Managing intestinal health through a preventative approach

Digestive disorders can be triggered by all kind of factors. A chicken with the best intestinal integrity, a diverse microbiome and a responsive immune system will master any challenge, resulting in a lower disease incidence and less need to treat with antibiotics. Cutting down on antibiotics and managing intestinal health through a preventative approach is the way forward.

by Valentine Van Hamme,
Kemin, Belgium
www.kemin.com/health-platform

A healthy microbiome: fading out intruders

There are more bacteria in the gastro-intestinal tract than cells in the body. Anything that affects the microbiota will enhance the potential for enteric pathogens to proliferate, damaging the growth potential and general health of your animals. Interestingly, the diet has a great influence on the composition and diversity of the intestinal microbiome, which brings new possibilities.

The mode of action of active microbials supplemented via the diet or drinking water are clear. Bacillus spp. (ATCC-6737) (Clostat) stimulates the growth of beneficial bacteria, such as Lactobacillus spp. and Bifido-bacterium spp. balancing the microbiome. Additionally, Bacillus spp. inhibits growth of different pathogenic strains of Clostridium spp. resulting in healthy and productive animals.

Through this preventative approach, disease incidence will be lower, resulting in a reduced need to treat with antibiotics. Field trials with Bacillus spp. (Clostat) in broiler and turkey flocks have proven to positively contribute to this strategy.

An integrated turkey producer in Europe used Clostat through drinking water application over a period of 27 weeks, in cases of wet litter or first symptoms of digestive disorders, as an overall antibiotic reduction strategy.

The main focus was to reduce the need for treatment with beta lactams and Colistin, due to their importance for human medicine.

Compared to the three previous years, a decrease in the number of beta-lactam applications (-13%) and a significant decrease in colistin treatments (-44%) and grouped other antibiotics (-51%) was observed. The frequency of diseases requiring antibiotic treatments decreased: -38% for enteritis and -34% for colibacillosis.

Another field experience confirms Bacillus spp. application in drinking water was the recommended preventative strategy to reduce bacterial enteritis incidence and consequently decrease antibiotic usage. Clostat was applied in drinking water starting at 10 days post-hatch until 30 days of age in 11 farms, in total more than 600,000 broilers.

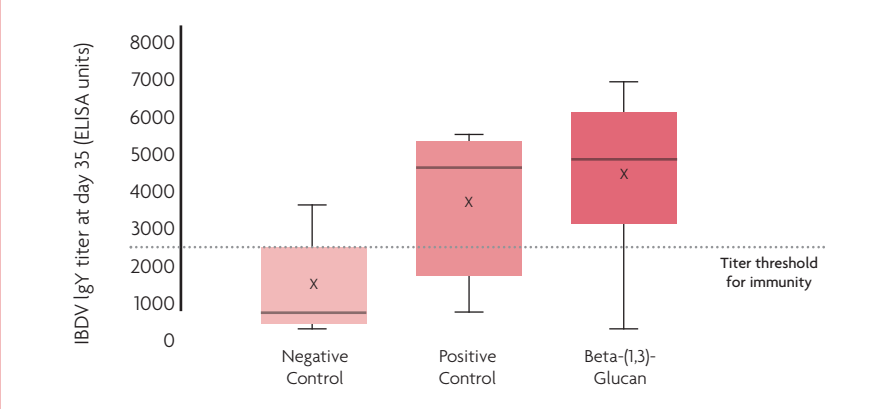
This trial resulted in a reduction in medication cost by 50%, an improvement of FCR by 0.06 and an overall profit for the farmer of €0.5 per square metre surface in the houses. For an average house with a surface of 1200m², this gave an extra benefit of €600 per house for one cycle which was 42 days approximately.

Balancing the intestinal microbiome is an important tool to reduce enteritis problems in poultry flocks, consequently cutting down on antibiotics.

Treatments	Starter (0-21d)	Grower (22-42 days)	Vaccination
Negative control	-	-	-
Positive control	-	-	+
Beta-glucan	50g/ton	50g/ton	+

Table. 1. Treatments.

Fig. 1. Serological response to IBD vaccination in relation to titer threshold for protective immunity.



A healthy immune response: tackling all intruders

By improving your animals' immune system, disease resistance and overall health, you can gain significant benefits in animal production. The fact that the intestinal tract is the largest immune organ in the body, brings a big opportunity for oral supplementation of immune supporting ingredients.

Obviously, those ingredients can be taken up by the gut associated lymphoid tissue and start an immune modulating effect affecting the entire body and health. A new

Continued on page 9

Continued from page 7
solution to support the bird's immune system is the Beta-(1,3)-Glucan derived from algae, Euglena gracilis.

Euglena gracilis is a freshwater protist and is synthesising Beta-(1,3)-Glucan as its energy source. In animals, these typical 1,3 linked glucose molecules are recognised by a receptor (Dectin-1) located on immune cells and induce a further immune modulating effect. By priming the immune response, it is thus possible to enhance resistance to diseases or to reinforce other prevention strategies focusing on immunity such as vaccination.

Vaccination is a common control strategy in case of viral infections in chickens, for example in case of infectious bursal disease (IBD) (or Gumboro disease).

It is caused by the IBD virus, which destroys B-lymphocytes in the bursa of Fabricius leading to immunosuppression, and consequently poor performance with significant economic impact.

Any solution that could enhance the IBD vaccine efficiency is worth trying. A scientific trial was therefore conducted to test the effect of an algal beta-glucan on IBD vaccination.

96 male Ross 308 broilers were divided over three treatments: a negative control group, a positive control group and an algal beta-glucan (Aleta) group. The broilers were orally vaccinated on day 18 with a live freeze-dried IBD vaccine.

To monitor vaccination efficiency, blood samples were taken at day 18 and 35 to measure antibody titers (IgY) against IBD. Measuring antibody titers on day 18 is important to detect if maternal antibodies, which can interfere with the vaccine, are still present, consequently making the bird not susceptible to the vaccination.

This trial showed that beta-glucan increases IBD seroconversion, as 52% of birds in the beta-glucan group seroconverted compared to only 25% of birds in the non-supplemented vaccinated group.

The beta-glucan supplemented birds showed significantly increased average antibody titers (4,564 ELISA units) compared to non-supplemented vaccinated birds (3,906 ELISA units).

Additionally, there were more birds with antibody titers above the titer threshold for protective immunity in the beta-glucan group (Fig. 1). These data prove that algae beta-glucan supplementation increases the success rate of an efficient vaccination.

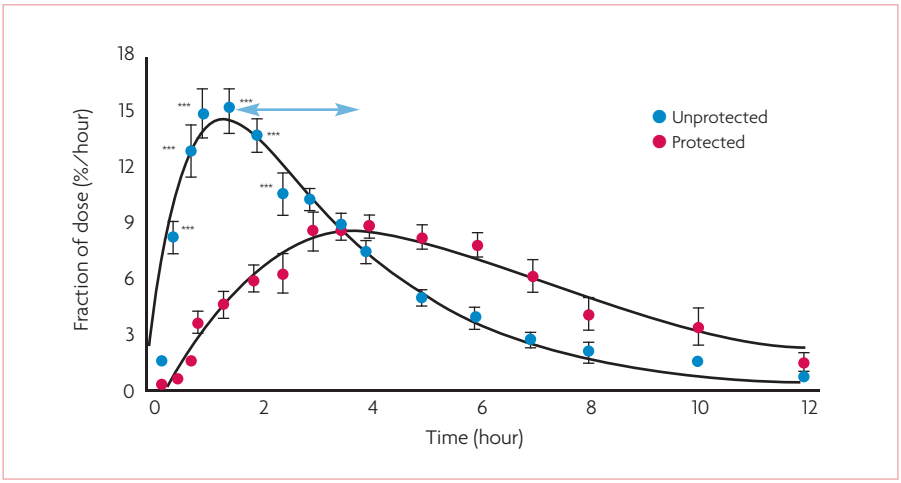


Fig. 2. Fractional release of [^{14}C]CO_2. Points marked with asterisks differ significantly.

The intestine is the entry gate for immune modulating ingredients benefitting the general health of the bird, an opportunity not to miss.

An optimal intestinal integrity: keeping intruders out

Intestinal integrity is all about maintaining the structure of the intestinal barrier, which is made up of a layer of epithelial cells, enterocytes.

This barrier must perform two very contrasting functions; maximise the absorption of nutrients and prevent bacteria and toxins from entering the body.

The translocation of bacteria and toxins is prevented by tight junctions, which are transmembrane protein complexes that bind intestinal enterocytes together. There is no need to explain that we must keep this barrier intact.

One substance consistently present in the intestinal ecosystem is butyric acid as it is naturally produced by the microbiome. Research has shown that it promotes the proliferation and maturation of enterocytes and consequently the lengthening of the villi, thereby substantially increasing the surface for absorption of nutrients.

Butyric acid also upregulates the expression of tight junction proteins, promoting the intestinal barrier. These days, butyrate is commonly added to commercial feeds for its important biological functions.

To guarantee a targeted delivery of the butyric acid in the intestine through in- feed supplementation, it needs to be encapsulated.

When administered in an unprotected form, butyrate is unable to reach the small intestine because of rapid absorption earlier in the gastrointestinal tract. To ensure this targeted release within the animal, a trial was performed to measure release patterns of unprotected versus protected calcium butyrate (ButiPEARL) in a broiler model. After a grow-out period, chickens at 12-16 days old were randomly assigned to each treatment and dosed with gelatin capsules containing either protected or non-protected radiolabelled calcium butyrate. Immediately upon dosing, each bird was placed in a small respiration chamber. Respiratory elimination of [^{14}C]CO_2 was measured as a marker for butyrate absorption because this (respiratory elimination) cannot occur without prior absorption of the butyrate in the gut.

The cumulative CO_2 release graph (Fig. 2) showed significant faster release of the unprotected calcium butyrate as the exhalation peak of the radioactive component occurs two hours faster compared to the encapsulated butyrate.

The micropearls encapsulation technology clearly delays the absorption of butyrate, allowing the butyrate to reach the small intestine.

Using the correct technology is important to deliver the butyric acid to the correct part of the intestinal tract maintaining intestinal integrity, a perfect barrier against all harmful substances.

Conclusion

Disease prevention and health promotion through preventative strategies reducing the need to treat with antibiotics is the way forward. Solutions addressing immunity, intestinal integrity and promoting microbiome diversity show clear benefits for maintaining intestinal health.

What can you expect from a bird with a healthy intestine? A well-functioning gastro-intestinal tract unlocks the potential of your feeds. Performance will exceed breed standards. Flocks will show low mortality and morbidity rates, leading to a reduced need to treat with antibiotics and reduced associated costs.

These preventative strategies are a sustainable approach and the return of investment is guaranteed. ■