Growth and Development 2


Trace minerals, Cu and Zn, play a key role in fetal development, being required for immune system and muscle development. However, little is known about the effects of maternal Cu and Zn nutrition on muscle and immune system development of ruminant offspring. Therefore, the objective of this trial was to evaluate effects of trace mineral source on ewe performance during gestation and epigenetic changes to muscle and immune function of their offspring. Ewes were allocated by body weight to receive: no additional Cu or Zn (CON); Cu and Zn sulfates supplying 300% of NRC requirement (ITM); or Cu and Zn as chelates (MINTREX trace mineral, Novus International) supplying 300% of NRC requirement (MMHAC). Treatments were fed 7 d before conception and through parturition. Following parturition, one lamb from every ewe was weighed and harvested at d 0 of life followed by a second lamb at d 60. Jejunum, longissimus dorsi (LD), and thymus were weighed and sub-sampled from lambs for epigenetic and gene expression measures. Treatment and lamb sex were fixed effects in the model. Lambs harvested on d 0 tended to weigh greater (P < 0.10) when ewes were fed MMHAC compared with ITM. Weight of LD on d 0 tended (P < 0.09) to be greater for lambs from ewes fed MMHAC compared with ITM, with no other differences in organ weights observed on d 0 or d 60. Global histone acetylation tended (P < 0.10) to be greater in LD of lambs from ewes fed MMHAC compared with ITM. Expression of FoxO3 on d 0 was significantly (P < 0.05) lower in LD of lambs from ewes fed MMHAC compared with ITM and CON on d 0. Expression of IkBKB tended (P < 0.09) to be greatest, while TNFα tended (P < 0.09) to be lowest, in jejunal tissue of lambs from ewes fed ITM or MMHAC compared with CON on d 0. TLR2 tended (P < 0.09) to be greatest injejunal tissue of lambs from ewes fed MMHAC compared with CON on d 60. Villi width and muscular thickness tended (P < 0.06) to be lower in jejunum of lambs from ewes fed ITM or MMHAC compared with CON on d 60. These data suggest trace mineral supplementation throughout gestation affects progeny muscle development and immune function.

Key Words: trace mineral, epigenetic, muscle

508 Milk consumption differs by breed and lung consolidation score in automated feeding systems. T. S. Steckler*, M. A. Erasmus, and J. P. Boerman, Purdue University Department of Animal Sciences, West Lafayette, IN.

Dairy farmers are increasingly using automation in their operations and a larger number of farms are breeding at least a portion of their cows to beef semen to increase the price received for calves. However, little information is available about best management practices for beef × Holstein F1 crosses and Holsteins in automated feeding systems. The objective of this study was to compare milk consumption, health, and growth of Holstein calves (H) and Angus × Holstein F1 calves (F1) during the pre-weaning phase. Data from calves (n = 212) including daily milk consumption (birth-weaning), serum total protein, pneumonia incidence, and lung scores were collected on a commercial farm from Nov. 9, 2018–Jan. 27, 2019. Calves were fed pasteurized waste milk with 20 g/L of a 30% protein, 5% fat milk enhancer through a Förster-Technik automated calf feeding system (pens = 4) for 63.4 d (range 55–72 d). Calves were weighed at birth and weaning, and the average birth weight was 41.2 ± 5.6 kg (mean ± SD). Thoracic ultrasounds were performed on each calf at 57 ± 4.8 d (mean ± SD) using a 1–3 scale for lung consolidation score (LCS, 1 = no lung consolidation, 2 = consolidation in one lung, and 3 = consolidation in both lungs). Effects of birth weight, health incidences, serum total protein, breed, sex, pen, and LCS on milk consumption and ADG were evaluated using a multiple regression model. Birth weight, LCS (both P < 0.0001) and LCS by breed (P = 0.02) all affected milk consumption at 60 d (R2 = 0.33). The interaction between LCS and breed resulted in F1 with LCS = 1 consuming more milk than H with LCS = 1 (452 vs 432 L), however, F1 with LCS = 3 consumed less milk than H with LCS = 3 (353 vs 390 L). Factors that impacted ADG included days on feeder and birth weight (both P < 0.01) and milk consumption up to 60 d (P < 0.0001; entire model (R2 = 0.41)). LCS proved to be a better predictor of milk consumption and ADG than incidence rates of pneumonia. Overall, F1 and H consumed different amounts of milk in an automated feeding system dependent on lung consolidation.

Key Words: milk consumption, average daily gain, lung consolidation