

ZAPOROZHYE STATE MEDICAL UNIVERSITY  
DEPARTMENT OF MEDICAL BIOLOGY

# **LECTURE**

# **PHYLLUM PLATHYHELMINTHES**

**Composed by  
Doctor of Philosophy  
Popovich A. P.  
madbio@zsmu.zp.ua**

**Zaporozhye - 2016**

# QUESTIONS

- -Plathyhelminthes in general
- -Class Trematoda: main features and life cycles of some parasites
- -Class Cestodea: main features and life cycles of some parasites

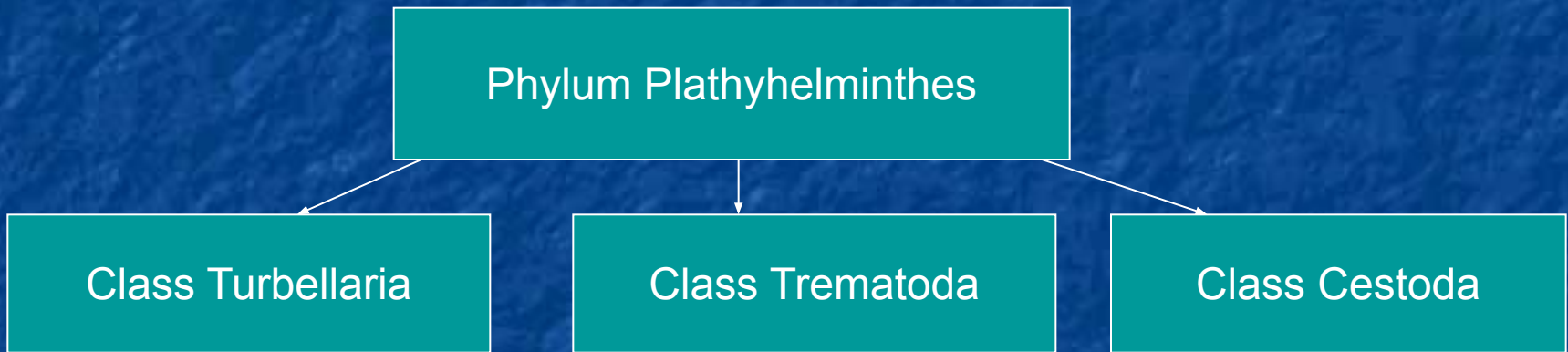
Platyhelminthes are known as flatworms, because they are much flattened dorso-ventrally. They are characterized by the following features:

- \*They are bilatary symmetrical animals. Many organs of flatworms become pair-ed with respect to a single plane that divides the animal into equal right and left halves.
- \*They are acoelomates. There is no coelom. Their primary body cavity is invaded by mesoderm cells.
- \*They are triploblastic. A third germ layer called mesoderm is formed between ecto-derm and endoderm. The mesoderm produces a new tissue and organs. Much of the mesoderm remains undifferentiated. It forms a packing tissue known as parenchyma.



- \*Body dorsoventrally flattened, leaf like or tape like and segmented.
- \*First animals to have organ system organization.
- \*Digestive system incomplete, anus is absent.
- \*Nervous system – a pair of ganglia with longitudinal nerve cords
- \*Excretory system has one or two canals with branches, the finer branches end in flame cells.
- \*Mostly hermaphrodite.

# Classification of Platyhelminthes



Free – living, Planaria

flukes: Fasciola,  
Clonorchis,  
Echinococcus,  
Schistosomes

tapeworms: Taenia,  
Diphillobothrium latum

# Class Trematoda.

General:

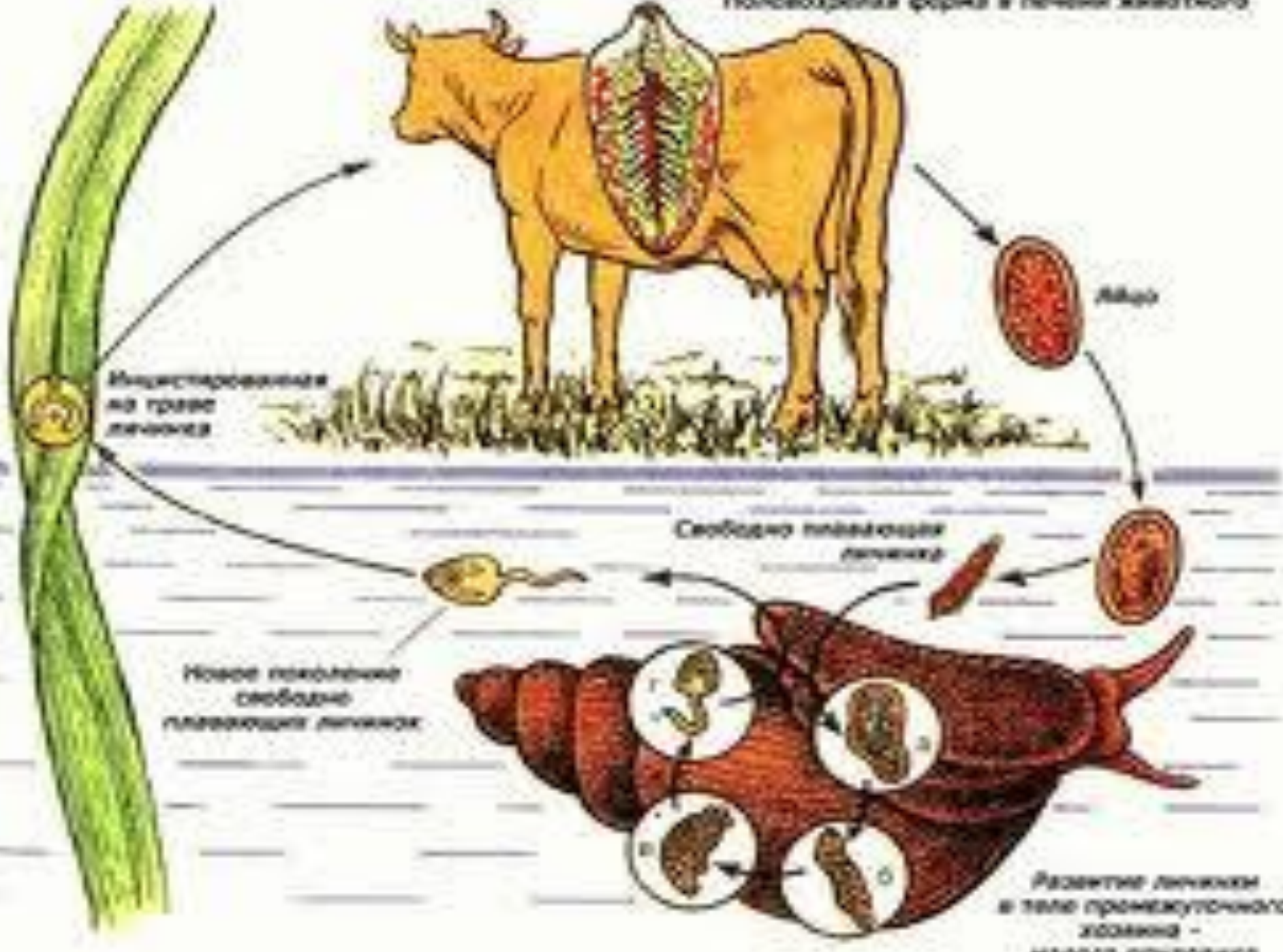
- Trematodes have flat and oval body, ranging from 1 mm to 3 cm in length.
- Organs of attachment (suckers) and reproduction are highly developed, but organs of lost entirely
- Trematodes have a complicated life cycles with the production of the following stages: the adult fluke-the egg- the ciliated miracidium, the sporocyst, the redia, the adult in the defenitive host.

Metacercaria is an infective stage.



# Fasciola hepatica





Инцистированная стадия личинки

Яйцо

Свободно плавающие личинки

Новое поколение свободно плавающих личинок

Развитие личинки в теле промежуточного хозяина - моллюка прудовика



# Schistosomes or Blood Flukes

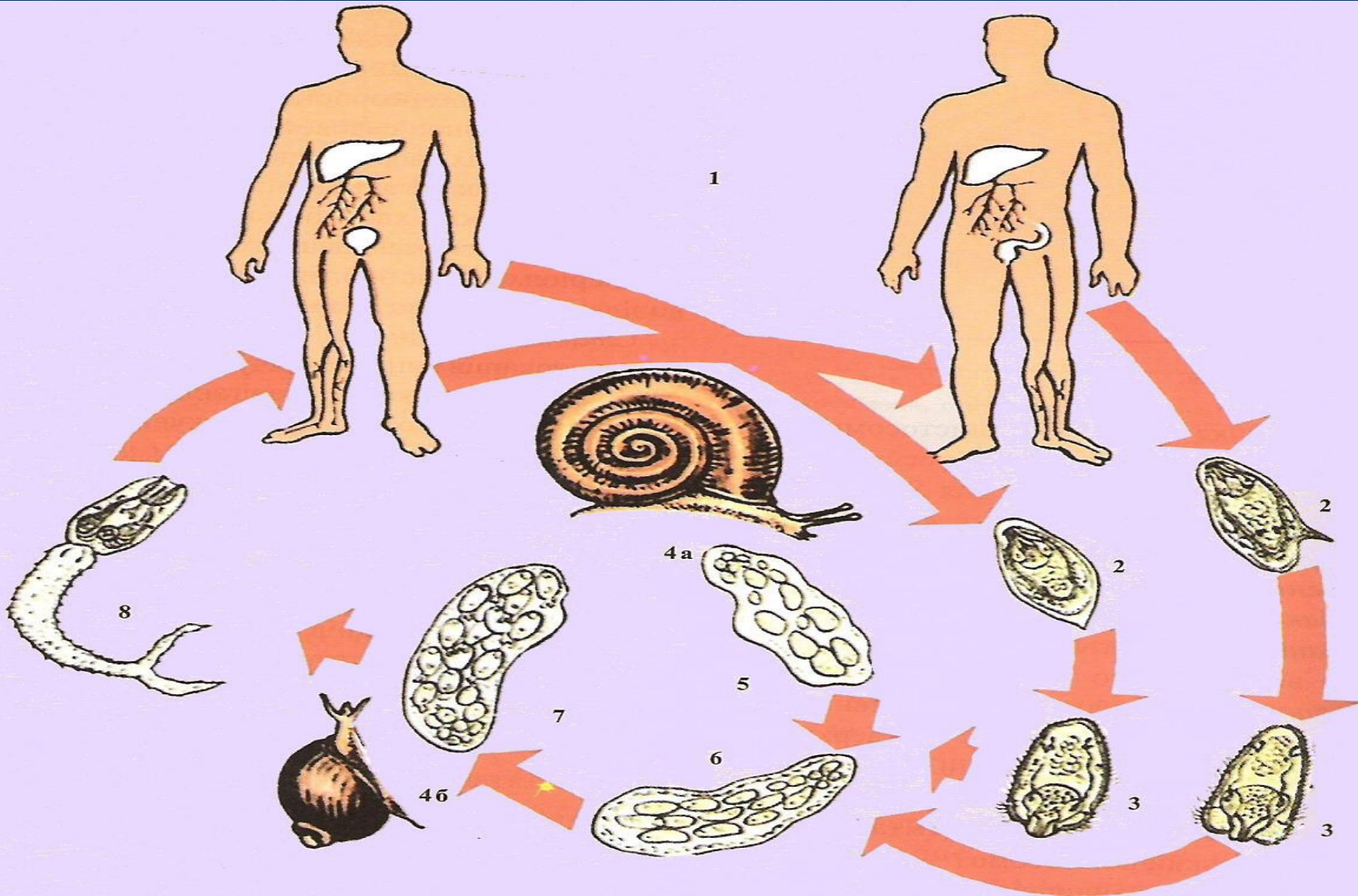
They are much differ from the other Trematodes:

- they are flukes with sexual dimorphism
- the larger males carry the more slender females in the gynaecophoric canal
- their eggs have spine
- in the life-cycle no redia stage





# Life – history of Schistosomes





# CESTODES (TAPEWORMS)

## I. GENERAL

1. The tapeworms are hermaphroditic worms, which as adults parasitize the gastrointestinal tract of vertebrates.
2. They are segmented /flat shape

## A. TAPEWORM ANATOMY:

1. HEAD or SCOLEX, with adhesive organs, at anterior end of worm.

Attachment to the intestinal mucosa is accomplished by the scolex.

2. PROGLOTTIDS -the multiple, hermaphroditic, egg-producing units.

These are the flattened segments of the worm body.

Medically important species of cestode.

a. *Diphyllobothrium latum* has a SCOLEX with elongated, slit-like attachment organs - Fish tape worm

b. *Taenia saginata* has four muscular SUCKERS- Beef tape worm.

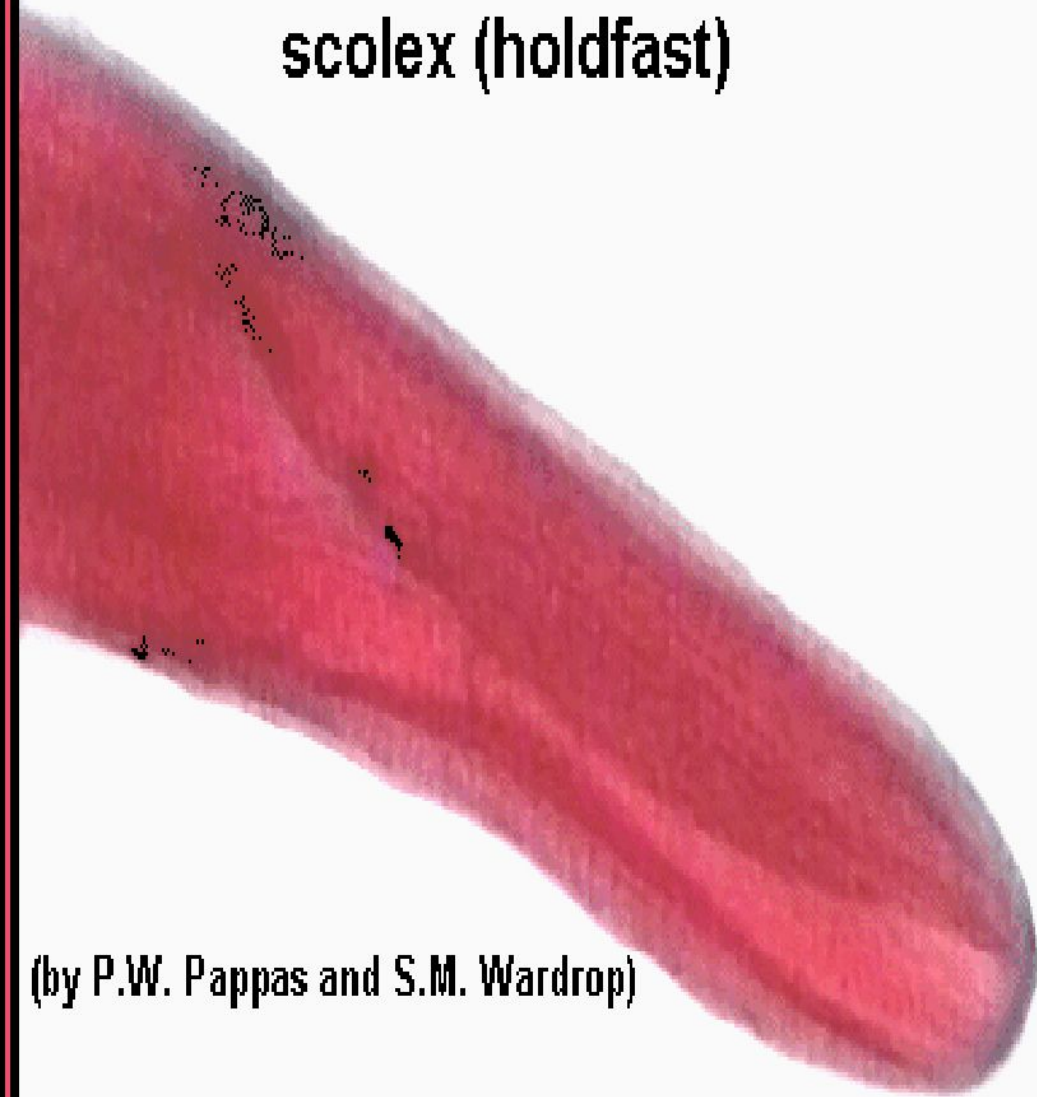
c. *Taenia solium* has similar muscular SUCKERS- Pork tape worm.

d. *Hymenolepis nana* \_ Dwarf tape worm.

e. *Echinococcus granulosus* \_ Dog tape worm.



*Diphyllobothrium latum*  
scolex (holdfast)



(by P.W. Pappas and S.M. Wardrop)





## TAPEWORM LIFE CYCLE:

The DEFINITIVE HOST ingests the larval form. Worms mature from larval

forms in the intestine of definitive host. The definitive host harbors ADULT

WORMS in the intestine. EGGS are passed in the stool.

Eggs are ingested by the INTERMEDIATE HOST. LARVAE develop from

eggs in the intermediate host and penetrate the host intestinal mucosa.

Larvae develop into ENCYSTED FORMS in tissues of intermediate host.

The CYSTICERCUS is the encysted form of the *Taenia* species. The HYDATID is the encysted form of the *Echinococcus*.

**NOTE:** *Diphyllobothrium latum* has two intermediate hosts.

# HUMAN DISEASE CAUSED BY TAPEWORMS

## 1. ADULT (WORM) STAGE:

- a. *Taenia saginata*, *Taenia solium*, *Diphyllobothrium latum*.
- b. The presence of adult tapeworms in the human GI tract only rarely causes symptomatic disease. People usually only become aware of the infection when proglottids are passed in the feces.

**NOTE:** *T. solium* causes human disease in both adult and larval stages.

## 2. LARVAL (CYST) STAGE (i.e., Cysticercosis):

- a. *Echinococcus granulosus*, *Echinococcus multilocularis*, *Taenia solium*
- b. The presence of the cyst stage of the tapeworm in extraintestinal tissues causes signs and symptoms relative to the site of the expanding cyst.

## LABORATORY IDENTIFICATION OF TAPEWORMS:

Morphology of the proglottid (degree of branching, configuration, size) is important in distinguishing *T. solium*, *T. saginata*, and sometimes *D. latum*. Eggs of *T. solium* and *T. saginata* are morphologically indistinguishable, but the eggs of *D. latum* are operculated.

# ***Taenia solium*: TAENIASIS**

Mode of transmission: Infection by ingestion of poorly cooked pork containing encysted larvae. Pathology: Adult worm inhabits the human jejunum and sheds eggs which pass in the stool. Pigs ingest the eggs which release embryos in the GI tract. The embryos travel to systemic tissue where they transform into encysted larvae (i.e., cysticerci). Humans are infected by eating undercooked meat containing the cysticerci.

**Laboratory diagnosis:** Examine STOOL for proglottids or eggs; *T. solium* can be distinguished from *T. saginata* by the proglottid branching. *T. solium* have proglottids with 5-10 primary uterine branches, but *T. saginata* proglottids have 15-20.



# *Taenia solium*: CYSTICERCOSIS

**Mode of transmission:** Humans accidentally become the intermediate host by ingestion of fecally contaminated food or water (most common) or autoinfection (eggs from anus to hand to mouth) or reverse peristalsis (rare).

**Clinical manifestations:** Clinical manifestations reflect the organ system affected by the cyst(s). The most common clinical manifestation results from CNS involvement. Symptoms include headache, seizures, paresis. (Cysticercosis is a common cause of childhood seizures in Mexico.)

**Pathology:** Embryos emerge from the ingested egg and travel through the human body where cysticerci develop. Common sites of encystment include the CNS, eye, heart, muscle, and skin. Symptoms result from mass effects of the expanding cyst(s) or from the host inflammatory response to degenerating cysts.

**Laboratory diagnosis:** Radiological tests (especially CT or NMR of the head with CNS symptoms shows ring-enhancing lesions), serologic tests, sometimes examination of cyst at surgery.

# *Echinococcus granulosus*

*Echinococcus granulosus*

Adult



2mm



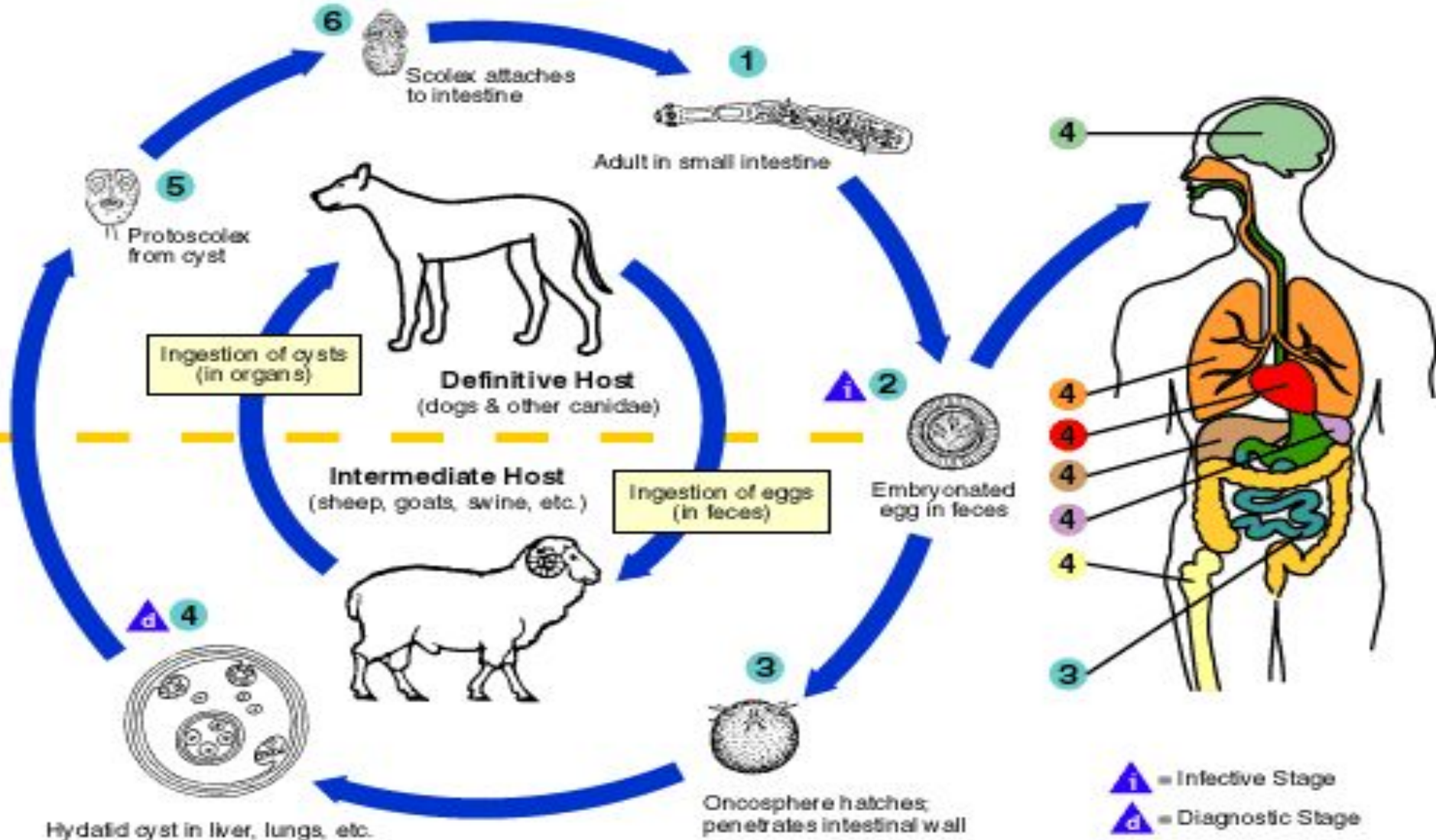


# *Echinococcus granulosus*:

**Epidemiology:** people (e.g., herders or hunters) who have close contact with dogs that may feed contaminated wild herd animals.

**Mode of transmission:** Disease has a zoonotic pattern of transmission. Humans ingest eggs shed by dogs that have fed on infected domestic or wild herbivores.

# Life cycle *Echinococcus granulosus*



**Pathology:** Dogs & other canines are definitive hosts.

The adult worm in dogs is very small, with only three (3) proglottids. Eggs are

shed in feces. Sheep and cattle (and wild herbivores in sylvatic form) are intermediate hosts which ingest the eggs and harbor the cysts. In

humans, the larvae penetrate the intestinal mucosa, invade submucosal venules, and are distributed to tissue where HYDATID forms. Common hydatid sites: liver, lung, bone. Hydatid cysts contain multiple BROOD CAPSULES containing

SCOLICES. If cysts rupture either spontaneously or during surgical removal, ANAPHYLAXIS can occur.



**Laboratory diagnosis:** The diagnosis is usually suggested by the patient history or by radiological findings (e.g., large hepatic cyst).

Patients usually have eosinophilia. Diagnosis usually confirmed serology and/or examination of material removed at surgery.

**Treatment:** Surgical excision is the treatment of choice.