

Mastitis Infection During Pregnancy Alters the Liver Proteome of Calves Postnatally

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Neonatal dairy calves are particularly vulnerable to respiratory and gastrointestinal illnesses, potentially due to developmental programming. We hypothesize that high milk yields and/or mastitis infections during pregnancy will impact hepatic protein expression of those factors involved in cellular function and metabolism. Holstein bull calves (N = 39) were brought to the University of Rhode Island Peckham Farm within 24 hours of birth. Based on their dam's milk production and somatic cell counts (SCC) during pregnancy, calves were categorized into three groups: HI (top 25% of herd M305, n = 7), MOD (lower 60% of herd M305, n = 16), HIMAST (HI with SCC \geq 200,000 cells/mL; n = 15). At ten weeks of age, calves were slaughtered and tissue samples from the liver were immediately collected and snap-frozen in liquid nitrogen. Proteomic analyses of the liver tissue was conducted on a subset of these calves (n = 4 per treatment) using ultra-performance liquid chromatography-tandem mass spectrometry on a Q Exactive HF mass spectrometer (ThermoFisher Scientific, Waltham, MA; University of Connecticut Proteomics and Metabolomics Facility, Storrs, CT). Proteins that were differentially expressed were quantified and identified utilizing the average precursor intensity in Scaffold v5.3.2 ($P \leq 0.05$; Proteome Software, Inc; Portland OR). Panther (Panther v18.0; Mi et al., 2021) was used for protein ontology analyses. A total of 3,673 proteins were identified across the treatment comparisons. A subset of 665 differentially expressed (DE) proteins were identified from this total number (MOD vs HI: 263; HI vs HIMAST: 195; MOD vs HIMAST: 207; $P \leq 0.05$). Two differentially expressed proteins Tensin (TNS)-2 and UDP-glucuronosyltransferase (LOC1001389) were identified as common between the three treatment groups. TNS2 and LOC1001389 were reduced in HIMAST when compared to HI and MOD ($P \leq .05$). Conversely, HI calves exhibited greater protein expression of TNS2 and LOC1001389 when compared to MOD calves ($P \leq 0.04$). Proteins were classified into the following groups: molecular function, biological processes, and protein class with subclassifications within each. Data presented are the classifications and subclassifications with the greatest number of proteins. A total of 104, 76, and 83 proteins were classified into the molecular function: catalytic activity category for MOD vs HI, MOD vs HIMAST, and HI vs HIMAST respectively. 129, 99, and 95 proteins were classified within biological processes: cellular processes category for MOD vs HI, MOD vs HIMAST, and HI vs HIMAST. A total of 79, 61, and 58 proteins were classified within protein class: metabolite interconversion classification for MOD vs HI, MOD vs HIMAST, and HI vs HIMAST. These data support the hypotheses that the level of milk production and/or mastitis infection during pregnancy can impact the expression of a wide variety of proteins that are involved in cellular function as well as metabolism.

