RESEARCH ABSTRACT

ANIMAL SCIENCE

Title: Development of an in vitro model of heat stress during pig oocyte maturation and its impact on embryonic developmental competency **- NPB #09-249**

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Scientific Abstract:

The objective of this project was to develop an *in vitro* model to evaluate the impact of heat stress during oocyte maturation and subsequent embryonic development competency in pigs. We characterized the impact of three different heat stress treatments during porcine oocyte maturation on subsequent embryonic developmental competency. To evaluate the molecular response to heat stress in oocytes that were exposed to heat stress treatments during maturation we measured several markers to determine oocyte viability and heat stress response. Three levels of heat stress were administered during in vitro maturation, 1) heat stress of oocytes at 41^{o}C for the first 21 hours, 2) heat stress for the last 21 hours of in vitro maturation, or 3) heat stress for the duration (42 hours) of in vitro maturation. Reduced maturation rates and developmental competency of embryos produced following in vitro maturation was affected by the timing and duration of heat stress. Compromised developmental capacity from the 4-cell stage to the blastocyst stage was greatest in embryos produced from oocytes heat stressed for the duration of in vitro maturation and was correlated to MIR21, PDCD4 and HSP90a expression at the 4- to 8-cell stage of development. These data demonstrate a temporal relationship between MIR21 and its target mRNA, PDCD4, and suggest their utility as molecular markers of developmental competence following heat stress. Four to eight cell stage embryos produced form oocytes subjected to 42 hours of heat stress had greater MIR21 and HSP90a expression and significantly lower PDCD4 expression, while HSF1 gene expression was not affected by oocyte heat stress treatment. These gene expression data represent biological mechanisms in the 4- to 8-cell stage embryo that are impacted by heat stress during oocyte maturation and provide potentially novel molecular markers of embryonic developmental competence as a result of heat stress during female gamete production.