members of their respective communities. Furthermore, SPARCC found ASV32_Corynebacterium is negatively correlated with ASV2_Mycoplasma (-0.25) in NS and ASV5_Mycoplasma_hyorhinis (-0.23) in NPS (P <0.05). Additionally, ASV26_Corynebacterium is negatively associated with ASV62_Ureaplasma (-0.37) and ASV5_Mycoplasma_hyorhinis (-0.21) in NPS and ASV12_Histophilus_somni in (-0.29) in BAL (P <0.05).

Abstract: Bull fertility is currently evaluated through a breeding soundness exam (BSE) that can detect infertile/sterile bulls with high accuracy; however, subfertile bulls are often classified as satisfactory breeders. In the first study, Angus bulls (n=5) were used to evaluate the effect of different insemination doses (10, 20 and 40 million sperm/dose) on pregnancy/fixed-time AI (P/FTAI; cows n=4,866). The interaction between insemination dose and bull was not significant (P=0.53), and there was no effect of insemination dose on P/FTAI (P=0.31); however, there was an effect of bull on P/FTAI (P <0.01). Two bulls had high, one bull had average, and two bulls had low fertility. Post-thaw sperm analysis was performed by computer assisted sperm analysis (CASA) and flow cytometry; however, analysis performed could not explain field fertility differences. In a second study, Angus and Angus crosses bulls were used to investigate differences in sperm longevity between epididymal and ejaculated sperm. Epididymal and ejaculated semen was incubated at pH 5.8, 6.8, or 7.3. Proteins in epididymal fluid, seminal plasma, and proteins loosely attached to epididymal and ejaculated sperm were also investigated. It was identified that epididymal sperm maintained viability longer compared to ejaculated sperm regardless of media pH (P <0.05). Ejaculated sperm had increased longevity (total motility >20%) at pH 6.8 compared to pH 5.8 or 7.3. There were 458 unique proteins between all samples; 311 and 178 in epididymal fluid and seminal plasma, respectively, and 334 and 298 on epididymal and ejaculated sperm, respectively. Based on comparative proteomics, epididymal sperm energy metabolism is more glycolytic compared to ejaculated sperm. In addition, there were greater numbers of antioxidants available for epididymal sperm likely to maintain reactive oxygen species (ROS) at low concentrations to inhibit premature sperm activation. From this dataset, three proteins that are associated with cell-to-cell interaction were studied [plasma serine protease inhibitor (SERPINA5), dystroglycan (DAG1), and CD9]. Among dairy bulls, SERPINA5 and DAG1 were not associated with field fertility; thus, they are
not potential fertility markers. The protein CD9 was evaluated to determine whether induction of sperm capacitation (in vitro) could be used to estimate/predict bulls fertility differences. Semen samples from first study were evaluated for total motility (CASA), and functional sperm analysis (flow cytometry) at pre-wash, post-wash, h 0, 3, 6, and 24 of incubation. Sperm analysis were not able to estimate fertility differences between high and average fertility bulls; however, low fertility bulls had decreased (P <0.05) viability, zinc signature 2, and zinc signature 1 + 2, and had increased (P <0.05) dead CD9+ sperm. In summary, the use of an insemination dose of 10-40 million sperm can generate acceptable P/FTAI, and evaluation of CD9, viability and zinc signatures may increase the industry’s ability to estimate fertility of bulls that pass a BSE.

**Keywords:** breeding soundness exam, computer assisted sperm analysis, flow cytometry, semen analysis

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395 Young Scholar Award Talk: Melatonin: A Promising Therapeutic for Compromised Pregnancies. Zully E. Contreras-Correa1, Riley D. Messman1, Hector Sanchez-Rodriguez2, Derris D. Burnett1, Caleb O. Lemley1,  
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Abstract: Poorly functioning placenta restricts oxygen and nutrient supply to the fetus resulting in fetal nutrient deficiency and intrauterine growth restriction. Intrauterine growth restriction dramatically increases neonatal mortality and those who survive are more prone to experience metabolic diseases such as cardiovascular diseases, hypertension, and type 2 diabetes in later life. Therefore, the placenta plays a critical role in the developmental origins of health and diseases. Currently, there is a vast effort evaluating the effects of compromised pregnancies such as maternal undernutrition, overnutrition, and heat stress on fetal development; however fewer studies have evaluated potential therapeutics to enhance placental efficiency and offspring performance. Melatonin, a hormone that modulates circadian rhythms, has shown to increase umbilical and uterine blood flow in pregnant dams. Moreover, a recent study observed that melatonin therapeutic effects during compromised pregnancies are seasonally dependent. Dietary melatonin supplementation to pregnant beef cattle increased uterine blood flow, rescued fetal weights, increased angiogenic factors in the placenta, and reduced vaginal temperatures in the summer, but not in the fall. The same study found that maternal nutrient restriction was more detrimental during the fall reducing uterine blood flow. Additionally, it was observed that dams that are nutrient restricted during the summer exerted a compensatory mechanism at the placentome level where they exhibited greater placentome vascularity and increased placental capillary size and angiogenic factors. Lastly, bovine placental circadian rhythms have been identified and interestingly, temporal increases in placental vascularity occur concomitantly with greater melatonin receptor 1A transcript abundance. In conclusion, these findings provide a better understanding of placental insufficiency and impaired fetal growth during maternal nutrient restriction, while temporal alterations in the placenta could lead to the development of proper guidelines for administration of placental blood flow therapeutics such as melatonin. Future studies should evaluate melatonin impacts on offspring organ development and potential for mitigating heat stress in livestock.

**Keywords:** maternal undernutrition, uteroplacental blood flow, circadian rhythms