Using ELISA Adjusted Optical Density (OD) Measures to Predict *Mycobacterium avium paratuberculosis* Shedding Status of Individual Dairy Cattle

Roxanne Pillars, *DVM, MS;* **John B. Kaneene,** *DVM, MPH, PhD;* **Daniel Grooms,** *DVM, PhD*
Department of Large Animal Clinical Sciences, College of Veterinary Medicine, Michigan State University, East Lansing, MI

Introduction

Fecal culture remains the standard for diagnosing *Mycobacterium avium paratuberculosis* (MAP) in individual cattle, however it generally requires 8-16 weeks to obtain results. The enzyme-linked immunosorbent assay (ELISA) has a rapid turnaround time, although its sensitivity is poor, especially in subclinically infected cattle. It is generally accepted that as the infection progresses, mean ELISA response and sensitivity increases. Cattle infected with MAP have a long prepatent period in which no shedding of the organism occurs, followed by intermittent then continuous shedding that increases in volume as the disease progresses. While any cow infected with MAP is undesirable, only cattle shedding the organism pose an immediate threat to other cattle. These cattle generally have higher ELISA optical density (OD) values compared to cattle not shedding MAP. The objective of this study was to compare the mean ELISA-adjusted OD values of cattle with negative fecal cultures to cattle classified as either low (≤10 cfu) or high (>10 cfu) shedders and determine the positive likelihood ratios for each.

Materials and Methods

Fecal culture results and ELISA OD values were evaluated from 2,578 adult cattle from six Michigan dairy herds over two years. Based on fecal culture results cattle were classified as fecal culture negative, low shedders (≤10 cfu), or high shedders (>10 cfu). The mean adjusted ELISA OD and accompanying 95% confidence interval (CI) were calculated for each group. Using the mean as the ELISA cutoff for each respective group and comparing it to fecal culture results, two-by-two tables were constructed and positive likelihood ratios calculated.

Results

Prevalence of MAP in these herds based on fecal culture ranged from zero to 42%, with an average of 9.8%. The mean ELISA OD value for fecal culture-negative cattle (n=2,362) was 0.023 (95% CI: 0.02-0.03). Values for cattle classified as low shedders (n=158) and high shedders (n=58) was 0.201 (95% CI: 0.12-0.28) and 0.784 (95% CI: 0.52-1.05), respectively. The likelihood ratios of a positive test for fecal culture negative, low, and high shedders were 3.2, 9.7 and 21.9, respectively.

Significance

Given the ELISA OD, the likelihood ratios can be used to predict the probability of a cow shedding MAP, provided herd prevalence information is available. This information is valuable in aiding producers making individual cow management and culling decisions.