

Brandon Smith

Major advisor- Kristen Govoni.

Poster title: Maternal nutrient restriction and re-alimentation influences liver and muscle tissue development and gene expression

B. I. Smith¹, M. A. Vásquez-Hidalgo³, K. A. Vonnahme³, A. T. Grazul-Bilska³, K. Swanson³, N. Mishra², S.A. Reed¹, S. A. Zinn¹, and K. E. Govoni¹

¹Department of Animal Science, University of Connecticut, Storrs, CT, USA; ²Department of Pathobiology and Veterinary Sciences, University of Connecticut, Storrs, CT, USA;

³Department of Animal Sciences, North Dakota State University, Fargo, ND, USA

To determine the effects of maternal nutrient restriction and re-alimentation on fetal liver and muscle development, 48 pregnant ewes with singletons, were fed a control diet [100% National Research Council (NRC) requirements (CON)] starting at the beginning of gestation. On day 50 of gestation, ewes (n=7) were euthanized and fetal liver and skeletal muscle samples were collected. The remaining animals were fed either CON or 60% NRC requirements (RES), a subset were euthanized at day 90 of gestation (n=7/treatment), and fetal samples obtained. Remaining ewes were maintained on the current diet (CON-CON, n=6; RES-RES, n=7) or switched to alternative diet (CON-RES, RES-CON; n=7/treatment). On day 130 of gestation, remaining ewes were euthanized, and fetal samples collected. Fetal liver was analyzed for general tissue morphology, and fetal skeletal muscles were analyzed for lipid accumulation. mRNA expression of growth and metabolic factors were quantified in liver and muscle tissues. Hepatocellular vacuolation was increased in RES-CON and RES-RES compared with CON-CON and CON-RES ($P < 0.01$). In the semitendinosus and triceps brachii, intramyocellular lipid content increased in RES-CON and RES-RES compared with CON-CON and CON-RES ($P \leq 0.02$) and in longissimus dorsi, lipid content was decreased in CON-RES and RES-RES compared with CON-CON and RES-CON ($P = 0.01$). In liver, insulin-like growth factor binding protein-1, glycogen synthase 2, and pyruvate dehydrogenase kinase 1 expression increased ($P \leq 0.03$) and fatty acid synthase expression decreased ($P = 0.04$) in CON-RES and RES-RES compared with RES-CON and CON-CON. In LD, IGF1-R and PAX7 expression increased in CON-RES and RES-RES compared with RES-CON and CON-CON ($P \leq 0.04$). These results demonstrate that maternal nutrient restriction followed by re-alimentation restores liver and muscle gene expression while increasing liver vacuolation and muscle lipid content potentially leading to altered tissue function later in life.