Lecture No.20 PARASITOLOGY DR.Raad H.H.

 **Family Paramphistomidae**

1. The **Ventral sucker posterior-terminal or posterior-subterminal**.
2. Called "**amphistomes** "because **acetabulum** is large and found near **posterior** **end** of the body.
3. Inhabitas Rumen and Reticulum .
4. Oral sucker absent.
5. Intestine is forked and **unbranched**.
6. Eggs are large.

 **Genus Paramphistomum**

 Name is derived from the Greek ‘amphistomos’ meaning having a double mouth ; Called also stomach fluke disease.

***P****.* ***cervi*** important parasites of cattle, sheep, goats and buffalo.



***Paramphistomum cervi* (family: Paramphistomidae)**

1. **Cosmopolitan in distribution**
2. **Adults in rumen of domestic animals, pinkish in color**
3. **Pathogenic; in large numbers can cause intestinal ulceration and death; secondary bacterial infections**
4. **life-cycle**
	1. **adults in rumen**
	2. **eggs out with feces**
	3. **mature in water**
	4. **miricidium hatches; penetrates multiple genera of snail hosts**
	5. **one sporocyst and two redial generations**
	6. **cercariae encyst on aquatic vegetation**
	7. **eaten by herbivore**
	8. **excyst in duodenum; penetrate gut; migrate through tissues to abomasum**
	9. **enter lumen and migrate anteriorly to rumen**
	10. **mature in 2-4 months**

**life cycle details :**

The life cycle of these parasites is similar to that of Fasciola hepatica in that they **require** two hosts to complete their life cycle; a **mammalian** definitive host and a **snail intermediate** **host**. Infected animals excrete **eggs** in the **faeces**. The eggs develop and **hatch** under suitable conditions (temperature and moisture) when the eggs have been freed from the faecal mass . The newly hatched **miracidia** find a suitable intermediate **aquatic snail** host belonging to the families **Lymnaeidiae** and **Planorbis**, **Bulins** , **Cleopatra** and **Lymnaea** .the intermediate host for F. hepatica appears not to be an intermediate host of P. cervi. Infected snails can live and shed cercariae for up to **one year** .After emerging from the snail, **cercariae** **encysted** form **metaceraciae** on the ventral surface of sub-aquatic plants where they can remain viable for up six months . The **final host ingests** the encysted **metacercaria** on the herbage. **Excystement** occurs in the **small intestine** and the newly hatched **juvenile** flukes attach to the **mucosa** in the first three-to-six months of the small intestine where they grow rapidly before **migrating** to the **rumen** after about three-six weeks. In the rumen the paramphistomes attach to their predilection sites on the dorsal surface of the anterior **ruminal** **pillar**, and dorsal and ventral aspects of the posterior ruminal pillar. Here they continue to grow to reach their maximum size five-to-nine months after infection.

**Epidemiology:**

**Rains**, results in the **dispersal** of **snails** from permanent water masses, such as lakes and ponds. Paramphistome **eggs**, deposited in these areas by grazing animals, **hatch** and infect the snails. **Out** **breaks** of disease **generally** occur **in** the **drier** **months** of the year when the receding water **uncovers** herbage contaminated with **encysted** **metacercariae** in these areas. **Previous** **infection** and the **age** of the host animal **afford** some **protection** against reinfection. **Acute disease is usually seen in young cattle less than two years of age.** **Older** (adult) animals often **continue** to **harbour** **low burdens** of adult **parasites** and are therefore important reservoirs of infection for snails . **Sheep** appear **susceptible** **throughout** their **lives** and multiple infections only result in partial immunity to reinfection.

**Pathogenesis & Pathogenesis & Clinical Disease:**

**Acute** paraphistomosis is caused by massive infection with **immature** worms in the small intestine. They **attach** them selves to the intestinal **mucosa**, drawing pieces of the mucosa into the **suckers** causing **strangulation**, **necrosis** and **haemorrhage**. Acute paramphistomosis usually **occurs in young cattle less than two years** of age and is characterised by listlessness and anorexia. **Profuse diarrhoea** (which can sometimes be projectile) develops two-four weeks after infection. The **faeces** are very **fluid** and may even contain immature flukes. **Sub-mandibular oedema** has been noted in several outbreaks and **anaemia** has also frequently been described. The association between the presence of adult flukes in the rumen and clinical disease has not been well established, although the presence of the parasite is often complicated by othe rconcomitant conditions (associated with animals in poor condition, suffering from ill thrift and concomitant with other parasitic diseases). It is generally believed that paramphisomes do not cause disease in animals in Ireland but cases of acute larval paramphistomosis have recently been reported in both sheep and cattle.

**Diagnosis**

**history** and **clinical signs** of disease (anorexia, polydipsia and projectilediarrhoea) and the presence immature paramphistomes in the fluid faeces **or** at **post mortem** examination. **Faecal examination for eggs at this stage is usually unrewarding as the disease is in the prepatent phase.** **Immature** flukes are **conical**, **pink** in colour and **1-5 mm** long. The **faecal sedimentation technique** commonly used for Fasciola diagnoses is the most **accurate** to indentify eggs in faeces. The **eggs** are **oval** and operculate, resembling that of F. hepatica; however, they are slightly larger and clear (**transparent**) rather than **yellow** in colour The addition of a **contrast** **stain** such as **methylene** **blue** may help to differentiate these two species of eggs. The **adult** flukes are **pear-shaped and red in colour, approximately 1cm long with a sucker at the tip of the cone and another sucker ventrally at the posterior-end.**

**Effective anthelmintic treatments in cattle are albendazole at 15 mg/kg in a single dose or 2 doses of 7.5 mg/kg on successive days, or netobimin at 20 mg/kg**

 **Genus Cotylophoron**

***Cotylophoron******cotylophorum*** has a wide distribution in cattle, sheep and goats of India.

 **Genus Carmyerius**

a genus of rumen (digenetic trematode) fluke found in Asia; member of the family Paramphistomatidae. Includes ***Carmyerius gregarius*, *C. spatiosus*** (small rumen flukes of Asia).

 **Genus Gastrodiscus**

***G****.* ***aegyptiacus*** — found in the intestines of horse, pig and wart hog.

 **Family Echinostomatidae**

1. **Head with a collar armed with thick spines**.
2. **Adults** often, but not always, with **spines** or scaled tegument (especially anteriorly) .
3. Many species **elongate Acetabulum** usually very **anterior** in location.
4. Tend to be **relatively non-host specific in semi-aquatic vertebrates (multiple species in humans too)**
5. Many species confused with one another in the literature.
6. **27-51 circumoral collar of spines, depending upon species**
7. **life-cycle**
	1. **adults in gut**
	2. **eggs passed in feces**
	3. **hatch; miricidia penetrate snails 1st. Lymenia or physa**
	4. **cercariae penetrate in 2nd. Snail Melania or Vivipara or Frog tadepole**
	5. **for instance, sporocyst; two redia**
	6. **metacercariae in molluscs, planaria, fish, tadpoles, etc. eaten by definitive host**
8. **typical species**

***Echinostoma revolutum* (37 collar spined; in lymnaeid snails; mammals and birds; Europe and Asia)**

**Morphology &life cycle :**

This flatworm can grow around **3mm** (1 ½ in) or smaller in length. They tend to have a **yellow-orange** coloration to them, but they can also have a pinkish tone. Flukes can adapt to different hosts, such as **ducks**, **geese**, **pigeons**, **chickens**, and **humans** . They have been found also in **snails** **and** frogs.

**Clinical Sings :**

Mild and when heavy cause bloody diarrhea mostly in young ages lead to death.

**Family Heterophyidae**

* 1. **cercariae with two eyespots**
	2. **acetabulum in adult body midventral**
	3. **adult body with spines**
	4. **cercariae encyst in second intermediate host**
	5. **cercarial tail not furcate**
	6. **primary finfold present on cercarial tail**
	7. **eggs very small, usually less than 40 micrometers**
	8. **eggs hatch in molluscan host after ingestion**

***Heterophyes heterophyes* (Egyptian intestinal fluke )**

1. Pyriform shape with 3 suckers ( oral , Acetabulum & genital ).
2. Definitive host: Human ; cats ; dogs & foxes .
3. 1st.Intermediate host *:Pirenella conica* ( snail ) in Egypt .
4. 2nd Intermediate host Mugil , fresh water fish .
5. Serious infection lead worm to penetration of mucosa that able eggs to enter mesenteric venules or lymphatic’s & reach heart , brain & spinal cord causing Granulomatous reactions & lesions ; “ Heterophyeid Myocarditis “ lead to fatalities sometimes .

 **FAMILY Schistosomatidae** **( Blood flukes)**

1. **Mature in blood vascular system .**
2. **One intermediate host; cercariae enter final host directly with encystation .**
3. **Most species dioecious, but with some exceptions .**

***Schistosoma* , other spp. and genera of family Schistosomatidae**

1. **Elongate bodies 10mm. male (small); 20mm. female (large)**
2. **Gynecophoral Canal (In Male )**
3. **In birds (many genera); mammals (3 genera)**
4. **Snails intermediate host.**
5. **Eggs non-operculate**
6. **Live in blood vessels, especially mesenteric blood vessels**
7. **Genus *Schistosoma* spp. (in mammals; 4 groups)**
	1. ***Schistosoma haematobium* group**
		1. **7 Species**
		2. **Most use *Bulinus* snails**
		3. **Indigenous to Africa and adjacent regions**
		4. **Most with terminal** **posterior spine on egg**
		5. ***S. haematobium, S. intercalatum, S. mattheei* in primates. Available evidence suggests that *S. haematobium* can cause urinary bladder carcinoma**
		6. ***S. mattheei, S. bovis, S. curassoni, S. margrebowiei, S. leiperi* in artiodactyla (**The even-toed ungulatesThe even-toed ungulates : camels ruminants **)**
		7. ***Schistosoma bovis*** :A [species](http://www.mondofacto.com/facts/dictionary?species) infecting [cattle](http://www.mondofacto.com/facts/dictionary?cattle), [buffalo](http://www.mondofacto.com/facts/dictionary?buffalo), [sheep](http://www.mondofacto.com/facts/dictionary?sheep), [goats](http://www.mondofacto.com/facts/dictionary?goats), and [wild](http://www.mondofacto.com/facts/dictionary?wild) [ruminants](http://www.mondofacto.com/facts/dictionary?ruminants) in Africa, the [Middle East](http://www.mondofacto.com/facts/dictionary?Middle+East), [southern](http://www.mondofacto.com/facts/dictionary?southern) Europe, and [Asia](http://www.mondofacto.com/facts/dictionary?Asia); characterised by [long](http://www.mondofacto.com/facts/dictionary?long) [spindle-shaped](http://www.mondofacto.com/facts/dictionary?spindle-shaped) [eggs](http://www.mondofacto.com/facts/dictionary?eggs) with a [terminal](http://www.mondofacto.com/facts/dictionary?terminal) [spine](http://www.mondofacto.com/facts/dictionary?spine).

Cattle infected with ***S. bovis*** develop a syndrome characterized by weight loss, poor weight gain, **diarrhea**, loss of appetite, roughness of the skin, and pale mucous membranes.

At necropsy, the presence of adult worms of the parasite in the **mesenteric vessels .** Parasitological **diagnosis** by finding eggs in a **fecal sample** or **biopsy** specimen will remain the only definitive diagnostic method for detection of an active ***S. bovis*** infection in a living individual.

***Schistosoma nasalis*** Is responsible **for nasal** **schistosomiasis** or Snoring **disease** in **cattle**, sheep and goats. The adult worms are found **in the veins of** nasal mucosa

* 1. ***Schistosoma mansoni* group**
		1. **4 Species**
		2. **Most used *Biophalaria* snails**
		3. **Indigenous to Africa; introduced to the Caribbean and south America**
		4. **Most with large, sublateral spine of egg**
		5. ***S. mansoni* in primates and rodents**
		6. ***S. rodhaini* in carnivores and rodents**
		7. ***S. edwardiense, S. hippopotami* in artiodactyla**
	2. ***Schistosoma indicum* group**
		1. **4 Species**
		2. **Most species use *Indoplanorbis* snails**
		3. **Indigenous to Asian countries**
		4. **Most species have egg with terminal spine**
		5. ***S. indicum, S. spindale, S. nasale* in artiodactyla**
		6. ***S. incognitum* in rodents, carnivores, and artiodactyla**
	3. ***Schistosoma japonicum* group**
		1. **4 Species**
		2. **Variety Of Snails**
		3. **Indigenous to Asian countries**
		4. **Most eggs spherical or subspherical, with small spine**
		5. ***S. japonicum* in primates, rodents, and carnivores. Evidence suggests that this parasite may cause hepatic carcinoma.**
		6. ***S. mekongi* in primates and carnivores**
		7. ***S. sinensium, S. malayensis* in rodents**
1. **life-cycle of *Schistosoma* spp.**
	1. **No redia**
	2. **Adults in veins in visceral region; females inch down into venioles to release eggs**
	3. **Eggs trapped in capillaries; granuloma; out with feces or urine or remain trapped**
	4. **Embryonate en route**
	5. **Hatch**
	6. **Miricidium penetrates snail**
	7. **Two Sporocyst generations**
	8. **Furcocercous cercariae released**
	9. **Penetrate skin of definitive host**
	10. **Schistosomule migrates; blood vessels; heart; liver**
	11. **Matures in about three weeks**
	12. **Migrate down veins to sites of infection; en route males and females pair**

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1. **pathology and immunology**
	1. **Adults Evade imune system by coating themselves with host proteins**
	2. **Adults cause little damage**
	3. **Most Pathology associated with eggs; many carried to exotic sites**
	4. **Delayed Type Hypersensitivity around egg granulomas; leaking antigens; eosinophilia; neutrophilia**
	5. **Blood Vessel Occlusion; fibrosis; bloody diarrhea; bloody urine; edema; ascites; cirrhosis**
2. **A Few reports have suggested that the pharaoh Akhenaton may have had *Schistosoma haematobium***
3. **Some historical reports have suggested that Napoleon Bonaparte, who had chronic dysuria, may have acquired *Schistosoma haematobium* during his Egyptian campaign of 1798.**
4. **Other genera and species of Schistosomatidae**
	1. ***Schistosomatium douthitti***
		1. **Rodents And Lagomorphs in far north America**
		2. **Hepatic portal system**
	2. ***Heterobilharzia americanum***
		1. **Medium sized mammals; carnivores; in North America**
		2. **in raccoons**
	3. ***Gigantobilharzia, Bilharziella, Trichobilharzia, Microbilharzia*, etc.**
		1. **Birds**
		2. **Many cause "Swimmer's Itch", where cercariae penetrate skin, die, and cause inflammation in abnormal hosts .**

