Molecular Studies of Mechanisms Regulating Embryo Development in Pigs

Walter T. Dixon, Linghuo Jiang, Jagdeece J. Ramsoondar, Joan Turchinsky, Susan Novak and George Foxcroft

Alberta Pork Research Centre/Department of Agricultural, Food, and Nutritional Science, University of Alberta, Edmonton, AB T6G 2P5.
Email: wdixon@afns.ualberta

Embryonic mortality is a major source of productivity losses in Alberta's swine herds, with estimates that as many as 30% of ovulated (and subsequently fertilized) eggs do not subsequently give rise to live born piglets. Much of this loss occurs around days 12-18 of pregnancy when migration, elongation, and uterine attachment of blastocyst–stage embryos occurs. The porcine blastocyst consists of an inner cell mass surrounded by a single layer of trophoblast, and has a spherical shape with a diameter of approximately 0.2 mm. Attachment of the blastocyst to the uterus (Day 14) is an essential step of pregnancy, leading to the formation of a placenta that supports embryonic/fetal development to term. Normal embryo growth depends both on soluble factors secreted by the cells lining the uterus and on factors produced by the blastocyst itself.

Total RNA (ribonucleic acid) was extracted from embryo- and uterus-derived tissues representing peri-implantation stages of pregnancy and was analyzed for the expression of a panel of genes, which may regulate growth, differentiation and attachment of porcine embryos. These genes include those which "code" for growth factors, cytokines (regulators of immune cell function), as well as genes which determine the ability of the embryo to attach to the uterus. The temporal profiles of expression of these genes over the peri-implantation period was examined and the results tentatively implicated several members of the panel as playing key regulatory roles at this stage of pregnancy.

Implications:
The ongoing research seeks to develop a gene expression profile from animals, which exhibit low or high rates of embryo survival, and the nutritional factors, which may contribute to this difference. This research is funded by Alberta Pork and the AARI.