### Introduction
- A large proportion of dairy cow deaths are concentrated within the early postpartum period.
- Appropriate detection of underlying diseases or physical derangements within this period is potentially useful for defining cows at risk for premature removal from herd.
- This study explores the value of analyzing standard biochemistry, and individual or management characteristics of early postpartum cows, in determining features related to removal (death and culling).

### Materials and Methods
- Two Northern Colorado dairies: 1,600 and 2,600 head.
- Serum collected from all fresh cows at 3 to 5 days postpartum.
- Cows followed in a longitudinal study.
- Cows removed from the dairy within 30 days of parturition (cases).
- Herd cohorts surviving through 100 days in milk (controls).
- Cases and controls matched by calving date and lactation.
- Serum biochemistry panels analyzed.
- For each biochemical parameter, descriptive statistics were evaluated, and mean values in cases were compared to control animals using t-tests.
- Univariable associations between dairy cow removal, 18 biochemical parameters and 4 animal management characteristics were evaluated via Chi-square test.
- Variables categorized dichotomously and those with chi-square p-value < 0.15 considered for additional analysis.
- Biochemical parameters:
  - Creatinine, albumin, total bilirubin, CK, AST, SDH, potassium.
- Management characteristics:
  - Antibiotic administration, calving intervention, drench administration.
- Forward and backward selection using stepwise logistic regression used to develop the best predictive model for herd removals.
- Variables with Wald F statistics where p < 0.1 were considered significant.
- Additional interaction term combining potassium and the use of a drench was included.

### Results
- Biochemistry panels evaluated for:
  - 47 removed cows.
  - 60 matched controls.
  - 19 parameters analyzed had significantly different means (p<0.05) between cases and controls.
  - Calcium (Ca).
  - Albumin.
  - Total Bilirubin (TB).
  - Creatine Kinase (CK).
  - Aspartate Aminotransferase (AST).
  - Ca and albumin below the standard range.
  - TB, CK, and AST above the standard range.
  - 36% and 17% of cases.
  - 25% and 7% of matched controls.
  - 79%, 66%, and 53% of cases.
  - 40%, 22%, and 8% of controls.

### Discussion
- The ability to define discriminating characteristics in the early postpartum period may provide insight into cows at risk of premature removal.
- Our study shows that cows that leave the herd within the first 30 days in milk demonstrate factors by 3-5 days in milk that are related to the risk of removal.
- These factors include:
  - Biochemical variations.
  - Recognizable derangements requiring systemic treatment.
  - Specifically the odds of removal are: 3.33, 2.78, and 5.70 times as high among cows with elevated total bilirubin, CK, and AST as among cows with normal total bilirubin, CK and AST.
  - The odds of removal are 5.68 times as high among cows that were drenched as among cows that were not assessed to need systemic treatment in the form of a drench.

### Conclusions
- Appropriate fresh cow management may be guided through adjunctive analysis.
  - Biochemical analysis provides useful information highlighting areas that may require modification in an effort to improve postpartum health, including:
    - Transition cow and calving management.
  - Post-partum cow-side evaluation and therapy protocols.
- Assessment that recognizes discriminating systemic characteristics (as evidenced by the application of the drench in this study) may provide insight for modifying individual sick cow management.

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