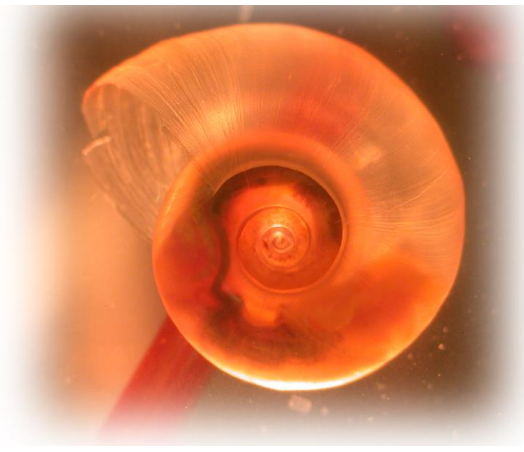
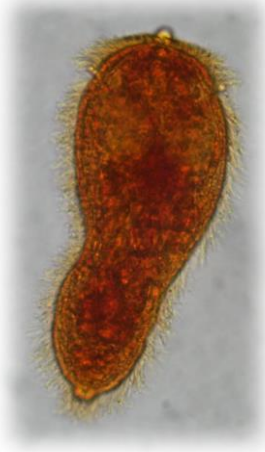


Schistosomiasis/ Bilharziasis



Dr. Nayana Gunathilaka
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Classification

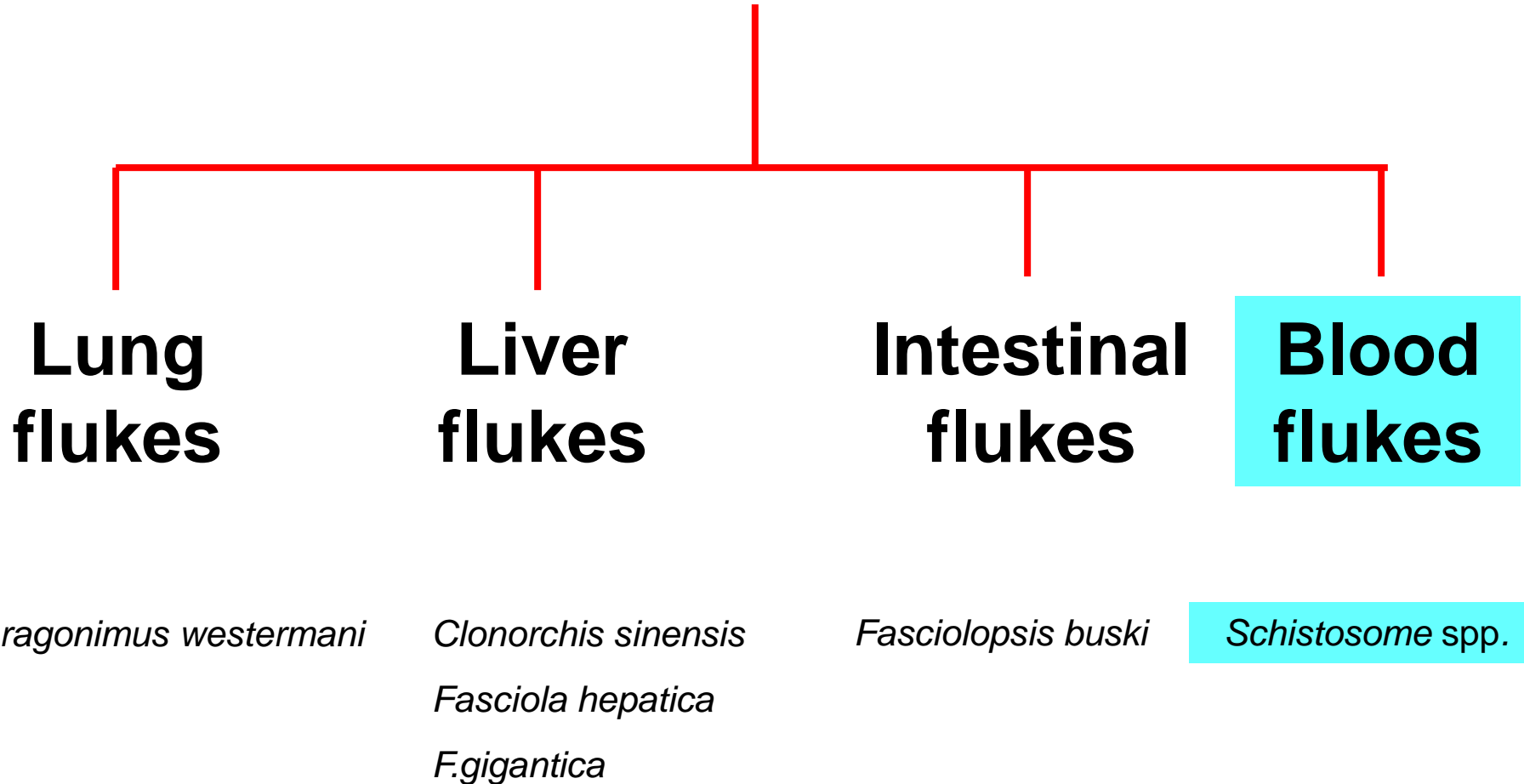
Phylum Platyhelminthes



Turbellaria **Trematoda** **Cestoda** **Monogeneans**

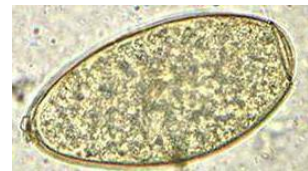
- Bilateral symmetry.
- Acoelomate.
- Triploblastic.
- Incomplete digestive tract.
- Presence of tegument

Trematodes can be classified according to site of infection



Features of trematodes

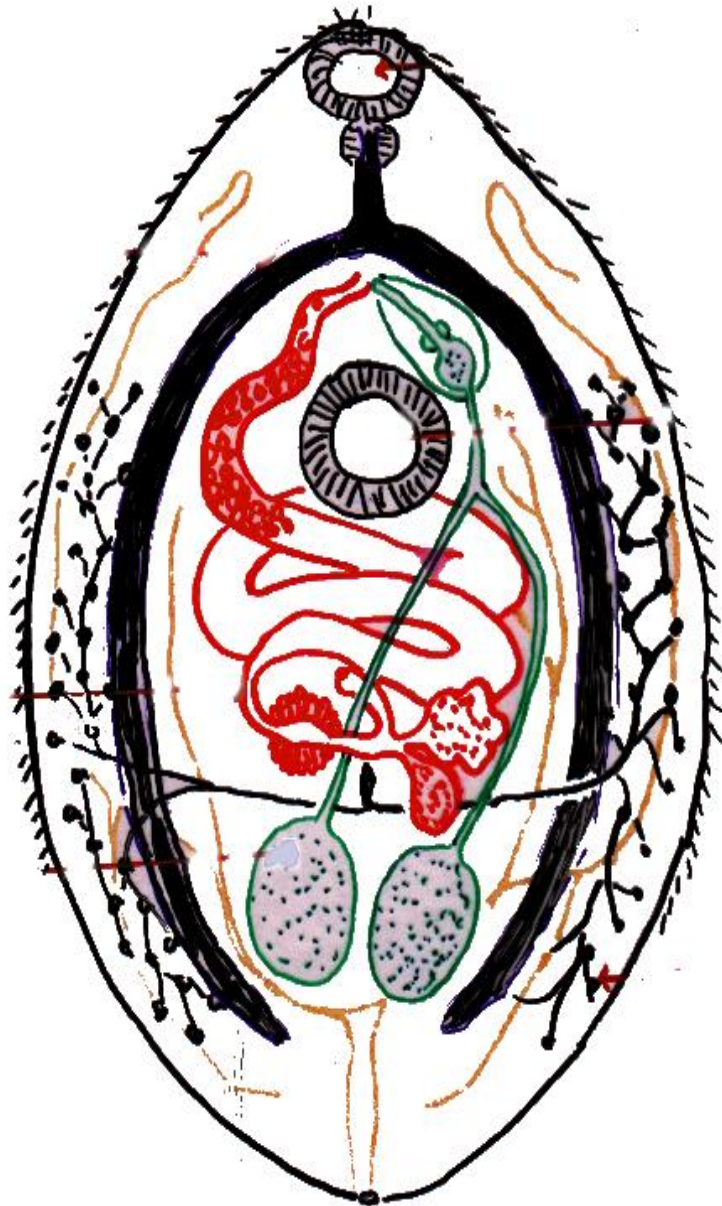
- Unsegmented.
- Dorso-ventrally flattened.
- Leaf-shaped.
- Bear 2 suckers oral and ventral sucker act as organs of attachment.
- Possess both male & female reproductive organs, no separate sexes.
- Incomplete digestive tract, no anus.
- Oviparous, **lay operculated eggs.**
- Two intermediate hosts **except blood flukes.**
- Metacercaria is the infective stage...
- **Hermaphroditic**



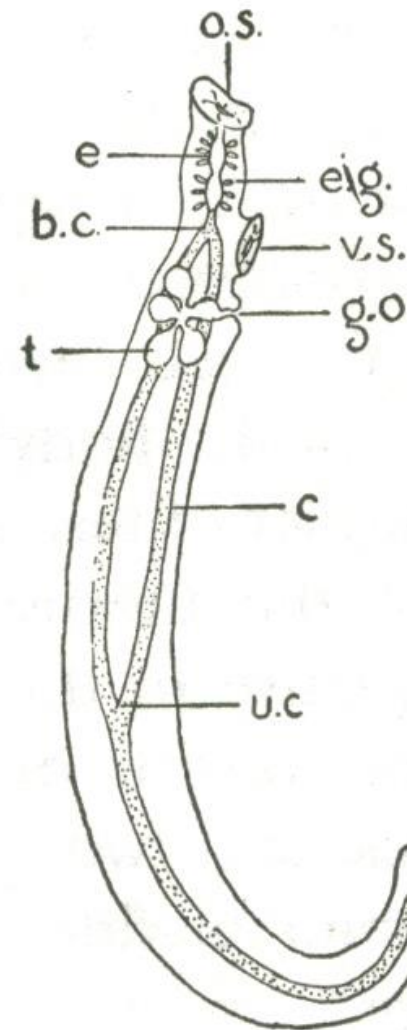
How to separate Schistosomes from other trematodes ?

- Narrow, elongated shape.
- Intestinal caeca reunite to form a single blind canal.
- Have separate sexes – NOT hermaphroditic.
- Cercariae have forked tails – infective stage.
- Produce non-operculated eggs.
- One intermediate host.
- No redia stage in larval development.
- No encysted metacercarial stage.

Other trematodes



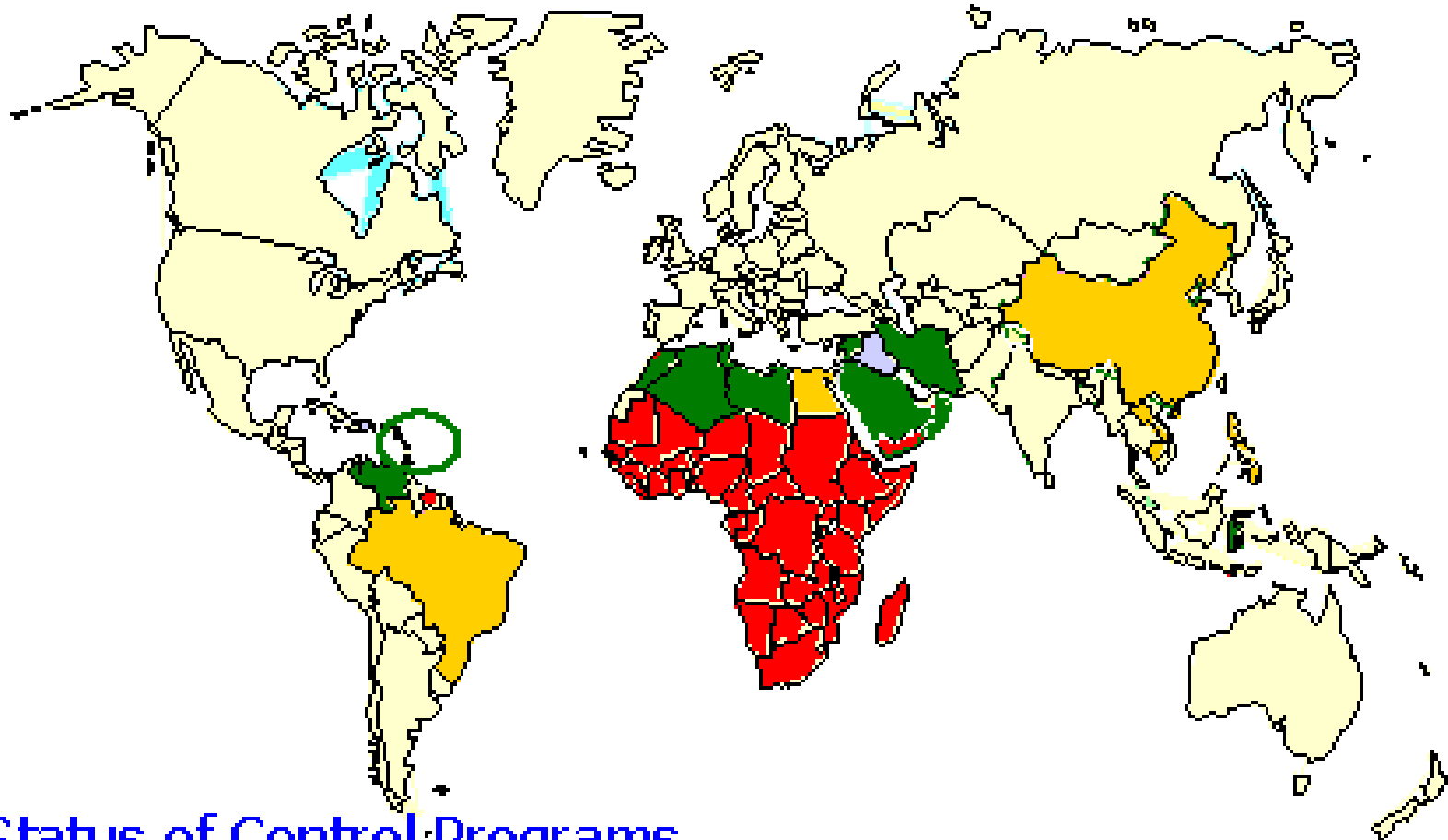
Schistosomes



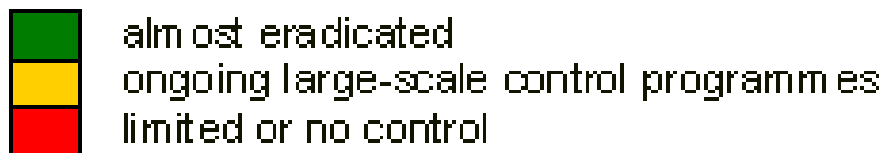
Why this is medically important ?

- Schistosomiasis is second only to malaria in human impact among tropical diseases.
- Endemic in 74 developing tropical countries.
- It affects almost 240 million people worldwide, and more than 700 M people live in endemic areas.
- The infection is prevalent in tropical and sub-tropical areas, in poor communities without potable water and adequate sanitation.

Global distribution



Status of Control Programs



Source: WHO

Schistosomiasis in Sri Lanka

- First reported in 1986.
- Imported by Sri Lankan who had been in west Africa.
- No local transmission.

Species of Human Schistosomes

Habitat

Distribution

Schistosoma mansoni

Mesenteric veins
Drain from LI

Egypt, Africa
S. America

S. haematobium

Vesical &
pelvic plexus

Egypt, Africa

S. japonicum

Mesenteric veins
Drain from SI

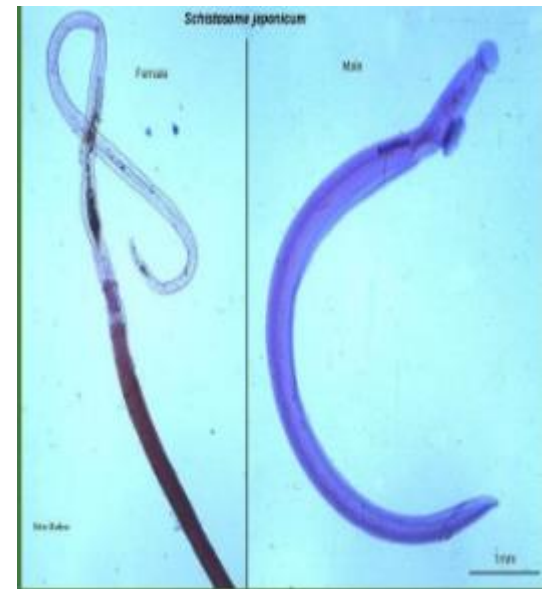
South East
Asia

Intestinal Schistosomiasis

Schistosoma mansoni (much commoner)



Schistosoma japonicum



- Leads to cirrhosis of the liver.

Urinary Schistosomiasis

Schistosoma haematobium



Worst complication - bladder cancer

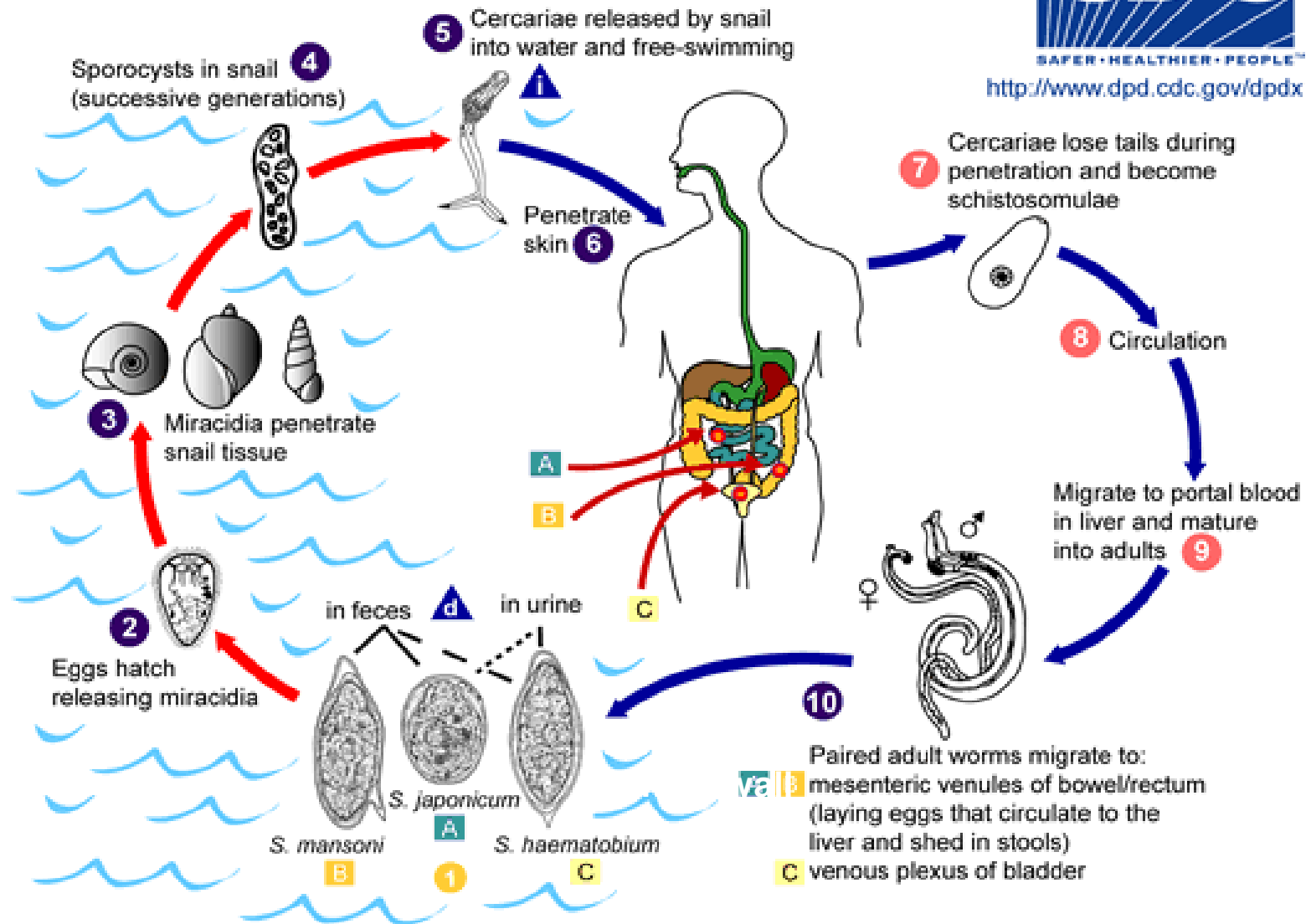
Life cycle

i = Infective Stage

d = Diagnostic Stage

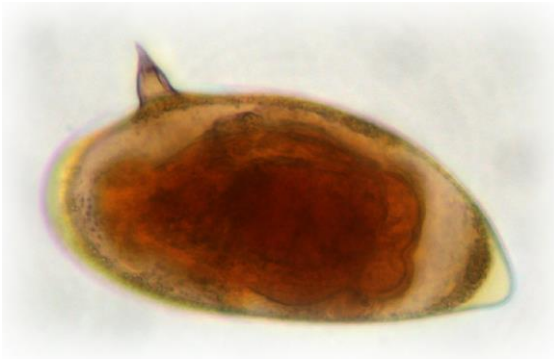


<http://www.dpd.cdc.gov/dpdx>



Eggs

- Non operculated.
- Pass through faeces or urine
(Depending on the habitat).



Miracidium

- Hatches from the egg in slightly alkaline clean water with a temperature between 25 – 31 °C.
- Free swimming ciliated embryo liberated from the egg.
- **Photactic** (Capable of a chemical or physical change in response to illumination.)
- Infect snail.



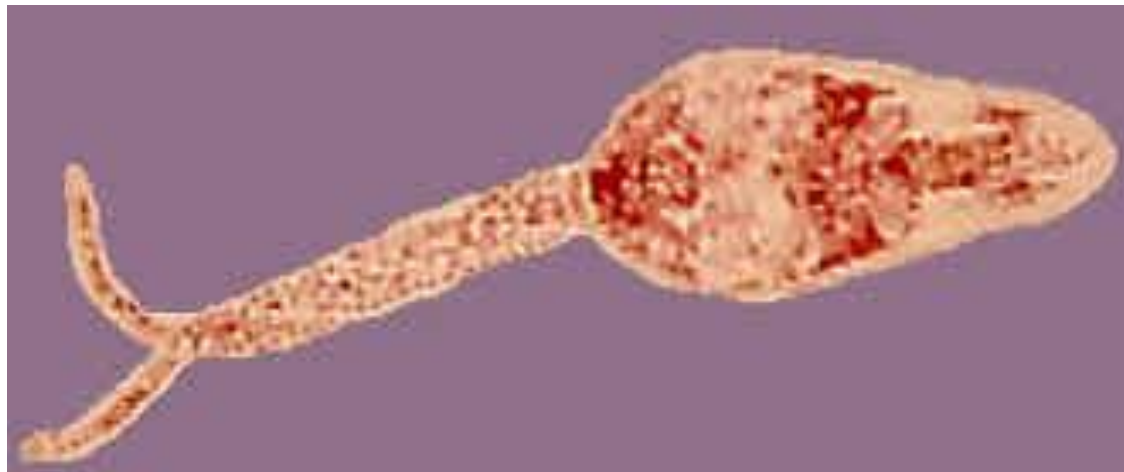
Sporocysts

- Inside the snail intermediate host, it developed to a “sac-like sporocyst.”
- This gets burst and invade a new tissue in the snail.
- They develop into **secondary sporocyst**.
- Sporocysts then develop into **Cercariae** which escape from snail into water.



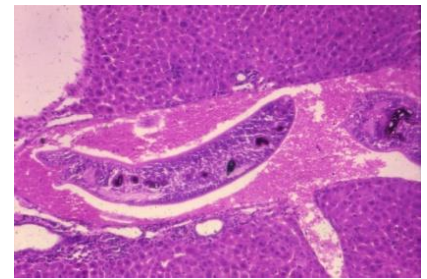
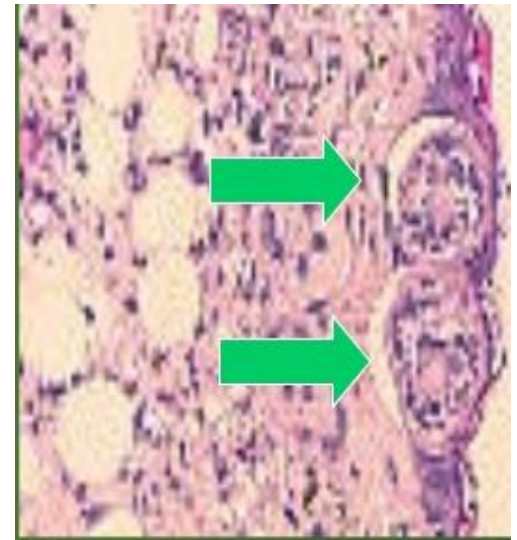
Cercaria

- Emerge from sporocysts.
- Escapes from the snail into water.
- Has a body and a forked tail.
- Infect man by skin penetration.



Schistosomulae

- Develops from cercaria after skin penetration.
- Enter to a blood vessel and carry in the blood stream, first in the lungs (Lung capillaries).
- Leave from the pulmonary vein and pass by the left side of the heart to liver.
- Develop to adult stages.



Developing schistosome in liver

- In the liver sexual reproduction happens.
- Paired flukes migrate through the portal vein to mesenteric vein and egg laying begins.
- The eggs ultimately penetrate the wall of the vein and the wall of the **colon** or **bladder**.
- The eggs laid by the female find their way into the **feces** (*S. mansoni*, *S. japonicum*) or **urine** (*S. haematobium*).

Adult stage

Males:

- Shorter & broader – larger than the female
- Body folded/Groove → **Gynaephoral canal**
- Upside down U- shape in cross section
- Well developed oral & ventral suckers



Females:

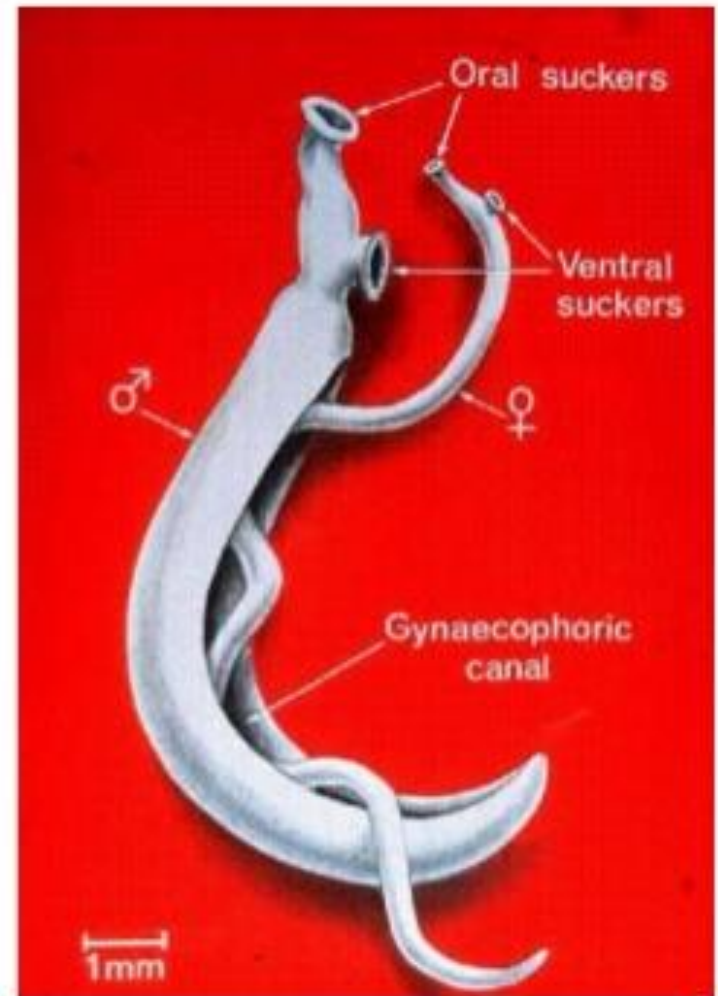
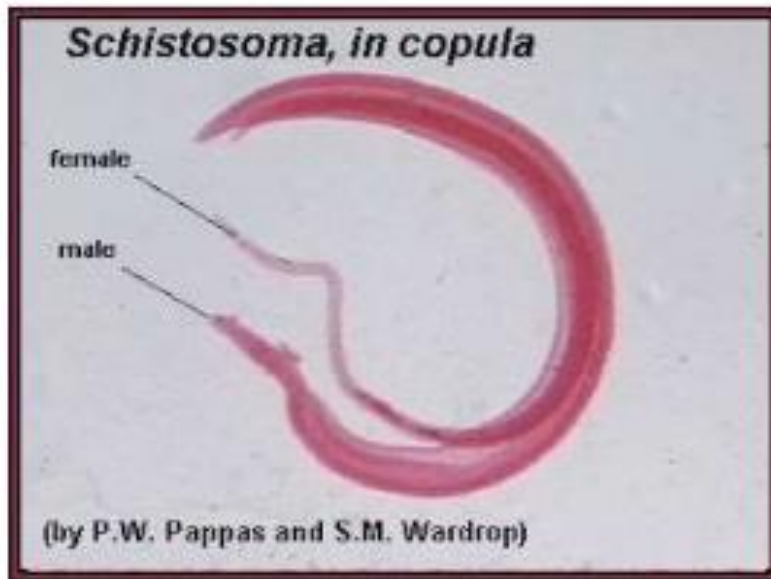
- Longer & thinner
- Cylindrical in cross section
- Poorly developed oral & ventral suckers



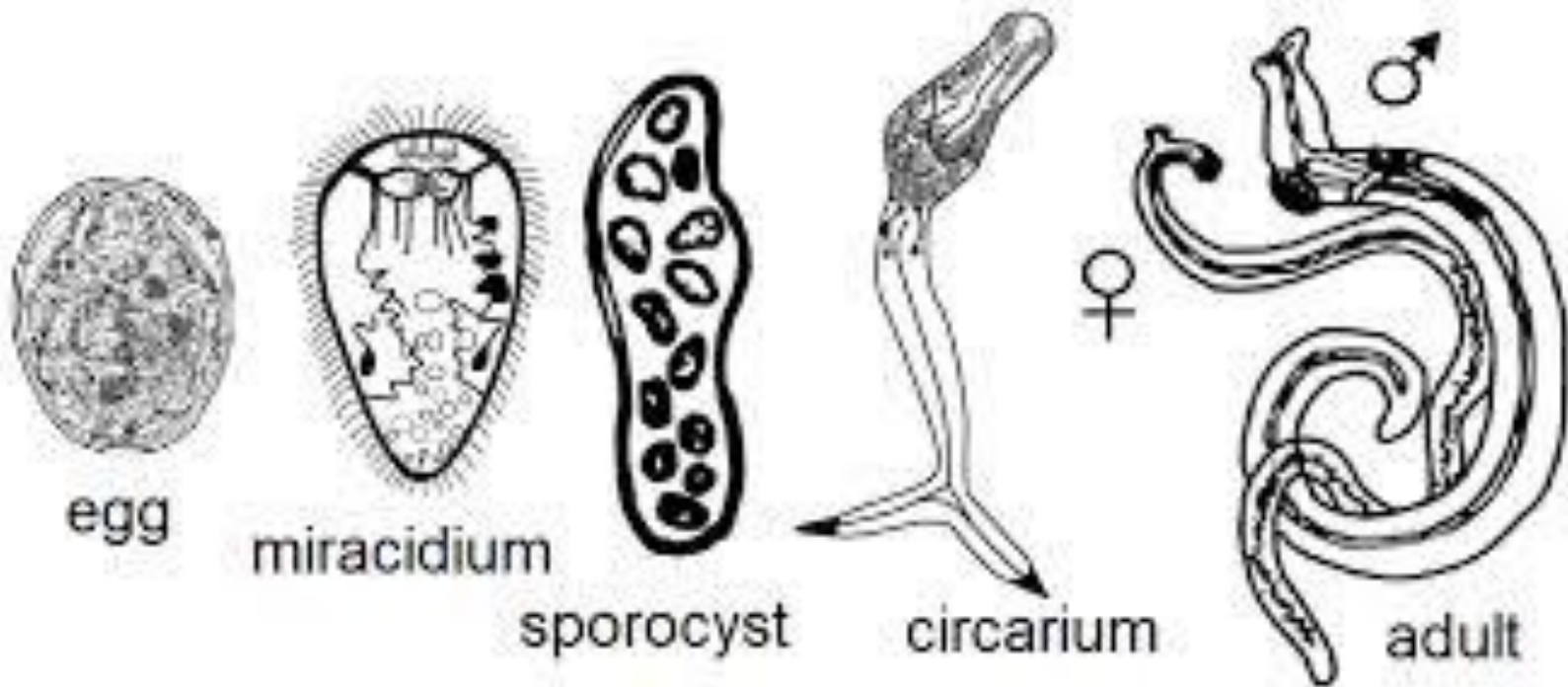
Life span – 3-10 yrs (up to 30 yrs)

male:

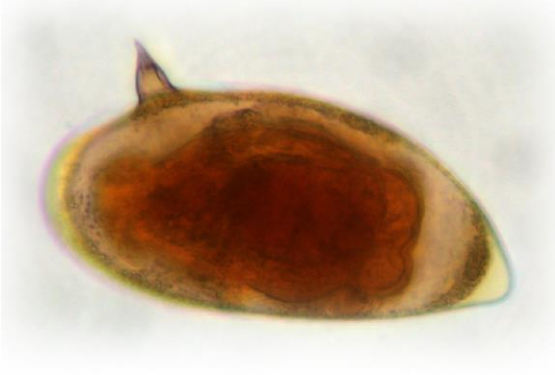
-also has a
gynecophoral canal
where the longer
and more slender
female is held.



Summary



How to distinguish these 3 species.



***S. mansoni* - lateral spine**



***S. haematobium* - apical (terminal) spine**



***S. japonicum* - ovoid eggs with knob**

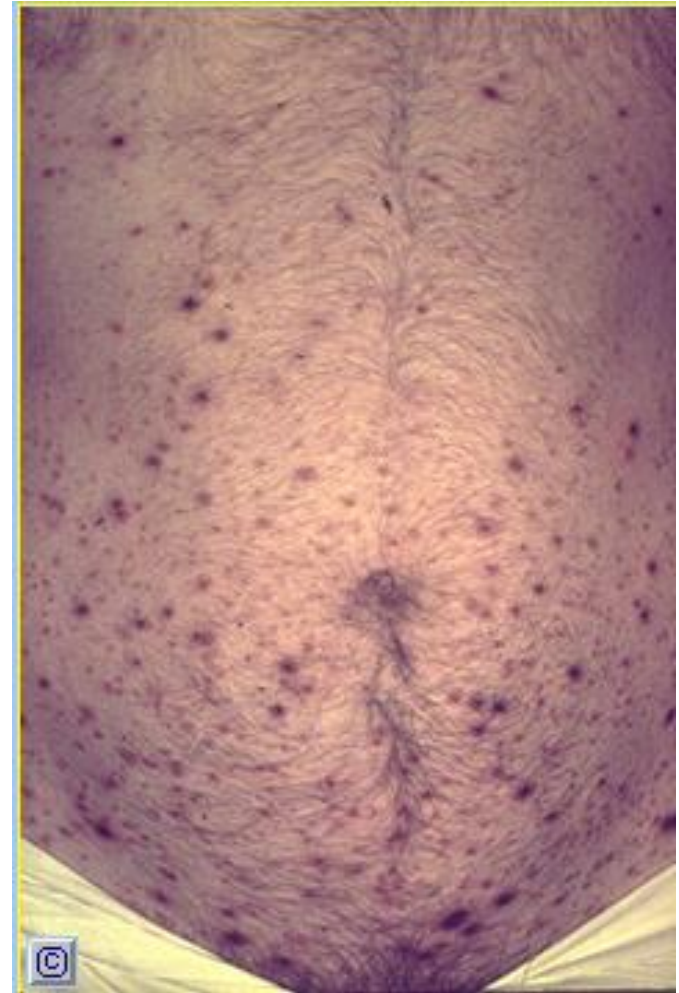
Stage specific pathology

1. Cercarial invasion
2. Maturation of adult worms
3. The period of active oviposition
4. Late stage (Terminal)

Immunologically mediated progressive tissue
response to eggs

1. Cercarial invasion

- Cercarial invasion of skin on exposure to infested water can occur in less than 15 min.
- Cercarial dermatitis.
(swimmer's itch) last for 24-48 hrs



Picture: A skin rash on the trunk of a patient. It was caused by the penetration of *Schistosoma cercariae* while he was bathing. Severe dermatitis such as this is usually caused by nonhuman species of schistosome.



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

2. Maturation of adult worms

maturation, pairing and commencement
of egg laying)

- Starts 2 to 3 weeks after invasion & extend to egg laying stage.
- Causes toxaemic schistosomiasis or “**Katayama syndrome**” in this period.

Symptoms

Fever with chills, cough, arthralgia, urticaria, eosinophilia- abdominal pain, diarrhoea

No eggs in faeces

3. Active oviposition (established infection)

- Systemic signs of Acute schistosomiasis subside

“Classical” clinical signs and symptoms of schistosomiasis

- Intestinal schistosomiasis- intermittent abdominal pain & diarrhoea
- Vesical schistosomiasis-periodic haematuria, urgency and painful urination

Acute Schistosomiasis

- Clinical manifestations come out after 4 to 8 weeks of infection, similar to the time from egg to adult worm (40 days).
- Schistosome dermatitis
- **Fever:** intermittent, maintain weeks to months
- **Allergic reaction:** urticaria, angioneuroedema, enlargement of lymph nodes and eosinophilia
- **Digestive syndromes:** abdominal pain, diarrhea with pus and blood, constipation or diarrhea.
- **Urinary syndromes:**

Urinary schistosomiasis

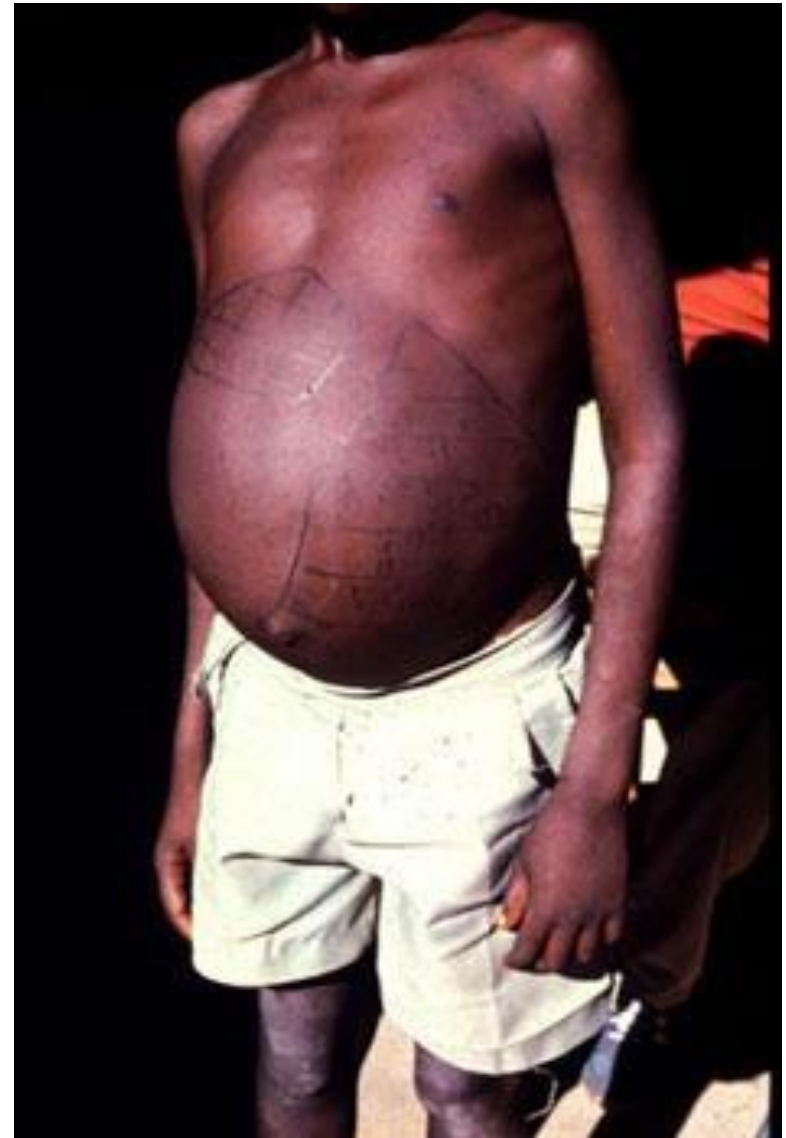
- Many patients will have minimal symptoms
- Recurrent painless haematuria – cardinal complaint
- Bladder involvement leads to
 - Urgency,
 - Dribbling or incontinence
- In Africa, haematuria regarded as sign of puberty in males

Intestinal schistosomiasis

- Eggs migrate through wall of large intestine.
- Granuloma formation leads to intestinal polyps.
- Eggs carried in portal circulation lodge in liver.
- Granuloma formation in liver.
- Ultimately turn into cirrhosis.
- Chronic or intermittent diarrhoea.
- Blood in stools.
- Abdominal discomfort or pain.
- Weight loss.

4. Late stage

- Hepatosplenic Schistosomiasis occurs primarily by *S. mansoni* and *S. japonicum* infections.
- Clinical features are:
 - Hepatosplenomegaly
 - Ascites.
 - Prominent collateral vessels
 - Oesophageal varices
 - Haematemesis.



Hepatosplenomegaly in chronic schistosomiasis

Diagnosis

- **Stool examination techniques**

- Merthiolate-Iodine Formlin Concentration Technique (MIFC)

Sensitive for moderate and heavy infections

Not adequate for light infections (less than 10 eggs/gram of stool)

- Kato Katz Technique

For enumeration of eggs

Most commonly used for evaluating epidemiology, effect of control measures, drug trials.

- **Immunodiagnosis**

- Intradermal tests for immediate cutaneous hypersensitivity using adult worm extracts.
- Indirect hemagglutination using adult worm and egg antigen.
- Circumoval precipitin test
- Enzyme Linked Immunosorbent Assay (ELISA) using soluble antigens of adults and eggs.

Treatment

- Praziquantel (heterocyclic prazinoisoquinolone compound).
 - Single dose of 40-50 mg/Kg.
 - 25 mg/kg in two doses.
 - 20 mg/Kg in three doses.
- Single dose of 20mg/kg is effective in
 - *S. haematobium*
 - *S. mansoni*
- Three doses of each 20mg/kg given at 4 hourly for
 - *S. japonicum*



Prevention

- Avoid contamination of environment with human excreta.
- Avoid contact with cercarial infested water.
- Snail control.
- Supply of clean water for endemic countries.
- Continued Health education.

Summary

- Why important
- Causative organisms
 - Organs affected
 - Life cycle
- Clinical features
- How to diagnose
 - How to treat
 - How to prevent

Thank You.