Microbiology Team
Med441

MED441
KING SAUD UNIVERSITY

# Parasitic helminths and arthropod

Revised & Reviewed by:
Abdulaziz & Bahammam
Faye Wael Sendi

Microbiology Team441

**Color Index:**

- Main text
- Boys slides only
- Girls slides only
- Doctor's notes
- Extra information
- ***Important***

**Editing File**

# Objectives

- Name the three main groups of parasitic helminths 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.

Finally, the last microbiology lecture !!

# Classification of parasites

## Protozoa

Unicellular (Single cell for all function)

Amoebae: move by pseudopodia.

Flagellates: move by flagella.

Ciliates: move by cilia.

Apicomplexa (sporozoa): Tissue parasites.

## Helminths (any parasite with more than one cell)

Multicellular (specialized cells).

A- Round worms = Nematodes
cylindrical, un-segmented (Ascaris).

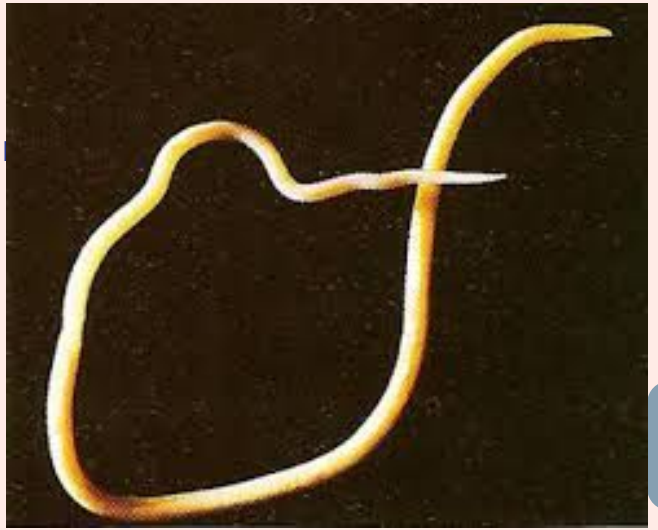
B- Flat worms
1-Trematodes:
leaf-like, un-segmented

2-Cestodes:
tape-like, segmented

Location in the body: intestinal helminths(GIT system), tissue helminths

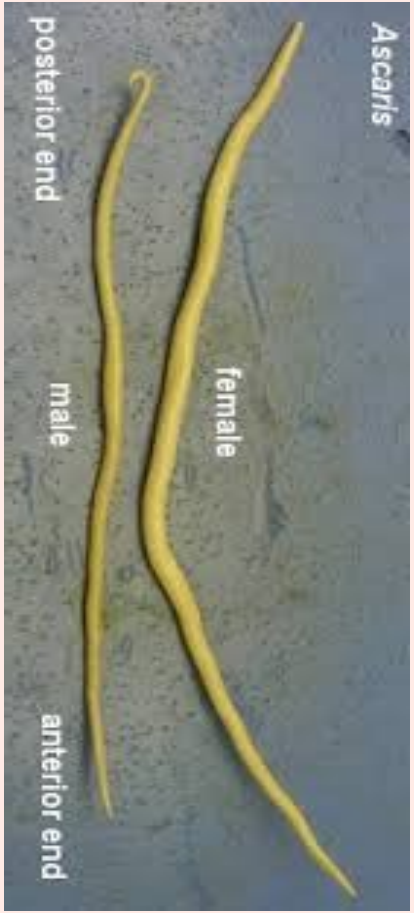
# Nematodes (roundworm)
# Intestinal nematode:

- **General features:**
- 1. Elongated worm, cylindrical, unsegmented and taperi
  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):

- The commonest **intestinal** helminthes can cause infection to human.
- Found in jejunum and upper part of ileum.(adult worm)
- Female (20-40 cm) which is longer than male (10-15 cm).
- Feed on semi digested food.

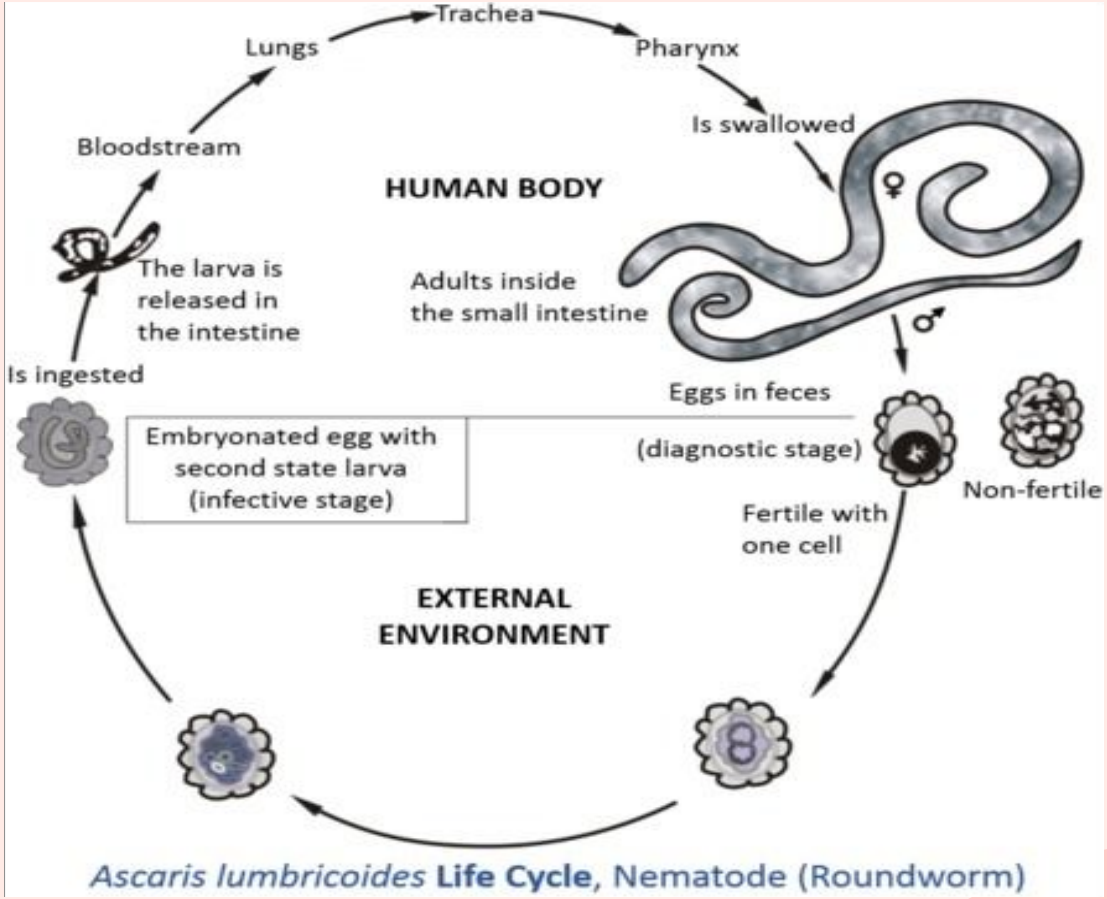


# Ascaris lumbricoides life cycle

**Dr's notes:**

**1- Embryonated egg is the infective stage.**

**2- fertilized/ unfertilized egg is the diagnostic stage.**



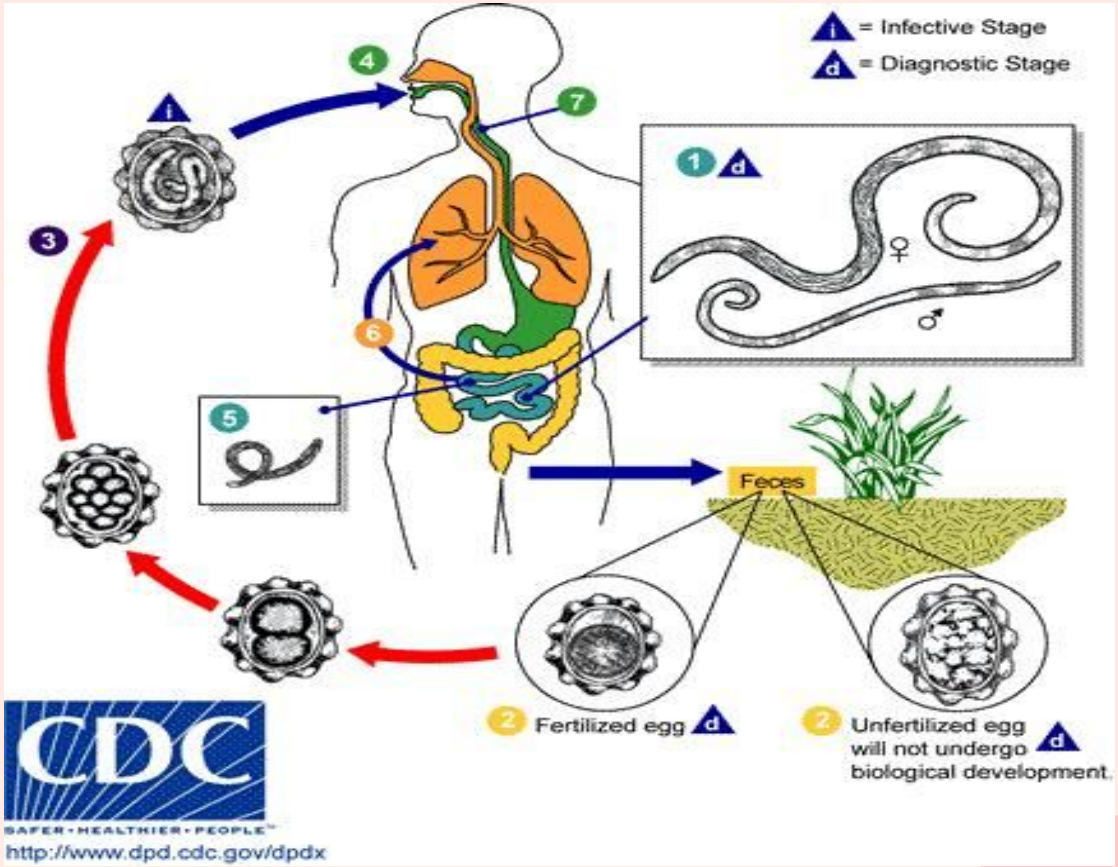
# Ascaris lumbricoides life cycle (cont.)

Dr's notes:

1- Human is the definitive host.

2- There is no intermediate host.

3- larva stay in the lung and cause pneumonia




Dr's notes:
1- the adult worm lives in the jejunum and upper ileum.

2- fertilized eggs stay in soil 2-3 weeks and mature to become an embryonated egg.

# Life cycle of ascaris lumbricoides (cont.)

- It infects the human when a person ingests a fertilized **(embryonated)** egg contaminated with food or water **(infective stage)**.
- This fertilized egg becomes a **Larva** that penetrates 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 ascaris lumbriocoids (cont.)

- It will grow and molt for three weeks then the Larva passes from respiratory system to be coughed up, swallowed, returned to the small intestine where it matures to adult males & females.

- fertilization takes place producing eggs **(definitive, primary host)** which pass in stool **as Fertilized or unfertilized eggs (diagnostic stage). only a fertilized egg can survive in the soil and after 2 weeks it becomes an embryonated egg ready to infect human.**

# Pathogenicity

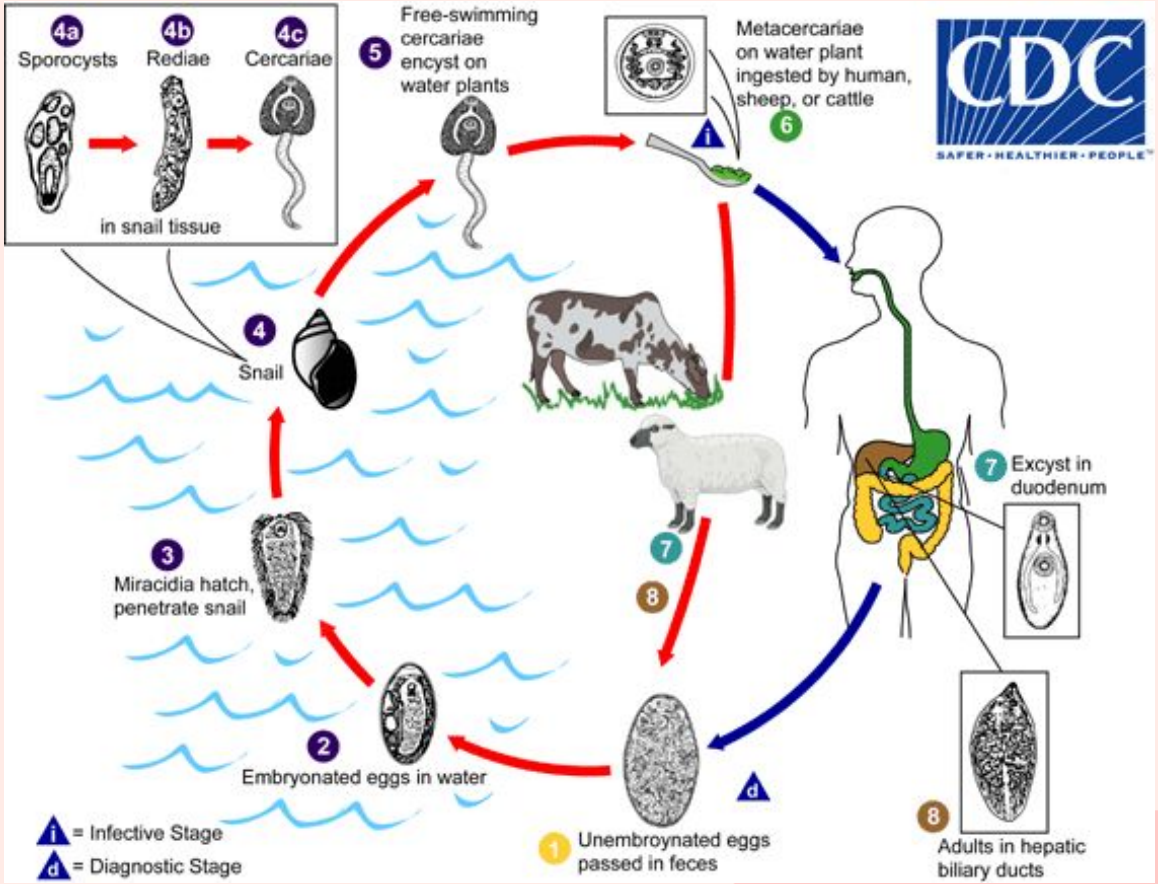
**Migrating LARVA:**
Ascaris pneumonia mainly but some times **LARVA** reach aberrant sites like brain, heart or spinal cord can cause unusual disturbance.

**Adult WORM:**
The worm consumes proteins and vitamins from host's diet and leads to malnutrition (اذا كان طفل راح يتأخر نموه)
Can cause **intussusception**, **intestinal ulcers** and in massive **infection** can cause **intestinal obstruction**.

Termatodes: flatworm, unsegmented, leaf like. (fasciola hepatica).

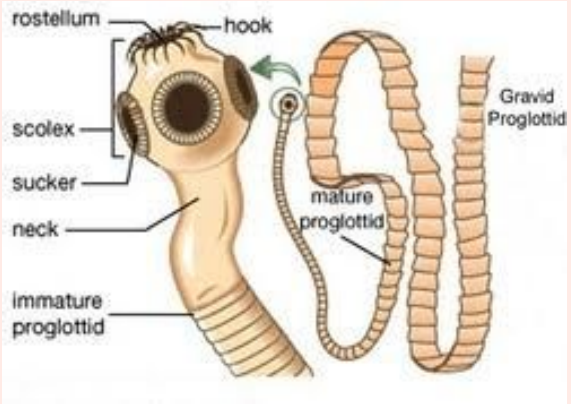
# Fasciola hepatica (trematodes) life cycle:

Dr's notes:
1- man & cattle are the definitive host.
2- snail is the intermediate host.
3- pathology is biliary destruction and jaundice.
4- leaf-like & unsegmented



# Cestode:

tape-like worm, segmented. E.g. **Taenia saginata**.




- **Humans are the primary definitive host, adult live and fertilized in small intestine of man.**
- **Cattle is the secondary intermediate host.**
- **Can cause abdominal discomfort, vomiting and diarrhea in human.**

**Dr's notes: human is the definitive host and cattle is the intermediate host.**

# Medical importance of arthropods :

1) **As aetiologic agents (causes) of diseases** (هو بنفسه يسبب المرض).
- Tissue damage **e.g: scabies (الجرب)**.
- Induction of hypersensitivity reactions.
- Injection of poisons **scorpions** (العقرب).
- Entomophobia **(acarophobia) (رهاب الحشرات)**.

2) **As vectors of diseases:** (ناقل للمرض)
- **Mechanical transmission - simple carriage of pathogens. Flies**
- **Biological transmission:**
  A-cyclical (دوري) filarial parasite
  B-propagative (تتكاثر) e.g:plaque bacillie in rat fleas
  C-cyclo-propagative (تنمو و تتكاثر ) e.g:Malaria in mosquito.

**3) Transovarian transmission (تتوارث) : transmitted as vector from arthopods parents to offspring as rickets is carried within ticks.**

Found in girls slides.

## 2) As vectors of diseases:

### Biological transmission

- **Cyclical (تنمو)**
  - cyclical change only but does not multiply in the body of the vector e,g :filarial parasite.
- **Propagative (تتكاثر)**
  - when the disease agent undergo no cyclical change but multiplies in the vector e,g;plaque bacillie in rat fleas. e.g:plaque bacillie in rat
- **cyclo-propagative (تنمو و تتكاثر)**
  - the disease agent undergoes cyclical change and multiply in the body of arthropods e,g; Malaria in mosquito.

### Mechanical transmission

- simple carriage of pathogens. e.g: Flies.

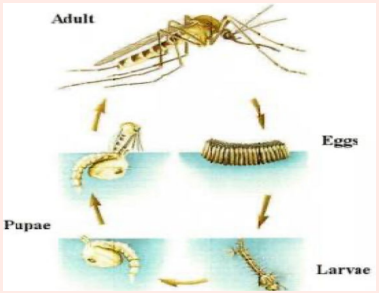
# ARTHOPODS OF MEDICAL IMPORTANCE:

| Class insecta (الحشرات) | Class Arachnida (العناكب) | Class Crustacea (القشريات) |
|---|---|---|
| Muscid flies : housefly , tsetse fly | scorpions (العقارب) | Water flea (cyclops) |
| Myiasis-producing flies | Spiders (العناكب) | |
| Mosquitoes (البعوض) : Anopheles , aedes , culex | Ticks (القراد):hard , soft | |
| Sandfly (ذباب الرمل ) : (phlebotomus) | Mites (السوس):sarcoptes scabiei, dust mites | |
| Black fly (stmulium) | | |
| Fleas البراغيث | | |
| Lice (pediculus , phthirus) القمل | | |
| Bugs : cimex , triatoma البق | | |
| Bees النحل | | |

# 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<br>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.<br>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 |

# Mosquitoes :




**Cyclo propagative (تنمو وتتكاثر)**
**Malaria**

01

Cosmopolitan, more than 3000 species.

02

Larval and pupal stages always aquatic (تعيش في الماء).
Mouth parts in female adapted to piercing and sucking blood.

03

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

**Dr's note:**
**Know that the mosquitoes have cyclo-propagative transmission and malaria is transmitted by mosquitoes.**

## Lice (القمل)
## Pediculus humanus


## Phlebotomus sand fly
## transmit leishmania

## Scabies (الجرب)
## As tissue damage example of arthropod.

# MCQs:

| | | | |
|---|---|---|---|
| 1- what are the definitive and intermediate hosts in cestodes, respectively? | | | |
| A) Human, cattle. | B) human, no intermediate host. | C) cattle, human. | D) No definitive host, human. |
| 2- what biological transmission type does the filarial parasite undergo? | | | |
| A) cyclical | B) propagative | C) Cyclo-propagative | D) transovarian. |
| 3- which one of these anthropods causes trynanosomiasis? | | | |
| A) Lice. | B) mosquitos. | C) tsetse fly. | D) sand fly. |
| 4- how long does the fertilized egg have to stay in soil til it mutaures and becomes an infecting worm? | | | |
| A) hours. | B) Couple of weeks. | C) A month. | D) two months. |

1- A
2- A
3- C
4- B

# Questions and Answers:

| | |
|---|---|
| **1- where is the ascaris worm found, mainly?** | A1- Jejunum & upper part of ileum |
| **2- what is the pathogenicity of trematodes?** | A2- biliary obstruction & jaundice |
| **3-what is the biological transmission for malaria?** | A3- cyclo - propagative |
| **4-what is the aetiologic agent that causes tissue damage?** | A4- scabies |
| **5- only _____ can be survive in the soil for 2 weeks:** | A5- embryonated egg |
| **6- what is the disease that is transported by mosquitoes?** | A6- malaria |

# Team Leaders:

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Reuf Alahmari  Subleader: Alanoud Alhaider  Abdulaziz Alqahtani

# Team Members:

Ghadah Alqahtani
Ghadeer Alturaifi
Leen Alrajhi
Manar Abdullah
Maram Alenazi
Nada Alsaif
Norah Alotaibi

Rana Almazrou
Reem Alkulaibi
Sarah Alhamlan
Sarah Alshammari
Shahad Almuqbil
Yara Almufleh
Ghadah alharbi

Abdulaziz Alqahtani
Abdullah Abdulrazaq
Ali Basfar
Bader Alshahrani
Fahad Alhifhti
Firas Alqahtani
Mohammed Alqahtani

Sulaiman Aldhalaan
Turki Alkhalifa
Nawaf Almadi
Ziyad Alzammam

Contact us:
microbiologyteam441@gmail.com