## How to diagnose paramphistomosis in animals?

Diagnosis relies on a combination of post mortem findings, history of the outbreak, clinical signs observed in the animal, and response to drenching. Faecal sample examination can be done to find out the presence of amphistome eggs which indicate the presence of adult flukes. Amphistome eggs are large than those of *Fasciola* eggs with transparent shells and distinct opercula (Fig. 4). Exception is *Gigantocotyle explanatum* eggs which are yellowish like those of *Fasciola* eggs. The embryonic cells are distinct and clear with a small knob like thickening at the broader end. Diagnosis can also be done by identifying the parasite in the intestine or rumen of the affected animal at post-mortem.

## What are the treatment strategies?

**Treatment of adult flukes:**

Although treatment for adult fluke has no direct benefit to the animal, it may reduce the source of infection for the snail intermediate host. This then reduces the load of the next generation of infective fluke larvae on pasture. Oxyclozanide is effective against both immature and mature rumen flukes.

**Treatment of immature flukes**

Effective treatment of immature fluke infection requires the combination of following measures:

1. Removal of stock from the source of infection, usually swampy land.
2. Treatment with a drench which is effective against immature fluke:
   a. Oxyclozanide @ 18.7 mg/kg two days apart (two doses) give consistent result against
      immature amphistomes in cattle.
   b. Hexachlorophene @20 mg/kg as single dose.
   c. Niclosamide @ 160 mg/kg single dose or two doses at 3 days apart is effective in cattle.
   d. Niclsoamide @ 100 mg/kg, effective against immature amphistomes in sheep.
3. Resorantel, combination of bithional and levamisole.
4. Supportive therapy to treat dehydration and secondary bacterial infection.

However any treatment should be given under the supervision of a qualified veterinarian.

## What are the control measures?

1. Remove animals from infected pasture during outbreak.
2. Metacercariae may persist on pasture for 2 or 3 months after flood water has dried out and susceptible animals should be kept away during the period of risk.
3. Destruction of snails (Copper sulphate @22.5kg/ha or Copper pentachlorophenate @11.2kg/ha), filling up of small pools and pits with sand, filtering of water in irrigation channels to strain snails and their eggs.
4. Treatment between the seasonal peaks.
5. Drainage and fencing of affected areas.
6. Processing of the fodder-
   - If the fodder is collecting from the water stagnant field, the portion of the fodder which is well above the water level should be used for feeding animals
   - The fodder portion which is immersed in water can be fed to the animals after converting it into hay by exposing them to sunlight for one week since metacercariae cannot withstand above 28ºC
   - Preparation of silage from fodder collected from marshy land can be practiced since metacercariae cannot withstand the heat generated in the silo pit.

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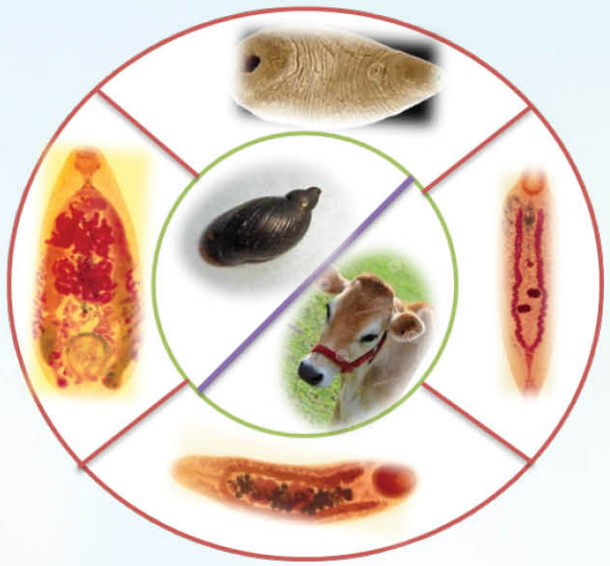
# PARAMPHISTOMOSIS IN RUMINANTS

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## Introduction:

Paramphistomosis is one of the most economically important parasitic diseases of ruminants in India. The disease is caused by several species of amphistomes commonly known as stomach or rumen flukes because of the localization of these flukes in the stomach of ruminants. Snails belonging to genera *Bulinus*, *Indoplanorbis, Gyraulus* and *Radix* (*Lymnaea)* have been incriminated as intermediate hosts which are essential for completion of its life cycle (Swarnakar *et al*., 2014,Hassan et al., 2005). In ruminants, paramphistomosis has been found to be associated with diarrhoea, loss of body condition, rough hair coat, dullness, weakness, loss of appetite, intestinal haemorrhages, anaemia, reduced milk production and intermandibular swelling (Kumar and Kumar, 2013). The adult fluke that lives in rumen and reticulum of ruminants does not cause serious problem, but massive number of immature amphistomes can migrate through intestinal tract causing acute gastroenteritis in the small intestine with high morbidity and mortality rate especially in young animals.

## What are the morphological characteristics of these flukes?

The adult parasites are usually pear-shaped with thick fleshy body usually pink or red in color. The adult fluke may be up to 15 mm long with a large posterior sucker and commonly found attached to the lining of the rumen (first chamber of the ruminant stomach) (Fig. 1). The dorsal surface is convex and the ventral surface is concave. Oral sucker is situated at the anterior extremity. Immature flukes are found in the duodenum and are usually 1-3 mm long.

*Fig. 1: Paramphistomes attached in the rumen*

## What are common species of flukes causing paramphistomosis?

The most prevalent species of amphistomes in India include *Paramphistomum cervi*, *Gastrothylax cruminifer*, *Fischoederius elongatus*, *F. cobboldi*, *Cotylophoron cotylophorum* and *Gigantocotyle explanatum* (Varma et al., 1989). The common amphistomes of ruminants along with their location in the definitive hosts and their respective intermediate hosts are depicted in Table 1. Among these species, *P. cervi* is the most pathogenic and is the most prevalent species found in ruminants. These flukes are present commonly in the rumen and reticulum of ruminants like cattle, buffalo, sheep and goat except *G. explanatum* which is usually present in the bile duct of buffaloes (Fig.2)

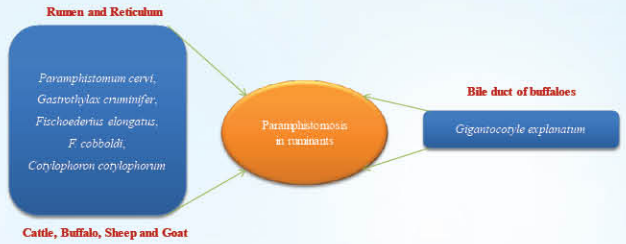


*Fig. 2: Paramphistomes prevalent in India*

| Sl. No | Paramphistomes | Location | Definitive hosts | Snail intermediate host |
|---|---|---|---|---|
| 1 | *Paramphistomum* spp. | Rumen and reticulum | Sheep, Goat, Cattle, Buffalo | *Indopalnorbis* spp., *Gyraulus* spp. |
| 2 | *Gigantocotyle explanatum* | Bile ducts, gall bladder and duodenum | Buffaloes, Cattle, Sheep, Goat | *Gyraulus spp., Indopalnorbis* spp. |
| 3 | *Cotylophoron* spp. | Rumen and reticulum | Sheep, Goat, Cattle, Buffalo | *Indopalnorbis* spp. |
| 4 | *Gastrothylax crumenifer* | Rumen and reticulum | Cattle, Buffalo, Sheep, Goat | *Gyraulus* spp. |
| 5 | *Fischoederius elongatus, F. cobboldi* | Rumen and reticulum | Cattle, Buffalo, Sheep, Goat | *Lymnaea* spp. |

*Table 1: Paramphistomes of ruminants in India*

## How the susceptible animals are getting infection?

Susceptible animals include cattle, buffaloes, sheep, goats, other domestic and wild ruminants. General life cycle of the rumen fluke is depicted in Fig.3. Briefly eggs are passed in the faeces of the definitive hosts. Eggs complete their development and hatch in the water at the optimal temperature of 27°C in 12 to 17 days. Upon coming in contact with the soft parts of the snail host, the miracidia attach and quickly burrow through the epidermis and into the underlying tissues. Young snails are more susceptible than older ones. After penetration, miracidium will form sporocyst, redia and cercaria. Cercaria will emerge out from the snail and will encyst on herbages as metacercaria which is the infective stage to the animals. Ingestion of massive doses of metacercariae, while grazing in an inundated, low lying area particularly after rainy season causes the disease. Upon being swallowed along with forage, excystment of the metacercariaea occurs in the duodenum and jejenum. The young flukes attach to the mucosal lining and burrow into it, migrating forward. In the abomasum, they return to the lumen and travel forward through the oesophageal groove, passing through the omasum and reticulum to the rumen where they attach among the villi. Excysted flukes in the small intestine often wander into the bile and pancreatic ducts. In the rumen, the flukes attain maturity and eggs appear in the faeces 60-120 days after infection of the host.

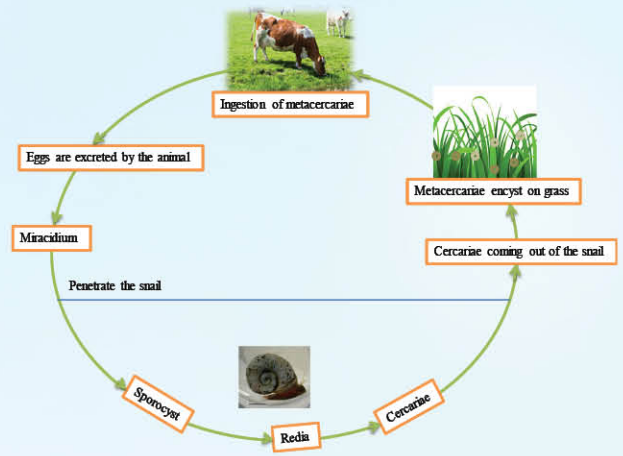


*Fig. 3: Life cycle of Paramphistomes*

## What are the key clinical signs in affected animals?

Adult flukes do not cause overt disease and large numbers of flukes may be encountered in these animals. Clinical disease due to immature amphistomes results from massive invasion of mucosa of duodenum following heavy intake of the metacercariae especially after rainy season. The immature flukes attach to the duodenal and, at times, the ileal mucosa drawing plugs of mucosa by means of their large posterior sucker and cause severe enteritis, possibly necrosis and hemorrhage. During the migration of young flukes in the small intestine, there is severe watery and foetid diarrhea which often accompanied by mortality of 80-90% of the infected animals. Also young flukes in the bile and pancreatic ducts cause marked thickening of the mucosa. Affected animals exhibit anorexia, polydipsia, loss of weight, submaxillary oedema, unthriftiness and severe diarrhea. The animals may be thirsty and may drink frequently. With the advancement of diarrhea, the animal generally shows symptoms of anaemia with pale mucous membrane. Extensive mortality may occur, especially in young animals. Older animals can develop resistance to reinfection but may continue to harbor numerous adult flukes.

Paramphistome egg *Fasciola egg*

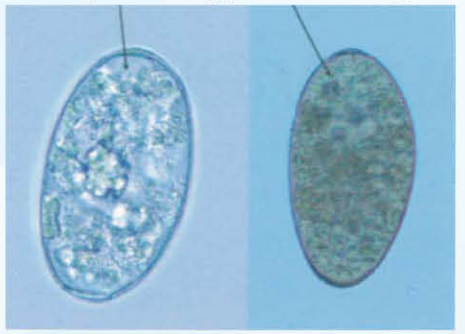

*Fig. 4: Comparison of Paramphistome egg and Fasciola egg*