

Schistosomiasis

Lecture objectives:

- know the global distribution of schistosomiasis
- describe the life cycle of schistosomiasis
- compare relation between chronic schistosomiasis and portal hypertension
- know pathology, diagnosis and treatment of schistosomiasis
- know life cycle of Fasciola hepatica
- know pathology , diagnosis and treatment of Fasciola hepatica
- compare between true infection and sheep liver infected with Fasciola hepatica which lead to false infection

Color index:

- Important
- Doctors' note
- Extra
- Found in Girls' slides
- Found in Boys' slides

Schistosoma

Classification of parasites

Protozoa

Unicellular, a single cell for all functions.

- Amoebae: moves by pseudopodia
- Flagellates: moves by flagella
- Ciliates: moves by cilia
- Apicomplexa (Sporozoa): tissue parasites

Helminths

Multicellular, specialized cells.

- Round worms (nematodes):
 - Elongated, cylindrical, unsegmented
- Flat worms:
 - Trematodes: leaf like, unsegmented
 - Cestode: tape-like, segmented

● Introduction:

- Schistosoma is a genus of **trematodes**, commonly known as blood-flukes, which are parasitic flatworms responsible for a highly significant group of infections in humans termed **schistosomiasis**.
- Schistosomiasis is considered by the WHO as the second most socioeconomically devastating parasitic disease (after malaria), with hundreds of millions infected worldwide.

Adult flatworms parasitize **blood capillaries** of either 1 or 2 depending on the infecting species

1. **Mesenteries (Schistosoma mansoni)**
2. **plexus of the bladder (Schistosoma haematobium)**

● Pathogenesis (Simplified)

Cercaria is the infective stage

- Cercaria emerge from **snail** in the water & **penetrate the skin** of the human.
- Cercaria is transformed into a schistosomulae inside the host tissues.

The **schistosomulae** first enters the systemic circulation then finds its way into:

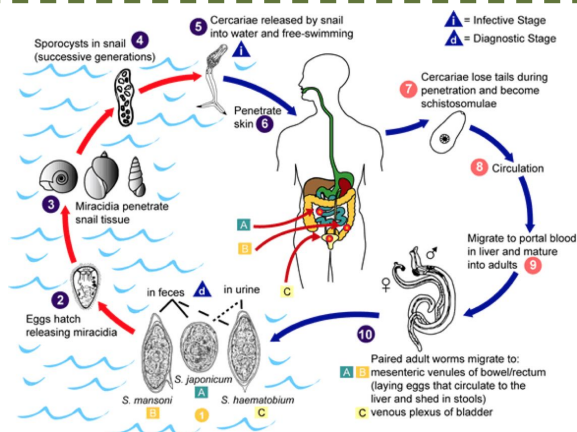
1. **Portal circulation (S. mansoni & S. japonicum)** worms mature in the mesenteric veins of the **portal circulation**
2. **S. haematobium** worms generally remain in the systemic circulation & mature in the blood vessels of the **vesical & venous plexus**.

The egg is the diagnostic stage :

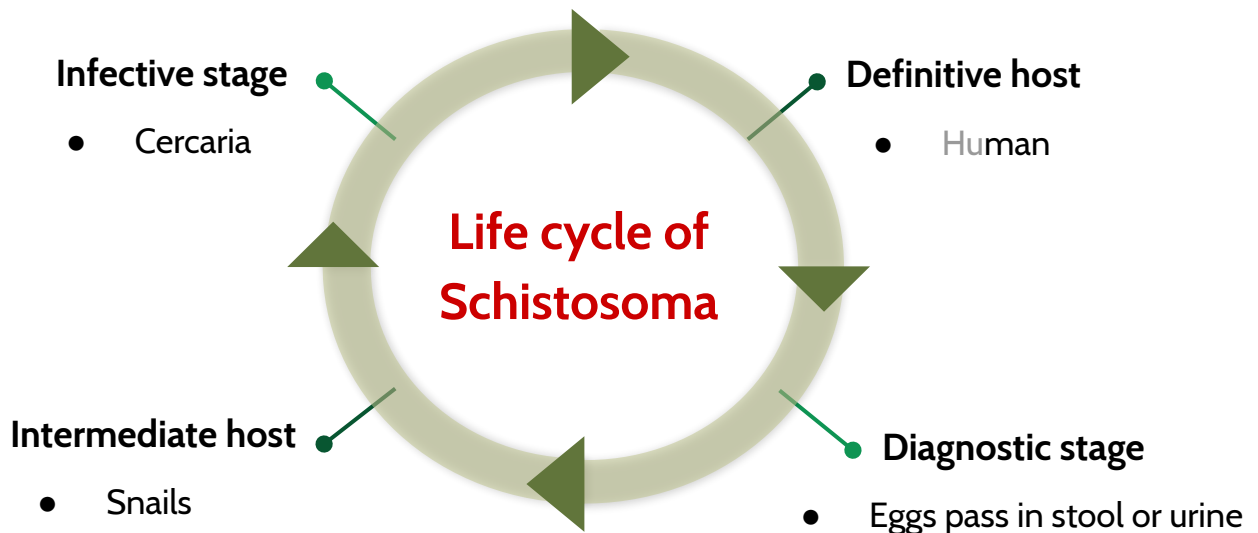
- eggs of S. mansoni & S. japonicum are passed mainly in stool
- eggs of S. haematobium passed mainly in the urine.

Human is the **DEFINITIVE HOST** .

SNAILS is the **INTERMEDIATE HOST**.



Schistosomiasis



• Pathogenesis (Extended)

After the **eggs** of the human-infected with **S.mansoni & S.japonicum** are passed in the **feces** into the water Or the **eggs are passed during micturition from host infected with S.haematobium**.

The miracidium hatches out of the egg and searches for a suitable freshwater **snail** to act as an **intermediate host**. In the snail the miracidium develops to **cercaria**. From a single miracidium result a few thousand cercaria, every one of which is capable of infecting a human

Cercaria emerge from **snail** in the water during daylight actively seeking out their final host, they then **penetrate the skin** of the human. The cercaria is transformed into a schistosomula inside the host tissue.

Each schistosomule spends a few days in the skin and then enters the systemic circulation starting at the dermal lymphatics and venules, they feed on blood.

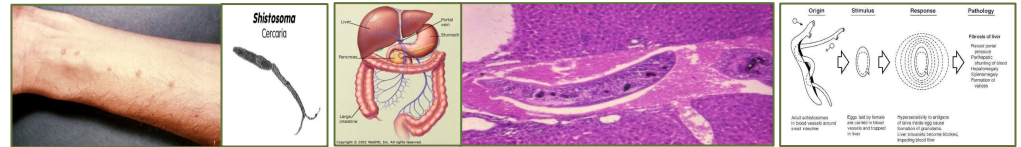
The schistosomule migrates to the lung and then moves via circulation through the left side of the heart then it develops into a sexually mature adult and the pair migrate to the **mesenteric portal circulation veins (S.mansoni & S.japonicum)** or to **urinary bladder veins (S.haematobium)**.

The female fluke (**S.haematobium**) generally remain in the systemic circulation and **mature** in the blood vessels of the **vesical plexus** & lays as many as 30 eggs per day which **migrate to the lumen of the urinary bladder and ureters**

Each female of (**S.mansoni & S.japonicum**) worms **mature** in the **mesenteric veins of the portal circulation** & lay 300 eggs a day the eggs move into the **lumen of the host's intestines** and are released into the environment with the **feces**.

Schistosomiasis

Pathology



Schistosome dermatitis, or "swimmers itch" occurs when skin is penetrated by a free-swimming, fork-tailed infective cercaria.

The dermatitis often develops **24 hours** after exposure and last for 2 to 3 days and then **spontaneously disappears**.

EGG is the main cause of pathology in schistosomiasis. Many eggs become stranded in the **tissues** or are carried by the bloodstream to other organs mainly the **LIVER**.

The host reaction to the eggs may vary from small **granulomas** to extensive fibrosis

The extent of damage is generally related to the number of eggs present in the tissues.

Developing Schistosome in liver:

S. mansoni & *S. japonicum* located mainly in **mesenteric vein** and its branches, the worm discharges **EGGS**, the eggs travel in 2 directions:

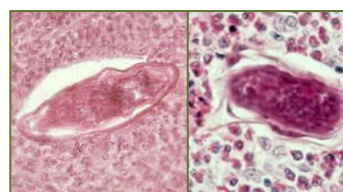
1- some eggs find their way into the **lumen of the bowel** and appear in the feces.

2- other flow with blood stream in the **portal circulation** and enter the **LIVER**.

Most of these eggs are trapped in the liver and give rise to pathology as ,fibrosis of the liver caused from eggs settled in the liver may produce **portal hypertension¹**, which may lead to **hepatomegaly, splenomegaly, esophageal varices**, hemorrhoids and **ascites**.

● Pathogenicity of Schistosomiasis:

1. **Cercarial dermatitis:** at the site of entry of cercaria.
2. **Toxic Metabolites:** liberated during the growth of schistosomulae in the circulation veins, may cause anaphylactic reaction, fever, urticarial rashes and eosinophilia.
3. **Terminal spined eggs :** may erode blood vessels and cause hemorrhages. Schistosome eggs, deposited in the tissues, act as foreign protein, cause irritation leading to cell infiltration and connective tissue hyperplasia, egg granuloma around each egg (cell mediated immunity).
4. **Chronic schistosomiasis** could cause:
 - a. Portal hypertension.
 - b. Hepatomegaly & Splenomegaly with ascites.



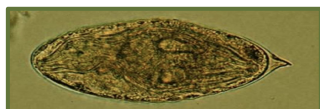
Eggs of *Schistosoma mansoni* in the liver and cellular reaction



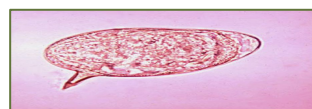
Eggs of *Schistosoma mansoni* with lateral spine

Schistosomiasis

| | Schistosoma haematobium | Schistosoma mansoni |
|--|---|--|
| Pathology | | |
| Causes | Urinary Schistosomiasis | Intestinal Schistosomiasis |
| Location | Vesical Venous plexus surrounding the urinary bladder. | Mesenteric portal circulation veins |
| Prepatent period | 10-12 weeks | 5-7 weeks |
| Egg deposition and extrusion | <ul style="list-style-type: none"> ● Painless hematuria. ● Inflammation of bladder and burning micturation. ● CNS involvement (rare). ● Eggs are trapped in the wall of the bladder where they may give rise to calcification and granuloma formation. | <ul style="list-style-type: none"> ● Dysentery (blood and mucus in stools). ● Hepato/splenomegaly. ● CNS involvement (rare). |
| Tissue proliferation and repair | <ul style="list-style-type: none"> ● Periportal fibrosis. ● Papillomata in the bladder and lower ureter (leading to obstructive uropathy). ● Constriction of the ureter may produce hydronephrosis and cancer of the bladder. ● Lung and CNS involvement. | <ul style="list-style-type: none"> ● Periportal fibrosis. ● Papillomata in the intestine. ● Lung and CNS involvement. |
| Diagnosis & Treatment | | |
| Microscopy | Examination of urine → Eggs with terminal spine | Examination of stools → Eggs with lateral spine |
| Immunology | Serology tests CFT, ELISA | |
| Indirect | <ul style="list-style-type: none"> ● Radiology ● Cystoscopy | <ul style="list-style-type: none"> ● Radiology ● Endoscopy |
| Intradermal test | With cercarial antigen cause allergic reaction. | |
| Treatment | Praziquantel | |



Egg of *S. haematobium*



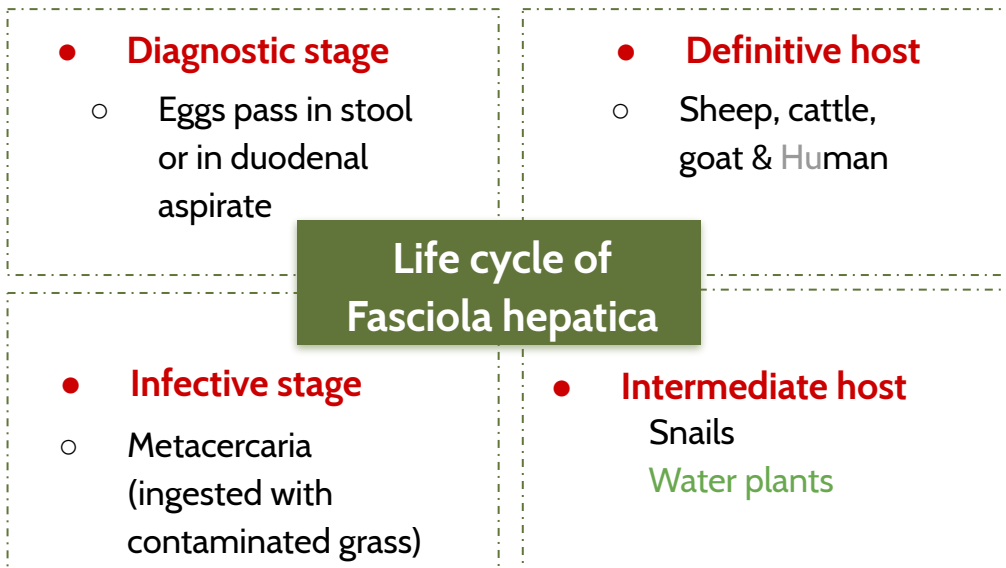
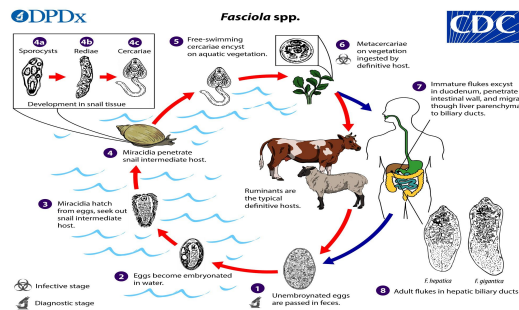
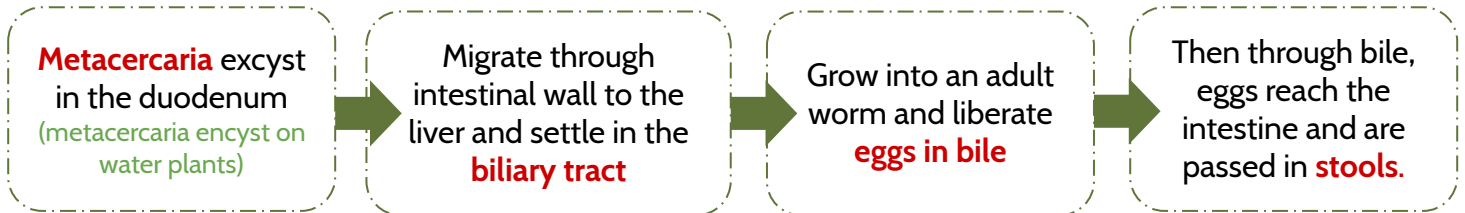
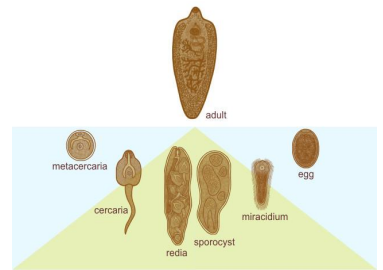
Egg of *S. mansoni*

Fasciola Hepatica

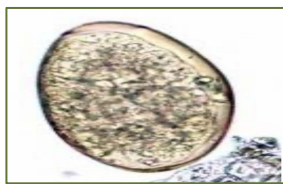
- Transmission¹:**

Ingestion of raw, fresh-water vegetation contaminated with metacercaria.

- Pathogenesis:**



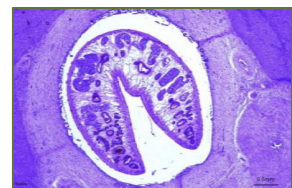
Fasciola hepatica worm in the definitive host



Egg of Fasciola hepatica can be seen in true patient's stool or in false infection.



Snail intermediate host of: Fasciola hepatica

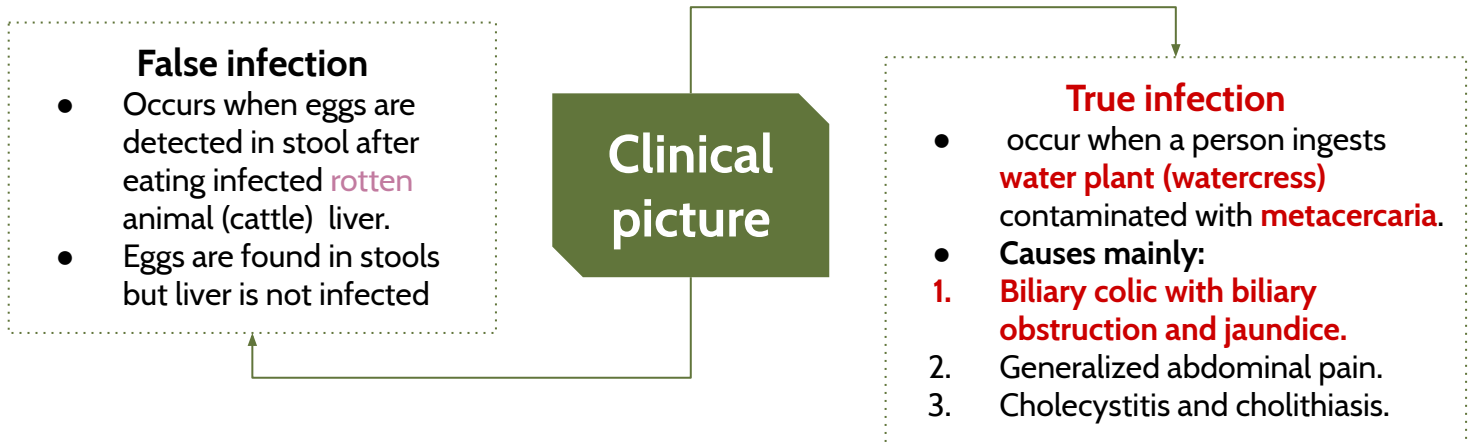


Fasciola hepatica in bile duct

¹- fecal-oral route NOT through the skin

Fasciola Hepatica

● Clinical picture:



● Diagnosis

1. **Eggs in stools or duodenal aspirate**
2. Serological test: CFT and skin test.

● Treatment NOT IMP

- **Triclabendazole**
(drug of choice to treat fascioliasis)
Dosage is calculated based on person's weight (10mg/kg) tablets are given at one time

THE END ... 

MCQ:

Q1:B , Q2:C , Q3:D

Q1: Four weeks after his arrival from Egypt, a 24-year-old graduate student presents with blood in his urine. Microscopic examination of his urine reveals the presence of eggs with terminal spines. In the interview he admits that he has been working on his family's rice field occasionally since his early childhood. The most likely etiologic agent of his complaint is:

- A- Fasciolopsis buski
- B- Schistosoma haematobium
- C- Schistosoma japonicum
- D- Schistosoma mansoni

Q2: A medical student presents to an infectious disease specialist complaining of abdominal distention and tenderness. The patient reports no recent changes in normal bowel habits. Physical examination shows hepatosplenomegaly. Bowel sounds are normal. On questioning, the patient reports that he traveled to Brazil several months ago to study tribal medical practices. He frequently went swimming in the Amazon River to wash himself. Several weeks after returning from his trip, he recalls having fever, diarrhea, weight loss, and "funny looking" stools. Which of the following conditions is most likely responsible for this patient's present symptoms?

- A- Bowel obstruction
- B- Enterocolitis
- C- Portal hypertension
- D- Ruptured viscus

Q3: Which of the following organisms penetrates skin, is endemic in Africa and Latin America, and has a large lateral spine on eggs?

- A- Paragonimus
- B- Schistosoma haematobium
- C- Schistosoma japonicum
- D- Schistosoma mansoni

SAQ:

Case: A 21-year-old college student presents to the clinic with fever, hives, headache, weight loss, and cough. On review of systems, she reports doing field research in Egypt over the summer. She recalls an intense itching sensation while collecting samples in a river. Physical examination reveals lymphadenopathy and hepatosplenomegaly.

Q1: What's the most likely diagnosis?

Schistosomiasis due to one of the 3 main flukes which are Schistosoma haematobium, Schistosoma japonicum, Schistosoma mansoni.

Q2: What's the intermediate and definitive host for this case?

Intermediate: Snails
Definitive: Human

Q3: In which human organs are the organisms found?

Schistosoma japonicum, Schistosoma mansoni reside in intestine, where organisms mate in the mesenteric veins and release eggs into the feces as well as the portal circulation, Schistosoma haematobium resides in the bladder, where organisms mate in the vesicular (Bladder) veins and release eggs into the urine.

Q4: What's the appropriate treatment?

Praziquantel is the treatment of choice

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