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CALF AGE DOES NOT AFFECT TEST SENSITIVITY OR SPECIFICITY FOR DETECTION OF BVD USING IDEXX ANTIGEN-ELISA ON EAR NOTCH TISSUE.

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Persistently infected animals excrete enormous amounts of Bovine Viral Disease (BVD) virus during their entire life cycle, which makes Persistently infected (PI) animals the most critical source of new infections on dairy and beef farms. The early detection and immediate removal of PI animals is, an essential step in any BVD control program.

SCREENING FOR PERSISTENTLY INFECTED ANIMALS IN NEWBORN CALVES, WHICH TEST TO USE?

To effectively control (and ideally eradicate) BVD, there is a need for accurate diagnostic tests with high sensitivity and specificity which can efficiently and effectively identify individual PI animals. Therefore, the ideal test identifies every animal that is persistently infected with BVD virus, while avoiding false-positive results. In addition, the test should be able to routinely test individual animals in a rapid, cost-efficient and user-friendly manner.

The sensitivity of the IDEXX antigen-ELISA is optimised to reliably detect all PI infected animals and eliminate the chance of TI animals reacting positively as is the situation with PCR tests where the PCR methodology amplifies the relatively low "viral loads" or TI animals.

Therefore, the ELISA-antigen test using ear notch tissue is a superior test for identifying PIs when testing calves (see trial results below for more detail).

THE BVD ANTIGEN-ELISA EAR NOTCH TRIAL

The aim of the 2019 Cognosco Animal Health and Research trial (McDougall 2021) was to assess the sensitivity (ability to identify all PI's) and specificity (ability not to falsely identify animals as PI) of ear notch samples of calves using a specific antigen-ELISA (targeting the Erns antigen which is secreted by the BVD virus in large amounts) and real-time PCR testing at four-time points after birth. Maternal antibodies against BVD have been reported to have a half-life of 21 days (Brar *et al*. 1978) and to persist for up to 30 weeks after birth (Bruschke *et al*. 1998; Zimmer *et al*. 2004). This may result in a "diagnostic gap" where PI calves test negative via serum soon after birth. Therefore, the recommendation to date in New Zealand is that testing is not done before 35 days of age using antigen-ELISA even when using ear notch samples. However, there are studies that have found that the use of tissue samples (e.g. by ear notching) reduces the likelihood of maternal antibody interference (Kuhne *et al*. 2005; Hill *et al*. 2007), and this was again shown in the current New Zealand trial (see below).

RESULTS

Of 1,030 calves tested on Day 38, 26 (2.5%) were positive for BVD virus by real-time PCR. However, only 5 in 1,030 (0.5%) were defined as PI. For the PI calves, all ear notch samples at all time points tested positive on both the antigen-ELISA and real-time PCR. One calf was subject to euthanasia on-farm before final sampling with symptoms consistent with BVD. Amongst the other 4 PI calves, all tested positive for serum antigen-ELISA on Day 100, and 3 of the 4 also tested positive for antibody by ELISA at this time (a possible reason for this may be due to residual maternal antibody in circulation).

Results showed that PI calves tested positive with the antigen-ELISA and the real-time PCR at all time points.Transiently Infected (TI) calves tested negative at all time points with the antigen-ELISA; however, the real-time PCR did not reliably differentiate between PI and TI animals. Therefore, the antigen-ELISA showed 100% sensitivity and 100% specificity for detecting PI

animals. And so was able to identify PI animals at any age. This research now confirms how PI animals can be identified and removed with one sample while leaving the TI replacement calves which will not be unnecessarily removed (culled) as they will subsequently clear the virus in about 2 weeks. Once they have seroconverted, they will then likely, be immune to the virus for an extended period.

Failure of passive transfer was found in 30.3% of calves, but the within-herd prevalence varied from 13% to 53%. The figure of 30% FPT correlates to the estimated percentage of FPT from other trials in New Zealand. And so is representative of the average New Zealand dairy farm.

DISCUSSION

Using Ear Notch samples, there was no evidence that the age of the calf at testing affected the test results either for the antigen-ELISA or the real-time PCR assay. The diagnostic gap occurs where serum is used, and where an ELISA targets NS3, rather than Erns (Fux and Wolf 2012).

The TI calves were antigen-ELISA test negative at all time points. When the goal of testing is to identify PI calves rather than TI calves, then the antigen-ELISA is the superior test as it achieved 100% sensitivity and specificity for detection of PIs, irrespective of the age of the calf when tested.

CONCLUSION

Control (or eradication) of BVD from New Zealand bovine herds is only possible using a combination of adequate testing protocols and the use of appropriate diagnostic tests within those protocols. At a farm level, testing and eliminating PI animals is essential and should be accompanied by strict biosecurity measures. From an epidemiological point of view, slaughtering TI animals is of little benefit and negatively impacts the economics of the farm.

This is where the new evidence from the Cognosco study supports the selection of the IDEXX antigen-ELISA test using ear notch tissue, as the superior test for the detection of PI calves at any age. By adopting this new diagnostic approach, we can assist farmers to make earlier and more informed management decisions while minimising the unnecessary culling of TI animals.

If you would like more information on the trial including access to a webinar by Dr. Scott McDougall please CLICK HERE

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