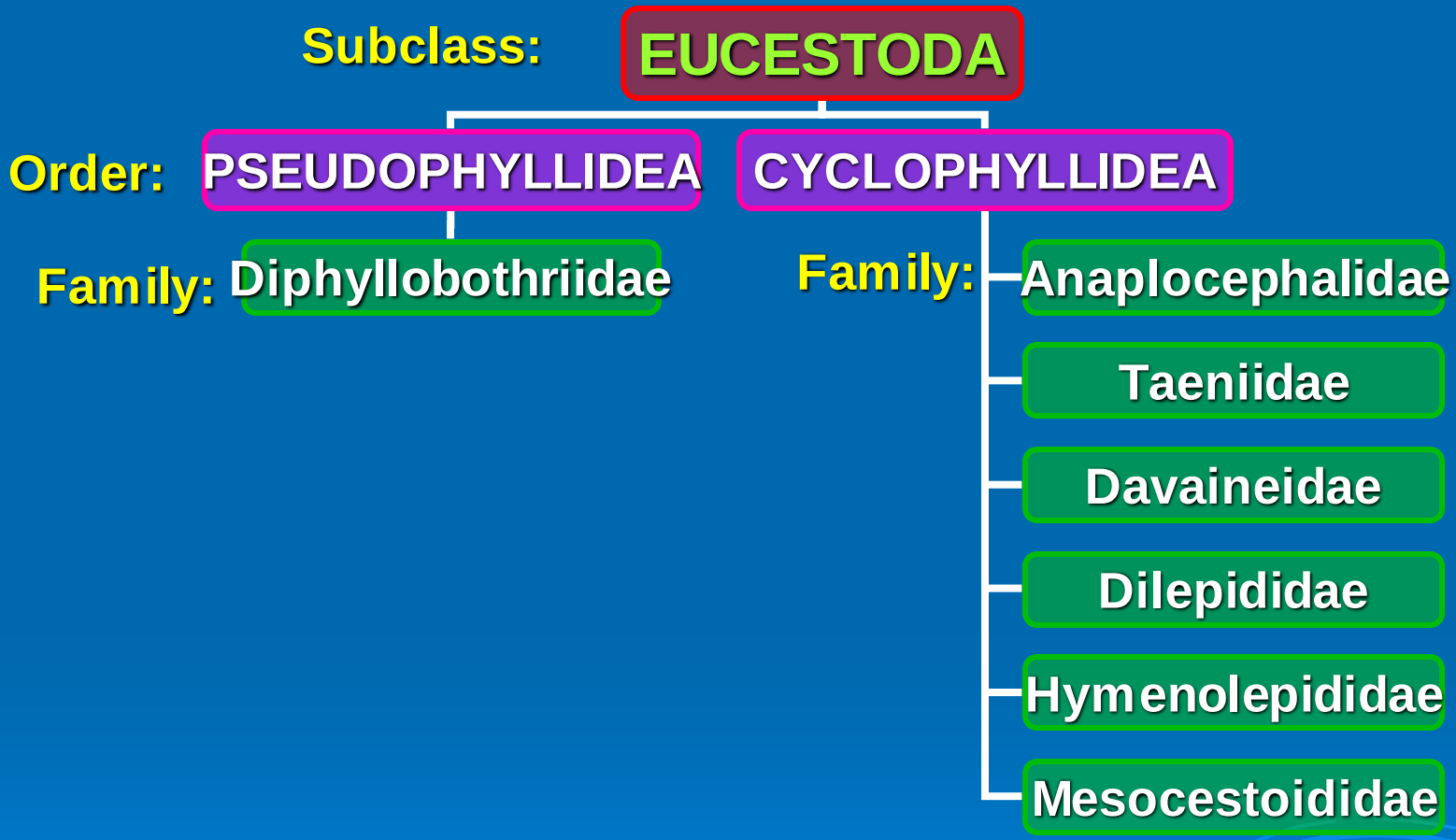
HELMINTHOLOGY

CESTODA-2


Subclass:
EUCESTODA
Order:
PSEUDOPHYLLIDEA
CYCLOPHYLLIDEA
Family:
Diphyllobothriidae
Family:
Anaplocephalidae
Taeniidae
Davaineidae
Dilepididae
Hymenolepididae
Mesocestoididae

Order: PSEUDOPHYLLIDEA

- **Family:** Diphyllobothriidae
  - Genus: Diphyllobothrium
    - Species: *D. latum*
  - Genus: Spirometra
    - Species: *S. erinacae*
  - Genus: Ligula
    - Species: *L. intestinalis*

Species: *Diphyllobothrium latum*

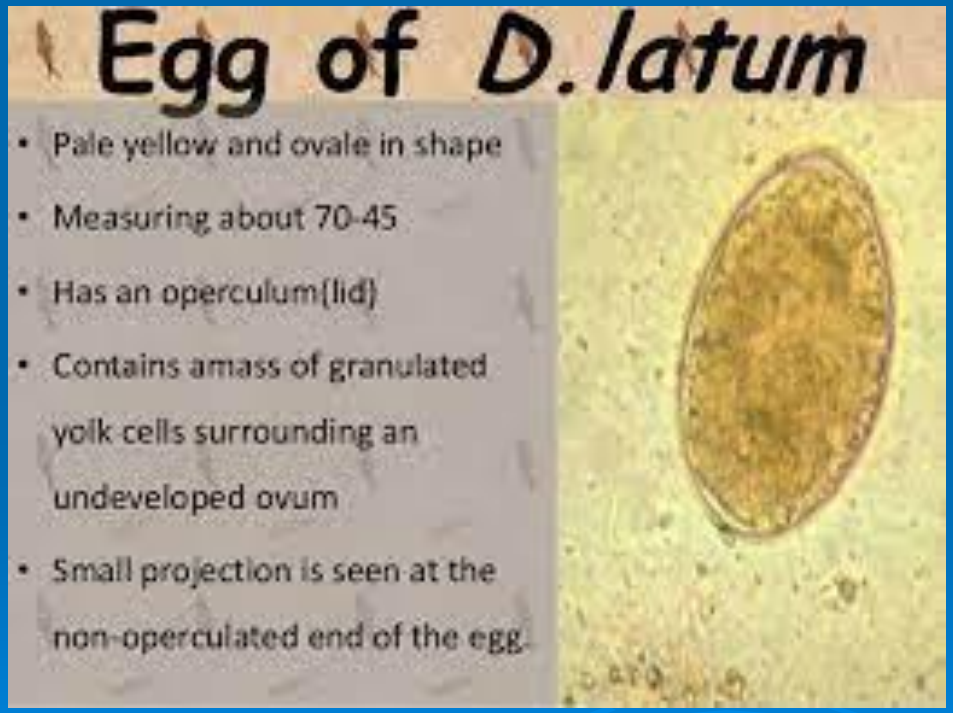
- Last hosts: Human, cat, dog, pig, polar bear and other fish-eating mammals.

- Intermediate hosts:
- 1. Frashwater Copepod (such as Cyclops, Diaptomus) ↔ Procercoid
- 2. Freshwater fish (Sea Bass, Crane, Carp etc.) ↔ Plerocercoid

- Distribution: Region of lakes in Europe and North America

- Morphology:
- 2 - 12 m, 25m
- Yellowish - gray color (dark middle proglottids)
- Scolex almond shape / 2 bothria
- Uterus in rosette shape

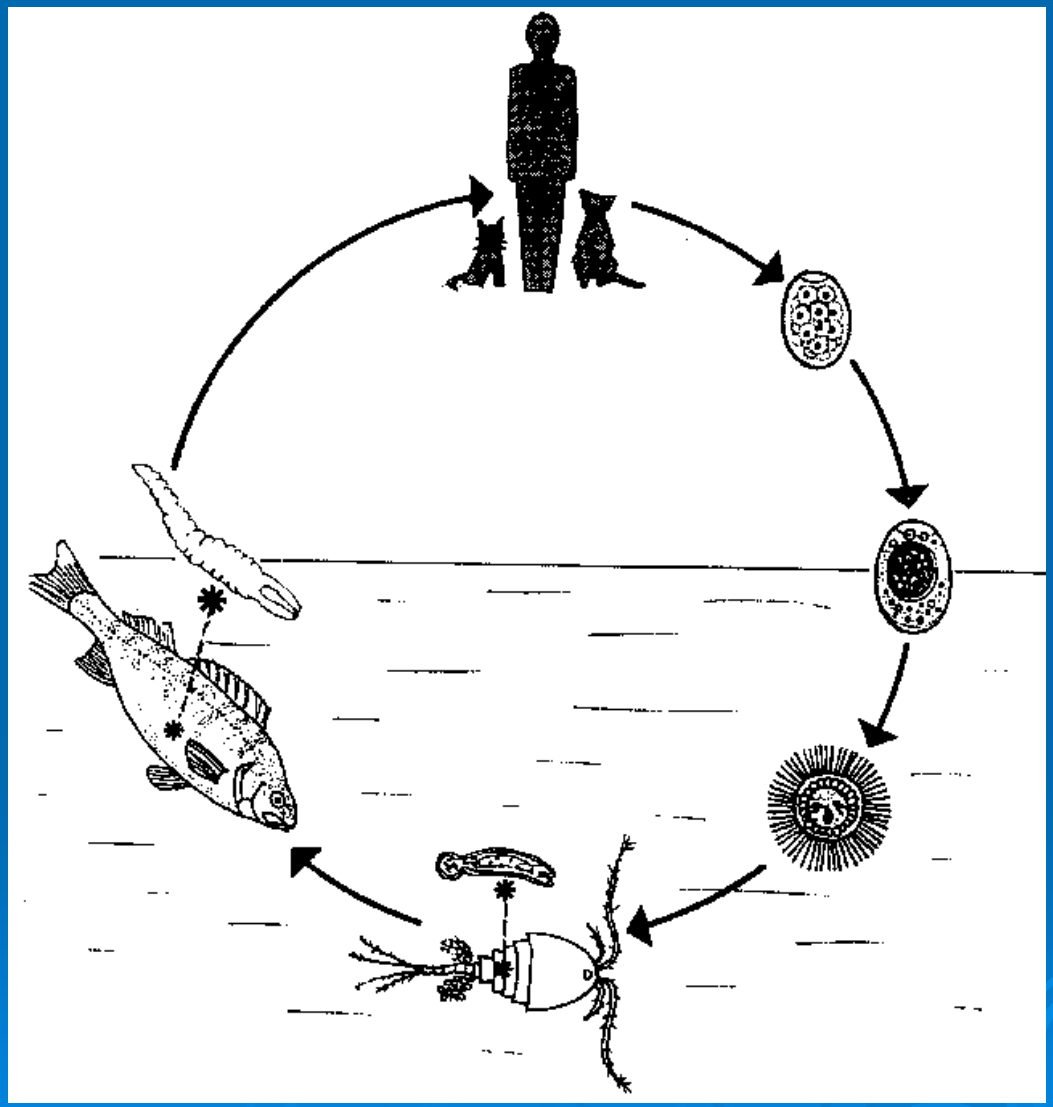
- Egg:
- 67 - 71 x 40 - 51 µm
- Covered, yellow, thick shelled
- The inner coracidium develops in 10 to 15 days.



https://www.google.com/url?sa=i&url=https%3A%2F%2Fpt.slideshare.net%2Fhudaalislam%2Fdiphyllobothrium-latum-

Diphyllobothrium latum

Biology / Life cycle:



https://www.google.com/url?sa=i&url=https%3A%2F%2Fpt.slideshare.net%2Fhudaalislam%2Fdiphyllobothrium-latum-

Epidemiology: Human*

1) Water is not contaminated with feces
2) Consumption of fish well cooked

Pathogenesis / Clinical signs:

Pernicious anemia (affinity to Vit B12)**

Abdominal pain, stiffness, diarrhea, leukocytosis, eosinophilia

Diagnosis: Appearance of eggs in feces (with Sedimentation method)

Control and treatment:

1) Fish consumption under favorable conditions
2) Human excrement does not reach the lakes
3) Praziquantel 25 mg/kg

   Niclosamide 100-200 mg/kg

   Trichlorophon=metrifonate 0.2 mg/kg (as inhibitor of acetylcholinesterase) as **inhibitor of acetylcholinesterase** (also known as AchE), an enzyme that hydrolyzes acetylcholine (Ach). Ach is a molecule involved in the transmission of nervous signals from nerves to muscles (so-called neuromuscular junctions) and between neurons in the brain (so-called cholinergic brain synapses).

Diphyllobothrium latum

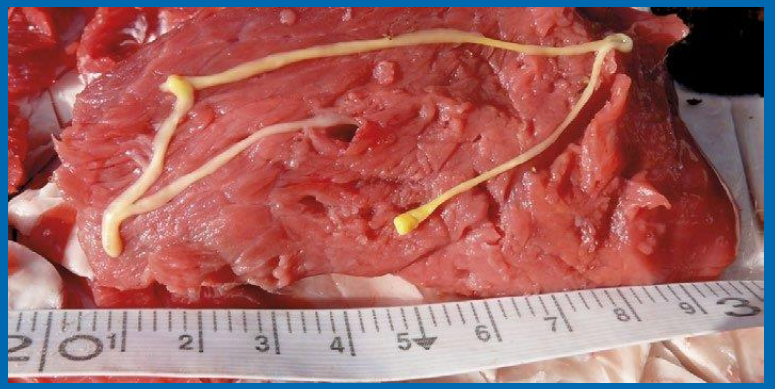
Genus: ***Spirometra***

Species:

- *Spirometra erinacei* (Australia, cat, fox)
- *Spirometra mansoni* (Far East, cat, dog)
- *Spirometra mansonoides* (Far East, cat, dog, raccoon)
- *Spirometra felis* (Far East, in large felines)

- Final host: Meat-eating animals

- Intermediate host:
- 1. Copepod crustacea ↔ procercoid
- 2. Water snake, tadpole, crocodile, bird, amphibian animals ↔ plerocercoid



https://www.researchgate.net/profile/Marta-Kolodziej-Sobocinska/publicationm-muscle-tissue-of-wild-boar-hunted-in.png

Differences between **Diphyllobothrium** and **Spirometra** genuses

Genus:	***Diphyllobothrium***	***Spirometra***
Length	Long	Short
Egg	The poles are round	poles pointy
Uterus	In rose (rosette) shape	Spiral*
Cirrus Vagina	Opens together	Opens separately
1.Intermediate host	Diaptomus	Cyclops
2.Intermediate host	Human, carnivores	Carnivores

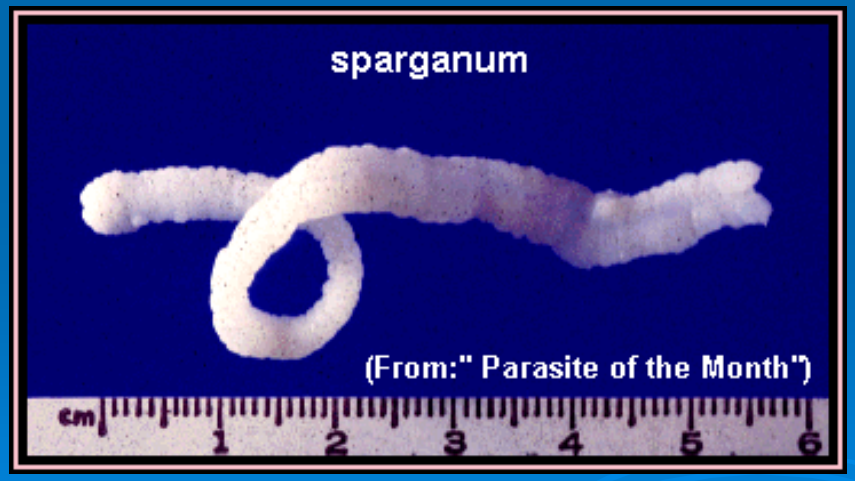
Importance: It causes **SPARGONOSE** disease.

Sparganum = plerocercoid

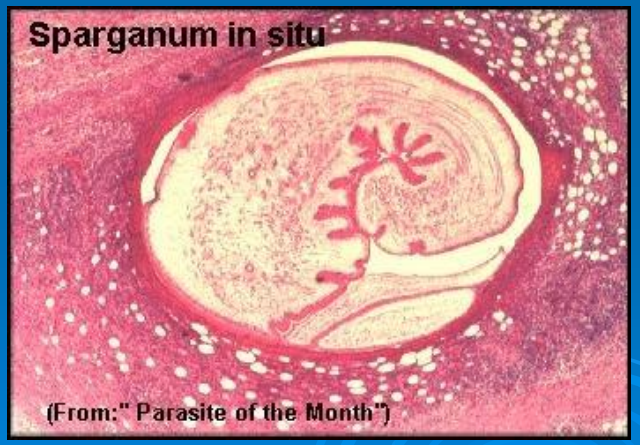
1) Ingestion of a creature carrying sparganum / plerocercoid (Raw)

2) Application of meats (carrying sparganum / plerocercoid) to wounds and eyes

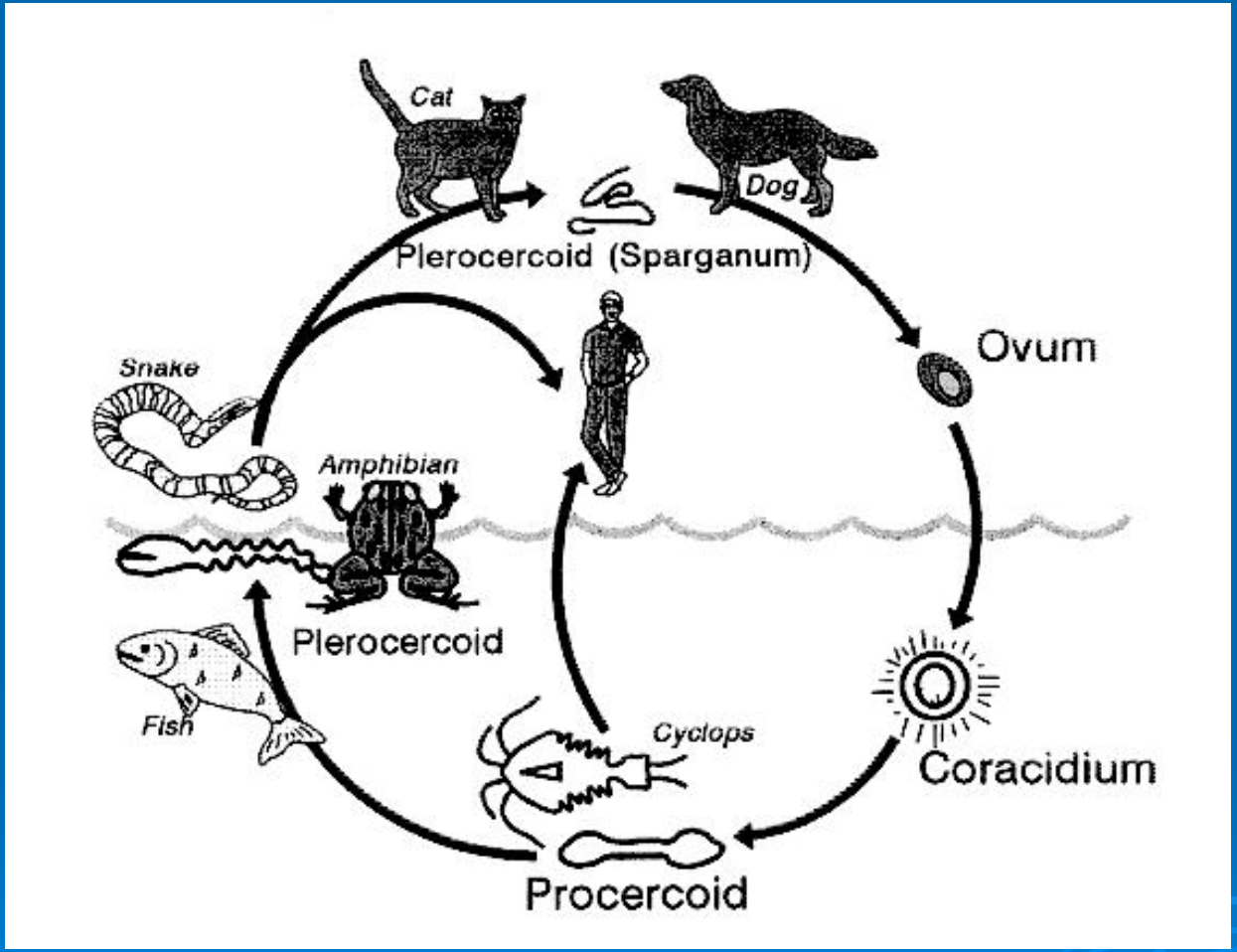
Clinical signs: Inflammation, edema, blood eosinophilia



https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQJ7rzxLzZRCEFAy6Kt4jbOVJJmJUkJdiX3pQ&usqp=CAU



Biology:



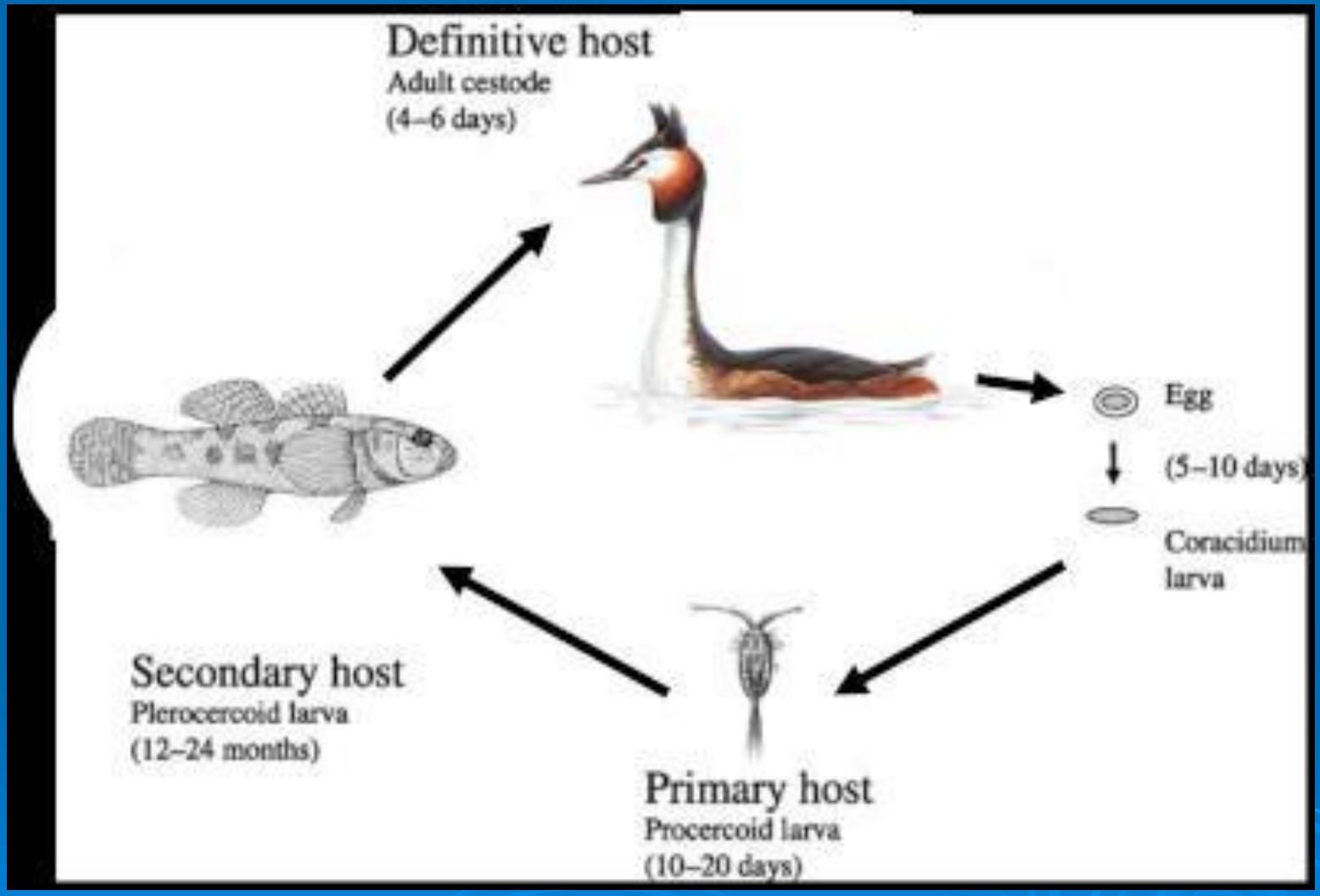
https://web.stanford.edu/group/parasites/ParaSites2006/Sparganosis/sparganosis_clip_image001.jpg

Species: ***Ligula intestinalis***

- Final host: waterfowl
- Intermediate host:
- 1) Crustacea – procercoid
- 2) Freshwater fish – plerocercoid
- Morphology: Mature tapeworm / cestods up to 28 cm.

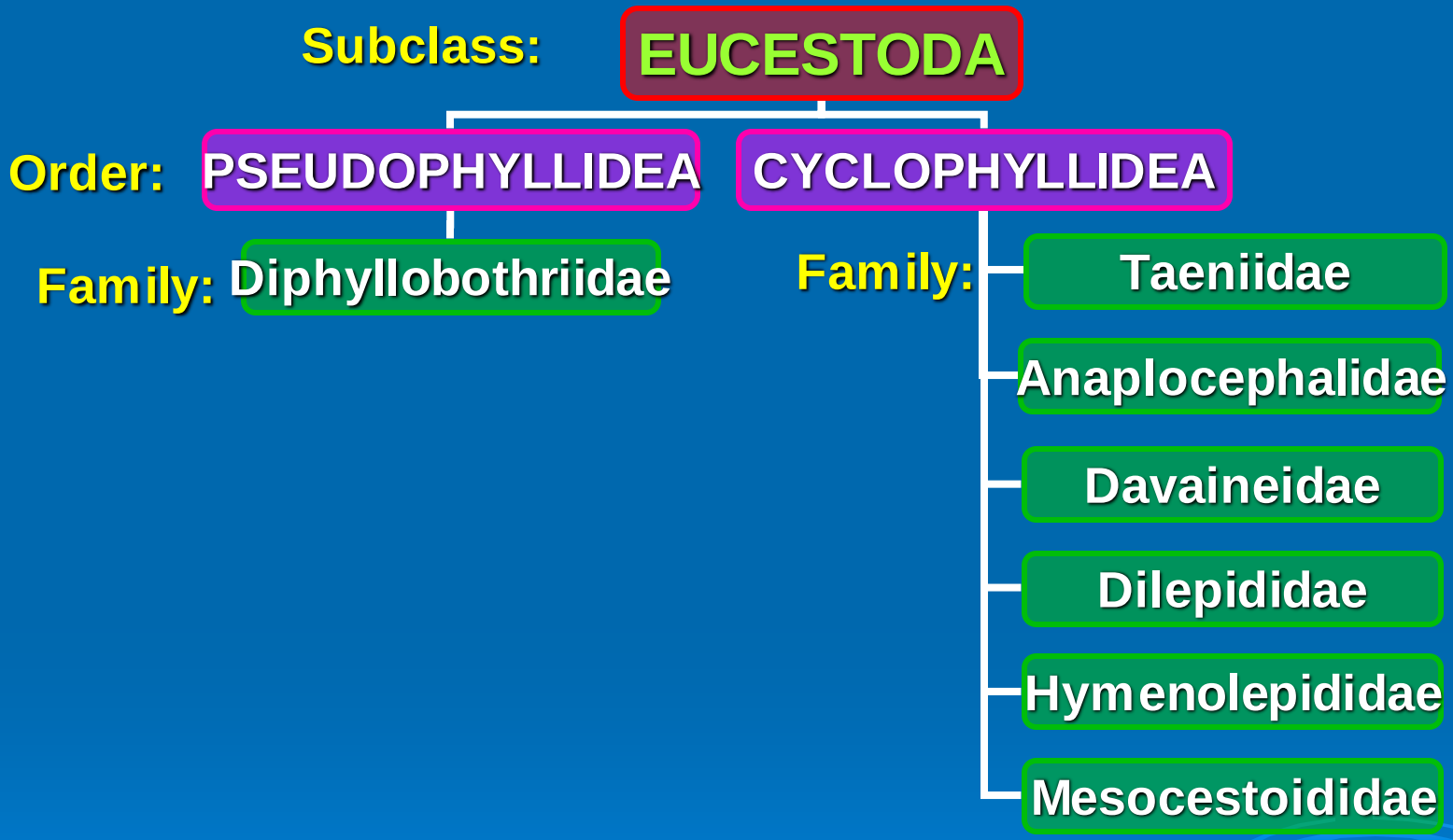
- https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTdrzipXDOdUT5NszyxbVZVs0l8eOoV8CwuMA&usqp=CAU

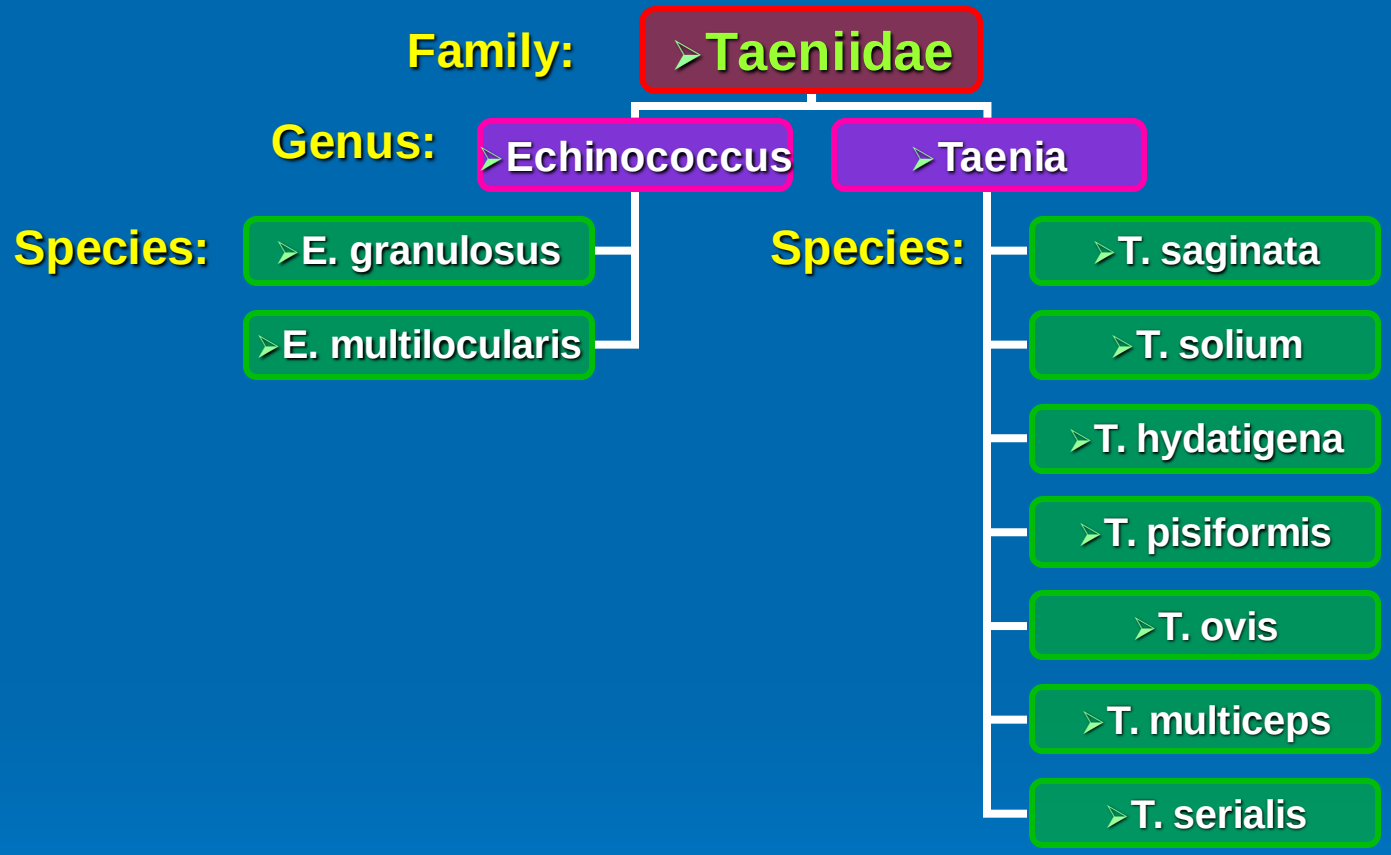
Biology / Life Cycle:



https://m.scoop.co.nz/stories/images/1610/6fd86b329e43d2f6cacf.jpeg

- **Distribution:** All over the world and * in Turkey.
- **Importance: LIGULOSE**
- Bloating and bursting of the abdomen – deaths
- Parasitic castration
- 1) Pressure effect
- 2) Antigonadotropic hormone activity
- NOT IMPORTANT TO HUMAN HEALTH.
- **Struggle:**
- 1) Dead fish and freed plerocercoids are collected.
- 2) The number of waterfowl is reduced (Hunting)


Subclass:
EUCESTODA
Order:
PSEUDOPHYLLIDEA
CYCLOPHYLLIDEA
Family:
Diphyllobothriidae
Family:
Taeniidae
Anaplocephalidae
Davaineidae
Dilepididae
Hymenolepididae
Mesocestoididae


Family:
Taeniidae
Genus:
Echinococcus
Taenia
Species:
E. granulosus
E. multilocularis
Species:
T. saginata
T. solium
T. hydatigena
T. pisiformis
T. ovis
T. multiceps
T. serialis

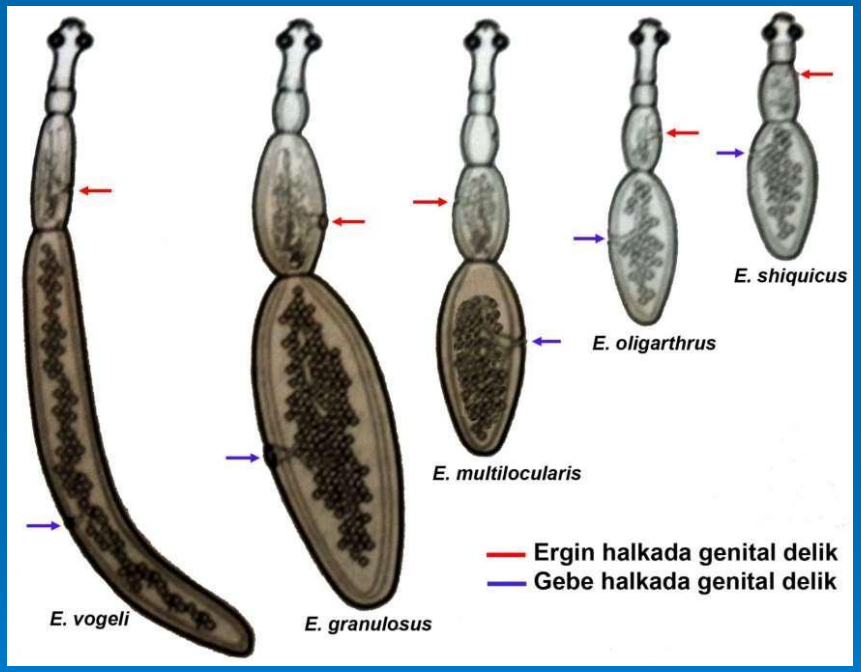
- Genus: ***Echinococcus***

  (E. granulosus*, E. multilocularis**, E. oligarthrus, E. vogeli)

  - Species: ***Echinococcus granulosus***

Subspecies	**E.g.granulosus**	**E.g.equinus**
Last host	Dog and wild carnivores except for red fox	Dog and wild carnivores including red fox
	**Cat is not suitable host (Does not reach sexual maturity).	
Intermediate host	Ruminants, pig, human	horse, donkey
Larvae	Echinococcal cyst = Hydatid cyst (all organs and tissues, especially liver, lung)	

E. granulosus, *E. multilocularis*, *E. vogeli*, *E. oligarthrus* and *E. shiquicus* that belonging to the genus *Echinococcus*, morphological appearances of these species.

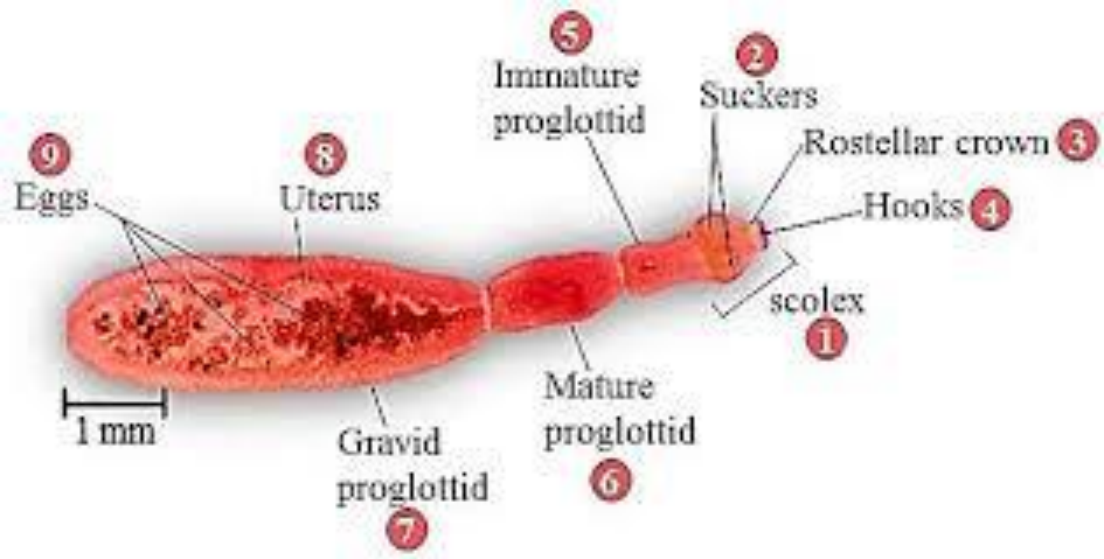


https://www.google.com/search?q=E.+shiquicus&source=lnms&tbm=isch&sa=X&ved=2ahUKEwj4xsvnuLzxAhXFhv0HHRlzBm8Q_AUoA3oECAEQBg&biw=929&bih=896#imgrc=uZQotHG9H17-wM

- **Distribution:**

Morphology:

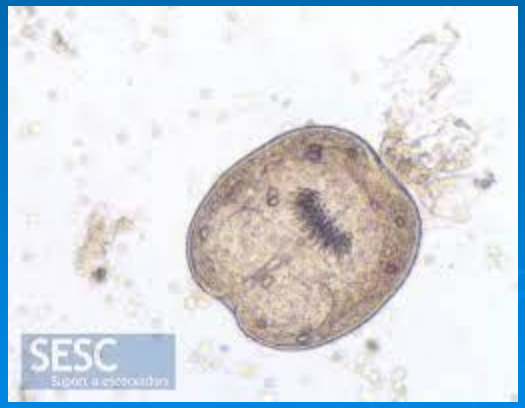
Adult



https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQWqO1FmXggCBj1-NhDqv2lzgov1yJ2FIoNZQ&usqp=CAU

https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcR7dhw34lpH8cWW0rgZOKpgTV4rCJNZQUbGXSv4W6Wz72UGtlr10wnE_P4vd_bqeuivPkg&usqp=CAU

- **Larvae (Hydatid Cyst)**



https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTdylgAPaMTkMN2fAcHBUxNnHG9CEBtdgjeAdC5bZeQR7bC2eRQlwnaGXUW9QeoXQ2v6fU&usqp=CAU

Cysts;

Development time

Format

size

Fertility status (Fertile, infertile) (*Type of host, *age)

Sheep* Pig Cattle

Biology:

Figure 4: Calcified hydatid cyst in the caudal lobe of the lung of male sheep (right) and Small to medium size hydatid cysts in the livers of sheep (left) [64].

Echinococcus granulosus

- **Epidemiology:**
- 1) Countryside (PASTORAL): Butchery animals (cattle, sheep, goat) → Dog
- 2) Wild = Forest (SYLVATIC): Wild ruminant (deer, elk, roe deer) → Wild carnivore (wolf, jackal, fox)

- PEOPLE ARE INFECTED BY GETTING EGGS!
- Taking eggs with water and food (Unwashed vegetables, fruits)
- With unwashed hands (From infected sand and soil and With Dog lovin')

- **Pathogenesis and Clinical signs:**
- MATURE PARASITE: Asymptomatic
- sometimes digestive system disorders

- ECHINOCOCCUS CYST / HYDATID CYST:

In animals	**In humans**
Asymptomatic Reduction in muscles weight * Economic loss	➢Asymptomatic ➢Pressure and obstruction effects ➢Liver – icterus ➢Lung – bronchopneumonia ➢Heart – failure ➢Brain – Encephalitis, Tumor-like clinical picture ➢Bone – Skeletal disorder, Lameness, Spontaneous fracture ➢****CYST EXPLOSION** ➢Anaphylactic shock ➢Secondary echinococcosis

Diagnosis:

- Mature parasite:
- Feces
- Arecolinization
- Autopsy
- Larvae:
- In animals:
- Serology?, Radiology, x-ray?
- In humans:
- Allergic
- Serological (IHA, IFAT, ELISA, Immune Blot)
- x-ray
- MR
- Ultrasound
- Omography
- Scintigraphy

Treatment:

- Mature parasite: *Praziquantel
- Larvae:
- In animals:
- In humans:
- Surgical
- Pharmaceutical applications
- Albendazole 10 – 15 mg/kg in monthly cycles
- Mebendazole 50 – 200 mg/kg
- Surgery + Drug applications (Percutan)

- **Control and Fight:**
- Infective dog treatment
- Controlling stray dogs
- Accustoming dogs to cooked food
- Disposal of slaughterhouse residues
- Prevention of illegal cutting
- Introduction of the disease

Treatment:

- **A) In the last hosts:** for the treatment of dogs;
- **1. Use of arecholine salts to cleanse the intestine of dogs**: A single dose of 4 mg/kg (or with a second follow-up dose) in dogs in approximately 30 minutes, paralyzes cestodes such as *Echinococcus, Taenia spp.*. By acting on the parasympathetic nervous system of dogs, it ensures the expulsion of parasites with involuntary intestinal contractions. Arekolin is not a helminthicide, so there is the possibility of some adult parasites remaining in the intestine apart from the excreted cestodes. Therefore, arecholine is mostly used as a surveillance tool (arecholine test) in the hydatid cyst control program.
- **2. Antihelminthic use:** Praziquantel, 2-5 mg/kg,. Dogs given medication should be kept in quarantine for 2-3 days after treatment and their feces should be buried or incinerated to prevent environmental contamination. The prepatent period of *E. granulosus* in dogs is between 42-45 days.
- **3. Dog population management**

- **B) In intermediate hosts:** Treatment methods applied in the treatment of liver cyst hydatid;
- **1.** Medical treatment; Benzimidazole derivatives (albendazole and mebendazole)
- **2.** Percutaneous treatment
- **3.** Surgical treatment

Echinococcus multilocularis = E. Alveolaris

Final host: Wild carnivores including foxes and dogs, cats → small intestine

Intermediate host: Rodent (Field mouse), human → liver, lung and other organs

Multilocular = Alveolar cyst

- **Morphology:**
- **Mature:**
- Smaller Too many proglottids (4 – 5 proglottids)
- End proglottid length < from other part of body
- Genital atrium anterior
- Ovary in the form of a bunch of grapes

E. granulosus

E. multilocularis

- **Larvae:** Multilocular = Alveolar cyst
- The parasitic cuticular layer is thin and weak
- Multiple cysts together
- There are gap links (It looks like a cauliflower on
- the outside, its section looks like a sponge)
- There is gelatinous substance inside
- Fibrous capsule does not form (Metastasis feature)

Biology and Epidemiology:

- **SLYVATIC**
- fox furs
- Garden contamination with fox feces

- **Pathogenesis:**
- Adult: Similar to other cestodes.
- Larvae: Dangerous in humans (Metastasis)

- **Protection and Control:**
- Sylvatic cycle – Power
- Compliance with general hygienic rules
- Treatment of adult cestodes

		E. granulosus	*E. multilocularis*
MORPHOLOGICAL	Mature	➢Bigger ➢Few proglottids ➢Last proglottid length > rest of body length ➢Genital atrium posteriorly ➢Ovary kidney shaped	➢Smaller ➢Too many proglottids ➢Last proglottid length < than the length of the rest of the body ➢in the anterior ➢in the form of a bunch of grapes
	Larvae	a) Uniloculer b) Multicystic = Multivesicular	Alveolar = Multiloculer
BIOLOGIC	Life cycle	a) Pastoral b) Sylvatic	Sylvatic
		➢Cannot mature in cat	➢Develops in the cat
		➢The prepatent period is long (6 – 7 weeks)	➢Shorter (4 – 5 weeks)