

An evaluation of the prevalence of BHV-1 abortions based on diagnostic submissions to five U.S. veterinary diagnostic laboratories

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Introduction

This retrospective study used data on bovine abortion submissions from 5 U.S. veterinary diagnostic laboratories (VDLs) from 2000-2011. Objectives of this study were to describe the prevalence and patterns of BHV-1-associated abortion in submissions at VDLs. There were three specific aims: 1) examine the proportion of BHV-1-associated abortions with the introduction of new diagnostic assays, 2) evaluate the agreement of the histopathology report of the abortion submissions and the result of the assay used, and 3) evaluate the association between farm history of vaccination against BHV-1 and BHV-1-positive abortion submissions.

Materials and Methods

In January 2011, data were requested for bovine abortion submissions from January 2000 to January 2011. For aim 1, the hypothesis that the proportion of BHV-1-positive abortion accessions had not changed over time for all labs combined was tested using an extended Mantel-Haenszel chi-square test for linear trend with Open Epi. Also tested was the hypothesis that adoption of PCR-based BHV-1 detection methods was associated with an increased diagnosis of BHV-1-positive abortions using a chi-square test.

For aim 2, each unique BHV-1-positive abortion accession was matched with a single BHV-1-negative accession. For the matched BHV-1-positive and BHV-1-negative accession pairs, the complete laboratory report and VDL submission form were obtained. Information about the diagnosis was redacted from the report. A diagnostic pathologist, unaware of the final diagnosis, BHV-1 positive or negative, then reviewed the redacted laboratory reports and reported whether the histopathologic lesions reported were consistent with BHV-1. The Cohen's Kappa coefficient test of agreement was used to test the null hypothesis that kappa = 0, for the comparison of the assay results with the histopathologic result.

For aim 3, both the matched and unmatched pairs' VDL submission forms were used to extract vaccination history for the submitting farms. For this aim, only the matched pairs where both accessions reported the

vaccine history were used to assess the association between BHV-1 diagnosis and BHV-1 vaccination history. McNemar's test for matched categorical data was used to test the matched null hypothesis. For unmatched data, a chi-square test was used to test the unmatched null hypothesis.

Results

Similar to other studies, our data suggested that diagnosis of BHV-1-associated abortion is rare (264/6,948 (3.8%) accessions submitted for BHV-1 testing; 264/19,459 (1.36%) accessions submitted for total bovine abortion screening). For aim 1, the extended Mantel-Haenszel chi-square for linear trend showed that collectively there is evidence of an increase of BHV-1 abortions over the study period ($P \leq 0.001$). There was no evidence that the proportion of

BHV-1-positive submissions changed from pre- to post-adoption of PCR assay ($P = 0.25$). For aim 2, Cohen's Kappa coefficient test of agreement gave a kappa value of 0.81 ($P \leq 0.001$), suggesting high agreement between lesions reported and PCR assay result. For aim 3, there was no evidence that there was an association between farm history and BHV-1-positive abortion submissions for matched data (McNemar test statistic, 1.23; df , 1; $P = 0.27$). For non-matched data, these data suggested that the failure to vaccinate against BHV-1 was almost twice as common for BHV-1-positive submissions as for BHV-1-negative submissions (27% versus 15%; chi-square $P = 0.068$). Not all of the laboratories had complete records available for the 11-year period, resulting in unavailability of complete records for the study period.

Significance

It was originally anticipated that PCR-based detection methods for BHV-1 would be more commonly used; however, this was not the case. Instead, these data suggested that the introduction of new assays may take longer to be adopted by laboratories. The adoption of PCR-based detection methods for BHV-1 are probably not responsible for any perceived increase in BHV-1-positive bovine abortion submissions.