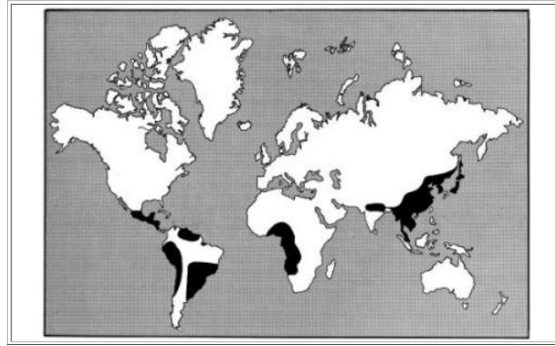


PARAGONIMIASIS

Geographic distribution of *P. westermani* infection



Paragonimus westermani is distributed in southeast Asia and Japan.

Other species of *Paragonimus* are common in parts of Asia, Africa and South and Central America.

It is a potential infection in Sri Lanka as *P. westermani* has been found in various species of wild cats.

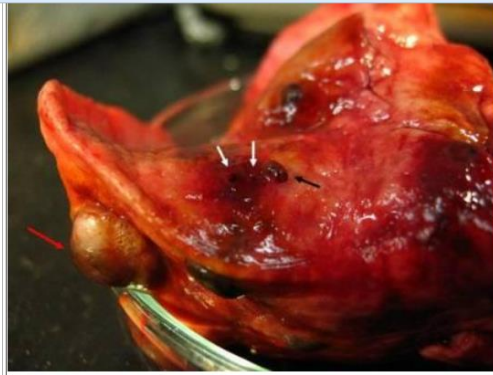
Adult flukes in the lung



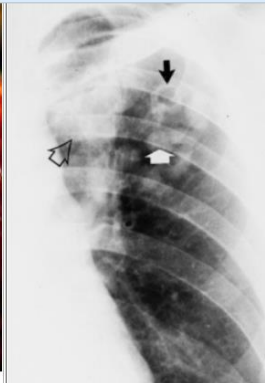
Two worms in a cyst or encapsulated together x100



Worm cysts (Soap bubble appearance)



Hemorrhagic holes in the visceral pleura (white arrows) and adult worms acquired from the holes (black arrows). Bump on the visceral pleura is the subpleural worm cyst (red arrow)



CXR - nodules representing worm cysts (*white arrow*), ring (soap bubble) shadow representing worm cysts with airway communication (*black solid arrow*), and patchy air-space consolidation surrounding worm cysts (*open arrow*)

The flukes lodge near bronchioles, usually encapsulated in pairs, and begin to lay eggs 5 to 6 weeks after infection; the eggs are then discharged in bronchial secretions.

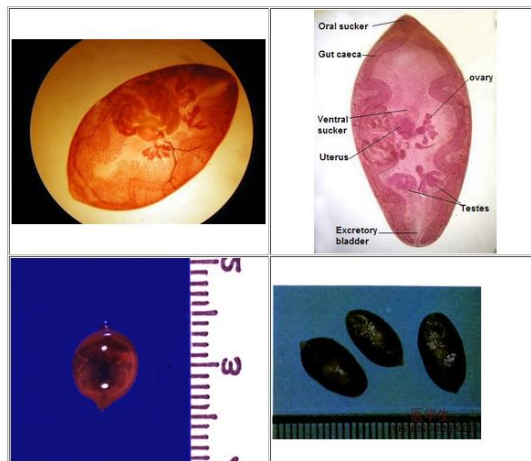
They cause a chronic inflammatory reaction in the lungs.

The flukes produce great quantities of eggs, so that a severely infected person may cough up or pass as many as 13,000 eggs in a single day.

Most adult worms die within 6 years, but some live for 20 years in humans.

Adult worms may also migrate to the brain leading to formation of cerebral abscesses.

Morphology of *Paragonimus westermani* Adults



Size - about 12 mm in length

Shape - oval, coffee bean shaped

Oral sucker - terminal

Ventral sucker - in the middle of the body

Gut caeca - wavy, not branched (simple), and end blindly

Testes - lobed, and lie in side by side in posterior one third of the body

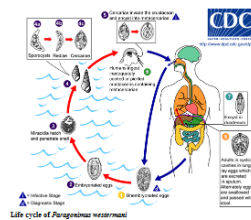
Ovary - lobed, anterior to testes on right side, opposite closely coiled uterus

Vitellaria - extends from anterior to posterior end

Life Cycle of *Paragonimus westermani* (Oriental lung fluke)

Move your mouse over each stage of the life cycle, a brief description will appear in right hand panel.

For more details click the appropriate stage.



The eggs are excreted unembryonated in the sputum or in faeces if swallowed.

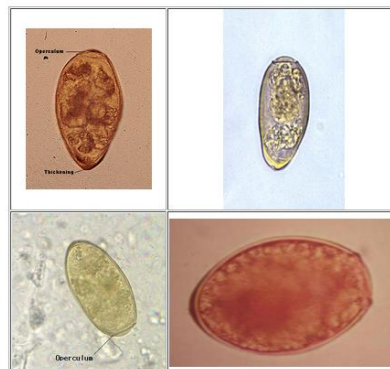
They become embryonated in water and miracidia hatch and enter a suitable snail host.

Miracidia go through several developmental stages inside the snail (sporocysts, rediae, and cercariae) and cercariae emerge from the snail and invade the second intermediate host, a crustacean such as crab or crayfish, and encyst as metacercariae.

Human infection occurs by eating undercooked or pickled crab or crayfish that harbor metacercariae.

The metacercariae encyst in the duodenum, penetrate through the intestinal wall into the peritoneal cavity, then through the abdominal wall and diaphragm into the lungs and develop into adults (7.5 to 12 mm by 4 to 6 mm).

Morphology of *Paragonimus westermani* eggs



Size - 100 µm

Shape - Oval with a slight flattening in one pole

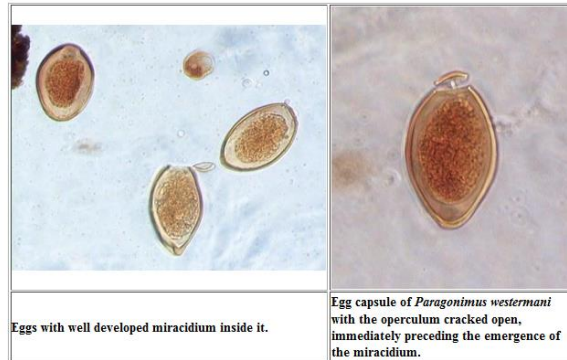
Shell - has a distinct thickening at opposite end to the operculum

Operculum - prominent with an obvious ring

Colour - golden brown

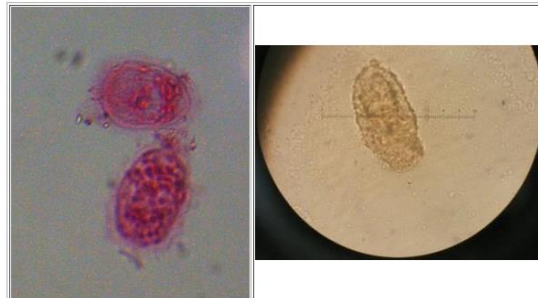
They are unembryonated when passed in sputum or stools, and become embryonated in water.

Embryonated eggs



The miracidium larva hatches out from eggs in about 3 weeks time.

Morphology of the Miracidium



The ciliated larval form that hatches out from the egg.

These miracidia enter the first intermediate host, a snail, undergoes asexual multiplication inside it (sporocyst, redia, cercaria).

Cercariae are released in about 3 months time.

Snail

The First Intermediate Host



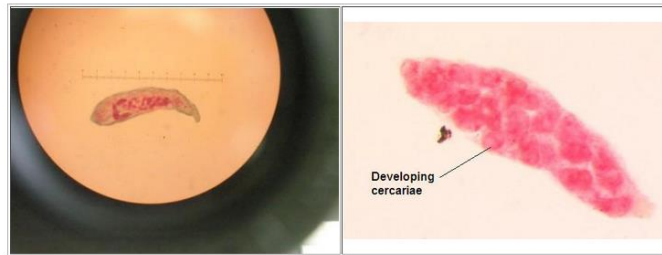
These Snails act as the first intermediate host for *Paragonimus westermani* miracidia.

Morphology of Sporocyst



A stage of asexual multiplication resembling a sac, with developing rediae inside the sac.

Morphology of Redia



A stage of asexual multiplication inside the snail.

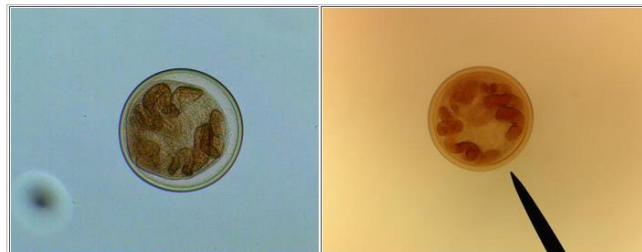
It has a primitive gut and developing cercariae inside the rest of its body.

Morphology of Cercaria



This cercaria will emerge from its snail host, and will "inch" along wet rocks, seeking its crab or crayfish host.

Morphology of Metacercaria







This is the infective stage for the definitive, vertebrate host and is found in a crab or crayfish.

The young fluke inside is well along in its development.

The tail has disappeared, oral and ventral suckers and gut caeca visible inside.

Humans get infected by eating raw crab or crayfish containing metacercariae.

Fresh Water crabs and crayfish

	
Sawagani crab	<i>Cambaroides sinilis</i> , the intermediate host of <i>Paragonimus westermani</i> .
	
Sawagani crabs	Cray fish

Cercariae will encyst on crustaceans such as crab or crayfish to become metacercariae, which is the infective stage for the mammalian host.

Human infection with *P. westermani* occurs by eating inadequately cooked or pickled crab or crayfish that harbor metacercariae of the parasite.

In Asia about 80% of the fresh water crabs are infected with the lung fluke.

Consumption of crabs and crayfish

	
Cray fish salad	Cray fish juice
	
Eating raw crab	Smothered raw crabs - a Korean dish



Eating raw crab



Smothered raw crabs - a Korean dish

Eating raw crab is popular in the Southeast Asian countries and Japan.

In Korea crayfish juice is given as a cure for measles.

The metacercariae exyst in duodenum, penetrate the intestinal wall and enter the abdominal cavity, penetrate the diaphragm to appear in the pleural cavity about 14 days after infection.

Then the young flukes enter the lung, where they mature into adults within several weeks and form parasitic cysts.

Reservoir Hosts



Cats, dogs and other carnivores that feed on crustaceans are the reservoir hosts for *P. westermanni*.