

# Bayesian estimation of sensitivity and specificity of IgG and serum total protein cut-off values for the diagnosis of failed transfer of passive immunity in neonatal beef calves

A. Thompson,<sup>1</sup> DVM, PhD; M. Scott,<sup>2</sup> DVM, PhD; D. Smith,<sup>1</sup> DVM, PhD, DACVPM (Epidemiology)

<sup>1</sup>Mississippi State University College of Veterinary Medicine, Mississippi State, MS 39762

<sup>2</sup>Veterinary Education, Research, and Outreach Center, Texas A&M University and West Texas A&M University, Canyon, TX 79015

## Introduction

Calves with failed transfer of passive immunity (FTPI) possess increased risk of preweaning disease. Common tests for FTPI such as radial immunodiffusion (RID) and optical refractometry (OR) have inherent imprecision. The objective of this study was to estimate test sensitivity and specificity for various IgG concentrations and serum total protein values (STP) to classify neonatal beef calves with FTPI.

## Materials and methods

Neonatal beef calves (2-7 days of age; n = 1974) from 6 commercial cow-calf herds had IgG concentrations recorded via RID and STP values through OR. A Bayesian latent class model assuming conditional dependence between tests was used to obtain estimates of test sensitivity and specificity for 9 IgG and 8 STP FTPI cut-off values using informed priors.

## Results

IgG sensitivity median (95% credible interval) ranged from 0.042 (0.033, 0.167) for 500 mg/dL to 0.964 (0.767, 0.999) for 2,500 mg/dL. IgG specificity median (95% credible interval) ranged from 0.985 (0.971, 0.996) for 500 mg/dL to 0.893 (0.842, 0.950) for 2,500 mg/dL. For STP, the sensitivity median (95% credible interval) ranged from 0.212 (0.100, 0.465) for 5.0 g/dL to 0.895 (0.734, 0.977) for 6.0 g/dL. STP specificity median (95% credible interval) ranged from 0.994 (0.979, 0.999) for 5.0 g/dL to 0.958 (0.925, 0.985).

## Significance

RID and OR performed similarly as cut-off values increased. Negative values at higher cut-off values were better at ruling-out FTPI and positive values at lower cut-off values were better at ruling-in FTPI. More than half of calves testing positive for FTPI would be false positives in typical beef herds.

