Assisted reproductive techniques alter the expression of genes that are important for metabolism

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Research to be presented at the Annual Meeting of the Society for the Study of Ingestive Behavior (SSIB), the foremost society for research into all aspects of eating and drinking behavior, finds that assisted reproductive techniques alter the expression of genes that are important for metabolism and the transport of nutrients in the placenta of mice. The results underscore the need for greater understanding of the long-term effects of new assisted reproductive techniques in humans.

Millions of children, comprising roughly 1-2% of all births in the U.S. and Europe, have been born to couples experiencing fertility problems through the use of assisted reproductive techniques such as in vitro fertilization (IVF). However, relatively little research has been conducted to evaluate the long term effects of assisted reproductive techniques.

It is suggested that children born following some assisted reproductive techniques have increased incidence of metabolic problems, such as increased blood pressure, higher fasting glucose level and more body fat. Mice generated through IVF show similar problems, and new research suggests that this may be linked to altered expression of genes in the placenta that are important for fetal growth and development before birth. "Our preliminary data suggest that transfer of nutrients or growth factors from mother to fetus may be changed by assisted reproductive techniques, and this change may contribute to increased body weight and

decreased glucose tolerance in the adult offspring", said the lead author of the study, Kellie Tamashiro.

The researchers are interested in examining the effect of different assisted reproductive techniques on the metabolic status of offspring using a mouse model. In the current study, they measured the expression of genes important for transporting nutrients and growth factors from the mother to the fetus during pregnancy.

They measured insulin-like growth factor 2 (Igf2) and glucose transporters 1 and 3 (Glut1 and Glut3) in placentas from female mice impregnated either by natural mating or by one of two different assisted reproductive techniques: in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). IVF involves incubating egg and sperm together, and is the most common form of assisted reproduction in humans. ICSI is increasingly used in the clinical setting to address male infertility. The ICSI technique involves injecting the sperm's head directly into the egg since the sperm is unable to fertilize the egg on its own.

Mouse embryos derived from IVF and ICSI were transferred to a surrogate mother mouse, and the pups were delivered by caesarean-section. IVF and ICSI increased Glut1 and Glut3 expression in the placenta compared with natural mating. These results suggest that artificial manipulations used in assisted reproductive techniques may increase offspring susceptibility to metabolic consequences through alterations in placental nutrient transfer from mother to the fetus.

"It is important to point out that it is premature to extrapolate these preliminary results in mice directly to humans. Further evaluation of assisted reproductive techniques and their long term effects are required. Rigorous testing of new assisted reproductive techniques prior to their use in clinical settings is needed to determine their safety for both mother and child", said Tamashiro.

Source: Society for the Study of Ingestive Behavior