RESEARCH ABSTRACT

SWINE HEALTH

Title: Improving Swine Health: Enhancing Humoral and Cell-Mediated Immunity Using Novel Polymer Adjuvants – **NPB #07-070**

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Scientific Abstract

Single dose vaccination has long been sought as one of the key hallmarks for increasing vaccine efficacy. Biodegradable polyanhydrides possess many properties that facilitate the development of single dose vaccines, including ability to enhance protein stability, tailorable release kinetics and surface erosion. This study evaluated the use of polyanhydride encapsulated pepsin-digested *Brachyspira hyodysenteriae* antigen (PD) as a vaccine regimen to protect pigs from the development of swine dysentery. In comparison to previously studied microspheres containing a single purified protein antigen, microspheres containing the complex antigen performed as expected with respect to morphology and release kinetics of the encapsulated antigens. Prior to challenge, mice vaccinated with PD encapsulated into microspheres developed demonstrable immune responses, both serum antibody and cellular proliferation, to *B. hyodysenteriae* antigen. Upon challenge with *B. hyodysenteriae* organisms, the cytokine profile of cells recovered from microsphere vaccinated animals and the antibody isotype profile was qualitatively different than those of mice vaccinated with PD or from non-vaccinated *B. hyodysenteriae* infected mice. In swine, animals vaccinated with PD in Freund's incomplete adjuvant (FIA) or PD loaded microspheres showed a reduction in disease severity upon challenge with *B. hyodysenteriae*, 100 % and 60%, respectively. While pigs vaccinated with PD-loaded microspheres exhibited a lower serum antibody titers than the pigs receiving PD in FIA prior to challenge, post-challenge serum antibody titers were equal and greater than that of sham vaccinated pigs indicating immunological priming. Furthermore, lymphocytes recovered from the colonic lymph node of pigs vaccinated with the PD-loaded microspheres exhibited greater in vitro antigen-specific recall responses than cells recovered from pigs receiving the PD-FIA vaccine. In addition, the proliferation of peripheral blood mononuclear cells recovered from the microsphere vaccinated pigs was lower than that for cells recovered from the PD-FIA vaccinated pigs, suggesting differential immune modulation. The results of these studies demonstrate that the use of polyanhydride microspheres is safe, induced no detectable tissue reaction at the site of injection, induced 60 % protection against swine dysentery with a single dose and facilitated immune modulation in vaccinated animals. Taken together, polyanhydride microspheres continue to demonstrate their promise in the pursuit of a single dose vaccine carrier that can be used in livestock species.