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METABOLIC PROFILING TO ASSESS HEALTH STATUS OF TRANSITION DAIRY COWS

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Use of blood chemistries in the form of metabolic profiles to determine nutritional status has been advocated, but acceptance has been limited by economics and interpretation difficulties. Different blood metabolite criteria are needed to evaluate disease potential compared to disease diagnosis. Laboratory blood metabolite reference ranges are often based on mid to late lactation cow populations and may not be appropriate for evaluating transition cows. Objectives of this study were to determine effects of time relative to calving and health status on blood metabolite concentrations and determine if any diagnostic relationships are present between prepartum metabolite concentrations and postpartum health status. Metabolic profiles were performed on plasma samples collected from 113 cows housed at 15 commercial dairies over three time periods. These periods were defined as: Early dry (ED), >30 days precalving; Close-up Dry (CU), 3 to 21 days precalving and Fresh (FR), 3 to 30 days postcalving. Metabolites measured included urea nitrogen (PUN), creatinine (Cr), glucose (Glu), total protein (TP), albumin (Alb), total bilirubin (TB), alkaline phosphatase (ALP), creatine kinase (Ck), γ-glutamyltransferase (GGT), aspartate aminotransferase (AST), sorbitol dehyrdogenase (SDH), sodium (Na), potassium (K), chloride (Cl), calcium (Ca), phosphorus (P), magnesium (Mg), total cholesterol (Chol), triglycerides (TG), nonesterified fatty acids (NEFA) and β-hydroxybutyrate (BHB). Disease diagnosis and treatment events were recorded. Blood metabolites were evaluated by ANOVA for repeated measures with period, health and their interaction as main effects and herd as a covariate. Relative risk of postpartum disease was determined using contingency tables of metabolite concentration categories and health status. Of all cows, 53 % had one or more disease events postcalving. Percent healthy calvings varied greatly between herds. Herd was significant in all metabolite models, except NEFA and Ck. Time period influenced (P<.05) all metabolite concentrations, except Ca, P and K. Health status influenced (P<.02-.002) NEFA, BHB, TG, GGT and AST independent of time period. An interaction (P<.02-.0002) between time period and health status was found for Alb, PUN, Glu, Chol, TG, AST, BHB and NEFA. Sick cows had lower Alb, PUN, Glu and Chol and higher AST, BHB and NEFA compared to healthy cows in the FR period. Fresh cow Alb concentration was stratified into three groups: <30 g/l, 30 to 35 g/l and >35 g/l and associated with health status. Percent of FR cows experiencing a health event within each group was 67, 61 and 32, respectively. Cows with CU Alb concentrations <32.5 g/l were 1.5 (P<.04; 1.04-2.04, 95% CI) times more likely to experience a postpartum disease event. Cows with FR Alb concentration <33.0 g/l were 1.8 (P<.003; 1.2-2.7, 95% CI) times more likely to have a disease event. If NEFA values were >0.4 mM in either CU or FR samples, cows were 1.6 (P<.03) and 1.5 (P<.04) times more likely to have a disease event, respectively. Disease risk was greater if NEFA concentration was >0.6 mM at CU (1.7, P<.02) and FR (1.9, P<.001) periods. No metabolites measured in the ED period were associated with disease risk. Based on these findings, reference ranges for diagnostic interpretation of blood metabolite concentrations should be adjusted to time periods relative to calving. Interactions between time period and health status suggest prepartum blood metabolite concentrations may provide some indication to

postpartum disease risk and can be useful as a herd monitoring tool. Preliminary data suggest Alb and NEFA concentrations in CU and FR periods can be used to predict potential disease risk.

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