Schistosoma *mansoni*

Presented by;

Dr. Asma

Schistosoma *mansoni*

Schistosomiasis also known as bilharzia, is an intravascular human disease caused by the worm Schistosoma *mansoni*.

People become infected when larval forms of the parasite released by freshwater snails genera *Biomphalaria* penetrate the skin during contact with infested water.

After skin invasion, migratory forms (schistosomula) travel through the host's cardiovascular system.

It is characterized by chronic inflammation and morbidity

Schistosoma *mansoni* is also frequently recovered from wild primates in endemic areas but is considered primarily a human parasite and not a zoonosis.

Morphology

- Schistosoma *mansoni* form five different developmental stages
- Eggs, miracidia, sporocysts, cercariae and adult worms

Eggs

- Eggs are round to oval in shape
- Operculate (hinged at one end)
- Contain a developing embryonic larva (miracidium)
- 115-175 x 45-7µm in size.
- Possess a sharp lateral spine.

Miracidia

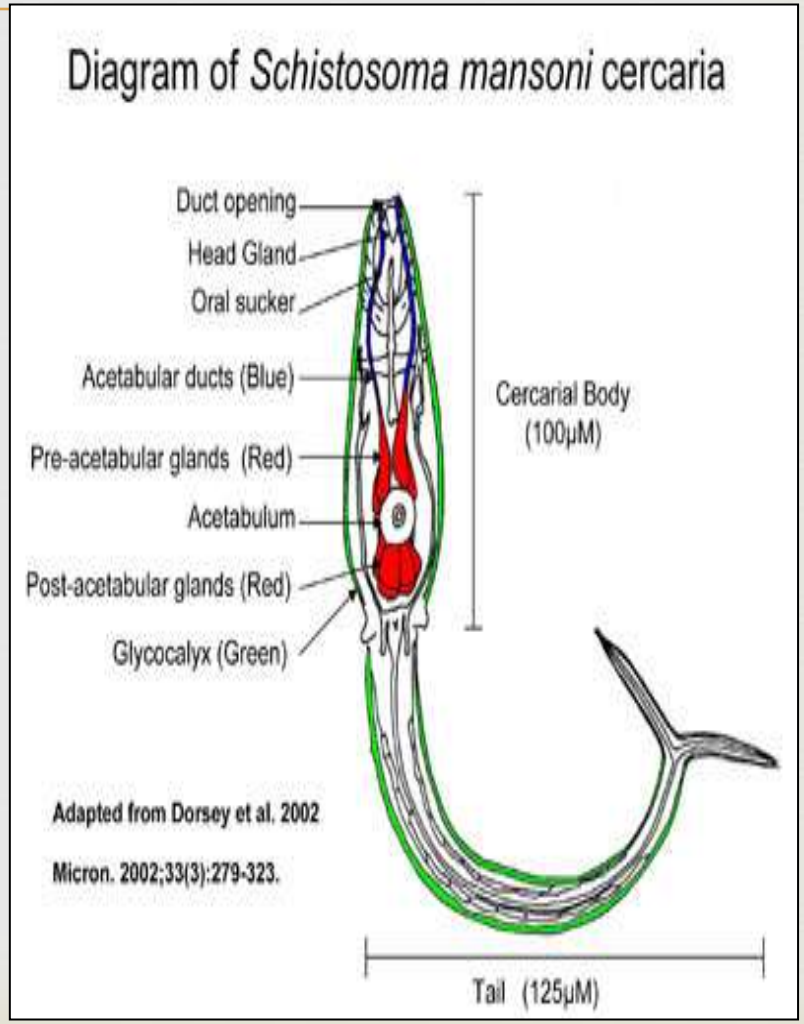
- Miracidia are elliptical free-swimming larval stages
- Approximately 200µm long in size
- They are covered with cilia

Sporocysts

- Sporocysts appear as pleomorphic sac-like bodies
- They contain developing cercariae

Cercariae

- Mature cercariae are elongate free-swimming larval stages
- They usually ranges 400-600µm long
- They consist of a tapering head (with prominent penetration glands)
- Possess a forked tail (furcocercous)



Adult flukes

- Adult flukes are elongate tubular worms
- They are usually 10-20mm long
- Possess rudimentary oral and ventral suckers
- Males are shorter and stouter than females
- They have a longitudinal cleft (gynecophoral canal or schist)

Schistosoma mansoni

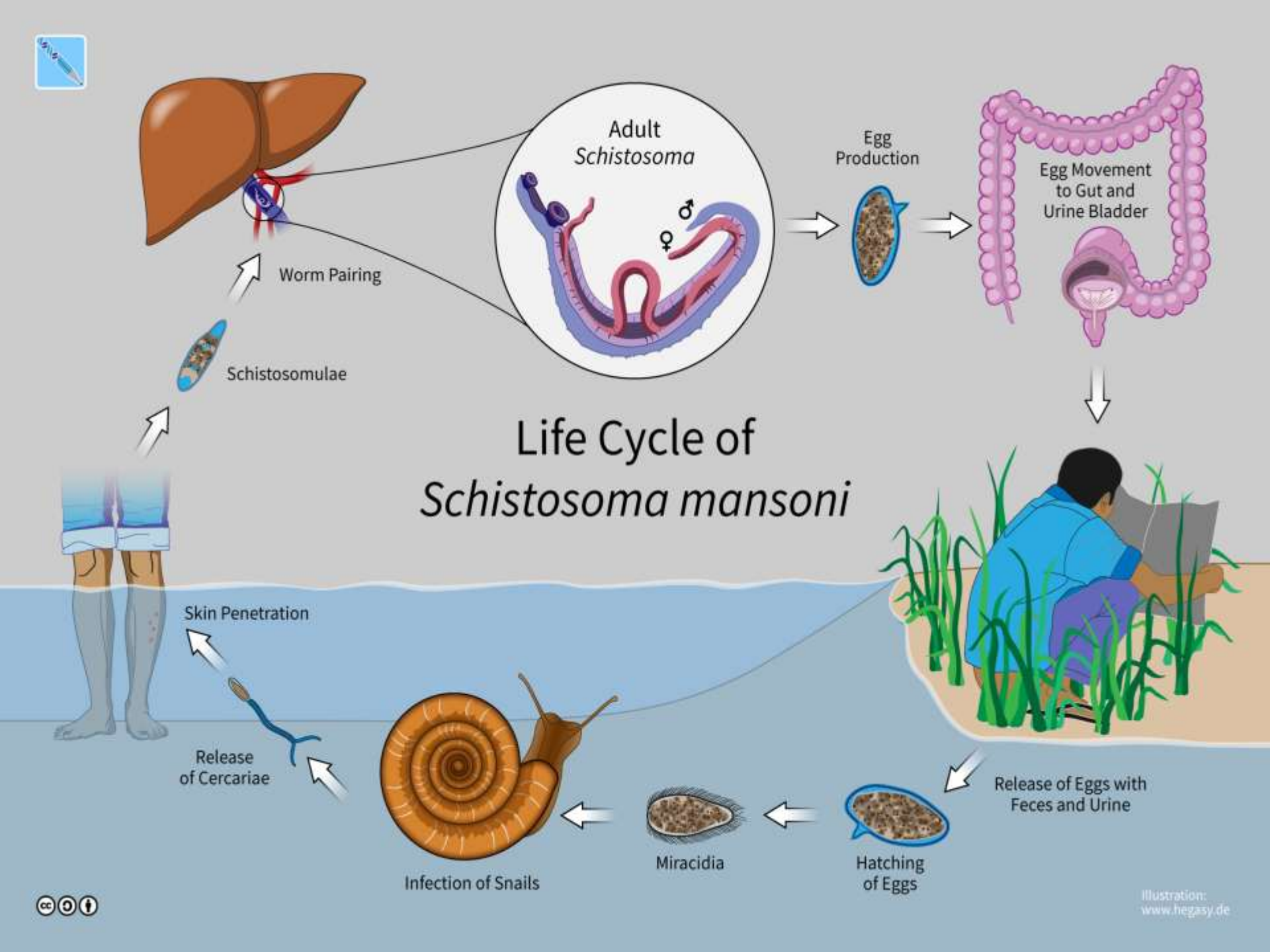
S. mansoni (male)

- 8-10 mm long
- has gynaecophoric canal
- dorsal surface covered with tubercle

S. mansoni (male & female)

S. mansoni (female)

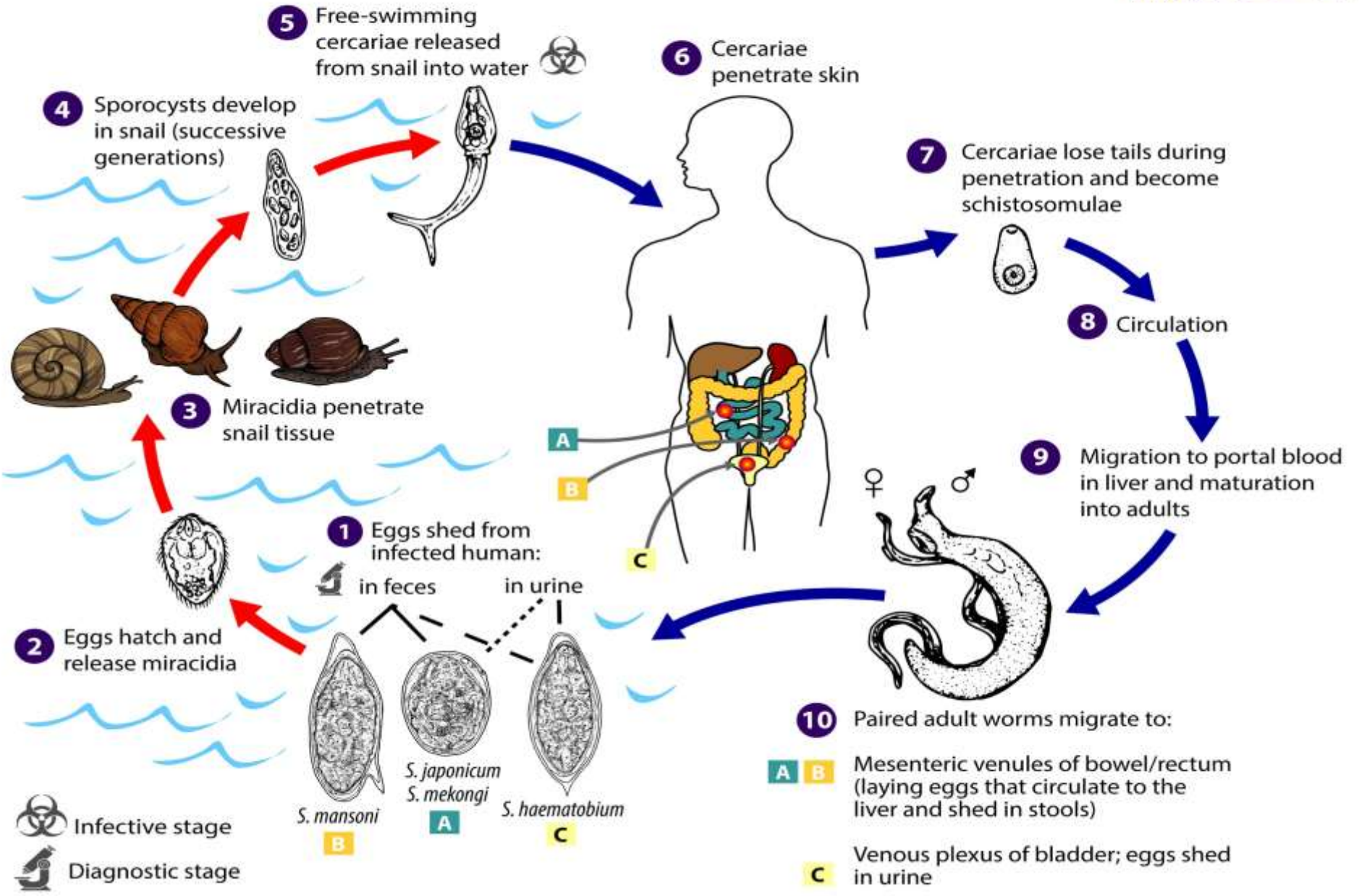
- 14 mm long
- taller and thinner
- vitelline glands occupy 2/3 of the body


Adult
Schistosoma
♂
♀
Egg
Production
Egg Movement
to Gut and
Urine Bladder
Worm Pairing
Schistosomulae
Life Cycle of
Schistosoma mansoni
Skin Penetration
Release
of Cercariae
Infection of Snails
Miracidia
Hatching
of Eggs
Release of Eggs with
Feces and Urine
Illustration:
www.hegasy.de

DPDx

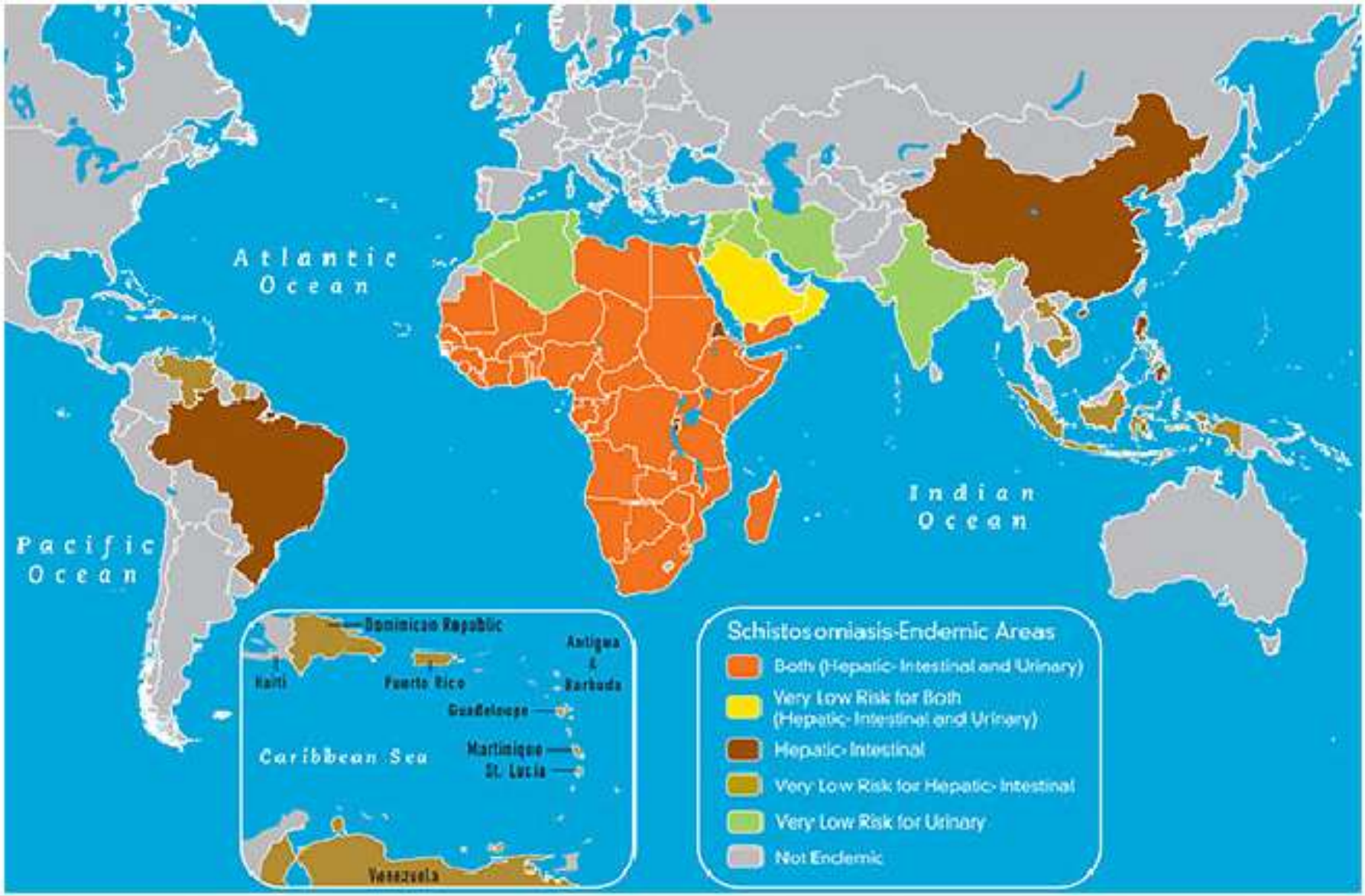
Schistosoma spp.

CDC



Epidemiology

- Schistosoma *mansoni* is found primarily across sub-Saharan Africa and some South American countries.
- It is more prevalent in Brazil, Venezuela, Suriname and the Caribbean, with sporadic reports in the Arabian Peninsula.
- Greater rate of infection found in the Caribbean, South America, the Middle East, and Africa
- Current estimated total number of individuals with morbidity and mortality due to Schistosoma *mansoni* infection in Sub-Saharan Africa



Epidemiology

Schistosomiasis Prevalence

Estimates show that at least 290.8 million people required preventive treatment for schistosomiasis in 2018

Out of which more than 97.2 million people were reported to have been treated in 2019.

Schistosomiasis transmission has been reported from 78 countries

It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa.

Schistosomiasis is prevalent in tropical and subtropical areas

The death estimates due to schistosomiasis varies between 24072 and 200000 globally per year.

Acute Schistosomiasis

The initial illness is characterized by fever, hepato-splenomegaly, skin rash and arthralgia known as Katayama fever.

It is a systemic hypersensitivity reaction that may occur weeks after the initial infection

Manifestations include systemic symptoms/signs including fever, cough, abdominal pain, diarrhea, hepatosplenomegaly, and eosinophilia.

Acute Schistosomiasis

Chronic schistosomiasis

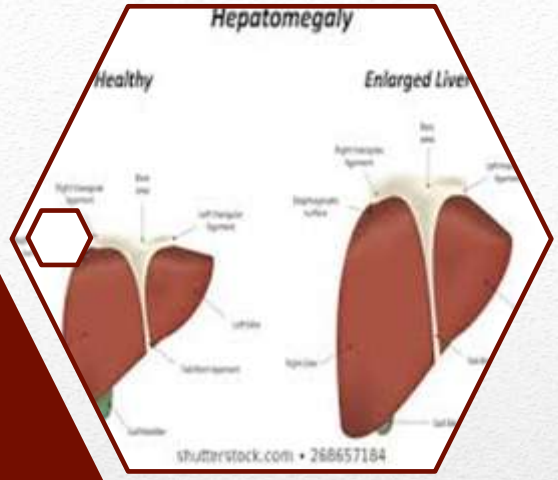
Without treatment, schistosomiasis can persist for years

Chronic infection can also lead to increased risk of liver fibrosis or bladder cancer.

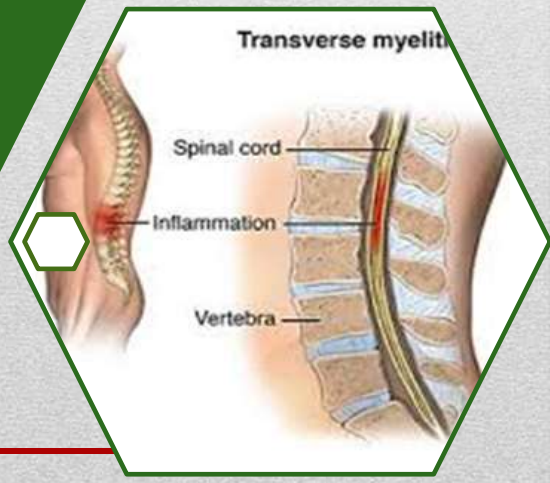
Eggs are found in the brain or spinal cord and can cause seizures, paralysis, or spinal cord inflammation.

Symptoms include abdominal pain, enlarged liver, blood in the stool or blood in the urine, and problems passing urine.

Hepatomegaly



Spinal cord inflammation



Paralysis

Stages	Symptoms
Acute (exposure to high numbers of cercaria)	✓ High fever ✓ Hepatomegaly
Chronic (untreated acute infection)	✓ Liver fibrosis ✓ Liver cirrhosis ✓ Liver portal hypertension ✓ Splenomegaly ✓ Ascites ✓ Impaired physical and cognitive development
Infection outside intestines, liver and spleen	✓ Morbidity due to immune reactions to eggs trapped or dispersed in lungs, nervous system, and other organs

SIGNS & SYMPTOMS

- Clinical picture: low grade fever. Fatigue, weight loss and anemia
- INTESTINAL SCHISTOSOMIASIS

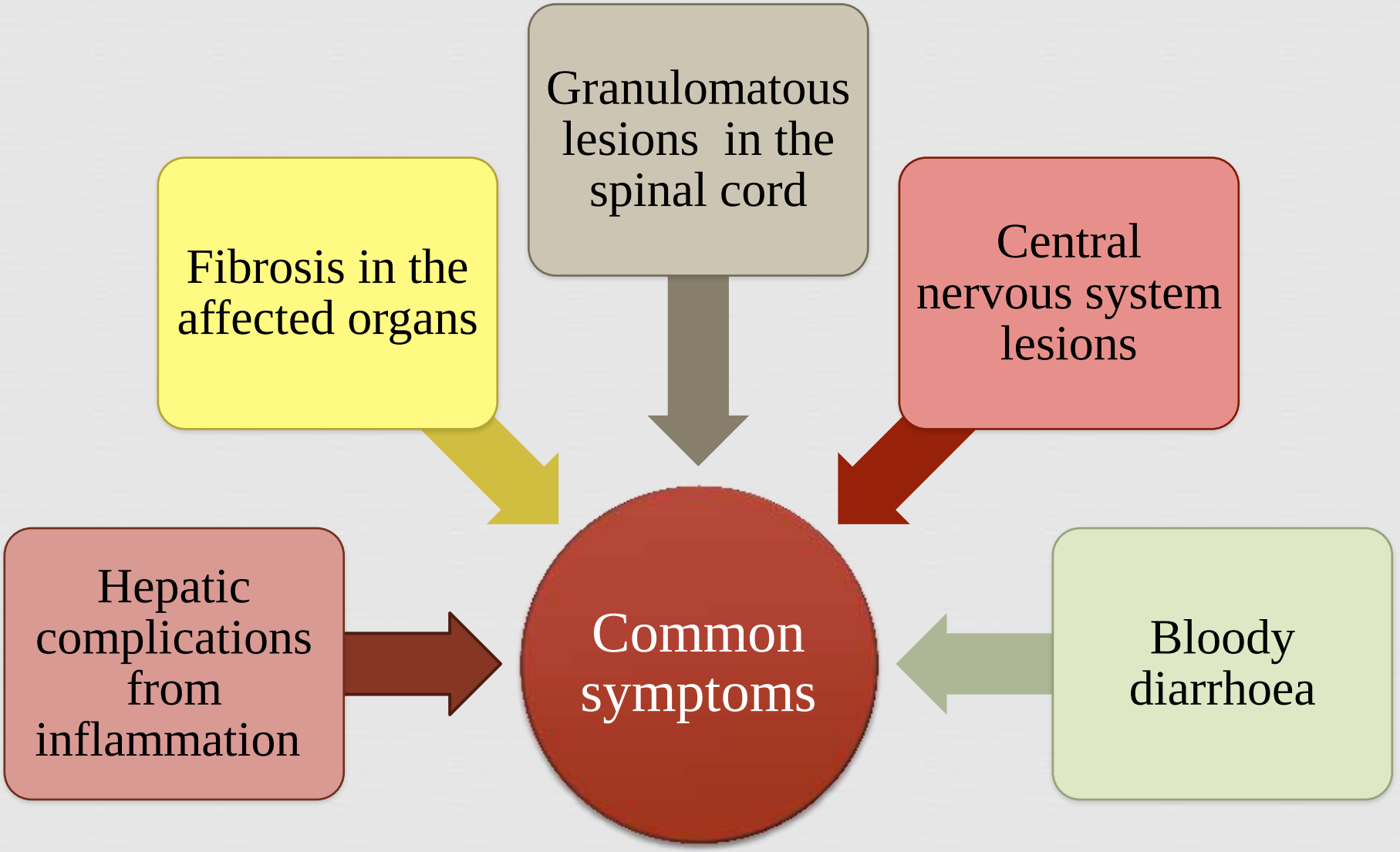
1. Abdominal pain
2. Diarrhea
3. Blood in stool, fresh or melena
4. Hematemesis
5. Liver enlargement

UROGENITAL SCHISTOSOMIASIS

1. Hematuria (terminal)
2. dysuria
3. Frequent need to urinate (polykauria)
4. In females; genital lesions, vaginal bleeding, pain during sexual intercourse and nodules on the vulva, irregular menstruation

	Species	Geographical distribution
Intestinal schistosomiasis	*Schistosoma mansoni*	Africa, the Middle East, the Caribbean, Brazil, Venezuela, Suriname
	Schistosoma japonicum	China, Indonesia, the Philippines
	Schistosoma mekongi	Several districts of Cambodia and the Lao People's Democratic Republic
	Schistosoma guineensis and related *S. intercalatum*	Rain forest areas of central Africa
Urogenital schistosomiasis	*Schistosoma haematobium*	Africa, the Middle East

(WHO, 2013)


Granulomatous lesions in the spinal cord
Fibrosis in the affected organs
Central nervous system lesions
Hepatic complications from inflammation
Common symptoms
Bloody diarrhoea

Migration of the worm in humans and parallel morbidity

The stage of invasion (cercarial dermatitis)

Migration through the lungs (pneumonia)

Egg-laying (acme of acute schistosomiasis)

Pulmonary involvement (nodules, pleural effusion)

Intestinal involvement (diarrhoea)

Skin involvement (papules, nodules, plaques)

Pyogenic liver abscess (staphylococci sepsis)

Neuroschistosomiasis (brain and spinal cord involvement)

Acute over chronic schistosomiasis (re-infection)

Diagnosis

- Detection of parasite eggs in stool or urine specimens.
- Antibodies / antigens detected in blood or urine samples
- For urogenital schistosomiasis, a filtration technique using nylon, paper or polycarbonate filters is the standard diagnostic technique.
- For intestinal schistosomiasis kato-katz technique is used.
- Serological and immunological tests may be useful in showing exposure to infection

Treatment

- Single dose of praziquantel (40 mg/kg), as recommended by the World health organization
- Oxamniquine (40 mg/kg), though now rarely used, is also effective.
- Prednisone (1 mg / 1 kg) is also used.

Prevention and control

- Use of Praziquantel
- Access to safe water
- Snail control
- Hygiene education
- Treatment of at-risk population groups

Paragonimus *westermani*

Presented by;

Dr. Asma

Paragonimus *westermani*

- Paragonimiasis is an infection by a member of the genus Paragonimus, the lung fluke.
- Paragonimus species are the only helminthic parasite that naturally inhabits the lungs as an adult worm.
- Infection is transmitted by eating infected crab or crawfish that is either, raw, partially cooked, pickled, or salted.
- More than 30 species of genus Paragonimus have been reported which infect animals and humans.
- Most common is Paragonimus *westermani*, the oriental lung fluke.

Human infection have been associated with eating raw crayfish on river raft trips in the Midwest.

Paragonimiasis

Parasitic lung infection caused by Lung Flukes of the genus Paragonimus

Eggs of Paragonimus Westermani

It is a food-borne disease that is endemic in Asian, African, North and South American countries

Human Paragonimiasis is usually caused by ingestion of raw or undercooked crustaceans that contain infective metacercariae

In America - P. kellikotti is endemic
1st intermediate hosts - Freshwater snails

2nd intermediate host - Freshwater Crayfish

In Asia and other tropical areas -
P.westermani is endemic
1 st intermediate hosts - Freshwater snails

2nd intermediate hosts - Freshwater crabs

MORPHOLOGY

Paragonimus *westermani* eggs

- Paragonimus *westermani* eggs range from 80 to 120 µm long by 45 to 70 µm wide.
- They are yellow-brown, ovoid or elongate, with a thick shell.
- They are often asymmetrical with one end slightly flattened.
- At the large end, the operculum is clearly visible.
- Opposite (abopercular) end is thickened.
- Eggs are unembryonated when passed in sputum or feces

Cercaria

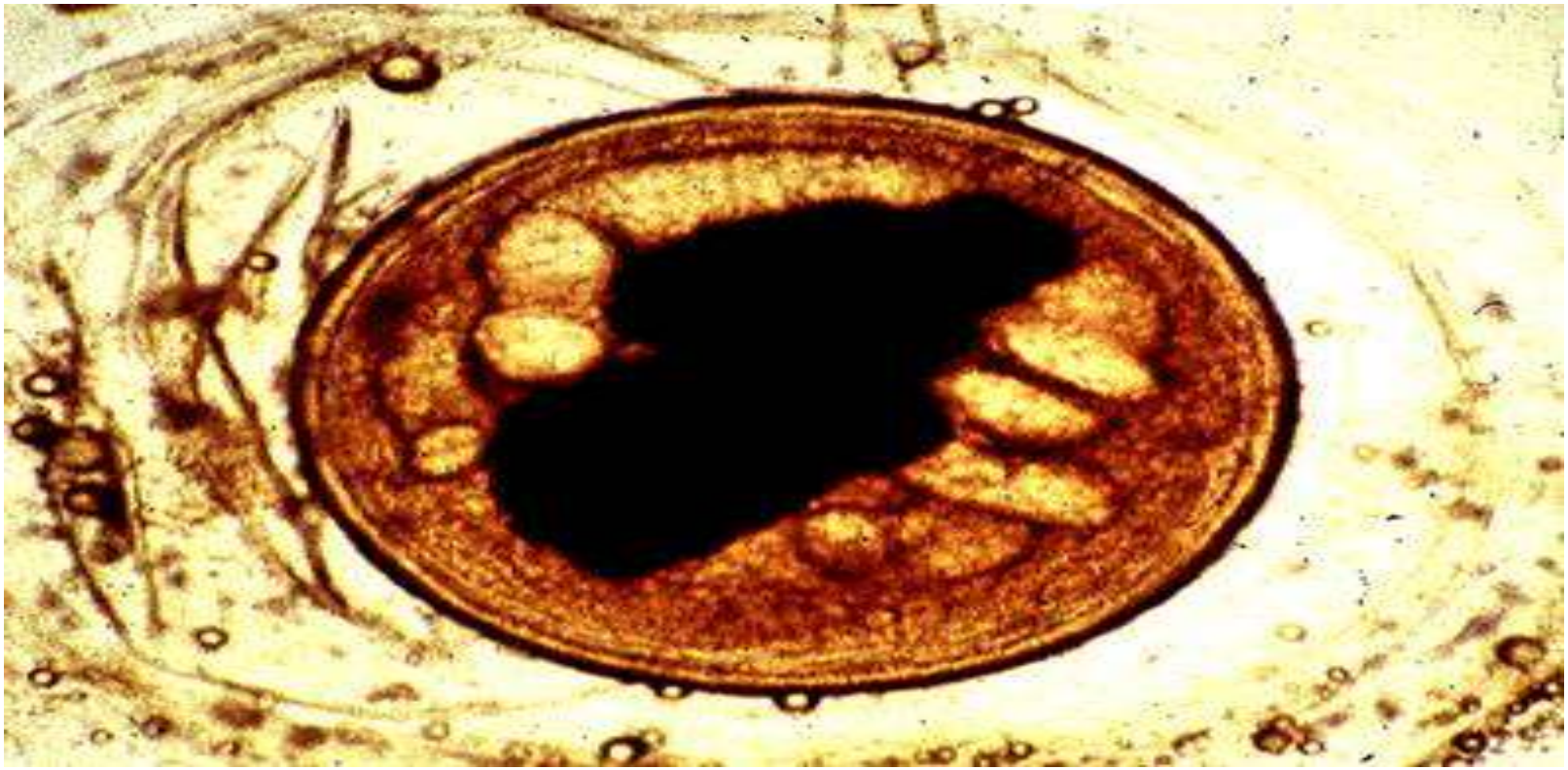
- Cercariae are often indistinguishable between species
- There is a large posterior sucker, and the exterior is spined

Metacercariae

- Metacercariae are usually encysted in tissue.
- The exterior is spined and has two suckers

* Animals such as pigs, dogs, and a variety of feline species can also harbor Paragonimus *westermani*.

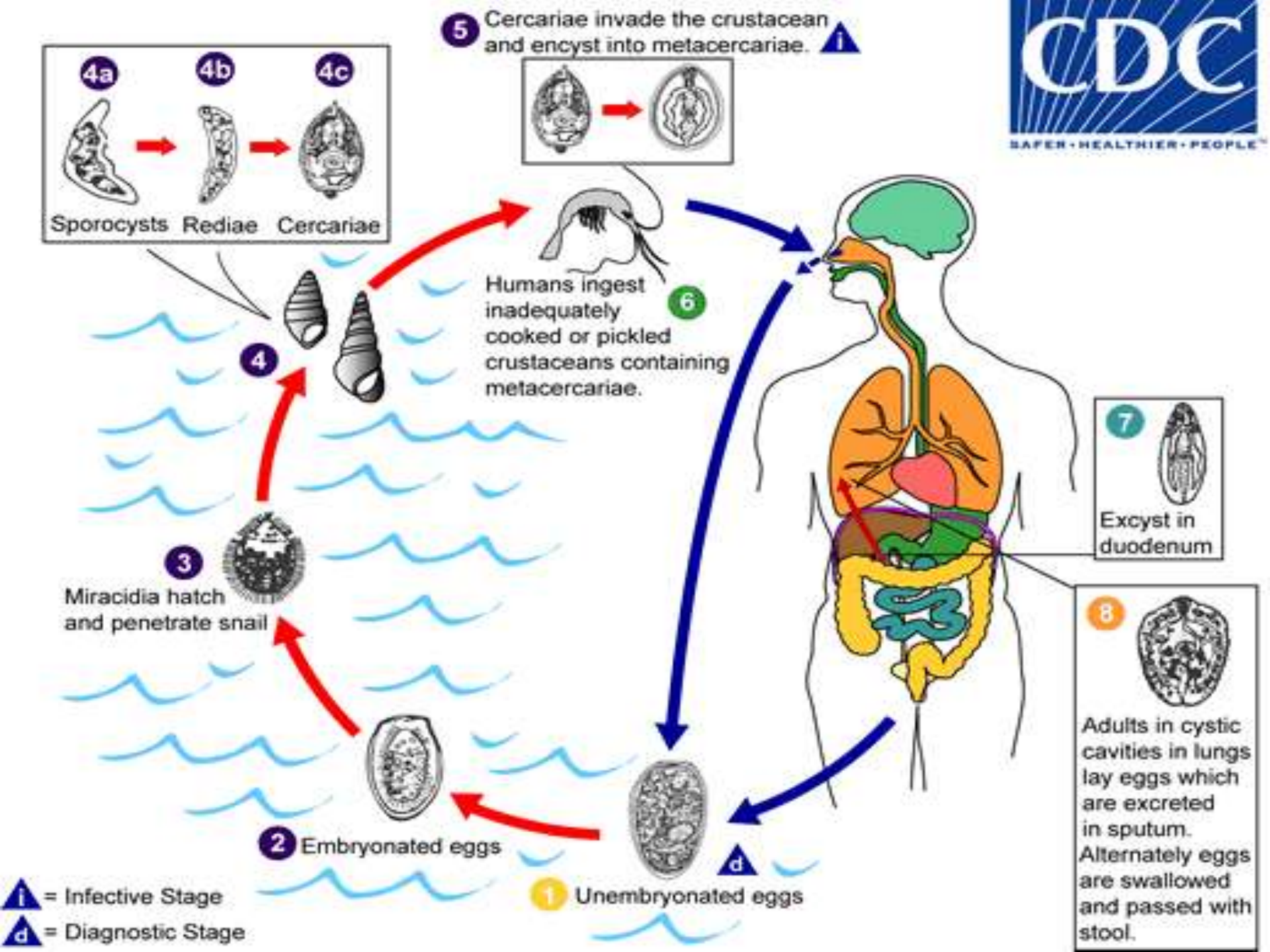
* Infections may persist for 20 years in humans.



Metacercariae of paragonimus *westermani*

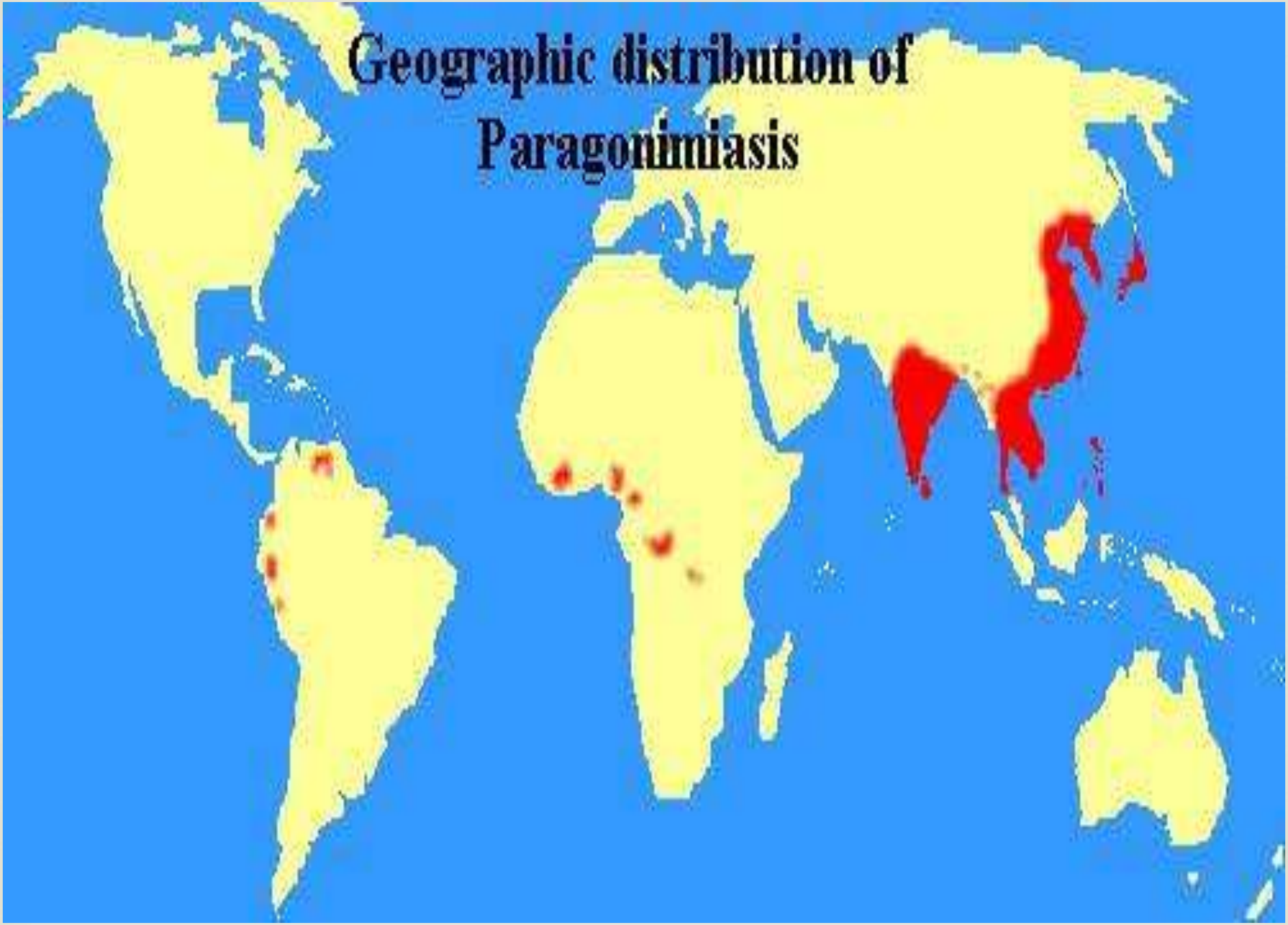
Paragonimus *westermani*

- Adult flukes are typically reddish brown and ovoid.
- They are 7.5 mm to 12 mm long and 4 mm to 6 mm wide.
- Thickness ranges from 3.5 mm to 5 mm.
- Skin of the worm tegument is thickly covered with scalelike spines.
- Oral and ventral suckers are similar in size.


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

EPIDEMIOLOGY

- *Paragonimus westermani* are found throughout eastern, southwestern, and southeast Asia.
- The species has been reported from Pakistan east to south eastern Russia and south to Sumatra, Philippines and possibly Papua New Guinea
- It is more prevalent in China, the Philippines, Japan, Vietnam, South Korea, Taiwan, and Thailand.
- Of the 10 or more *Paragonimus* species that are human pathogens, only 8 cause significant infections in humans.


Geographic distribution of
Paragonimiasis

Paragonimiasis Prevalence

The first case described in humans was at autopsy in Taiwan in 1879.

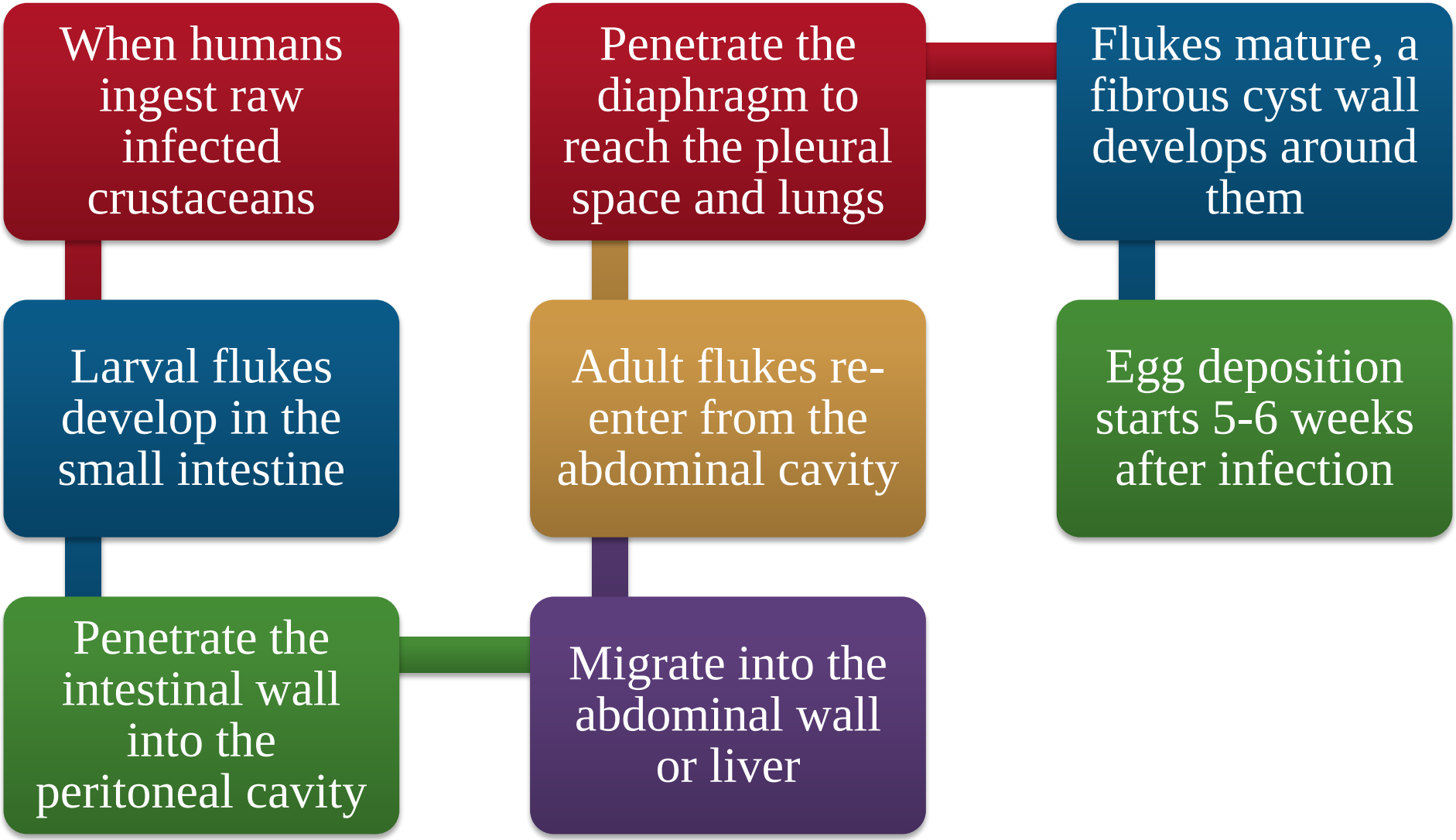
There are more than 22 million people infected globally.

About 200 million people are at risk.

Prevalence of infection in endemic areas ranges from 0.1-23.75%

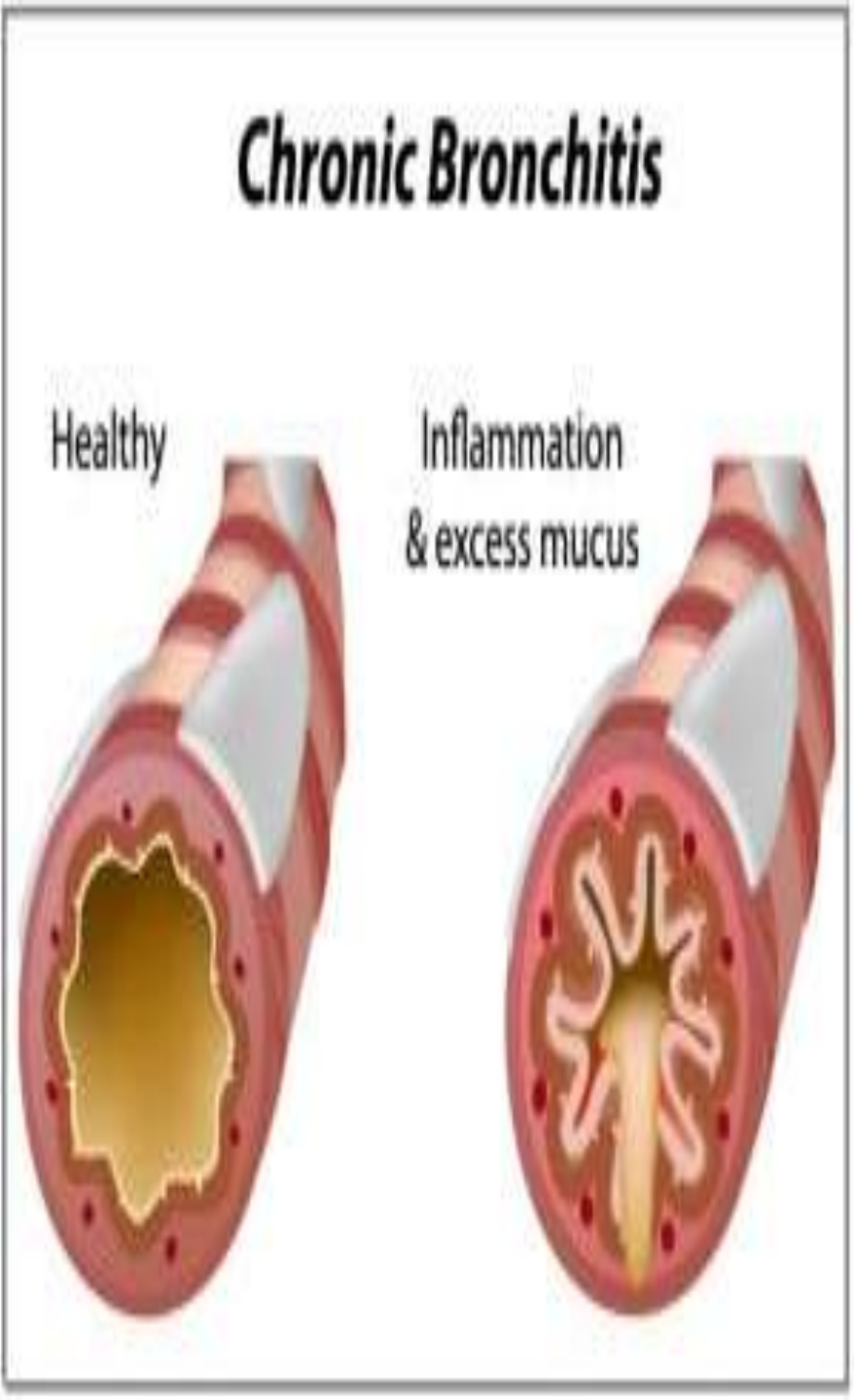
Endemic Paragonimus species have yet to be reported from Europe, Australia, and Antarctica

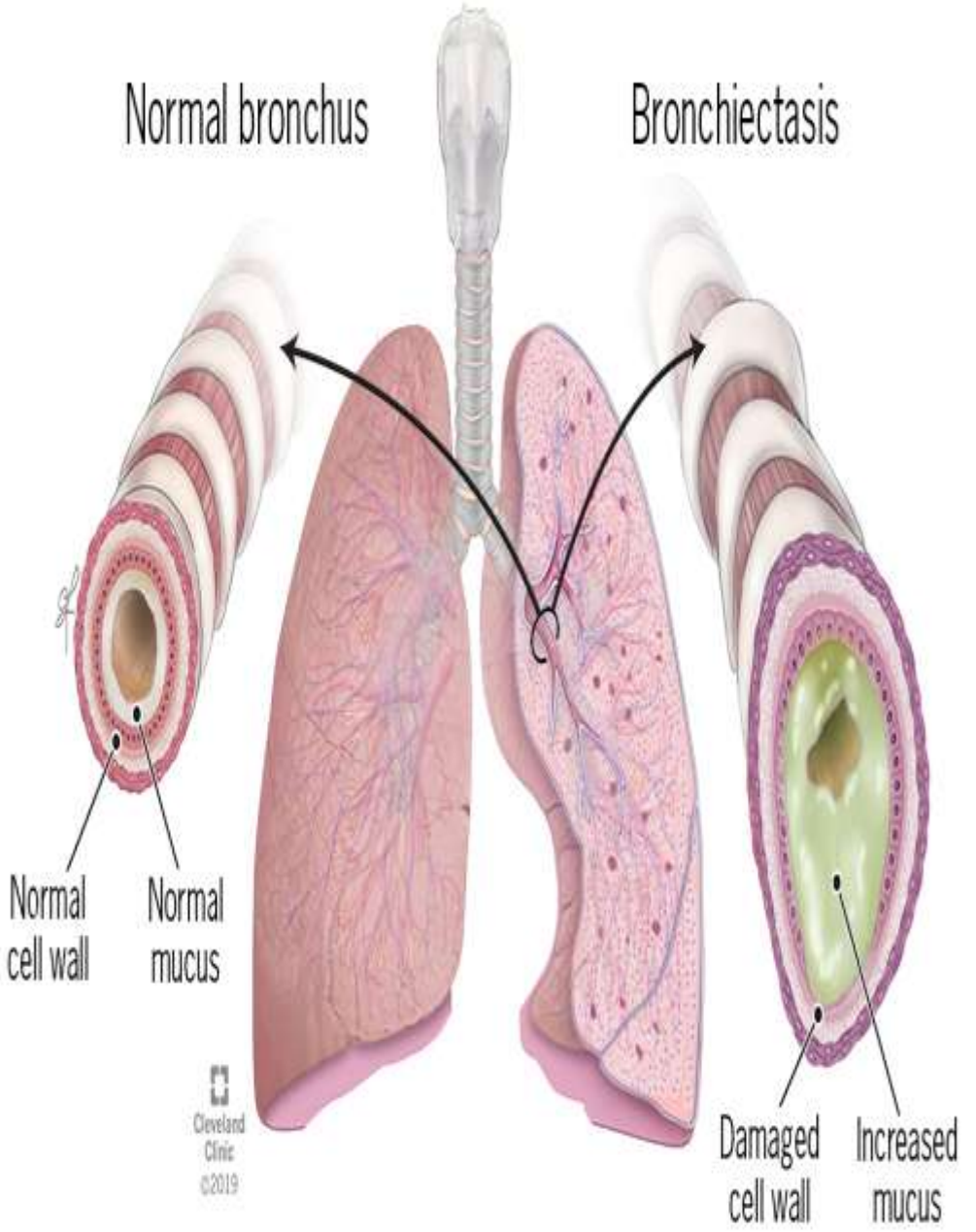
PATHOPHYSIOLOGY



Symptoms

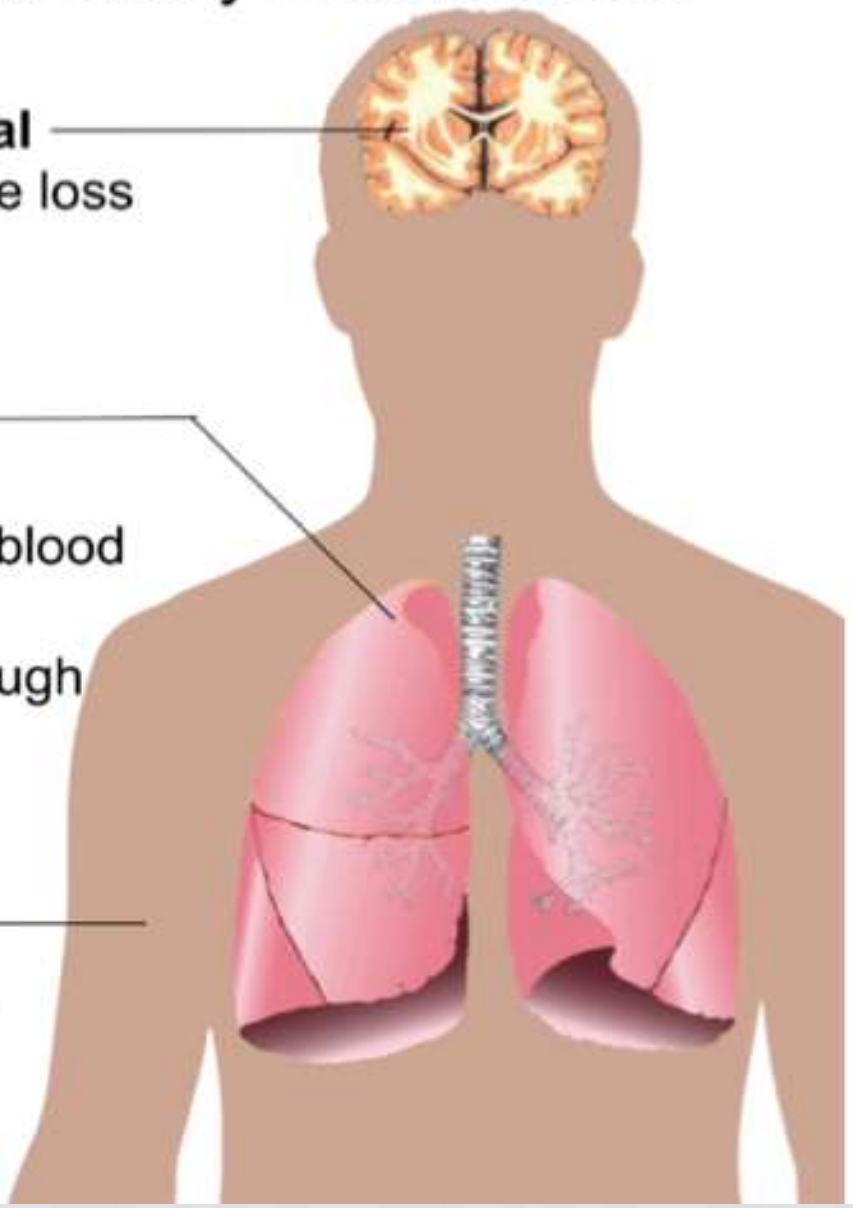
- Chronic bronchitis
- Cerebral paragonimiasis
- Low-grade fever
- Bronchiectiasis
- Cough with sputum
- Plumonary tubercluosis


Chronic Bronchitis
Healthy
Inflammation
& excess mucus


Normal bronchus
Bronchiectasis
Normal
cell wall
Normal
mucus
Cleveland
Clinic
©2019
Damaged
cell wall
Increased
mucus

Main symptoms of

Pulmonary tuberculosis



Central
- appetite loss
- fatigue

Lungs
- chest pain
- coughing up blood
- productive, prolonged cough

Skin
- night sweats,
- pallor

Diagnosis

Identification of *paragonimus* eggs in sputum and stool samples

MRI and

CT scan

Tissue biopsy

Chest X-ray

Thoracentesis

Bronchoscopy

Antibody tests based on

P. Westermani antigens

Serologic tests

Paragonimiasis Treatment

By oral anti-parasite medications

Praziquantel

Surgery

Anti-seizure medications

Triclabendazole

Prevention & Control

- Travelers should be advised to avoid traditional meals
- Cook crabs and crayfish for to at least 145°F (~63°C).
- Never eat raw freshwater crabs or crayfish


Thank
you