

1A-107: Reducing early embryonic loss in the pig

Project Leader Associate Professor Mark Nottle,
School of Paediatrics and Reproductive Health, University of Adelaide

Project Participants Dr Pieter Langendijk , Research Scientist, SARDI

Aims and Objectives

The Australian sow ovulates on average 22 oocytes per cycle yet the number of pigs born live is around 11. A recent study by us showed that 33% of embryos (7 potential piglets) were lost by day 35 of gestation, with 23% (5 potential piglets) lost by day 21 (Langendijk et al., Pork CRC project 5A-105). Apparent differences in embryo survival between Australian and overseas herds suggest that further studies in this area are warranted. Previous studies in mice have demonstrated that the number of cells in the inner cell mass of blastocysts is correlated with implantation rate and fetal development and that this can be influenced by nutrition (Lane and Gardener 1997). As a first step in understanding the reasons for this loss in Australian Herds the present study examined the relationship between nutrition and inner cell mass number in gilts and sows using the known effect of feed restriction to increase early embryonic loss.

Key Findings

The present study confirmed previous studies that gilts fed at recommended levels for at least two weeks prior to ovulation (control) have a higher ovulation rate and as a consequence numbers of embryos, compared with those fed at maintenance (restricted). Interestingly blastocysts from the restricted group tended to have higher total, trophectoderm and inner cell mass cell numbers. Similar trends in ovulation rate and blastocyst total, trophectoderm and inner cell mass cell number were also seen in the sow study.

Application to Industry

This is the first time to our knowledge that the effect to feed restriction on blastocyst inner cell number has been examined in gilts and sows. The apparent increase in cell number with restricted feeding was an unexpected finding which we have interpreted to mean that under normal management conditions gilts and sows produce a proportion of embryos which are less viable (as indicated by inner cell mass cell number) which is a major contributor to early embryonic loss. Alternatively cell number may not be a good predictor of early embryonic loss in the pig. Given the potential to increase the number of piglets born by up to five the present study needs to be extended to confirm which hypothesis is correct. If confirmed that a proportion of embryos ovulated under normal management conditions are non-viable, the current approach will not only have identified a major source of early embryonic loss but also provide a model whereby strategies designed to reduce this can be evaluated by determining whether or not increasing inner cell mass number.

The immediate message to Australian pork industry is that the results of this project confirm the adverse effects of restricted feeding prior to ovulation and insemination on ovulation rate and litter size. Every attempt should be made to ensure satisfactory feed levels are achieved for the 1-2 weeks prior to insemination.