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Animal Trypanosomiasis - an overview

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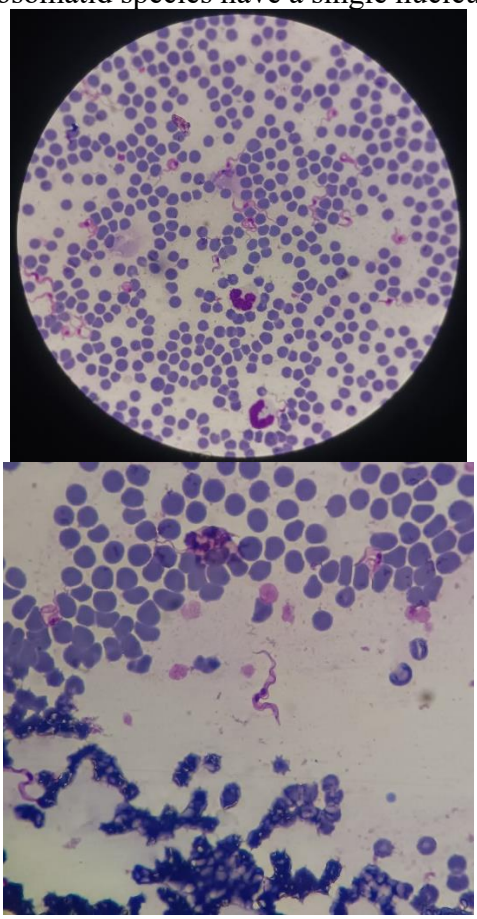
By 2050, food production will need to expand by almost 50% to meet human consumption. This will be impossible without animal food. Animals are now used to be infected with bacteria, viruses, fungus, parasitic diseases, and other pathogens. Among these blood protozoans play a major impact on lowering animal productivity. Trypanosomiases or trypanosomoses are a group of wasting disorders caused by unicellular protozoan parasites from the genus Trypanosoma (order Kinetoplastida). Of the 125 Trypanosoma species recognised in mammals, 10% are considered pathogenic to humans and animals. All animal pathogenic trypanosomes (T. vivax, T. congolense, and T. brucei) are classified as Salivaria because they are transmitted to vertebrates primarily through the infected saliva of blood-sucking insects via biological or mechanical transmission. Peroral, venereal, intraplacental, and iatrogenic routes are also modes of transmission. These pathogenic trypanosomes reside primarily in the host's blood and lymph, but they can also be found in cerebrospinal fluid (CSF) and other host tissues, and some have intracellular stages. Most valuable domestic and wild animals, including horses, mules, donkeys, camels, cattle, buffaloes, sheep, goats, dogs, pigs, elephants, deer, foxes, tigers, and jackals, are susceptible to infection by one or more Trypanosoma species. This can cause acute or chronic wasting disease, resulting in significant morbidity, death, and infertility if not treated. Animal trypanosomiases have a significant economic and social impact across a broad region of the tropics and subtropics where transmission occurs. The disease is primarily prevalent in the Indian subcontinent, with the majority of epizootics occurring in cattle, with a high fatality rate ranging from 20 to 90%.

Trypanosoma is an elongated, unicellular organism with a spindle-shaped, flattened, and leaf-like body. It has a hard but elastic pellicle that covers and shapes the body, as well as a long thread-like flagellum that extends from the front end. The kinetoplast has a close relationship with the basal body at the base of the flagellum, and all trypanosomatid species have a single nucleus.



Trypanosomiasis in cattle and buffaloes is asymptomatic, where only acute or peracute infection is seen. Clinical signs include intermittent fever, anaemia, weight loss, a stumbling walk,

laboured breathing, lachrymation, bellowing, excessive salivation, icterus, muscular twitching, and death. Infection in sheep and goats is typically moderate or asymptomatic, with unilateral superficial corneal ulcers and retinochoroiditis but no visible loss of vision.

Surra can be acute or chronic in camels. Acute infections are characterised by high fever, anaemia, weakness, emaciation, and mortality. Chronic infections are more common, and the debilitating course of disease lasts three years (tibrsa), with clinical signs of intermittent fever, dullness, weakness, loss of appetite, loss of weight, swelling in ventral regions, anaemia, and petechial haemorrhages on mucous membranes are observed. Young animals are more susceptible, although disease affects all age groups. Camels may have enlarged and suppurated lymph glands in the inguinal region. Abortion and infant mortality occur on rare occasions. Equines are another species that exhibits conventional clinical symptoms. Horses are the most susceptible of all equines, whereas mules, donkeys, and asses are less susceptible. Animals exhibit intermittent fever, weakness, lethargy, anaemia, severe weight loss, local or general cutaneous eruption, petechial haemorrhages on the nictitating membrane, vulvar and vaginal mucosa, into the anterior chamber of the eye, abortion, locomotive disturbance, nervous signs, and edema of the lower part of the body, particularly the reproductive organs, testicles, legs, and lower abdomen. Chronic instances are characterised by weight loss, anaemia, and jaundice with dark yellow urine.

Dogs are very vulnerable to Trypanosoma, with clinical signs including intermittent fever, oedema of the head and larynx, abdominal wall and legs, anaemia, lymphadenopathy, tachycardia, weakness, muscle spasms, emaciation, hindquarter paralysis, and myocarditis. Ocular symptoms such as conjunctivitis, lachrymation, and keratitis may appear. Corneal opacity is a cardinal indication that is typically found bilaterally. Haemato-biochemical alterations included hypoglycemia, hypoalbuminemia, hyperglobinaemia, and hyperkalemia. Cats exhibit broad clinical indications comparable to dogs, with the exception of edoema in the head and ocular opacity, which is accompanied by bilateral epiphora and photophobia. Pigs exhibit symptomless or minor clinical symptoms, including fever, anorexia, emaciation, abortion, and reduced fertility.

Surra can be diagnosed using a variety of approaches, ranging from classical to molecular. Microscopic examination of parasite is done by wet mount of blood, thin blood smear and thick blood smear. This approach has insignificant sensitivity, with a detection limit of 10^5 trypanosomes per millilitre of blood. More than 50-80% of infections are cryptic and undetectable by direct microscopy; thus, these methods are insufficient to determine the epidemiology and extent of surra in the country. Although these approaches are not sensitive, they are straightforward to conduct in the field and require fewer equipment. Concentration procedures such as the Hematocrit Centrifuge Technique or the dark ground Buffy Coat Method boost the test's sensitivity to 100-200 trypanosomes per millilitre. The concentration method is a lower-cost alternative to direct microscopy. The mouse inoculation test for cryptic trypanosomes is highly sensitive, with 20-50 parasites per millilitre, and is regarded as the most effective parasitological test for the identification of sparse trypanosomes.

Molecular diagnosis of Trypanosoma can be performed using Polymerase Chain Reaction (PCR) with a set of primers specific to the subgenus Trypanozoon or to the species level. This PCR-based detection is extremely sensitive, although it has not been established in the field. Card Agglutination test and ELISA are based on antigen antibody reactions and are useful for diagnosing Trypanosoma. Card Agglutation test detects immunoglobulin M; thus, it can be used to diagnose early infections; ELISA, on the other hand, detects immunoglobulin G, therefore it is used to diagnose established infections. This test has the same sensitivity range and 90-95% specificity across host species.

A variety of chemical substances are used to treat trypanosomiasis. The most often used trypanocide chemical is diminazene aceturate. Aside from diminazene aceturate, other chemical compounds available include isometamidium chloride, suramin, quinapyramine sulphate (curative), quinapyramine chloride (prophylactic), and cymelarsan (only for camels). Diminazene aceturate is the prescribed treatment for trypanosomiasis in buffalo, cattle, sheep, and goats, at a dose rate of 7 mg/kg BW deep intramuscularly. Resistance to diminazene aceturate in trypanosomes has been found in various parts of the world. If the animal does not respond, isometamidium chloride or melarsomine hydrochloride can be employed at a dose rate of 0.5

mg/kg BW deep intramuscularly. The alternate use of diminazene aceturate and isometamidium chloride was recommended because they form a sanative pair, which implies that if one of the medications develops resistance, the other drug can still be used to control the infection. Horses, dogs, and cats can be treated with diminazene aceturate or isometamidium chloride, but the animal must be given enough water to avoid a harmful effect on the kidneys. Melarsomine dihydrochloride is the best medicine for camels, with a dose rate of 0.25-0.5 mg/kg BW, but other trypanocide drugs could also be employed.

Trypanosoma control measures include the use of antitrypanosomal medications for treatment and prophylactic, vector management, and the selection of trypanotolarent breeds (such as N'Dama, Muturu, and Dahomey). Quinapyramine chloride may be used for chemoprophylaxis. In cattle breeding areas, vector control can be achieved by the use of insecticide impregnated screens and insect sterilisation procedures. Waterbuck, like other animals, emits chemical smells that deter tsetse flies. This has resulted in the development of collars that store and gradually release these compounds, lowering tsetse attack and consequently trypanosomiasis incidence in cattle wearing these collars. If the epidemic is found early, the organism can be eradicated by quarantines, movement restrictions, and the euthanasia of affected animals.

Despite extensive study, no vaccine for trypanosomiasis in animals or humans has been established due to the parasite's ability to adjust its own antigen, known as antigenic variation, which signifies the parasite's ability to routinely switch its surface coat glycoprotein. Another explanation is that the parasite weakening the host's capacity to build an adequate immune response and maintain its immunological memory, which is termed immunodeficiency to the host.

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