EFFECT OF A DIETARY FEED ADDITIVE WITH ANTI-INFLAMMATORY PROPERTIES ON GROWTH PERFORMANCE AND ON THE IMMUNE RESPONSE OF CHICKENS IMMUNIZED WITH HUMAN SERUM ALBUMIN (HSA)

Goderis A.¹, Mombaerts R.¹, Van de Mierop K.¹, Niewold, T.²

¹Nutrex nv, Lille, Belgium
²Catholic University of Leuven, Leuven, Belgium
Corresponding author: anne.goderis@nutrex.be

ABSTRACT
The effect of a natural feed additive with anti-inflammatory (AI) properties on performance and immune response of immunized chicks was studied. 200 day old male broilers were allocated to 8 pens. 2 treatments were studied, with 4 repeats each. Group 1 (NC) received a commercial diet, while Group 2 received the same diet + 300 ppm Product A. At d21, blood samples were collected from 5 chicks / pen: 3 chicks were injected with 100 µg of HSA and Freund's complete adjuvant (FCA) while 2 chicks were injected with 100 µl PBS. The acute phase response (APR) was measured by quantifying Ceruloplasmin (Cp). At d42, the Group 2 chicks had the highest BW (3105g vs 2940g) and the lowest FCR (1,674 vs 1,756) compared to the NC-chicks. A lower APR is expected after FCA injection in the chicks given product A as result of a reduced inflammatory cytokine production. In this trial, the chicks didn't show any increase in Cp after injection with FCA, so it wasn’t possible to draw any conclusions regarding the AI properties of Product A. However, Product A increased the anti-HSA IgG response (1,444 AU vs 1,209 AU) (p<0,05). It is concluded that Product A can enhance chick performance and the IgG response.

KEY WORDS: immunization, acute phase proteins, humoral response, immunomodulation

INTRODUCTION
Under normal physiological conditions most nutrients in feed are directed towards growth. The immune system is only moderately active and therefore requires little energy and nutrients. During infection, the immune system is triggered and consumes more nutrients, which comes at the expense of the live performance. Symptoms associated with an infection are not only caused by the pathogen, but usually to a greater extent by the immune system. According to several researchers, the immune response is often more severe than necessary to eliminate the pathogen. It is therefore important to control the immune response. Oversensitivity of the immune response leads to an inflammatory response which is characterized by an overproduction of inflammatory cytokines. Those signalling molecules, of which IL-1, IL-1β, TNF-α and IL-6 are most important, target several tissues in the body which eventually results in a lower feed intake, muscle catabolism and fever (Dibner et al, 2007; Klasing et al, 1987; Klasing et al, 1997; Roura et al, 1992; Spurlock, 1997).

Anti-inflammatory molecules help to overcome this. They act by tempering the overproduction of inflammatory cytokines, thereby shifting the major supply of nutrients from the immune system to growth (Grimble and Westwood, 2001; Niewold, 2007; Saemann et al, 2000). This trial was undertaken to study the effect of a feed additive containing natural anti-inflammatory substances on the performance and on the immune response of immunized chicks.
MATERIALS AND METHODS
Two hundred one-day-old male broiler chickens (Ross 308) were allocated at random in equal numbers to 8 floor pens (25 chickens per pen). After arrival, half of the chickens received a commercial starter diet (unsupplemented control diet) whereas the other half received the same starter diet supplemented with 300 mg Product A per kg complete feed (Y-Mune, supplied by Nutrex NV). Starter feed was fed from day 0 to day 14. On day 14, non-consumed starter was weighed by pen and discarded. Grower feed was issued and fed until day 28. On day 28, non-consumed grower was weighed by pen and discarded. Finisher feed was issued and fed until day 42. On day 42, non-consumed finisher was weighed by pen and discarded. Body weight (BW) and feed intake were recorded per pen on day 0, 14, 28 and 42. At 3 weeks of age, blood samples were collected from a wing vein from 5 chicks of each pen. 3 of these chicks per pen were then injected subcutaneously in the neck with 100 µg of human serum albumin (HSA) and Freund's complete adjuvant (FCA) (100 µg HSA/100 µl PBS and FCA: 50:50 v/v). The 2 other chicks per pen were injected with 100 µl phosphate-buffered saline (PBS) as control vehicle. During the next 18 days, blood samples were taken regularly. Fourteen days after the first immunization, the chickens received a second immunization. ELISA was used for quantification of plasma anti-human serum albumin IgG concentrations. The acute phase response, which is a reaction to FCA, was measured by quantification of ceruloplasmin concentrations. Data on performance and plasma parameter values were analyzed with a two-factor ANOVA with age and diet as variables.

RESULTS AND DISCUSSION
At d42, the Product A supplemented chicks had the highest BW and the lowest total feed conversion compared to the control chickens (3105 g vs 2940 g and 1,674 vs 1,756) (not statistically significant (p<0,05)) (fig 1). The acute phase response is a reaction to FCA containing Bacillus Calmette Guerin (BCG). A lower acute phase reaction is expected after BCG injection in the Product A supplemented chicks as result of a reduction in inflammatory cytokine production. For unknown reasons, the chickens didn't show any increase in ceruloplasmin concentration after injection with BCG in this trial, so it was not possible to evaluate the anti-inflammatory properties of Product A. In contrast, Product A supplementation increased the anti-HSA IgG response significantly (1,444 AU vs 1,209 AU) (p<0,05) (fig 2).

Figure 1. Effect of immune on zootechnical performance

![Figure 1](image-url)
CONCLUSION
It is concluded that Product A enhances performance and stimulates the IgG response after immunization. Further study of the anti-inflammatory properties and growth promoting effect of Product A is planned for better understanding of its mode of action.

REFERENCES