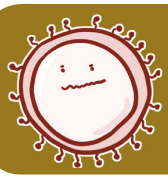

NOTES
TREMATODES (FLATWORMS)

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- AKA flukes; parasitic flatworm; infects internal organs
- *Phylum:* Platyhelminthes

Characteristics

- *Adult morphology:* flattened oval/elongated
- Structures
  - Tegmentum (outer body covering)
  - Ventral, oral suckers
  - Pharynx → esophagus → caeca
  - Testes, uterus/ovary (hermaphrodites)
- Eggs generally operculated (lidded); except schistosomes
- Obligate parasites of mollusks, vertebrates

Development

1. Egg
2. Miracidium (ciliated, lacks mouth; infects first intermediate host)
3. Sporocyst (elongated sac, produces rediae)
4. Redia (larval stage with oral sucker)
5. Cercaria (larval stage; may be infectant)
6. Metacercaria (encysted cercaria)
7. Adult

SIGNS & SYMPTOMS

- See individual trematodes

DIAGNOSIS

DIAGNOSTIC IMAGING

- Medical imaging (e.g. ultrasound, CT scan, MRI)

LAB RESULTS

- E.g. blood tests
- Direct microscopy

OTHER DIAGNOSTICS

- Serologic tests

TREATMENT

MEDICATIONS

- Anthelmintic

CLONORCHIS SINENSIS

osms.it/clonorchis-sinensis

PATHOLOGY & CAUSES

- Parasitic fluke; invasion of biliary tree → liver infection
- AKA Chinese liver fluke
- Morphology
  - *Adult:* flat, elongated body; 25 x 5mm
  - *Egg:* oval-shaped; 30 x 15μm
- Intermediate hosts
  - *First:* freshwater snail (e.g. *Parafossarulus manchouricus*)
  - *Second:* freshwater fish/shrimp
- *Reservoirs:* cats, dogs
- Transmission
  - Ingestion of raw/undercooked fish/shrimp
- *Infectious form:* metacercariae
  - Ingestion of metacercariae → excyst in duodenum → migration to biliary tract → inflammation, epithelial hyperplasia
- Endemic to Eastern Asia (e.g. China, Japan, Philippines, Vietnam)

RISK FACTORS

- Recent travel to endemic areas
- Consumption of raw/undercooked fish/shrimp

COMPLICATIONS

- Pancreatitis, cholangitis, liver abscesses, cholangiocarcinoma

SIGNS & SYMPTOMS

- Mostly asymptomatic
- *Acute infection:* fatigue, right upper quadrant abdominal pain, indigestion, diarrhea, flatulence
- *Chronic infection:* fatigue, weight loss, abdominal discomfort, diarrhea, dyspepsia, jaundice (severe cases)

DIAGNOSIS

DIAGNOSTIC IMAGING

Ultrasound, CT scan, MRI

- Enlarged gallbladder, hepatomegaly, bile duct inflammation, dilated/thickened intrahepatic bile ducts

Endoscopy

- Visualization of adult organisms

LAB RESULTS

- Acute infection
  - Eosinophilia, ↑ IgE
- Chronic infection
  - ↑ alkaline phosphatase, ↑ bilirubin
- Direct microscopy
  - Detection of *Clonorchis* eggs in stool samples
  - Formalin ethyl-acetate concentration technique (FECT) → parasite separation from faeces
- Serologic tests
  - E.g. ELISA
- Polymerase chain reaction (PCR)

TREATMENT

MEDICATIONS

- Anthelmintic (e.g. praziquantel)

Figure 102.1 An adult *Clonorchis sinensis* worm.

PARAGONIMUS WESTERMANI

osms.it/paragonimus-westermani

PATHOLOGY & CAUSES

- Parasitic flatworm; causes pulmonary paragonimiasis
- AKA Japanese lung fluke
- Morphology
  - *Adult:* oval-shaped body with spines; 15 x 8mm
  - *Egg:* oval-shaped, thick shell; 100 x 55μm
- Intermediate hosts
  - *First:* freshwater snails (e.g. *Semisulcospira* spp.)
  - *Second:* crustaceans (e.g. crabs, crayfish)
- Transmission
  - Ingestion of raw/undercooked crustaceans (e.g. crab, crayfish)
- *Infectious form:* metacercariae
  - Ingestion of metacercariae → excyst in duodenum → penetration of peritoneal wall → migration to lungs → encapsulate, mature → inflammation, fibrosis
- Endemic to Eastern Asia (e.g. China, Japan, Philippines, Vietnam)

RISK FACTORS

- Poor sanitary conditions
- Seafood consumption in endemic areas

COMPLICATIONS

- Meningitis, encephalitis, seizures

SIGNS & SYMPTOMS

Pulmonary

- Early infection
  - *Systemic:* fever, malaise
  - *Pulmonary:* dyspnea, cough, pleuritic pain
  - *Gastrointestinal:* diarrhea, epigastric pain
- Late infection
  - Malaise
  - Recurrent, chocolate-colored hemoptysis

Extrapulmonary

- *Cerebral:* headache, fever, vomiting, seizures, papilledema, paresis/paresthesias, visual disturbances (e.g. diplopia)
- *Abdominal:* nausea/vomiting, hematoquezia (bloody stool), pain, hematuria
- *Subcutaneous:* tender, firm, painless, mobile nodules

DIAGNOSIS

DIAGNOSTIC IMAGING

X-ray, CT scan, MRI

- Brain
  - *Skull X-ray:* soap-bubble calcifications; calcified cysts
  - *CT/MRI:* grape clusters; conglomerated, cystic lesions
- Lungs
  - Pleural effusion, parenchymal cysts/nodules, cavitary lesions, parasite migration tracts

LAB RESULTS

- Eosinophilia, ↑ IgE
- Direct microscopy
  - Detection of eggs in stool, sputum, bronchoalveolar lavage
- Serologic tests
  - Enzyme-linked immunosorbent assay (ELISA), immunoblot

TREATMENT

MEDICATIONS

- Anthelmintic (e.g. praziquantel, triclabendazole)

SCHISTOSOMES

osms.it/schistosomes

PATHOLOGY & CAUSES

- Blood flukes; parasitize mesenteric veins/vesical venous plexus → gastrointestinal/genitourinary tract infections
- AKA bilharziasis/snail fever
- Morphology
  - *Adult:* elongated body, 1–2cm/0.39–0.79in
  - *Eggs:* not operculated
- Intermediate host
  - Snails
- Transmission
  - Contaminated freshwater contact
- *Infectious form:* cercariae
  - Contact with cercariae in fresh water → skin penetration → schistosomulae → migration to liver through circulation → adult form → migration to mesenteric venules/vesical venous plexus → egg deposits → inflammation → fibrosis
- High-prevalence area is sub-Saharan Africa

RISK FACTORS

- More common in individuals who are biologically male, rural areas
- Recent contact with fresh water bodies in endemic areas

COMPLICATIONS

- Bacteremia, infertility, intestinal obstruction, nephrotic syndrome, renal failure, cardiomegaly, acute myelopathy

Figure 102.2 A scanning electron micrograph of a *S. japonicum* flatworm.

SIGNS & SYMPTOMS

Acute infection

- Swimmer's itch
  - Pruritic papular/urticarial rash, esp. legs/feet
- Acute schistosomiasis syndrome/Katayama fever
  - Non-specific symptoms (fever, urticaria, chills, arthralgia, myalgia, headaches)
  - Angioedema, dry cough, abdominal pain, diarrhea

Chronic infection

- *Intestinal:* abdominal pain, poor appetite, diarrhea
- *Hepatosplenic:* hepatosplenomegaly, portal

hypertension (e.g. collateral circulation, gastrointestinal bleeding, ascites)
- *Pulmonary:* dyspnea; pulmonary hypertension → cor pulmonale (enlarged right cardiac chambers)
- *Urogenital:* hematuria, pyuria, dysuria, increased urinary frequency
- *Neuroschistosomiasis (acute myelopathy):* seizures, sensory/motor impairment, cerebellar syndrome (incoordination)

DIAGNOSIS

DIAGNOSTIC IMAGING

Chest X-ray, CT scan, MRI, abdominal ultrasound

- *Brain:* contrast-enhancing infiltrates
- *Bladder:* wall irregularities/fibrosis
- *Liver:* widened periportal space, periportal fibrosis, collateral pathways
- *Lungs:* patchy infiltrates, miliary nodules
- *Spinal cord:* radicular thickening, intramyelinic lesions

LAB RESULTS

- Bladder/rectum biopsy
  - Egg-filled granulomas in mucosa
- Direct microscopy
  - Detection of eggs in stool/urine samples
  - Kato–Katz method (thick smear)
  - FLOTAC stool concentration method
- Lab tests
  - *Acute infection:* eosinophilia
  - *Chronic infections:* anemia
  - *Portal hypertension:* thrombocytopenia (splenic sequestration)
  - *Urogenital infection:* hematuria/leukocyturia in urinalysis
- Serologic testings
  - E.g. ELISA, indirect hemagglutination

TREATMENT

MEDICATIONS

- Anthelmintic (e.g. praziquantel, oxamniquine)
- Corticosteroids (e.g. prednisolone, prednisone)
- Manageme pruritus (e.g. antihistamines)

OTHER INTERVENTIONS

- Prevention
  - Water sanitation programs
  - Mass therapy
  - Control of snails (e.g. molluscicides)

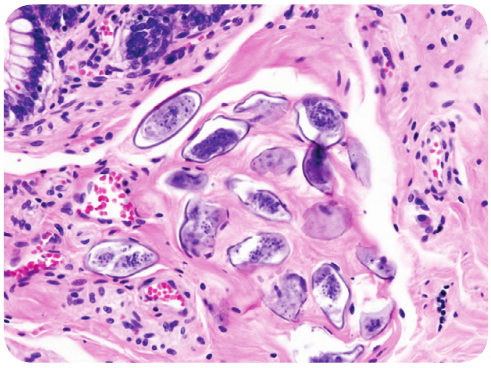

Figure 102.3 Calcified eggs of the flatworm *Schistosoma japonicum* in the submucosa of the colon of an individual previously treated for schistosomiasis.

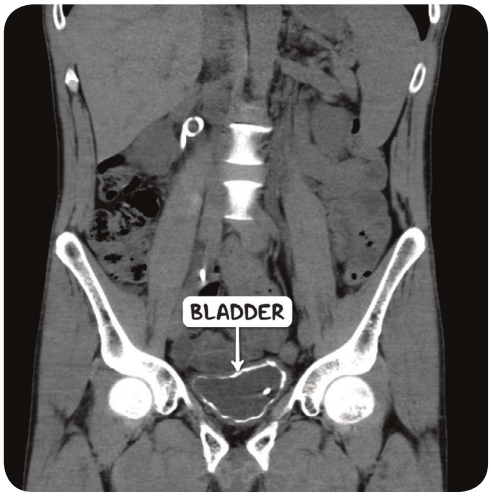

Figure 102.4 A CT scan of the abdomen and pelvis demonstrating calcification of the bladder secondary to schistosomiasis.

COMMON SPECIES OF SCHISTOSOMES

	VISUALIZATION	RESERVOIR	MODE OF TRANSMISSION
SITE OF INFECTION	Gastrointestinal tract	Gastrointestinal tract	Urogenital tract
GEOGRAPHIC DISTRIBUTION	Africa, South America	East Asia	Africa, Middle East
INTERMEDIATE HOST (SNAIL SPECIES)	*Biomphalaria* spp.	*Oncomelania* spp.	*Bulinus* spp.
EGG MORPHOLOGY	Oval Lateral spine 60 x 150 µm	Round No spine 100 µm	Oval Large terminal spine 60 x 150 µm