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MED 443
King Saud University

TEAM443
MICROBIOLOGY

Trypanosomiasis

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Objectives

No objectives were found

Any future corrections will be in the editing file, so please check it frequently

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Important
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Introduction

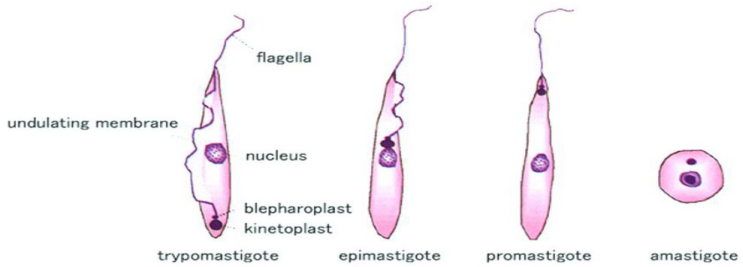
Female Slides

Classifications of Parasites		
Class	**Protozoa**	**Helminths**
Features	○ Unicellular ○ Single cell for all functions No sexual stage, replicate by binary fission	○ Multicellular ○ Specialized cells - They are like human have systems: Respiratory, Reproductive. - As long as there is reproductive system so there will be sexual stage in their life cycle
Types	**1. Amoebae:** move by pseudopodia **2. Flagellates:** move by flagella - Intestinal flagella e,g Giardia & Entamoeba histolytica - Blood hemoflagellate e,g Trypanosoma - Tissue & visceral flagella e,g leishmania. **3. Ciliates:** move by cilia **4. Apicomplexa** (Sporozoa) tissue parasites	**1. Roundworms (Nematodes):** - Elongated, cylindrical, unsegmented **2. Flat worms** - **Trematodes:** leaf-like, unsegmented - **Cestodes:** tape-like,segmented ○ Mnemonic: trematodes = tree = leaf like Cestodes = cm = tape

Trypanosomiasis

There are two types of trypanosomiasis that affect humans, they are divided according to their geographical location:

African trypanosomiasis (1)	○ Known as African sleeping sickness. because the patient tend to syncope & coma ○ Caused by Trypanosoma brucei parasites in Africa ○ Transmitted by the **Tsetse fly** (**Vector**) ★★ ○ Trypanosoma brucei rhodesiense: East Africa, wild & domestic animal reservoirs ○ Trypanosoma brucei gambiense: West & Central Africa, mainly human infection ○ The earlier sleeping sickness is diagnosed & treated, the greater are the chances for recovery ○ 60 million people who live mainly in rural parts of East, West and Central Africa are at risk of contracting sleeping sickness
American trypanosomiasis (2)	○ Known as **Chagas disease** ○ Transmitted by the **'kissing' bugs** (Triatomine bugs) (**Vector**)★★ ○ Trypanosoma cruzi parasites: in Central & South America, Latin America

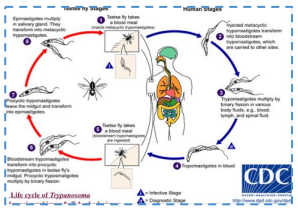


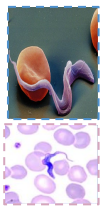
Different stages of Hemoflagellates

African Trypanosomiasis

African Sleeping Disease

Overview	○ A parasitic disease. Infection transmitted by the bite of infected tsetse fly (**Vector**/intermediate host) ○ It gets its nickname sleeping sickness because symptoms can include a disturbed sleep pattern. ○ Humans, domestic cattle & wild animals are the main reservoir host for Trypanosoma (definitive host)	
Pathogen	T.rhodesiense causes a more acute illness	T. gambiense causes a chronic illness.
Transmission	1. Trypanosoma are transmitted from human to human through the bite of the tsetse fly which is only found in rural parts of Africa. 2. However, trypanosomes can also be transmitted from mother to child as the parasite can cross the placenta in the blood and infect the baby while it is still in the womb. 3. Contaminated needles can also contribute to the spread of trypanosomes, but this is rare.	
Life cycle 3 Ts 1. Tsetse fly 2. Trypanosoma 3. Trypomastigotes	○ The trypanosome parasite is first introduced into the human/mammalian host as **trypomastigotes** when a tsetse fly takes a blood meal and secretes parasite-filled saliva into the host's skin. ○ Once in the bloodstream, the trypomastigotes multiply in the blood, lymph or spinal fluid. ○ ★★ Trypomastigotes: Infective stage & diagnostic stage (3)	
Pathology Stages & Clinical Picture (4)	Skin stage (**chancre**): Primary infection Occurs at the site of inoculation of trypomastigotes, **chancre** -small ulcer around the bite- which resolve in 2-3 weeks.	
	Systemic Haemato-lymphatic stage: Intermittent fever, headache and generalized lymphadenopathy mainly in the cervical and suboccipital region **(★Winterbottom sign),** anemia	
	CNS stage: (as long as they reach to the CNS, we can diagnose by taking a CSF sample) ○ This stage begins when the trypanosome parasites cross from the blood- brain barrier into the spinal fluid, infecting the CNS including the brain (Meningoencephalitis), result in change in behavior, confusion, poor coordination difficulties with speech and disturbance of sleep (sleeping during day and insomnia at night.) ○ In typical case, there is daytime sleeping, psychological changes, tremors, convulsions and finally coma. without treatment, the disease is invariably fatal. ○ Development of the disease more rapid in Trypanosoma brucei rhodesiense	
Diagnosis Best method is CSF because it is concentrated in the CNS	○ Diagnosis relies on recognition of the trypomastigote in: ‣ Peripheral blood during fever (blood stream) ‣ Sternal bone marrow aspirate ‣ Lymph node aspirates ‣ CSF lumbar puncture. Motile organisms may be visible in the buffy coat ○ Serological testing is also common as IF and ELIZA. ○ Diagnosis of T.b. Gambiense HAT follows a 3 step pathway: screening, diagnostic confirmation & staging. Diagnosis depends on demonstration of trypanosomes in blood, CSF or lymph node aspirates ○ Primary screening, includes serology: 1. CATT (card agglutination test for trypanosomiasis) / T.b. Gambiense 2. RDT (rapid diagnostic test) for T.b. Gambiense 3. CLN (cervical lymph node) palpation and puncture ○ Antigen detection test identification of antibodies that are suitable for antigen protection assays and antigens for use in developing antibody detection tests are running concurrently	





Winterbottom's sign


Chancre


Lymph node aspirate


CSF lumbar puncture

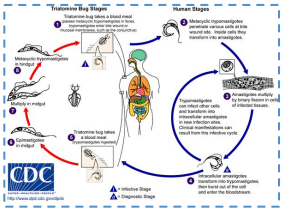
Treatment (according to WHO)

First stage treatment:
- Pentamidine
- Suramin

Second stage treatment:
- Melarsoprol
- Eflornithine
- combination treatment of Nifurtimox and Eflornithine

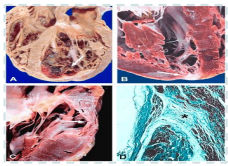
American Trypanosomiasis

American trypanosomiasis (★Chaga's disease★)	
Overview	○ Is a tropical parasitic disease caused by the Trypanosoma cruzi. ○ The human disease occurs in two stages: an acute stage and chronic stage.
Life cycle	○ C-shape Trypomastigotes ○ ★ Vector:kissing bug / Triatomine bug, which feed on blood during the night, and they are called kissing bugs because they prefer to bite humans around the mouth or eyes. ○ Free in bloodstream → Trypomastigotes (★Infective & Diagnostic stages) ○ In the muscle (tissue) → Amastigotes
Pathogenesis (5, 6)	1. The parasites produce focal lymphangitis and oedema at the site of parasites entry (★chagoma) 2. After that parasites (trypomastigote) enter the bloodstream and find their way, mainly on the face near the eyelids, it produces a swelling of the eye & temporal region with conjunctivitis ★(Romana's sign) 3. And also find their way mainly the cardiac muscles cells. The most constant feature of the cardiac disease is cardiomyopathy, which in severe cases can lead to partial or complete heart block which may lead to/and congestive heart failure. 4. Also can infect the gastrointestinal tract and cause megacolon
Male Slides **Symptoms & Signs**	○ In the early stage, symptoms are typically either not present or mild, and may include fever, swollen lymph nodes, headaches, or local swelling and/or redness at the site of the bite (chagoma -cutaneous stage-) ○ The most recognized marker of acute Chagas disease is called Romaña's sign -Ocular lesion-, which includes swelling of the eyelids on the side of the face near the bite wound or where the bug feces were deposited or accidentally rubbed into the eye ○ Other symptoms: Fatigue, body aches, skin rash, Nausea, vomiting, and/or diarrhea, Abdominal discomfort or pain
Complications	○ T. cruzi mainly causes a chronic illness with progressive myocardial damage leading to cardiac arrhythmias, cardiac dilatation cardiomegaly, and also can cause gastrointestinal involvement leading to mega-oesophagus and megacolon. ○ T. cruzi causes acute illness in children, which is followed by chronic manifestations later in life. ○ Intracellular amastigotes destroy the intramural neurons of the autonomic nervous system in the intestine and heart, leading to megaintestine and heart aneurysms ○ If left untreated, Chagas disease can be fatal, in most cases due to heart muscle damage. ○ Heart damage due to American trypanosomiasis: About ⅔ of people with chronic symptoms have cardiac damage, including congestive heart failure and dilated cardiomyopathy, which causes heart rhythm abnormalities and may result in sudden death. Amastigote will be found in the cardiac muscle in autopsy after death
★Diagnosis (7)	○ Microscopical examination of Giemsa–stained blood film, to look for Trypomastigote. diagnostic stage in blood ○ Serology: IFAT (Immunofluorescence Antibody Technique) ○ Xenodiagnosis: feeding bugs on a suspected cases. For researches ○ PCR: used to detect trypomastigotes. Before it was not available  
Male Slides **Treatment**	○ Benznidazole. ○ Nifurtimox.




Romana's sign


Chagoma


Damaged cardiac muscle

Dr Notes

1. Story of the disease: the disease was discovered by americans while transporting slaves from africa, the slaves were transported by ships and stayed for months in them, when they arrived some of them had enlarged neck lymph nodes and began feeling lazy and wanting to sleep and afterwards collapsing and entering commas and dying, americans then decided to check slaves lymph nodes before taking them and not to pick ones with large lymph nodes, and if they discovered them in the middle of sailing they would throw them into the ocean.
2. When you see bugs (ethir they say kissing bug or Triatomine bugs) immediately think of american trypanosoma
3. It's enter the blood and stay free in circulation NOT in macrophages -doesn't spread to another site-, so the infective & diagnostic stage are the same which is Trypomastigotes
4. It's sequence, first is chancre then secondly lymph node enlargement and third CNS involvement
5. when the parasite is in the blood, it will be in the form of Trypomastigote (diagnostic). However, by the time it reaches the heart tissue it becomes Amastigote (Not diagnostic).
6. There are three stages of American trypanosoma's pathology (Chagas disease):
   - First, when Triatomine bug (kissing bug) takes a blood meal from someone, it passes some feces that will penetrate the cells and cause Chagoma (local lymphangitis & edema).
   - Second, it will enter bloodstream and go to its favorite site (eyelids) causing Romana's sign to appear.
   - Lastly, it will go to systemic circulation and find its way to cardiac muscle (it can cause cardiomyopathy, complete heart block, and it can also affect the colon).
7. Amastigote biopsy not used for diagnosis (it's not the diagnostic stage) because usually they don't think about in heart failure and mostly used to confirm the reason of death, في تشريح الجثة بعد الوفاة

Extra

Summary

African Trypanosomiasis (★African Sleeping Disease)	
Pathogen	○ Trypanosoma rhodesiense ○ Trypanosoma gambiense
Life cycle	○ Vector (Transmission) & intermediate host: Infected **Tsetse fly** ○ Definitive host: Human ○ Infective & diagnostic stage: Trypomastigotes
Clinical Picture (3 Stages) 3 Ts 1. Tsetse fly 2. Trypanosoma 3. Trypomastigotes	1. Skin stage (**chancre**): Primary infection at the site of infection -small ulcer around the bite- 2. Systemic Haemato-lymphatic stage: Intermittent fever, headache and generalized lymphadenopathy mainly in the cervical & suboccipital region **(★Winterbottom sign),** anemia 3. CNS stage: result in change in behavior, confusion, poor coordination difficulties with speech and disturbance of sleep
Diagnosis Best method is CSF because it is concentrated in the CNS	○ Diagnosis relies on recognition of the trypomastigote in: ‣ blood stream ‣ Sternal bone marrow aspirate ‣ Lymph node aspirates ‣ CSF lumbar puncture ○ Serological testing is also common as IF and ELIZA.
American Trypanosomiasis (★Chaga's disease)	
Pathogen	Trypanosoma cruzi
Life cycle	○ Vector (Transmission): kissing **bug** / Triatomine **bug** ○ Parasite free in bloodstream in the form of Trypomastigote, but in the tissue it become Amastigote. ○ Infective & diagnostic stage: Trypomastigotes
Clinical Picture	1. ★Chagoma: focal lymphangitis & oedema at the site of parasites entry 2. ★Romana's sign: swelling of the eye & temporal region with conjunctivitis because of trypomastigote 3. Go mainly to the cardiac muscles cells
Complication	Heart damage due to American trypanosomiasis
Diagnosis	○ Microscopical examination of Giemsa–stained blood film, to look for Trypomastigote. ○ Serology: IFAT ○ Xenodiagnosis: feeding bugs on a suspected cases. ○ PCR: used to detect trypomastigotes.

Winterbottom's sign

Chancre

Romana's sign

Chagoma

MCQs

Q1 - What is the vector for african trypanosoma?			
A) Kissing Bugs	B) Tsetse fly	C) Sandfly	D) Mosquitoes
Q2 - What is the skin stage of African trypanosomiasis?			
A) Chaga stage	B) Winterbottom stage	C) Romanna stage	D) Chancre stage
Q3 - Which of the following parasite causes Chaga disease?			
A) Trypanosoma cruzi	B) Trypanosoma brucei	C) Trypanosoma gambiense	D) Winterbottom stage
Q4 - Which one of the following could cause dilated myopathy			
A) african sleeping sickness	B) visceral leishmaniasis	C) chagas disease	D) cutaneous leishmaniasis
Q5 - Lymphadenopathy is a manifestation of an infection of which ONE of the following?			
A) Leishmania tropica	B) Hepatitis A Virus	C) Trypanosoma cruzi	D) Trypanosoma brucei
Q6 - Winterbottom's sign is characteristic of which of the following?			
A) Mucocutaneous Leishmaniasis	B) American trypanosomiasis	C) African trypanosomiasis	D) Visceral Leishmaniasis
Q7 -Which organ is most commonly affected by amastigone in the chronic phase of Chagas disease?			
A) liver	B) kidney	C) heart	D) lungs
Q8 - What is the Best way to Diagnose African trypanosoma?			
A) CSF lumbar puncture	B) RIBA	C) ELISA	D) PCR

SAQ

How is Trypanosoma gambiense transmitted?

Transmitted by the Tsetse fly (Vector)

Answer Key: A1. B A2. D A3. A A4. C A5. D A6. C A7. C A8. A

TEAM 443
MICROBIOLOGY

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