false-positive results on the caudal fold tuberculin test was 0.023 and 0.044 for beef and dairy herds, respectively. The spatial analysis was performed using 1,039 beef and 2,262 dairy herds. The most significant (primary) cluster (P<0.05) was found in the center of Alpena County, and had a radius of 12.1 miles (19.5 km). A total of 759 caudal fold tuberculin test false-positive cattle were observed in this area, and the expected number was 331. An additional 32 less significant (secondary) clusters (P < 0.05) were located throughout Michigan.

Significance

Our results may be useful for bovine tuberculosis control efforts by adjusting the observed proportion of suspects on the caudal fold tuberculin test by herd type and geographical location, and hence improving the interpretation of a caudal fold tuberculin test. Also, the results could be used as a quality assurance program to determine if testers with an unusually low (or high) false-positive proportion test record need to be contacted for retraining in the application or interpretation of the caudal fold tuberculin test. In the current bovine tuberculosis testing program in Michigan, all animals with a suspect caudal fold tuberculin test have to be retested with the comparative cervical tuberculin test within seven days of reading the caudal fold tuberculin test, and animals positive on the comparative cervical tuberculin test will be culled and submitted for mycobacterial culture and PCR. Results of this study make it possible to quantitatively determine whether the observed numbers of caudal fold tuberculin test suspects are significantly different from what would be expected according to herd type and geographical location of the herd. However, this approach should be validated on data including results of the comparative cervical tuberculin test, mycobacterial culture and PCR.

Serum Mineral Concentrations and Risk of Periparturient Disease

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Introduction

Serum mineral concentrations are very dynamic around the time of calving as homeostatic mechanisms are altered to facilitate transition into lactation or mineral is lost to colostrum formation. If homeostatic control or reserve mobilization are unable to maintain normal physiologic mineral concentrations, a variety of periparturient metabolic diseases may occur. The objective of this study was to evaluate the relationship of serum mineral concentration around the time of calving to animal health status and specific disease conditions.

Materials and Methods

A series of serum samples were obtained from 60 randomly selected mature Holstein dairy cows that had participated in one of two feeding trials. Individual cow serum samples (n=8) represented a four-week collection period prior to and following calving, and were analyzed for calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), inorganic phosphorus (P), chloride (Cl), zinc (Zn), iron (Fe), copper (Cu) and selenium (Se). Veterinary disease diagnoses were recorded. Serum mineral concentrations and time-based regression coefficients were analyzed by ANOVA (repeated measures for weekly data) with time relative to calving, health or specific disease status and their interaction as main effects and feeding trial as a covariate. Odds ratios (OR) for postpartum disease events were determined using Chi-square contingency tables of defined metabolite concentration categories and health status.

Results

Healthy cows had higher Ca (P<.001), Na (P<.0002) and Cl (P<.004) concentrations pre- and postpartum, and higher Mg (P=.01) concentration postpartum compared to cows that experienced one or more disease conditions. Irrespective of time relative to calving, cows with serum Ca concentration below 8.0 mg/dl prepartum or postpartum were at 3.8 (OR, 1.2 to 12.4, 95% CI) and 4.0 (OR, 1.1 to 14.1, 95% CI) times greater (P=.03) risk,

respectively, for any postpartum disease. Cows with prepartum serum K concentration greater than 4.8 mEq/l were at 3.1 (OR, 1.1 to 9.3, 95% CI) times greater (P=.04) risk for postpartum disease. Serum Na concentrations predicted disease risk both pre- (P=.003) and postpartum (P=.0003). Cows with pre- or postpartum serum Na concentrations below 137 mEq/l were at 5.2 (OR, 1.7 to 15.9, 95% CI) or 8.3 (2.5 to 27.8, 95% CI) times greater risk for disease, respectively. Ten or more cases were diagnosed for ketosis, metritis, mastitis and udder edema. Cows with mastitis had lower serum Cl (99.8 vs 101.3 mEq/L, P=.01) and higher Fe (1.90 vs 1.63 mg/ml, P=.03) concentrations pre- and postpartum and lower postpartum Mg (2.24 vs 2.30 mg/dl, P=.002) concentrations compared to healthy cows. Ketotic cows had lower serum Ca (8.2 vs 8.6 mg/dl, P=.04), Na (130.9 vs 141.0 mEq/l, P=.001) and Cl (99.9 vs 101.3 mEq/l, P=.02) concentrations compared to healthy cows across pre- and postpartum periods. Cows with retained placenta had lower serum Ca (7.8 vs 8.6 mg/dl, P=.006) and Na (134.6 vs 141.4 mEq/l, P=.03). Udder edema cows had lower Ca (8.1 vs 8.7 mg/dl, P=.02), Na (133.5 vs 141.9 mEq/l, P=.01) and Cl (100.0 vs 101.3 mEq/l, P=.04) and higher K (4.97 vs 4.8 mEq/l, P<.05) serum concentrations both pre- and postpartum. Both metritis and retained placenta cases tended to have lower Zn concentrations (0.96 vs 1.05 mg/ml, P=.09). No other trace mineral had differences related to disease status. Cows with serum Ca below 8.0 mg/dl postpartum were at 6.0 (OR, 1.2 to 20.7, 95% CI, P=.02) times greater risk for ketosis, especially if low Ca was present at two and three weeks post-calving. Low Ca (below 8.0 mg/dl) prepartum increased risk for retained placenta 8.9 (OR) times (1.7 to 47.3, P=.006). Pre- and postpartum Na concentration below 137 mEq/l increased the risk of ketosis (OR=5.3, 1.1 to 25.7, 95% CI, P=.03, prepartum; 37.5, 2.0 to 712, 95% CI, P=.0005, postpartum). Prepartum Cl concentration below 101 mEq/l also increased the risk of ketosis (OR=8.4, 1.5 to 45.7, 95% CI, P=.01). Risk of udder edema was increased by low prepartum serum concentrations of Ca (OR= 6.8, 1.6 to 29.7, 95% CI, P=.007) and Na (OR= 5.0, 1.2 to 21.0, 95% CI, P= .02) and high prepartum serum concentration of K (OR= 7.3, 1.6 to 34.0, 95% CI, P=.007).

Significance

Observed effects of disease on serum mineral concentrations, irrespective of time period relative to calving, suggest a possible diagnostic capacity to predict possible disease risk. Significance of Na, Cl and K concentrations with a number of periparturient diseases may suggest an important component of fluid regulation in periparturient disease pathogenesis. These data underscore the important role of subclinical hypocalcemia in periparturient disease risk as there were no clinical milk fever cases. Although a number of significant disease risk relationships were found, these data were limited in numbers and interpretation needs to be taken carefully. The relationships between serum electrolyte concentrations and presence or absence of udder edema are of interest and should be further evaluated.

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