FOOD BORNE TREMATODE INFECTIONS

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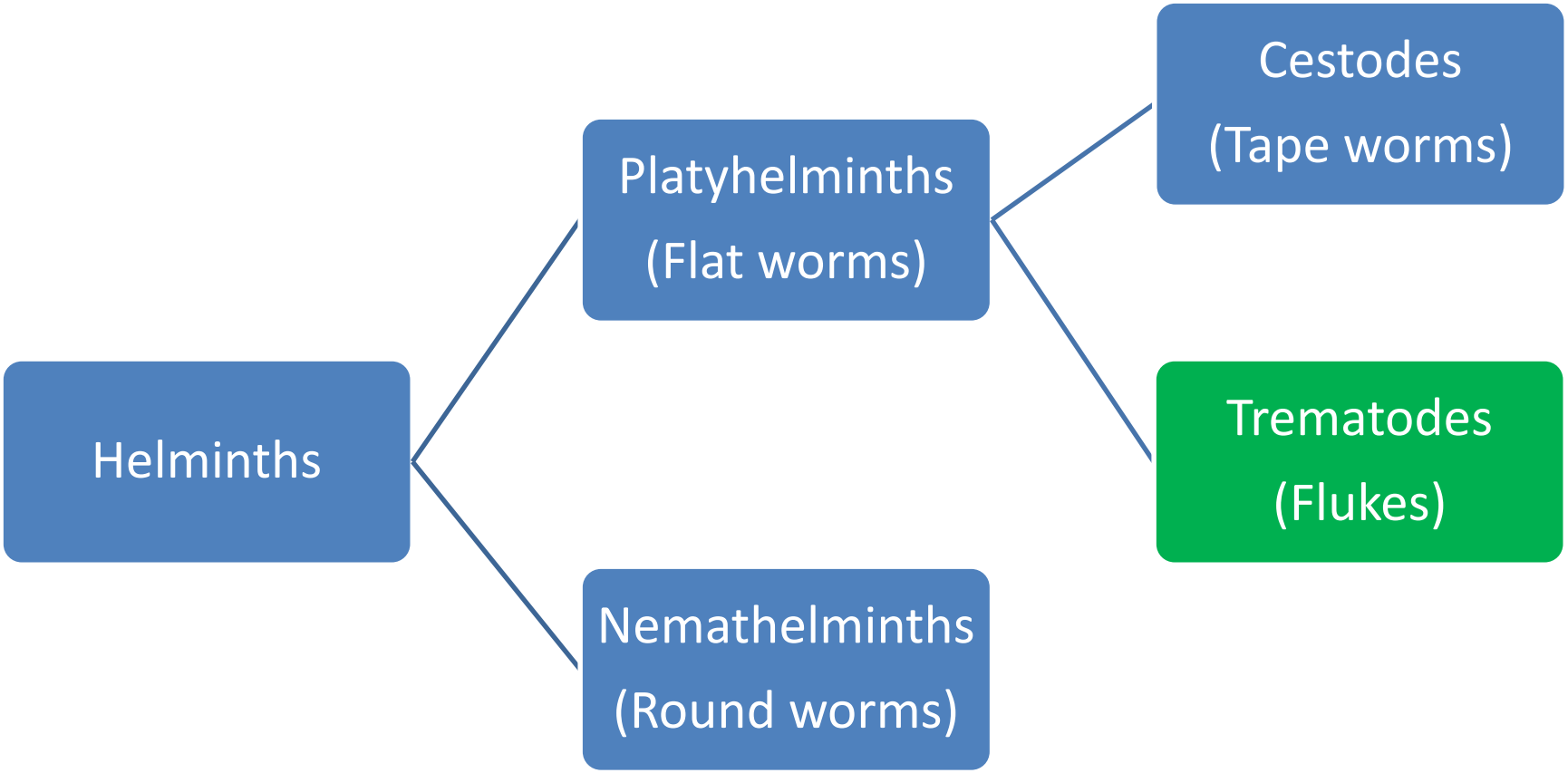
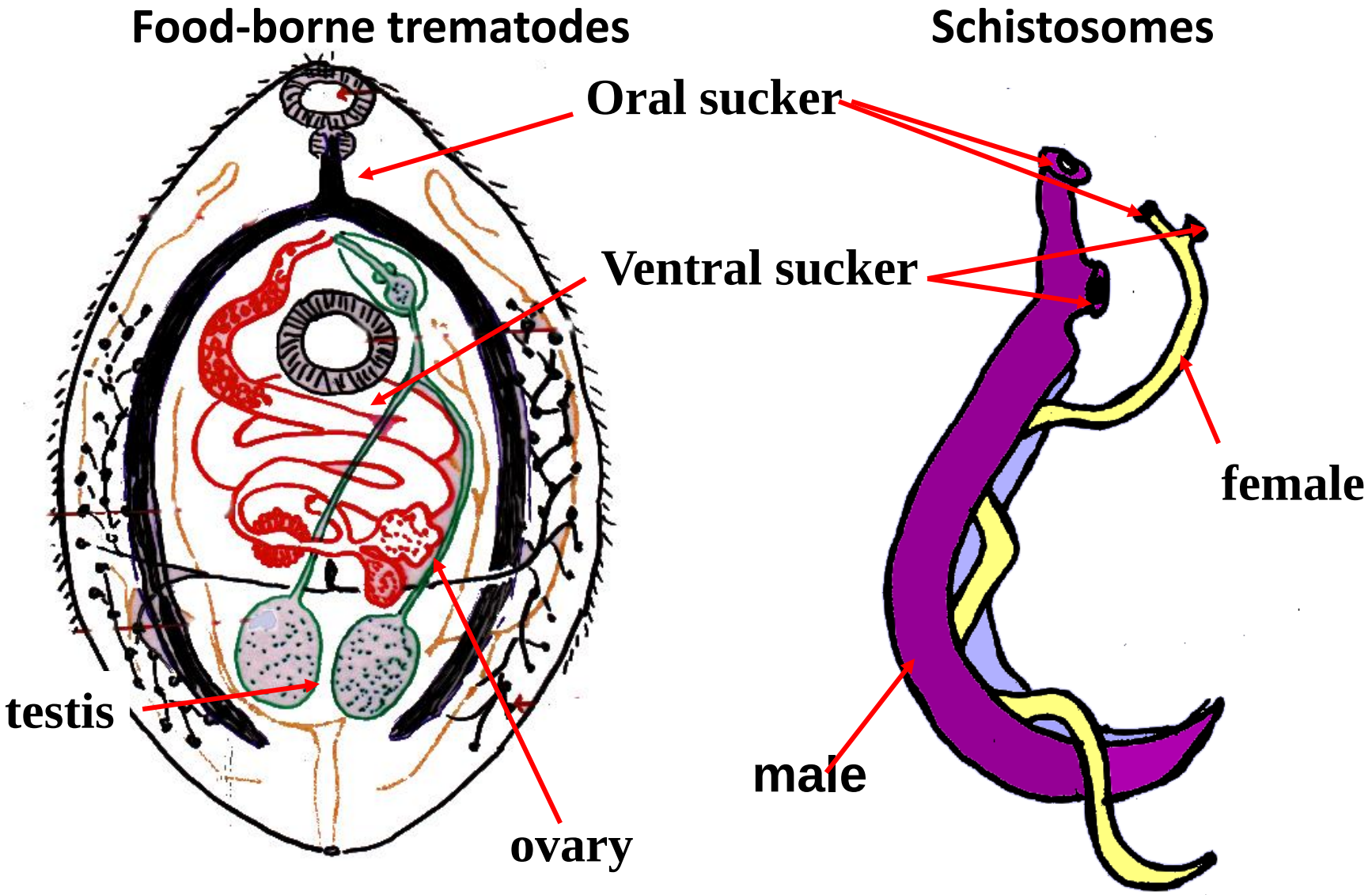

Helminths
Platyhelminths
(Flat worms)
Nemathelminths
(Round worms)
Cestodes
(Tape worms)
Trematodes
(Flukes)

Characteristics of Trematodes

- Flat, leaf-like adult worms with no body cavity
- Size few millimeters to 7 cm
- Oral and ventral suckers for attachment
- Simple, incomplete digestive system
- In man, they inhabit the intestinal tract, bile ducts, lungs or blood vessels (Schistosomes)
- Nutrition obtained from intestinal contents, or tissues and secretions

- Reproduction: both male and female reproductive organs may be in one body (food-borne trematodes) or the sexes may be separate (schistosomes)
- Complex life cycle with one or more intermediate hosts and several morphological stages
- Human – the definitive host
- 2 intermediate hosts – snail + freshwater fish/crustacean/water plant
- Almost always zoonotic infection with animal reservoir

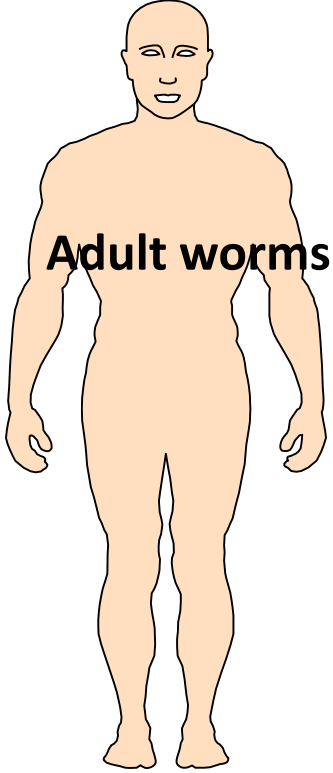
TYPICAL ADULT MORPHOLOGY

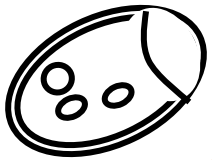


General life cycle

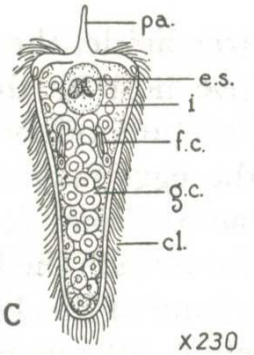
Metacercariae encysted on plants or animals

(**2nd intermediate host**)



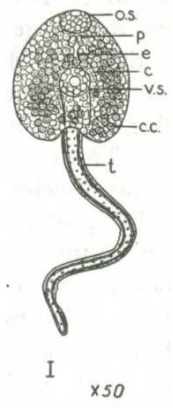


egg



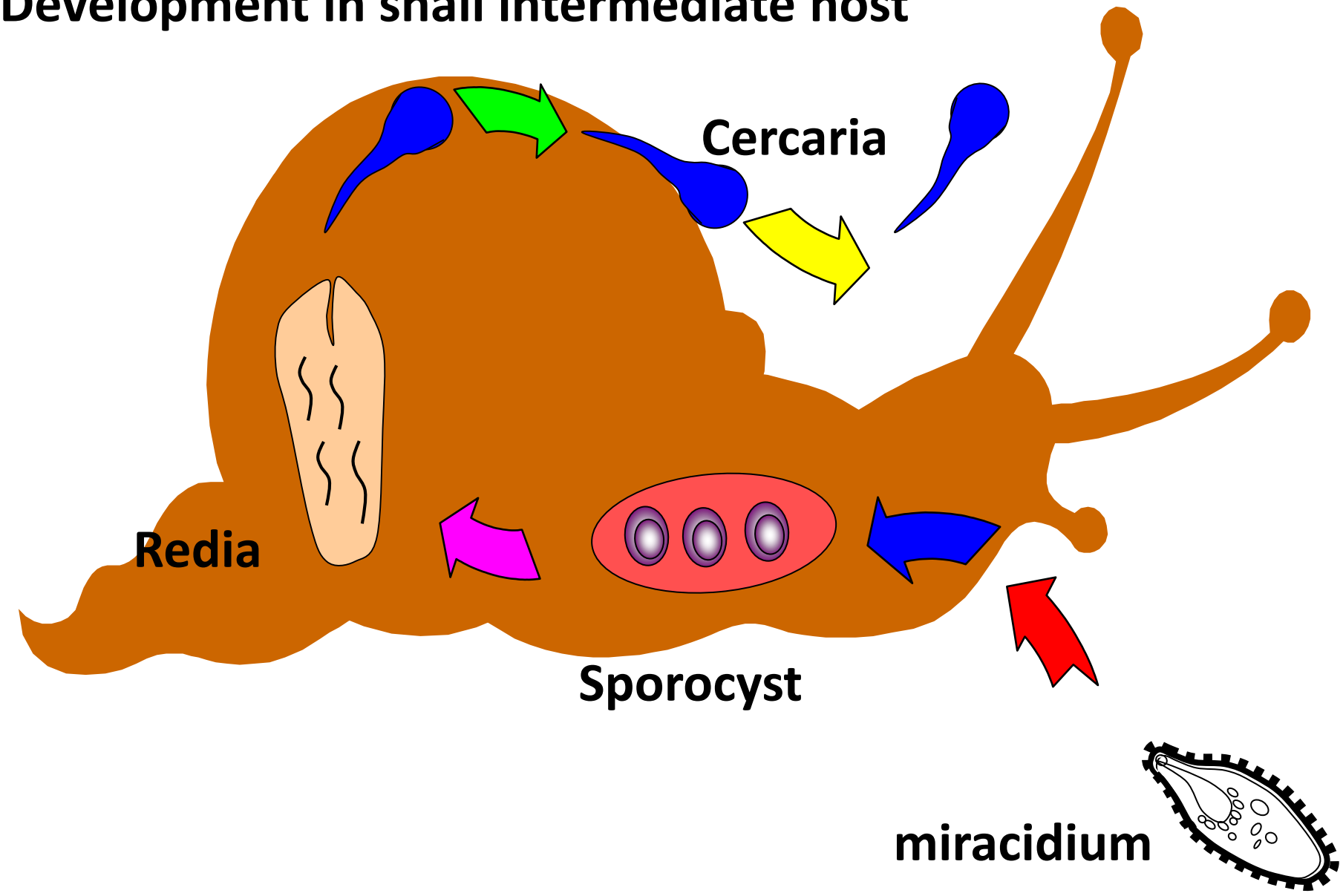
miracidium

1st intermediate host
- snails



Free-swimming **cercaria**

Development in snail intermediate host



FOOD-BORNE TREMATODES

- Lung flukes
  - ***Paragonimus westermani***
- Liver flukes
  - ***Clonorchis sinensis***
  - *Opisthorchis viverrini*
  - *Fasciola hepatica*
  - *Fasciola gigantica*
- Intestinal flukes
  - *Fasciolopsis buski*

Paragonimiasis

- Caused by *Paragonimus westermani* (Lung fluke)
- Estimated 23 million infections worldwide
- Most infections found in the Far East: China, Korea, Japan, Vietnam, and South East Asia
- Less common in South Asia, Africa and South America
- Infects humans + other mammals that eat crabs and crayfish
- Parasite is found in Sri Lanka, but only in wild animals, no human cases reported
- Adult life-span: 5 -10 years

Morphology

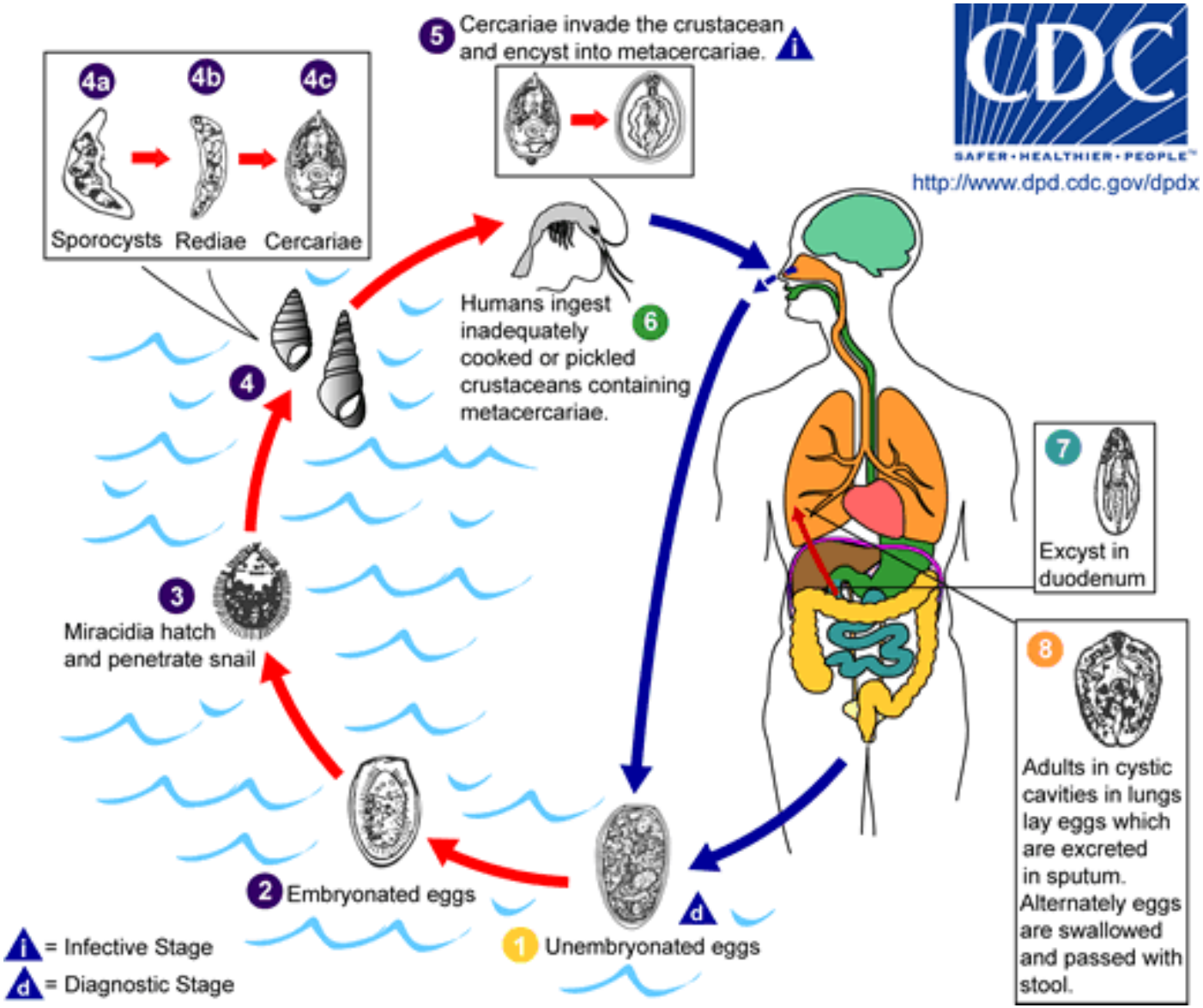
Adults

- Coffee bean shaped, thick, fleshy parasites
- Reddish brown in colour
- 8 – 20 mm long x 5 – 9 mm wide
- Suckers equal in size
- Lobed testes and ovary
- Pairs within cysts in the lungs

Egg

- Yellowish-brown
- Large size
- Operculated
- Excreted in sputum or faeces

Life Cycle


5 Cercariae invade the crustacean and encyst into metacercariae. i
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4a
4b
4c
Sporocysts
Rediae
Cercariae
Humans ingest inadequately cooked or pickled crustaceans containing metacercariae.
6
4
7
Excyst in duodenum
3
Miracidia hatch and penetrate snail
8
Adults in cystic cavities in lungs lay eggs which are excreted in sputum. Alternately eggs are swallowed and passed with stool.
2 Embryonated eggs
d
1 Unembryonated eggs
i = Infective Stage
d = Diagnostic Stage

- Infection acquired by eating
  - undercooked / raw freshwater crabs or crayfish
  - Crabs soaked in vinegar / wine / salt
  - Crab juice considered to have medicinal properties
  - Metacercariae may contaminate hands, knives, chopping boards, etc used during food preparation

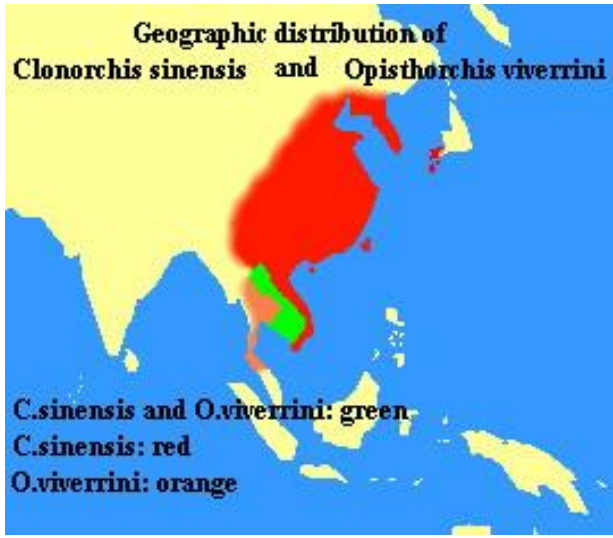
- Ingested metacercariae excyst in small intestine and migrate through intestinal wall, peritoneal cavity, diaphragm, pleura and lung tissue into bronchioles
- Aberrant migration → larvae at ectopic sites (brain, abdomen, groin, heart)

Clinical features

- Main habitat in lungs: lumen of bronchioles and peri-bronchial tissues
- Inflammatory response to immature worms, adults and eggs leads to granuloma formation and development of cysts and abscesses
- Most infections are asymptomatic
- In heavy infections: chronic cough with purulent sputum and haemoptysis (resembles TB)

Clonorchiasis & Opisthorchiasis

- Caused by *Clonorchis sinensis* (Chinese liver fluke) & *Opisthorchis viverrini*
- Estimated to cause about 17 million infections (*Clonorchis*) + 11 million (*Opisthorchis*) worldwide
- Mostly found in China, Hong Kong, Korea, Thailand
- Not reported in Sri Lanka

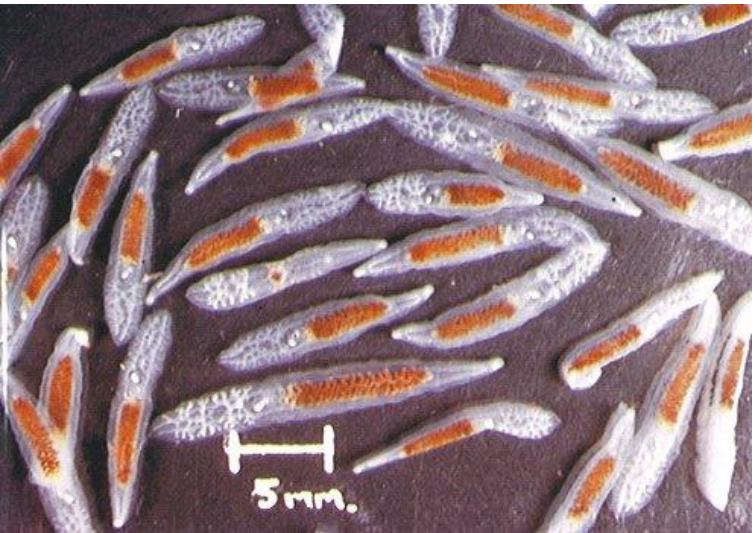


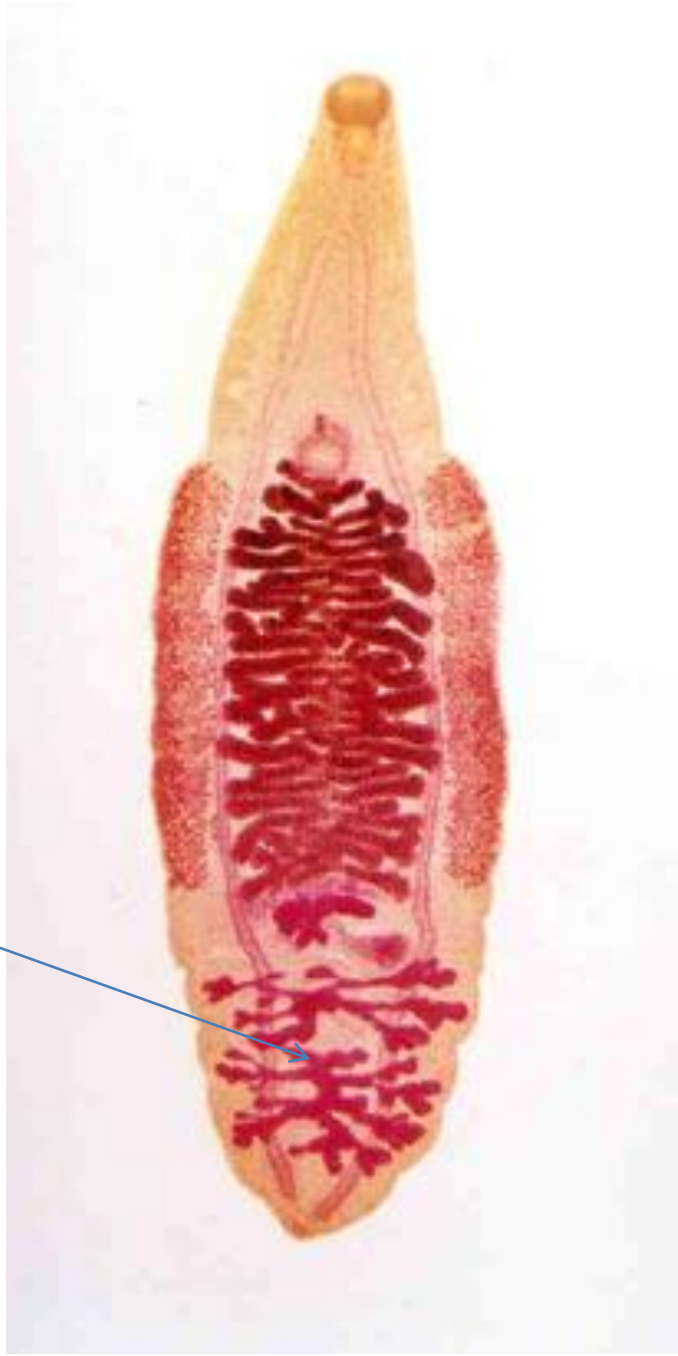
- Definitive hosts include humans & other fish-eating mammals
- Adult worm life-span: 20 – 25 years

Morphology

Adult

- Adult flukes are leaf-shaped and gray in colour
- Size : 6 - 20 x 2.5 mm
- Rounded posterior end; tapers anteriorly
- Ventral sucker smaller than oral sucker
- Deeply lobed testes

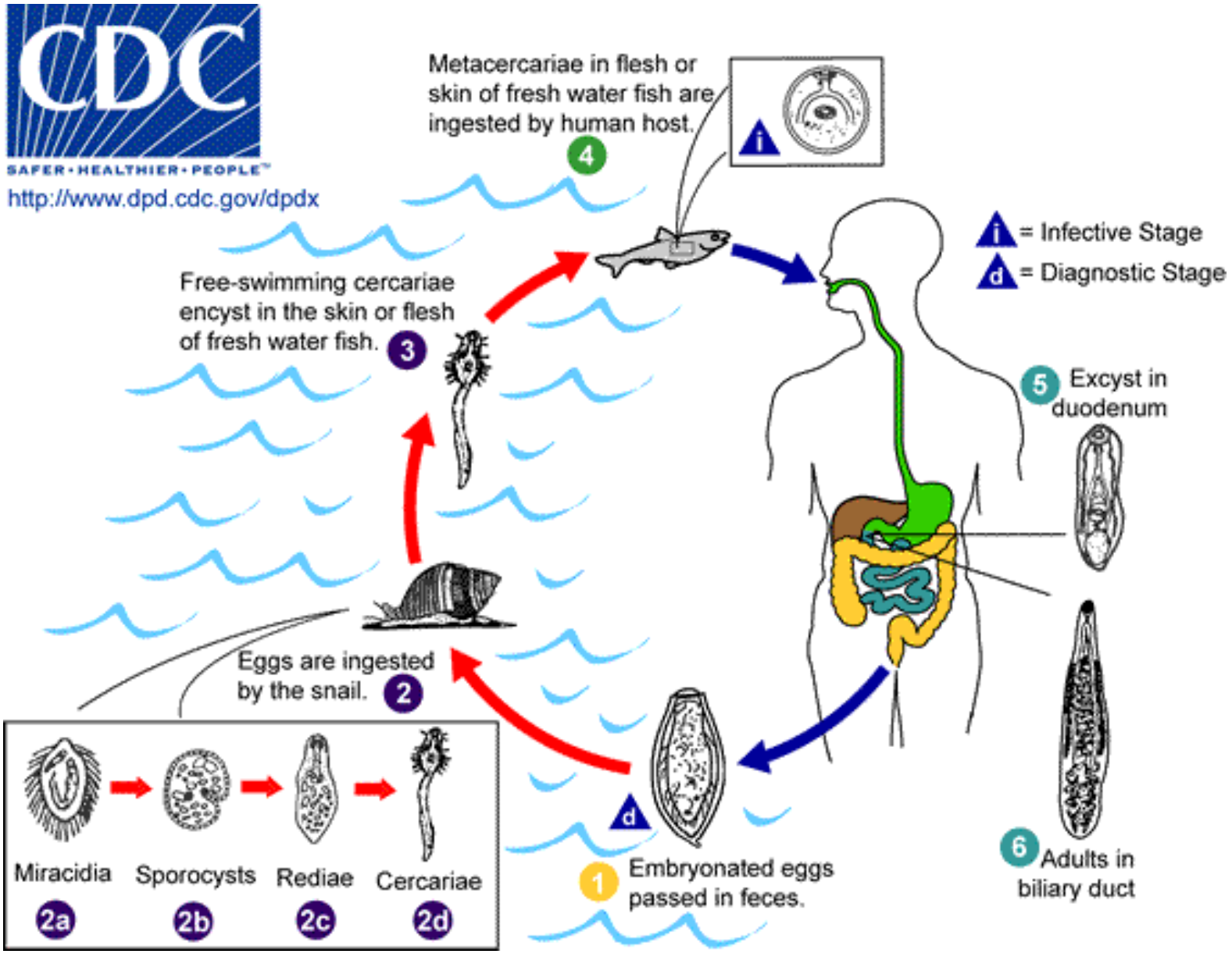




Egg

- Small operculated egg
- The operculum, at smaller end of the egg, is convex and rests on a visible "shoulder".
- At the opposite (larger, abopercular) end, a small knob or hook- like protrusion is often visible
- The miracidium is visible inside the egg

Life cycle


CDC
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Metacercariae in flesh or skin of fresh water fish are ingested by human host. 4
i = Infective Stage
d = Diagnostic Stage
Free-swimming cercariae encyst in the skin or flesh of fresh water fish. 3
5 Excyst in duodenum
Eggs are ingested by the snail. 2
Miracidia 2a
Sporocysts 2b
Rediae 2c
Cercariae 2d
1 Embryonated eggs passed in feces.
6 Adults in biliary duct

- Infection is acquired by eating raw/ undercooked or pickled freshwater fish or shrimps carrying metacercariae

- Ingested metacercariae excyst in the small intestine and migrate through the Ampulla of Vater into common bile duct

- Adults inhabit intra-hepatic bile ducts but in heavy infections may be found in the gall bladder and pancreatic ducts

Clinical features

- Usually light infections
- More worms acquired over the years
- Insidious onset of clinical symptoms
- Heavy infections –
  - Low grade fever, malaise, R/ hypochondrial pain, diarrhoea, eosinophilia
  - Recurrent cholangitis, cholecystitis, and gall stones, pancreatitis, obstructive jaundice and cirrhosis
  - Malignant changes in endothelium of bile ducts - cholangiocarcinoma

Fascioliasis

- Caused by *Fasciola hepatica* (sheep liver fluke)
- Found around the world
- More common in sheep rearing countries
  - Australia, UK, France, Egypt, Iran, South American countries
- Not reported in Sri Lanka
- Adults found in sheep and cattle (herbivorous animals), and only occasionally in man
- Adult worm life span: 3 – 5 years

Morphology

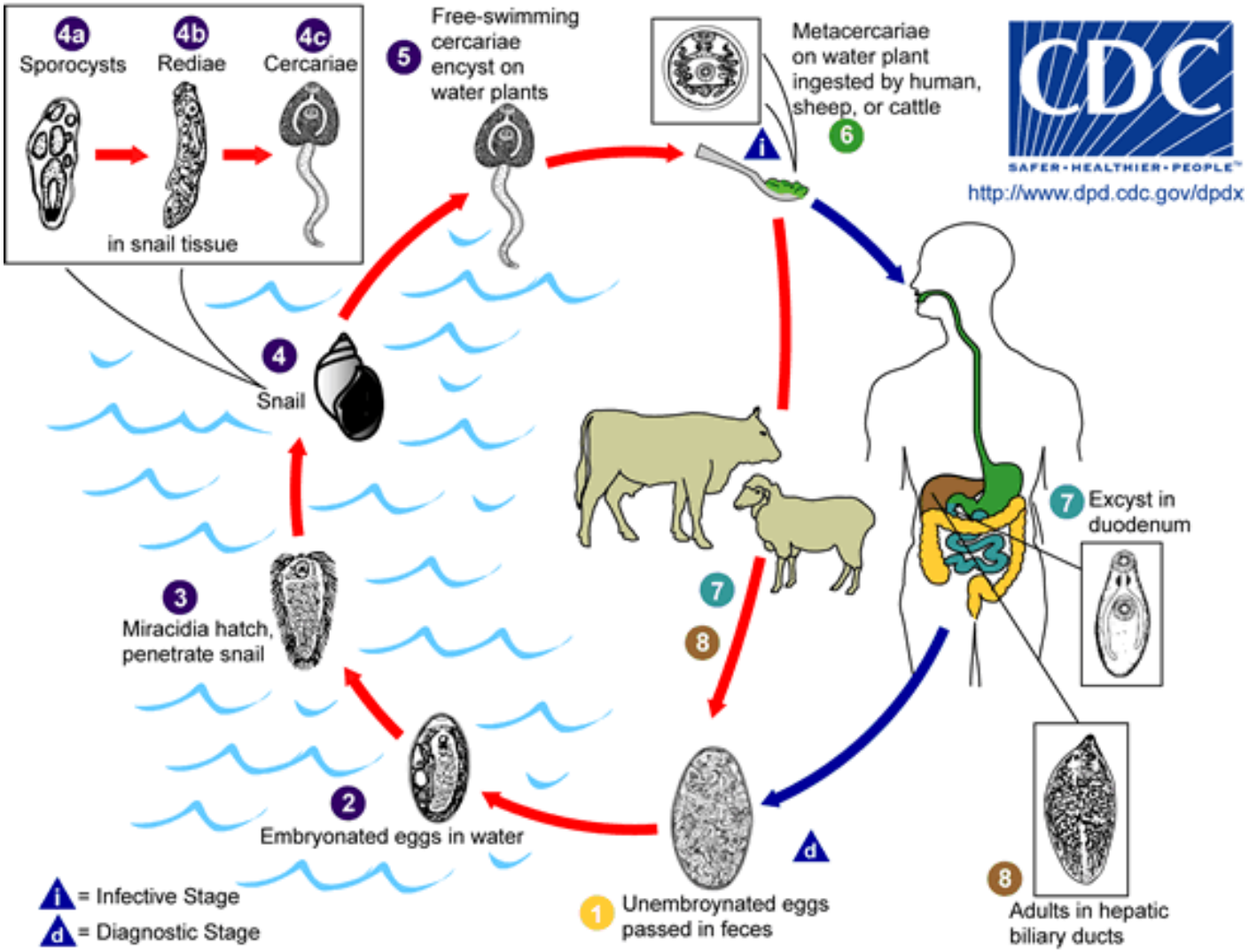
Adults

- Adult fluke - large 2 - 3 cm X 1 cm
- Flat & leaf shaped, brown in colour
- Shouldered appearance due to cephalic cone
- Oral sucker = Ventral sucker in size

Egg

- Large, oval in shape
- Small, barely distinct operculum
- Thin shell with a slight thickening at the abopercular end
- They are passed unembryonated

Life cycle


4a
Sporocysts
4b
Rediae
4c
Cercariae
in snail tissue
5
Free-swimming cercariae encyst on water plants
Metacercariae on water plant ingested by human, sheep, or cattle
6
i
CDC
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4
Snail
3
Miracidia hatch, penetrate snail
7
Excyst in duodenum
7
8
2
Embryonated eggs in water
d
1
Unembroynated eggs passed in feces
8
Adults in hepatic biliary ducts
i = Infective Stage
d = Diagnostic Stage

- Infection acquired by ingestion of metacercariae
  - on plants grown near water – water cress, radishes and other salad vegetables;
  - Floating free in water

- Young flukes eat their way through the intestinal wall, peritoneal cavity, and liver capsule to enter bile ducts in liver

Clinical features

- Acute (migratory) phase
  - Upper abdominal and R/ hypochondrial pain
  - Fever with chills and rigors, vomiting
  - Hepatomegaly and eosinophilia (high)
- Chronic phase (adult stages)
  - Painful enlargement of liver
  - Recurrent cholangitis and cholecystitis, formation of gall stones
  - Obstructive jaundice and biliary fibrosis

Diagnosis of trematode infections

- History of travel to endemic areas - eating raw salads / fish or crustaceans
- Microscopic identification of eggs in the

  stool

  vomitus

  duodenal aspirate

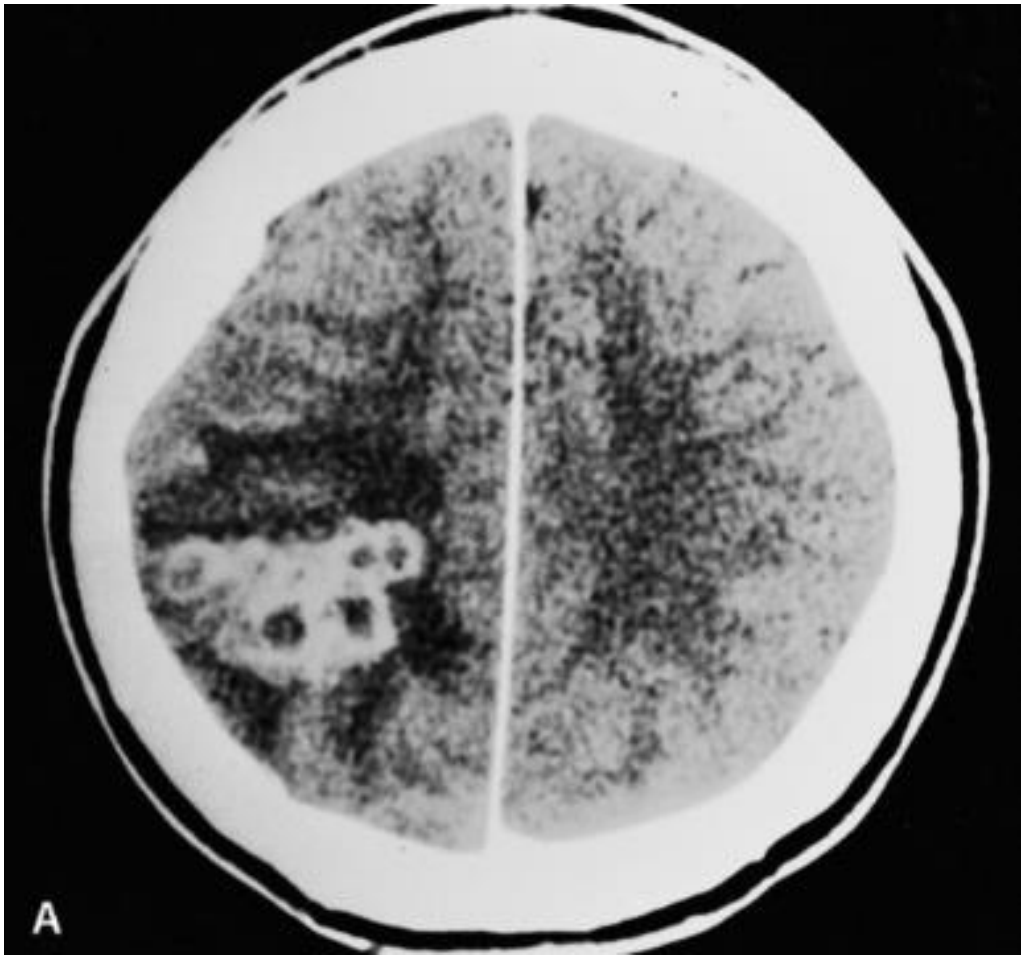
  sputum

  (concentration techniques in light infections)

In paragonimiasis

- Radiography – ring-shadowed opacity (bunch of grapes)
- CT scan – “soap bubble appearance” in brain scans
- Skin & immunodiagnostic tests (ELISA, CF) – highly sensitive

Chest X-ray – ‘bunch of grapes’ appearance



‘soap bubble’ appearance in CT brain

Treatment of trematode infections

- Praziquantel is the drug of choice for all trematode infections except fascioliasis

- Triclabendazole or bithionol is used for treatment of fascioliasis

Prevention and control of trematode infections

- Avoid eating raw/inadequately cooked fish/crustaceans or water plants in endemic areas
  - Metacercariae are not killed by refrigeration
  - Killed by heat at 55°C for 5 minutes/ roasting
- Snail control- using molluscacides
- Proper treatment of night soil-using lime & $CuSO_4$
- Reduction of usage of un-sterilized night soil as fertilizer
- Chemotherapy to reduce the human and animal reservoirs of infection

THANK YOU!