Parasitic Helminthes & Arthropod Agents & Vectors of Diseases

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Parasitic Helminths
and
Arthropod Agents and Vectors of Diseases

Objectives:

By the end of this lecture the student should be able to:

- ❑ **Name the three main groups of parasitic helminthes and their characteristic morphological features .**
- ❑ **Describe the life cycle of *Ascaris lumbricoides* as an example of parasitic helminthes .**
- ❑ **Discuss the role of arthropods as agents and as vectors of diseases in humans.**
- ❑ **Give examples of the main arthropod vectors of diseases.**

Classification of Parasites

Protozoa	Helminths
Unicellular **Single cell for all function**	**Mulicellular** **Specialized cells**
Amoebae: move by pseudopodia **Flagellates: move by flagella** **Ciliates: move by cilia** **Apicomplexa (sporozoa): Tissue parasites**	**A- *Round worms* = Nematodes** **cylindrical, un-segmented (*Ascaris*)** **B- *Flat worms*** **1-Trematodes:** **leaf-like, un-segmented** **2-Cestodes:** **tape-like, segmented**

Location of helminths in the body:

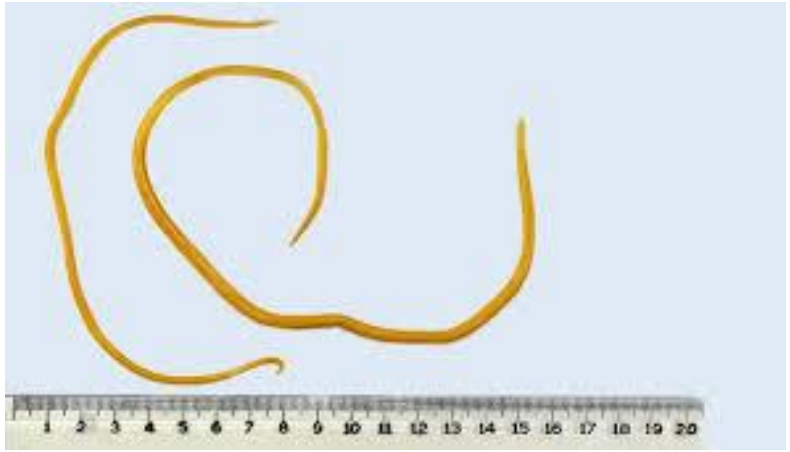
- **Intestinal helminths**
- **Tissue helminths**

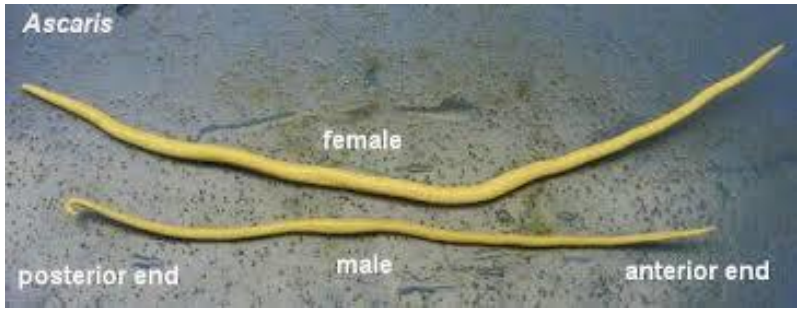
Nematodes (round worm) intestinal Nematode

General features

1. **Elongated worm, cylindrical, unsegmented and tapering at both ends.**
2. **Variable in size, measure <1 cm to about 100cm.**
3. **Sex separate and male is smaller than female**

Ascaris lumbricoides (roundworm)



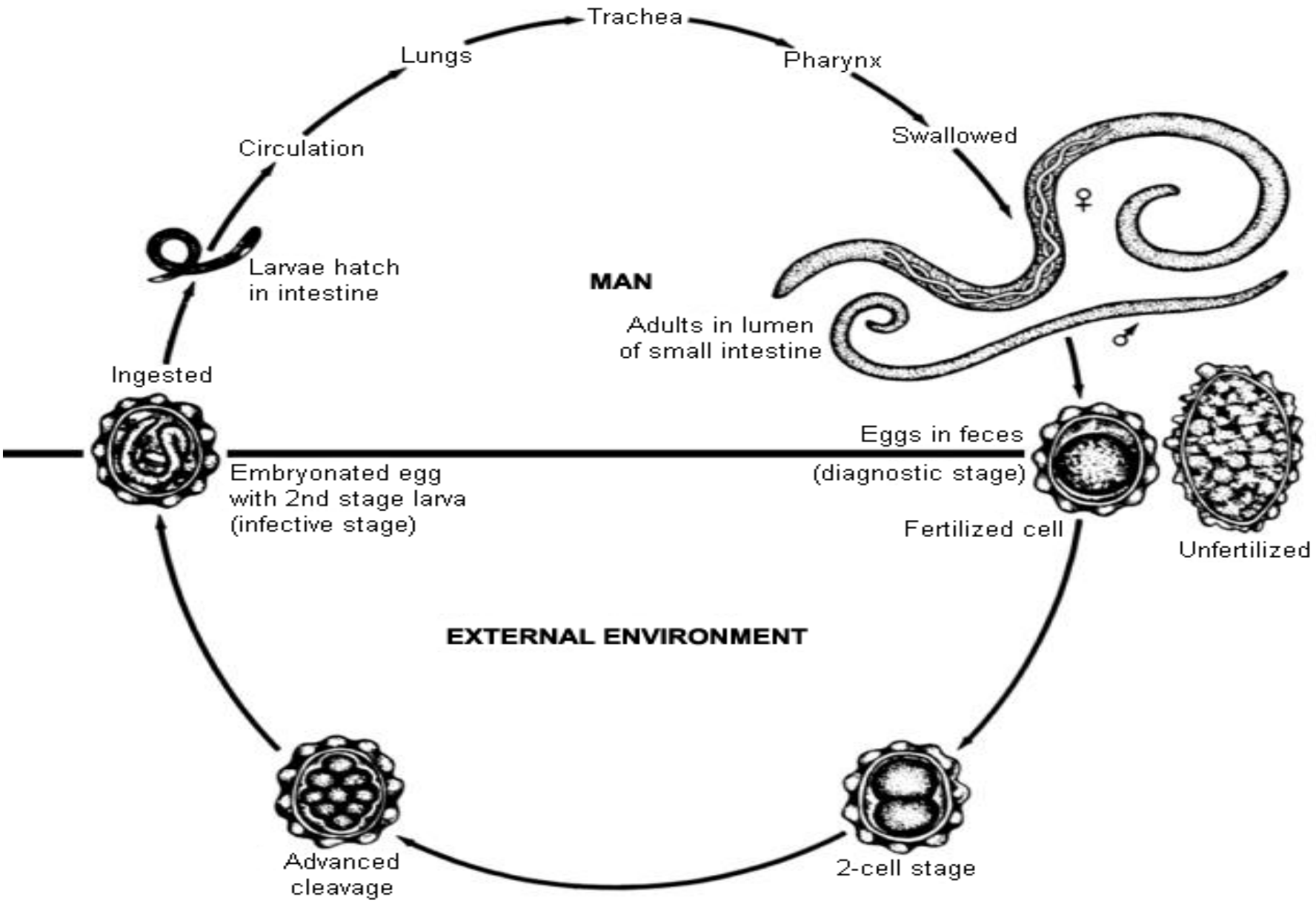


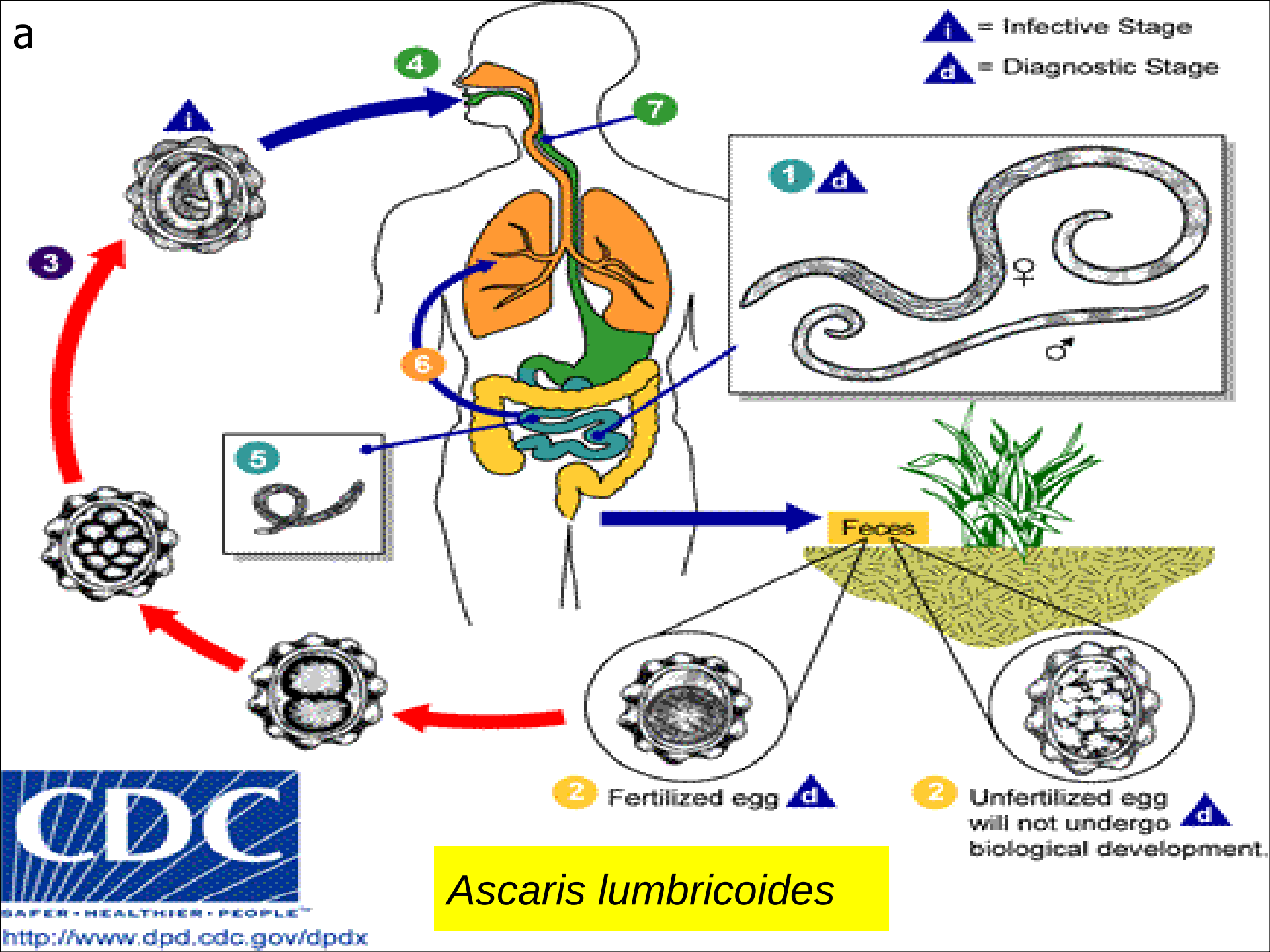
Ascaris lumbricoides (roundworm)

The commonest intestinal helminthes can cause infection to human.

- Found in **jejunum** and upper part of **ileum.**
- Female (**20-40 cm**) which is longer than male (**10-15 cm)**
- Feed on semi digested food.

Ascaris lumbricoides life cycle




a
= Infective Stage
= Diagnostic Stage
1 d
2 Fertilized egg d
2 Unfertilized egg will not undergo biological development. d
Feces
3
4
5
6
7
CDC
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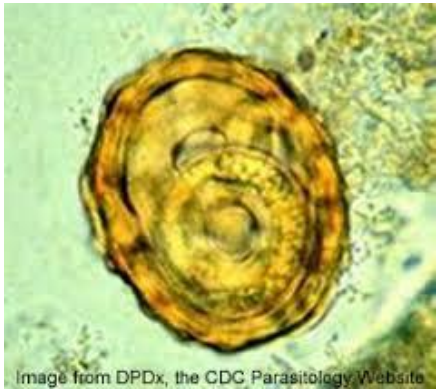
Ascaris lumbricoides

Life cycle of *Ascaris lumbricoides*

It infect human when man ingest **fertilized egg** contaminated with food or water

This fertilized egg become a **Larva** that penetrate the wall of the **duodenum**

It will enter the blood stream to the heart, liver and enter the pulmonary circulation and stay in the **alveoli**



Life cycle of *Ascais Lumbricoides* (cont.)

It will grow and molts for three weeks then **Larva** passes from respiratory system to be **coughed up**, swallowed, returned to the small intestine where it mature to adults male & female

fertilization take place producing eggs which pass in stool.

Pathogenicity

- **Migrating LARVA:**

Ascaris pneumonia, some times LARVA reach aberrant sites like brain, heart or spinal cord can cause unusual disturbance.

Adult WORM:

The worm consumes proteins and vitamins from host's diet and leads to malnutrition

Can cause intussusception, intestinal ulcers and in massive infection can cause intestinal obstruction.

The Trematodes

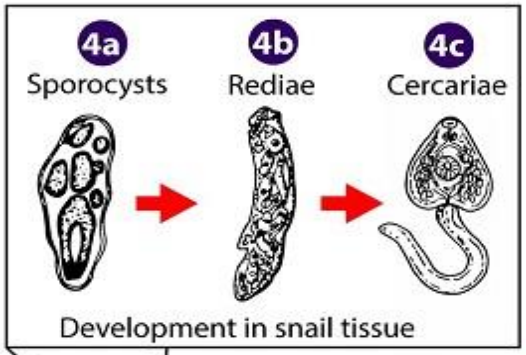
flat worm, unsegmented, leaf like

Fasciola hepatica

DPDx

Fasciola spp.

CDC



5 Free-swimming cercariae encyst on aquatic vegetation.

6 Metacercariae on vegetation ingested by definitive host.

7 Immature flukes excyst in duodenum, penetrate intestinal wall, and migrate though liver parenchyma to biliary ducts.

4 Miracidia penetrate snail intermediate host.

Ruminants are the typical definitive hosts.

3 Miracidia hatch from eggs, seek out snail intermediate host.

2 Eggs become embryonated in water.

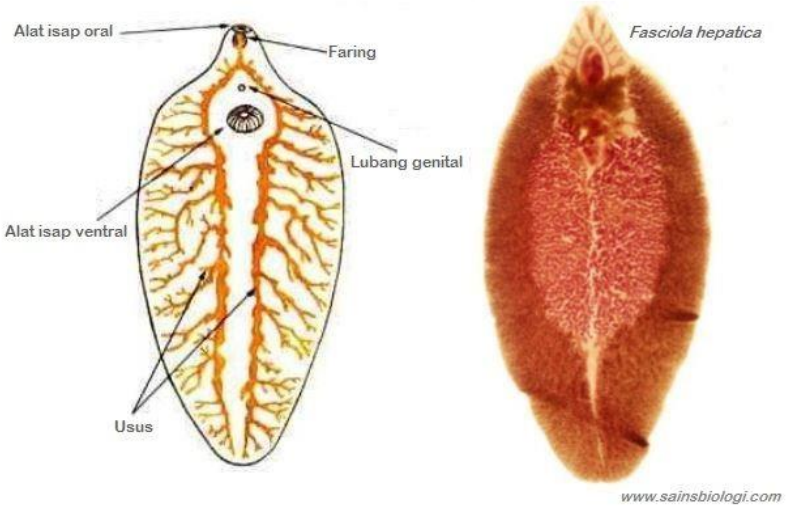
1 Unembroynated eggs are passed in feces.

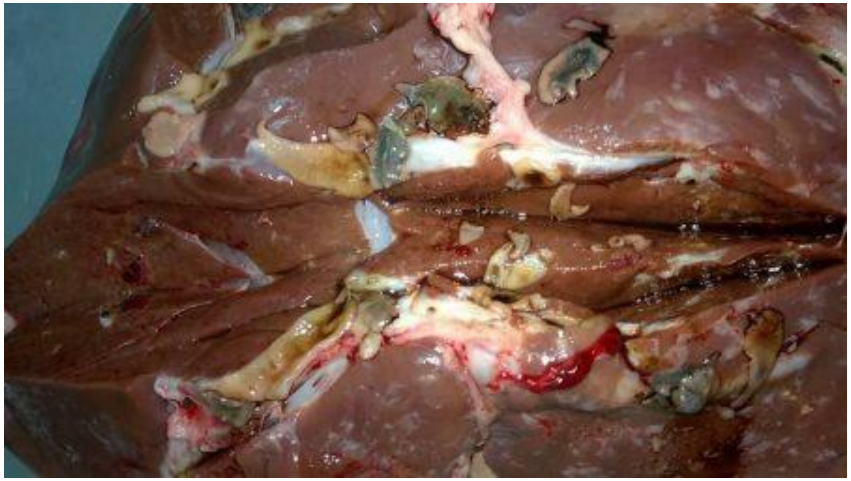
F. hepatica *F. gigantica*

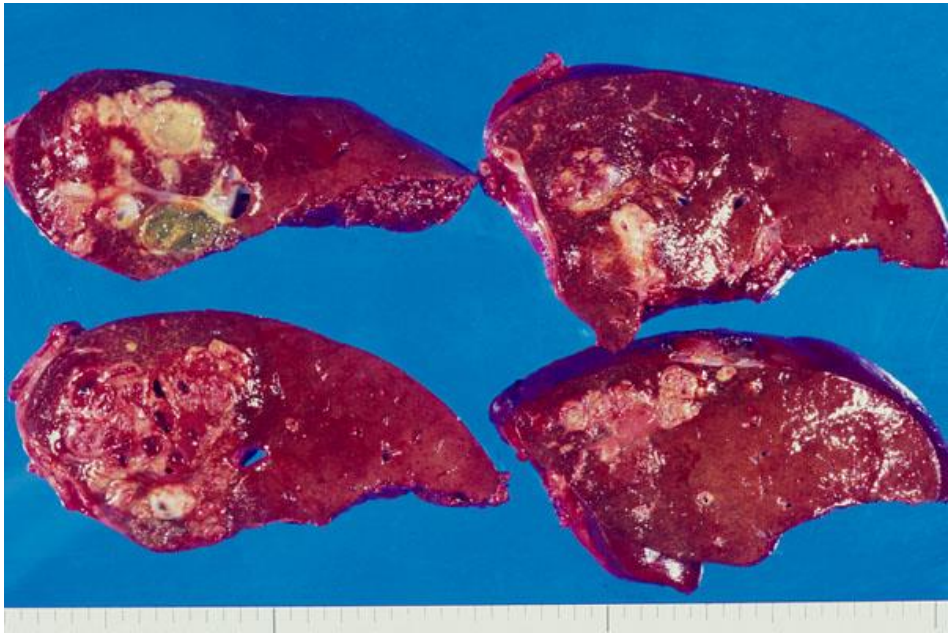
8 Adult flukes in hepatic biliary ducts

Infective stage

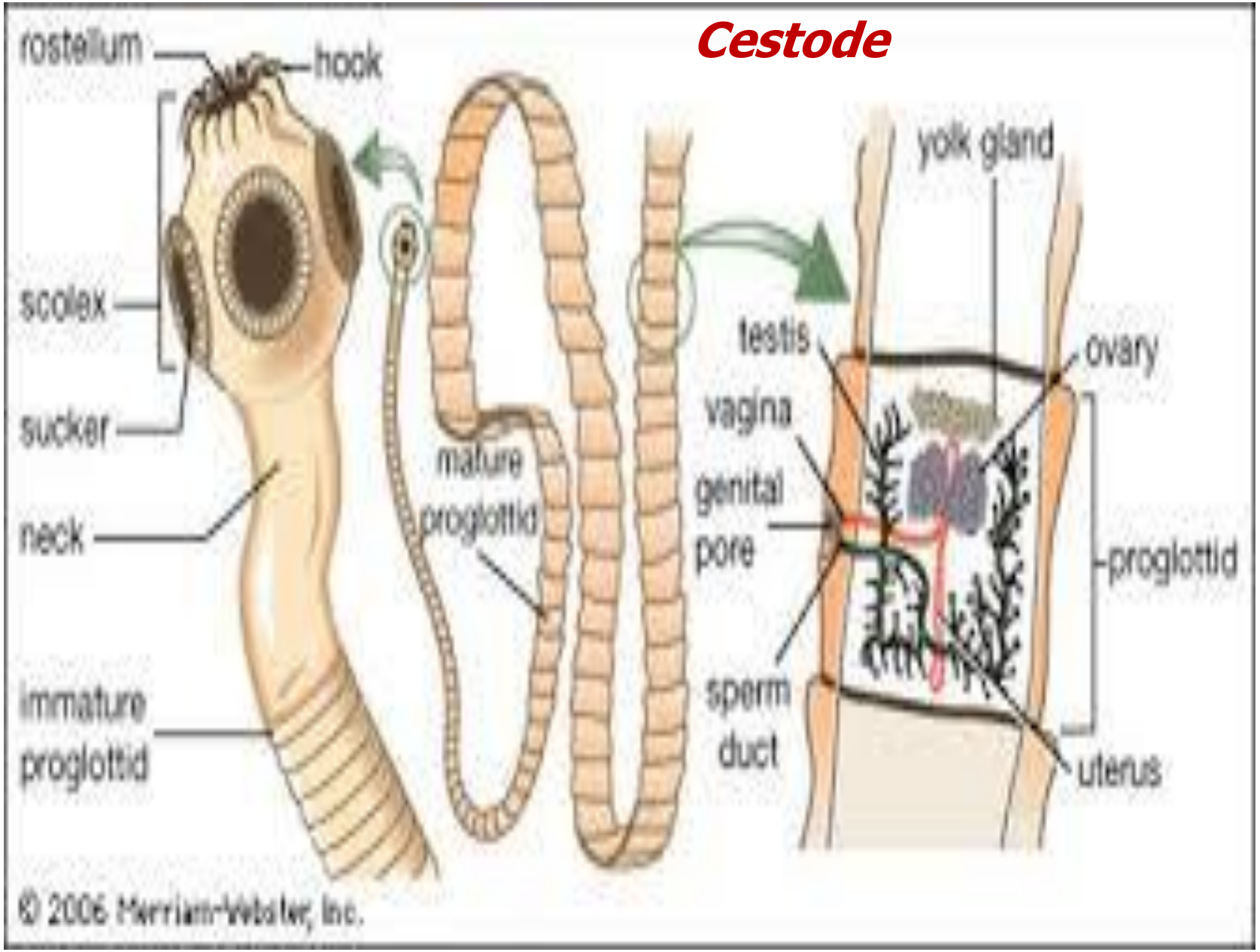
Diagnostic stage


Alat isap oral
Faring
Lubang genital
Alat isap ventral
Usus
Fasciola hepatica
www.sainsbiologi.com





Cestode


rostellum
hook
scolex
sucker
neck
immature proglottid
mature proglottid
yolk gland
testis
ovary
vagina
genital pore
sperm duct
uterus
proglottid
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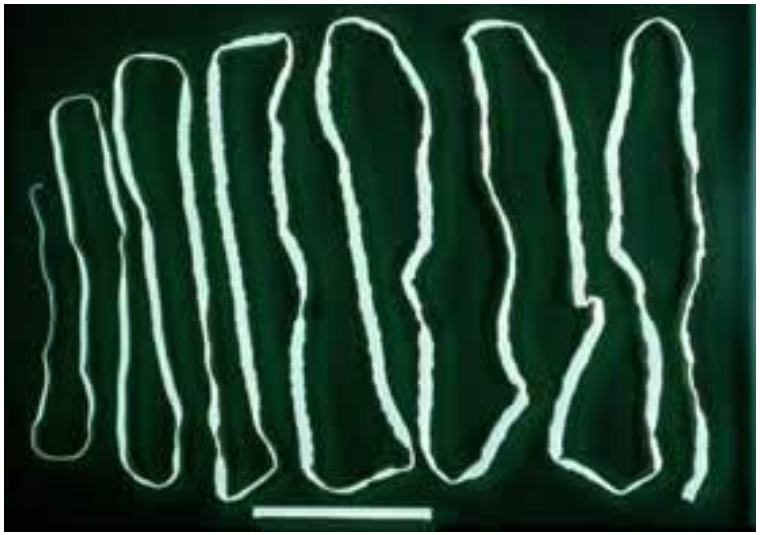

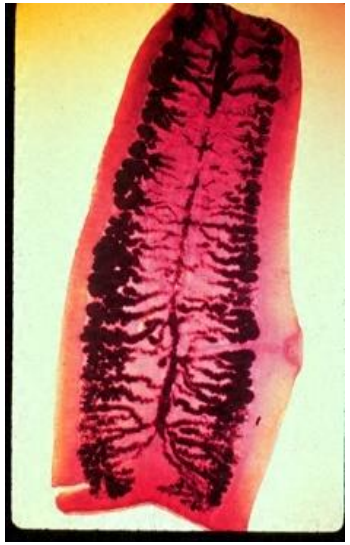

Taenia saginata Example of a Cestode,Tapelike worm segmented.


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muhadharaty.com

MEDICAL IMPORTANCE OF ARTHROPODS

1) As aetiologic agents (causes) of diseases:

- **Tissue damage**
- **Induction of hypersensitivity reactions.**
- **Injection of poisons**
- **Entomophobia (acarophobia)**

2) As vectors of diseases:

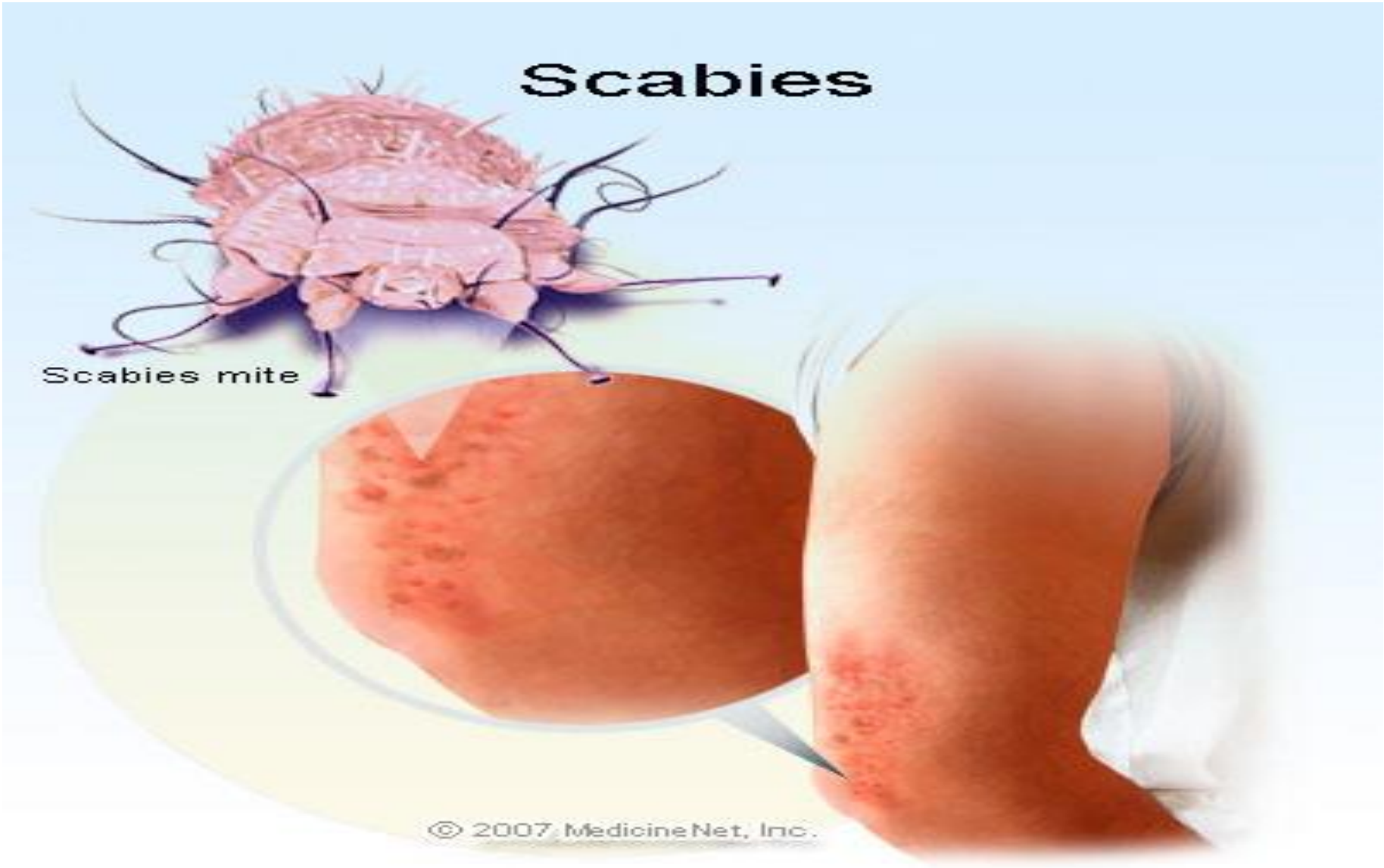
I: Mechanical transmission - simple carriage of pathogens.

II: Biological transmission:

- **cyclical**
- **propagative**
- **Cyclopropagative**

III: Transovarian transmission

Scabies as tissue damage example of Arthropod


Scabies
Scabies mite
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Scabies الجرب

ARTHROPODS OF MEDICAL IMPORTANCE

Class *Insecta* الحشرات	Class *Arachnida* العناكب	Class القشريات *Crustacea*
• Muscid flies: housefly,Tsetse fly • Myiasis-producing flies . • Mosquitoes البعوض: *Anopheles, Aedes, Culex* • Sandfly ذباب الرمل (*Phlebotomus)* • Black fly*(Simulium)* • Fleas البراغيث • Lice (*Pediculus, Phthirus)* القمل • Bugs: *Cimex,Triatoma* البق • Bees النحل	• Scorpions العقارب • Spiders العناكب • Ticks: القراد hard, soft • Mites السوس -*Sarcoptes scabiei*, -dust mites	• Water flea (*Cyclops*)

Important arthropod vectors for human diseases

House fly (*Musca domestica*) الذباب المنزلي	Mechanical transmission of many viruses, bacteria and parasites.
Mosquitoes البعوض	***Anopheles***: malaria, filariasis ***Culex***: filariasis, viruses ***Aedes***: yellow fever, dengue fever, Rift Valley Fever
Lice القمل	**Body louse:** vector for Relapsing fever, typhus and trench fever.
Fleas البراغيث	**Rat flea:** is vector for plague due to *Yersinia pestis*.
Ticks القراد	**Soft ticks:** some are vectors for: *Borrela duttoni* **Hard ticks** Include vectors for Babesiosis (protozoa), Q fever and Rocky mountain spotted fever
Tse tse fly *(Glossina)* ذبابة التسي	**Vector for African Trynanosomiasis** (African sleeping sickness)
Black fly *(Simulium)* الذبابة السوداء	Vector for *Onchocerca* (river blindness)
Sand fly *(Phlebotomus)* ذبابة الرمل	Vectors for ***Leishmania*** and sandfly fever virus.
Cyclops	Vector for *Dracunculus medinensis*

LICE القمل

Pediculus humanus

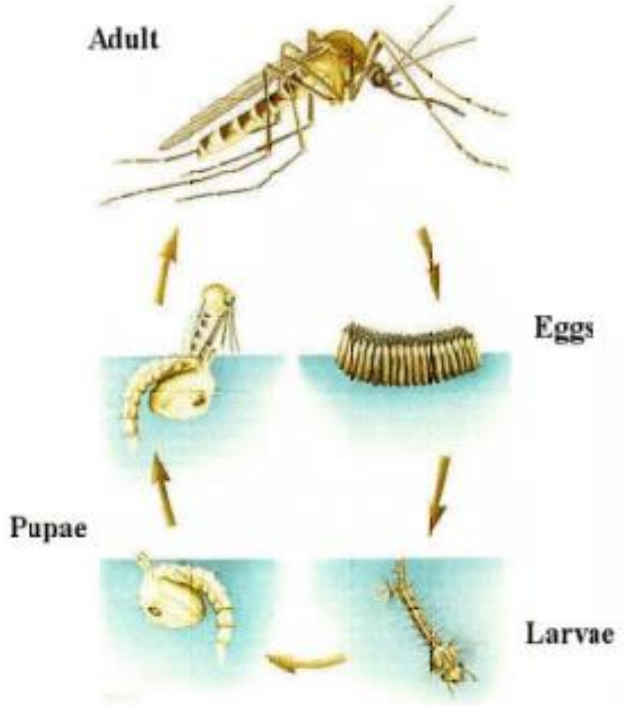
Mosquitoes :

Cosmopolitan, more than 3000 species.

Larval and pupal stages always aquatic

Mouth parts in female adapted to piercing and sucking blood.

Genus and species distinguished by morphology of adult and deveopmetal stages.



Phlebotomus sand fly


Thank you