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Open Access Journal of Veterinary Science and Research
ISSN: 2474-9222

A Systematic Review on Dourine (Equine Trypanosomiasis)

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Research Article
Volume 9 Issue 1
Received Date: March 27, 2024
Published Date: April 15, 2024
DOI: 10.23880/oajvsr-16000258

Abstract

Dourine is a chronic infectious disease that affects breeding horses and spreads from animal to animal during coitus. Trypanosoma equiperdum is the causal agent in this case. Both infected males and females have vaginal discharges that contain these protozoa. Trypanosoma equiperdum is mostly found in tissue and is rarely seen in blood, in contrast to other Trypanosoma species. Dourine is the only biological vector capable of dispersing the Trypanosoma infection, as there are no other viable options. Sometimes the disease is passed on to foals by tainted milk or colostrum meal. Primarily, dourine affects mules, horses, and donkeys. However, donkeys and mules are more resilient than horses and could still be employed as covert messengers in the future. The primary symptoms of the illness are vaginal edema, cutaneous plaques, neurological symptoms, and persistent malnourishment. Identification of the parasite and detection of clinical symptoms are prerequisites for making a diagnosis. Horses from locations where the disease is endemic should not be brought in to prevent its spread to areas where it is not present. Not much research has been done on the condition, especially in developing countries where there is a lack of understanding about it, although it has a significant and asymptomatic influence on an animal's health. Therefore, the objective of this review is to review Dourine (equine trypanosomiasis).

Keywords: Dourine; Prevention; Sexual Transmission; Trypanosoma Equiperdum

Abbreviations: CFT: Complement Fixation Test; AI: Artificial Insemination.

Introduction

Equines, which include horse, mule and donkey are affected with several diseases of diverse etiologies, such as viral (Hendra virus, disease, eastern equine encephalitis, Japanese encephalitis, rabies], bacterial [tuberculosis, anthrax, salmonellosis, listeriosis, glanders, staphylococcosis, tularaemia, necrobacillosis], fungal [dermatophytosis, cryptococcosis, guttural pouch mycosis, histoplasmosis, sporotrichosis, aspergillosis, epizootic lymphangitis], and parasitic [echinococcosis, fascioliasis, trypanosomiasis, toxoplasmosis, scabies [1-6]. Dourine is a chronic or acute contagious parasitic venereal disease of equines caused by the flagellate protozoan Trypanosoma equiperdum of the order Trypanosomatida, family Trypanosomatidae, and subgenus Trypanozoon. Other species within this subgenus are Trypanosoma brucei and Trypanosoma evansi. Recent genomic studies propose that Trypanosoma equiperdum, along with Trypanosoma evansi, are subspecies of Trypanosoma brucei. One hypothesis asserts that the disease condition "dourine" is a host-specific immune response to Trypanosoma equiperdum, Trypanosoma brucei, or Trypanosoma evansi infection [7].

Transmission of infection from mare to foal can occur via the mucosa, such as the conjunctiva. Trypanosomes were found in the mammary gland of a non-lactating mare and skin samples after examination by immunohistochemistry [8]. The subgenus Trypanosoma has diverse means of transmission, which include several Glossina species, where they undergo a complex mode of development; mechanical transmission by blood-sucking flies, in which there is no development; and coitus [9]. These flagellates can be found in virtually every warm-blooded vertebrate species [10].

The parasite is found in the seminal fluid and mucous exudates of the penis and sheath of the infected male and in the vaginal mucus of the infected female. This means that infection is spread during copulation, most frequently from stallion to mare, although it can also occur from mare to stallion. The only form of trypanosomiasis that is not spread by an insect vector is dourine. Unlike other trypanosomes, Trypanosoma equiperdum is largely a tissue parasite that is rarely found in the blood. Other than infected equids, there is no other known natural reservoir for the parasite [11].

Equines are considered to be the only natural host of T. equiperdum. Horses are very susceptible to T. equiperdum and usually die at the end of a chronic disease that may last for 1–2 years. Occasionally, acute forms that lead to death in 2–3 months are seen in thoroughbred horses. Donkeys and mules, despite being susceptible to infection, develop a mild syndrome or remain asymptomatic. The incubation period in horses ranges from 1 week up to 6 months [12]. The initial lesions of dourine often involve the genitalia. Mares typically develop a mucopurulent vaginal discharge, and the vulva becomes edematous. Some mares may abort. Stallions develop edema of the prepuce and glans penis and can have a mucopurulent discharge from the urethra; paraphimosis is also possible [13].

Treatment may result in unapparent disease carriers and is not recommended in a dourine-free territory. Successful treatment with trypanocidal drugs has been reported in some endemic areas [14]. This disease has an asymptomatic character in its nature. Even though the disease is asymptomatic, it is very important due to its effect on the health of animals. Regarding this, a few studies have been done, and there is a lack of awareness about this disease in developing countries. Therefore, the objective of this communication is to present a review on dourine (equine trypanosomiasis).

Dourine (Equine Trypanosomiasis)

Etiology

The cause of dourine is Trypanosoma equiperdum, a member of the subgenus Trypanozoon [15]. The three subspecies Trypanosoma brucei (Trypanosoma brucei brucei, Trypanosoma brucei gambiense, and Trypanosoma brucei rhodesiense) and Trypanosoma evansi are also members of this subgenus. In household animals, Trypanosoma brucei brucei causes nagana; in humans, Trypanosoma brucei rhodesiense and Trypanosoma brucei gambiense cause sleeping sickness. Furthermore, although it can also affect other mammals, Trypanosoma evansi primarily causes surra in sheep [16].

Epidemiology

Host Range: Trypanosoma equiperdum mainly affects horses, donkeys, and mules. These species appear to be the only natural reservoirs for Trypanosoma equiperdum. Zebras have tested positive by serology, but there is no conclusive evidence of infection [11]. Donkeys and mules are more resistant than horses and may remain unapparent carriers. Horses usually die from infection without treatment, whereas the infection may occur in donkeys and mules without obvious clinical signs. Rats, rabbits, dogs, and mice can be infected experimentally [17].

Geographical Diseases Distribution: Dourine has a worldwide distribution, but few cases have been reported during the last three decades owing to the wide use of artificial fertilization technology [18]. It was once widespread during times when the horse was militarily, economically, and agriculturally important. It was of great concern in the USA and Canada at the beginning of the twentieth century. Nowadays, Western Europe, Australia, and the USA are considered to be free from dourine [19]. The infection is endemic in many areas of Asia, Africa, Russia, the Middle East, and Eastern Europe [20]. The latest official reports of dourine (i.e., Complement Fixation Test (CFT) positive cases) were in China, Kazakhstan, Pakistan, Ethiopia, Botswana, Namibia, South Africa, Brazil, Italy, and Germany. However, due to possible cross-reactions in the CFT, it is difficult to conclude that seropositive animals are real T. equiperdum cases [9].

Transmission

Dourine is the only trypanosomiasis that is not transmitted by an invertebrate vector. Transmission from stallions to mares is more common, but mares can also transmit the disease to stallions. Trypanosoma equiperdum can be found in the vaginal secretions of infected mares and the seminal fluid, mucous exudates of the penis, and sheath of stallions [18]. Periodically, the parasites disappear from the genital tract, and the animal becomes noninfectious for weeks or months. Noninfectious periods are more common late in the disease. Male donkeys can be asymptomatic carriers [20].

Mucous membranes, including the conjunctiva, are also regarded as a conduit for infections. When sexually immature animals contract the infection, they can subsequently spread the pathogen to others. It's not clear if this happens during labor or delivery [21]. Trypanosomes can infect foals during birth or through the consumption of infected milk, as infected mares' milk may contain the parasite. Foals infected in this way may transmit the disease when mature and develop a lifelong positive CF titer. This method of disease transmission is rare; however, some foals may acquire passive immunity from the colostrum of infected mares without becoming actively infected; in such foals, the complement fixation titer declines and the animal becomes seronegative by 4 to 7 months of age [22].

Source of Infection

Trypanosoma equiperdum may be found in the vaginal secretions of infected mares, seminal fluid, mucous exudate of the penis, and sheath of stallions. Rarely, infected mares have been reported to pass the infection to their foals, possibly from the infected mare to the fetus via the placenta. Trypanosomes have been detected in the mammary secretions of some infected animals [23].

Morbidity and Mortality

Trypanosoma equiperdum may be found in the vaginal secretions of infected mares and seminal fluid, mucous exudates of the penis, and the sheath of stallions [24]. The severity and duration of dourine may vary with the virulence of the strain, the health of the horse (e.g., nutritional status, concurrent illnesses), and the existence of stressors that may precipitate a relapse. While some animals progress to the end stage of the disease within 1-2 months, experimentally infected horses have survived up to 10 years. More severe disease is usually seen in improved breeds of horses, while donkeys, mules, and native ponies tend to be more resistant. Subclinical infections have also been described. The mortality rate in untreated cases is estimated to be 50–70%. However, apparent recoveries have been questioned by some, given the long course of the disease and the waxing and waning clinical signs. Some authors feel that nearly all cases are eventually fatal [25].

Clinical Signs

A dourine's clinical symptoms might differ significantly in appearance and severity. The disease has variable symptoms, including vaginal enlargement, cutaneous plaques, and neurological disorders. These include the virulence of the strain, the nutritional status of the horse, and environmental stresses. Clinical signs often take weeks or months to manifest, and they frequently wax and wane with relapses that are almost certainly caused by stress. This could occur several times until the animal dies or appears to recover. It is believed that the death rate is greater than 50%, according to Sidney R, et al. [26].

The course has been divided into three phases: stage 1 (genital lesions), stage 2 (cutaneous signs), and stage 3 (nervous signs) [27]. The first signs of edema in stallions are in the prepuce and glans penis. The perineum, thorax, ventral abdomen, and scrotum could all experience enlargements. On the genitalia, vesicles or ulcers may appear; when they heal, these ulcers may leave behind lifelong scars. Orchitis can develop and irritate the area where the stallion's penis is continually drawn and delayed. You could have paraphimosis. Mares consist of vaginitis with mucopurulent discharges. The vulva becomes edematous; this swelling may extend along the perineum to the ventral abdomen and mammary gland. Vulvitis, vaginitis with polyuria, and signs of discomfort may be seen. The genital region, perineum, and udder may become pigmented. Abortion can occur with more virulent strains [18].

The cutaneous signs, also known as the stage of urticarial, are marked by distinct, raised, round, or oval-shaped patchy eruptions called "Plaques'', that appear on the skin in both sexes. Edematous patches, also called ''Silver Dollar Plaques'', up to 5-8 cm in diameter and 1 cm thick, may appear on the skin, particularly over the neck, shoulders, ribs, and thighs. They usually last for 3–7 days and are considered to be pathognomonic for dourine [20]. The final phase, known as the stage of paralysis, is characterized by disorders of the nervous system. Initially, these signs consist of restlessness and the tendency to shift weight from one leg to another, followed by progressive weakness and coordination, and ultimately, paralysis (mainly of the hind legs) and death. Other clinical signs include progressive anemia seen by increasing pallor of the mucous membranes of the eyes and mouth, conjunctivitis, keratitis, intermittent fever, and emaciation [20].

Pathogenesis

During sexual contact, the recipient picks up the trypanosomes from the diseased donor animals, which are found in the seminal fluid and mucosal membranes of the genitalia. After that, parasites may enter the blood and travel to different areas of the body. This metastatic invasion typically results in the development of recognizable cutaneous plaques. Although dourine is frequently deadly, spontaneous recoveries are seen [20]. There are wide variations in the disease's length, intensity, and incubation period. The illness is usually moderate, chronic, and can last for several years in South Africa [22].

Diagnosis and Differential Diagnosis

Diagnosis of dourine is a challenge due to limited knowledge about the parasite and host-parasite interaction following infection. In practice, diagnosis is based on clinical evidence supported by serology [28]. Clinical signs of dourine can provide a strong indication of the presence of the disease, but a confirmatory diagnosis is needed [27]. The incubation period may vary from a few weeks to several years, and some of the clinical signs, which include genital edema, weight loss, skin lesions known as silver dollar plaques, and neurological signs, may be absent in the early stages or during latent infections. Diagnosis of dourine, therefore, requires confirmation by parasitological, serological, and molecular techniques [27].

The differential diagnosis includes coital exanthema, surra, equine infectious anemia, equine viral arthritis, and causes of purulent endometritis such as contagious equine metritis. In countries where Nagana or Surra occur, it is difficult to distinguish Trypanosoma equiperdum microscopically (morphology, motility) from other members of the subgenus Trypanozoon (Trypanosoma evansi or Trypanaosoma brucei) [29].

Treatment

Pharmaceutical therapy is not recommended because animals may improve clinically but remain carriers of the parasite [18]. Yet, a relative efficacy of diminazine aceturate on T. equiperdum isolates was observed following in vitro drug sensitivity tests [30]. In contrast, diminazine aceturate was ineffective in curing and preventing relapses of Trypanosoma evansi infections in horses and mules. Despite this knowledge, local veterinarians and veterinary assistants in the highlands of Ethiopia still use diminazine to treat suspected trypanosome infections [31].

Horses are treated against dourine only irregularly when trypanocidal drugs are available, but even such treated animals show frequent relapse, and generally, treatment is not able to cure clinical cases. Some of the trypanocidal drugs used, whenever available, include Veriben (diminazine aceturate) and Quinapyramine sulfate [28].

Prevention and Control

For dourine, there is no vaccination available. The most crucial method of control for dourine is to avoid natural mating or artificial insemination (AI) with diseased horses (stallions or mares) or contaminated stallion semen, since dourine is essentially a venereal disease. Hence, the foundation of dourine prevention is the building of immunity against infection, which is achieved by testing blood for antibodies against T. equiperdum, which is a more accurate method than testing for the protozoan parasite itself. Any horses brought in from endemic or incursion areas should be segregated, and a complement fixation test should be used to check the blood for antibodies [26].

Mandatory notification, the slaughter of infected animals, and mobility restrictions enforced by law in the majority of nations are the main methods of controlling the spread of the illness [18]. Euthanasia of infected and seropositive horses, comprehensive tracking and testing of individuals in contact, and source identification are the recommended methods for eliminating dourine following an incursion into a non-endemic area [26]. Right now, the World Organization for Animal Health (OIE) has implemented an eradication policy that forbids treatment and calls for the killing of seropositive horses [9]. However, it is not economically feasible to apply a strict test and slaughter policy to control dourine in developing countries. Based on the result of the in vivo drug sensitivity study, a revised strategy of appropriate drug treatment in dourine-endemic areas instead of eradication could be recommended to the OIE [32].

It is important to note that castrating adult stallions does not always change the copulatory ability of such animals, and it should be performed with caution when attempting an eradication program. To prevent the introduction of dourine, serum samples should be taken following a period of isolation (quarantine) to ensure that the animals are not in the incubation period [9]. The difficulty in the diagnosis of Trypanosoma equiperdum has led to difficulties in obtaining reliable data on the prevalence and distribution of the disease and for the implementation of monitoring, treatment, and control programs. Moreover, shortages of trypanocidal drugs and the absence of vaccines against trypanosomiasis have hampered the control and prevention of the disease in endemic areas [33].

Conclusion and Recommendations

Parasitic diseases are a severe hindrance to the productivity and job performance of working horses, often resulting in high rates of morbidity and mortality. Dourine is one of the several health and welfare issues facing these animals. Dourine, a chronic or acute infectious disease that affects equines, is spread directly from animal to animal during coitus. There is a significant case fatality rate associated with this protozoa infection, which can cause neurological symptoms and emaciation. Dourine is virtually exclusively transferred during reproduction, in contrast to other trypanosomal diseases. Although it is more likely for mares to contract the disease from stallions, stallions can also contract the disease from mares. There is currently no vaccination available, and therapeutic efficacy over the long term is unknown.

Based on the above conclusions, the following recommendations could be made:

- Male animals should be examined before being used for breeding.
- Castration of stallions is a good way to try and stop the spread of disease.
- To completely eradicate the disease in an area where it is endemic, serological testing for horses of all ages should be conducted, and affected animals should normally be put down.
- Animals from disease-free areas are introduced into areas that are free of disease.

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