

Is Serum Total Protein a Useful Predictor of Clinical Johne's Disease in Dairy Cows that are ELISA-positive for *Mycobacterium avium* subsp *paratuberculosis*?

J. Kalthoff, BS; S. Godden, DVM, DVSc; S. Wells, DVM, PhD; J. Fetrow, DVM, MBA; Luis Espejo, DVM, MS
Department of Veterinary Population Medicine, University of Minnesota, St. Paul, MN 55108

Introduction

ELISA tests are often used to identify cows subclinically infected with *Mycobacterium avium* subsp *paratuberculosis* (MAP). However, they lack diagnostic sensitivity and specificity and are not necessarily useful to predict if or when a subclinically infected cow might develop clinical signs of Johne's disease (CSJD). If producers could predict this, they might cull a cow sooner to avoid economic losses associated with CSJD. A study of one infected herd reported that cows with low serum total protein levels (STP < 6.7 g/dl) in the pre-calving period were at increased risk of culling due to CSJD in the subsequent lactation (Raizman *et al*, *Prev Vet Med* 80:166, 2007). The objective of this study was to describe, for ELISA-positive cows, whether STP, serum albumin (SALB), ELISA SP ratio (ESPR), or level of fecal shedding (FS) on ELISA test day are associated with subsequent risk for developing CSJD.

Materials and Methods

The study was conducted using lactation records and frozen serum samples previously collected in 2006 and 2007 from two infected dairy herds participating in the MN Johne's Disease Demonstration Herd Project. Adult cows had been tested annually using serum ELISA and fecal culture, and the serum frozen. Lactation records included birth, calving and cull dates, lactation milk yield, Johne's test dates and results, and culling reason.

Test results were used to classify cows in the database as being MAP-positive (MAPP) or negative (MAPN), and culled (C) or not culled (NC) in the 365 days following the test date. From this list, 182 cows were randomly selected to try to achieve approximately equal numbers of cows in each cohort (MAPP-C, MAPP-NC, MAPN-C, MAPN-NC). Serum from these cows were submitted to test for STP and SALB at the Midland BioProducts Laboratory (Boone, IA) using a Roche Cobas Mira analyzer. From this database, records from all ELISA-positive cows (n=24) were used for analysis in this study. Regression analysis was used to describe the relationship between the occurrence of CSJD (Yes/No) and each of four potential predictor tests: STP (g/

dl), SALB (g/dl), ESPR, and MAP fecal shedding level (FS: 0,1,2,3,4) on test day. Herd was controlled for as a fixed effect.

Results

In ELISA-positive cows the level of FS was negatively correlated with STP ($R^2 = -0.63$, $P=0.001$) and SALB ($R^2 = -0.52$, $P=0.01$), but not correlated with ESPR ($R^2 = 0.19$, $P=0.38$).

ELISA SP Ratio and SALB were not associated with risk for developing CSJD. However, ELISA-positive cows that did go on to develop CSJD (n=8) had significantly lower mean (+/- SD) STP values and higher levels of FS (n=8; STP=7.9 +/- 1.1 g/dl; FS=3.6 +/- 1.1) versus ELISA-positive cows that did not develop CSJD (n=16; STP=9.3 +/- 1.4 g/dl; FS=2.1 +/- 1.8) in the 365 days after test.

One hundred percent (2 of 2) of ELISA-positive cows with STP < 6.7 g/dl developed CSJD, while only 27% (6 of 22) of ELISA-positive cows with STP ≥ 6.7 g/dl developed CSJD in the 365 days following test. For every 1 unit (g/dl) decrease in STP, the odds of an ELISA-positive cow developing CSJD increased by 3.7 (0.99, 14.1) ($P = 0.052$). Forty seven percent (7 of 15) of ELISA-positive cows with a FS ≥ 2 developed CSJD, while only 11% of ELISA positive cows with FS < 2 developed CSJD. For each 1 unit increase in level of FS above 0, the odds of an ELISA-positive cow developing CSJD increased by 2.2 (0.98, 4.87) ($P=0.055$).

Significance

Level of FS or STP may be useful secondary tests to predict if ELISA-positive cows are at risk for developing CSJD in the 365-day period following an ELISA test. This could guide producers in the decision to cull an ELISA-positive cow sooner to avoid losses associated with CSJD. Because STP is negatively correlated with FS level and is a more rapid and inexpensive test, it might be more attractive to producers. Due to the relatively small size of this study, the utility of using either STP or level of FS to predict future onset of CSJD requires further study.