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Human African Trypanosomiasis - Review

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Abstract

Human African Trypanosomiasis (HAT) is essential protozoal diseases in many parts of Africa. Because it retards economic progress by affecting both human and animal. The diseases in human is caused by two species of Trypanosoma genus. These species are; *Trypanosomes brucie gambiense (T,b.g.)* which causes classical sleeping sickness(chronic disease) in Western Africa and the second species is *Trypanosoma brucie rhodensiense (T.b.r),* which causes accelerated (acute) sleeping sickness in Eastern Africa. Tsetse flies of Glossina species are vector of this disease. They also cause diseases to animal and called Trypanozoon. Epidemiologically, HAT is limited to Tsetse fly infested areas of Africa between 15◦N and 20◦S latitudies. Prevalence of diseases is different in different countries of Africa. *Trypanosomes* Undergo different morphological changes during their developmental stages in their life cycle both in vector and host before being infective stage. Depending on site of infection, diseases have different stages. Chancre, stage I and stage II (CNS) stage. Based on clinical feature, different diagnostic activities are conducted for confirmative diagnosis and to recommend successful treatment for patient. Treatment of HAT depends on stage of diseases and type of *Trypanosoma* species involved and also age of patients. Prevention and control programmes are strategic plan to eradicate both vector and parasites.

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Introduction

Human African Trypanosomiasis (HAT) is the most important protozoal diseases of human and known as sleeping sickness in tropical Africa. It is caused by unicellular protozoal parasite of flagellate family *Trypanosomatidae* that transmit by bite of tsetse fly of *Glossina* species. There are two species of these parasites that are pathogenic to both human and animals. They are different in their virulence and geographical distribution.

These species are; *Trypanosoma brucie gambiense (T.b.g)* which causes Western and central African sleeping sickness and the second species is *Trypanosoma brucie rhodensiense (T.b.r)* which causes East African sleeping sickness. The overall distribution of these species stretches from Pasific Ocean to Indian Ocean. Coinciding with tsetse fly distribution area and latitude of tsetse fly infested area of Africa is 15ºN and 20ºS (Murray and Gray, 1984). Another human Trypanosomiasis is South American type which is caused by *Trypanosoma cruzi.* Disease caused by *Trypanosoma cruzi* is called Chagas diseases and its vector is called redviid bug (Parija, 2004). The causative agents of Human African Trypanosomiasis can also cause diseases in animal and called Trypanozoon. Animals can host human pathogenic parasites especially *T.b.r* Thus, both domestic animals and wild animals are important parasite reservoir. Animal can also infected by *T.b.g* but subclinical.

Human African Trypanosomiasis is not only a public health but also it has a huge impact on the economy. For example, in cattle the disease is a major obstacle in economic development of rural areas. It results economic retards by affecting both human and animals and risk of infection has greater impact especially in agricultural development of communities within tsetse infected areas of Africa (WHO, 2006). Tsetse flies infest about 10 million km^2 of fertile land and spread across about 36 sub- Saharan countries of Africa. African countries are unable to implement effective control program due to political instability, and financial incapacity (Eldryd, 2004).

Epidemiologically, prevalence of diseases is different in different countries of tsetse infested area of Africa. Sleeping sickness is the "Deadliest diseases', in the world, democratic republic of congo (DRC) suffer from HAT more than any other country. It is difficult to assess the current situation in number of epidemic countries due to lack of surveillance and diagnostic expertise (WHO, 2006).

The Objective of this seminar paper is to compile and provide information on the status of Human African Trypanosomiasis.

Human African Trypanomiasis (Hat) (Sleeping Sickness)

Human African Trypanosomiasis is also known as sleeping sickness and it is a vector born parasite diseases. Vectors has acquired their infection from patient or from reservoir host harboring human pathogenic parasites. Parasites concerned are protozoa belonging to the *Trypanosoma* genus. They are transmitted to human by bite of tsetse fly of *Glossina* species. Its impact is determined by prevalence and distribution of diseases in areas infected by Tsetse fly of *Glossina* species. Tsetse flies are found in sub-Saharan Africa and infest about 10 million km^2 of fertile land and spread across 36 countries of Africa. Different species have different habitats. They are mainly found in vegetation, rivers and lakes, gallery, forests and in vast stretches of wooded savannah (Dumas *et al.,* 1996).

Etiology and Its General Features

Human African Trypanomiasis has two forms based on the parasites (etiology) involved. These parasites are; *Trypanosoma brucei gambiense (T.b.g)* which found in West and central Africa. It represents more than 90% of reported cases of sleeping sickness and causes chronic infection. *Trypanosoma brucie rhodensiense (T.b.r.)* which is found in Eastern and Southern Africa represents less than 10% of reported cases and causes acute infection. The first signs and symptoms are observed after few months or weeks. The disease develops rapidly and invades centeral nervous systems (McGovern *etal.*, 1995).

Morphology and Life cycle

Trypanosomes undergo different developmental stages during their life cycle. In man, *Trypanosomes* multiplies in blood, lymph node (LN), cerebrospinal fluid (CSF) and intracellular space, but they don't penetrate cells. In vectors, *Trypanosoma* consumed during ingesting of blood meal from infected man and multiply in mid guts and hindgut within 10 days and then migrate toward the proventiculus where they multiply and then travel to salivary gland. In salivary gland, they attach themselves to epithelial cells. *Amastigote* turns to *Epimastigote*, *Epimastipote* continue to multiply rapidly and transformed to short fat metacyclic *Trypomastigote* which is infective stage for man. This metamorphosis of parasites accompanied by distinct metabolic changes leading to expression of different protein coats on cell surfaces. Complete life cycle of *Trypanosomes* inside tsetse fly can range from 15-35 days and 21 days on average. Infected flies remain infected for rest of their life and inoculate *Trypanosomes* every time they take blood meal (Elderyd, 2004).

Trypanosomes exist in four morphological forms during their developmental stages.These developmental stages are; *Amastigote* form,it is intracellular parasite living in cell of reticuloendothelial systems. Its oval in shape and contains nucleus and kinetoplast.*Promastingote* form, it is slender measuring 10-15 micrometer in length. *Promastpote* is motile organism with single anterior flagellum, kinetoplast and central nucleus.

It develops in vector. *Epimastingote* forms in vector, develops to flagellated forms with kinetoplast which is attached to cell wall except at anterior tip where terminates with free and single flagellum is constantly moving, it pulls the cell wall into irregular extension.

Trypomastigote form, this active motile flagellated form of parasite, which lives extracelullary in blood and LN of man. Kinetoplast is situated posterior to nucleus and flagellum originates from it, round along the length forming long undulating membrane (Ochei, 2000).

The life cycle of pathogenic *Trypanosoma brucirhodondiense (T.b.r)* and *Trypanosoma brucie gambiense (T.b.g* is indicated in fig 1 as the following.

Taxonomic classification

Taxonomically, *Trypanosoma* positioned as the following series. Phylum: *Protozoa*, sub- phyhlum; *Sarcomastigophora*, supper class; *Mastigophora*, class; *Zoomastigophora*, order *kinetoplastidae*, suborder *Trypanosonidae*, family *Typanosomatidae* and Genus *Trypanosoma* (Mira shah and Raph, 1989). *Trypanosomes* are also classified in to two categories based on their development in vector. The descriptive name is given for two species are stecorarian, their developmental stage is mid gut and posterior station, where the second species are called salivarian, their developmental stage occur in salivary gland and called anterior station (Norman, 1985).

Epidemiology

Human African Trypanosoniasis epidemiology and its impact is determined by prevalence and distribution of diseases within vector infested area. Tsetse flies infest about 10 million km^2 of fertile land and spread across about 36 sub- Saharan countries of Africa (Murray and Gray, 1984).

Geographic Distribution

Human African Trypanosomiasis occurs between 15ºN and 20ºS latitudes in Africa where tsetse fly is densely populated. *T,b,r* is found in multiple foci in East Africa over area stretching from Ethiopia to Botswana, while *T.b.g* is found in central and Western Africa from Northwest of Senegal to Northeast of Sudan in Southern to Angola. The overall area covered between this latitude is stretching from Pacific Ocean to Indian Ocean. Outside the endemic area, there are occasional cases in tourists and immigrants from endemic countries (Murray and Gray, 1984).

Trypanosoma brucie rhodensiense is found mostly in south east of Uganda and transmission is caused by tsetse fly which lives in area of wooded vegetation and usually not found on flat plain. There are two types of tsetse flies in this area. They are; riverine and wooded land types. Tsetse fly of riverine types are main vectors of *T.b.r* in East Africa. *G. palpalis* is the most important vector of *T,b.g* and transmission occurs during river crossing. It prefers to bite cattle but also persons in Busoga Uganda, outbreak of *T.b.r* appears to have been caused by *G. palpalis* at river crossing and in Garden (Mira & Raph, 1989).

Source of Infection and Transmission

Source of Infection

Animals can host the human pathogen parasites especially *T.b.r.* Thus, domestic and wild animals are important parasite reservoir. *Trypanosoma brucie gambiense* can also infect animal, but the precise epidemiological role of the reservoir is not well known. Antelope is the main reservoir host of *T.b.r*. Man is the main reservoir of *T.b,g* and sources of infection of the vector. Affected individuals moves and propagate infection in new area where vector exist. Animal reservoirs are not important source of infection for *T.b.g* infection in areas where isolated human cases have occurred with long interval between them. The main victim of *T.b,.r* are; hunters, tourists, persons who have contact with wild animals habitats where infection is enzootic (PAHO, 2003).

Antelope, hyena, sheep, cattle and lion develop sufficiently high and prolonged parasitaemia and act as source of infection (Bales, 1991). Animal reservoirs for Human African Trypanosomiasis are indicated in table 1.

Method of Transmission

Human African Trypanosomiasis is transmitted cyclically by species of tsetse flies and occurred while infected tsetse fly takes up blood meal. There are three major categories of tsetse flies responsible for this condition and they are; riverine, savannah and forest types. Human African Trypanosomiasis is conceding with the tsetse fly infected areas.

Vectors of *T.b.r* are; *G. morsistance*, *G. pallidipes* and *G. swynnerteni*. The main vectors of *T.b.g* infection are: *G. fusc ipes*, *G. palpalis* and *G. tachinoides* (Bales, 1990).

Even though, greatest percentage of disease transmission is by vector of *Glossina* species, transmission can also possible by other means. These include mother to child infection (congenital). *Trypanosoma* can cross placenta and infect the fetus. Mechanical transmission is also possible, but it is difficult to assess the epidemiological impact of transmission through other blood sucking insects and accidental infection have occurred in laboratories due to pricks from contaminated needles

(WHO, 2006). Main vectors of HAT and major characteristics of diseases are shown in table 2.

Risk Factors

Ecology of vectors in Africa is the most important environmental factor for transmission of HAT. Vector is distributed to limited area of equatorial belt between 15°N and 20ºS latitudes (Murray and Gray, 1984). Wet season is also another essential risk factor for transmission of HAT. During high vector rearing (breeding season), epidemically outbreak will occur in sub-Sahara African countries; but in dry season, fly population is at minimum and concentrated in certain limited area (permanent breeding places). In addition to this, tsetse fly also attracted to human by sight while they wear dark clothes and mobile objects (Mirah and Raph**,** 1989**).**

Prevalence of Human African Trypanosomiasis in Africa

In past, there were devastating epidemics of *T.b.g* brought on by migration of settlers during colonization at the beginning of 20th century. 500,000 people died within decades in Congo basin alone and there were about 200,000 fatalities (Goodwin, 1990). Following implementation of control measure by 1950/1960s, prevalence of HAT was dropped to low level in some areas between 0.1%--2% and annual incidence was estimated at less than 10,000 cases in 1972. In 1992, WHO reported that *T.b.g* infection was endemic in 23 African countries.45 million people were at risk and there was nearly 10,000 new cases every year (WHO, 1992). Currently, HAT is endemic in 36 sub-saharan African coutries. *T.b.g* infection is chronic and tends to occur sporadically and gives rise to fewer epidemics while *T.b.r* infection is endemic among live stock raising tribes in East Africa and acute in type. Human Afrcan Trypanomiasis is epidemic in Sudan, Uganda, DCR and Angola. Its endemic in other countries.60 million people were at risk of infection and >300,000 new cases reported each year. According to (WHO, 2006), 300,000 – 500,000 cases of HAT was not diagnosed and treated. However, 7% of people is currently under surveillance for this infection. In some Ugandan communities, prevalence of HAT is 25% and in some villages of DRC prevalence reaches 70% and in certain part of Southern

Sudan >50% of the infection was stage II of HAT. Sleeping sickness during recent epidemic periods considered as the first or second greatest cause of mortality even ahead of HIV/AIDS in those communities. By 2005, surveillance had been enforced and number of new cases reported throughout the continent had substantially reduced, between 1998 and 2004 the figure for both forms of diseases together fell from 37991 to 17616 and estimated number of cases currently between 50,000 and 70,000 and considered that due to increased control measure. Sleeping sickness is the 'Dead list' diseases in the world. Democratic republic of congo (DRC) suffers more than any other country. Prevalence of diseases differs from one country to another and in different parts of single country. Due to this, its difficult to assess the current situation in number of epidemic countries because of lack of surveillance and diagnostic experts (WHO, 2006).

There is no report of Sleeping sickness (HAT) in Ethiopia. But *T.b.r* which causes East African sleeping sickness is found in Western parts of Ethiopia, in Gambella region. Epidemiologically, its limited to tsetse fly infested area following Baro and Akobo river valleys. The main vectors of this area are riverine types. So there is probability of diseases to occur (Mohammed, 2006).

Pathogenesis and Clinical Feature

Pathogenesis

Pathogenesis of sleeping sickness is complex and not fully understood. The exact mechanism of tissue injury is not known. It may be due to production of antigene-antibody complexes which may release kinines and other mediator of inflammation. Release of lysosome enzymes from degenerated phagocytes, and auto-immune mechanism. Sleeping sickness is categorized into 3 based on parasite and host interaction (chancre, systemic and CNS (Mohammed, 2006).

Trypanosomal chancre is acute inflammatory local response seen in week after bite of infected tsetse fly. Its large red and robbery. Chancre appear as painful swelling and several centimeters in diameter (Parija, 2004).

Trypanosomal chancre is more frequently seen *i*n *T.b.r* infection than T.b.g Infection. It shows intense inflammatory infiltration, vasodilatation and interstitial edema. A chancre lesion is filled with parasites and disappears after 2 or 3 weeks (McGovern *et al.,* 1995).

With advanced chronicity of diseases, parasites are carried by blood to produce systemic infection. Systemic

infection without involvement of CNS is called stage I diseases. The lymph node and spleen are enlarged during this stage. This is usually accompanied by infiltrate of lymphocytes, plasma cells and macrophages. B cells and macrophages are expanded significantly. Paracortical area of T. cell relatively reduced, but contain much macrophages (Ian Maudlin, 2004). Parasites are few and difficult to demonstrate in these tissues. Blood brain barrier (BBB) becomes permeable due to infiltration of by lymphocytes.

Trypanosome then break blood brain barrier (BBB) and invade the CNS to produce stage II diseases. Permeability of BBB results in rise to vasogenic cerebral edema. Atrocytes and microglia are activated together with immune cells and begin to produce cytokinines which contribute to progression of diseases (Pentreath *et al.,* 1994).

They cause leptomeningitis which extend into perivascular vircho robin spaces and finally causing demyelization pan-encephalitis. Its accompanied by infiltrates of leukocytes which typically consist of plasma cells containing glycoprotein globules (flam cells or mott cells). This condition lead to progressive chachoxia, wasting and cardiac complication. Cell degeneration occurs in skeletal muscle, CNS and in heart. The most significant one is seen in myocardium where there is separation and degeneration of muscle fibers. This is more common in infection of *T.b.r* than *T.b.g*. Some patients die before reaching neurologic phase (Greenwood and Whittle, 1998).

Trypanosoma infection causes strong humeral immune response. Massive B cells and IgM macroglobulinanemia are constant features characteristically. Parasites invade host defense by production of variant antigenic types (VAT).VAT specific protective antibodies destroy the homologous parasites by causing their lysis and opsonization there resulting remission, but each time host protective antibodies successfully clear off the infection. *Trypanosoma* evade destruction by expressing new VAT and then multiple rapidly. Multiplication continues till appearance of protective antibodies against new variant VAT. Both HAT alters severely the patient immune system resulting synthesis of large alpha globulins auto antibody formation and immunodeficiency. IgM also elevated in the CSF (Vincendeau *et al.,* 1996). Parasites covered by Variant glycoprotein surface antigen which generates antibody and activation of macrophage which produce tumor necroting factor (TNF) alpha, but *Trypanosomes* express >1000 genes coded for this antigen and covered with different antigen. Then glycoprotein coat initiate new wave of parasitaemia. Although, T. lmphocytes diminish parasites proliferation, they continue to produce gamma interferon(IFN-gamma) which levels are directly related to severity of diseases (Krauss *et al.,* 2003). Heterophila antibodies, anti DNA antibodies and rhermatoid factors in serum are also elevated. High level of antibody-antigen complex is another feature of diseases (Mohammed, 2006)

Clinical Feature

The symptoms are more acute in *T.b.r* and appear after incubation period of 4 weeks, while onset of symptoms are slow and insidious in case of *T.b.g* infection and its chronic with incubation period varying from month to year. Clinical manifestation begins with development of chancre and progress from hematolymphatic stage to meningoenephalitic stage II disease (PAHO, 2003).

Chancre: painful chancre appears on skin within few days of bite and characterized by erythema, swelling and local tenderness. Chancre is surrounded by heavy erythematous tissue reaction with local edema and regional lymphadenopathy. It heals without treatment after 2-4 weeks leaving permanent hyperpigmented spot (Eldryd, 2004).

Haematolymphatics stage (Stage I diseases) appears within weeks or months of infection. Fever is the earliest symptom and more frequent in *T.b.r.* infection than in T.b.g. infection. This stage is commonly accompanied by headache, intermittent fever, general malaise and myalgia. As infection progress, it increasingly associated with tachycardia, irregular rash, anemia, oedema, hepatosplenomegally and weight loss (Parija, 2004). The cyclic release of cytokines during period of increased cell lysis in intermittent nonspecific symptoms hepatomegally and generalized lymphadenopathy are commonly indicating hyperplasia of reticuloendothelial system, rigor and joint pain. All these signs misdiagnosed as malaria or viral infection and broaden range of possibly differential diagnosis. Cervical lymphadenopathy showing enlarged, non-tender and mobile posterior cervical lymph node (winter bottom's sign) is classical sign in *T.b.g.* infection. Auxillary and inguinal lymphadenopathies are observed more in patients with T.b.r. form (krauss *etal..*, 2003).

Meningoencephalitic form (stage II diseases) is sever and last stage of diseases that can result death. The on set

of CNS symptom is slower in *T.b.g* infection while faster in East African form. Persistent headaches which is resistant to analgesic, personality changes and profound disorder of sleep patterns with day time somnolence followed by night time insomnia are silent features of the diseases (Parija, 2004).

Memory loss, progressive apathy, indistinct speech, ataxia, tremors, seizures, depression, sleep disturbance, with day time somnolence and nocturnal insomnia, impaired vision up to total blindness, coma and finally death (Krauss *et al*.., 2004).

Within week in *T.b.r.* Infection, but within mouth in *T.b.g*. Infection. Typanosoma cross Blood brain barrier and start to destroy CNS. In children, sleeping sickness progress even more rapidly toward meningoencephalitic stage. Behavioral change of personality and neurological symptoms can be focal gradually, and generalized based on site of damage in CNS. Comatose state, progressive wasting and dehydration follow inability to eat and drink (Murray, 2002).

Histopathologically, perivascular infiltation of inflammatory cells, cuffing and glial proliferation can be detected. The pathognomic signs for CNS involvement of HAT is the appearance of molular cell of mott in brain tissue and CSF. These are activated plasma cells with characteristic eosinophilic inclusion. Complications include; wasting syndrome, meningoenephalitis, stupor or coma and death (Elderyd, 2004).

Diagnosis

The clinical manifestation of Human African Trypanosomiasis is protean and highly variable. There is different approach for diagnostic purposes.

Parasitological Diagnosis

The available parasitological methods may not to be sensitive enough to find Trypanosome. Thus, negative parasitological result in the presence of positive serological test doesn't necessary indicate absence of infection. So test should be repeatedly tested. (WHO, 2006).

Wet Blood Smear

After preparation of specimen, look by 40x and it's a simplest method to examine Typanosoma, but it's not sensitive. However, its used for detection of *T.b.r*. which has wave of parasitaemia approximately every 8-15 days, but in case of *T.b.g*, parasite peaks may be month apart, so that wet blood smear is less useful for diagnoses of *T.b.g.* (Minter, 1996).

Thick and Thin Blood Smear

The same procedure is conducted for preparation of specimen in both cases, but they differ in level of thickness. Thick blood smear is good for large population survey and Trypanosoma detected in thick blood smear at lower level of parasitaemia than in wet blood smear and thin blood smear. So *T.b.g* is more detectable in thick blood smear than thin blood smear, because thick blood smear yields higher parasites than thin blood smear but *T.b.r* can easily detected in both cases due to high parasitaemia. Thin blood smear is more useful for species identification (Warren, 2004)

Lymph Node and Chancre Fluid Aspiration

These techniques widely used specially for diagnosis of *T.b.g.* infection. Fluid of enlarged lymph node taken from posterior triangle of neck (winter bottom's signs) is aspirated and examined immediately at 400 magnifications. Mobile Trypanosoma can be detected between numerous lymphocytes for about 15 minutes until they become immotile (Ochei, 2000).

Concentration Method

This is conducted to increase sensitivity of blood examination. Various concentration assays has been developed for this purpose. Trypanosoma accumulate just above the buffy coat layer after centrifugation of blood sample. The best results in field have been obtained with minianion exchange column techniques where Trypanosoma concentrated after passage through cellulose column and QBC which is originally developed for diagnosis of malaria (PAHO, 2003).

CSF Analysis for Determination of HAT

Sample of CSF is taken by lumbar puncture and examination of Leukocytes, pleocytosis, mostly lymphocytes >5 cells/ mm3.Molular cells of mott-activated plasma cells with numerous vacuoles and pathognomic for cerebral involvements.

Protein, 40 mg of protein in 100 ml of CSF (dye binding protein) assay as result of autochonous production of IgM antibody in CSF. This method is used to diagnosis

stage II diseases of HAT. Determination of stage II diseases is essential for correct management of patient (Eldryd, 2004). Blood count and bone marrow aspiration are another diagnostic approach to detect Trypanosomal infection.

Animal Inoculation

Sample of blood or CSF inoculated intraperitonially to mice which develops detectable parasitaemia within 2 weeks. Its difficult to infect Rodents by *T.b.g* while the ongoing method will be unsuccessful, but parasitaemia develop incase of *T.b.r.*

Blood incubation infectivity test- used to differentiate *T.brucei brucei., T.b.g.* and *T.b.r*. Suspected *Trypanosoma* strain is incubated with human blood or plasma and then injected to rat to determine subspecies based on fact that normal human blood destroys infectivity for rats but not for *T.b.r / T.b.g.* They develop parasitaemia (PAHO, 2003).

Sero-immunolegical Diagnosis

Card Agglutination test (CATT)

Serological screening test for detection of West African Trypanosomiasi*s* (T.b.g). For rapid screening under field condition CATT is excellent tool in areas of West African Trypanosomiasis. It's easy to perform and delivers results within 5 minutes. Visible agglutination in CATT suggests the existence of antibody.

ELISA

ELISA is used for antibody detection for species specific monoclonal antibody detection which reacts with determinant of antigens.

IFAT

Commonly used for diagnosis of HAT and recently added to diagnosis of animal Trypanosomiasis. Its techniques are conducted by labeling of immunological reagents with fluorescent stain. Fluorescence gives green yellow color in the present of ultra violet light. If serum sample is positive for *Trypanosoma,* it contains antibody which fix on antigenic site of *Trypanosomes*.

The reaction is visible by adding anti gamma globulins specific to suspect serum combined with flourchrome radial. If patient previously exposed to *Trypanosomes,* the fluorescent anti gamma globulin bind antibody of the test serum that are fixed on antigen (Rae and Lucking, 1984).

Molecular Tests

Molecular test is accurate diagnosis of *Trypanosomes* and definitive identification of causative agent based on detection and amplification of DNA and RNA.

This technique is based on stable parasite, specific genetic characteristics and parasite that can with stand environmental influences exerted by either host or vector. Genome of different species of

Trypanosomes have unique region of highly repetitive multi copy DNA sequences with the identification of base pairs repeat of which >10,000 copies exist with haploid genome of *Trypanosomes* species. Species specific probes are now available for specific identification of the known species of *Trypanosoma* DNA hybridization (Majiwa, 1998).

Both DNA hybridization and polymerization chain reaction (PCR) have been applied to great effect to characteristics specific *Trypanosoma* species in both vector and host using PCR to identify multiple copies segment of DNA (Scharis, 1996).

Culture

This method is recommended when repeated attempts by microscopy fail to show any parasites in blood. Blood is inoculated in the neoxy nexyl medium which is diaphasic and essentially 25% blood agar slant or liver infusion treptose medium and incubated at 22^{o}C -24^{o}C for 4 mouths to 6 months.

The fluid from the culture is examined microscopically by 4th day and every week for 6 weeks. Epimastigote and *Trypomastigotes* are found in this culture. Trypanosoma can also cultivated in developing chick embryo and in tissue culture (Parija, 2004).

Differential Diagnosis

Malaria, kala' azar, Tuberculosis, Brucellosis and Lymphoma during early phase and Neurophils, brain tumors, and viral meningoencephalitis during late phase must be considered in differential diagnosis (krauss *et al.,* 2003).

Table.1 Animal reservoirs for Human African Trypanosomiasis

Parasites	Reservoirs	
	Wild animals	Domestic animals
T.b.g ***T.b.r***	**Monkey, Antelope** **Bush bucks, Antelope, Red bucks, water buck, lion and Hyena**	**pig, cattle, dog, sheep** **cattle, sheep, goat and dog**

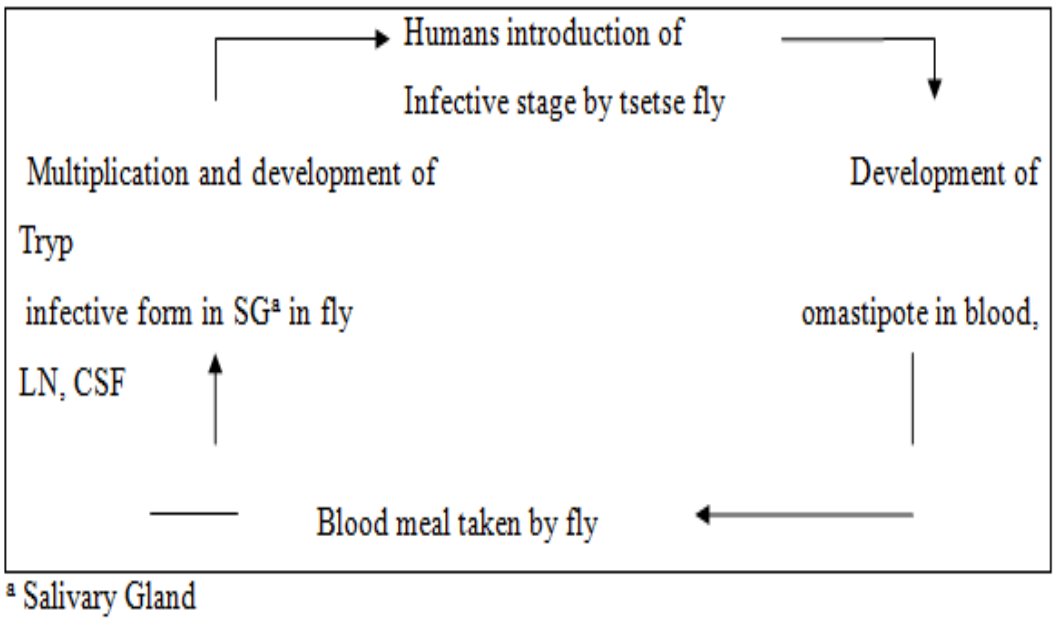
Source: (Krauss *et al*., 2003)

Table.2 Main vectors of HAT and major characteristics of diseases

Parasites	Diseases	Vector	Major characteristics
T.b.g.	**Western and central Africa Sleeping sickness**	***G.palpalis, G. tachinoides G.palpallis***	**Insidious onset, chronic course, death after months or year.**
T.b.r	**East African sleeping sickness**	***G.morsistance, G.pallidipes***	**rapid onset, acute, death often within a week**

Source: (Eldryd, 2004)

Figure.1 Life Cycle of pathogenic *T. b.g* and *T.b.r.* Source: (Ochei, 2000).



Management of Diseases

Diseases management is performed in three steps. Screening for potential infection. This involves the use of serological tests or checking for clinical signs genet\rally swollen cervical glands. Diagnosis shows whether parasites present. Staging to determine the state of progression of diseases entails examination of CSF obtained by lumber puncture and used to determine course of treatment. Diagnosis must be early as possible and before neurological stage to avoid complication and risk of treatment (WHO, 2006).

Treatment

Choice of treatment depends on stage of diseases and *Trypanosoma* species involved. The drugs used in stage I of diseases are less toxic and easier to administer and

effective. Treatment success in stage II is based on the drug which can cross BBB to reach the parasites. Such drugs are quite toxic and complicated to administer. Four drugs are registered for treatment of sleeping sickness and provide free charge to endemic countries through WHO private partnership with sanofi aventis. pentamidine, melarsoprol, eflornithine and Bayer AG (suramine) (WHO, 2006). Infection with *T.b.g* stage I, treated with suramine, eflornithine or pentamidine. Stage II, eflornithine is indicated. Infection with *T.b.r* stage I, treated with, suramine and pentamidine. Stage II, melarsoprol, incase of intolevance, tryparsamid and suramine are indicated.

Dosage and routes of administration

Suramine 10mg/kg every 5th day for total of 12 injections by intra venous route is recommended. Maximum dose is 1g/kg/day for adults and 20 mg/kg/day for children slow intra venous infusion. Pentamidine 4mg/kg/day by intra muscular routes and given for 10 days. Eflornithine 100 mg/kg four times /day through intra venous route for 2 weeks and followed 75/mg/kg 4x1day through oral route for 3-4 weeks. Treatment with melarsoprol follows complicated schedule. Adult 2-3.6 mg/kg1 day applied in 3 intra venous infusions per day for 3 days. After week 2nd series and after another 10-21 days 3rd series of infusion is given. Total dosage for children is 18-25 mg/kg. Each drug has its own side effect (krauss *et al.,* 2003).

Prevention and Control

The progress in diseases control is increasing time to time. In 2000, WHO established a public private partnership with Aventis pharma (now sanotiaventis) which has enabled creation of WHO surveillance team providing support for endemic countries in their control activity and supply of drugs free of charge for the treatment of patients. In 2006, success in curbing the number of sleeping sickness cases has encouraged a number of private partners to sustain WHO's initial effort towards elimination of diseases as public health problem (WHO 2006).

Two main approaches to control HAT are; to reduce the principal reservoir of infection and diminishing of vector. In diminishing of vector of West African Human Trypanosomiasis, detecting and treating of human infection should be emphasissized to reduce source of infection for vector. The challenge is greater in case of East African Human Trypanosomiasis because of measures must be taken to control livestock population both wild animals and domestic animals. Reducing of vector population is the most efficient in controlling *T.b.r* and can be achieved either by targeted destruction of fly or habitats or used insecticides. Trapping and sterilizing of tsetse flies and saturate natural environment with male flies sterilized in laboratory is successful in eradication of flies that transmit trypanosome. Preventing host vector contact by using protective clothing and avoid going to tsetse fly infested areas. Reducing vector population is most efficient during epidemics while reducing reservoir host is more effective in endemic areas. The problem of antigenic variation in HAT has impeded production of vaccine against them (PAHO, 2003).

Conclusion and Recommendations

Human African Tryponosomiasis is the most essential protozoal diseases of human and it is also called sleeping sickness. It is caused by unicellular parasites of *Trypanosomatidae* family which are pathogenic to human and animals. These species are *T.b.g*. which causes chronic HAT in Western Africa and *T.b.r* which causes acute HAT in Eastern Africa. Geographic distribution is concedes with tsetse fly infested area between 15°N and 20°S latitudes. They can cause diseases to animal and called 'Trypanozoon', both domestic and wild animals serve as reservoir host for them, especially for *T.b.r*.

Trypanosomal parasites undergo different developmental stages during their life cycle both in vector and host. Transmission of diseases is greatly by bite of tsetse fly and its also possible congenitally (mother to fetus).

Prevalence of diseases is different in different countries of Africa. Due to lack of surveillance and diagnostic expertise, it is difficult to asses current situation of prevalence in number of epidemics.

Based on the relevant information entitled in this paper, the following recommendations are recommended:

- ✓ Early confirmatory diagnosis should be conducted for successful treatment of HAT.
- ✓ In endemic areas of Human African Trypanosomiasis, progressive control program must be implemented for eradication of vector and as well as parasites.
- ✓ In higher endemic areas, the indiscriminate donation of blood should be prohibited.

- ✓ Because of sever side effects of medication, never start *Trypanosomes* treatment without confirmatory diagnosis.
- ✓ Chemoprophylaxis should not be given for visitor to endemic areas.
- ✓ Even though, antigenic variation of trypanosomal parasite doesn't allow vaccine production, scientific study must be implemented to produce vaccine in the future.

References

Bales, G.D. (1991): African Trypanosomiasis in strick land G.T ed Hunters Tropical Medicine, 7th ed. Philadelphia: Saunders. pp. 617-628.

Dumas, M. B, Boutille. (1996): Trypanosoma Humaine Africaine CR Seances: Soc Brolfil. pp. 395-408.

Eldryd, P. (2004): Principles of Medicine in Africa. 3rd ed. United Kingdom: CAMBRIDGE. 33: 475-488.

Greenwood, R. G. and Whittle, M. (1998): Pathogenesis of Sleeping Sickness.*Traus Rsoc Trop Med Hyg.* Pp. 716-725.

Goodwin, L.G.(1990): Pathology of African Trypanosomias. *Traus R soc Trop Med Hyg*. Pp.395-408.

Ian Maudlin, p. Holmes, H. and Miles A. (2004): Trypanosomiasis 1st ed. United kingdom: CABI publishing. Pp. 1134-147.

Krauss, H., Albert, W., Max Appeal and others. (2003): Zoonoses Infectious disease Transmissible from Animal to Human. 3rd ed. Germany: ASM press. 4: 302 – 307.

Majiwa, P.A. O. (1998): Application of PCR doe Detaction of Trypanosomiasis 1st ed., Viennal, pp. 7-11.

McGovern, T.W., Williams, J. E. Fitzpatrick, M.S. Ceteron, B. C. Hepbura, R.H., Gently. (1995): Cutaneaus manifestation of African Trypanosomiasis, 2nd ed. Arch Dermatal, pp.1178-1182.

Minter, D.M. (1996): Trypanosomes in Manson, P. FTCA. Ptd manson's Tropical Disease. 18th ed. London: Balliere Tindall. Pp. 216-228.

Mira Shah, F. and Ralph. R. (1989): Manual of Tropical Veterinary Parasitology. 1st ed. England: CABI. Pp. 181 -278.

Mohammed, A. A. and Waqtola, C. (2006): Medical Parasitology 2nd ed. Jimma University: Rohobot Printer. PP. 133 -146.

Murray, M. and Gray, A. R. (1984): The current situation on Animal Trypanosomiasis in Africa, *Prev. Vet Med*. pp. 22-29.

Murray, P. R. (2002): Medical Microbiology. 4th ed. Baltimore: Maryland. PP. 723-725.

Norman, D. (1985): Vetrinary Protozology. University of Illinois: Iowa State University press. PP. 19-57

Ochei. J. (2000): Medical Laboratory Science. 2nd ed. Muscat: Tata. Pp. 999-1004.

PAHO, (2003): Zoonoses and Communicable Disease common to Man and Animal, 3rd ed. Washington D.C.: Parasitosis. pp. 3 -9.

Parija, S. H. and Chandra. (2004): Medical Parasitology 2nd ed. Chennani: New Delhi. Pp. 112 – 118.

Penetreath, V. W., P.J. Baugh, R.R. Lavin. (1994): Sleeping Sickness and CNS. *Understepoort: J. vetles*. 61. 369-377.

Rae, P.F. and Luckins, A.G. M. (1984): Detection of Circulation Trypanosome Antigen by EILSA. Tropical made: Parasitol. 78: 587 -596.

Schares, G.D. and mehlitz. (1996): Sleeping Sickness in Zaire, anest PCR Improves Identification of *Trypanosomes* (Trypanozoon) *brucie gambiense* by specific kinetoplast DNA probs. *Trop med Int Health,* 1: 59-70.

Vincendeau, P. M.C. okomo – Assoumous, S. and Semballa. (1996): Immunology et. Immuno-pathology dela Trypanosome Africane. *Med Trop: Mars*. pp. 73-78.

Warren, L. (2004): Medical Microbiology and Immunology. 8th ed. Sanfransisco: Medical publishing division. pp. 500.

WHO, (1992); Parasitic Zoonosis R eport WHO exepert Committee with Participation of FAO.Technical Report series 637. Pp. 548-564.

WHO, (2006): Media Center Fact Sheet N^0 259. Revised August 2006 (Accessed 31, March, 2010).

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