SEMEN EXPOSURE IN EARLY PREGNANCY IMPACTS FETAL AND NEONATAL GROWTH

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Optimal uterine receptivity is critically important to embryo implantation and subsequent development of the fetus and placenta. Modulators of the uterine cytokine and immune environment are present in seminal plasma. To determine the extent to which seminal plasma programs uterine receptivity and subsequent fetal growth, an embryo transfer model was developed. Embryos were transferred to female recipients prepared by mating with either vasectomised (vas) males or vasectomised males from which seminal vesicles, the major source of seminal plasma, were removed (vas+svx). Placental and fetal parameters were measured at Day 18 of pregnancy, and an additional cohort of embryo recipients progressed to birth to allow growth trajectories and body composition measurement in progeny. At Day 18 of pregnancy, the number of viable implantation sites was unaffected but fetal weight was reduced by 4% ($P = 0.05$) when females were mated to vas+svx males compared with control pregnancies. Placental weight was not affected. Histological analysis of Day 18 placentas showed decreases in the total mid-sagittal cross sectional area and that of labyrinthine (nutrient exchange) tissue of placentas derived from vas+svx mated females. In term experiments, neonates from matings with vas+svx males were 12% smaller 24 h after birth ($P < 0.001$) and 14% smaller at 8 days ($P < 0.001$). Mice derived from vas+svx matings exhibited lower weights compared to those from vas matings until 14 weeks of age. The data demonstrates a critical role for semen in preparing the pre-implantation uterine environment so as to optimise subsequent growth of the fetus and neonate. The effects of seminal plasma are likely to be mediated through the maternal immune response and cytokine expression which influence placental morphogenesis and nutrient transfer function. Our findings have relevance to assisted reproduction programs, where pregnancies are routinely initiated in the absence of female tract exposure to semen.

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