RESEARCH ABSTRACT

SWINE HEALTH

Title: Evaluation of Nucleic Acid Delivery Methods for a Genetic (DNA) Vaccine against PRRS - **NPB# 98-025**

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Abstract.

The injection of recombinant DNA into an animal for vaccination purposes (i.e., naked DNA immunization) has great potential for controling the infectious diseases of swine. However, an issue that needs consideration is the optimal route and method of delivery of naked DNA for immunization in pigs. Therefore the aim of this project was to evaluate the efficacy of two different methods of DNA delivery to immunize pigs against PRRS virus. The two methods of administration were: (i) intradermal utilizing a gene gun and (ii) intramuscular via a needle and syringe. As a vaccine we utilized a mixture of two plasmids containing cDNA encoding for either PRRS virus glycoprotein GP4 or GP5. These were given twice at a 4-week interval. By four weeks after the second administration of the naked DNA only a very weak cellular immune response against PRRS virus had been induced regardless of the method of delivery. Likewise, a humoral immune response was not detectable when using the IDEXX PRRS ELISA. We reasoned that the poor performance of the DNA vaccine could be at least partly due to the death (apoptosis)-inducing effect of GP5, which would result in low expression of the introduced cDNAs. To circumvent this problem and achieve our goal of testing the efficacy of the two proposed methods of DNA immunization, we changed our strategy. Previous studies in our laboratory have shown that porcine interleukin-12 (poIL-12) can enhance the cellular immune response of pigs to a commercial PRRS modified live virus (MLV) vaccine. Thus, we tested the ability of poIL-12 cDNA introduced into pigs by either of the two proposed routes to enhance the cellular immune response to a PRRS MLV vaccine. When the poIL-12 cDNA was administered biolostically (gene gun) in conjunction with the intramuscular injection of PRRS MLV vaccine, the frequency of PRRS virus-specific interferon (IFN)-□-secreting cells was three-fold greater than that found in pigs immunized with the PRRS MLV vaccine alone or in combination with poIL-12 cDNA injected into the muscle ($p<0.03$). However, in both cases, the negligible titer of virus-specific neutralizing antibodies induced by the MLV vaccine was not altered by the administration of poIL-12 cDNA. These results indicate that biolistic delivery of naked cDNA to pigs is more effective than intramuscular injection of the same entity. Moreover, the observed divergent humoral and cellular immune responses suggest that the development of virus neutralizing antibodies and of IFN-□-secreting cells are independently regulated. In any case, poIL-12 cDNA, when administered via gene gun has the potential to be used as an adjuvant to enhance the poor cellular immune response stimulated by PRRS MLV vaccines.