

Regulation of the oviduct environment as a factor in embryonic survival in the gilt

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The oviduct secretes specific proteins and growth factors during the peri-ovulatory period that play a role in maturation of gametes, fertilization and embryonic viability. In vivo, changes in the oviductal environment are very dynamic and regulated by major changes in local ovarian steroid concentrations in the oviduct vasculature during the peri-ovulatory period. Furthermore, studies in the pig indicate that both the absolute concentrations of ovarian steroids, and the temporal relationships between E₂ and P₄, are important to embryonic survival. As specific patterns of feed restriction during the estrous cycle and high feed intakes after ovulation in gilts, reduce post-ovulatory progesterone concentrations and embryonic survival at d 28 of pregnancy, oviduct secretion may be an important mediators of such effects.

In a series of studies, the mechanisms regulating oviduct function, and affects of nutritional regimen on the oviduct environment were investigated. Porcine oviductal secretory protein (pOSP) and insulin-like growth factor (IGF)-I were chosen as markers of oviduct quality, as they have roles in fertilization and embryonic development. We have shown that pOSP mRNA, and protein, and insulin-like growth factor (IGF-I) change dynamically over the peri-estrous period in oviduct flushings. Furthermore, we demonstrate that higher plasma steroids were associated with higher pOSP in oviductal flushings, and the oviduct environment is regulated locally by high ovarian steroid concentrations. Feed restriction in the late, compared to the early, luteal phase reduced estradiol concentrations in oviductal plasma, pOSP mRNA in oviductal tissue, and IGF-I concentrations and pOSP abundance in oviduct flushings. Previous insulin treatment also differentially affected oviduct function. These data provide the first direct evidence for effects of previous feed restriction and insulin treatment on the oviduct environment in the peri-ovulatory period, which may contribute to nutritional effects on embryonic survival.

Implications: This study has provided important insights into the regulation of components of oviductal fluid that have been implicated in embryonic development. Previous feed restriction can affect the oviduct environment in gilts and may contribute to established differences in subsequent fertility.