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African trypanosomiasis (Sleeping Sickness)

By: Pedro Garcia and Austin Burton



Background

Importance: The people most exposed to the tsetse fly have a better chance of getting the African sleeping sickness also known as African trypanosomiasis. This sickness kills over 50,000 people per year in Africa. This may not be important to us Americans but people are dying right now due to this sickness. African sleeping sickness is most prevalent in the area of East and West Africa. These areas have a total square mileage of 252,791. African trypanosomiasis is transmitted from person to person by a vector, the tsetse fly. Sleeping sickness is rarely transmitted by blood transfusion or across the placenta during pregnancy because the disease causes infertility and spontaneous abortion in women of child-bearing age. The Rhodesians form is a zoonotic, with occasional infection of humans. In the gambiense form, humans are regarded as the main reservoir that plays a key role in the transmission cycle of the disease (Food and Agriculture Organization, 2014).

Historical: Modern history of African trypanosomiasis revolves around the identification of the causative agents and the mode of transmission of the infection, and the development of drugs for treatment and methods for control of the disease. From the recent history of sleeping sickness we can learn that the disease can be controlled but probably not be eradicated. Current history of human African trypanosomiasis has shown that the production of anti-sleeping sickness drugs is not always guaranteed, and therefore, new, better and cheaper drugs are urgently required (WHO, 2014).



Tsetse Fly

Micro Organism: The African sleeping sickness is known as a protist. Sleeping sickness occurs only in 36 sub-Saharan Africa countries where there are tsetse flies that transmit the disease. The tsetse fly is large, brown and stealthy (NML). While taking blood from a mammalian host, an infected tsetse injects metacyclic trypomastigotes into skin tissue. The parasites enter the lymphatic system and pass into the bloodstream (Seattle Biomed, 2015).

African sleeping sickness kills 50,000 people each year. There are 60 million people at risk of catching the disease, which is about two and a half times the population of Texas, living in 36 sub-Saharan African countries, an area a little bigger than the 48 contiguous states. For each person diagnosed and treated for African sleeping sickness twelve go undiagnosed and die.



Map of world effected by African Trypanosomiasis

Treatment

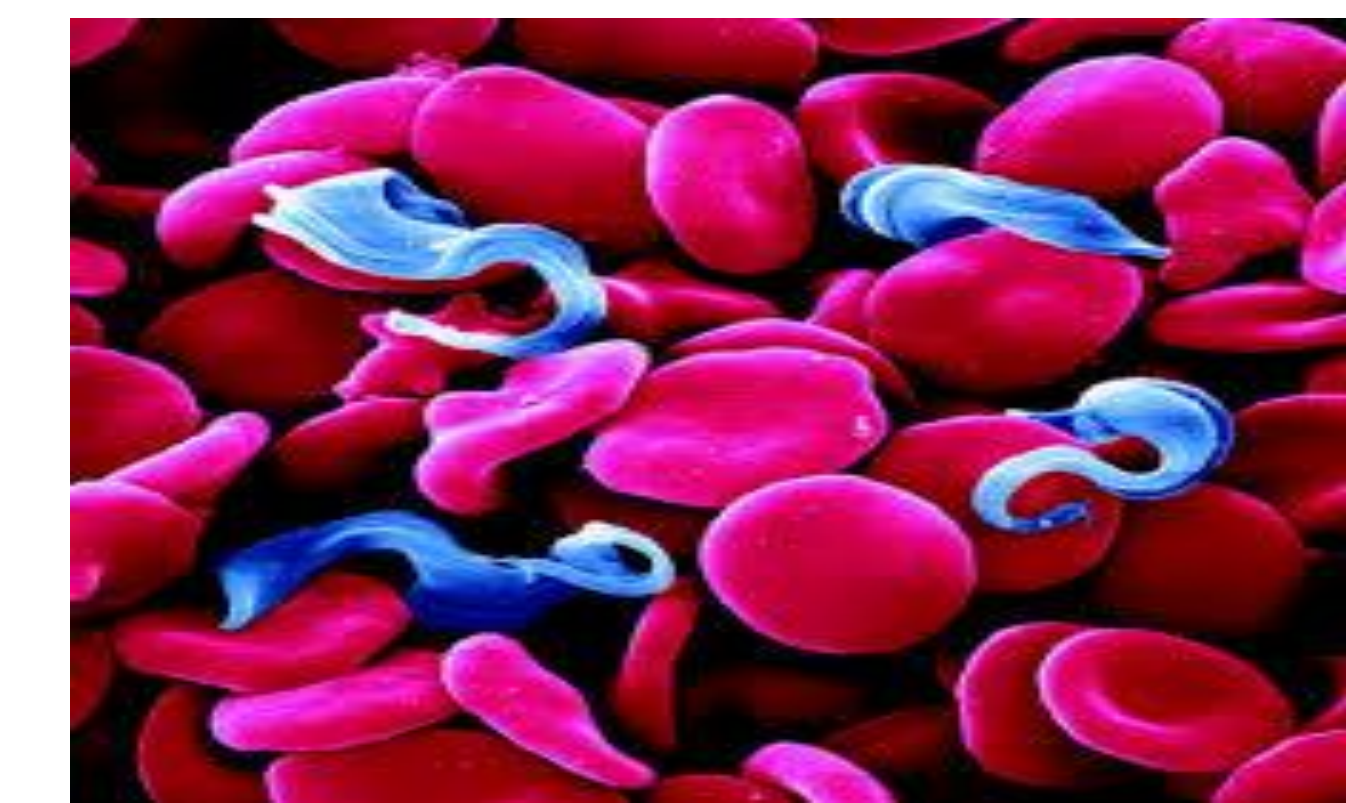
The type of treatment depends on the stage of the disease. The drugs used in the first stage of the disease are of lower toxicity and easier to administer. The earlier the disease is identified, the better the prospect of a cure. Treatment success in the second stage depends on a drug that can cross the blood-brain barrier to reach the parasite. Such drugs are toxic and complicated to administer. Four drugs are registered for the treatment of sleeping sickness. These drugs are donated to the World Health Organization (WHO) by manufacturers and distributed free of charge to countries endemic for the disease. All persons diagnosed with African Trypanosomiasis should receive treatment. The specific drug and treatment course will depend on the type of infection (*Trypanosoma brucei gambiense* or *Trypanosoma brucei rhodesiense*) and the disease stage (i.e., whether the central nervous system has been invaded by the parasite). Pentamidine, which is the recommended drug for first stage T. b. gambiense infection, is widely available in the U.S. The other drugs (suramin, melarsoprol, eflornithine, and nifurtimox) used to treat African trypanosomiasis are available in the U.S. only from the Centers for Disease Control (CDC). Physicians can consult with CDC staff for advice on diagnosis and management and to obtain otherwise unavailable treatment drug. Without treatment death is inevitable (National Institute of Health, n.d.).



Medicine used for African sleeping sickness

Infection/Disease

African Sleeping Sickness, also known as human African trypanosomiasis, is caused by the parasite trypanosomes. Trypanosomes are unicellular organisms that do not have a cell wall and usually obtain food by ingesting other organisms. African Sleeping Sickness usually stays in the blood stream, but in later stages the disease moves into the central nervous system, which can lead to fever, swollen lymph, headaches, mood changes, and sweating. Trypanosomes have the ability to temporarily change their major surface antigens giving memory t cells problems. This is called Antigenic Variation and is believed to be the biggest cause for Trypanosomes' survival in the body (Food and Agriculture Organization, 2014).



Trypanosomes in the blood stream

There are two different stages of progression, before the sporozoan reaches the central nervous system and after the sporozoan reaches the central nervous system. There are also two different types of African sleeping sickness, East and West, and different progression rates of each (CDC, 2014).

East African Sleeping Sickness

This is the more rapid of the two. Most patients will develop systems within 1-2 weeks of the infected bite happening. After a few weeks it enters the central nervous system and this leads to mental deterioration and death usually follows within about a month (CDC, 2014).

West African Sleeping Sickness

This is the slower of the two methods. Mild symptoms are to occur at first but after about a year or two the side effects at this point are personality changes, daytime sleepiness and night time disturbance and progressive confusion. Partial paralysis or problems with walking will occur here as well. Untreated it rarely last longer than 6-7 years and death usually happens within 3 years. Death can occur within 6 months without treatment from cardiac failure or from the infection itself which can cause the disease to get much worse much faster often over a few weeks (CDC, 2014).

