Southern Technical University

Technical institute of Amara

Department of Nursing Technology

first class

MEDICAL VIROLOGY AND PARASITOLOGY

done by

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الاسبوع الاول

Parasitology

Parasitology : Is the science which deal with living organisms which live temporary or permanently on or within other organisms for the purpose of procuring food and shelter.

Medical Parasitology : Is the science which deals with the parasites which cause human infections and the diseases they produce .

Parasites : Organisms that infect other living beings. They live in or on the body of another living beings called **host** and obtain shelter and nourishment from it .

Types of Parasites :

1.Ectoparasite (external) : Which inhabit the body surface only, without penetrating into the tissues. Like : Lice, ticks, mites, fleas and mosquitos.

2. Endoparasite (enternal) : Which live within the body of the host. Like: all protozoan and helminthic parasites.

3. Pathogenic parasites : Which causes injury to the host by its mechanical or toxic activity .

4. Temporary parasites : It is free-living parasite which visite the host occasionally for obtaining the food .

5. **Permanent parasites :** Which remain on or in the body of the host from early life untile it's muturity.
6. **Facultative parasites :** Organisms which may exist infree-living state or may become parasitic living .
7. **Obligate parasites :** It is organisms which is completely depend on the host .

The host : It is the organisms or animale which parasite live on or in it .

Types of hosts :

1. **Definitive (**final**) host :** The host in which the adult stage lives or the sexual mode of reproduction takes place.
2. **Intermedial host :** The host in which the larval stage of the parasite lives or the asexual multiplication takes place .
3. **Reservoir host :** It is an animal that can harbor the parasite and can be potential store of infection for man .
4. **Vector :** It is usually on arthropods (insect) that carries the parasite to it's host. There are **2** types :

A. **Mechincal vector :** Only transport the parasite without any role of life cycle, like fly .
B. **Biological vector :** The parasite undergo development or multiplication in the body of it.

" Host - Parasite relationship "

Symbiosis : It is relationship between parasite and host. Symiosis divided into :

1.Mutualism : In which asymbiotic association is benefit to both organisms. (flagellate in termit's intestine).

2.Commensalism : When one of the associated organism is benefit and the other is neither benefit non affected. (***Trypanosoma musculi*** live in Rat's blood) .

3.Parasitism : It is an association in which one organism depend upon another for it's existence, the one organism called (parasite) and the other called (host) and usually causes harm to the host .

The parasitic disease required the following Factors:

1. Source of infection .
2. Method of transmission .
3. Suitable host
4. Presence of vectors .

General Classification of Parasie

- ¤ Medical Protozoology .
- ¤ Medical Helminthology .
- ¤ Medical Entomology

Medical Protozoology

Parasitic protozoa

The main characteristics .

1. **Unicellular organism :** consist from :

a. Protoplasm consist from **: (** Cytoplasm + Nucleus **)**

b.Nucleus consist from **: (** Nuclear membrane + Chromatin **)**

2. **Nutrition :** by Engulfment
3. **Motility** . by **:**

a. Pseudopodia ⟶ *Entamoeba histolytica*

b. Flagella ⟶ *Giardia lambli*

c. Cilia *Balantidium coli*

d. Non motile *plasmodium SPP*

4. Reproduction : By many method.

A. **A**sexual Reproduction **:** Binary fission, Schizogony, Longitudinal

B. sexual Reproduction .

Classification of Protozoa :

Phylum Protozoa include 4 classes due to locomotive organs .

1. Rhizopoda: move by **: pseudopodia**
2. Flagellata : move by **: flagella**
3. Ciliata move by **: cilia**
4. Sporozoa . move by **: have no locomotive organs**.

1-The class Rhizopoia :

Divided in to **4** groups due to to their **locomotive organs** .

1. *Entamoeba histolytic*

2. *Entamoebia coil*

3. *Entamoebia hartmanni*

4. *Naegleria SPP* . free living amoebae.

Example **: <u>Entamoeba</u> <u>histolytic</u>**

Multiply: by binary fission .

Disease : Amoebic dysentery , Intestinal amoebiasis , Amoebic hepatitis .

Habitat : large intestine of human .

Geographical distribution : Cosmopolitation

Morphology : two stage, **A.** Cyst → non motile . **B.** Trophozoite → motile .

Site in host : Lumen and wall of large intestine in human and Monkeys.

Source of infection : Cyst in food and water from feces of human .

Infective stage : Mature cyst with 4 nuclei .

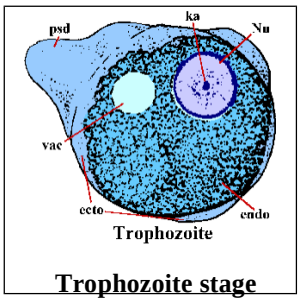
Diagnostic stage : Trophozoite and cyst .

Mode of infection : Oral route by ingestion mature cyst contaminated foods or drinks .

Morphology : Have 2 stages :

1. Trophozoite stage :

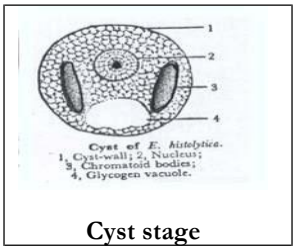
- Irregular shape.
- Cytoplasm is differentiated in to ectoplasm and endoplasm .
- Number of food vacules in the cytoplasm continig (RBC).



Trophozoite stage

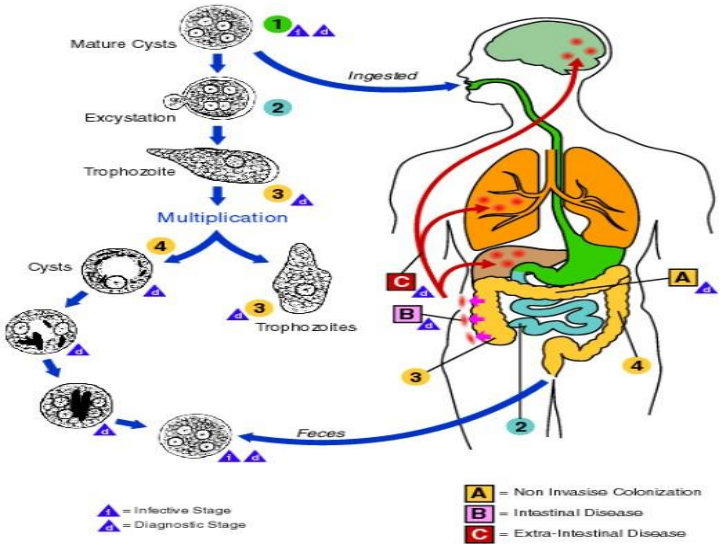
2. Cyst stage:

- Cyst can formed only in the luman of host intestine .
- Spherical or round or oval shape .
- Contain 1-2-3 nucleus (**immature cyst**), four nucleus (**mature cyst**).



Cyst stage

Diagnosis sample : Stool examination to identify **trophozoite** or **cyst**



Life cycle of Entamoeba histolytica

2 -The class Flagellates :

Dividedin in to **3 groups** due to their habitate **:**

1- **Intestinal flagellates.** Ex **:** *Giardia lamblia*

2- **Genital tract flagellates.** Ex **:** *Trichomones vaginalis*

3- **Blood and tissue flagellates :** *Leishmania tropic*

Leishmania donovani

Leishmani

brazillensis

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Intestinal flagellates

Example : *Giardia lamblia*

Disease : Giardiasis

Habitate : Upper part of small intestine.

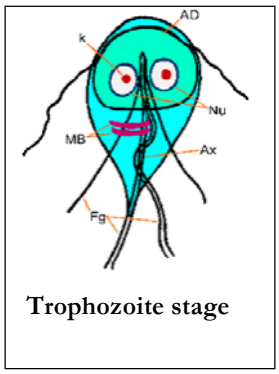
Host : Final host (human) , Intermediat host : No .

Infect stage : (Mature cyst with **4** nucleic)

Diagnostic stage : Trophozoite and Cyst .

Mode of infection : Oral-route . (by ingestion mature Cyst with contaminated food)

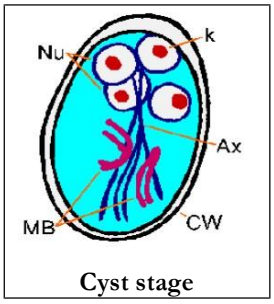
Morphology : Have 2 stages:



Trophozoite stage

1. Trophozoite stage :

- Pear shape. – Size-long about (15M with 12 M)
- Bilaterally symmetrical .
- Two large sucking disc anteriorly .
- Two Axostyle .
- Two nucleic with large central Karyosome .
- 4 pairs of flagella .

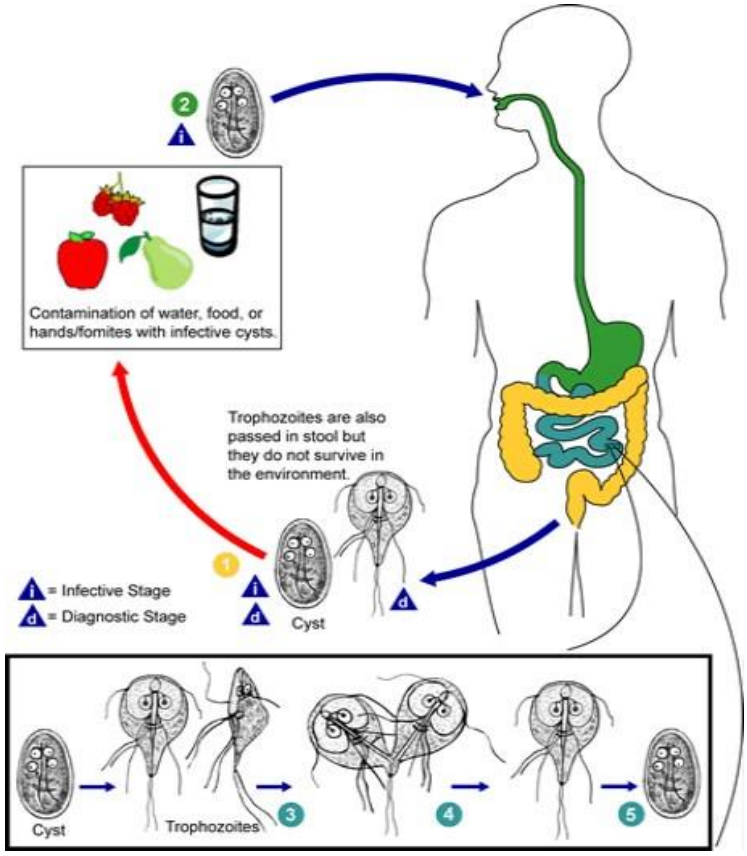


Cyst stage

2. Cyst stage:

- Oval shape .
- Well define double cyst wall.
- 2 or 4 nucleic .
- Found in diarrheic stool and immature cyst found in normal stool in a large number .

Diagnosis : Stool ⟶ direct smear ⟶ iodine and Microscopic examination reveal trophpozoite and cyst .



Life cycle of Giardia lamblia

Blood and tissue flagellates

(Haemoflagellates **)**

Phylum : Protozoa

Class : Flagellates include 2 genus **:**

Genus Leishmania

Genus Leishman include 3 speices infected human . ***Leishmania tropica***

Leishmania donovani

Leishmania brazillensis

Example **:** ***Leishmania tropica***

Disease : Cutanous Leishmaniasis, troika sore, Baghdad boil . It cause 2 types of Lesion :-

1- Leishmania tropica major (Wet-type lesion) .

2- Leishmania tropic major (Dry -type lesion) .

Example **:** ***Leishmania donovani***

Disease : Viscular Leishmaniasis or Kala – azar .

Habitat : Tissue of Reticulo – endothelial , system (Liver, spleen, lymphnodes, bone marrow

Example **:** ***Leishmania brazillensis***

Disease : Muco cutanous Leishmaniasis .

Habitat : Muco cutanous membrane of (nose, Larynx, ear)

Host : Intermediate host **:** Female of **sand fly** . Final host **: Human** .

Infective stage : Promastigote stage .

Mode of infection : Through the skin by bitting of infected insect vector (**sand fly**) .

Sample for diagnosis : Blood or tissue (skin according habitate).

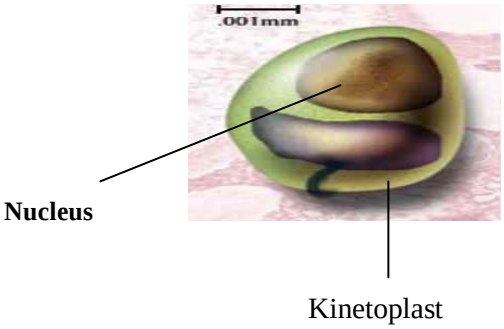
Morphology : Leishmania parasite found in 2 forms .

1- **Amastigot stage :** or (Leishmania form)

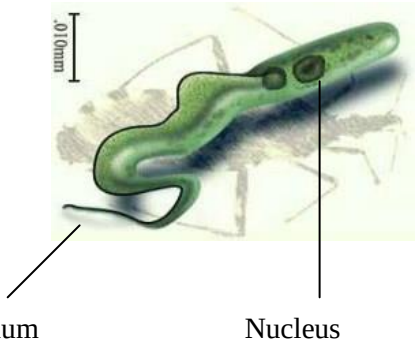
- This stage found in human only .
- Oval shape .
- One nucleus oval or round lies in the central .

2- **Promastigote stage :**

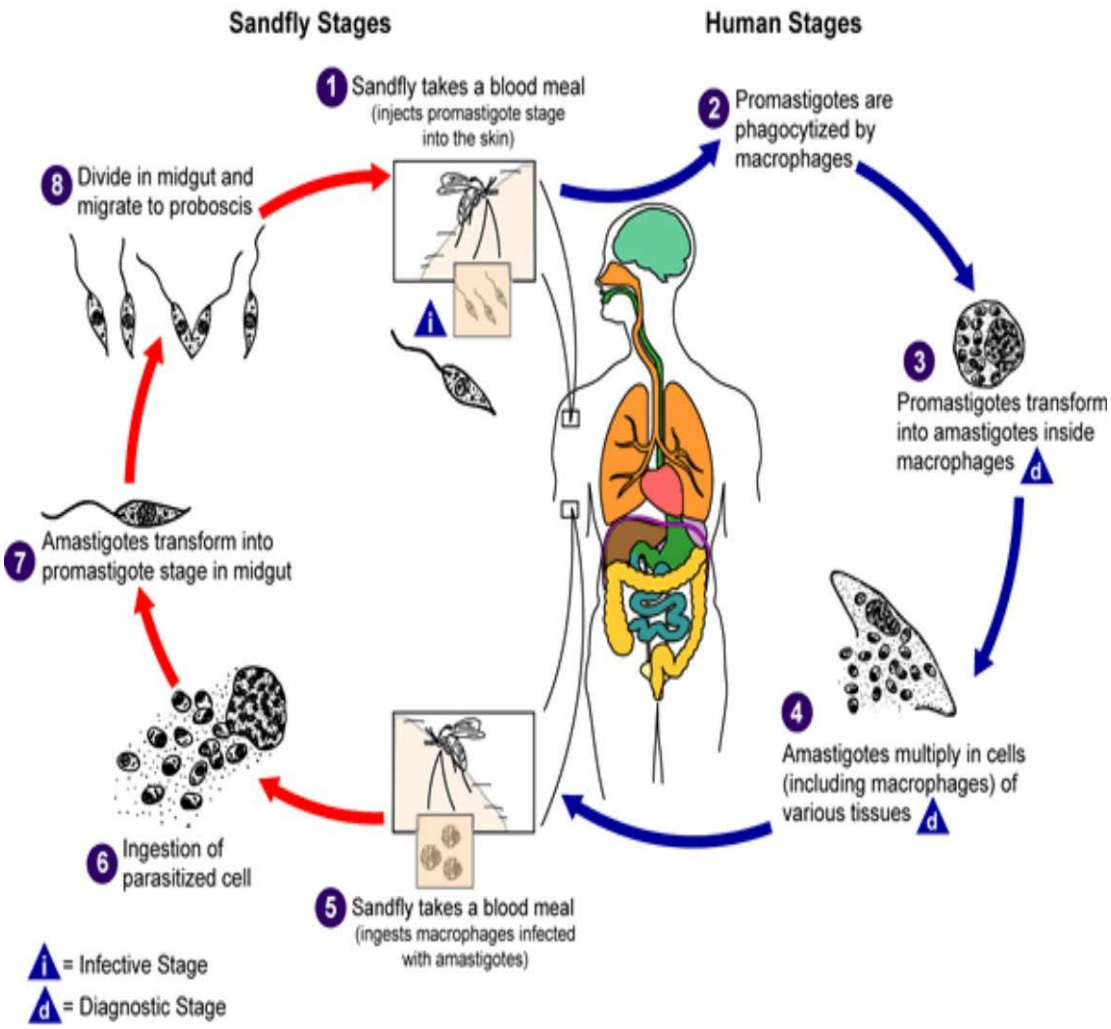
- Elongated shape or spindle .
- Found only in insect ,
- Nucleus in the middle (large).
- Have one free flagellum .



Amastigot stage



Promastigote stage



Life cycle of Leishmania

The class ciliate

Class ciliates .

Genus : Balantidium coli

Ciliates : The body of this protozoa cover with short hairs like processes known **cilia** .

Disease : Balantidiasis dysentery or Balantidiasis .

Habitat : Large intestine of man .

Host : Human

The infective stage : Cyst

Diagnostic stage : Cyst

Mode of infection : Oral route by ingestion mature cyst contaminated foods or drinks .

Morphology : Have 2 stages : 1-Trophozoite 2-Cystic stage . Both stages (Trophozoite and Cystic stage) have macronucleus (reniform is shape) kidney shape .

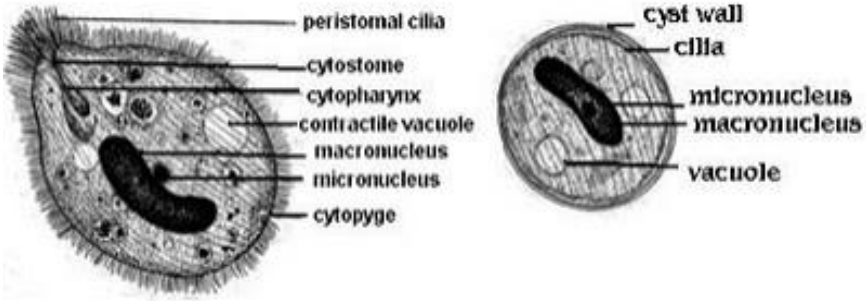
Trophozoite stage :

- Large oval shape .
- The cell coverd with cilia (Locomotive organs).
- The cell has two nuclei . **Macronucleus** and **Micronucleus** .

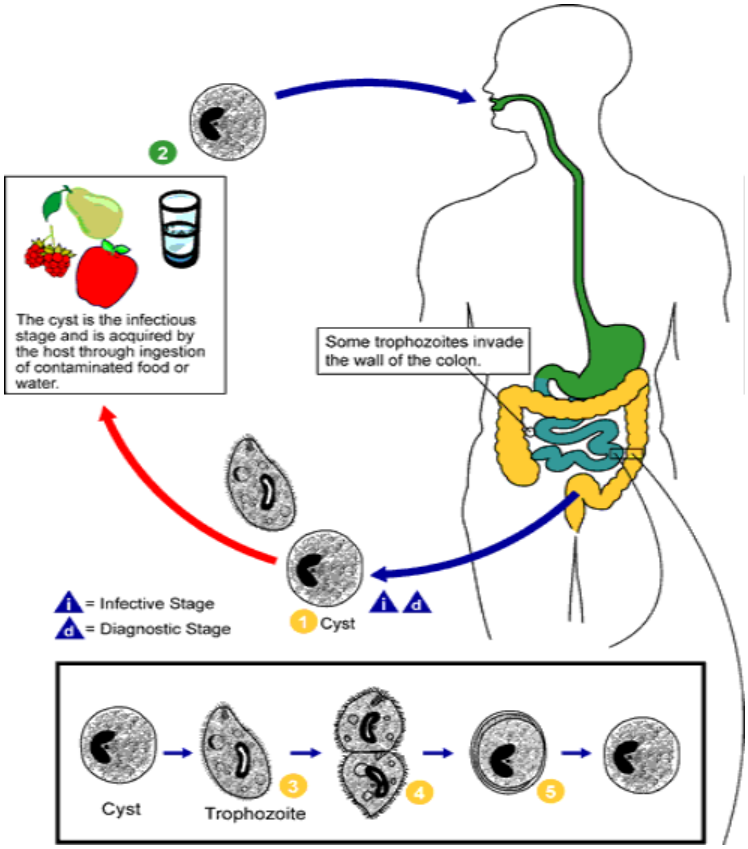
Cyst stage :

- Ellipsoidal shape.
- No ciliated and.
- Contain 2 nuclei spherical or ovoid in shape.

Diagnosis :- General stool Examination (G-S-E) infective cyst or non infective trophozoite . in the acute dysentery actively motile trophozoite are seen .



Trophozoite stage **Cyst stage**



Life cycle of Balantidium coli

The class Sporozoa

Include 4 types **:**

Plasmodium vivax **:** cause Benign tertian malaria

Plasmodium ovale **:** cause tertian malaria

Plasmodium malaria **:** cause quarter malaria

Plasmodium falciparum **:** cause Malignant tertian malaria

Example : *Plasmodium vivax*

Disease : All species cause malaria .

Host : There are 2 host :

1. Intermediate host vertebrate host **" human"** in blood intra **RBC** cell (**Asexual phase**)

2.Final host: invertebrate host (insect) called (Female of Anophelas mosquito**)** as avector. **(sexual phase)**.

Vector : female of Anopheles insect (Mosquito) .

Infective stage : Sporozoite (salivary gland of Anopheles)

Mode of infection : By biting of Mosquito.

Habitat : In circulatory system of vertebrates .

Clinical aspects : (**fever**, **coldness**, **sweating**) that symptom occur during the sudden liberation of merozoites into blood stream . and bloody urine .

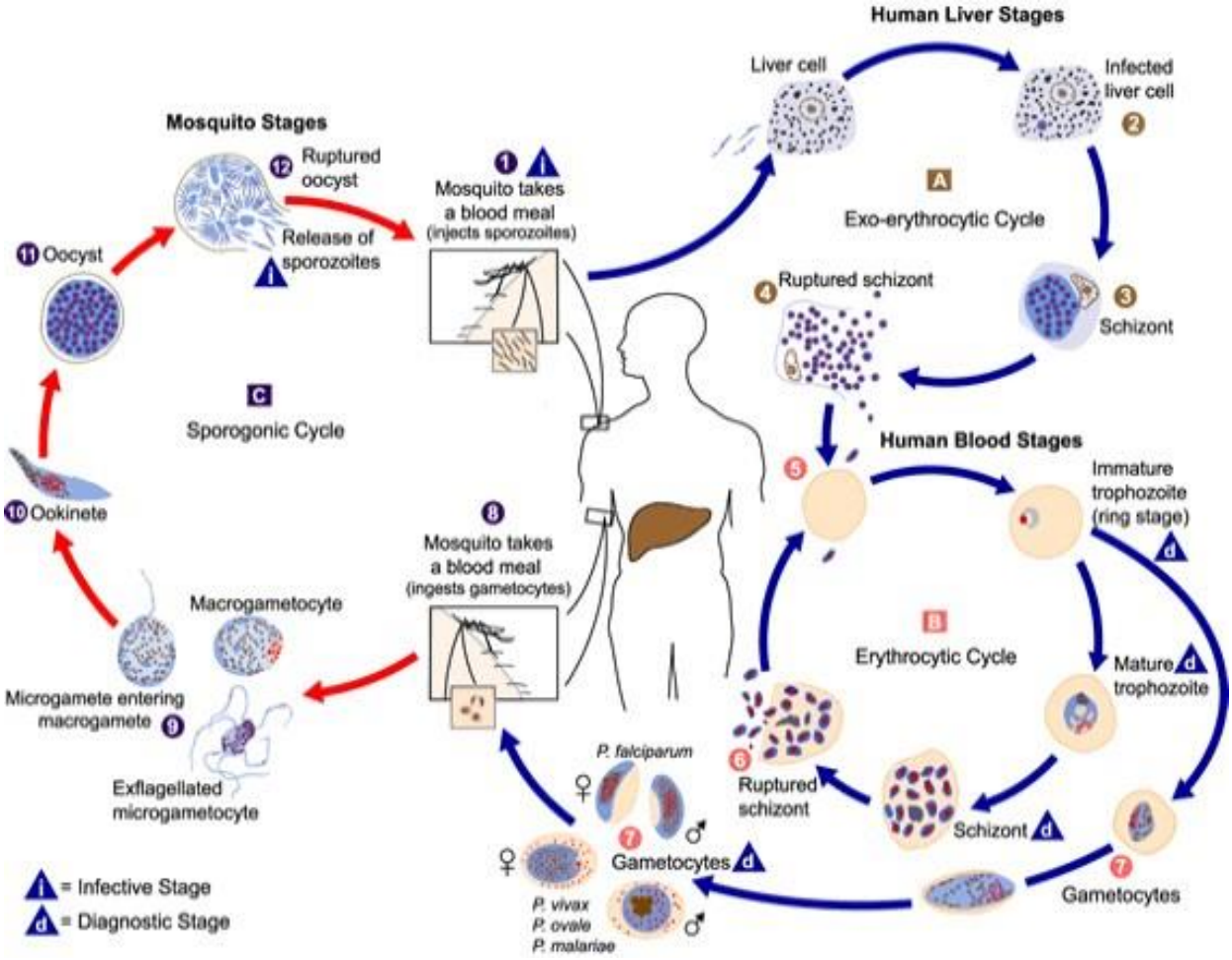
Laboratory diagnosis .

1. Microscopic examination of blood film **thick** and **thin** film .

thick film ⟶ in case light infection

thinfilm ⟶ in case species diagnose and maintain shape of **R.B.C** but in thick film **R.B.C** Lysed .

2. Immunological test .



Life cycle of **Plasmodium vivax**

Medical Helminthology

Platyhelminthes Nemathelminthes Acanthocephal

Platyhelminthes :

Class: Trematoda

General character :

1. This group of parasites is also known as **flukes** .

2. The body flattened (Leaf like) except of schistosomes which are elongated.

3. All are **monoecious**, except of schistosome (**Diecious**).

4. The eggs of trematoda are **operculateds** except of schistosome, have no **operculum** but have **spine** .

Phylum : Platyhelminthes

Class: Trematoda

Genus : Schistosoma

Species :
- *Schistosoma Haematobium*
- *Schistosoma mansoni*
- *Schistosoma Japanicum*

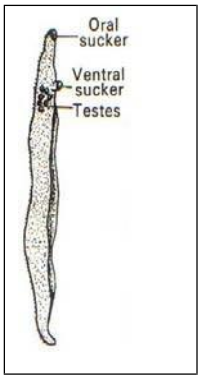
All trematodes pass through a phase of asexual development in the snail host

Bulinus truncates.

Disease : Urinary bilharziasis . *S. haematobium*.

Habitat : Depend on the type**.**

1. **Adults :-** Int the portal vein specially the vesical plexus of man .
2. **Egg :-** passes out in urine and very rarly in faces .
3. **Larval stage :-** in the tissues of snail Bulinus spp.



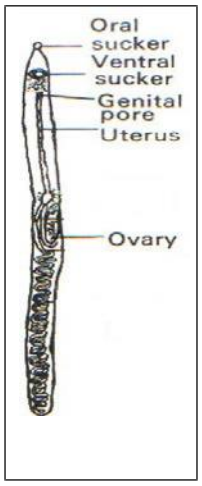
Morphology : Have two form Male and female .

1- Male :

- Have small oral suckerand larger ventral sucker .
- Have a gynaecephoric canal ,
- Cuticle on the doesal surface.

2- Female :

- Body is cylindercal (thread like).
- Cuticle is smooth (without tubercles).
- Overy is small elongated .

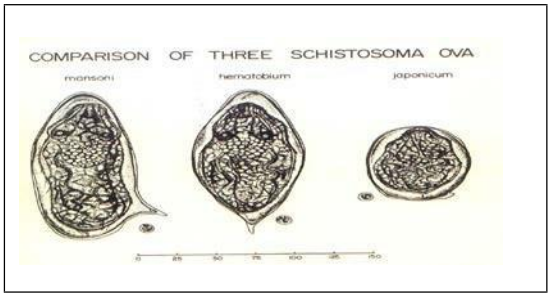


There are three types of schistosome eggs :

1- *S. Mansoni* : Lateral spine.

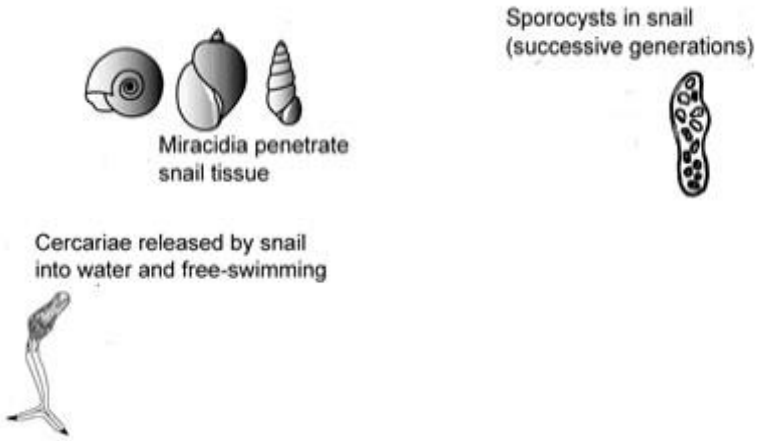
2- *S. haematobium* : Terminal spine.

3- *S. japanicum* : Rudimentary spine .



The larval stage of *Schistosoma SPP.*

1. Miracidium **:** is the Larval stage surrounded by cilia , that infected snail .
2. Sporocyst **:** 2nd Larval stage grow in the snail .
3. Sporocyst **:** Redia , Daughterredia , cercaria.



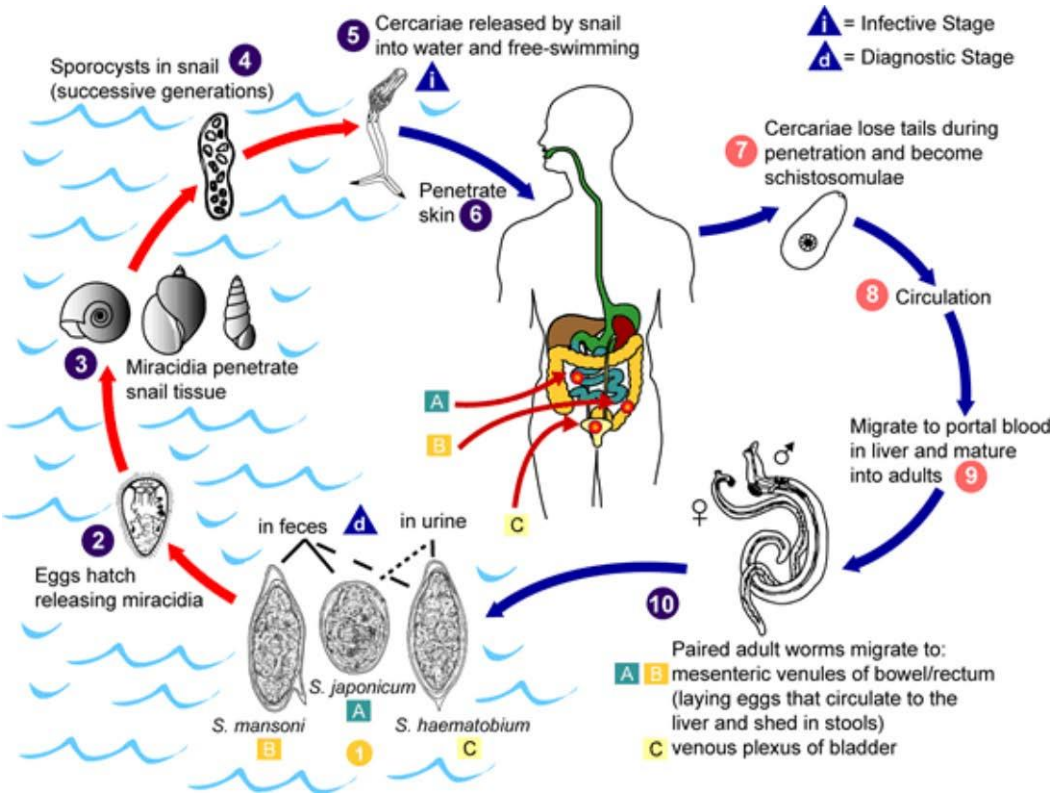
Miracidium **Sporocyst** **Cercariae**

Host: Final: **human**. Intermediate host :- ***Snail bulinus truncatus***

Infective stage : Cercaria with forked tail .

Diagnostic stage : Eggs with terminal spine in urine .

Mode of infection : By pentration of cercaria directly through the skin.



life cycle of schistosoma spp

Nemathelminthes :

Nematoda :

General characteristics :

1. Cylindrical worm, un segmented, cover with thick Layer of **cuticle** .
2. Has cutting plates, and teeth, mouth with buccal cavity .
3. Separated sexes. ( ).
4. No sucker and no hooks .
5. Has intestinal tract .
6. Has body cavity .
7. produce ( ) a large number of ova .
8. Habitat in intestine, blood, tissues .

Class: Nematoda

Example : *Enterobius vermicularis*

Common name : pin worm

Disease : Enterobiasis or Oxyuriasis or pin worm infection .

Habitat : Large intestine in man .

Geographical distribution :

Host : a:- Final host :- **Man** b:- Intrermediat host : **No**

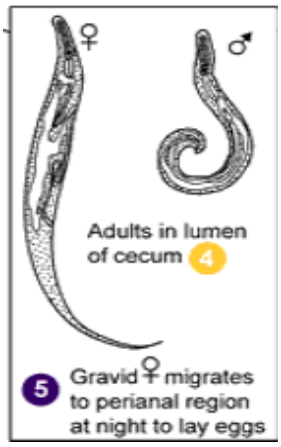
Source of infection :

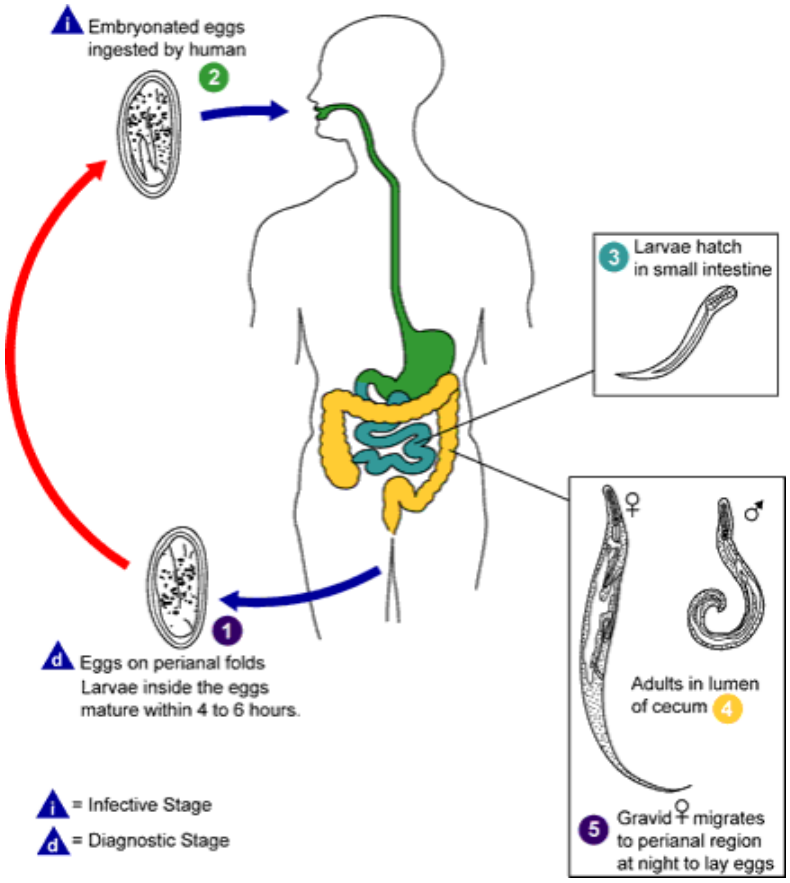
Infective stage : Embryonated egg .

Diagnostic stage : Egg and adult worm .

Mode of infection : Oral – rout by ingestion of eggs .

Diagnosis sample : Stool.





life cycle of Enterobius vermicularis

Nemathelminthes :

Class: Nematoda

Genus :

Example : ***Ascaris lumbricoides***

Common name : Giant round worm.

Common name : Giant round worm .
Disease : Ascariasis

Habitat : Small intestine of man and pigs .

Host : **A:** Final host : **Man** **B:** Intrermediat host : **No**

Infective stage : Embryonated egg . (which contain mature larvae)

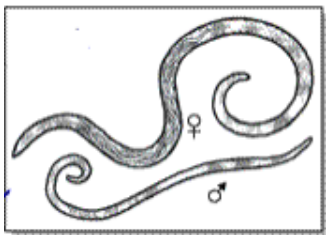
Diagnostic stage : Unembryonated egg .

Mode of infection : Oral-rout by ingestion of embryonated egg with food or drink .

Morphology : **1.** It is the largest intestinal nematode in man .

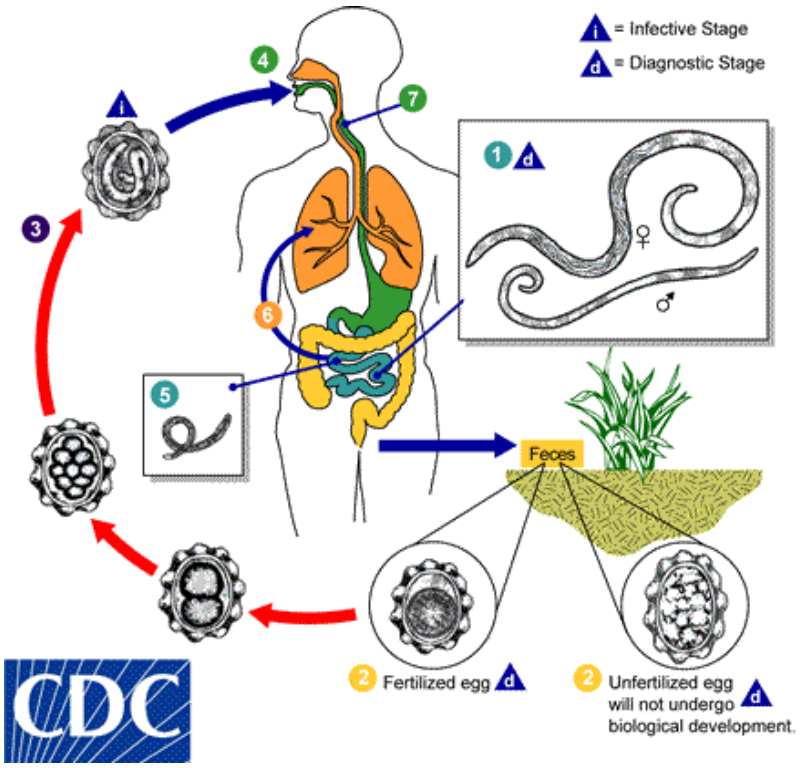
2. Body of adult is cylindrical with tapering ends .

3. Mouth is surrownded by **3** toothed lips .



Male : is smaller than female. **Egg :** Round or oval in shape .

Diagnosis sample : Stool .



life cycle of Ascaris lumbricoides

Nemathelminthes :

Class: Cestoda.

General characters .

1. The body of the worm segmented (proglottids)
2. The Length of the worm variable (few mm- many meter).

Adult worm consist of **:** **a.** scolex **b.** neck **c.** strobila (many of proglottid)

3. Scolex supplied with suckers .

4. Hermaphrodite (O + 7) in the same proglottids .

5. Development and complete reproductive system .

6. Segments or proglotticls divided into .

A. Immature segment .Small and reproductive organ, located near the **Scolex**.

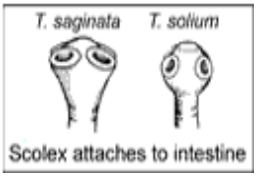
B. mature segment (proglottid) known **gravid segments** located in the end of worm body full with ova.

Class : Cestoda

Genus : Taenia

Species : Taenia

Example : ***Taenia saginata , Taenia solium***



Common name : Beef tape worm or Bovin tap worm .
Disease : Taeniasis or Beef tap worm infection .

Morphology :

1. **Scolex :** Round 12mm in diameter, has 4 suckers (cuplike) no spine hook and rostellum.
2. Length 5-10meter (2000 proglottids)
3. **Eggs :** spherical, 33-43um in diameter transparent shell, radically striated Layer surrounded the embryo (Hexacanth embryo)
4. Lateral branch of uterus /15-30 branch

Habitat : **1.** Adults inhabit small intestine of man only .

2. Egg passes in human feaces.

3. Larvae (Cysticercus) in the muscles of cattle.

Final host .Human (adult worm) in intestine .

Intermediate host : found Larval stage cysticercus bovis in the muscle of beef

Source of infection :

Infective stage of human : form eating meat contain Cysticercus bovis

Infective stage of animals: form eating eggs and gravid proglottid that found in stool

Diagnostic stage :

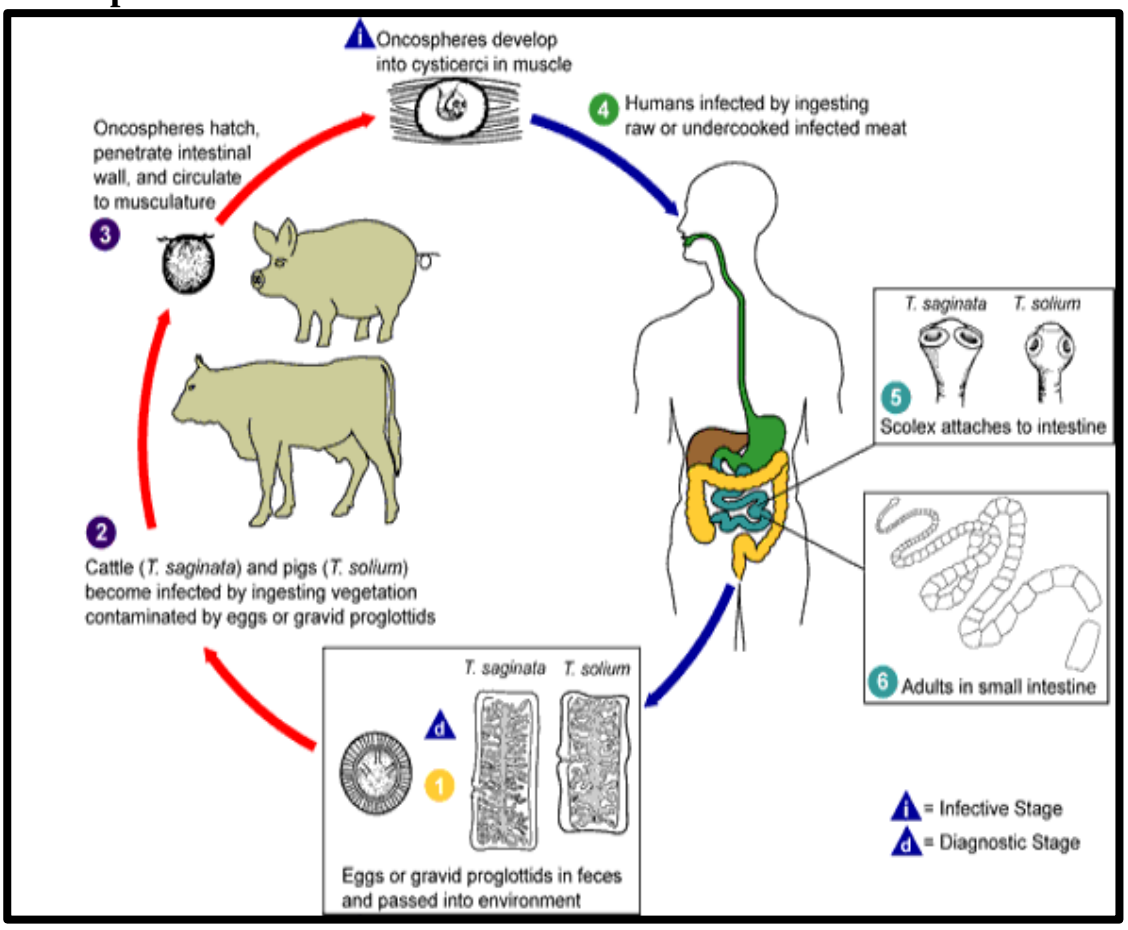
Mode of infection :

Diagnosis sample :

Morphology:

a. **Scolex** : 1mm in diameter 4suckers.
b. Rows of spine hook with Rostellum.
c. **Eggs** : resemble that in T. saginata .
d. Lateral branch of uterus, 5-15 branch.

Diagnosis sample : Stool examination :



Life cycle of Taenia spp.

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The class Ciliate

Class ciliates .

Genus : *Balantidium coli*

Ciliates : The body of this protozoa cover with short hairs like processes known **cilia** .

Disease : Balantidiasis dysentery or Balantidiasis .

Habitat : Large intestine of man .

Host : Human

The infective stage : Cyst .

Diagnostic stage : Cyst .

Mode of infection : Oral route by ingestion mature cyst contaminated foods or drinks .

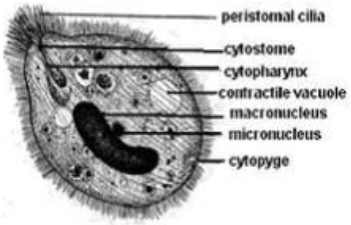
Morphology : Have 2 stages : 1-Trophozoite **2**- Cystic stage . Both stages (Trophozoite and Cystic stage) have macronucleus (reniform is shape) kidney shape .

Trophozoite stage :

-Large oval shape .

-The cell coverd with cilia (Locomotive organs).

-The cell has two nuclei . **Macronucleus** and **Micronucleus** .



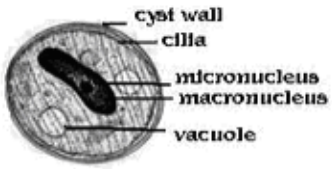
Trophozoite stage

Cyst stage :

-Ellipsoidal shape.

-No ciliated and.

-Contain **2** nuclei spherical or ovoid in shape.

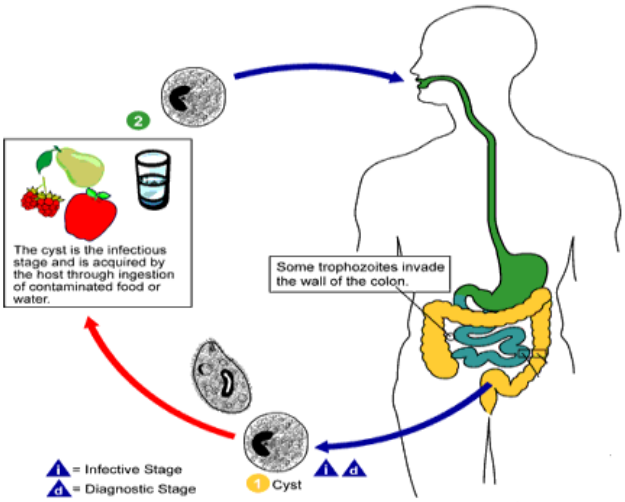


Cyst stage

Diagnosis :-

General stool Examination (**G.S.E**) **:**

1. In the acute dysentery, actively motile **trophozoite** are seen .
2. In norml dysentery,non motile **cyst** are seen .



life cycle of Balantidium coli

الاسبوع العاشر والحادي عشر

The class Sporozoa

Include 4 types :

Plasmodium vivax **:** Cause Benign tertian malaria

Plasmodium ovale **:** Cause tertian malaria

Plasmodium malaria **:** Cause quarter malaria

Plasmodium falciparum **:** Cause Malignant tertian malaria

Example **:** ***Plasmodium vivax***

Disease : Cause Benign tertian malaria .

Habitat : In **circulatory system** of vertebrates .

Host : There are **2** host **:**

1. Intermediate host: vertebrate host **" human"** in blood intra **RBC** cell , **Asexual** phase.

2. Final host:invertebrate host (insect) called (Female of Anophelas mosquito**),Sexual** phase.

Vector : female of Anopheles insect (**Mosquito**) .

Infective stage : Sporozoite (Salivary gland of Anopheles) .

Mode of infection : By biting of Mosquito .

Clinical aspects : (**Fever**, **Coldness**, **Sweating**) that symptom occur during the sudden liberation of merozoites into blood stream .

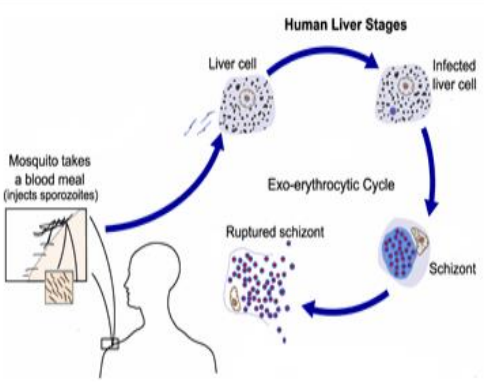
Laboratory diagnosis :

Microscopic examination of blood film **thick** and **thin** film . **To identify :** Ring shape**,** Amoeboid shape**,** Immature Shizont shape**,** Mature Shizont**,** Gametocyte shape**.**

Life cycle of *Plasmodium SPP* : There are **3** stages .

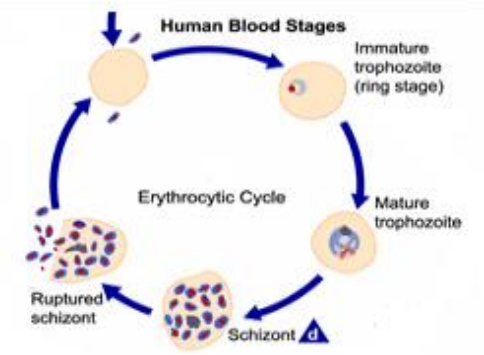
1. **Human liver stages :**

- Parasite enter the liver cells of the human .
- Reproduce in to cells called **Shizont** .
- Ruptured shizont .



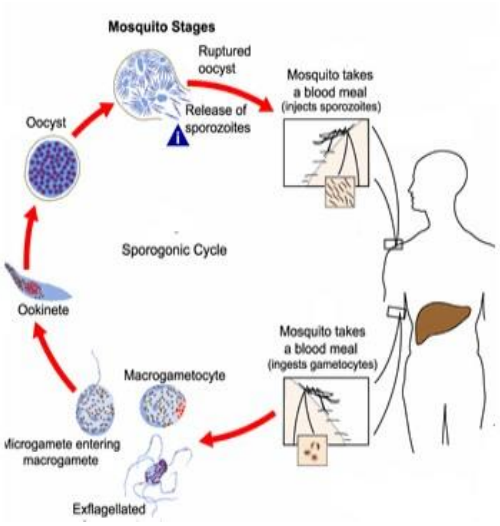
2. **Human blood stages :**

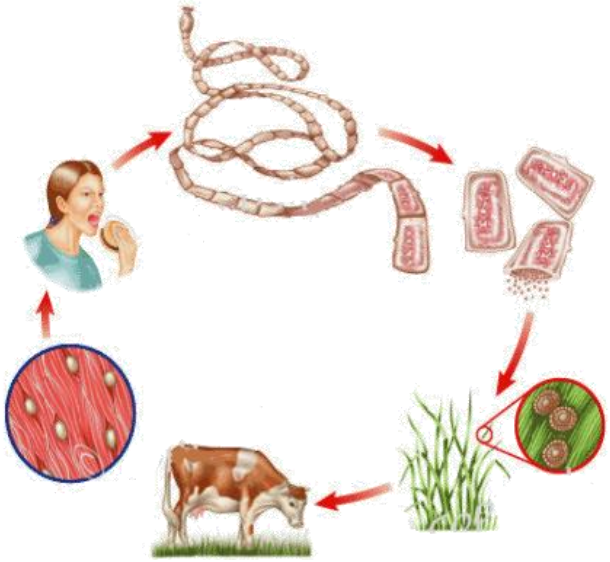
- The parasite (**Shizont**) enter to the (**Erthrocylic cycle**) and to the (**RBC**).
- The parasite (**Shizon**) attact the other (**RBC)**.



3. **Mosquite stagese :**

- Mosquite takes meal contain (**gametocytes**).
- Relase the Macrogamets and Microgamets in the intestine of insect .
- Microgamets enter Macrogamets and become **Ookinete** and **Oocyte** .
- Relase the Sporozoites in the **Salivary gland** of insect.


Mosquito Stages
Ruptured oocyst
Release of sporozoites
Mosquito takes a blood meal (injects sporozoites)
Oocyst
Sporogonic Cycle
Ookinete
Mosquito takes a blood meal (ingests gametocytes)
Macrogametocyte
Microgamete entering macrogamete
Exflagellated



Nemathelminthes :

Class: Nematoda

Example : ***Ascaris lumbricoides***

Common name : Giant round worm.

Common name : Giant round worm .
Disease : Ascariasis

Habitat : Small intestine of man and pigs .

Host : **A:** Final host : **Man** **B:** Intrermediat host : **No**

Infective stage : Embryonated egg . (which contain mature larvae)

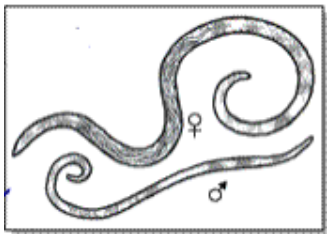
Diagnostic stage : Unembryonated egg .

Mode of infection : Oral-rout by ingestion of embryonated egg with food or drink .

Morphology :1. It is the largest intestinal nematode in man .

2. Body of adult is cylindrical with tapering ends .

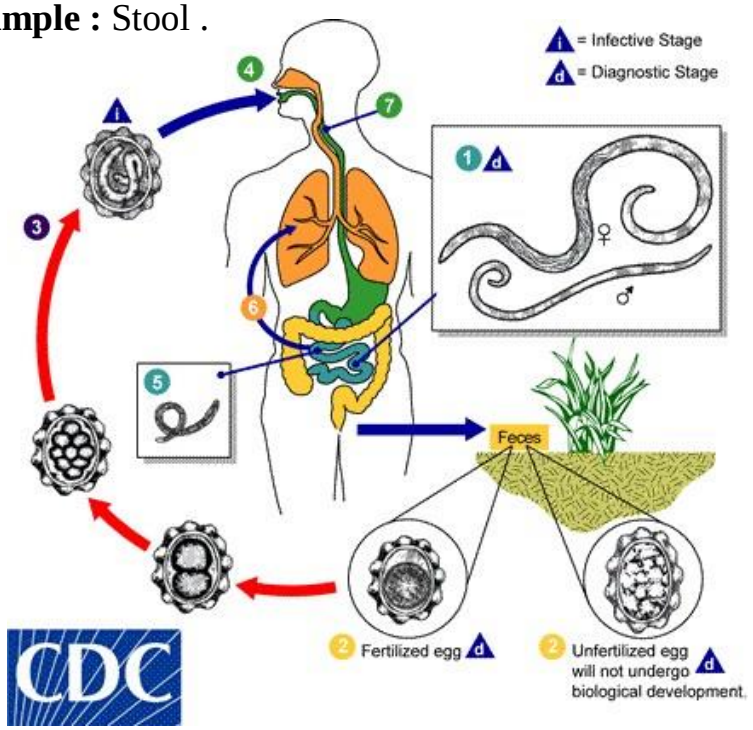
3. Mouth is surrownded by **3** toothed lips .



Male and Female of Ascaris lumbricoides

Male : is smaller than female. **Egg :** Round or oval in shape .

Diagnosis sample : Stool .



Life cycle of Ascaris lumbricoides

Nemathelminthes :

Class: Cestoda.

General characters .

3. The body of the worm segmented (proglottids)

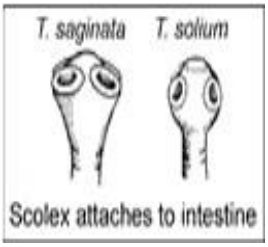
2. Adult worm consist of **: a.** scolex **b.** neck **c.** strobila (many of proglottid)

3. Scolex supplied with suckers .

4. Hermaphrodite (O + 7) in the same proglottids .

5. Development and complete reproductive system .

6. Segments or proglotticls divided into : **A.** Immature segment, **B.** mature segment



Class : Cestoda

Species : Taenia

Example : Genus :*Taenia saginata , Taenia solium*

Common name : Beef tape worm or Bovin tap worm .

Disease : Taeniasis or Beef tap worm infection .

Morpholog :

1**.Scolex:** Round or Pyriform shape, has **4** suckers (cuplike) no spine hook and rostellum

2**.Strobila:**Is cremy-white–yellowish in colour contain 1000-2000 segments.

3**.Immature segments :**are small and wider than length,

4**.Mature segments:** are nearly squae and each one contain complete well developed stes of both male and female reproductive organs.

5**.Eggs :** Spherical, brownish colour, transparent shell, radically striated Layer surrounded the embryo (**Hexacanth embryo**) Lateral branch of uterus /15-30 branch.

Habitat : 1**.** Adults inhabit small intestine of man only .

2**.** Egg passes in human feaces.

3**.** Larvae (**Cysticercus**) in the muscles of cattle.

Final host .Human (adult worm) in intestine .

Intermediate host : found Larval stage cysticercus bovis in the muscle of beef

Infective stage of human : form eating meat contain Cysticercus bovis or from etting eggs or gravid proglottid that found in the stool .

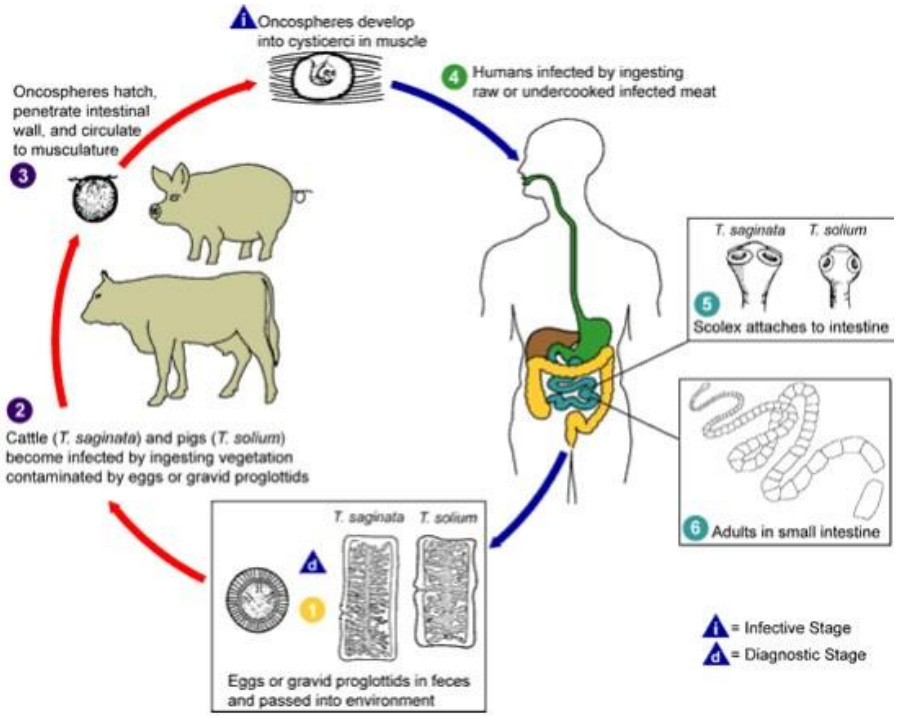
Diagnostic stage :

Diagnosis sample :

Morphology :

e. **Scolex** : 1mm in diameter 4suckers.
f. Rows of spine hook with Rostellum.
g. **Eggs** : resemble that in T. saginata .
h. Lateral branch of uterus, 5-15 branch.

Diagnosis sample : Stool examination



Life cycle of Taenia spp.

Mycology

Mycology : is the branch of biology concerned with the study of fungi, including their **genetic** and biochemical properties, their taxonomy and their use to humans as a source for tinder, medicinals (e.g., **penicillin**), food (e.g., **beer**, **wine**, **cheese**, edible mushrooms) and entheogens, as well as their dangers, such as poisoning or infection.

Fungi : Are plants that has lack chlorophyll and reproduced by spores .

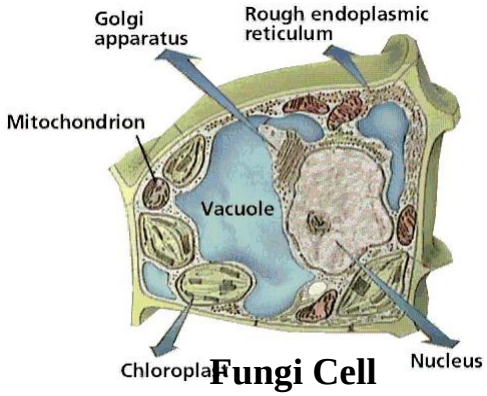
General characteristics :

1. All fungi are **eukaryotic** organism .
2. Most Fungi are **obligate** or **facultative** aerobic .
3. Nutritional requirement to growth of fungi is simple, sometimes need enrich media .
4. Each fungal cell has at lest one **nucleus** and **nuclear membrane** , endoplasmic reticulum , mitochondria and secretory apparatus.
5. Optimum temperature of growth of fungi 28C° .
6. Growth in pH (2-9), it growth well in acidic PH .
7. Fungi may reproduced sexually or asexually
8. Fungi grow in two basic forms as **yeast** and **molds** .

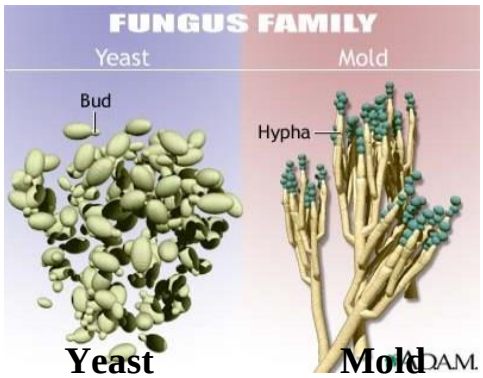
Classification of fungi according to the morphology :

1- **Molds :-** Most fungi consist of microscopic branching filaments, called (**hyphae**). These are normally divided septa in to cells . **e.g :** *Rhizopus*

2- **Yeast :-** When fungi appear **unicellular**, spherical or oral shaped and reproduce by budding are generally called yeast . . **e.g :** *Cryptococcus neoformans*



Fungi Cell



Yeast **Mold**

Dimorphic fungi : The term dimorphic is used to describe a fungus which occurs in two different forms according to the environmental culture.

Appear filaments at 22C but appear yeast on the culture media at 37C or in the human body.

For example some pathogenic fungi are (**Mycelia**) in culture and yeast like in infected tissues.

A **mycosis** (plural: ***Mycoses***) is a fungal infection of animals, including humans.

There are three types of mycosis :

1. Superficial mycosis: ***Candida albicans***
2. Subcutaneous mycosis: ***Mycetoma***
3. Systemic mycosis : ***Crytococcus***