Title: Enhancing mucosal immunity in chickens
Project No: US-72A
Authors: W. I. Muir

Summary

The mucosal organs are the most common portal of entry of potential pathogens that cause diseases such as infectious bronchitis, campylobacteriosis, salmonellosis and coccidiosis. Under ideal conditions, contact with a potential pathogen at a mucosal surface will stimulate a local mucosal immune response.

When the initial contact between microbial pathogens and chickens occurs at the intestinal surface, locally produced IgA antibodies interfere by binding to the pathogen and ultimately decreases the incidence of infection. In addition, improved resistance to disease will improve flock health and performance.

Therefore, the focus of this research was to assess the ability of novel vaccination strategies to enhance IgA antibody production at the intestinal surface. Strategies assessed have included the delivery of known mammalian immunostimulatory substances at 18 days of embryonation. In particular, the delivery of dietary supplements Vitamin E (VE) and the cytokine interleukin-6 (IL-6) were assessed.

The series of experiments undertaken during this project identified a number of novel techniques for improving IgA antibody production at the intestinal site, which can reduce infection with bacteria such as S. typhimurium. The delivery of cytokine IL-6 either before or after immunisation will induce an increase in the anti-antigen IgA antibody levels at the intestinal surface.

In addition, the results indicated that delivery of mammalian immunostimulatory substances at day 18 embryonation increased (not statistically significant) the mean concentration of anti-S. typhimurium IgA antibody in the serum compared with chicks vaccinated with S. typhimurium in the absence of VE.

Lastly, evaluation of the impact of dietary supplementation with VE demonstrated that a maize-based diet rich in VE fed to broiler chickens significantly increased total IgA antibody levels. The study revealed that the upregulation of IgA antibody production is more effective when feeding chickens from a day old.

Further clarification and elucidation of the research outcomes is required before the identified immunoenhancing strategies can be successfully adopted by the poultry industry. These studies have identified the requirement to feed vitamin E supplemented diet (VESD) from day old and prior to immunisation for immunoenhancement. However, the feasibility of reducing the pre-immunisation VESD feeding interval while maintaining an enhanced immune response to the antigen must be determined.

These studies have also established the potential for IL-6 cytokine to activate the mucosal immune system in chickens and in particular, IgA antibody production at the intestinal surface following immunisation. However the current delivery schedule is impractical and more research is needed to determine the potential of administering IL-6.