5A-106 (2D-130): *Improving reproductive performance in pigs*

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Project Participants: University of Adelaide, Roseworthy piggery and Australian Pork Farm group

Aims and Objectives

The project uses a three-prong approach to increase farrowing rates, increase litter size, decrease the number of NIPs and reduce the use of boars in the mating shed. The project consisted of 3 subprojects to address these aims:

(1) Fixed-time AI (FT-AI) using Gonavet using only one insemination to increase farrowing rates;
(2) Increasing progesterone levels during early pregnancy to increase litter size; and
(3) Development of an early pregnancy test strip to detect pregnancy as early as day 19 post mating and reduce the number of NIPs and empty days in the herd.

Key Findings

Protocols for using FT-AI were developed and tested in a series of experiments using research and commercial herds. The preferred FT-AI protocol was an injection of equine chorionic gonadotrophic hormone (eCG) 24 hours after weaning, followed by a gonadotrophin releasing hormone analogue (GnRHa) 96 hours after weaning. Insemination with one dose of 3×10^9 spermatozoa followed 24 hours after the GnRHa injection. This FT-AI protocol with one insemination maintained subsequent litter size, but increased pregnancy and farrowing rates without requiring boar stimulation and synchronization of heat.

Several experiments were conducted to develop progesterone (P4) implants that were capable of releasing sufficient progesterone to increase circulating levels of P4 in early gestation to improve embryo survival. Progesterone levels in blood samples collected from the jugular vein were increased by P4 implants inserted on day 10 of pregnancy but this was not associated with an increase in subsequent litter size. Budget constraints for this component of the project prevented more refinement of this strategy to increase P4 in early gestation.

In the third component of the Project, a nitrocellulose (NC) test strip based on lateral flow technology was suggested as a technology to detect pregnancy in sows within about day 20 after insemination. Pregnancy detection using blood and urine samples from day 19 pregnant gilts and sows was possible using established laboratory-based oestrone and progesterone radioimmunoassay. However, although pregnancy was able to be detected by the NC strips containing the appropriate antibodies that were developed within this project, it was not anywhere near the level of accuracy required for a commercial product.

Application to Industry

The standard FT-AI protocol of eCG 24 hours after weaning, followed by GnRHa 96 hours after weaning and then insemination 24 hours later with one dose of 3×10^9 spermatozoa does provide at least equivalent performance to the standard oestrus detection and mating procedures. This FT-AI protocol should be evaluated in further field studies, particularly under conditions where fertility may be compromised.

The findings from the progesterone implant studies cannot be directly applied to commercial pork production because the progesterone response from implants was inconsistent and not sufficient to evoke an increase in early embryo survival.

A Pork CRC commercialization project was initiated with a Belgium company to examine whether the NC technology could be commercially developed to the stage of being able to accurately diagnose pregnancy at about day 20 after insemination.