

## Concentrations of Amino Acids and Expression of Their Transporter in the Pig Uterus Throughout Pregnancy

Alexandria Ross<sup>1</sup>, Bryan A. McLendon<sup>1</sup>, Avery C. Kramer<sup>1</sup>, Xilong Li<sup>2</sup>, Guoyao Wu<sup>2</sup>, Fuller W. Bazer<sup>2</sup>, and Gregory A. Johnson<sup>1</sup>

<sup>1</sup>Departments of Veterinary Integrative Biosciences and <sup>2</sup>Animal Science, Texas A&M University, College Station, TX 77843

Progesterone (P4) is an essential hormone for the establishment and maintenance of pregnancy. The porcine conceptus (embryo/fetus and placental membranes), requires histotroph, a mixture of hormones, cytokines, amino acids, and other nutrients, to undergo elongation, implantation/attachment, and placentation essential for development of the embryo/fetus. Solute Carrier Transporters (SLC) transport amino acids (small neutral, large neutral, anionic, cationic) across membranes. To characterize SLC expression during gestation, gilts were assigned to cyclic or pregnant groups, with hysterectomies performed on either Day 9, 12, or 15 of the estrous cycle or Day 10, 12, 15, 20, 25, 30, 35, 40, or 60 of gestation. qPCR was used to measure relative changes in the endometrial expression of select SLC mRNAs. Expression of SLC1A4 mRNA was elevated on Day 15 of both the estrous cycle and pregnancy, and further increased between Days 35 and 60 of pregnancy ( $p < 0.05$ ). SLC1A5 mRNA expression was also elevated on Day 15 of the estrous cycle and pregnancy, and increased significantly ( $p < 0.05$ ) from Day 25 through Day 60 of gestation. Expression of SLC7A10 mRNA was slightly elevated on Day 10 of pregnancy, decreased until Day 25 and then increased significantly ( $p < 0.05$ ) to Day 60 of gestation. No significant changes in expression between days were detected in cyclic gilts. Expression of SLC6A9 mRNA was greatest on Day 12 of the estrous cycle and Days 10 and 12 of pregnancy, but decreased significantly by Day 15 of both the estrous cycle and pregnancy ( $p < 0.05$ ). SLC7A8 mRNA expression increased between Days 10 and 15 of gestation, and slowly decreased through Day 30. Expression of SLC7A8 mRNA increased between Days 9 and 12 of the estrous cycle, and decreased by Day 15. The secretion of histotroph is regulated by P4, estrogen (E2), and other paracrine signals. To study the contribution of P4 to amino acid transport across the endometrial luminal epithelium (LE) during pregnancy, ovariectomized gilts received daily injections of either P4 or corn oil (CO) from Day 12 through Day 39 post-estrus. HPLC was used to determine concentrations of amino acids in the uterine lumen on Day 40 in P4- and CO-treated gilts. Aspartate, serine, glycine, threonine, citrulline, arginine, taurine, alanine, methionine, valine, phenylalanine, isoleucine, leucine, and lysine were significantly more abundant in uterine flushings of P4-treated than CO-treated gilts. Next, qPCR was used to analyze the endometrial mRNA expression of the facilitated solute carrier transporters, SLC1A4, SLC1A5, SLC6A9, SLC7A8, SLC7A10, and SLC38A1, to determine effects of P4 on their expression. SLC6A9 mRNA expression increased ( $p < 0.05$ ) in response to P4

whereas P4 treatment decreased ( $p < 0.05$ ) expression of SLC7A10 mRNA. There was no significant difference in the relative expression of mRNAs for the other amino acid transporters. The results from these studies indicate a dynamic role of P4 in the regulation of solute carrier expression in the endometrium for transport of amino acids across the endometrial LE to support elongation, implantation and placentation of pig conceptuses. This research was supported by Agriculture and Food Research Initiative Competitive Grants no. 2022-67015-37229 from the USDA National Institute of Food and Agriculture.