

Management and control of bovine trichomoniasis



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Abstract

Bovine trichomoniasis has been recognized as a cause for bovine reproductive failure since the late 1800's. Description of the causative organism, *Tritrichomonas foetus*, led to its control. However, effective control has not occurred in many parts of the US. The purpose of this discussion is to provide steps to have an effective control plan for this disease, present a tool to develop a plan, and outline future research opportunities that may strengthen our knowledge of this disease and aid in its control.

Keywords: *Tritrichomonas foetus*, biosecurity, microbiome

Introduction

The control of bovine trichomoniasis has proven to be challenging despite aspects of the disease that make it amenable to control and eradication. There are several reasons for the lack of control in some areas of the US. One of the primary challenges is in not having an educated and organized approach to keep trichomoniasis out of a herd or eliminate it should the herd become infected. The following narrative describes the steps to create an overall control plan for trichomoniasis, explains the use of a web-based assessment tool, and offers suggestions for further research that may aid in the control of this disease.

Control

The following 4 steps (education, risk evaluation, plan development, and execution), outline a coordinated series of actions necessary to effectively control this devastating disease.

Education

To quote H.P. Harding, "In conclusion, may I say that it is my opinion that if more care was taken in the sale and purchase of barren cows, in the purchase of bulls of breeding age, and if the farmers could be sufficiently educated to the unique opportunities for control that this disease offers, then its total elimination should be practicable in the quite near future."¹ Educating producers and veterinarians to distinctive features of *T. foetus* that include venereal transmission, typical transient infection in females, and a predilection for the prepuce in chronically infected older bulls. This will provide a basic

understanding of trichomoniasis so that a practical and a sound plan for control is recognized as essential, developed, and implemented.

Risk evaluation

Evaluating a cattle herd's risk of trichomoniasis exposure is necessary to determine the level of preparedness an operation should achieve. Knowing the prevalence in a specific locale is important in determining if the herd is at no, low, or high risk for trichomoniasis. However, determining accurate and current prevalence estimates is difficult, as many of the prevalence estimates in the literature are quite dated and most are specific to a region or state that may not be comparable to most producer's location.

Plan development

After assessing the risk of trichomoniasis in a cattle herd, an informed, practical plan should be developed. The following 6 aspects of a biosecurity program should be addressed to ensure there are no gaps.

Recordkeeping

Accurately tracking reproductive performance can provide indications of reproductive failure that may be an early indication of trichomoniasis and allow an organized investigation into the cause. Records of animal location and movement may also allow strategic testing of specific management groups in multi-unit operations that may also

lead to an early diagnosis of the disease before it spreads into uninfected units within the operation.²

Isolation

Isolate cattle if unplanned commingling with neighboring herds has occurred. Females should be isolated from the rest of the herd until end of breeding season and their pregnancy status can be confirmed. Bulls should be isolated and tested to ensure that they are *T. foetus*-negative before being allowed to return to breeding. Any new additions, whose *T. foetus* status is questionable, should be isolated until they are confirmed negative.

Testing

Routine, systematic testing of bulls for *T. foetus* can provide early detection of a disease incursion and is a key component of a trichomoniasis prevention program for herds in trichomoniasis-endemic areas, herds neighboring *T. foetus*-positive herds, or herds recovering from a recent outbreak. The decision to test and which testing protocol to utilize should be guided by the local prevalence of trichomoniasis, the herd owner's aversion to the risk of a disease incursion, and balancing the cost and benefits of testing.

Generally, surveillance testing occurs sometime between the end of a breeding season and the beginning of the next and includes a single test of all bulls in the herd. The advantage of surveillance testing closely after the breeding season is early detection of infection that allows time to develop and implement a complete trichomoniasis control program before the next breeding season. Bulls tested under this program must not be exposed to cows prior to the next breeding season. Alternatively, all bulls may be tested immediately before the breeding season, as that has the advantage to time the test to coincide with an annual breeding soundness examination, thereby reducing the number of times the bulls must be handled. However, this may not allow sufficient time for appropriate management of the disease before the start of the breeding season.

Before any surveillance testing is undertaken, the issue of false-positives should be fully explored. In populations of bulls with a very low prevalence of trichomoniasis (e.g. virgin and yearling bulls) there can be occasional unexpected positive test results. Owners and veterinarians should be prepared to interpret these results in a way that minimizes the impact of these false-positive tests.

Vaccination

A commercial *T. foetus* vaccine (TrichGuard®, Boehringer Ingelheim Vetmedica, Inc., Ingelheim, Germany) is licensed and available for use in the US. The vaccine is a killed product that requires 2 initial doses, with the second dose given ~ 4 weeks prior to breeding. An annual booster dose, 4 weeks prior to breeding, is required. The vaccine may increase cervical vaginal mucus

trichomonal antibodies, increase calving rates, and decrease duration of infection for vaccinated versus controls. However, there is no evidence that the vaccine can eliminate carrier cows, and it does not prevent infection and subsequent establishment of the organism in the herd. Even with vaccine use, *T. foetus* can become established in a herd without implementation of other biosecurity measures.³

Sanitation

There is evidence that *T. foetus* can be mechanically transmitted from infected to uninfected animals.⁴ Although this is not a common form of transmission, it is important to practice good sanitation to avoid transmitting the organism through obstetrical instruments, artificial insemination equipment, or semen collection devices.

Traffic control

Fences should be monitored closely to rapidly identify when unplanned commingling with another herd has occurred so immediate steps can be taken to address the problem and reduce the risk of introducing trichomoniasis.

Execution

For a plan to be effective it must be executed correctly. An investigation⁵ into reproductive failure in a cattle operation identified *T. foetus* to be an underlying cause. After a plan was created and implemented the herd returned to reproductive success indicating the value of not only identifying the problem but also following appropriate steps to correct the problem.⁵

Trich CONSULT

Creating an effective, herd-specific management plan for trichomoniasis utilizing steps outlined previously may appear overwhelming, especially, in light of the variations among herds regarding *T. foetus* status, risk of exposure, herd owner willingness to accept risk, and ability to implement appropriate management practices. To facilitate such a process Trich CONSULT (Collaborative, Online, Novel, Science-based, User-friendly, Learning, Tool) was developed as a web-based trichomoniasis assessment tool that incorporates science-based recommendations into an interactive format that mimics a conversation with an expert.

Trich CONSULT uses a series of questions to assess the *T. foetus* status and management practices of a herd and uses the responses to the questions to provide feedback that allows the user to evaluate the impact of their decision. Each question also includes a link to additional information and references to aid the individual in making informed decisions. After all questions have been answered, an optional, customized report may be generated that summarizes the questions and responses with comments suggesting prudent choices and warnings for

responses that may have negative consequences. Trich CONSULT is currently available for use free of charge at the Kansas State University Beef Cattle Institute website.

Future opportunities

There are several aspects of bovine trichomoniasis that are open to further investigation including improved local and regional prevalence estimates, improved sampling protocols, and treatment options. However, metagenomics offers the possibility of understanding the interaction of *T. foetus* within the microenvironment of the bovine reproductive tract, which may provide insights into prevention and treatment strategies.

Trichomonas vaginalis is a human reproductive tract parasite that produces symptoms in humans similar to clinical signs of bovine trichomoniasis caused by *T. foetus*. A human study identified an interaction between *Lactobacillus acidophilus* and *T vaginalis* in vitro⁶ whereas others have demonstrated an association between the vaginal microbiome of women and their risk for developing sexually transmitted diseases including trichomoniasis, suggesting that the microbiome of the reproductive tract may provide opportunities for prevention and treatment.⁷⁻¹⁰

With development of next generation sequencing technology, the microbiome of the bovine reproductive tract has been described¹¹ in an attempt to understand the host-microbiome relationship and its influence on the reproductive efficiency of cattle.¹² Additional studies have explored the specific relationship between the vaginal microbiome and reproductive outcomes and disease that hold the potential for a better understanding of the pathogenesis of reproductive tract disease in cows.¹³⁻¹⁵

Although culture-dependent studies have reported routine isolates from the preputial cavity of bulls, there is a lack of information regarding the preputial microbiome utilizing next generation sequencing technology.¹⁶

The path to bovine trichomoniasis infection in males and females is most likely multifactorial. However, the findings of the previously mentioned studies in human and bovine females and lack of microbiome information of the bovine prepuce suggest for an exploration of the reproductive tract microflora in cows and bulls in association with *T. foetus* infection, a reasonable step to understand this disease.

Conclusion

Trichomoniasis has long been recognized as a disease with substantial impact on reproductive performance in infected herds and severe financial implications for the farm or ranch. Characteristics of the disease lend itself to control; however, effective control will only be achieved through education, risk assessment, careful planning and meticulous execution of the plan. Use of a web-based trichomoniasis assessment tool, Trich CONSULT, may be a valuable way to facilitate development of a

trichomoniasis control plan. Future investigation into multiple facets of this disease may also provide valuable insights into additional opportunities for its control.

Conflict of interest

None to report.

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