

Metabolic Profiling to Evaluate Transition Cow Nutrition and Health Status

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Use of metabolic profiles to determine health status has been advocated, but acceptance has been limited due to costs and interpretation difficulties. Different criteria are needed to determine disease potential rather than disease diagnosis using blood metabolite concentrations. Objectives of this study were to determine if any diagnostic relationships are present between prepartum blood metabolite concentrations and postpartum health status.

Metabolic profiles were performed on plasma samples collected from 111 cows on 13 commercial dairy farms for three time periods. Time periods were defined as: Early dry (ED), >30 days prior to calving; Closeup Dry (CU), 3 to 21 days prior to calving and Fresh (FR), 3 to 21 days postcalving. Analyses included in this metabolic profile include urea nitrogen (BUN), creatinine, glucose, total protein, albumin, total bilirubin, alkaline phosphatase (ALP), creatine kinase (Ck), gamma-glutamyltransferase (GGT), aspartate aminotransferase (AST), sorbitol dehydrogenase (SDH), sodium (Na), potassium (K), chloride (Cl), calcium (Ca), phosphorus (P), magnesium (Mg), total cholesterol (Chol), triglycerides (TG), beta-hydroxybutyrate (BHB) and nonesterified fatty acids (NEFA). Disease diagnosis and treatment events were recorded. Relative risk of postpartum disease was determined using contingency tables of selected metabolite concentration categories and health status.

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 ($P < 0.02$). Within FR cows, Chol concentration increased ($P < 0.01$) with increasing Alb concentration. Cows with CU Alb concentrations < 32.5 g/l were 1.46 ($P < 0.04$; 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 1.79 ($P < 0.003$; 1.19-2.70 95% CI) times more likely to have a disease event. If NEFA values were >0.4 mEq/l in either CU or FR samples, cows were 1.57 ($P < 0.03$) and 1.47 ($P < 0.04$) times more likely to have a disease event, respectively. Disease risk was greater if NEFA concentration was >0.6 mEq/l at CU (1.69, $P < 0.02$) and FR (1.85, $P < 0.0007$) periods. No metabolites measured in the ED period were associated with disease risk. These preliminary data suggest Alb and NEFA concentrations in CU and FR periods can be used to predict potential disease risk.