly hatched chick gut is largely considered sterile, although there is some evidence to suggest that caeca of embryonic chicks can be colonised by bacteria from the mother. However, development of the intestinal microbiota is generally considered to begin upon hatching, where bacteria are picked up from the environment, people handling etc.

After one day post-hatch the ileum and caeca are both dominated by bacteria with densities up to 10^{10} bacteria/g digesta respectively. Within two weeks the typical adult small intestinal microbiota will be well established and after 30 days the caecal flora has developed.

The taxonomic composition of the intestinal microbiota demonstrates a temporal effect, the diversity of bacterial populations increasing with age, while nutritional influences are also apparent.

The role of additives in the developing microbiota

The use of additives in drinking water or feed to help the development of a stable, mature microflora has received considerable focus in recent years, driven in part by the

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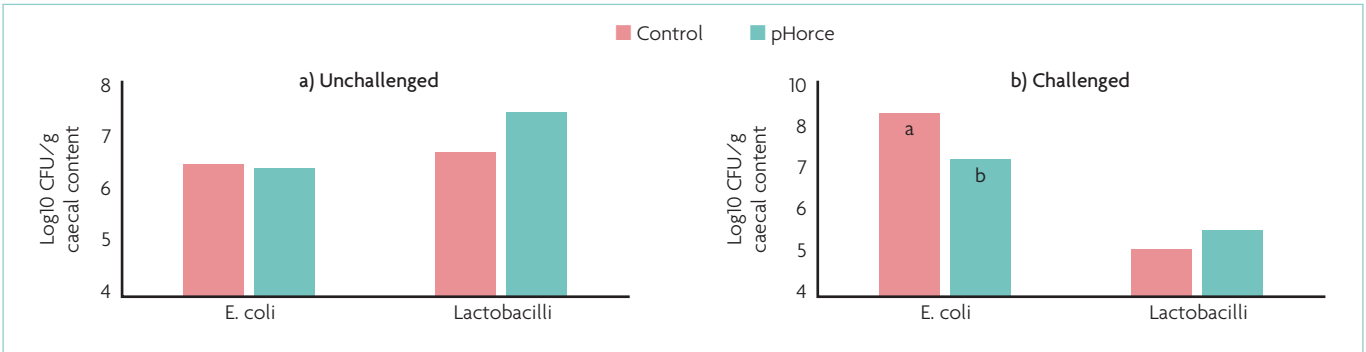
Fig. 1. Changes in number of E. coli and lactobacilli in the caeca in 10 day old chicks either a) unchallenged or b) challenged with E. coli K88+ at seven days of age. Different letters denote significant difference (P<0.05) within a category.



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recognition of the importance of the gut microbiota to the avian host.

The diversity of additives is extensive, from pre and probiotics, to bacteriocins, short chain fatty acids (SCFA) and phytotherapeutics.

While there is no 'one size fits all' approach, additives can be used strategically depending upon the situation and many additives have overlapping modes of action.

SCFA presented on mineral carriers have broad scope as eubiotics – products that contribute to eubiosis, the healthy balance of the gut microbiota. When fed to broiler chicks from day-old, a mineral carrier eubiotic based on the SCFAs formic and propionic acid (pHorce, Anpario plc, UK) increased the number of caecal lactobacilli at seven days of age as compared to birds that did not receive SCFA (Fig. 1a).

When seven day old chicks were challenged with E. coli K88+ at a sub-clinical dose, those chicks receiving SCFA had lower E. coli numbers than chicks not fed SCFA (Fig. 1b).

At 35 days of age E. coli numbers were still lower and lactobacilli numbers higher in those birds fed SCFA. Furthermore, propionate and butyrate levels (energy sources for intestinal cells and other bacteria) in-situ were higher in the birds fed SCFA, accompanied by improved bird performance.

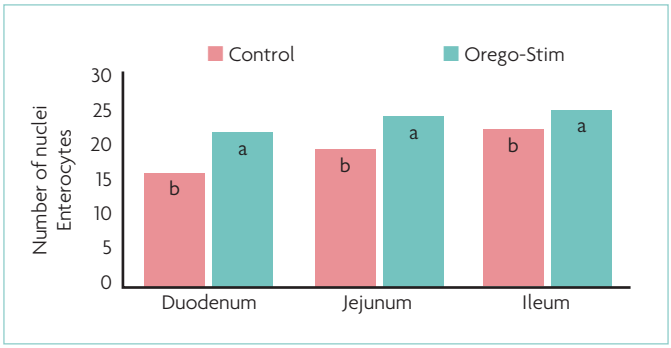

Fig. 2. Oregano increases enterocyte proliferation. Different letters denote significant difference (P<0.05) within a category.

This example highlights the important role that additives, such as SCFA eubiotics, can have on the development of the early microflora and the subsequent benefits that can be seen in the flock at the end of the production cycle.

Development of the early gut and the benefits of additives

The first week of life is a critical period in the physical development of the avian gut. Not only is the microbiota developing at a rapid rate, but the morphology of the gut is developing as well. Villus volume increases substantially in the first four days post hatch, while crypt depth increases until around 10 days of age.

The first week post-hatch therefore is a critical period for intestinal development. The gut microbiota is important for intestinal development. At seven days, conventional chicks can have twice the number of proliferating enterocytes compared to germ free chicks (with minimal gut microbiota).

Given the rapid development of the gut in this first week, it is noteworthy that chicks will experience significant intestinal stress in this early period from ingestion of feed, water and bacteria in addition to those typical pathogens found in the litter, such as Eimeria.

While SCFA support the microbiota, eubiotics such as those comprising oregano such as Orego-Stim (Anpario plc, UK), can support the young chick in dealing with intestinal stress. Increases in antioxidant status, regulation of immune responses, for example inflammation and stimulation of enterocyte proliferation (Fig. 2), are all observed with Orego-Stim.

This holistic activity can also ameliorate early impact of circulating parasites such as Eimeria, leading to less intestinal damage mid flock and improved later flock performance.

Summary

Giving chicks the best possible start in the first week of life requires a multifactorial approach. The key factors of brooding are essential but the importance of supporting the early developing microbiota cannot be emphasised enough.

Eubiotics, such as mineral carrier based SCFA blends, or phytotherapeutics, such as those based on oregano, have a key role to play in ensuring that newly hatched chicks get off to the best start possible. ■