RESEARCH ABSTRACT

SWINE HEALTH

Title: Strategies to include STa antigen in vaccine development against porcine post-weaning diarrhea (PWD); **NPB #08-005**

Investigator: Weiping Zhang

Institution: South Dakota State University

Date Submitted: Mar. 2nd. 2010

Summary

Enterotoxigenic *Escherichia coli* (ETEC) strains are a major cause of diarrhea disease in humans and farm animals. *E. coli* fimbriae or colonization factor antigens (CFAs) and enterotoxins including heat-labile (LT) and heat-stable (ST) are the key virulence factors in ETEC diarrhea. Unlike fimbriae or LT, STa has not been much included as an antigen in vaccine development against ETEC diarrhea because of its poor immunogenicity. STa becomes immunogenic only after being coupled with a strongly immunogenic carrier protein. However, native or shorter STa antigens either had to retain toxic activity in order to become antigenic or elicited anti-STa antibodies that were not sufficiently protective. In this study, we genetically mutated porcine LT (pLT) gene for a $pLT_{192(R\rightarrow G)}$ toxoid and STa (pSTa) gene for three full-length pSTa toxoids [$STa_{11(N\rightarrow K)}$, $STa_{12(P\rightarrow F)}$, and $STa_{13(A\rightarrow Q)}$], and used the full-length pLT_{192} as an adjuvant to carry the pSTa toxoid for 'pLT_{192}:pSTa-toxoid' fusion antigens. Rabbits immunized with 'pLT_{192}:$pSTa_{12}$' or 'pLT_{192}:$pSTa_{13}$' fusion protein developed high titers of anti-LT and anti-STa antibodies. Furthermore, rabbit antiserum and antifecal antibodies were able to neutralize purified cholera toxin (CT) and STa toxin. In addition, preliminary data suggested that suckling piglets born from a sow immunized with the 'pLT_{192}:$pSTa_{13}$' fusion antigen were protected when challenged with a STa-positive ETEC. This study demonstrated that pSTa toxoids are antigenic when fused with a pLT toxoid, and elicited anti-LT and anti-STa antibodies were protective. This fusion strategy could provide instructive information to develop effective toxoid vaccines against ETEC associated diarrhea in animals and humans.