



Parasites of the Urogenital System

In this lecture we will discuss two of the most important parasites infecting the urogenital system, which are:

1. Schistosoma
2. Trichomonas Vaginalis

Schistosoma

-Schistosoma is a parasite that belongs to **trematodes**. The doctor explained the general description of trematodes last year and he said that there are many exceptions regarding its characteristics when it comes to distinguishing schistosoma from other trematodes. I will point them out as we go forward in this sheet.

Remember from last year that trematodes in general are characterized by:

- 1- They are **hermaphrodites** which means that one worm has both male and female reproductive organs
- 2- Their eggs contain **operculum** on one of its edges
- 3- The worms are oval and flattened in shape
- 4- They all need an intermediate host -no exceptions -

-Regarding schistosoma: they are **not hermaphrodites**; instead we have a male worm and a female worm (first exception). In Schistosoma parasite, the female is **rounded** in shape looking like a nematode and the male worm is **elongated** with a groove ventrally where the female worm lies (second exception). The disease caused by schistosoma parasite is called **Belharzia** or **schistosomiasis**.

Schistosoma is also characterized by:

- 1- An Oval opening
- 2- Blind ending Gastrointestinal tract
- 3- They have both ventral and oral suckers
- 4- The surface of the worm is spiny which helps in the attachment of the worms on mucosal surfaces.
- 5- The primary host are **humans** while the intermediate host are **fresh water snails**



- 6- The eggs of schistosoma parasite are also special from other trematodes in that they don't have an operculum at one end instead they have a **spine** (third exception).
- 7- There are three species of schistosoma that are pathogenic to humans, which are: **S.Haematobium** which infects the urogenital system, **S.mansoni** which infects the large intestine and **S.japonicum** which infects the small intestines.

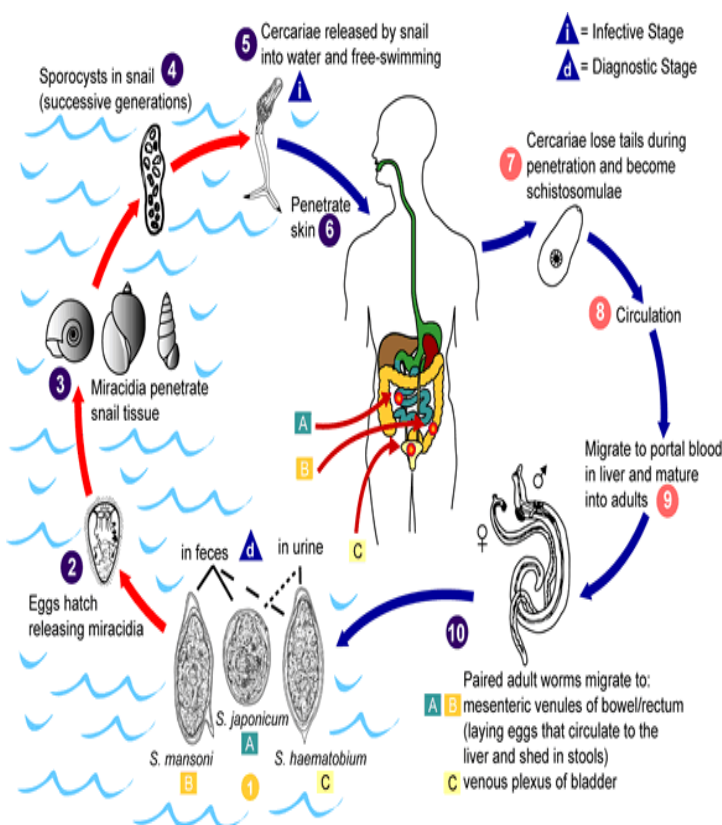
-Here are the eggs of schistosoma species; you can notice the prominent spine in each one of them

-The egg of S.Haematobium has a prominent terminal spine. The egg of S.mansoni has a spine which is lateral; however, S.japonicum has a rounded egg smaller than the other species with a rudimentary spine on the lateral edge.



-The eggs contain an embryo known as **miracidium**. Like the rest of trematodes, this miracidium is ciliated because it has to swim in water to reach the intermediate host and penetrate it by an anterior spine.

Life cycle



- 1- The eggs are released in the feces or the urine of the primary host (human being)
- 2-The eggs reach the water and **miracidium** comes out then it swims by its cilia to the intermediate host, which is fresh water snail
- 3-In the tissue of the snail, the miracidium form a **sporocyst**, this sporocyst will eventually develop into **Cercariae** (shaped like an arrow) which leaves the snail back into the water .
- 4-Cercariae will enter the primary host by **penetrating the skin**



Remember that cercariae of trematodes has a few ways to reach humans: one of these ways is that it becomes encysted in fish or other water organisms; in this case it will be called **metacercariae** not cercariae (this is common in intestinal and liver trematodes). However in schistosoma, it does not undergo this process; instead, it remains as cercariae and enters human through the skin.

5-In the subcutaneous tissue, the cercariae loses its tail and become **Schistosomulae** which will get access into venous blood -> lungs -> arterial blood -> Liver.

6-In the liver, Schistosomulae start maturing to become adult male and female worms in a period of few weeks. These worms will eventually leave the liver to inhabit the **post capillary venules** of the respective organ depending on the schistosoma species.

Note: During this period of schistosomulae maturation in the liver into adult worms, there might be symptoms of malaise, fever, enlargement of the liver and this is known as **Katayama fever**. This fever will actually disappear when adult worms migrate to their respective organs and start producing eggs. [NOTE: Katayama fever is present during the maturation period of schistosomulae ONLY.]

Question: how would the adult worms reach the post capillary venules of their respective organs from the liver?

They appear to migrate **retrogradely** through venous blood of portal vein then superior or inferior mesenteric vein then they get stuck in the post-capillary venules and can't go any further.

-S.mansoni go to the inferior mesenteric vein to infect the large intestines; S.Japonicum go to the superior mesenteric to infect the small intestines; however S.haematobium appear to reach the post capillary venules of the urinary bladder by squeezing themselves in some kind of pelvic anastomosis between the rectal veins and the vesical veins.

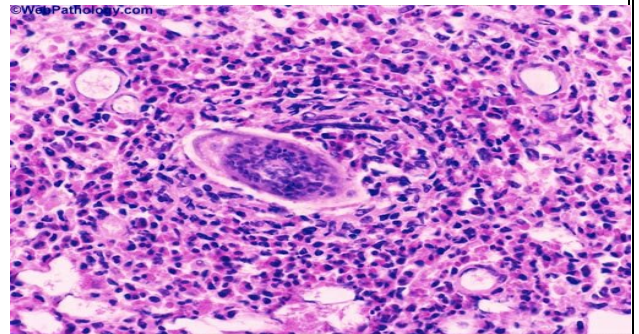
-When schistosoma inhabit the post capillary venules they live for years in these venules without provoking an immune reaction, how? By camouflaging (تمويه) itself. This is done by acquiring self-antigens like ABO blood antigens and HLA-antigens from the host and attaching them on its surface. So, our immune cells will not recognize them as foreign and no immune reaction can happen, but when the



worms die they produce an immune reaction because they can no longer protect themselves from immune cells.

-On the contrary, the **eggs** are antigenic and give rise to an inflammatory process in the post capillary venules and this inflammatory process is actually **granulomatous** in nature. The eggs then penetrate the wall of post-capillary venules and eventually damage and penetrate the wall of the organ of which the species inhabit (GI tract or urinary tract) and get released in urine or feces to eventually reach water and complete the life cycle.

- Here is a microscopic slide of *S.Haematobium* egg in the wall of urinary bladder surrounded by a **granuloma**



Role in diseases

1- Skin

The first reaction to schistosoma infection is an **itchy rash** that results after the cercariae penetrate the skin.

2- Gastrointestinal tract

The involvement of the GI tract occurs with *S.masoni* and *S.japonicum*. These will produce inflammatory lesions in the wall of the respective GI tract segment which causes **abdominal pain and diarrhea with blood in the stool**.

In addition to the attachment of the eggs on post-capillary venules, the eggs can also get swept away by the portal venous blood to the liver and these eggs will evoke an immune reaction around the portal vein in the liver which will eventually lead to **peri-portal fibrosis**. Consequently this fibrosis leads to stagnation and obstruction of portal blood flow through the liver which leads to **portal hypertension**.

Portal hypertension causes shunting of blood at the sites of porto-systemic anastomosis. One of the most important sites is the lower third of the esophagus which leads to the development of **esophageal varices**; this condition is serious because these dilated vessels can rupture and bleed profusely leading to death.



Keep in mind that peri-portal fibrosis DOES NOT lead to liver cirrhosis and the hepatocytes will maintain their normal function however the main complication would be portal hypertension.

3-Cental nervous system

Involvement of the CNS can occur with all three species however it most commonly occur with **Schistosoma Japonicum** presenting with seizures if the brain is involved or flaccid paraplegia if the spinal cord is involved. (Very rare)

Why the schistosoma Japonicum are the highest associated with CNS involvement out of the three species? Due to two reasons:

- 1- The Size of the eggs is very small compared to the eggs of other species so it can pass easily into the blood stream of CNS.
- 2- S.japonicum is highly active in producing huge amount of eggs compared to other species.

4-The urinary system (Important)

Involvement of the urinary system occurs exclusively with **S.Haematobium**, which is characterized by inflammation of the wall of the urinary bladder that consequently leads to **dysuria and hematuria**.

Chronic inflammation of wall of the bladder due to long term schistosomiasis can predispose to **bladder cancer** which is common in endemic areas like Egypt.

In addition to the urinary bladder, other organs can be involved like male or female genital system and the ureter. Involvement of the ureter leads to fibrosis and obstruction of urine flow which leads to **hydronephrosis** (similar to impacted stone) and this can compromise kidney function. [NOTE: Hydronephrosis is characterized by dilation of the renal pelvis and ureter].

Note: portal hypertension can occur with S.Haematobium but this is rare because its eggs are swept away to the systemic venous circulation rather than portal circulation.

5- Cardiopulmonary system:

Involvement of the heart and lungs occurs with **S.Haematobium**, how?

The eggs of S.haematobium DO NOT get swept into the portal circulation instead get swept in the systemic venous blood ->Right atrium ->Lungs. In the lungs, these eggs evoke an inflammatory reaction that eventually progresses to fibrosis and as you know fibrosis of the lungs leads to **pulmonary hypertension**.

Pulmonary hypertension increases the load on the right side of the heart which leads to right side heart failure, a condition called **Cor pulmonale**.

Diagnosis

Diagnosis is done by looking for the eggs in feces or urine and as we said before the shape of the eggs is really distinctive for each species (written in page 2)

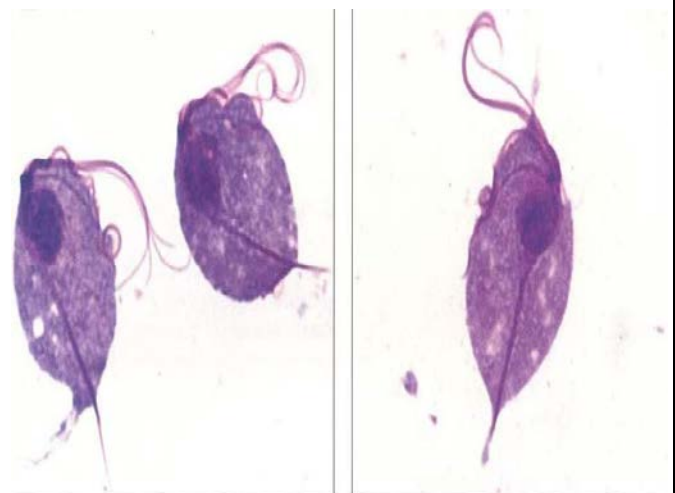
Epidemiology

Belharzia is not common in Jordan; however, it is very common in Egypt, northern Iraq, Yaman, and southeast Asia (and that's where japonicum naming came from). These areas will have high incidence of bladder cancer.

Trichomonas Vaginalis

It is a **flagellated protozoa** characterized by:

- 1- Has **four** anterior flagella and **one** posterior flagella
- 2- On the side of its body there is an **undulating membrane**.
- 3- Very high level of motility due to the presence of two structures that help in locomotion which are flagella and undulating membrane.





-It can be found in the vagina of females as the name implies, and it can also be found in the urethra or the prostate of males. The presence of the microorganism produces an inflammatory reaction that is **symptomatic in females** and they complain of itching around the opening of the vagina along with a "frothy" greenish-grayish vaginal discharge.

-Trichomonas infection actually remains localized and does not go up the urogenital tract and produce complications in the uterus like gonorrhoea or other STD; however, it causes disturbances in the normal flora of the vagina - especially lactobacillus - increasing the predisposition to vaginal candidiasis.

Transmission:

Trichomonas vaginalis is commonly transmitted **directly** by sexual contact between male and females so it's an STD.

Remember that in order for protozoa to be transmitted in general it needs to form **cysts** (like amoeba, giardia and balantidium) **however trichomonas vaginalis is special in that it does not lay cysts because of two reasons:**

- 1- Because the transmission is direct through sexual intercourse
- 2- Because the trophozoite itself can actually survive outside the body for 1-2 days unlike the trophozoite of other protozoa which die as soon as they leave to the environment

Note: Because the trophozoite can survive outside the genitals, infections can be transmitted mechanically by sharing towels or underwears and not necessarily by sexual intercourse .

-trichomonas vaginalis infection in males is very mild and sometimes asymptomatic and this is problematic because it can lead to spread of the disease.

Diagnosis:

- 1- Female: Examination of vaginal or urethral discharge on light microscope and you can see the trophozoite because they are highly motile
- 2- Male: Massage the prostate gland to get discharge and examine it. You examine this discharge on a light-microscope slide.



Treatment:

Treated by **flagyl** or **metronidazole** .

The End

هاي الشيت بتعمل التهابات وقعدت اربعمستشهر وأنا بكتب فيها

Dedication to Abdulrahman Al-Khasawneh