RESEARCH ABSTRACT
SWINE HEALTH

Title: Development of novel mucosal vaccines for the control of PRRSV outbreaks – **NPB #09-213**

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Scientific Abstract:

Currently practiced control and prevention strategies have been inadequate to reduce PRRS induced economic loss to the pork industry. Stimulating the immune system systemically (i.e. via injection) results mainly in systemic protection, but low mucosal immune responses are generated. Adequate stimulation of the mucosal immune system results in production of both local mucosal and systemic protection, so that infectious agents are blocked from entry into the body. But it is difficult to elicit protective mucosal immunity without the help of appropriate mucosal adjuvants and vaccine delivery system. Since last few years it has been established that anti-viral mucosal immune responses help in the prevention of viral entry to the body and also protect against both homologous and heterologous viral challenges. In this study, we evaluated the adjuvant effects of cholera toxin B subunit and OK432 to potentiate MLV-PRRS induced specific adaptive immunity. Our results indicated that both these candidate adjuvants upregulated the frequency of various anti-PRRSV specific immune cells, Th1 and Th2 cytokines in immunized and both homologous and heterologous PRRSV challenged pigs. But they failed to dampen the immune suppressive mediators, IL-10, TGFβ and Foxp3+ T-regulatory cells. Our attempt to evaluate killed PRRSV vaccine delivery using nanotechnology-based approach has resulted in satisfactory results. In nanoparticle-killed-PRRSV vaccine inoculated (intranasally) PRRSV homologous (strain VR2332) and heterologous (strain MN184) challenged pigs reduction in viremia with reduced viral load in the lungs was detected compared to both the control unvaccinated and killed PRRSV vaccine immunized virus challenged pigs. Clinically, virulent PRRSV MN184 challenge induced the typical PRRS symptoms in unvaccinated and killed-PRRSV vaccine received pigs but not in nanoparticle-killed-PRRSV vaccine inoculated animals. Microscopically, hematoxylin & eosin stained lung sections of both unvaccinated and killed-PRRSV vaccine inoculated MN184 challenged pigs had severe infiltration of inflammatory cells while the nanoparticle-killed-PRRSV vaccine received pigs had substantially reduced infiltration of inflammatory cells. These results were supported by PRRSV specific immune responses at both mucosal and systemic sites, indicated by increased frequency of various immune cell subpopulation and also cytokines, IFN-α (Innate), IL-12 and IFN-γ (Th1) in the lungs and serum, and also upon restimulation of immune cells. In addition, PRRSV specific increased levels of IgA antibodies and virus neutralizing antibody titers were detected in nanoparticle-killed-PRRSV vaccine received compared to control pig groups. In summary, intranasally administered nanoparticle-killed-PRRSV

vaccine is capable of inducing protective immunity to PRRSV, and further studies aimed at few critical modifications to this killed vaccine delivery system may help to take up this strategy to control PRRS in the field.