Australasian Pork Research Institute Ltd APRIL

PROJECT SUMMARY

Project Number and Title:
A3B-104 *Seasonal fertility: a novel approach to alleviating seasonal infertility in sows*

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Aims and Objectives:

1. Quantify whether the negative impact of the summer season on reproductive output is reduced in more fertile sows.
2. Determine if post-cervical insemination (PCAI) can be used to increase prolificacy and so reduce seasonal influences on sow productivity.

Experimental design:

1. **Part A** involved the analyses of two large, historical datasets that used herd performance recording software (Metafarms, Burnsville MN, USA). Data for Exp 1 was obtained from a 7,500-sow commercial South Australian farm from September 2012 to September 2020 and analysed for differences in reproductive performance across months. The final dataset used for the analysis consisted of 36,535 farrowing records of 15,850 parity 1 to 4 sows. Observations were truncated after the fourth parity as older sows did not display seasonality in litter size. As the largest seasonal influences on reproductive traits were apparent in younger sows, a farm that had detailed recording of gilt arrival information was sourced.

   Data for Exp 2 was obtained from a 4,500-sow commercial South Australian farm and extracted from May 2017 to April 2020 with records for 26,007 sows containing arrival, mating and farrowing information. Gilt arrival and first lactation parameters were explored as potential factors to drive seasonal fertility.

2. **Part B** involved two experiments to test the impact of PCAI on litter size and influence on seasonal fertility.

   a. Experiment 1 – a pilot investigation conducted outside the seasonal infertility period to quantify impacts of mating technique (cervical artificial insemination (CAI) vs PCAI) on total pigs born, born alive and born dead. Two hundred and seventy-seven sows were allocated based on parity to one of the two treatments and mated over a three-week period at an 8,000-sow breeder unit in Queensland with reproductive parameters (farrowing rate, total born, born alive and born dead) recorded.
   b. Experiment 2 - involved 483 sows selected from August to October 2019 from a 4,000-sow breeder unit in South Australia and allocated to using CAI (n = 252) or PCAI (n = 231). These sows were weaned during January to March 2020 and reallocated to one of the following three treatments: CC, n = 90: Sows mated during winter using

CAI and re-mated in summer using CAI; PP, n = 92: Sows mated during winter using PCAI and re-mated in summer using PCAI; CP, n = 120: Sows mated during winter using CAI and re-mated in summer using PCAI). The same reproductive parameters were recorded, in addition to pre-foster piglet mortality and number of pigs weaned.

Key Findings:

1. **Part A**: the number of piglets born alive was lowest in first- and second-parity sows across seasons. The greatest reduction in number of piglets born alive was observed in first- and second-parity sows mated in warmer months, farrowed in cooler months. Third- and fourth-parity sows had less variation in number of piglets born alive across seasons. Gilt arrival age was a significant covariate for the number of piglets born alive, but arrival weight was not.

   For the trait of farrowing rate, weight at arrival tended to be a significant factor, with the highest performance observed at 115 -120 kg. The mean farrowing rate of parity 1 to 5 sows across three years was 85.5%, with a 3.6% drop between summer matings compared to winter matings.

   First- and second-parity sows had the greatest change in farrowing rate, with first parity sows incurring a 15.5% reduction and second parity sows a 13.9% reduction when mated in the warmer months. None of the traits recorded in the first lactation (number of pigs weaned, lactation length) impacted on second breeding performance in summer.

2. **Part B**: the pilot study showed whilst there was no difference in farrowing rate or total pigs born, pigs born alive were reduced by 1 pig per litter when PCAI was applied. The larger investigation revealed that in spring matings, there was no change in farrowing rate, total born, born alive or born dead between CAI and PCAI contrasting the pilots finding. However, there was an increase in number of pigs weaned and a tendency for reduced pre-foster deaths in the PCAI compared to CAI sows (weaned; 10.3 vs 9.7 pigs per litter, pre-foster mortality; 0.6 vs 0.8 pigs per litter).

   When sows were re-mated in summer (Experiment 2), no treatment effects were identified for farrowing rate, total born or born alive. Sows in the CC group weaned significantly fewer pigs in comparison to the CP and PP sows. Sows in the PP group gave birth to significantly fewer piglets born dead and showed a tendency for the lowest pre-foster mortality.

Applications to Industry:

1. First- and second-parity sows are more susceptible to the negative impacts of heat stress on reproduction and so should be the target population for any strategy employed to promote seasonal fertility. Older sows are more resistant to seasonal fertility which may be a consequence of metabolism or culling strategies used on farm.
2. There was some indication that gilt entry weight may drive seasonal fertility for first parity sows, with an optimum of 115-120 kg, but future work should also examine weight at mating, or even better, growth rates to mating.
3. Performance in the first lactation had no impact on seasonal fertility in second party sows.
4. Use of PCAI does not improve farrowing rate or litter size farrowed either leading into summer matings, or when applied during seasonal infertility risk period. However, number of pigs weaned is improved when sows are bred using PCAI and this is driven improvements in piglet viability.