Australasian Pork Research Institute Ltd APRIL

PROJECT SUMMARY

Project Number and Title:
5A-103: Development of a *Streptococcus suis* vaccine via measurement of immune responses to four different *S. suis* vaccine preparations, using an Australian cps2 ST25 strain.

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Project Participants:
A/Prof Sam Abraham, Dr Shafi Sahibzada, Dr Diana Turpin and Mrs Josie Mansfield (Murdoch University); Prof Mariela Segura and Prof. Marcelo Gottschalk (University of Montreal).

Aims and Objectives:
This study aimed to assess the efficacy of four different vaccine preparation methods for *S. suis* bacterins in producing an immune response as measured by analysis of different immunoglobulin subclasses.

Experimental design:
Bacterial cultures of a cps2 ST25 *S. suis* strain were prepared at concentrations of $1x10^9$ cfu/ml and $1x10^{10}$ cfu/ml, and inactivated using either formalin, binary ethylenimine (BEI), lysozyme/detergent or heat treatment. Eight weaner pigs were assigned to each vaccine group, including a negative control group, and received 1 ml of vaccine preparation intra-muscularly on days zero and 14 after weaning. Blood was collected from each pig on days 0, 7, 14, 21 and 28 for measurement of serological response, and pigs were weighed on days 0, 7, 14 and 21. Analysis of total immunoglobulin, IgM, IgG1 and IgG2 was performed using ELISA.

Key Findings:
The heat-inactivated vaccine using a dose of $1x10^{10}$ cfu/ml produced the most robust immune response as measured by total Ig and IgG1. Using sample to positive ratio as a proxy of antibody level, mean optical density (OD) levels were higher than all other treatment groups. In week 4 they were significantly ($P<0.05$) higher than heat, formalin and BEI at $1x10^9$ cfu/ml, and significantly ($P<0.05$) higher than formalin at $1x10^{10}$ cfu/ml. These results were mirrored in week 5.

Higher mean OD sample/positive ratio for heat-inactivated vaccine using a dose of $1x10^{10}$ cfu/ml was seen for IgG1 subtype, with a significant ($P<0.05$) difference when compared to lysozyme and BEI at $1x10^9$ cfu/ml and BEI at $1x10^{10}$ cfu/ml. The IgG2 sample/positive ratio was also higher overall for heat-inactivated vaccine at $1x10^{10}$ cfu/ml. However, a significant ($P<0.05$) difference was only seen between this and BEI at $1x10^9$ cfu/ml. There were no statistically significant differences when assessing IgM.

Titration of serum samples from day 0 and day 35 was performed for all $1x10^{10}$ cfu/ml vaccine preparations. The heat treatment vaccine showed a significant increase in total Ig measured, with a four-fold increase in antibody titre over this period, and both the heat treatment and formalin vaccines showed ≥4-fold titre increases in IgG1 measured.

Applications to Industry:

S. suis heat-treated vaccine preparations can elicit IgG antibody responses that are superior to other preparations tested, including the currently used formalin inactivation method. The use of heat inactivation is a simple and cheap method for bacterin production, and would likely be a feasible option for large scale vaccine production following field trials to assess protective efficacy.

Adoption by producers would not require any further labour costs or production costs, as existing formalin vaccines could be swapped out for heat-treated vaccines. It would also minimise costs associated with formalin inactivated vaccine production as there are no chemical costs or residual formalin testing required.