Lab 1 parasitology

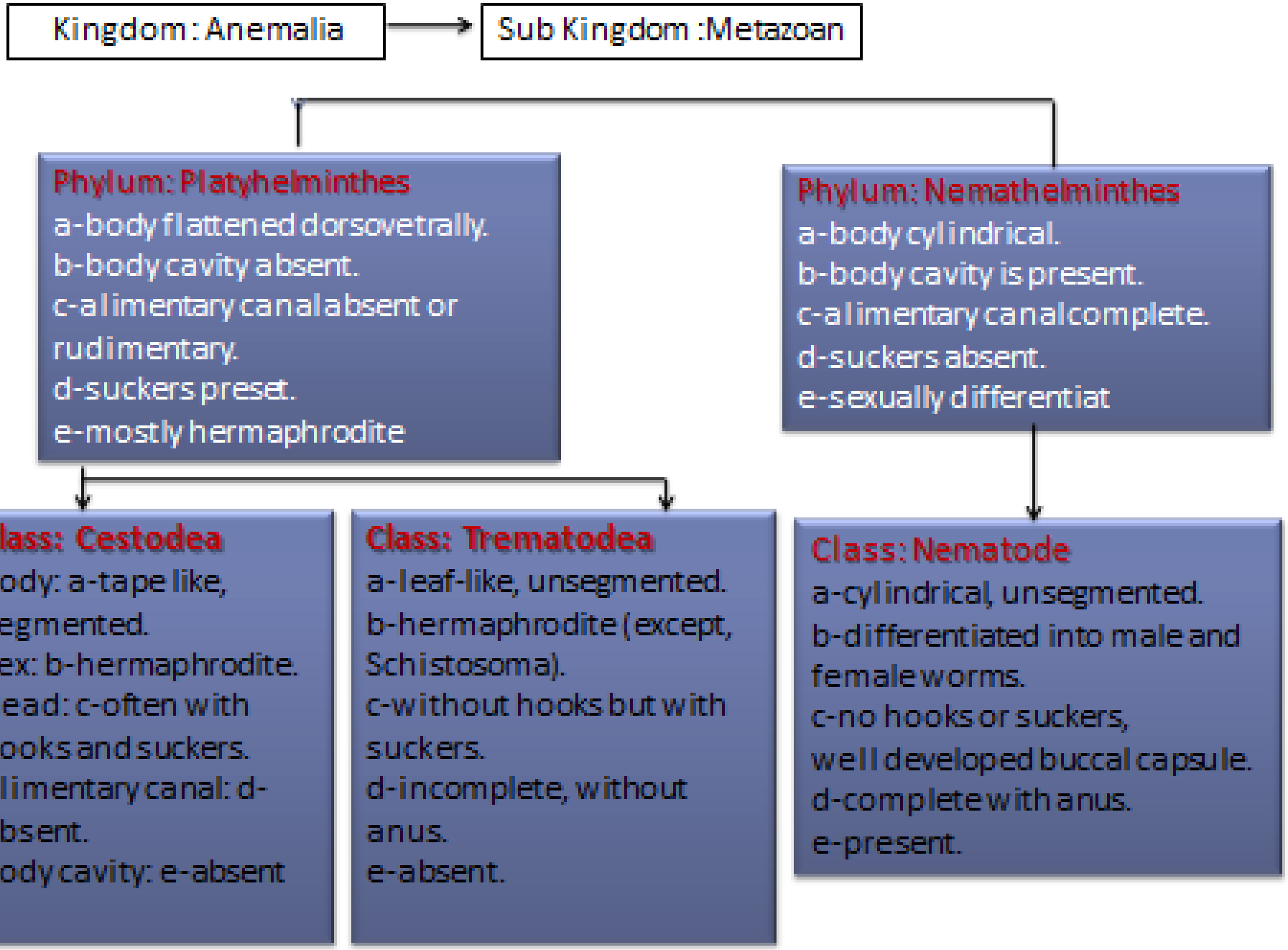
Classification system divided animal kingdom into:

protozoa and Metazoa .
Metazoan *include helmithes, arthropods and mollusc.*
Helminthes *are classified into three phyla: Platyhelminthes, Nemathelminthes and other phylam like Annelida.*
Platyhelminthesis *divided into two classes:*
Cestodea (tapeworms) and Trematodea (flukes) .
Nemathelminthes *has only one class Nematodea (roundworms).*

- Medical Parasites:

- - Protozoa
- - Helminthes:
- - Arthropoda

1- Platyhelminthes
2- Nemathelminthes
3- Annelida


Kingdom : Anemalia
Sub Kingdom :Metazoan
Phylum: Platyhelminthes
a-body flattened dorsovetrally.
b-body cavity absent.
c-alimentary canal absent or rudimentary.
d-suckers preset.
e-mostly hermaphrodite
Phylum: Nemathelminthes
a-body cylindrical.
b-body cavity is present.
c-alimentary canal complete.
d-suckers absent.
e-sexually differentiat
Class: Cestodea
Body: a-tape like, segmented.
Sex: b-hermaphrodite.
Head: c-often with hooks and suckers.
Alimentary canal: d-absent.
Body cavity: e-absent
Class: Trematodea
a-leaf-like, unsegmented.
b-hermaphrodite (except, Schistosoma).
c-without hooks but with suckers.
d-incomplete, without anus.
e-absent.
Class: Nematode
a-cylindrical, unsegmented.
b-differentiated into male and female worms.
c-no hooks or suckers, well developed buccal capsule.
d-complete with anus.
e-present.

Metazoa
Helminthes (worm)
Phylum: Platyhelminthes (flat-worm)
Class: Cestoda (tape worms)

General features of cestodes.

1-Cestodes are segmented tape-like worms.
2-Body structure: adult worm consist of 3 basic structures:
A-**Scolex** (head): is organ for attachment including sucking depressions they are 3 types (bothria, bothridia and suckers or acetabula), then rostellum with or without hooks.
B-**Neck**: is the region of growth, non segmented.
C-**Strobila**: represents the body of adult worm, it is composed of various numbers, they are 3 types of segments:
1-Immature: male and female organs are undifferentiated.
2-Mature: Contain full sets of male and female organs.
3-Gravid: Contain uteri and lateral branches are filled with eggs.

3-Body wall composed of 3 layers covered with microvilli (increase surface area of absorption)
4-Tape worm lack both a mouth and digestive tract.
5-Tape worm has excretory system with contain the flam cells, and simple nervous system.
6-Reproductive system: (sexes are not separate) or (hermaphrodite) which mean each segment contain male and female. ireproductive system (self fertilization and cross fertilization may also occur between segments of the same or two worms).

Metazoa

Helminthes (worm)

Phylum: Platyhelminthes (flat-worm)

Class: Cestoda (tape worms)

Order :1- Pseudophyllidea:

- *Diphylllobothrium*

  Spirometra

- **2-Cyclophyllidea:**

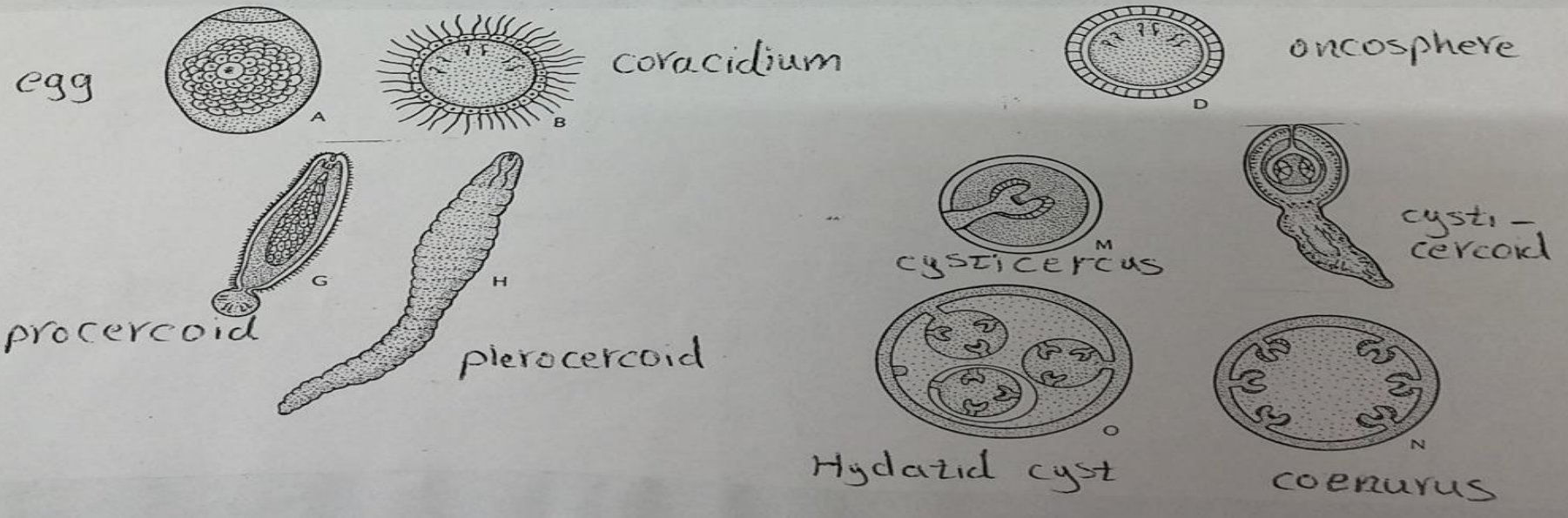
  Taenia

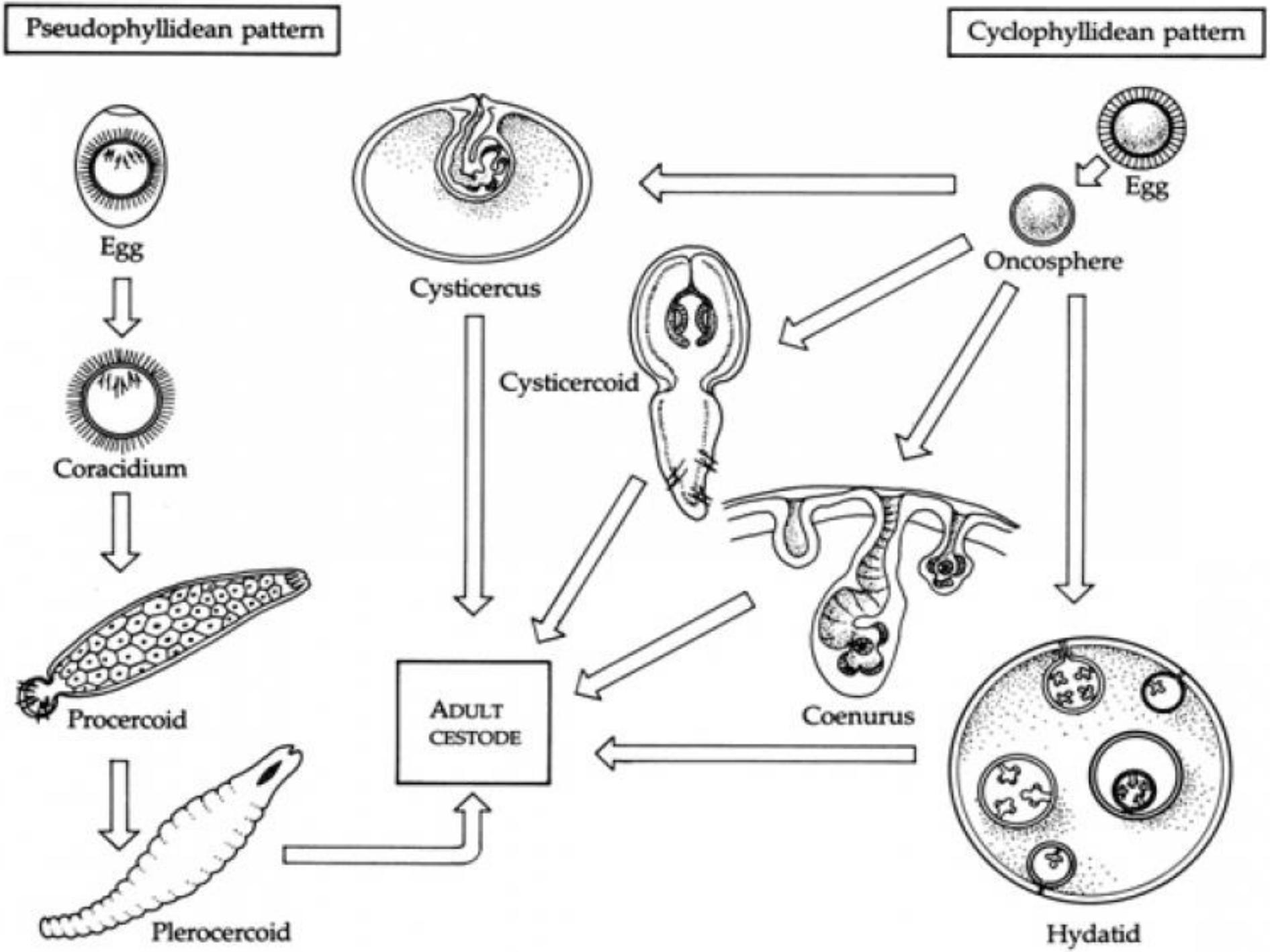
  Echinococcus

  Hymenolepsis

  Dipylidium

Characteristics	Pseudophyllidea	Cyclophyllidea
1-Organ of attachment	Two slit like groove (bothria)	Four suckers with or without hooks
2-Intermediate hosts	Two	One or none as in Hymenolepis nana
3-Uterus	Convoluted	Branch, sac-like and egg capsule
4-Uterine pore	Present	Absent
5-Genital pore	Mid ventral	Lateral
6-Eggs in faeces	Operculated, non embryonated	Double layered, embryonated
7-Embryo	Coracidium	Hexacanth (oncosphere)
8-Larvae	Solid form **A-Procercoid**:sac-like solid body with cephalic invagination and caudal appendage at its posterior end which contain hooks **B-Plerocercoid** (sparganum) elongate worm-like larva has invaginated scolex in the neck and caudal solid appendages ex: Diphyllobothrium latum	Vesicular or bladder form **A-Cysticercus:**scolex invaginated surrounded by oval membranous bladder filled with the fluid ex:Taenia solium **B-Cysticercoid**:the scolex is surrounded by bladderlike cyst that contain little or no fluid and a tail ex: Hymenolepis Spp. **C-Hydatid cyst:**it is alarge bladder has inner germinal layer giving brood capsules and scolex and outer laminated layerfilled with fluid ex:Echinococcus Spp **D-Coenurus** : has number of invaginated scolex surrounded by a cyst wall ex:Taenia multiceps




Pseudophyllidean pattern
Cyclophyllidean pattern
Egg
Coracidium
Procercoid
Plerocercoid
Cysticercus
Egg
Oncosphere
Cysticercoid
Coenurus
Hydatid
ADULT CESTODE

Metazoa
Helminthes (worm)
Phylum: Platyhelminthes (flat-worm)
Class: Cestoda (tape worms)
Order :Pseudophyllidea
Diphyllobothrium latum

Causal Agents:
The cestode *Diphyllobothrium latum* (the fish or broad tapeworm), the largest human tapeworm.

. . .

Diphyllobothrium latum

-Common name: The broad or fish tapeworm.

-Disease: Diphyllobothriasis, fish tape worm infection, broad tape worm infection.

Morphology .

-**Adult worm:** it is the longe tape worm, it measures 3-10 m in length and 2 cm in width and may have 3000-4000 proglottids.

-**Scolex:** is elomgated (almond-shaped) with 2 slit like grooves (bothria) then short neck.

-**Typical mature segment** is broader than long fill with male and female reproductive organs, 3 genital pores opening vasdeferens,vagina and uterus located at the mid ventral line, bilobed ovary located in the posterior part of the segment.

-**Gravid segment** has the coiled rosatte shaped uterus in the middle portion of the segment and genital pores.(some time chainof segments is at times passed in the faeces).

-Egg: oval shaped, thin shelled operculated at one end and contain knob-like thicking at the other end, non embryonated, and average 70 by 50 µm.

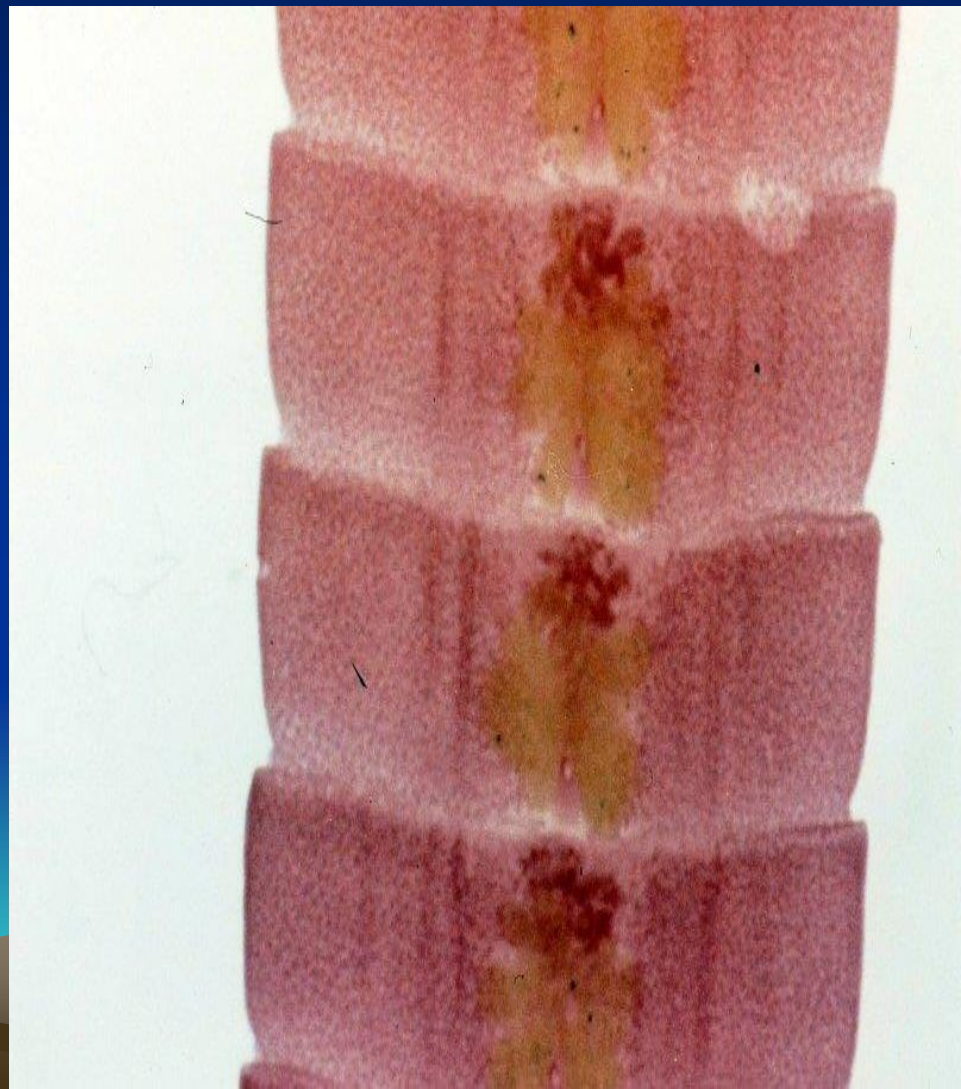
Section of an adult *D. latum* containing many proglottids

Scolex of *D. latum*

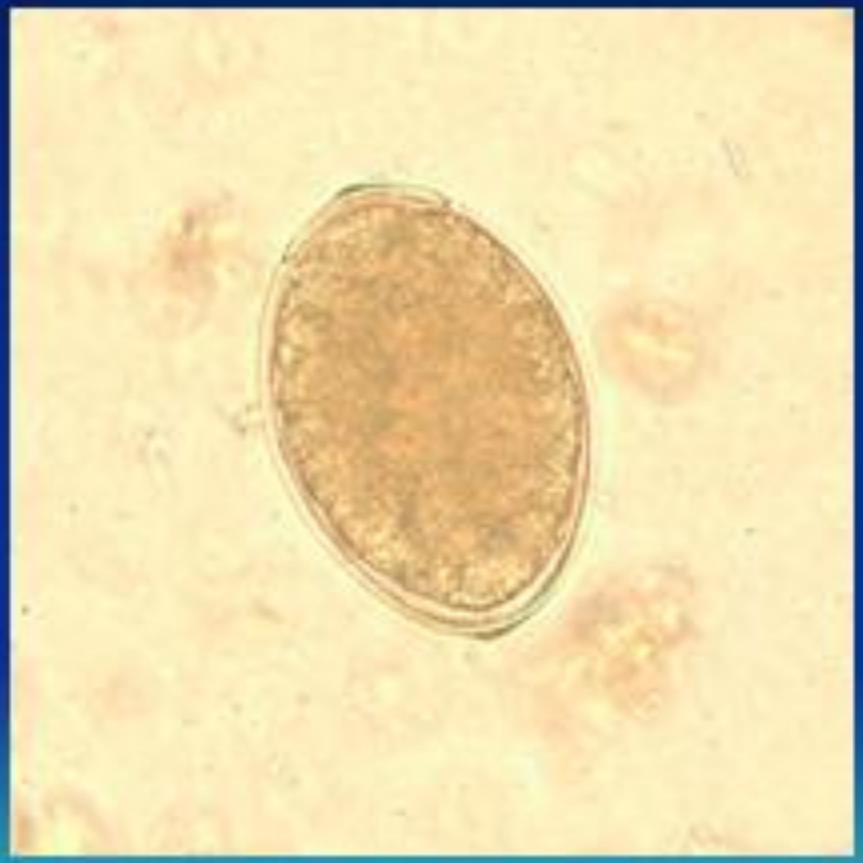
Stained adult *Diphyllobothrium latum*

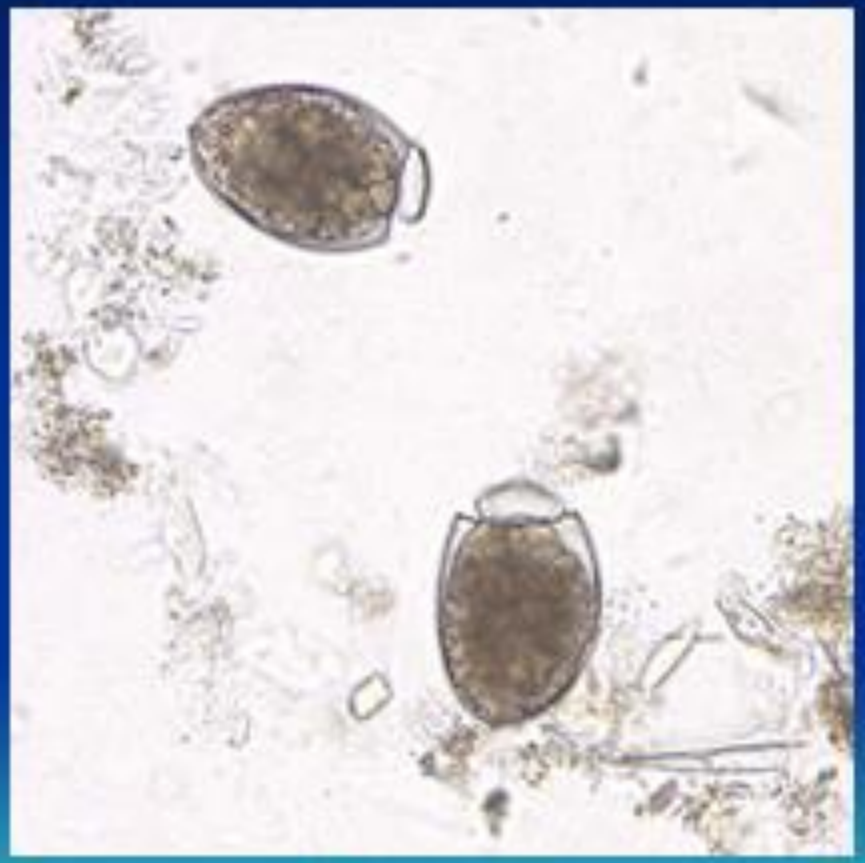
This cut portion shows early mature segments

Proglottids of *D. latum*



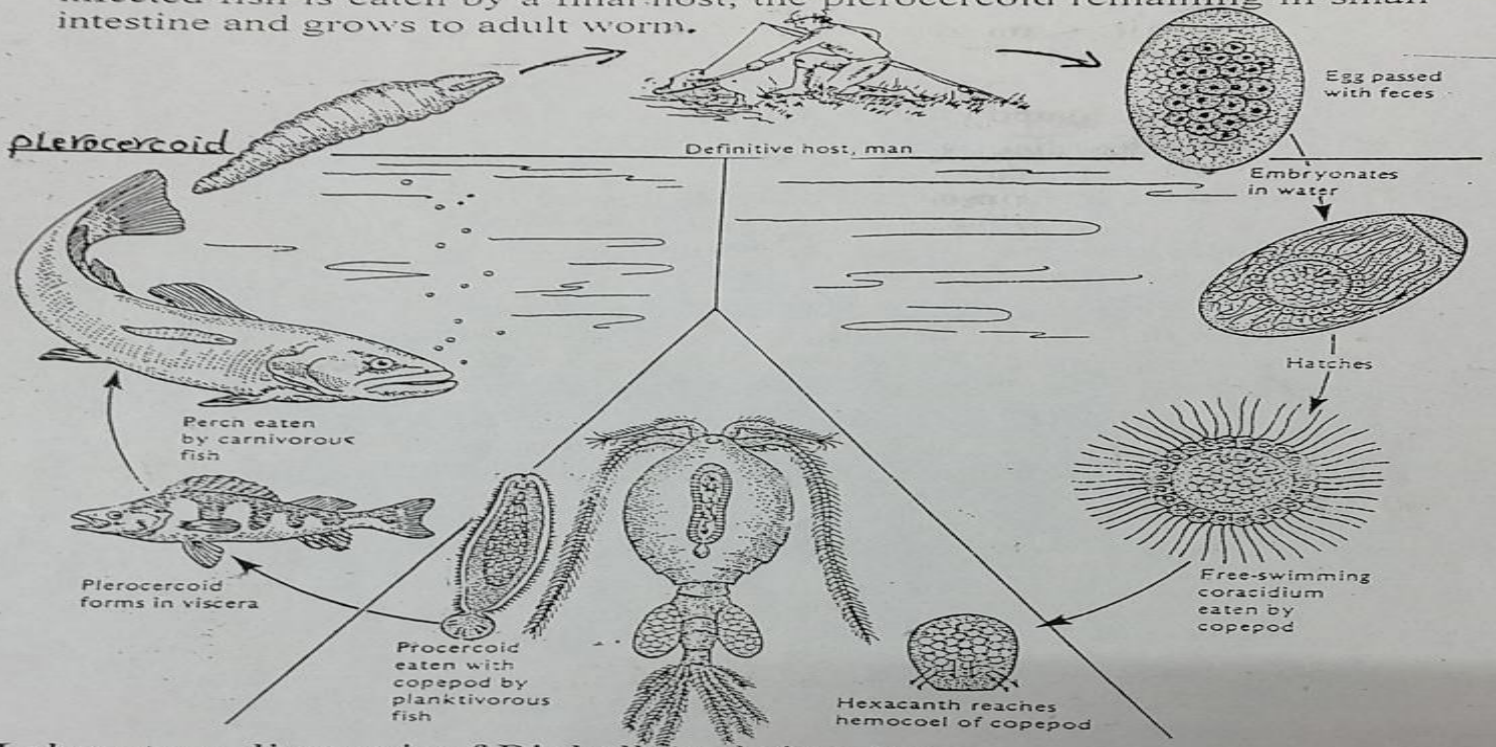
Diagnostic findings
Microscopy





Life cycle
Definitive host: man, other species of fish-eating mammals.
Intermediate hosts: 1-copepod (Cyclops) 2-a fresh water fish.

Eggs passed in the feces of final host in water hatch into coracidium in copepod the coracidium develops to procercoid larvae. In fresh water fish procercoid in viscera develops to plerocercoid larva, if this fish is ingested by a larger fish, the plerocercoid may infect the larger fish but will not continue to growth in this transport (or paratenic) host. When the infected fish is eaten by a final host, the plerocercoid remaining in small intestine and grows to adult worm.



Laboratory diagnosis of Diphyllobothrium latum

1-Stool examination

A-Demonstration the segments of the worm (Identified based on the character of the uterus and position of the genital pores)

B-Demonstration of characterized egg by direct wet mount and concentration methods .

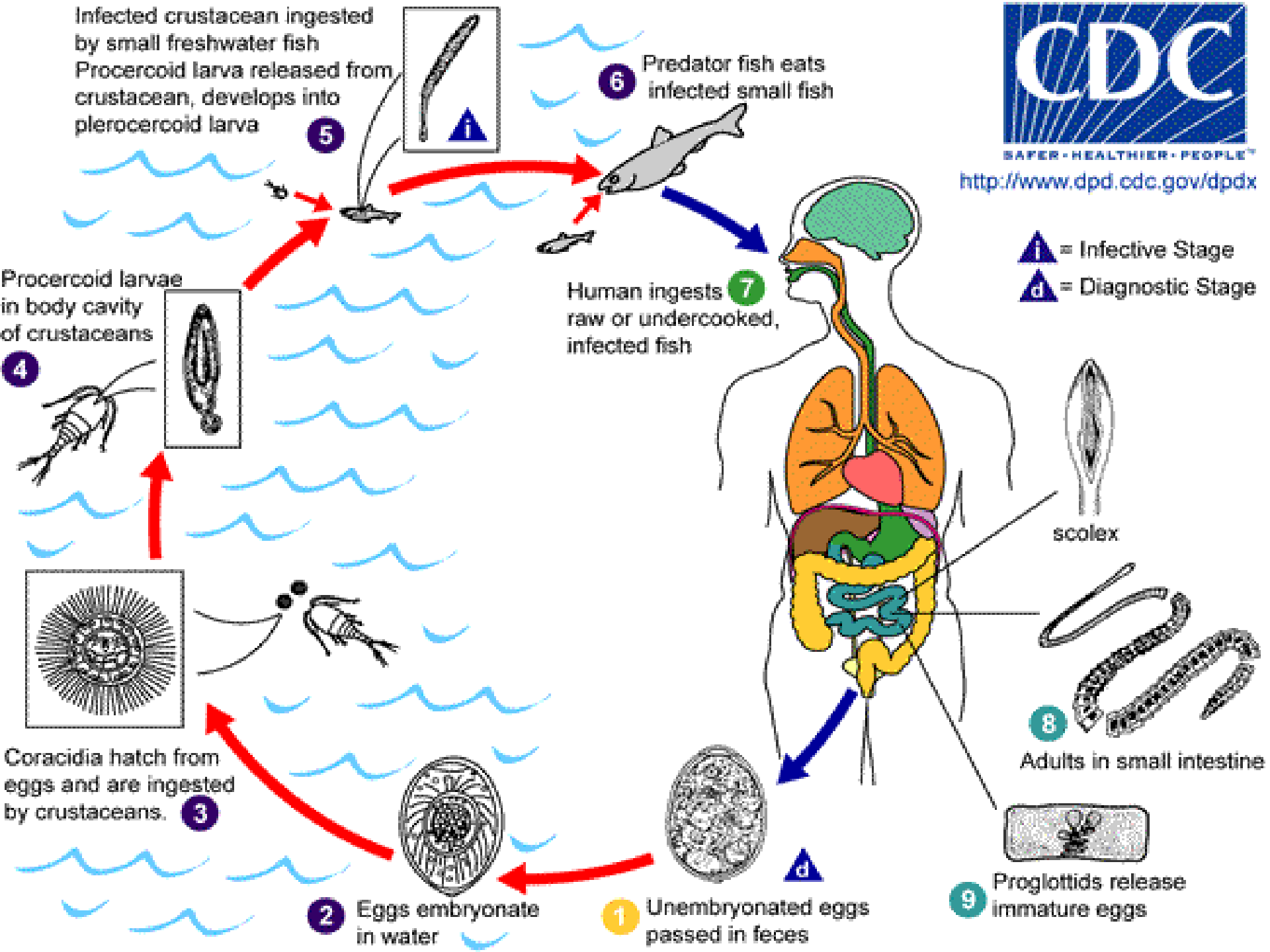
2-Immunodiagnosis: ELISA, Latex agglutination.

3- PCR

Clinical symptoms, including occasional parasite-induced B_{12} deficiency

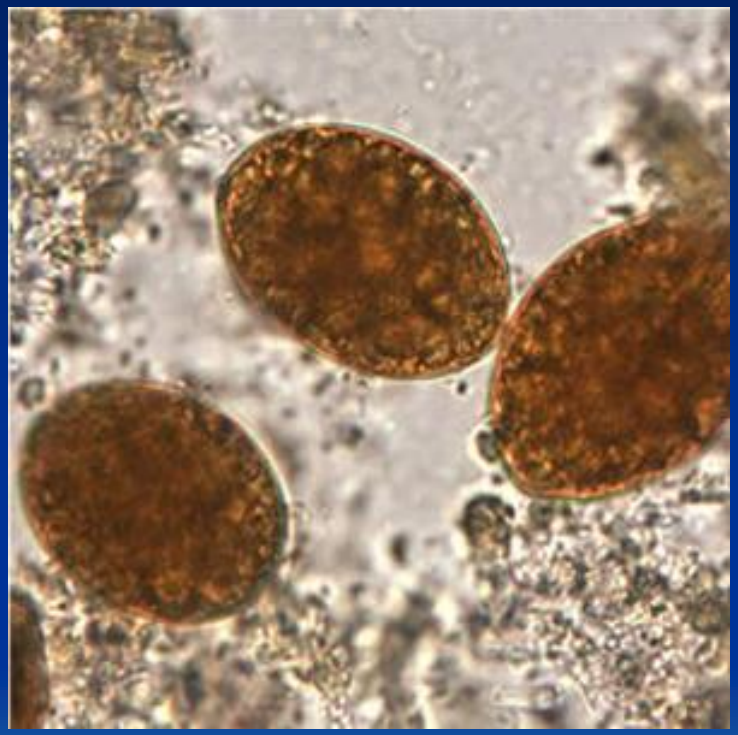
Symptoms of diphyllobothriasis are generally mild, and can include diarrhea, abdominal pain, vomiting, weight loss, fatigue, constipation and discomfort. Approximately four out of five cases are asymptomatic and may go many years without being detected. In a small number of cases, this leads to severe vitamin B_{12} deficiency due to the parasite absorbing 80% or more of the host's B_{12} intake. Such tape worm anemia, indistinguishable from

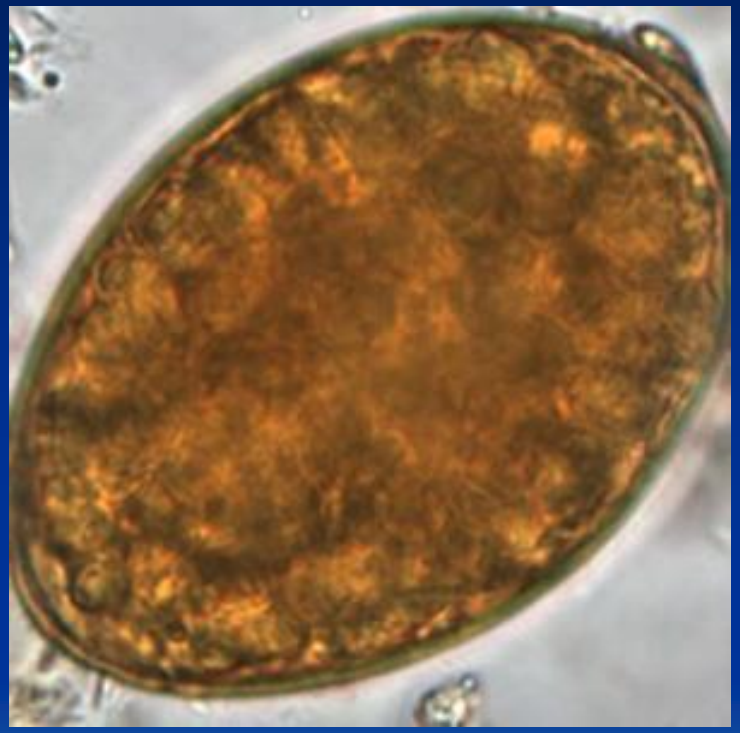
pernicious anamia


Infected crustacean ingested by small freshwater fish
Procercoid larva released from crustacean, develops into plerocercoid larva
5
6 Predator fish eats infected small fish
Procercoid larvae in body cavity of crustaceans
4
Human ingests 7 raw or undercooked, infected fish
i = Infective Stage
d = Diagnostic Stage
scolex
8 Adults in small intestine
Coracidia hatch from eggs and are ingested by crustaceans. 3
2 Eggs embryonate in water
1 Unembryonated eggs passed in feces
9 Proglottids release immature eggs
CDC
SAFER · HEALTHIER · PEOPLE™
http://www.dpd.cdc.gov/dpdx

Diagnostic findings

Microscopy





Carmine-stained proglottids of *D. latum*, showing the rosette-shaped ovaries