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African sleeping sickness: Causes and Treatments

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Abstract

Among many diseases; African sleeping sickness is a tropical disease which is result of the bite of tse.tse fly where parasitic protozoans (trypanosomes) are transmitted. Early symptoms of this disease are fever, limbs pain, anemia and chills. It affects the nervous system seriously even sometimes causing death. Four drugs are used to treat Human African Trypanosomiasis (HAT). I.e, Suramin, Pentamidine, Melarsoprol and Eflornithine. First half of the 20th century was very important for the development of first three mentioned drugs, later on modern technology is discovering more innovative drugs for treatment of Sleeping Sickness. This article reviews about the stages, diagnosis and treatments of African sleeping sickness in living organisms.

Keywords: Sleeping Sickness, Tsetse fly, Fever, Eflorithine, Treatments.

1. Introduction:

The African sleeping sickness can be referred as Human African Trypanosomiasis (HAT). According to WHO, it is a fatal disease if not treated timely and properly. The causative agent of disease is par**asite** protozoal specie called as *Trypanosoma brucei*. It has two sub-species *T. brucei gambiense* and *T. brucei rhodosianse*, which cause HAT. Common in Africa and transmitted by the bite of tsetse flies (Glossina species) it is common fly in rural areas of Africa. Trypanosoma multiplies in host's blood and tissue fluid (Varmus et al, 2003). *T. brucei gambiense* causes chronic form of Human African trypanosomiasis specie that is common in West and Central Africa. *T. brucei rhodosianse* causes acute form of disease and it is common in East and Southern Africa. The patient dies in Year if suffering from chronic Sleeping Sickness, while it takes few months to die when affected by acute form of African sleeping sickness.

2. Stages and Symptoms of Human African trypanosomiasis

Stages are defined by the presence of white blood cells in cerebrospinal fluid (CSF) and also by the presence of Trypanosoma.

HAT can be in two stages;

1. The first stage is also called haemolymphatic phase. In this stage the control of Trypanosoma to the lymph and blood. Symptoms are joint pain, fever, headache, itching.
2. Second stage of disease is called neurological phase in this phase the causative agent will be in cerebrospinal fluid. Symptoms are confusion, sensory disturbance, coma, disturbed sleeping patterns (Nijokou et al, 2006).

Sometimes patient suffering from sleeping sickness does not depicts symptoms of disease. With the passage of time the parasite migrates from blood to the central nervous system which leads to neurological changes including sleeping disorders therefore named as sleeping sickness.

3. Diagnosis

To diagnose sleeping sickness is difficult in initial stages due to lack of sign and symptoms. In late 1970s Card Agglutination Trypanosoma Test (Chappuis et al., 2004) was developed for serological (examinations of blood serum) screening, but unfortunately it was only applicable for the HAT the causative agent is *T. brucei gambiense*. In case of HAT the number of parasites (*T. brucei gambiense*) in blood serum is low so that Parasitic Logical Methods (PLM) may not be efficient to find that parasites.

4. Treatments

Treatment of sleeping sickness is getting difficult by currently available drugs because parasites are resistant to drug. Gambiense is highly resistant therefore aggregate of two drugs is used against the particular disease. Up till now only four drugs available which are being used for treatment of HAT:

a. Pentamindine
b. Suramin
c. Melarsoprol
d. Eflornithine

4.1. First stage treatment

Pentamindine is used to treat *T. brucei gambiense* and Suramin used for early stages of *T. brucei rhodosianse*. In early stages the lymph is affected.

4.2. Second stage treatment

Nifurtimox eflornithine Combination Therapy (NECT) is used for Gambinese HAT (Alirol et al, 2012). In 2009 this drug was in the list of World Health Organization (WHO). It had highly curable rate of 95-98 % as compared to Melarsoprol or Eflornithine Monotherapy.

5. Epidemiology

Death rates were 34,000 in 1990 and reduced to 9,000 in 2010 (Lozano et al, 2012). From 2010-2014, there was An estimate that 55 million people were gambiense African Trypanosomiasis's risk and about 6 million people were rhodesiense African Trypanosomiasis's risk (WHO, 2000). According to a report of WHO that 3,797 cases of

Human African Trypanosomiasis in 2014 (Franco et al, 2017). The total number of cases has been reduced to 86% in 2014 as compared to cases reported in 2000. 37 countries, of sub-Saharan Africa were under that disease. In 2008 more than 48,000 people's death occurs due to HAT in southeast Uganda and Western Kenya (Okagbue et al, 2016). One of the most affected countries in the world is Democratic Republic of the Congo, *Trypanosoma brucei gambiense* cases are high. The numbers of cases are reduced due to the drugs. Sleeping sickness elimination is a possible only through drugs. Sleeping sickness eradicated by the year 2020 by WHO.

6. **Human African trypanosomiasis treatment:** Trypsosomas specises and treatments at different stages with their defined doses are described in the table 1:

Table 1:

Species	Stages	First line treatment	Dose	Alternate treatment
Gambiense	1st	Pentamidine	4mg/kg/day For 7 days	
	2nd	Nifurtimoxeflornithine combination therapy (NECT)	Nifurtimox 15 mg/kg/day orally in three doses x 10 days Eflornithine 400 mg/kg/day (each dose diluted in 250 ml water for injection)a x 7 days Incomplete instructions.	Eflornithine 400 mg/kg/day (each dose diluted in 100 ml water for injection) (14 days) Third-line (e.g. treatment for relapse): Melarsoprol 2.2 mg/kg/day (10 days)
Rhodesiense	1st	Suramin	4–5 mg/kg (day 1), then 20 mg/kg weekly x 5 weeks (maximum 1 g /injection) (days 3, 10, 17, 24, 31)	Pentamidine 4 mg/kg/day (7 days)
	2nd	Melarsoprol	2.2 mg/kg/day (10 days)	

Source: (Bucsher et al, 2017).

Conclusions

African Human trypanosomiasis is a disease, not only damages human population in sub-Saharan regions, but also the cultural and economic developments. People were dying before introduction of drugs while this trend was controlled positively after drugs were introduced. Drugs are used with respect to condition of disease whether it is acute or chronic. *T. brucei gambiense* and *T. brucei rhodosianse* are responsible for the HAT. Pentamindine is used to treat *T. brucei gambiense* and Suramin used for early stages of *T. brucei rhodosianse*. Death rates have reduced from 34,000 in 1990 to 9,000 in 2010. Nifurtimoxeflornithine Combination Therapy (NECT) is used for Gambinese HAT. It had highly curable rate as compared to Melarsoprol or Eflornithine Monotherapy.

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