PARASITOLOGY

Parasitism **Commensalism** **Mutualism**

harmful! ☹ **beneficial**☺

- Parasitology **=>** Para **(+)** cyto **(+)** Logos
  Beside *Nutrition* *Science*

- **Parasite;** Is an organism living on or in another organism with harming him without any benefit at any time during its life cycle.

- **Parasitology;** investigates the structure, life cycle, relationship with the host of parasites and dieseases they do, treatment and prevention methods to be applied against these diseases.

The aim of a parasite is

- To guarantee its own life
- To ensure the continuity of the natural occurrence

A parasite;

- Should reach to host and must enter into the body
- Should settle in the host
- Could feed, could grow
- Should multiply
- Should get out of the body

General structures of a parasite;

- In order to survive, needs another living thing in terms of metabolism
- Generally smaller than host
- Harmfull
- Should not kill the host
- May cause or not cause disease

Fields of parasitology

- Veterinary Parasitology
- Agricultural Parasitology
- **Medical Parasitology**
- Structural Parasitology
- Quantitative Parasitology
- Parasite Ecology
- Systematic Parasitology
- Biochemical and Molecular Parasitology
- Public Health Parasitology
- Spatial Parasitology
- Neuroparasitology

Parasitic living beings

- Virus
- Rickettsia
- Pathogenic bacteria and fungi
- Protozoa
- Helminths
- Arthropods

Medical Parasitology

Some of these creatures have been adapting to parasitic life.

- The relationship between mother and baby in pregnancy?

- Humans can host more than 100 parasite.
- Most of the parasites on Earth are found in our country.

Important terms

- **Host**; The organism that parasite lives in or on.
- **Intermediate host**; Infant or intermediate form of the parasite lives in/on temporarily but it is very necessary for its biological evolution.
- **Last host**; Adult form of the parasite lives in/on
- **Rezervoir host**; Provides the continuation of the parasite in nature.
- **Vector;** is an arthropod or invertebrate animal carrying a parasite from vertebrate to other vertebrate.
- **Zoonoses;** is a disease caused by some of the parasites that do not show host specificity and spreads from animal to human.

Important terms

- **The evolution of parasitism**; the whole of the development periods among the parasite's life cycle
- The parasites that need only one host to complete the life cycle are called **monoxan** parasites.
- The parasites that need more than one host to complete the life cycle are called **heteroxan** parasites.
  - The parasites that need one kind of different hosts are called **diheteroxan** parasites.
  - Parasites that require hosts from different living species are called **polyheteroxan** parasites.

Important terms

- **Etxernal (ecto) parasitism;** Parasite is found on the body surface or under the skin.
- **Endo parasitism;** Parasite is living in body cavities or in blood and other tissues.
  - Intracellular parasitism
  - Extracellular parasitism

Transmission resources of parasites

Living resources

- Other people
- Heself/sheself
- Blood sucking vectors
- Domestic and wild animals

Non-living resources

- Soil
- Water
- Nutritions
- Air

Transmission routes of parasites

- Skin
- Respiratory tract
- Digestive tract
- Placental pathway
- Urogenital route

Effects of parasite on the host

- **Exploitive effect; …**
- **Toxic and Allergic effect; …**
- **Mechanical; …**
- **Traumatic and Perforative effect; …**
- **Lytic effect;** …
- **Irritative effect; …**
- **Irritation effect; …**
- **Nutritional inhibition effect; …**
- **Negative effect on blood tissue; …**
- **Necrosis, cancer etc.; …**

The reaction of host

- Functional reactions
  - Symptomatic, clinical
  - Immune response (immunity, anaphylaxis, allergy)

- Somatic reactions
  - Cellular reactions (phagocytosis)
  - Textural reactions (inflammation, metaplasia, hyperplasia, neoplasia)

Diagnosis

- Symptoms vary according to the number of parasites, the type of entry into the organism, the location of the organism, and the migration within the body. It emerges after the incubation period.
- Clinical symptoms are insufficient.
- It is mandatory that adult parasite or one of its developmental stages be seen.

Direct diagnostic methods

- Blood examination
  - Peripheral smear or thick drop
- Faecal examination
  - Native, floatation (floatation) and sedimentation (sedimentation)
- Selotype method
- Direct microscopic examination of suspected body material
- Biopsy material
- Autopsy

Indirect diagnosis methods

- Precipitation
- Agglutination
- Complemant integration
- Techniques of immunofluorescence
- Skin tests

Parasitological Examination of Faeces

- Simple methods:
  - Used for quick general scan.

  a. Salt-water preparation (Direct-Native method)

  b. Stool preparation in iodine solution

  c. 5% Eosin solution
- Concentration methods:

  Used to show helminth eggs and protozoa cysts.
  - Precipitation methods
  - Flotation methods

Precipitation methods

1. Simple precipitation

1 g faeces + 20 ml water

2. Precipitation with formalin and aetal

The last sediment obtained from simple sedimentation + 10 ml %10 Formalin

Wait 5 min

Add 3 ml cold aetal, shake

Centrifugation

Preparation of precipitate

3. Teleman method

For helminth eggs;

1 g faeces+ 5 ml % 6 HCl

Wait 1 min

the filtrate + Shake with equal amounts of aetal

Preparation of precipitate after centrifugation at 1500 rpm

Fight against parasites

- Mechanical
- Chemical
- Biologic

Treatment

- Chemotherapy
- Surgical intervention

Groups of human parasites

- Protozoans
- Helminths
  - Trematodes
  - Cestodes
  - Nematodes
- Arthropods

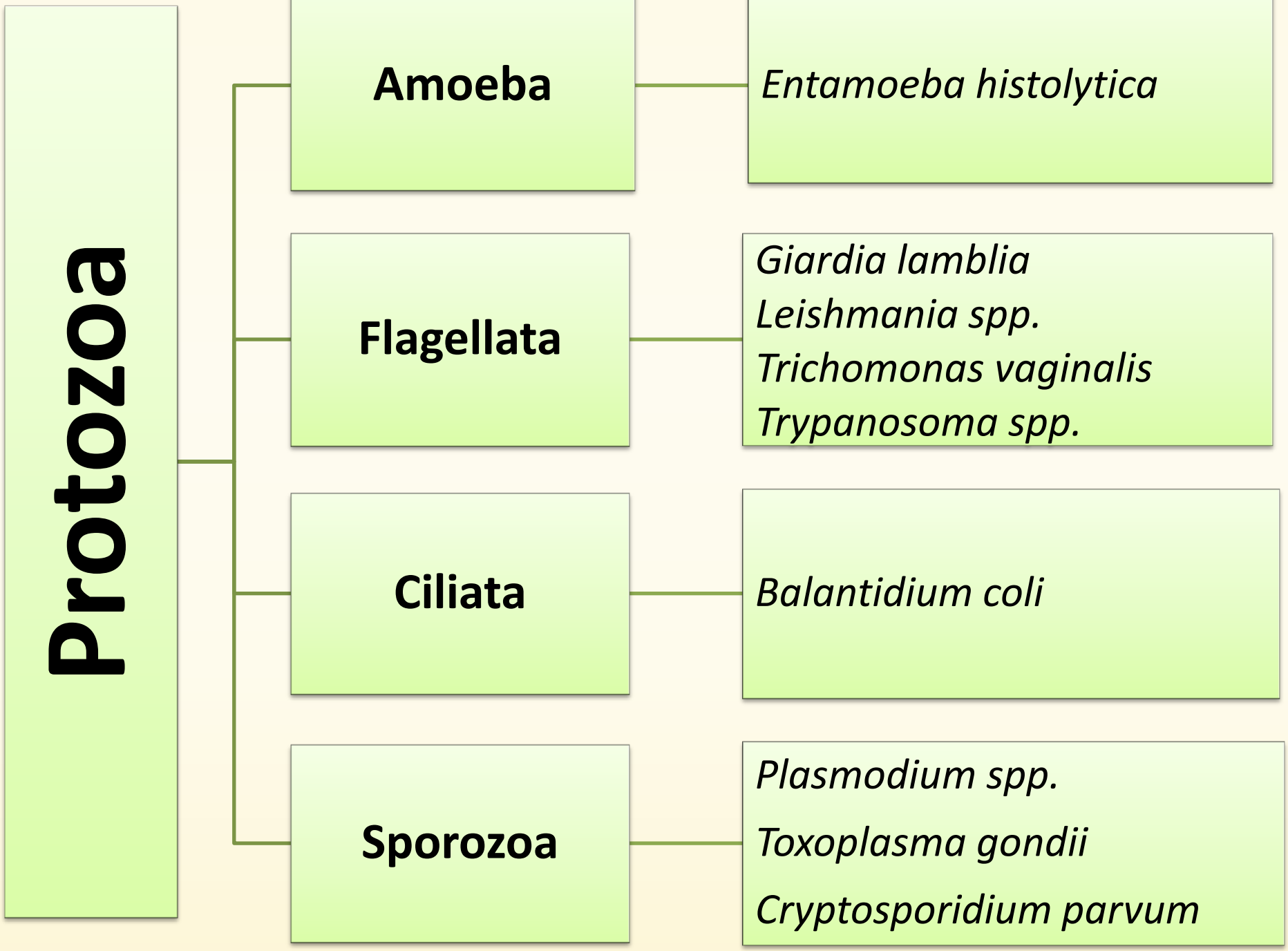
Reproduction in parasites

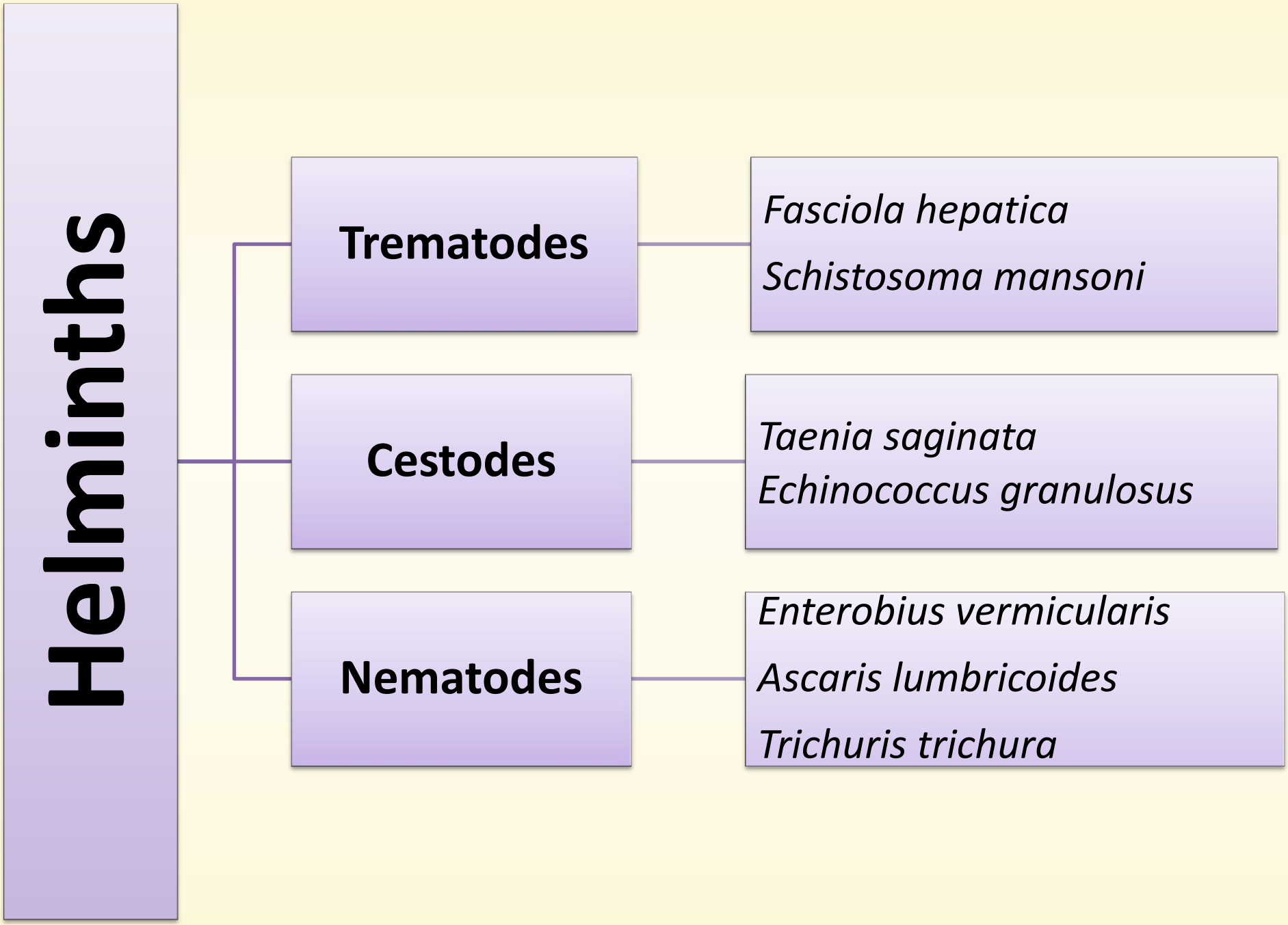
A. Protozoons
1) Asexual reproduction
A) Split in two
B) Budding
C) Schizogony
2) Sexual reproduction
A) Sporogony
B) Conjugation

C. Annelids
1) Hermaphroditism

B. Helminths
1) Trematodes
A) Complete hermaphroditism
B) Insufficient hermaphroditism
C) Sexual sequential hermaphroditism
2) Cestodes;
A) Sexually sequential hermaphroditism
B) Budding
3) Nematodes;
A) Sexual reproduction

D. Arthropods
1) Sexual reproduction
2) Hermaphroditism


Protozoa
Amoeba
Entamoeba histolytica
Flagellata
Giardia lamblia
Leishmania spp.
Trichomonas vaginalis
Trypanosoma spp.
Ciliata
Balantidium coli
Sporozoa
Plasmodium spp.
Toxoplasma gondii
Cryptosporidium parvum


Helminths
Trematodes
Fasciola hepatica
Schistosoma mansoni
Cestodes
Taenia saginata
Echinococcus granulosus
Nematodes
Enterobius vermicularis
Ascaris lumbricoides
Trichuris trichura

Entamoeba histolytica

- Monoxenous, trophozoite and cyst (4 nuclei) stage.
- Cysts are taken from the oro-fecal route with dirty food or water, turns into trophozoite in the ileus.
- Trophozoites colonize on the colon epithelium, secrete enzymes that cause necrosis.
- Amoebic dysentery (bloody-mucus diarrhea) is seen with abdominal pain, gas and tenesmus.
- Passes through the liver with the portal circulation.
- Causes to **amoebic dysentery** characteristic with **pain in the liver,** weight loss, fever and enlarged liver.

Giardia intestinalis (lamblia)

- There are trophozoite and cyst stages.
- Cysts are taken with dirty food or water, turns into trophozoite the duodenum.
  - There are 2 trophozoites from 1 cyst.
  - Trophozoids move through flagella.
- Trophozoites prevent the absorption of protein and fat by inflammation in the duodenum mucosa.
- Causes to giardiosis characteristic malodorous, bloodless diarrhea seen with nausea, loss of appetite, gas and abdominal cramps.

Trichomonas vaginalis

- There is no cyst form, it has trophozoid form.
- It has one nucleus, five flagella. It attaches to the body surface with one of the flagella.
- The trophozoids spread with sexual contact, settle to the vagina and prostate.
- Trichomoniasis

→It is characterized by smelly, greenish fluid accompanied by itching and burning in women.

→ There is no symptoms or sometimes urethritis in men .

Plasmodium spp.

- There are 5 types of infections in humans.

  Plasmodium falciparum – Malignant tersiyan sıtma

  Plasmodium vivax – Bening tersiyan sıtma

  Plasmodium ovale - Tersiyan sıtma

  Plasmodium malariae – Kuarten sıtma

  *Plasmodium knowlesi** – Makak sıtması

- They cause to malaria.

- They are carried with female mosquitoes of the genus Anopheles.

- It is multiplied by schizogony in liver hepatocytes and erythrocytes, sporogony in mosquitos.

Plasmodium spp.

- When the mosquito sucks the person, it gives the spores from the salivary glands to the blood.
- Sporozoites enter the liver parenchyma cells in about an hour. The cycle of exoeritrositic schizogony begins here.
- The following bodies form by sporozoites respectively:
  - young trophozoite,
  - mature trophozoite,
  - young schizont,
  - mature schizont and at the end
  - merozoites.

Plasmodium spp.

- Some of the merozoites re-initiate the cycle of schizogony in the liver, others enter the erythrocytes and begin the cycle of erythrositic schizogony .
- Merozoites explode erythrocytes, pour into the blood, and infect new erythrocytes and continue to erythrositic schizogony.
- Meanwhile, some of them form macro and micro gametocytes in erythrocytes.
- With the insertion of mosquitos, gametocytes pass to mosquitos.

Plasmodium spp.

- When infected erythrocytes explode, parasites mostly infiltrate to other erythrocytes. Erythrocyte explosion wave vary to species (every 48 or 72 hours).
- The gametocytes that enter the system of mosquitos turn into female and male gametes in mesothelium. With gametogoni, a sexual reproduction type, they form to the zygote. This is called ookinete.
- Oocyte migrate to stomach muscles and forms oocyte. Sporozoites form by meiosis from oocyte and migrate again to salivary glands of mosquitoes.

Plasmodium spp.

Diagnosis;

- Malaria is diagnosed only by the appearance of any stage of Plasmodium.
- To diagnose, blood smear (peripheral smear) and thick drop preparations should be examined.

Treatment;

- 4 amino and 8 amino quinoline derivatives, biguanide derivatives, quinine medication as well as treatment with vaccines have gained importance in recent years.

Toxoplasma gondii

- It is a obligative intracellular parasite.
- Sporozoid, bradyzoid, and tachyzoid are infectious.
- The typical crescent appearance of the tachyzoid is characteristic.
- The asexual phase may replicate in any cell which has a nuclei of warm-blooded vertebrate animals. Macrophages are also included.
- The sexual phase is observed only in Felines' intestinal epithelium and multiplies with sporogonia.
- Especially when a pregnant women become infected with oocysts, can lead to infant disease. It is the cause of hydrocephalus, blindness and even the clow blood pressure.

Taenia spp.

- *Taenia saginata* (cattle tapeworm) and *Taenia solium* (pig tapeworm) are the most common species. They are overtaken by the consumption of raw or uncooked meat.
- Body formation: **scolexes** (head+neck) and **proglotid**.
- *Taenia saginata* has sculptors to hold at the scolex. Taenia solium also has a rostellum, which is a hook line.
- Often, the infection may be symptomless.
- Cysticercosis is caused by muscle tissue placement.

Ascaris lumbricoides

- It is the biggest nematode for humans.
- It lives in the small intestine, larval form is seen in lungs and in some other organs.
- It is gonochoristic (male and female), cylinder shaped bodies covered with cuticle. The body fills the tip.
- The egg is oval (sometimes round) and thick crust.
- When the fertilized egg is thrown outdoors, the larva is formed in a few weeks in the presence of suitable heat, humidity and oxygen in the soil.

Enterobius vermicularis

- It is one of the most common parasitic infections in the world.
- Infection occurs by ingesting the infective egg. The eggs open in the small intestine.
- The larva becomes adult in the caecum.
- Fed with blood, epithelial cells and organic substances.
- Females - usually in the early hours of the morning - come out of anus, leaves eggs around the perianal region. The eggs become infective in about 6 hours.
- In women, when they transmit into the urogenital system, they make vulvavaginitis and ovarian cysts.
- The most important symptom is itching around the night anus.

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