DIETARY VITAMIN E MODULATES INTESTINAL IMMUNITY

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Supplementation of poultry diets with Vitamin E (VE) has been shown to improve some aspects of immune function in the chicken, including increased macrophage phagocytosis and increased immunoglobulin G (IgG) and IgM antibody production (Tengerdy and Brown, 1976; Haq et al., 1996). However, the effect of dietary VE on IgA antibody, which acts as the first line of defence of the intestinal mucosa, has not been evaluated in the chicken. Interestingly, recent studies in rats have shown a significant increase in the number of IgA-producing lymphocytes in the mesenteric lymph nodes with VE supplementation of the diet (Kaku et al., 1999).

The present study was designed to investigate the impact of dietary VE on IgA antibody production in broiler chicks, with and without immunisation. From the day of hatch chicks were placed on a maize-based diet containing 50 mg VE/kg which was supplemented with either 50, 250, 1250 or 5000 mg VE [BASF, Lutavit E 50 Special]/kg. At d 21 all chickens were intraperitoneally immunised with Tetanus toxoid in Auspharm adjuvant (patent pending). Two weeks later they received an oral booster of T. toxoid. Serum samples for determination of antibody levels were collected on days 21, 35 and 42, samples of peripheral blood lymphocytes for analysis of T cell subsets were collected on d 19, 26, 33 and 40 and samples of intestinal scrapings were taken at the end of the experiment on d 42.

The effect of dietary VE supplementation on total IgA antibody and antigen-specific IgA antibody levels were determined in serum and intestinal scrapings by ELISA. Total immunoglobulin (Ig) in the serum was also measured. The percentage of circulating CD3⁺, CD4⁺ and CD8⁺ T lymphocytes and Ia⁺ cells were determined by flow cytometry.

Birds receiving 250 mg VE/kg had notably higher total IgA antibody levels in the intestinal scrapings at d 42. Total serum IgA of these birds was significantly higher than for the control birds at d 21, 35 and 42. Following immunisation with T. toxoid, birds receiving 5000 mg VE/kg had significantly higher anti-T. toxoid IgA in the intestinal scrapings at d 42. Total serum Ig was significantly increased at day 35 in birds receiving 250 mg VE/kg and at d 42 in birds 5000 mg VE/kg.

Significant alterations in T-cell subsets in peripheral blood lymphocytes were observed at d 26 when birds receiving 250 mg VE/kg had an increased percentage of CD3⁺ T lymphocytes. These birds also demonstrated higher percentages of CD4⁺ lymphocytes and Ia⁺ cells compared to the control birds.

These results demonstrate the positive impact of dietary VE on systemic and mucosal immune responses in the chicken. In particular, VE induces an increase in IgA (total and antigen-specific) antibody in the serum and intestinal mucosa.


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