

Review on Dourine (Equine Trypanosomosis)

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Abstract: Dourine is a chronic contagious disease of breeding equids that is transmitted directly from animal to animal during coitus. The causal organism is *Trypanosoma equiperdum*. This organism present in the genital secretions of both infected males and females. *Trypanosoma equiperdum* differs from other Trypanosoma in that it's rarely detected in blood rather primary in tissue. Dourine is the only trypanosomal disease which cannot be transmitted by biological vectors or which can mostly transmitted venerally. Sometimes the disease can also transmit to foals by ingestion of infected colostrum or milk. Dourine mainly affects horses, donkeys and mules. However, 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. Depending on virulence of the infecting strain, the nutritional status of the horse and stress factor, the course and clinical signs of dourine are highly variable in manifestation and severity. The disease is characterized mainly by swelling of the genitalia, cutaneous plaques, neurological signs and chronic emaciation. Diagnoses depend on the recognition of clinical signs and identification of the parasite. Any introductions of horses from endemic areas should be prevented to avoid entrance of the disease in area where disease not found. Even though the disease is very important due to asymptomatic effect on the health of animal there is a few researches have done and lack of awareness regarding the diseases in developing countries. So, the aim of this paper is to review on dourine.

Key words: Dourine • Equine • Neurological Signs • *Trypanosoma Equiperdum* • Prevention

INTRODUCTION

The world equine population is estimated at 44 million donkeys, 11 million mules and 59 million horses [1]. More than 97% of the world's donkey and mule populations and over 72% of the world's horse population is found in developing countries specially kept for draft purpose [2]. Ethiopia has a very large equine population of approximately 2.16 million horse, 8.44 million of donkey, 0.41 million heads of mules and about 1.21 million camels which have a significance contribution to national economy [3]. In developing countries such as Ethiopia the contribution of equine animals is extremely diverse. They can carry heavy loads, draw carts, serve as a means of personal transport and provide a taxi service; consequently, they contribute significantly to the national economy [4].

Even though equine species have often been described as sturdy animals; they are exposed to a variety of diseases and number of other unhealthy circumstances, among these, parasitic infection is a major cause of illness. Trypanosomosis is a serious parasitic diseases constraint to livestock production and agricultural development in Ethiopia. Five species of trypanosomes are recorded in Ethiopia and the most important trypanosomes in terms of economic loss in domestic livestock are the tsetse transmitted species: *Trypanosoma congolense*, *Trypanosoma vivax* and *Trypanosoma brucei*. The other trypanosome species of economic importance are *Trypanosoma evansi* of camels and *Trypanosoma equiperdum* of horse [5].

Dourine is a chronic contagious disease of equids that is transmitted directly from animal to animal during coitus [6]. The causal organism is protozoan parasite

called *Trypanosoma equiperdum* [7]. Transmission of infection from mare to foal can occur via the mucosa con, such as the conjunctiva. Trypanosomes were found in the mammary gland of a non-lactating mare and in skin samples after examination by immunohistochemistry [8, 9]. The sub genus *Trypanozoon* has diverse means of transmission, which includes a number of *Glossina* species, where they undergo a complex mode of development, mechanical transmission by blood sucking flies in which there is no development and during coitus [10]. These flagellates can be found in virtually every warm-blooded vertebrate species [11].

Infection is transmitted during copulation, more commonly from stallion to mare, but also from mare to stallion, due to the presence of the parasite 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. Dourine is the only trypanosomosis that is not transmitted by an invertebrate vector. *T. equiperdum* differs from other trypanosomes in that it is primarily a tissue parasite that is rarely detected in the blood. There is no known natural reservoir of the parasite other than infected equids [12].

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 thorough breed 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 [13]. 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 and Paraphimosis also possible [7].

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 asymptomatic character in its nature. Even though the disease is asymptomatic, it is very important due to effect on the health of animal, regarding this a few researches have been done and lack of awareness is looked on this disease in developing countries. Therefore the objectives of this paper are:

- To review on Dourine (Equine Trypanosomosis) and its status in Ethiopia.

Table 1: The taxonomic classification of *T. equiperdum*

Kingdom	Animalia
Phylum	Protozoa
Class	Mastogophora
Order	Kinetoplastida
Suborder	Trypanosomatida
Family	Trypanosomatidae
Genera	Trypanosoma
Species	<i>Trypanosoma equiperdum</i>

Source: Urquhar *et al.* [17]

Dourine (Equine Trypanosomosis)

Etiology: Dourine is caused by infection with the protozoal parasite *T. equiperdum* (Subgenus Trypanozoon, Salivarian section) [7]. Strains of *T. equiperdum* vary in their pathogenicity [15]. Whether *T. equiperdum* can be considered a distinct species is controversial, it is very closely related to *T. brucei* subsp. *brucei*, *T. brucei* subsp. *gambiense* and *T. brucei* subsp. *rhodesiense*, which cause African trypanosomiasis in a variety of species and to *T. evansi*, which causes surra in camels. Based on genetic evidence, some authors argue that some strains of *T. equiperdum* were misidentified with the strains of *T. evansi* and the others should be placed in *T. brucei* subsp. *brucei* or in a new subspecies *Trypanosoma brucei* subsp. *T. equiperdum* [16]

Epidemiology

Host Range: *Trypanosoma equiperdum* mainly affects horses, donkeys and mules. These species appear to be the only natural reservoirs for *T. equiperdum*. Zebras have tested positive by serology, but there is no conclusive evidence of infection [12]. 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 [18].

Geographical Diseases Distribution: Historically, dourine has been present in Europe, North America, Asia and Africa. After World War I, the disease was eradicated from Western Europe by serologic screening, strict sanitation and treatment of some horses with trypanocidas [16]. Dourine is considered a reportable disease by the World Organization for Animal Health (OIE) and is present in most of Asia, southeastern Europe, South America and Africa [10].

Transmissions: Unlike other trypanosomal infections, dourine is transmitted almost exclusively during coitus. Dourine is the only trypanosomosis 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. *T. equiperdum* can be found in the vaginal secretions of infected mares and the seminal fluid, mucous exudates of the penis and sheath of stallions [19].

Periodically, the parasites disappear from the genital tract and the animal becomes noninfectious for weeks to months. Noninfectious periods are more common late in the disease. Male donkeys can be asymptomatic carriers [20]. Rarely, infected mares pass the infection to their foals, possibly before birth or through the milk. Infections are also thought to occur through mucous membranes such as the conjunctiva. Sexually immature animals that become infected can transmit the organism when they mature. It is unclear if this occurs in utero or during birth [21].

Because trypanosomes may occur in the milk of infected mares, foals may be infected per os during birth or by ingestion of infected milk. 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 colostrums' of infected mares without becoming actively infected; in such foals, the CF titer declines and the animal becomes sero negative by 4 to 7 months of age [22].

Sources of Infection: Trypanosoma equiperdum may be found in vaginal secretions of infected mares and seminal fluid, mucous exudates of the penis and sheath of stallions [23]. This agent does not survive very long outside its hosts and is not transmitted by fomites, therefore, parameters associated with resistance to physical and chemical actions i.e. temperature, chemical/disinfectants and environmental survival are not meaningful [24].

Morbidity and Mortality: The mortality rate in untreated cases is estimated to be 50-70%. However, apparent recoveries have been questioned by some, in view of the long course of the disease and the waxing and waning symptoms. Some authors feel that nearly all cases are eventually fatal [25]. In endemic areas, drug treatment may be possible; however, treatment may result in apparent disease carriers [20].

Although the course of the disease may be long, it is usually fatal. Uncomplicated dourine does not appear to be fatal unless the nervous system is involved. The progressive debilitation associated with the

neurological manifestation of the disease predisposes infected animals to a variety of other conditions. Because of the long survival time in some experimental cases, reports of recovery from dourine should be regarded with skepticism [14].

The severity and duration of this disease vary with the virulence of the strain, the nutritional status of the host and the existence of stressors that may precipitate a relapse [8]. The prevalent strains in southern Africa tend to cause a chronic, mild disease that may last for several years. Experimentally infected horses have survived up to 10 years. In South America and northern Africa, cases have been more acute, often lasting only one to two months. More severe disease is usually seen improved breeds of horses, while donkeys, mules and native ponies tend to be more resistant [10].

Clinical Signs: Clinical signs vary considerably, depending on the virulence of the infecting strain, the nutritional status of the infected animal and the presence of other stress factors. The strain prevalent in southern Africa is apparently less virulent than the European, Asian, or North African strains and produces an insidious, chronic disease. In some animals, clinical signs may not be apparent for up to several years' so-called latent infection [22].

A number of authors have broken the course down into three stages: stage 1 (Genital lesions), stage 2 (Cutaneous signs) and stage 3 (Nervous signs) [16]. In stallions, the first symptoms are oedema of the prepuce and glans penis. The swelling may spread to the scrotum, perineum, ventral abdomen and thorax. Vesicles or ulcers may be seen on the genitalia, when they heal, these ulcers can leave permanent scars. Orchitis may occur and cause irritation, where the stallion constantly draws and retards the penis. Paraphimosis may also occur. In mares consist of vaginitis, with mucopurulent discharges. The vulva becomes oedematous; 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 depigmented. Abortion can occur with more virulent strains [19].

The cutaneous signs also known as stage of Urticaria, is marked by distinct, raised round or oval shaped patchy eruptions called "Plaques", that appear on the skin in both sexes. Oedematous patches, also called "Silver dollar plaques", up to 5-8 cm diameter and 1 cm thick may appear on the skin, particularly over the neck, shoulders, ribs and thighs and usually last for 3-7 days and is considered to be pathognomonic for dourine [20].

The final phase known as 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 in coordination and ultimately, paralysis (mainly of the hind legs) and death occur. Other clinical signs include progressive anaemia seen by increasing pallor of the mucous membranes of the eyes and mouth, conjunctivitis, keratitis, intermittent fever and emaciation [26].

Necropsy Finding: Cachexia, anemia and genital edema are often seen at necropsy. The swelling can extend to the ventral abdomen. Gelatinous exudates can often be found under the skin. In stallions, the scrotum, sheath and testicular tunica may be thickened and infiltrated [24]. The testes may be embedded in sclerotic tissue and may not be recognizable. In mares, a gelatinous infiltrate may thicken the vulva, vaginal mucosa, uterus, bladder and mammary glands. Chronic lymphadenitis may be apparent [25]. The perineural connective tissue can be infiltrated with edematous fluid and the spinal cord may be surrounded by a serious infiltrate. A soft, pulpy or discolored spinal cord may be noted, particularly in the lumbar or sacral regions [16].

In mare; vulva, vaginal mucosa, uterus, bladder and mammary glands may be thickened with gelatinous infiltration a genital mucosa may show raised and thickened semitransparent patches folds of swollen membrane may protrude through the vulva. In the stallion; the scrotum, sheath and testicular tunica are thickened and infiltrated testes may be embedded in a tough mass of sclerotic tissue and may be unrecognizable. Depigmentation of the genital area, perineum and udder may occur Lymph nodes, particularly in the abdominal cavity, are hypertrophied and softened and, in some cases, hemorrhagic Spinal cord of animals with paraplegia is often soft, pulpy and discolored, particularly in the lumbar and sacral regions [24].

Pathogenesis: The trypanosomes, which are present in the seminal fluid and mucous membranes of the genitalia of the infected donor animal, are transferred to the recipient during sexual intercourse. Parasites then may pass into the blood, where they are carried to other parts of the body. In typical cases, this metastatic invasion gives rise to characteristic cutaneous plaques. Dourine is often fatal, but spontaneous recoveries can occur [26]. The incubation period, severity and duration of the

disease vary considerably. In South Africa, the disease is typically chronic, usually mild and may persist for several years [22].

Diagnosis and Differential Diagnosis: Diagnosis of equine trypanosomosis caused by the subgenus Trypanozoon commence with the observation of clinical signs and symptoms however, further diagnosis requires demonstration of the parasite, serological, biochemical and molecular tests. In Ethiopia little and fragmented studies were conducted with regard to Dourine based on clinical signs [27].

A definitive diagnosis depends on the recognition of the clinical signs and the demonstration of the parasite. This is rarely possible because: (a) although the clinical signs and gross lesions in the developed disease may be pathognomonic, they cannot always be identified with certainty, in the early stages or in latent cases; they can be confused with other conditions, such as coital exanthema (moreover, in some countries (e.g. in South America), *T. evansi* infections give rise to similar clinical signs; (b) the trypanosomes are only sparsely present and are extremely difficult to find, even in oedematous areas; and (c) the trypanosomes are only fleetingly present in the blood and in small numbers that defy detection. Illustrating the challenges to isolate *T. equiperdum* and most of the strains currently available in national veterinary diagnostic laboratories are related to *T. evansi* [28].

Definitive diagnosis is by identification of the parasite; however, the organisms are extremely difficult to find. A small number of trypanosomes may be found in the lymph, edematous fluids of the external genitalia, vaginal mucus and fluid content of plaques. Detection is more likely shortly after the edema or plaques first appear. Organisms may sometimes be found in the urethral or vaginal mucus, 4 to 5 days after infection [29].

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 *T. equiperdum* microscopically (morphology, motility) from other members of the subgenus *Trypanozoon* (*T. evansi* or *T. brucei*). In particular, *T. equiperdum* and *T. evansi* cannot be differentiated on the basis of morphological criteria. Both are monomorphic, slender trypanosomes with a free flagellum, although pleomorphic, stumpy forms are recognized. Typical strains of the parasite range in length from 15.6 to 31.3 μm [30].

Variable strain pathogenicity has been described but, for unknown reasons, no parasite strain of *T. equiperdum* has been isolated in any country of the world since 1982 and most of the strains currently available in national veterinary diagnostic laboratories are related to *Trypanosoma evansi*. One hypothesis asserts that *T. equiperdum* does not exist as a separate species and the disease condition “dourine” is actually a host-specific immune response to either *Trypanosoma brucei* or *T. evansi* infection. A more recent study of kinetoplast DNA proposes that *T. equiperdum*, along with *Trypanosoma evansi*, are subspecies of *Trypanosoma brucei*. Definitive categorization of Dourine is pending [31].

Treatments: Pharmaceutical therapy is not recommended because animals may improve clinically but remain carriers of the parasite. Yet, a relative efficacy of Diminazene aceturate on *T. equiperdum* isolates was observed following in vitro drug sensitivity tests [32, 33]. In contrast, that Diminazene aceturate was ineffective in curing and preventing relapses of *T. evansi* infections in horses and mules. Despite this knowledge, local veterinarians and veterinary assistants in the highlands of Ethiopia still use diminazene to treat suspected trypanosome infections [34].

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 for, whenever available, include Veriben (Diminazene aceturate) and quinapyramine sulphate [35].

Prevention and Control: There is no vaccine available for dourine. As dourine is primarily a venereal disease, prevention of natural mating or artificial insemination with infected horses (Stallions or mares) or infected stallion semen is the most important means of control. Prevention of dourine is therefore based on the establishment of freedom from infection and this is done by testing blood for the presence of antibodies against *T. equiperdum*, which is more reliable than testing for the presence of the protozoan parasite itself. Any introductions of horses from endemic areas or areas of incursion should be isolated and blood tested for antibodies by complement fixation test (CFT) [36].

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. Control of the disease depends on compulsory notification, slaughter of infected animals and movement control enforced by legislation in most countries [19].

However, therapeutic regimes have not been thoroughly investigated and treatment is usually discouraged due to fears that the organism will persist inapparently. Good hygiene should be used at assisted mating. Immunity to trypanosomiasis is complicated. *T. equiperdum* has the ability periodically to replace major surface glycoprotein antigens, which is a strategy supporting chronic infection [14].

Status of Dourine in Ethiopia: Despite their important contribution to transport in rural and sub-rural parts of Ethiopia, little attention has been paid to equines in terms of health care and husbandry managements [4]. The first official report of dourine in Ethiopia was made in 1980 when the Arsi Rural Development Unit asked the Tsetse and Trypanosomosis Survey and Control Department to investigate a persistent disease problem in horses in the administrative regions of Arsi and Bale [37]. Since then, dourine has been found to be prevalent throughout the highlands of Ethiopia, particularly in the Arsi and Bale zones [38].

Because of diagnostic problem, unrestricted movement, uncontrolled breeding and lack of effective trypanocidal drugs, dourine remains a potential threat to the life and productivity of the high equine population in Ethiopia [35]. The problem of dourine in Ethiopia has been recognized by local farmers for many years and it has been found to be a threat to the life and productivity of the equine population in the Arsi-Bale highlands [37]. According to this report, the disease was widely spread in Ethaya, Sagure, Bekoji and Koffle districts of Arsi- Bale highlands. In those areas, the disease is known commonly as "Lappessa" or “DudaKuta”. There have been reports indicating the presence of *T. equiperdum* causing dourine in Ethiopia based on clinical signs, serological and molecular tests [39, 40].

Since dourine is principally and only transmitted by coitus and due to the marked emaciation observed in late stages of the disease, some farmers used to call it ‘Horse's AIDS’. They associated the disease incidence with horses having sexual contact with so-called prostitute horses or diseased horses. Though dourine is a common clinical case throughout the year, it has a seasonal character, which most commonly occurs following the breeding season from June to late September. Sometimes a second peak is observed in the dry seasons of the year (March to

May), which was probably associated with relapse of previously infected and recovered cases due to stressful conditions of feed shortage [39, 40].

CONCLUSION AND RECOMMENDATIONS

In conclusion, Dourine is a chronic or acute contagious disease of equids that is transmitted directly from animal to animal during coitus. This protozoal infection can result in neurological signs and emaciation and the case fatality rate is high. Unlike other trypanosomal infections, dourine is transmitted almost exclusively during breeding. Transmission from stallions to mares is more common, but mares can also transmit the disease to stallions. No vaccine is available and the long-term efficacy of treatment is uncertain. The problem of dourine in Ethiopia has been a threat to the life and productivity of the equine population. Generally, to reduce the occurrence of this disease the following points should be considered.

- Before using for breeding male animals should be tested
- Stallions should be castrated in an attempt to prevent disease transmission.
- To eradicate the disease in area where its endemic serological test should be done in all ages of equine and infected animals should typically be euthanized.
- Introductions of animals from disease free areas to disease free areas.

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