Faculty of Medicine Research Bursary Program

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** To be printed as is in Student Research Day booklet; abstract must be no more than 1 page in length **

Title: The Effect of Individual and Well Culture on In Vitro Development of Mouse Embryos

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Background information: Two assisted reproductive technologies, in vitro maturation and in vitro fertilization of oocytes, both require the transfer of multiple embryos to the uterus to increase the likelihood of pregnancy. However, transfer of multiple embryos can result in unwanted and dangerous multiple pregnancies. As such, new research is underway in the mouse model to explore non-invasive ways to assess the inherent developmental potential of individual oocytes, thereby reducing the number of embryos transferred while maximizing pregnancy rates. In order to optimize the precision of such studies, an efficient method to keep track of the individual developmental viability of each oocyte and its derived embryo needs to be established. One possible tracking method is to culture each oocyte and embryo singly (single culture), but this may negatively impact development. A potential alternative is to culture in groups while immobilizing individual embryos in micro-wells to prevent mixing (well culture).

Purpose of the study: To evaluate, by comparing mouse embryonic developmement in single culture and well culture, the relative feasibilities of these two culture systems for future studies of in vitro oocyte competence assessment.

Methods: Female CD-1 strain mice were superovulated by 6IU pregnant mare's serum gonadotropin (PMSG) followed 48 hours later by 10 IU human chorionic gonadotropin (hCG). Oocytes were collected from half of the females for in vitro fertilization, while the other half were mated with males of the same strain to produce in vivo fertilized embryos. The in vitro and in vivo fertilized zygotes were distributed into three in vitro culture conditions: single culture in 7ul of medium, well culture of 8 embryos in 56 ul of medium, and conventional group culture of 8 embryos in 56 ul of medium as control. The percentage of 2-cell embryos developing to the blastocyst stage (blastocyst rate) was used to evaluate embryonic development.

Results: The single culture blastocyst rates for both IVF and mated embryos were 5.8% and 23.3%, respectively. These rates are significantly lower than those observed in group culture (48.0% in IVF, 64.5% in mated) and well culture (57.9% in IVF, 75.9% in mated). Well culture produced a slightly higher blastocyst rate than the group culture control for both IVF and mated embryos, but the differences are not statistically significant.

Conclusion: Well culture is suitable for tracking the development of individual mouse embryos while maintaining development, and therefore should be used in future studies of oocyte competence assessment. Single culture, on the other hand, impedes development too much to be used effectively. In addition, the possible developmental benefits of the well culture system applied to general in vitro embryo culture warrants further investigation.