Adapting Vitamin D Supplementation to Support Broilers Under an IBV-Challenge

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Animal diets have developed over the years, including a renewed interest in optimising nutrients such as vitamins and minerals. A good example of the latter is vitamin D, primarily known for its role in calcium metabolism and bone strength.



However, there is more to vitamin D than this. Apart from its proven impact on the microbiota and anti-inflammatory activities, the vitamin has a role as an essential immunological mediator. Vitamin D (sub-)deficiencies are also associated with increased mortality and immunological responses, highlighting the broad importance of the vitamin itself. This has led to more recent research focusing on the use of different vitamin D metabolites to enhance immunity under stress, underscoring the importance of proper vitamin D supplementation in poultry – especially when it comes to achieving long-term productivity.

25-OH vitamin D_3 put to the test

One of these trials evaluated the use of 25-OH vitamin D_3 in animals under a high Infectious Bronchitis Virus challenge. The economic impact of the virus speaks for itself, whilst 25-OH vitamin D_3 was chosen as the most efficient vitamin D metabolite. From the available commercial options, a unique 25-OH vitamin D_3 of fermentative origin was selected, based on molecular characteristics such as stability and bioavailability.The trial aimed to evaluate the hypothesis that dietary supplementation of 25-OH vitamin D_3 could reduce the impact of the virus, through decreased shedding of the virus itself as well as an improved immunocompetence of the birds under these conditions.

To do so, 1,000 one-day-old Ross 308 broilers were evaluated for 35 days. Animals were vaccinated at hatch for Infectious Bursal Disease and received two different live attenuated Infectious Bronchitis Virus vaccines on d4 and d18. Birds were divided at random into four groups (10 replicates/group, 25 birds/replicate) and reared under commercial conditions. These four groups included a control (basal diet, standard vit D_3 at 5,000 IU/kg feed) and three levels of 25-OH vitamin D_3 supplementation, with the highest total vitamin D dose equalling 7,784 IU vit D_3 per kg of feed.

Mortalities were recorded daily during the challenge, along with body weights and feed intake. Virus shedding was analysed by qRT-PCR of tracheal swabs on days 3, 5, and 7 post-challenge. At the end of the experiment on day 35, blood samples were collected from the wing vein of 10 randomly selected chickens from each group to further analyse blood and immunity parameters. Cell-mediated immunity gene expression was evaluated via cytokine gene expression (interferon-γ and interleukin-10). Finally, the European production efficiency factor (EPEF) was calculated at the end of the trial.

There was a clear and positive dose-response relationship between survival rates, performance recovery and immunity on one hand, and 25-OH vitamin D_3 inclusion on the other. Similarly, overall virus shedding reduced whilst antibody titres improved with increasing dosages of the vitamin D metabolite. Treatments with 25-OH vitamin D_3 consequently noted higher EPEF values: from the control's 403, increasing 25-OH vitamin D_3 concentrations achieved values of 420, 432 and 439, respectively.

These results shed light on vitamin D's broad impact within the animal, underlining the importance of a proper and continuous vitamin D supplementation from start to finish Apart from this, the evaluation also clearly underlined the benefits of working with 25-OH vitamin D_3 compared to standard vitamin D_3.

Simultaneously, the results obtained here add to the scientific body of work for 25-OH vitamin D_3 from fermentative origin, proving once more the added value it brings to ensure long-term productivity. ■