Bovine Trichomoniasis

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INTRODUCTION:

Bovine trichomoniasis is a reproductive disease of cattle which can have significant economic impact on the operations of a cattle breeding farm. Venereal transmission of the causative organism, *Tritrichomonas foetus*, can cause one of the most commonly recognized diseases leading to decreased reproductive efficiency in cattle. An infected cow becomes subject to early embryonic death, abortion, pyometra and transient infertility. Although the organism has been known to cause reproductive problems for over 100 years, there has been an increased awareness of the disease only in the past few years because of the economic impact, compulsory testing requirement in some areas and more frequent diagnosis due to improved diagnostic methods.

The economic impact of trichomonas infection is severe. In dairy operations, there can be significant calf losses depending on the percentage of bulls infected and the susceptibility of the cows in the herd. In addition to the obvious loss from fewer calves, further losses include increased number of repeat breeders.

CHARACTERISTICS OF THE CAUSATIVE ORGANISM:

*Tritrichomonas foetus* is a flagellated protozoan which inhabits the reproductive tract including the prepuce and distal penis in bulls and the vagina and uterus in cows. It is a motile organism approximately twice the size of a white blood cell. Protozoa are single celled organisms which are structurally more complex than bacteria but with many similar biologic characteristics including multiplication by binary fission. The organism can be identified in liquid medium under low power where it is recognized by its characteristic jerky-tumbling motion. Under higher magnification, structures of locomotion including three anterior flagella, a single posterior flagellum and an undulating membrane. There is considerable pleomorphism and the organisms cultivated in artificial medium tend to become spherical.
PATHOGENESIS:

Although much has been learned in recent years, the exact disease-causing mechanism induced by T. foetus infection is not known. Other than protozoan-induced abortion, the pathogenic processes results in rather insignificant problems such as unnoticeable or slight signs of inflammation in the bull and transient vaginitis, cervicitis, and possible endometritis in the cows. T. foetus is generally considered an organism of limited ability to invade tissues and this would make it easy to explain the apparent lack of irritation in the prepuce of the bull. Recent microscopic documentation with specialized techniques has demonstrated the organism deep in the tissues of the placenta and the fetus. The inflammation is mild, however the exact abortive mechanism and timing of abortion is not understood.

TRANSMISSION

Transmission of T. foetus is from infected bull to susceptible cow or from infected cow to susceptible bull. Unlike many other protozoan organisms, T. foetus is incapable of forming cysts and cannot survive outside the host for any length of time. Thus, direct venereal contact is necessary for transmission of the infection. Rarely, dirty equipment along with unsanitary technique for genital examination can be a possible means of transmission.

Bulls are long term carriers of the infection. They carry the infection in the folds of the penis or in the fornix area of the prepuce. Younger bulls are less likely to become permanent carriers than are older bulls, but may still transmit the organism to susceptible females. Cows are also potential sources of new infections and maintaining the organism in a herd. Usually they only harbor the organism for a few heat cycles after infection or pregnancy loss. Sexual rest of at least 4 months has been prescribed for infected cows. Some cows can carry the organism through the gestation period and well into the postpartum period. Such a carrier cow presents a problem when trying to control the disease and offers at least partial explanation for the persistence of infected animals when control measures have concentrated on eliminating positive bulls.

Transmission rarely is possible by artificial insemination using frozen semen. The organism does not normally inhabit the urethra but could be found in the semen if infectious preputial fluid is drained into the artificial vagina at the time of semen collection. A few trichomonads can survive the dilution techniques and freezing and thawing along with the sperm. Transmission with artificial insemination (AI) is not likely with proper technique because bulls donating semen are regularly tested for Trichomoniasis. In fact AI is a recommended method of dealing with infection problems.
Cows are better than bulls in mounting an effective immune response to *T. foetus* infection. In the cow, parasites seem to provoke a mild inflammatory response that is associated with either early or late termination of pregnancy. Although it is often considered as though it were only a disease symptom, inflammation is mediated by immune mechanisms and can be an important in having effective immune response. In some cows *T. foetus* infection might bring the infection to a close, perhaps simply by flushing organisms out of the reproductive tract. In carrier cows the immune or flushing mechanisms is not apparently successful in destroying or expelling the organism.

Antibodies in immune cows appears in the mucus secreted primarily by the uterine endometrium. Immunoglobulins of the IgG class have been found in these secretions. IgG antibodies can protect the cow by a number of mechanisms of action including preventing attachment of the organism to vaginal or uterine epithelial cells, immobilization or by lysis of the parasite. In other infectious diseases this antibody class is commonly found in the blood, not in secretions. Unlike this in more usual immune response, circulating antibody has not been detected in cows infected with *T. foetus*.

Since infection in bulls seems to provoke neither disease nor an immune response, bulls, once infected, are the important hosts for parasite maintenance in a herd. Young bulls are less likely to be infected and thus a source of infection than are older animals. This correlation of prevalence with age, however almost certainly has nothing to do with immunity. Instead, it seems likely to be a consequence of differential susceptibility to infection. Older males, with deeper furrows or folds in the mucosal coverings of penis and prepuce, are simply more likely to retain organisms in the more protective environment of these folds than are younger animals.

The vaccine commonly in use in cows against *T. foetus* is administered by intramuscular injection. It is not surprising, then, that it provokes a transitory circulating antibody response. More important, however, is the cow’s response to vaccination by antibody secretion in the reproductive tract. This response, being transitory one, care must be taken to follow the vaccination protocol established by the manufacturer so that antibody is available in the reproductive tract in high titer at the appropriate time in the infection process. Parasites like *T. foetus*, are often successful even though they provoke an immune response. *T. foetus*, like some other parasites, may
cope with the immune response directed against it by masking itself in host protein. It is perhaps ironic that the protein used by *T. foetus* for antigenic disguise is the antibody itself. Scientists have demonstrated that bovine IgG can be bound to the surface of this organism in a non-antibody specific way. As such it could be an effective barrier to the usual antigen-antibody reaction necessary for destruction of the parasite.

**DIAGNOSIS**

There is no consistent observable sign to help with the diagnosis of the disease. Lesions in an aborted fetus may lead to a presumptive diagnosis, but confirmation of the diagnosis requires demonstration of the organism in the tissue or most frequently by culturing it in vitro. Herd or individual diagnosis of bovine trichomoniasis in bulls or cows depends on the accurate demonstration of *Trichomonas foetus* in culture. Two cultivation techniques have been successfully employed with consistent results: in vitro Diamond’s medium, specifically prepared for culture of *T. foetus* and the InPouch TF® culture system. The latter is a plastic pouch convenient for uses in the field containing a proprietary medium with a 12-15 month shelf life. Other diagnostic techniques including serological methods and DNA probes. Serological tests lack the sensitivity needed for effective diagnosis. Reliability of the culture techniques depends on proper collection and handling of the specimen. In either case it is recommended that the specimen is directly deposited into the culture medium as up to 20 percent of positive samples may be lost if proper collection methods are not followed. Proper collection of the specimen requires understanding the areas that the organism is likely to inhabit. Collection of vaginal discharge, uterine discharge directly in the tube containg medium and prepucial washings, smegma with little mucous membrane in the preputial foldson sterile swabs and then immersed in the medium. In cases of abortion, vital organs of the foetus, and abomassal contents may be sent on ice.

**TREATMENT:**

Unfortunately, there is no therapeutic agent for treating bovine trichomoniasis. In the past ipronidazole was used, but it was never approved for use in cattle and is no longer available. Other related compounds do not seem to be as effective as ipronidazole, and they likewise are not approved for use in cattle and/or are not available. Although the possibility exists for new therapeutic agents, control of this disease has to be by other means at the present.
CONTROL:

Two basic principles of control of trichomoniasis in cattle are:

1. keep breeding susceptible cows away from infected bulls.
2. keep breeding susceptible bulls away from infected cows.

Except for the introduction of a new vaccine for immunization with the *T. foetus* organism and the increased emphasis on culturing and culling positive bulls, little has changed in the past few years in regards to control programs for trichomoniasis. These practical suggestions may help reduce the losses from this disease. The suggestions are for naturally bred herds in range situations, but some of the suggestions apply to other management situations.

1. Good fences make good neighbors and prevent problems. Keep fences in good repair and make note of any co-mingling of the herd with neighboring herds. If common grazing lands are used, keep bulls out of these areas if possible.

2. A breeding season with a limited exposure to bulls (i.e. 90 day breeding season) should be used. In the event of an outbreak it is much easier to identify the problem if the time of exposure to the bulls is reasonably tight. If the breeding season is extended or year-round, the disease will be more difficult to control and to identify animals carrying the organism.

3. Replace old bulls with young bulls, keeping the average bull age as young as possible.

4. Culture all new bulls coming into the herd regardless of age. It is essential that the veterinarian be comfortable with the diagnostic collection procedure and has some confidence in his ability to isolate and identify the organism. On many occasions culture can be done at the same time as breeding soundness examinations. All bulls should also be checked before shipping to other areas, 3-4 weeks before the breeding season begins and 2-3 weeks after the bulls are taken from the cows at the end of the breeding season.

5. Cull open cows at pregnancy check time and any others that abort or have a noticeable discharge. Check the aborted fetus and any discharge for *T. foetus*. Although most cows clear themselves within the first few estrus cycles after abortion or early embryonic death, it has been shown that cows can carry the infection throughout the pregnancy and well into the post-partum period. This "carrier cow" can re-introduce the organism into the bulls.
6. Use artificial insemination if it can be administered effectively with proper personnel for insemination and estrus detection. Check the source of the semen to see if bulls at that facility are tested for trichomoniasis.

7. Control other reproductive disease like campylobacteriosis (vibriosis) with an appropriate vaccination program. Conscientious vaccination for diseases like vibrio will make it easier to spot a trichomoniasis problem.

PROCEDURES FOR IDENTIFYING TRICHOMONAS:

Changes in calving rates or calving intervals may indicate a trichomoniasis problem. Concentrate diagnostic efforts in the bull battery, in open cows, and in cows with a uterine discharge. All bulls should be checked on a regular basis. But checking is especially important before the breeding season begins, whenever new bulls come into the herd, after the breeding season ends and if return heats or open cows are observed. After the breeding season, it is important to give the bulls about two weeks of rest from breeding before taking diagnostic samples. Specimen collection technique is important regardless of the nutrient medium used for culturing. Use a dry infusion pipette with a 20-cc syringe for both bulls and cows. In the bull, direct the pipette to the distal penis in the sheath. Collect the specimen by scraping the mucosa of the distal penis and the fornix area while applying suction with the syringe. In the cow use the same technique in the anterior vagina. The mucus in the anterior vagina may be thick and some persistence may be required to get the mucus into the pipette. If the In Pouch TF test is used, open the pouch by tearing off its top. Using the pipette, place the specimen into the upper chamber. As the pipette is introduced into the upper chamber, draw a small volume of the liquid medium into the pipette. Move the medium back and forth to rinse the mucus from the pipette. Then deposit the liquid into the upper chamber. Fold the top of the pouch down several times to the middle of the pouch. This introduces the specimen into the lower chamber. The wings of the pouch are then folded to seal the pouch for incubation. Incubate at 37°C with the pouch in a vertical position to concentrate the organisms at the bottom. Cultures are usually examined microscopically at 24, 48, and 72 hours of incubation. Apply the plastic viewing clamp provided by the manufacturer to the bottom of the pouch (do not open the pouch). The clamp serves as a microscope slide. View the specimen at a magnification of 100x. Trichomonads are recognized by their jerky movements.