

LIFE CYCLE

Paragonimus westermani passes its life cycle through 3 host —

Definite host \Rightarrow Human.

Intermediate host \Rightarrow SNAIL / CRAB.

The adult worm usually live in an encapsulated form in the lung of man and other definite host. The eggs are expelled with the sputum when the cyst encapsulating the adult worm ruptured into the bronchioles and the eggs are coughed off. The eggs are also eliminated in the ~~faeces~~ faeces when the host swallows the infected sputum. ~~The eggs are get.~~

Eggs \Rightarrow

The eggs are golden brown in colour and ovoid and provided with flattened operculum. They measure $80 \times 50 \mu$ and each contains a fertilized unsegmented ovum surrounded by yolk shells. In moist environment, the eggs develop into miracidia, and after maturation escape out of the egg shell through opercular lid in 2-7 weeks time depending on temperature.

Miracidia \Rightarrow

Under optimum condition hatching occurs after a minimum period of 16 days. The Miracidia are sac

like larva containing a number of germ cells from which will arise future generations of larvae. Each miracidium is more or less fusiform and is covered by ciliated epidermis of relatively few large cells arranged in 4 rows. Eye spots are lacking. The excretory system consists of tubules and a pair of flame cells. The miracidium contains a number of glands, the chief of which is a large apical gland which empties during penetration and is thought to secrete a proteolytic substance which aid in the process. In addition, a pair of so called penetration gland is situated on either side of the apical gland which secrete a mucous substance that appear to help in the attachment to the snail host.

The miracidium are free swimming and live only for few hours. They swim about actively in search of their snail (intermediate host) where further development occurs.

Sporocyst ⇒

After penetrating the snail host and entering into the soft tissues (digestive gland), the miracidium sheds its ciliated coat and develops into a sporocyst, measuring $300-550 \times 30-130 \mu$. Each sporocyst gives rise to approximately 121 first generation redia or mother redia developing from the germ cells within a month after penetration. Each ~~first generation redia~~ contains

Redia ⇒

Each first generation redia contains an oral sucker, a relatively large pharynx and a sac like intestine. Each 1st generation redia gives rise to in turn produces a similar number of 2nd generation redia or daughter redia. These are recognised by smaller size of the pharynx and larger size of the body (800 μ in length) within the broad chamber of 2nd generation redia, 20-30 cercariae are formed.

Cercaria ⇒

The cercaria break off the redia and escapes out of the body of snail at about 78 days after infection. Escaping cercaria are small and microcercous type (possessing small tail). Each cercaria is ovoid, measuring 175-240 x 80 μ and possess a knob like tail, a spinous tegument, a large oral sucker, a small ventral sucker, a well developed stylet arising at the anterior end of the oral sucker, a small gut, flame cells and a large excretory vesicles opening posteriorly and well developed histolytic and cystogenous glands (1-4 in number). The cercaria crawl rather than swimming and once they come in contact with the crustacean (second intermediate host), they penetrate through the soft parts.

Yokogawa (1953) and Noble (1963) reported that crab acquires Paragonimus sp. cercaria

by eating free cercarial or infected snail. The cercarial encyst in the gills and muscle, sometimes liver and heart of the second intermediate host.

A host capsule is formed around the cyst. The process of encystment takes about 6 weeks or more. During encystment, many of the cercaria structures such as stylet, histolytic and cytogenous glands disappear. The encysted cercaria is known as metacercaria or adolesecaria. The metacercaria are actually juvenile replica of adult. They measure 0.5 mm in diameter, possess an oral sucker, a ventral sucker, a convoluted intestinal caecum and a large excretory vesicle.

Infection of the definite host occurs by ingesting flesh of infected crab or cray fish. The metacercaria are released by the action of gastric juice in the duodenum.

Adult ⇒

The young fluke then penetrates through the intestinal wall into the body cavity and enters the pleural cavity in about 4 days and into the lungs in about 14-21 days. Within the lungs, a host capsule is formed around the adult worm. Normally, the worms live in pairs in encapsulated forms but a single individual or many individuals may be present within a single capsule. The worm matures in about 6 weeks and produce eggs. Imprisoned host in the host lung tissue, the parasite are usually long-lined and may persist for 13-14 years.

Sometimes, the worms may not reach lungs and may lodge in liver, brain, spleen, muscles, eyes, intestinal wall and kidney.

Pathogenicity

† Paragonimus westermani causes a serious disease of lung in man and susceptible animals known as paragonimiasis. Although, the lung is the normal site of localization for young parasite, it can enter any organ of the body such as liver, brain and other organs. Thus, the disease may be described broadly in 2 heading. —

- A) Pulmonary paragonimiasis.
- B) Extrapulmonary paragonimiasis.

A) Pulmonary paragonimiasis ⇒

On the lungs of the host, the parasite provides a tissue reaction forming a thick capsule around it. Burrows and tunnels are thus produced by the necrosis of the tissue. The capsule consists of a layer of lymphocyte infiltration surrounded by a broad layer of fibrous tissue. Besides the parasite the cyst contains a brown exudate in which the eggs of the parasite and Charcot-Leyden crystals are found. The brown material forms the characteristic sputum of pulmonary paragonimiasis.

The symptoms include chronic cough, difficulty in breathing, mild anaemia and slight fever. Fatal cases of Paragonimiasis are known.

especially if the human host is infected with large number of parasite. Secondary infection may occur resulting in bronchopneumonia and formation of abscess. Discovery of eggs in the sputum is probably the most reliable diagnostic sign.

B) Extrapulmonary paragonimiasis ⇒

Clinical manifestation of extrapulmonary paragonimiasis depends on the organs involved. In case of the abdominal organs, the symptoms include pain in the abdomen, diarrhoea and enlargement of the liver. In cerebral infection Jacksonian type of epilepsy and other symptoms characteristic of brain tumor develop and may even terminate fatally. The pathological lesions in the brain are limited to the temporal and occipital lobe.

Prophylaxis ⇒

- 1) Preventing the consumption of raw, freshly salted or inadequately cooked crabs or cray fishes as food.
- 2) Care must be taken to avoid contamination of utensil etc. during culinary operations of the crabs.
- 3) Control of molluscan host.