PARA311- Prelim- Topics

Medical Laboratory Science (MedTech) (Our Lady of Fatima University)

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CLINICAL PARASITOLOGY (LEC)

PARA311 LC
OUR LADY OF FATIMA UNIVERSITY – ANTIPOLO CAMPUS
OSMENA, DIVINE GRACE E, ======== SY 2022 – 2023

(WEEK 1 PRELIM) INTRODUCTION TO CLINICAL PARASITOLOGY

DEFINITION OF TERMS

PARASITOLOGY

- the area of biology concerned with the phenomenon of dependence of one living organism on another.
- Main concern is the parasite as the causative agent of diseases.

MEDICAL PARASITOLOGY

- is concerned primarily with the animal parasites of humans and their medical significance, as well as their importance in human communities.
- Human parasite.

TROPICAL MEDICINE

- Deals with tropical diseases and other medical problems of tropical regions.
- Much tropical diseases in the Philippines are parasitic diseases.

PARASITE

- Organism depending on another living creatures for existence.
- Needs another organism to obtain nutrients or simply for survival purposes.

HOST

- Organism that supports or harbors parasite.
- In medical parasitology, we will be dealing to humans as the host.

VECTOR

- are responsible for transmitting the parasite from one host to another.
- Belong to phylum Arthropoda such as mosquitoes and flies.

As part of epidemiologic measures, the important terms in studying epidemiology that deals with the patterns, distribution, and occurrence of diseases are incidence and prevalence.

DEFINITION OF TERMS

INCIDENCE

- number of new cases of infection in a population in a given period of time.

PREVALENCE

- number of new and old cases of infection in a population in a given period of time.
- Expressed as percentage.

WORM BURDEN/INTENSITY OF INFECTION

- Refers to the number of worms present per infected person.
- Can be measure directly and indirectly.
- In the case of soil transmitted helminths such as Ascaris, Ascaris can be measure directly by couning the expelled worms durong treatment or indirectly by counting the number of eggs per gram of stool.

In the treatment for parasitic infection, the important terms are:

DEWORMING

- Use of anti-helminthic/Anti-parasitic drug in public health program.
- These drugs can be very effective in the treatment of the parasites.

ELIMINATION

- Reduction to zero of a given infection brought only by joined efforts in a community.
- Example: spraying or fogging of certain barangay to eliminate dengue.

ERADICATION

- Permanent reduction to zero of the worldwide incidence of infection.
- Example: if everyone will practice the safe sexual intercourse, sexually transmitted disease will be eradicated,.

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INFECTION

EXPOSURE

- the act or process of inoculation.
- Introduction of infectious agent.
- After the agent had successfully entered the body establishes itself to the host would mean an infection.

PATHOGENIC PARASITE

- animal parasites which are harmful, frequently causing local and systemic damage of one type or another.
- Majority of the parasites are pathogens that cause mechanical injury to the host.

INCUBATION PERIOD

- Period between infection and evidence of symptoms.
  - ➔ Biologic incubation period / Pre-patent period
    - Period between infection and evidence or demonstration of infection, where the specimen becomes positive for the presence of parasite.
  - ➔ Clinical incubation period
    - Period between infection and evidence of symptoms.

EXPOSURE AND INFECTION

INFESTATION

- Parasites live in the surface of the skin. (Ectoparasites)
- The presence of ectoparasites results to infection.

INFECTION

- Parasite lives inside the human body. (Endoparasites)
- The presence of endoparasites results to infection.

SUPERINFECTION / HYPERINFECTION

- when an individual harboring a parasite is reinfected with the same species leading to massive infection of the parasite.
- Will also result to large increase in worm burden of parasites.
- Super infection will lead death to the patient.

AUTOINFECTION / AUTOREINFECTION

- when the infected person is his own direct source of reexposure. /infection
- Example: in the case of Enterobiasis or Tin worm infection, this will occur through hand – to mouth transmission. And may reinfect the same person following accidental ingestion of the eggs.

COINFECTION

- when two different parasite enters the human body.
- Example: in the case of Ascaris and Trichuris it is possible that this soil transmitted parasites may enter the body at the same time infecting the same person. Since both of the eggs embryonate in the warm moist soil.

TYPES OF PARAITES ACCORDING TO THE MODE OF HABITAT

1. ECTOPARASITE

- parasite living outside the body of the host
- will not penetrate into the tissues.
- living on the surface of the skin
- the caused of these are called as infestation
- examples: ticks, flies, lice

2. ENDOPARASITE

- parasite living inside the body of the host
- living within the body of the host (infection)
- usually these are responsible to cause human infections.
- Most of the parasites that we will discuss oin this course are considered as endoparasites like Ascaris Lumbricoides

3. SAPROPHYTES

- that which lives in organic substances in state of decomposition.
- Considered as parasites since they derived their nutrients from death and decaying organic matters.
- Example: Some protozoans

4. ERRATIC

- parasites found in an organ which is not it's usual habitat.
- EXAMPLE: when Ascaris is recovered in the lungs. Ascaris usual habitat is in the small intestines.

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TYPES OF PARASITES ACCORDING TO THE MODE OF DEVELOPMENT

1. OBLIGATE PARASITE

- depend entirely upon their host for existence.
- Needs a host to complete their development.
- Example: Taenia, needs pigs or cowst o develop into its larval form. At the same time it will need human, to develop into its adult form.

2. FACULTATIVE PARASITE

- exist in a free-living state or may become parasitic when the need arises.
- May exist both in free or parasitic forms.
- Example: Free living amoeba, in the case of Acanthamoeba

3. INCIDENTAL / ACCIDENTAL PARASITE

- establishes itself in a host where it does not ordinarily live.
- Example: Dipylidium Caninum

4. PARTHENOGENETIC PARASITE

- Female parasite capable of reproducing eggs without being fertilized by male parasite and whose eggs contain larva that immediately hatches.
- Example: Strongyloides stercoralis.

TYPES OF PARASITES ACCORDING TO PATHOLOGIC LOCATIONS

1. SPURIOUS/COPROZOIC PARASITE

- Passes digestive tract of humans without infecting them.
- Considered non-pathogenic.
- Example: Commensal amoeba. (Entamoeba coli)

2. COPROPHILLIC PARASITE

- Parasite multiply in fecal matter outside the human body.

3. HEMATOZOIC PARASITE

- Live inside the red blood cells. (Plasmodia)

4. CYTOZOIC PARASITE

- Live inside the cells or tissues (Leishmania)

5. COELOZOIC PARASITE

- Live in body cavities. (Atrial flagenates)

6. ENTEROZOIC PARASITE

- Live in the intestine. (Entamoeba histolytica causes amoebiasis)

TYPES OF PARASITES ACCORDING TO DURATION OF PARASITISM

1. PERMANENT

- Remains on the host on almost their entire life.
- Parasite is present in the body of the host form early life until its maturity.
- Example: Entamoeba histolytica.

2. TEMPORARY

- Lives in human for a short period of time.
- Plasmodia and Mosquitoes.
- Also known as intermittent parasite.
- Classified when they would only visit the host for nutrients.

TYPES OF VECTOR

1. MECHANICAL / PHORETIC VECTOR

- the parasite is only seen on the surface of this organism and there will be no development on the parasite.
  → eg. Cockroaches, house flies.

2. BIOLOGICAL VECTOR

- the parasite is seen inside the body of this organism and the parasite needs this organism for its development
  ➔ eg. Mosquitoes, tsetse flies serves as the vecto for trepanosoma.
  ➔ plasmodium that causes malaria.

DIFFERENT TYPES OF HOST

TYPES OF HOST	
Definitive Host	Host in which the adult sexual phase of parasite development occurs.
Intermediate host	Host in which the larval asexual phase of parasite development occurs.
Reservoir Host	Host harboring parasites that are parasitic for humans and continues the life cycle of the parasite
Paratenic Host	Host that harbors parasite that do not develop further into its final stage; no continuation of life cycle
Transport Host	Host responsible for transferring a parasite from one location to another
Carrier	Parasite harboring host that is not exhibiting any clinical symptoms but can infect others.

Intermediate and definitive host – most coomon type.

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DIFFERENT TYPES OF HOST

Definitive Host – plasmodium.
Intermediate Host – human
Reservoir host – additional source of infection.

- Pigs and Balantidium coli

Paratenic Host – harbors the parasite in it's arrested state of development.

- May transfer the infective stage into another host.
- Example: Paradominus – wild boar meat.

Transport host – example: fishes

- Diphyllobothrium latum

Carrier – example: food handlers – ascaris lumbricoides.

TYPES OF PARASITES ACCORDING TO CLINICAL SIGNIFICANCE

1. DIAGNOSTIC STAGE

- Parasitic stage of development that is seen in clinical samples when examined in the laboratory.
- Can be detected via laboratory retrieval.
- Example: Ova of Ascaris recovered in the stool sample.

2. INFECTIVE STAGE

- Parasitic stage of development that is infectious or able to cause disease to the host upon exposure.
- Morpholic form that invades human.
- Example: Cercaria – Schistosoma
- Skin penetration.

BIOLOGICAL RELATIONSHIP

PARASITE – HOST RELATIONSHIP	
	DEFINITION/ DESCRIPTION
SYMBIOSIS	Living together, the association of two living organisms.
COMMENSALISM	Association of two different species of organisms that is beneficial to one and neutral to other
MUTUALISM	Association of two different species of organism that is beneficial to both.
PARASITISM	Association of two different species of organisms that is beneficial to one at the other's expense.
COMMENSALISM	Relating to commensalism; the association between two different organisms in which one benefits and has a neutral effect on the other.

BIOLOGICAL RELATIONSHIP

Organisms may develop unique relationships due to their habitual and long asscoiations.

SYMBIOSIS

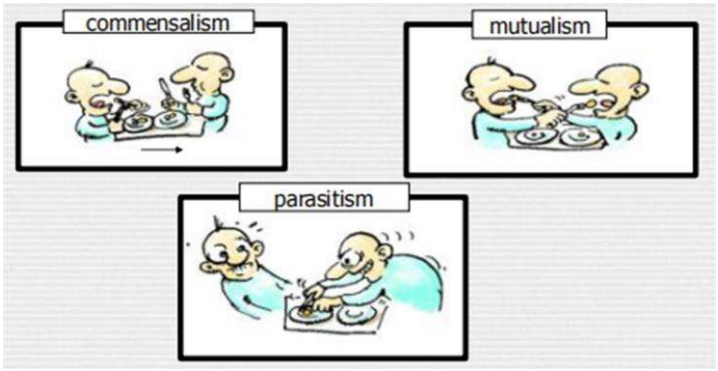
- Living together of unlike organisms.

Type:

1. Commensalism – only one organism benefits while the other is unaffected. Meaning, neither benefitted nor harmed.
   Example: Entamoeba coli that inhabits the intestinal tract provided with nutrients while it not harm the host.
2. Mutualism – both organisms benefits from each other.
   Example: Flagellates that inhabits the digestive tract of termites which synthesize cellulase used in the breakdown of ingested wound.

3. Parasitism – one organism benefits at the expense of the other organism.
   Example: giarbia lambia derives nutrients form human host and cause gastrointestinal disturbances.

HOST PARASITE RELATION – SYMBIOSIS



PORTALS

1. PORTAL OF ENTRY

- particular site of the body where the parasite prefer to enter.
- Example: mount via ingestion of Ascaris egg from contaminated food and water.
- Skin via penetration of larva of hookworms.

2. PORTAL OF EXIT

- site of the body where the parasite moves out.
- Rectum where cysts of Entaamoeba histolytica pass out of the stool in case of amoebiasis.

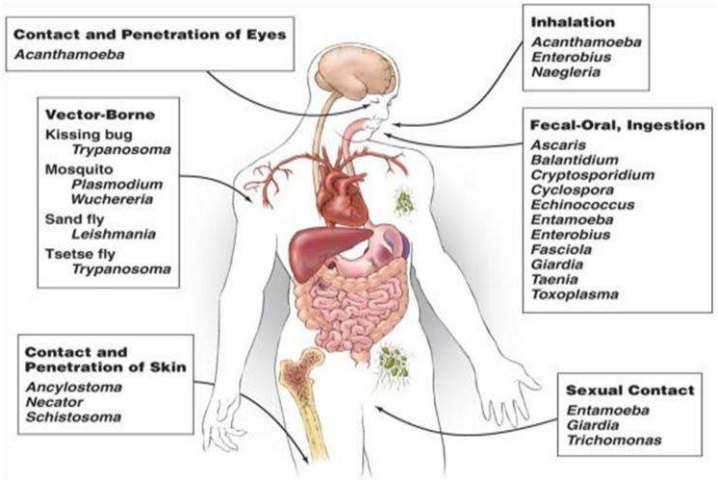
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PORTAL OF ENTRY

I. MOUTH – Trichuriasis
II. SKIN - Schistosomiasis
III. PERCUTANEOUS – Trypanosoma – blood transfusion
IV. INHALATION – tin worms
V. SECRETIONS – trichomonas tenax
VI. SEXUALLY TRANSMITTED – Trichomonas vaginalis.

SOURCES OF INFECTION

1. Ingestion of contaminated food or drink (primarily water)	
EXAMPLE: CYST OF	
	- E.histolytica
	- G.lamblia
2. Hand – to – mouth transfer	
EXAMPLE: EGGS OF	
	- A.lumbricoides
	- T.trichiura
3. Insect bite (Mosquitoes)	
EXAMPLE:	- W.bacrofti
	- B.malayi
4. Entry via drilling through the skin	
EXAMPLE:	- Schistosoma sp.
	- Hookworm
5. Unprotected sexual relations	
EXAMPLE:	- T.vaginalis
6. Mouth – to – mouth contact	
EXAMPLE:	- T.tenax
7. Eating raw or inadequately cooked foods	
EXAMPLE:	- E.ilocanum (snails) - C.phippinensis (fish) - D.latum - T.saginata (beef) - T. solium (pork)
8. Domestic Animals	
EXAMPLE:	- D.caninum (dog)
	- H.diminuta (rat)



1. Contact and penetration of the Eyes – Acanthamoeba
2. Vector borne –
   - ➔ kissing bug – Trypanosma
   - ➔ mosquitoes → Plasmodium Wuchereria
   - ➔ sand fly → Leishmania
   - ➔ Tsetse fly → Trypanosoma
3. Contact and Penetration of Skin
   - ➔ Ancyclostoma
   - ➔ Necator
   - ➔ Schistosoma
4. Inhalation
   - ➔ Acanthamoeba
   - ➔ Enterobius Naegleria
5. Fecal, Oral, Ingestion
   - ➔ Ascaris
   - ➔ Balantidium
   - ➔ Cryptosporidium
   - ➔ Cyclospora
   - ➔ Echinococcus
   - ➔ Entamoeba
   - ➔ Enterobius
   - ➔ Fasciola
   - ➔ Giardia
   - ➔ Taenia
   - ➔ Toxoplasma
6. Sexual Contact
   - ➔ Entamoeba
   - ➔ Giardia
   - ➔ Trichomonas

In the case of toxoplasma gondi , thrug congenital transmission.

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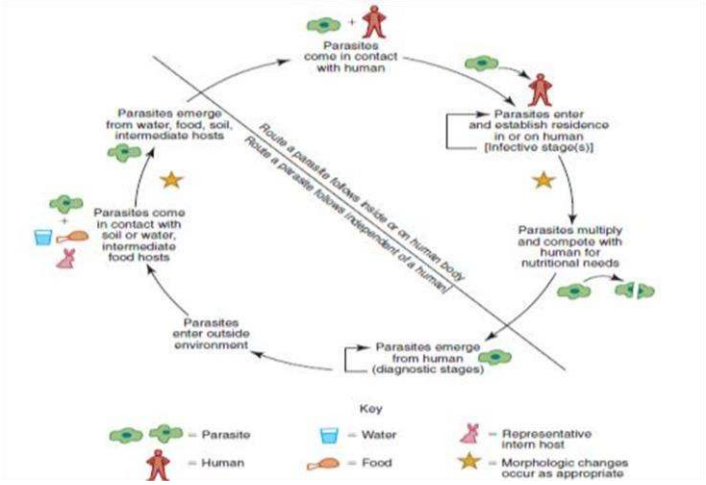
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LIFE CYCLE

- Parasitic life cycle range from simple to complex, they all have three common components.
  1. Mode of transmission
  2. morphologic form that invades humans
  3. forms that can be detected via laboratory retrieval methods. – **diagnostic stage.**
- Some parasites require only 1 definitive host, whereas others also require 1 or more intermediate host.
- A parasite life cycle consists of two common phases.
- Consists of two common faces: w face involves the route a parasite follows, when in or on the human body this face provide information about pathology and clinical manifestations of the disease cause by the parasite.
- Appropriate treatment and method can be also determined for diagnosis.
- The second face involves a route a parasite follows independent of human. The parasite would emerge from human.
- This provide information relevant to epidemiology prevention and control.

DIRECT LIFE CYCLE
Monoxenous parasites – only require one type of host which is the definitive host.

INDIRECT LIFE CYCLE
Heteroxenous parasites – requires more than one host which is the intermediate host.



INDIVIDUALS AT RISK

Most infection is commonly found among:

- Individuals in underdeveloped areas and countries.
- Refugees
- Immigrants
- Visitors from foreign countries
- Individuals who are immunocompromised
- Individuals living in close quarters (e.g., prisons)
- Children who attend day care centers

TREATMENT

- Anti-parasitic drugs
- Chemotherapy
- Surgical intervention – if chemotherapy is unavailable or has proved inadequate.

The following points must be considered:

- Severity, duration and intensity of infection and the probability of reinfection.
- Efficacy, availability, toxicity and acceptability of the treatment.

Drug resistance – genetically transmitted loss of susceptibility to a drug in a worm population that was previously sensitive to the appropriate therapeutic dose.

PREVENTION

- Sanitation – access to safe drinking water.
- Development and implementation of parasite awareness (Education programs) – encourage people to adapt and maintain healthy life practices.
- Use of insecticides and other chemicals
- Use of protective clothing/protective netting
- Proper water treatment
- Good personal hygiene
- Proper handling, cooking, and protection of food
- Avoidance of unprotected sexual relations

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TAXONOMIC CLASSIFICATION OF PARASITES

SUB-KINGDOM	PHYLUM	SUBPHYLUM	GENUS
Protozoa	Sarcomastigophora	Sarcodina - Move by pseudopodia	Entamoeba
		Mastigophora - Move by flagella	Giardia
	Apicomplexa (Sporozoa) - No organelle of locomotion		Plasmodium
	Ciliophoran (Ciliates) - Move by cillia		Balantidium
	Microspore - Spore – forming		Entercytozoa

SUB KINGDOM	PHYLUM	CLASS	GENUS
Metazoa	Aschelminthes	Nematoda (Round worms)	• Ascaris (round worm) • Trichuris (whipworm) • Ancylostoma (hookworkm • Enterobius (pinworm or threadworm) • Strongyloides
		Cestoda (tapeworm)	• Taenia
	Platyhelminthes (Flat worms)	Trematoda (Fluke)	Fasciolopsis Schistosoma

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(WEEK 4 PRELIM) AMOEBA SARCODINA

PROTOZOA

PARASITIC AMOEBA (SUBPHYLUM SARCODINA)

PATHOGENIC

- *Entamoeba histolytica*

NON-PATHOGENIC

- *Entamoeba dispar*
- *Entamoeba hartmanii*
- *Entamoeba coli*
- *Entamoeba gingivalis*
- *Entamoeba polecki*
- *Entamoeba moshkovskii*
- *Endolimax nana*
- *Iodamoeba butschlii*
- *Blastocystis hominis*

PATHOGENIC AND FREE-LIVING

- *Naegleria fowleri*
- *Acanthamoeba spp.*
- *Hartmanella spp.*
- *Balamuthia mandrillaris*

CILIATA

- *Balantidium coli*

OTHER INT. PROTOZOAN

- *Dientamoeba fragilis*

PROTOZOAN DEVELOPMENT AND REPRODUCTION

2 stage of development:

- **Cyst** – Non-motile, Non-Feeding stage, Resistant to acid
- **Infective form**.
- **More protected than the tropozoid counterpart**
- **Trophozoite** – Motile, Feeding stage, Fragile

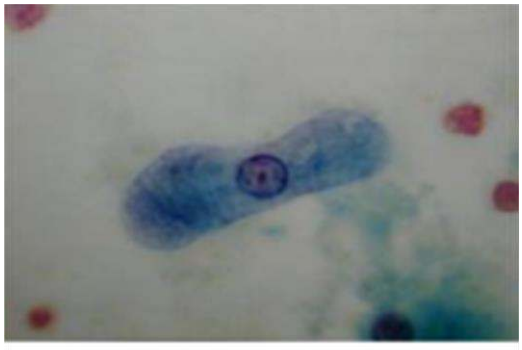
3 stages of reproduction:

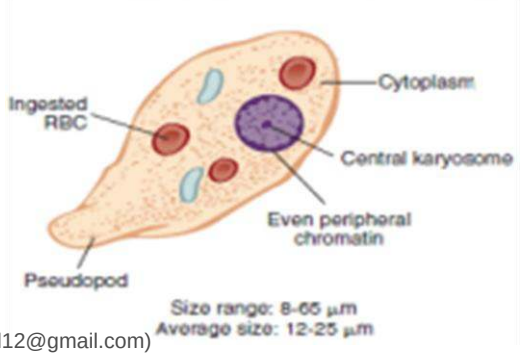
- **Excystation** – development of cyst into trophozoite.
- **Encystation** – development of trophozoite into cyst.
- **Binary Fission** – mode of reproduction of trophozoite.

1. ENTAMOEBA HISTOLYTICA (TROPHOZOITE)

("Named by Schaudinn")

- Locomotor apparatus.
- Fingerlike pseudopod
- Responsible or the progressive movement
- Shorter – blunt, longer – fingerlike appearance
- Nucleus contains centrally located karyosome.
- Peripheral chromatin is fine and evenly distributed.
- Stain preparation – you can observe nuclear characteristics
- Nucleus contains centrally located karyosome.
- Peripheral chromatin is fine and evenly distributed.
- Cytoplasm includes ingested Red Blood Cells.

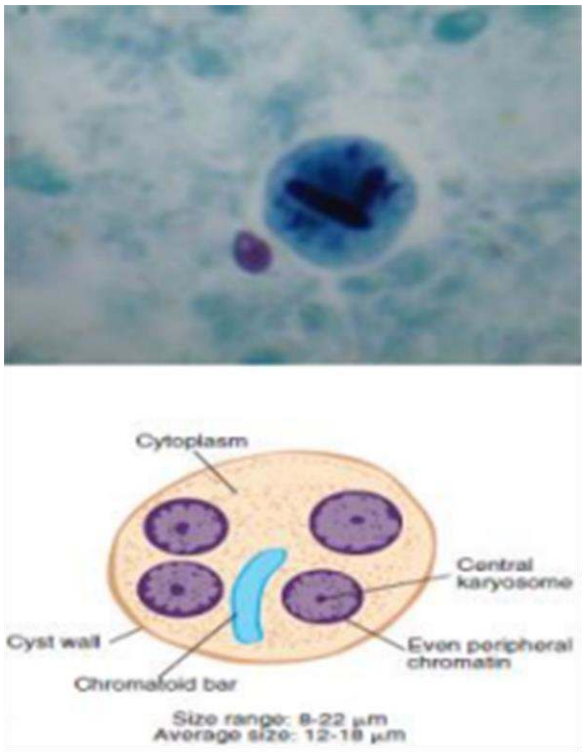




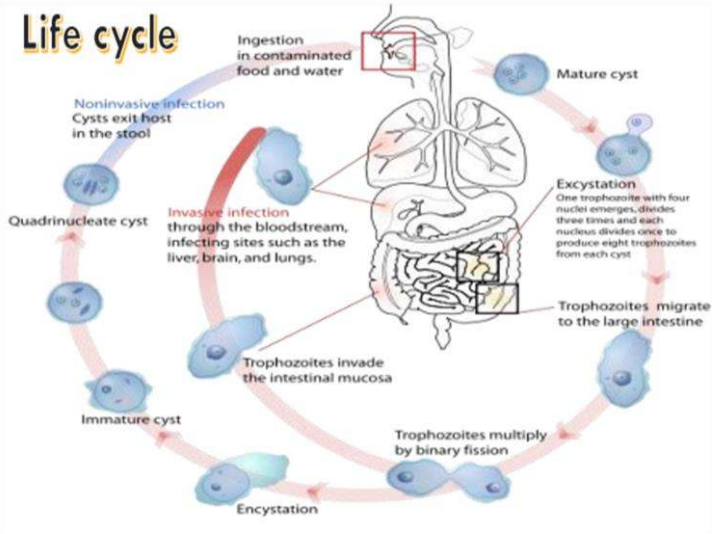
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TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	8-65 um
Motility:	progressive, one finger-like pseudopodia
No. of nuclei:	One
Karyosome:	Small and central
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Finely granular
Cytoplasmic Inclusions:	Ingested red blood cell

CYST	
PARAMETERS	**DESCRIPTION**
Size range:	8-22 um
Motility:	Spherical to round
No. of nuclei:	1 to 4
Karyosome:	Small and central
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Finely granular
Cytoplasmic Inclusions:	Chromatoid bars, rounded ends on young cysts Diffuse glycogen mass in young cysts



- The picture above shoes the unnucleated cyst. Where you can find the chromatoid bars that have rounded ends.
- The center part of the first picture shows the nucleus.
- The picture below shows the quadrinucleated cyst form.
- The cyst of Entamoeba histolytica has rounded ends



- The quadrinucleated form of the cyst is the one infective.
- It can be ingested since it may contaminate food and water which is the mode of transmission.
- Encystation takes place in the small intestine.
- The cyst produces trophozoites and settle in the large intestines and undergoes multiplication
- It will invade the intestinal mucosa and some of this trophozoites would further migrate via the bloodstream infecting other site most commonly is the liver.
- It will not anymore return to the mucosa. It would be the time where the life cycle of entamoeba histolytica would end.
- After the trophozoites would multiply if the environment becomes unfavorable for further trophozoite multiplication, that's the time where encystation would be initiated.
- The process is completed once there would be 4 nuclei present in the cyst. That would serve as the infective form leaves the body of the host, and contaminates food and water sources, once ingested another human host become infected.

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CLINICAL SYMPTOMS

Since this is the only intestinal pathogenic amoeba, the disease associated is known as AMEBIASIS.

- The only known **pathogenic intestinal amoeba**. The range of symptoms varies and depends on two major factors:

- Asymptomatic Carrier state
- Symptomatic Intestinal Amebiasis
- Symptomatic Extraintestinal Amebiasis

PATHOLOGY

- **ENTAMOEBA HISTOLYTICA has the ability to secrete enzymes that are responsible for its invasiveness of the mucosa and sub mucosa.**
- **By the time it was invaded we call it as AMOEBIC COLITIS STAGE.**
  Following formation of the flask shape ulcers is known as AMOEBIC DYSENTERY which is the second stage.

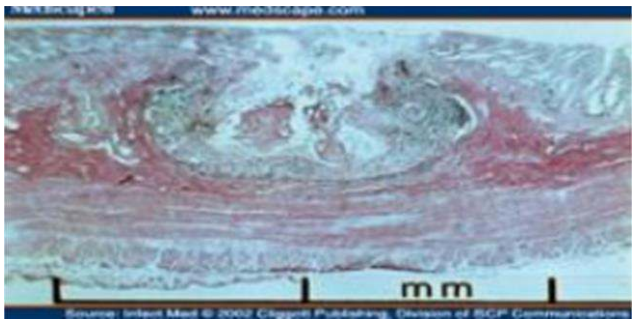
INTESTINAL AMEBIASIS

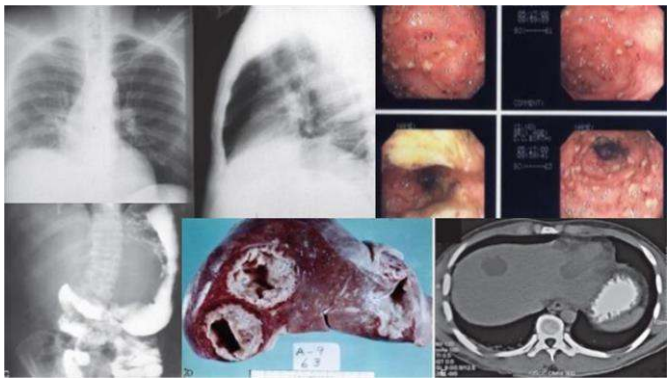
a. Amebic colitis / Amebic dysentery: abdominal pain, diarrhea (w/ or w/o mucus & blood)
b. Characteristic ulcer: FLASK SHAPE ULCER
c. Ameboma – mass-like lesion with abdominal pain and dysentery (<1%)
- thickening of the intestinal wall.

EXTRAINTESTINAL AMEBIASIS

a) Hepatic amebiasis: - due to liver infection.
- Leads to liver abscess.
- Amebic Liver Abscess: **ANCHOVY SAUCE-LIKE EFFUSION**

b) Pulmonary amebiasis – lungs.
c) Cerebral amebiasis – brain.
d) Amebic pericarditis - pericardium
e) Cutaneous amebiasis - skin
f) Genital amebiasis - genitalia





DIAGNOSIS

1. Direct Fecal Smear – routine test

a. Unstained
b. Stained
c. Liquid stool: shows trophozoite
d. Formed stool: shows cyst

For the diagnosis of extraintestinal amebiasis.

2. Liver aspiration biopsy

3.Culture: Robinson's and Inoki medium

4.Serologic Test: ELISA, IHAT, CIE, AGD, IFAT

5. Concentration test: FECT, MIFC, FECT, ZnSO4

6. Radiographic non-invasive techniques: X-ray/MRI/CT scan

7. Molecular techniques (PCR)

EPIDEMIOLOGY

- A leading cause of parasitic deaths after only malaria.
- Infection occurs is as many as 10% of the world's population

Locations at:

- Night soil
- areas of poor sanitation
- hospitals for mentally ill
- prisons
- day care center

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TREATMENT

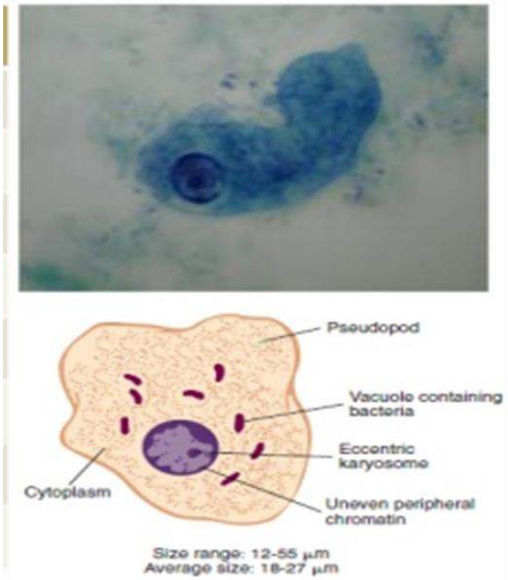
Disease	Drug of Choice
Asymptomatic cyst passer	Diloxanide furoate Metronidazole
Amebic colitis	Tinidazole Metronidazole
Amebic Liver Abscess	Tinidazole

PREVENTION AND CONTROL

- Boiling or treating water with iodine crystal
- Water filtration or chemical treatment
- Proper washing of food products
- Avoiding the use of human feces as fertilizer
- Good personal hygiene
- Protection of food from flies and cockroaches
- Avoidance of unprotected sexual practice

COMMENSAL AMOEBAE

2. ENTAMOEBA COLI



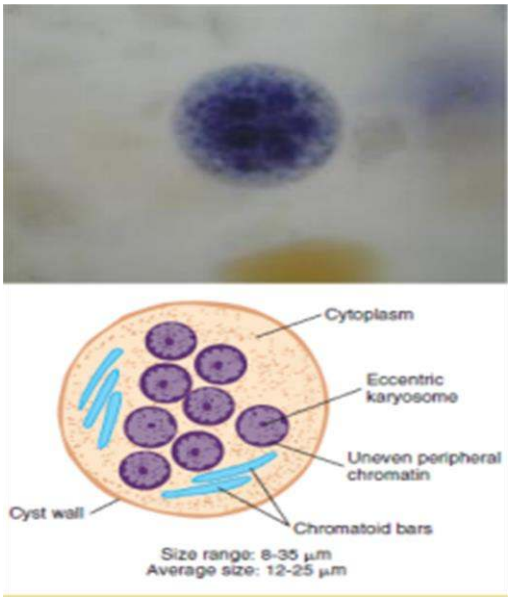
- In the picture above, there are 2 non – pseudopods.
- Consists of karyosome that is eccentrically nucleated.
- Unevenly distributed - chromatin

TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	12-55 um
Motility:	Non-progressive or sluggish, many blunt /rounded pseudopodia
No. of nuclei:	1
Karyosome:	Large, irregular shape eccentric
Peripheral Chromatin:	unevenly distributed
Cytoplasm:	Coarse and granulated
Cytoplasmic Inclusions:	Vacuoles containing bacteria often visible

Cytoplasmic Inclusions:

Vacuoles containing bacteria often visible

- Pointed end



CYST	
PARAMETERS	**DESCRIPTION**
Size range:	8-35 um
Motility:	Round to spherical
No. of nuclei:	1 to 8
Karyosome:	Large, irregular shape eccentric
Peripheral Chromatin:	Unevenly distributed
Cytoplasm:	Coarse and granulated
Cytoplasmic Inclusions:	Diffuse glycogen mass present in young cyst thin chromatoidal bars w/ pointed to splintered ends in young cyst

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EPIDEMIOLOGY

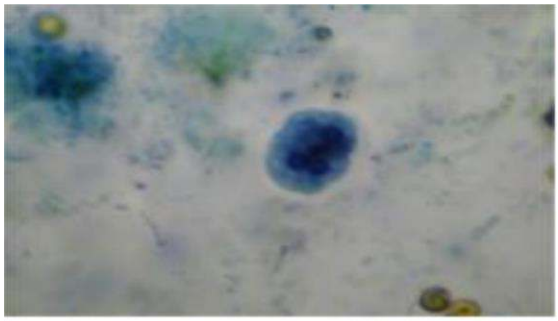
Geographic areas that have poor hygiene and sanitation practice

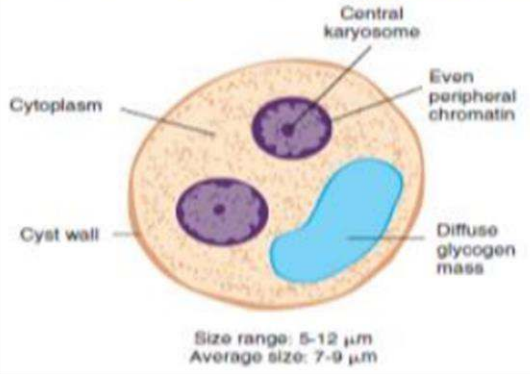
TREATMENT

No specific drug is needed to treat the infection

PREVENTION AND CONTROL

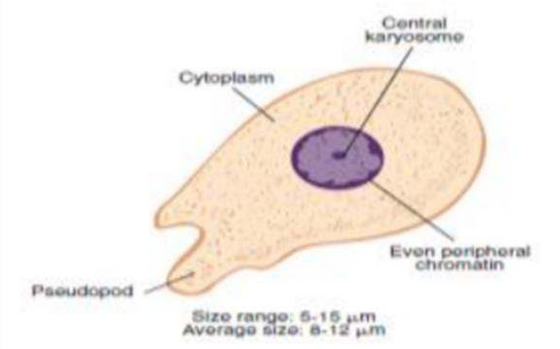
- Proper disposal of human feces
- Proper personal hygiene practices
- Protection of food and drinks from flies and cockroaches.





3. ENTAMOEBA HARTMANII





TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	5-15 um
Motility:	Non-progressive, finger-like pseudopodia
No. of nuclei:	1
Karyosome:	Small and central
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Finely granular
Cytoplasmic Inclusions:	Ingested bacteria may be present

CYST	
PARAMETERS	**DESCRIPTION**
Size range:	5-12 um
Motility:	spherical
No. of nuclei:	1 to 4
Karyosome:	Small and central
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Finely granular
Cytoplasmic Inclusions:	Chromatoid bars, rounded ends in young cysts Diffuse glycogen mass in young cyst

CLINICAL SYMPTOMS

- Infections with E. hartmanni are typically asymptomatic

EPIDEMIOLOGY

- Geographic areas that have poor hygiene and sanitation practice

TREATMENT

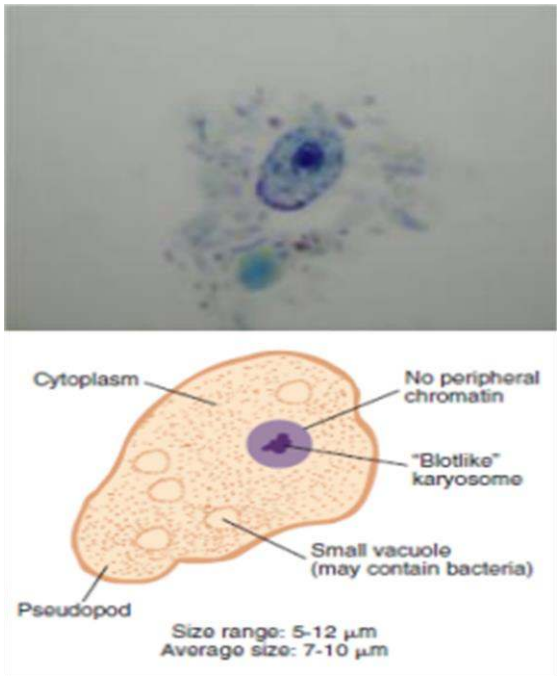
- No specific drug is needed to treat the infection

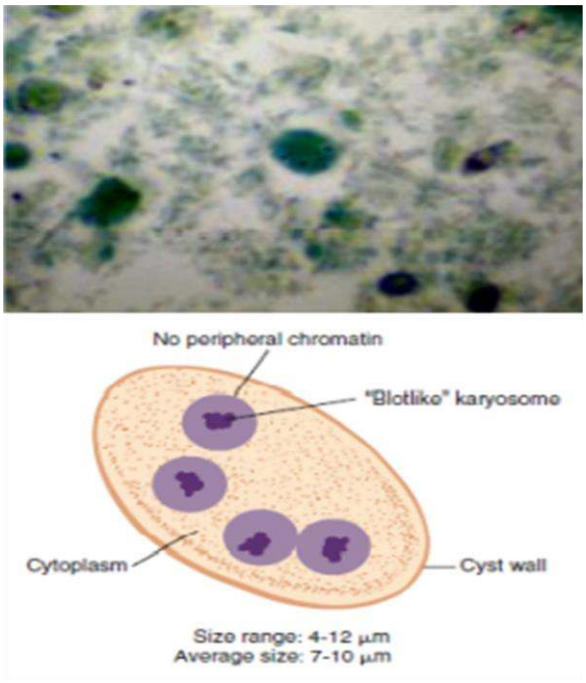
PREVENTION AND CONTROL

- Proper disposal of human feces
- Proper personal hygiene practices
- Protection of food and drinks from flies and cockroaches.

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4. ENDOLIMAX NANA





- Non pseudopod, single nucleus containing blot like karyosome irregular in shape.
- Lacks the peripheral chromatin.
- Cytoplasm appears granular and vacuolated.
- Pseudopod is blunt.
- Small pseudopod

- In both pictures, you can see quadrinucleated form of the cyst.
- Same number of nuclei which is 1-4
- Lack peripheral chromatin. Nuclei is arranged in pairs and located near the peripherum.
- Termed cross – eyed cyst.

TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	5-12 um
Motility:	sluggish, nonprogressive blunt pseudopods
No. of nuclei:	1
Karyosome:	large, irregular, blotlike
Peripheral Chromatin:	Absent
Cytoplasm:	Granular and vacuolated
Cytoplasmic Inclusions:	Bacteria

CYST	
PARAMETERS	**DESCRIPTION**
Size range:	4-12 um
Motility:	Spherical, ovoid, ellipsoid
No. of nuclei:	1 to 4
Karyosome:	large, blotlike, usually central
Peripheral Chromatin:	Absent
Cytoplasm:	Granular and vacuolated
Cytoplasmic Inclusions:	Chromatin granules nondescript small mass Diffuse glycogen mass in young cyst

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CLINICAL SYMPTOMS

- Infections are typically asymptomatic

EPIDEMIOLOGY

- E. nana is found primarily in warm, moist regions of the world. Areas in which poor hygiene and substandard sanitary conditions exist.

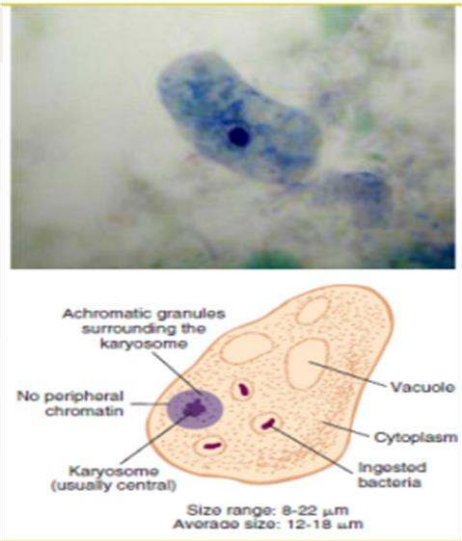
TREATMENT

- No specific drug is needed to treat the infection

PREVENTION AND CONTROL

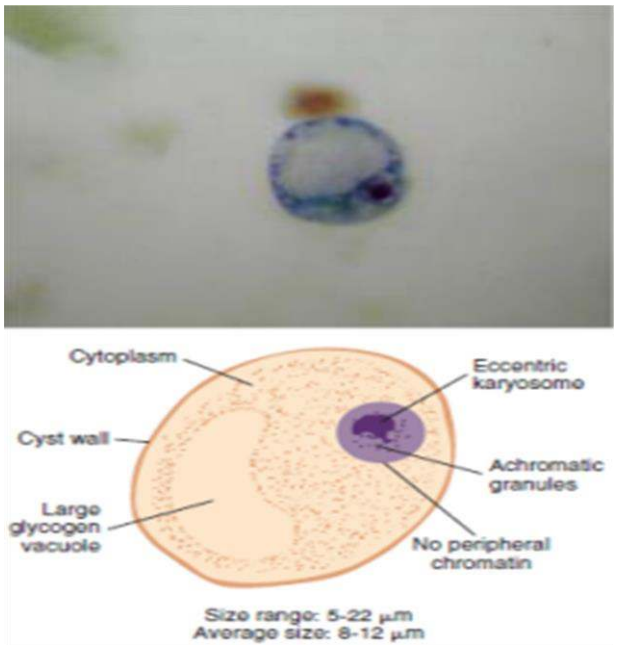
- Proper disposal of human feces Proper personal hygiene practices Protection of food and drinks from flies and cockroaches.

5. IODOMOEBA BUTSCHLII (TROPHOZOTE)



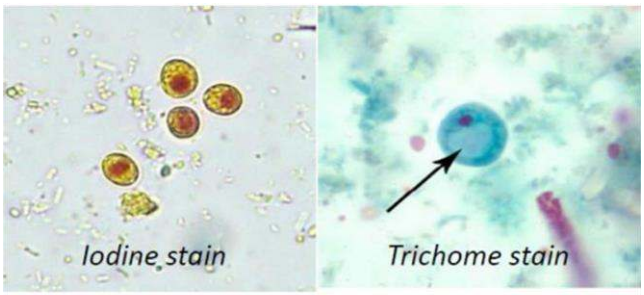
- You can observe that the karyosome almost covers the entire nucleus because of it's big size.
- Lacks peripheral chromatin but surrounded by achromatic granules.
- Vacuolated.

CYST	
TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	8-22 um
Motility:	sluggish, usually progressive
No. of nuclei:	1
Karyosome:	large, eccentric achromatic granules may or may not be present
Peripheral Chromatin:	Absent
Cytoplasm:	Coarsely granular and vacuolated
Cytoplasmic Inclusions:	Bacteria Yeast Other debris



- You will be able to see the diagnostic feature of the cyst particularly in the stained preparation because it would appear colorless or clear zone.
- Would only contain single nucleus
- Lacks peripheral chromatin but surrounded by achromatic granules.

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Iodamoeba butschlii cyst

- Contains glycogen vacuole
- Deeply stain in the iodine stain.

CYST	
PARAMETERS	**DESCRIPTION**
Size range:	5-22 um
Motility:	ovoid, ellipsoid, triangular
No. of nuclei:	1
Karyosome:	large, eccentric achromatic granules on one side may be present
Peripheral Chromatin:	Absent
Cytoplasm:	Coarsely granular and vacuolated
Cytoplasmic Inclusions:	Well-defined glycogen mass Granules may be present

CLINICAL SYMPTOMS

- Infections are typically asymptomatic

EPIDEMIOLOGY

- Found worldwide and has a higher prevalence in tropical regions.

TREATMENT

- No specific drug is needed to treat the infection.

PREVENTION AND CONTROL

- Upgrading the personal hygiene and sanitation practice.

6. ENTAMOEBA GINGIVALIS

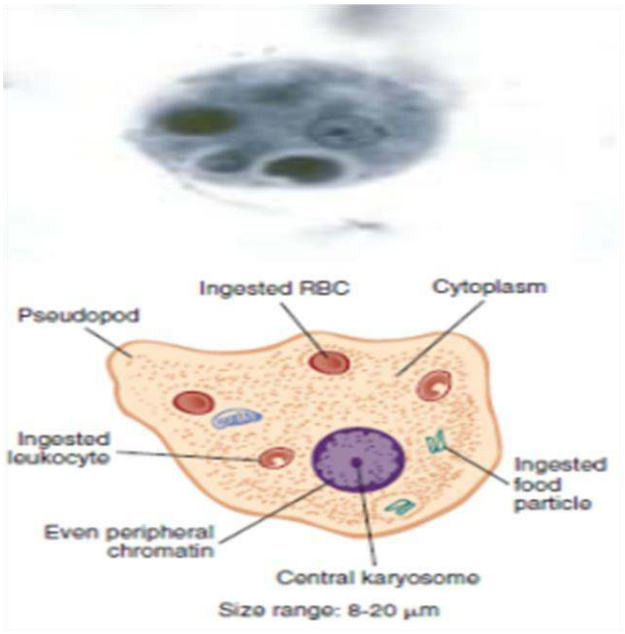
- inhabits the oral cavity

- only exist in trophozoite form

- Nearly identical to entamoeba histolytica.

Characteristics that are identical to Entamoeba Histolytica

- Single nucleus containing centrally nucleated karyosome
- Evenly distributed peripheral chromatin.



- The picture above shows that the karyosome is not totally at the center but located near the center which is a variation from the typical characteristic.
- LEUKOCYTES – main content of the endoplasm.

TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	8-20 um
Motility:	active, varying pseudopod appearance
No. of nuclei:	1
Karyosome:	Centrally located
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Fine granular
Cytoplasmic Inclusions:	Leukocytes Epithelial cells Bacteria

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DIAGNOSIS

- Mouth scrapings (gingival areas) Vaginal and cervical materials

EPIDEMIOLOGY

- Found in all populations that have been studied for its presence

CLINICAL SYMPTOMS

- Occur in the mouth and in genital tract but asymptomatic Trophozoites are frequently recovered from patients suffering from pyorrhea alveolaris

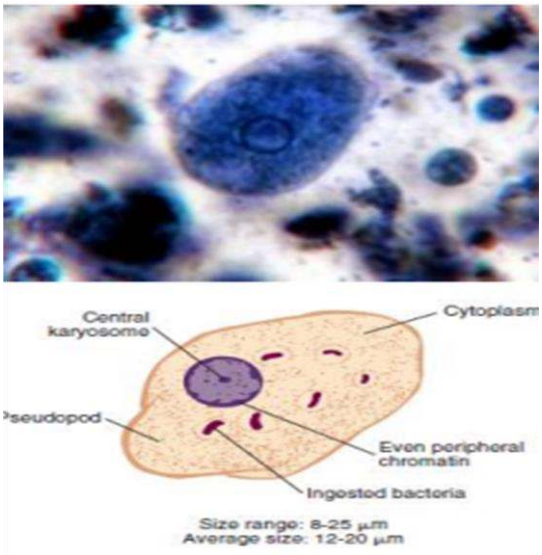
TREATMENT

- No specific drug is needed to treat the infection

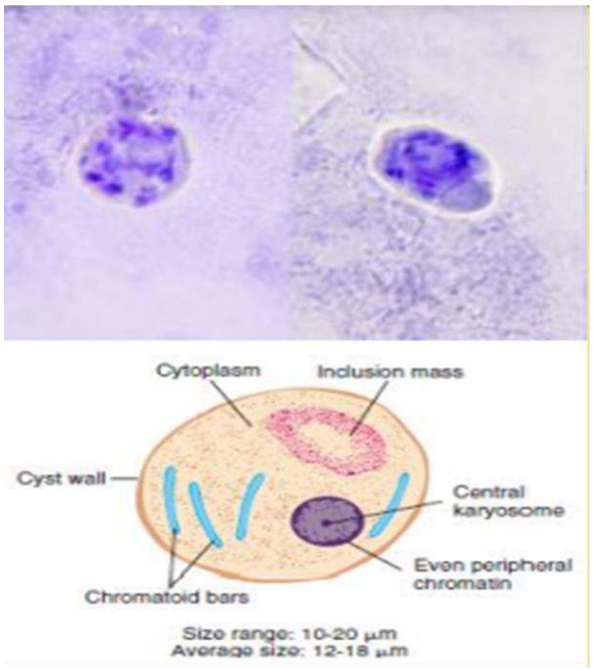
PREVENTION AND CONTROL

- Improved oral hygiene Proper care of teeth and gums Prompt removal of IUD's in infected patients spontaneously removes E. gingivalis from the genital tract.

7. ENTAMOEBA POLECKI



TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	8-25 um
Motility:	sluggish non-progressive Progressive unidirectional
No. of nuclei:	1
Karyosome:	Small and central
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Granular and vacuolated
Cytoplasmic Inclusions:	Ingested bacteria Other food particles



CYST	
PARAMETERS	**DESCRIPTION**
Size range:	10-20 um
Motility:	Spherical or oval
No. of nuclei:	1
Karyosome:	Small and central
Peripheral Chromatin:	Fine and evenly distributed
Cytoplasm:	Granular
Cytoplasmic Inclusions:	Chromatoidal bars, angular pointed ends in young cyst Glycogen mass in young cysts , inclusion mass

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EPIDEMIOLOGY

- This amoeba is found only in select areas of the world, with highest prevalence occurring in Papua New Guinea. Considered to be a parasite of pigs and monkeys

TREATMENT

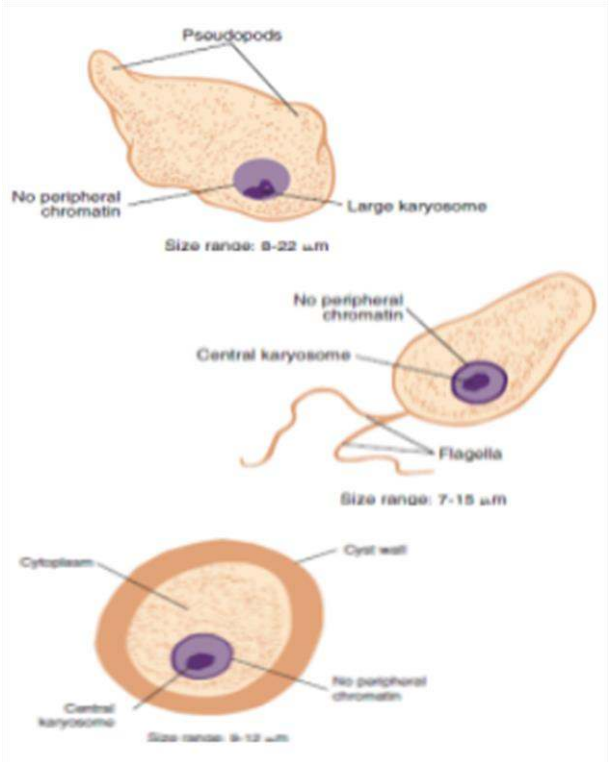
- No specific drug is needed to treat the infection

PREVENTION AND CONTROL

- Protection of food and drinks from flies and cockroaches Good sanitation and personal hygiene.

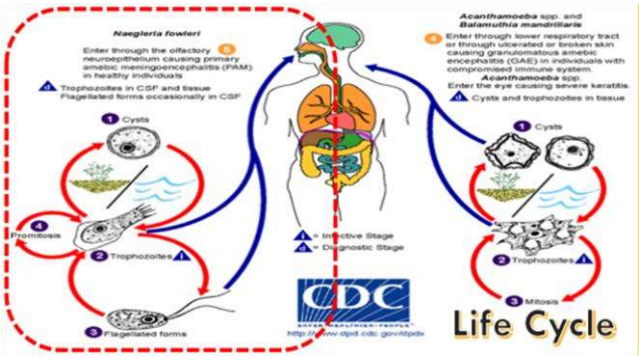
FREE-LIVING PATHOGENIC AMOEBAE

8. NAEGLERIA FOWLERI



TROPHOZOITE	
PARAMETERS	**DESCRIPTION**
Size range:	8-22 um
Motility:	Sluggish, blunt peudopods
No. of nuclei:	1
Karyosome:	Large and usually centrally located
Peripheral Chromatin:	Absent
Cytoplasm:	Granular, usually vacuolated

CYST	
PARAMETERS	**DESCRIPTION**
Size range:	5-22 um
Motility:	Ovoid, ellipsoid, triangular
No. of nuclei:	1
Karyosome:	Large, eccentric achromatic granules on one side may be present
Peripheral Chromatin:	Absent
Cytoplasm:	Coarse granular and vacuolated
Cytoplasmic Inclusions:	Chromatoidal bars, angular pointed ends in young cyst Glycogen mass in young cysts , inclusion mass



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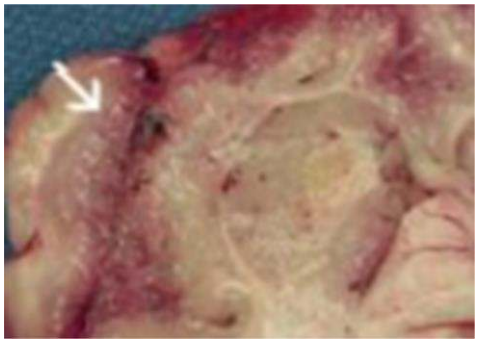
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EPIDEMIOLOGY

- Found in warm bodies of water, including lakes, streams, ponds, and swimming pools.
- Can survive in up to 0.5µg/ml of hyperchlorinated water
- Higher in the summer months of the year
- Able to survive in elevated temperatures up to 46˚C
- Can be acquired in contaminated dust.

CLINICAL SYMPTOMS

- Infects children to young healthy adults
- Asymptomatic
- Kernig's sign
- Primary amebic meningoencephalitis (PAM)
  - CSF findings: pleocytosis (high percentage of PMN cells)
  - Hypoglycorrhacia
  - elevated protein levels



DIAGNOSIS

- Microscopic examination: Trophozoite
- CSF (wet mount)
- Brain (biopsy)
- Tissue (biopsy)
- nasal discharge

- Saline wet preparation: CSF
- Culture: Balamuth medium, Nonnutrient agar overlayed with Escherichia coli

- Molecular Techniques: ELISA, PCR

TREATMENT

- Amphotericin B – DOC

- Amphotericin B with rifampin /miconazole

PREVENTION AND CONTROL

- Posting of off-limit sign around known sources of contamination

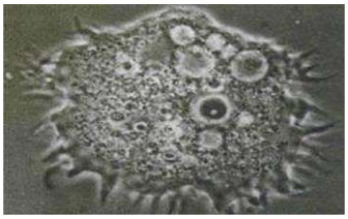
- Educating the medical community and public

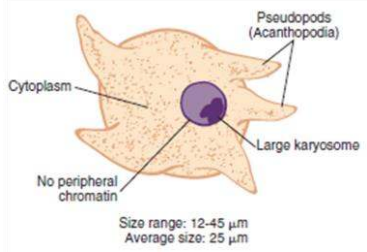
- Swimming pools and hot tubs be adequately chlorinated

- Cracks found in the walls of the pools, hot tubs, and baths should be repaired immediately

ACANTHAMOEBA SPP.

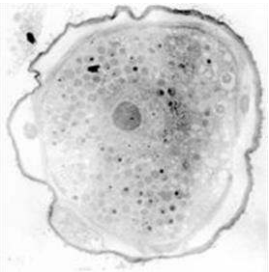
Acanthamoeba (Trophozoite)	
PARAMETERS	DESCRIPTION
Size range:	12-45 um
Motility:	Sluggish, spinelike pseudopods
No. of nuclei:	One
Karyosome:	Large
Peripheral Chromatin:	Absent
Cytoplasm:	Granular and vacuolated

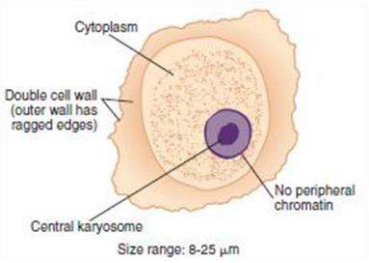


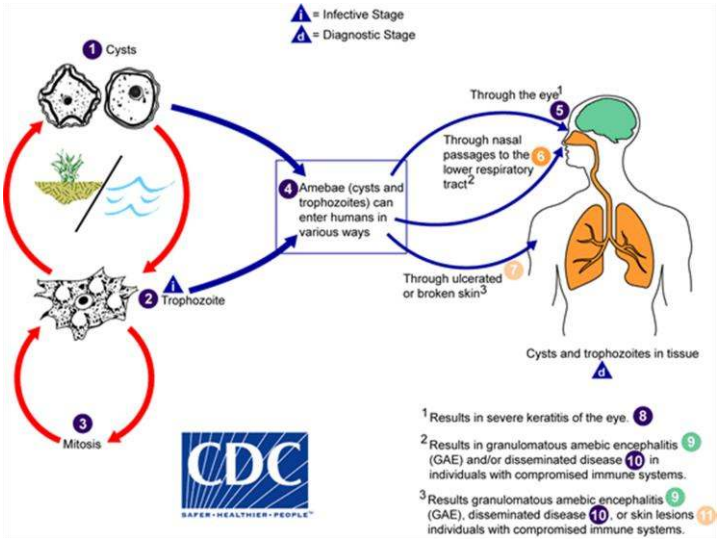


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Acanthamoeba (Cyst)	
PARAMETERS	DESCRIPTION
Size range:	8-25 um
Shape:	roundish with ragged edges
No. of nuclei:	One
Karyosome:	Large and central
Peripheral Chromatin:	Absent
Cytoplasm:	Disorganized, granular, sometimes vacuolated
Cytoplasmic Inclusions:	Double cell wall, smooth polygonal inner cell wall and outer wrinkeld /jagged cell wall







DIAGNOSIS

Microscopic Examination:

- CSF (wet mount)
- Brain tissue (biopsy)
- Corneal scrapings (wet mount)

CULTURE:

- Non nutrient agar with *E. coli*, Proteose-peptone, yeast extract, glucose and cysteine (PYGC) containing antibiotics

Molecular techniques: PCR

EPIDEMIOLOGY

- Reported from many countries worldwide both **CNS and eye infection**
- CNS infection appears in patient who are **immunocompromised.**
- Isolated from air, aquaria, bottled mineral water, soil swimming pools, deep well water, **contact lens solutions**.
- Unlike *Naegleria* fowleri, common *Acanthamoeba* infection is seen in immunocompromised hosts only.

CLINICAL SYMPTOMS

- **Granulomatous amebic encephalitis** (GAE)
- First documented by **Stamm**
- Incubation period: **10 days**
- **Acanthamoeba keratitis**



TREATMENT

- Sulfamethazine
- Itraconazole
- Ketoconazole
- Miconazole
- Propamidine isethianate (DOC)
- Rifampin

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BALAMUTHIA MANDRILLARIS

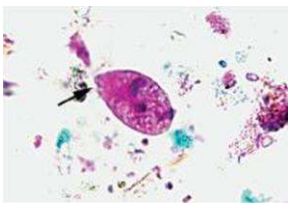
B.MANDRILLARIS

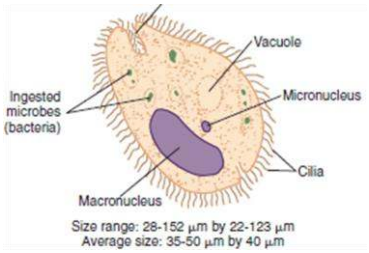
- Infects both immunocompetent and immunocompromised host
- MOT: Inhalation of cyst from soil, or direct inoculation through skin lesion/cuts
- Skin infection presents painless nodule, then parasite spread hematogenously and reaches BBB where it penetrates through receptor and proteolytic enzymes.
- It can now reproduce through binary fission and cause CNS abrasion.
- Cyst: Round, 10-30 um, single nucleus, multiwalled (3 layers)
- Trophozoite: Broad pseudopods, 30-60 um, large single nucleus with multiple nucleoli
- Diagnosis: CSF, Skin aspirate. Biopsy, Immunologic testing, and PCR

CILIOPHORA

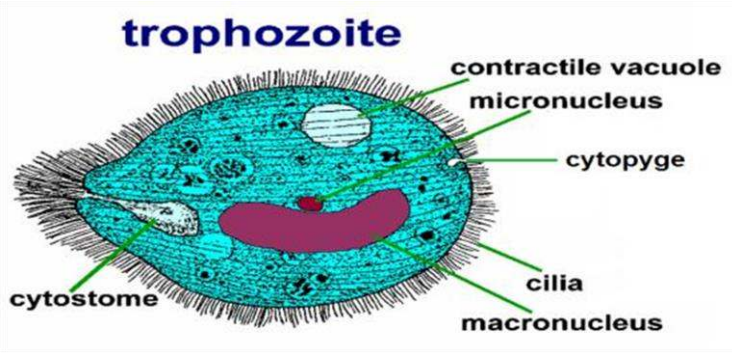
BALANTIDIUM COLI

Balantidium coli (Trophozoite)	
PARAMETERS	DESCRIPTION
Size range:	28-152 um in length 22-123 um wide
Motility:	Rotary, Boring
No. of nuclei:	Two Kidney shaped (macronucleus) small spherical (micronucleus)
Other features	One or two visible contractile vacuoles Cytoplasm may contain food vacuoles or bacteria small cytostome present Layer of cilia around organism

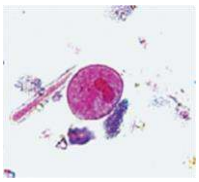


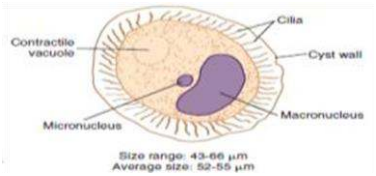


BALANTIDIUM COLI



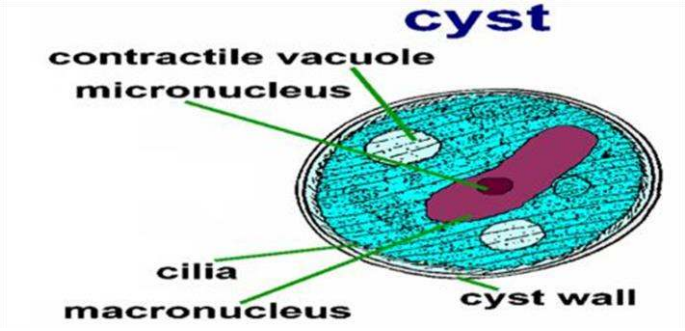
Balantidium coli (Cyst)	
PARAMETERS	DESCRIPTION
Size range:	43-66 um
Number and app. Of nucleus	Two Kidney shaped (macronucleus) small spherical (micronucleus)
Other features	One or two visible contractile vacuoles in young cyst Double cyst wall Row of cilia visible in between cyst wall layers of young cyst

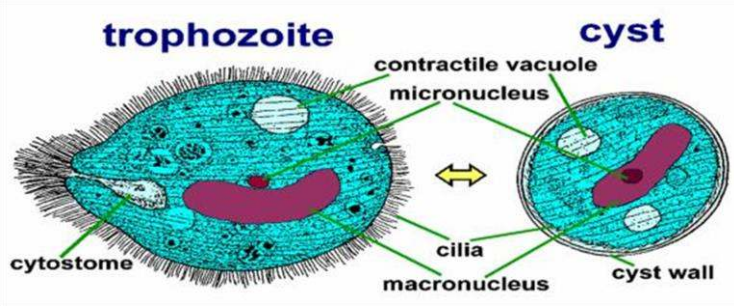




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BALANTIDIUM COLI





BALANTIDIUM COLI

- Infective stage: **cyst**, viable for several weeks
- Human infection results from ingestion of food or water contaminated with pigs' fecal material containing *Balantidium coli* cysts
- Incubation period: **4-5 days**
- Ingested cysts excysts in the small intestine
- Trophozoites inhabit the lumen, mucosa and submucosa of the large intestine, primarily the cecal region.

PATHOGENESIS

- Disease: Balantidiasis, balantidial dysentery
- *Balantidium coli* invades the intestinal epithelium through release of the enzyme **hyaluronidase** and creates a characteristic ulcer with a **rounded base and wide neck**
- Acute diarrhea with mucus and blood, cramps
- Complications include intestinal perforation and acute appendicitis

PATHOGENESIS

- usually non-pathogenic commensal in the large intestine
- Many infected individuals are asymptomatic
- Majority of the symptomatic patients complain of diarrhea and dysentery
- Abdominal discomfort or pain associated with nausea and vomiting

DIAGNOSIS

- Microscopic identification of trophozoites and cysts in the feces using direct examination
- Repeated stools for increase sensitivity
- Concentration techniques
- Biopsy from sigmoidoscopy: trophozoite

TREATMENT AND PREVENTION

- Treatment: metronidazole, tetracycline or iodoquinol
- Prevention: proper sanitation, safe water supply and protection of food from contamination
- Cyst is resistant to environmental conditions and may survive for long period, they are **easily inactivated by heat and 1% sodium hypochlorite.**

OTHER INTESTINAL PROTOZOA

BLASTOCYSTIS HOMINIS

FOUR MORPHOLOGICAL FORMS

1. Vacuolated forms

- **Most predominant**
- Large central vacuole (reproductive organelle) and very thick capsule

2. Ameba-like forms

- Active extensions and pseudopodia
- Nuclear chromatin: peripheral clumping
- **Intermediate stage** between vacuolar and pre-cystic

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3. GRANULAR FORMS

- Observed from **old cultures**
- Granular contents **develop into daughter cells of the ameba-form** when it ruptures

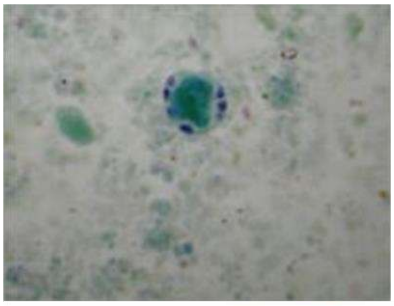
4. MULTIPLE FISSION FORM

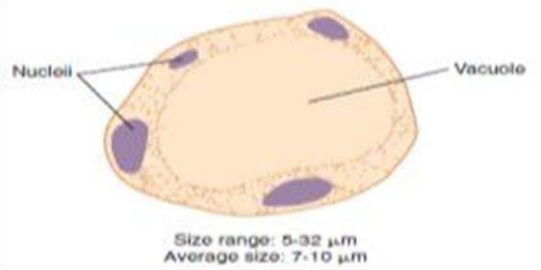
- **Arise from vacuolated forms**
- **Produce many vacuolated forms**

5. CYSTIC FORM

- Very prominent and thick osmophilic electron dense wall
- Infective stage
- **Thick walled cyst**: responsible for external transmission
- **Thin walled cyst**: reinfection within a hosts intestinal tract

Blastocystis hominis (Vacuolated form)	
PARAMETERS	DESCRIPTION
Size range:	5-32 um
Vacuole:	Centrally located Fluid-filled structure consumes almost 90% of organism
Cytoplasm:	Appears as a ring around periphery of organism
Nuclei:	Two or four located in cytoplasm





DIAGNOSIS

- Stool is the specimen of choice for the recovery of blastocystis
- Concentration technique: increase sensitivity
- Hematoxylin or Trichrome: to differentiate various stages
- Culture: Boeck and Drbohlav's media, Nelson and Jones media

EPIDEMIOLOGY

- B. hominis infections indicated that they occurred as epidemic in subtropical countries.\

CLINICAL SYMPTOMS

- mild to moderate diarrhea
- vomiting
- nausea
- fever
- abdominal pain and cramping
- bloating
- flatulence

TREATMENT

- Iodoquinol
- Metronidazole (DOC)
- Trimethroprim-sulfamethoxazole

PREVENTION AND CONTROL

- Proper treatment of fecal material
- Proper hand washing
- Subsequent proper handling of food and water

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CLINICAL PARASITOLOGY (LEC)

PARA311 LC

OUR LADY OF FATIMA UNIVERSITY – ANTIPOLO CAMPUS

OSMENA, DIVINE GRACE E, ======== SY 2022 – 2023

(WEEK 4 PRELIM) SYBPHYLUM MASTIGOPHORA (ATRIAL FLAGELLATES)

ATRIAL FLAGELLATES

- Generally have one to several long flagella in trophozoite form (except **D. fragilis: pseudopodia**)
- Some species have rudimentary mouth called **cytostome**
- Neuromotor apparatus consists of **kinetoplast** and **axoneme**
- Reproduction is through **binary fission**.
- *G. duodenalis* and *C.mesnili* have cyst and troph forms, the others exist in **trophozoite stage only**.

LEGEND

- Intestinal parasite
- Vaginal parasite
- Gingival parasite

PATHOGENIC

- *Giardia lamblia*
- *Trichomonas vaginalis*

NON-PATHOGENIC

- *Chilomastix mesnili*
- *Retortamonas intestinalis*
- *Pentatrichomonas hominis*
- *Trichomonas tenax*

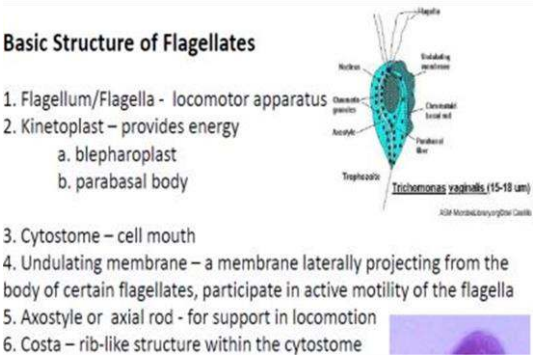
QUESTIONABLE PATHOGENICITY

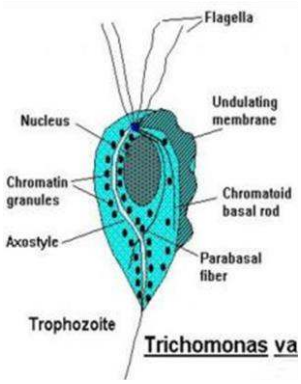
- *Dientamoeba fragilis*

GIARDIA DUODENALIS

- Also known as:
  - *Giardia duodenale*
  - *Giardia intestinalis*
  - *Giardia lamblia*
  - *Lamblia duodenalis*
  - *Lamblia intestinalis*
- First discovered by **Antoine Van Leeuwenhoek**
- First described by French scientist **Dr. F. Lambl** and Czechoslovakian scientist **Dr. Giard: Cercomonas intestinalis**
- **Stiles** coined Giardia lamblia



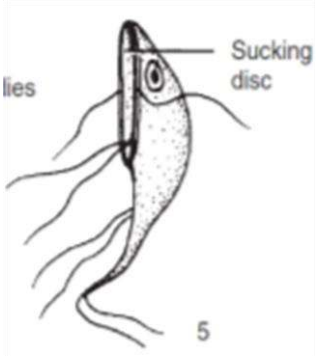




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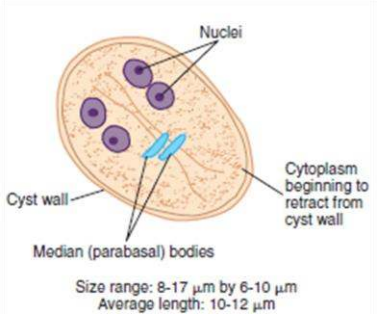
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Giardia Duodenalis (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	8 – 10 um long 5 – 16 um wide
Shape:	**Pear – shaped, teardrop**
Motility:	**Falling leaf**
Appearance	**Bilaterally symmetrical**
Nuclei	**Two – ovoid – shaped**, each a large karyosome No peripheral chromatin
Flagella:	**Four pairs**,origination of each: one pair, anterior end one pair, posterior end two pair, central, extending laterally
Other Structure:	**Two median bodies** **Two axonemes** **Sucking disk**

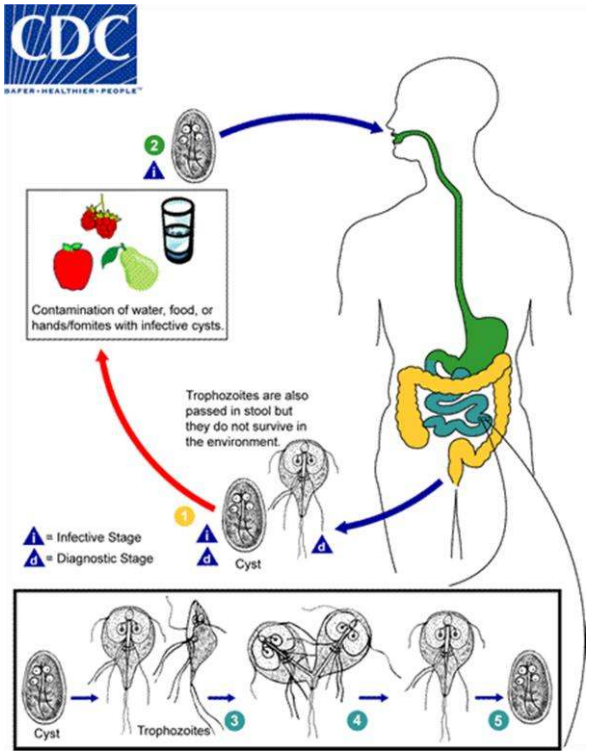


Giardia Duodenalis (Cyst)	
PARAMETER	**DESCRIPTION**
Size Range:	8-17 um long 6-10 um wide
Shape:	**Ovoid**
Nuclei:	Immature cyst, two Mature cyst, four Central karyosomes No peripheral chromatin
Cytoplasm:	Retracted from cell wall
Other structure:	**Median bodies**: two in immature cyst or four Interior flagellar structures





LIFE CYCLE

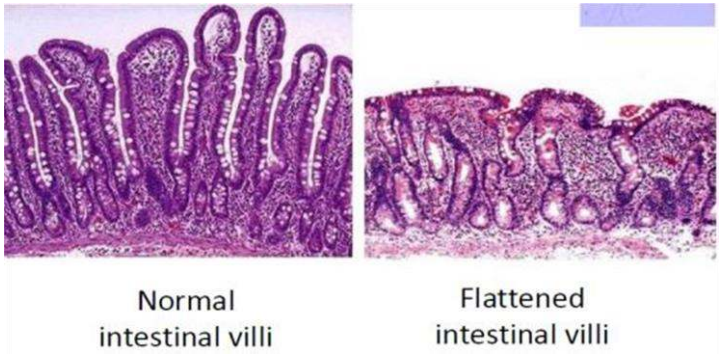


EPIDEMIOLOGY

- Found world-wide in lakes, streams, and other water sources.

CLINICAL SYMPTOMS

- Asymptomatic Carrier State
- Villous flattening and crypt hypertrophy
- Giardiasis
- Acute
- Abdominal pain
- Malaise and Flatulence
- Odor of rotten egg flatus (Hydrogen sulfide)
- Chronic
- Steatorrhea (greasy, frothy stool that floats)
- Failure to thrive syndrome
- Malabsorption of electrolyte, glucose, fluid
- Gay Bowel Syndrome



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DIAGNOSIS OF GIARDIA DUODENALIS

NON-INVASIVE PROCEDURE

- Stool examination
- **Enterotest**

INVASIVE PROCEDURE

- Duodenal aspirate
- Biopsy

IMMUNOLOGIC AND MOLECULAR METHODS

- Direct Fluorescent Antibody – gold standard
- EIA and ELISA
- Western Blot
- PCR

GIARDIA DUODENALIS	
TREATMENT	• Metronidazole • Tinidazole • Nitazoxanide
PREVENTION AND CONTROL	• Proper water treatment and control • Exercising good personal hygiene • Proper cleaning and cooking of food • Avoidance of unprotected anal and oral sex

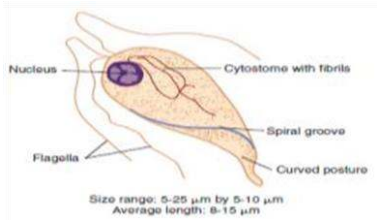
CHILOMASTIX MESNILI

Chilomastix mesnili (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	5-25 um long 5-10 um wide
Shape:	**pear-shaped**
Motility:	**Rotary, Cork screw, Jerky movement**
Nuclei:	One, with small central or eccentric karyosome No peripheral chromatin
Flagella:	Four (total) • 3 extending from anterior to end • 1 extending posteriorly from cytostome region
Other Structure:	• **Prominent cytostome** (extending 1/3 to 1/2 • body length) • **Spiral groove**

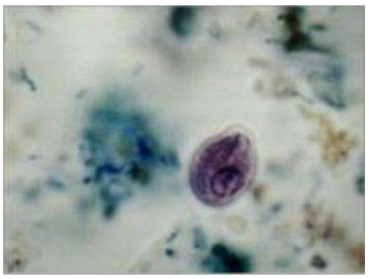
Chilomastix mesnili (Cyst)	
PARAMETER	**DESCRIPTION**
Size Range:	5-10 um long
Shape:	**lemon-shaped, with clear hyaline knob extending from the anterior end**
Nuclei:	One, with large central karyosome no peripheral chromatin
Other structure:	well-defined cytostome located on one side of the nucleus

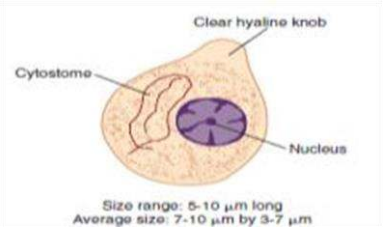
CHILOMASTIX MESNILI (TROPHOZOITE)





CHILOMASTIX MESNILI (CYST)





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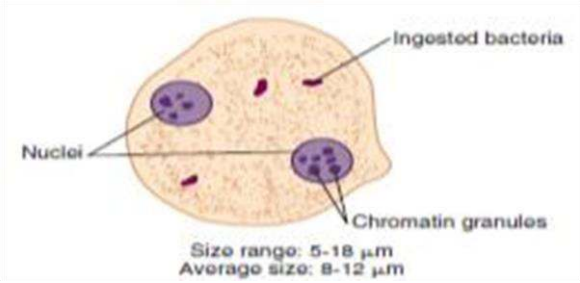
Chilomastix mesnili	
Epidemiology	*C. mesnili* is cosmopolitan in its distribution and prefers warm climate. This may occur primarily through hand-to-mouth contamination or via contaminated food or drink
Diagnosis	Traditional examination of freshly passed liquid stool Iodine wet preparation for demonstration of cyst.
Clinical Symptoms	Asymptomatic
Treatment	No treatment is necessary
Prevention and control	Proper personal hygiene Public sanitation practices

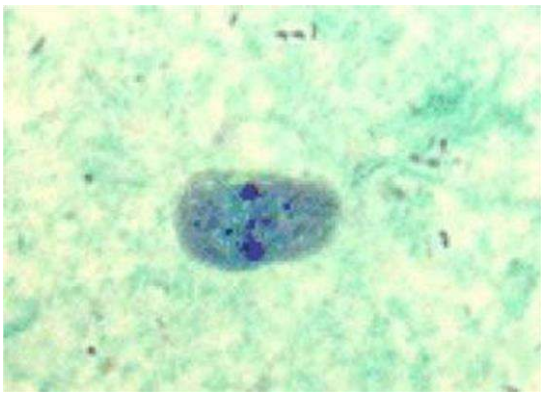
DIENTAMOEBA FRAGILIS

CHARACTERISTICS

- Originally described as an ameba, but molecular study, ultrastructure observation through electron microscope and presence of no cystic stage determines that it is closely related to the trichomonads (flagellate).
- Common in mental institutions, missionaries, pediatric population and patients younger than 20 years old. Sometimes isolated in homosexual men that are symptomatic.
- Co-infection with **Enterobius vermicularis**
- **Hakansson phenomenon**: *D. fragilis* differs from the amebic trophozoites when mounted in water preparations. Although both types of organisms swell and rupture under these conditions, only *D. fragilis* returns to its normal size. Numerous granules are present in this stage and exhibit Brownian motion.

Dientamoeba fragilis (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	5-18 µm
Shape:	**Irregularly round**
Motility:	**Progressive, broad hyaline pseudopodia**
Nuclei:	One or Two (most of the time), each consisting of massed clumps of four to eight chromatin granules No peripheral chromatin
Cytoplasm:	Bacteria-filled vacuoles common





CLINICAL SYMPTOMS

Life cycle is *unknown*.

- Exact transmission is not yet well understood; no fecal-oral, foodborne or waterborne transmission has been documented, but transmission is associated to helminthic eggs especially *Enterobius vermicularis* (Pinworm) eggs.
- The parasite is isolated from both asymptomatic and symptomatic patients, so many still argues about the pathogenicity of this parasite. New studies shows its role as a pathogen.
- Symptomatic patients have intermittent diarrhea and fatique in young population [Irritable bowel syndrome (IBS)]

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DIENTAMOEBA FRAGILIS

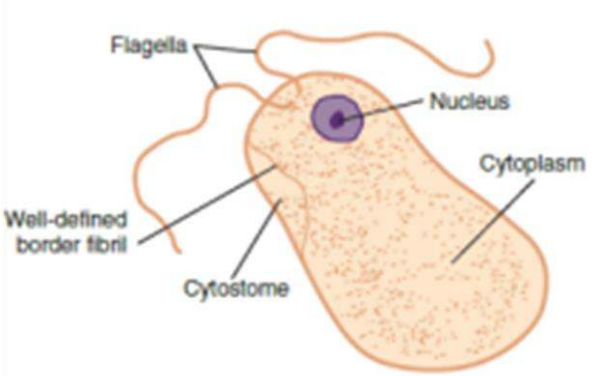
DIAGNOSIS

- NO available rapid test kit.
- Microscopic evaluation of freshly passed liquid stool is still the standard procedure.
- Fixed stool with polyvinyl alcohol or Schaudinn's fixative
- Permanent stained smear: Iron hematoxylin.
- Molecular techniques: RT-PCR

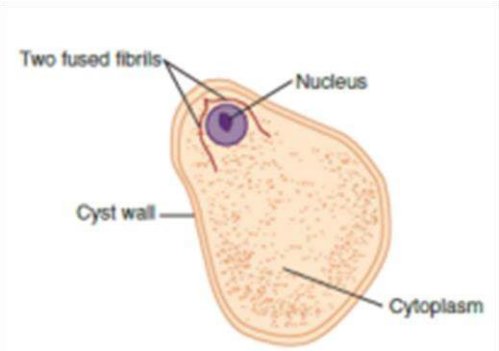
Dientamoeba fragilis	
TREATMENT	• Diiodohydroxyquin • Tetracycline • Metronidazole
PREVENTION AND CONTROL	Fecal-oral transmission has not been documented but is associated to helminthic eggs. Proper hygiene. Public sanitation practices

RETORTAMONAS INTESTINALIS

Retortamonas intestinalis (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	3-7 um long 5-6 um wide
Shape:	**Ovoid**
Motility:	**Jerky movement**
Nuclei:	One, with small central karyosome Ring of chromatin granules may be on nuclear membrane
Flagella:	Two anterior
Other structure:	Cytostome extending halfway down body length with well-defined fibril border opposite the nucleus in the anterior end



Retortamonas intestinalis (Cyst)	
PARAMETER	**DESCRIPTION**
Size Range:	3-9 um long; 5 um wide
Shape:	**lemon-shaped, pear-shaped**
Nuclei:	One, located in anterior-central region with central karyosome With delicate ring of peripheral chromatin
Other structure:	two fused fibrils resembling bird's beak



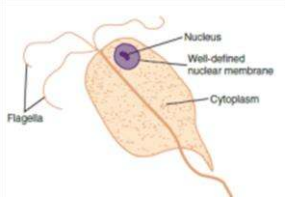
Retortamonas intestinalis	
Epidemiology	Rarely reported. Documented in warm and temperate climates throughout the world. Poor sanitation and hygiene in psychiatric hospitals may lead to infection by ingestion of infective cysts.
Diagnosis	Permanently stained smear (Iron hematoxylin) is the best method for stool samples.
Clinical Symptoms	Asymptomatic
Treatment	No treatment is necessary
Prevention and control	Proper personal hygiene Public sanitation practices

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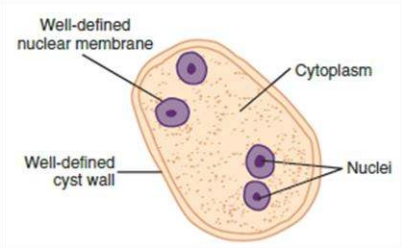
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ENTEROMONAS HOMINIS

Enteromonas hominis (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	3-10 um long 3-7 um wide
Shape:	**Oval**
Motility:	**Jerky movement**
Nuclei:	One, with small central karyosome No peripheral chromatin granules
Flagella:	Four (total) 3 directed anteriorly 1 directed posteriorly
Other structure:	None



Enteromonas hominis (Cyst)	
PARAMETER	**DESCRIPTION**
Size Range:	3-10 um long; 4-7 um wide
Shape:	**oval, elongated**
Nuclei:	One to four, binucleated or quadrinucleated located at opposite ends Central karyosome, no peripheral chromatin
Other structure:	None



Enteromonas hominis	
Epidemiology	Documented in warm and temperate climates throughout the world. Transmitted through ingestion of infective cysts.
Diagnosis	Stool sample for wet mount or permanently stained smear is recommended. May be missed by medtech because of small size.
Clinical Symptoms	Asymptomatic
Treatment	No treatment is necessary
Prevention and control	Proper personal hygiene Public sanitation practices

PENTATRICHOMONAS HOMINIS

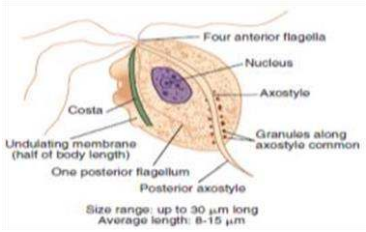
Pentatrichomonas hominis (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	7-20 um long 5-18 um wide
Shape:	**pear-shaped**
Motility:	**Nervous, jerky**
Nuclei:	One, with a small central karyosome No peripheral chromatin
Flagella:	3-5 anterior 1 posterior extending from the posterior end of the undulating membrane
Other structure:	axostyle that extends beyond the posterior end of the body **full body length undulating membrane conical cytostome cleft** in anterior region ventrally located opposite the undulating membrane

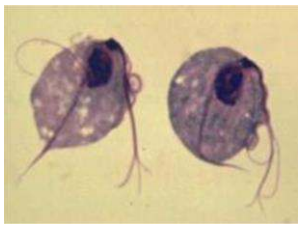
Pentatrichomonashominis	
Epidemiology	• P. hominis is found worldwide • Transmission mostly occurs by ingesting trophozoites • Contaminated milk is one of the source of infection.
Diagnosis	Stool sample for wet mount or permanently stained smear is recommended.
Clinical Symptoms	Asymptomatic
Treatment	No treatment is necessary
Prevention and control	Proper personal hygiene Public sanitation practices

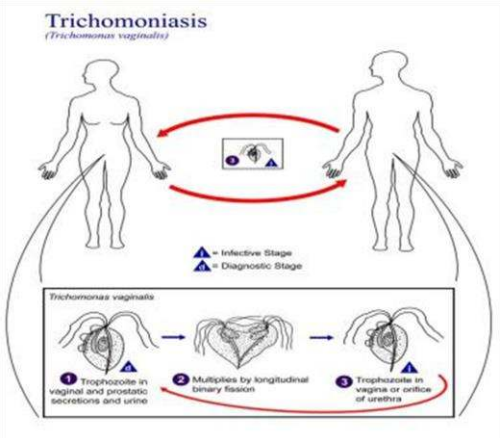
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TRICHOMONAS VAGINALIS

Trichomonas vaginalis (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	5-14 um long
Shape:	**ovoid, round or pear-shaped**
Motility:	**Rapid, jerky**
Nuclei:	One, ovoid, nondescript
Flagella:	all originating anteriorly **3-5 extending anteriorly one extending posteriorly**
Other structure:	Undulating membrane Extending **half of body length** Prominent axostyle that often curves around nucleus granules maybe seen along axostyle







EPIDEMIOLOGY

- Infection with T. vaginalis occur worldwide.
- **Sexual intercourse** is the primary mode of transmission.
- Men are asymptomatic (carrier) and
- Women are symptomatic. Infected women are usually 15-24 years of age.
- Can survive moist environment over extended periods of time like toilet utilities, damp towels, or underclothes.

CLINICAL SYMPTOMS

MEN

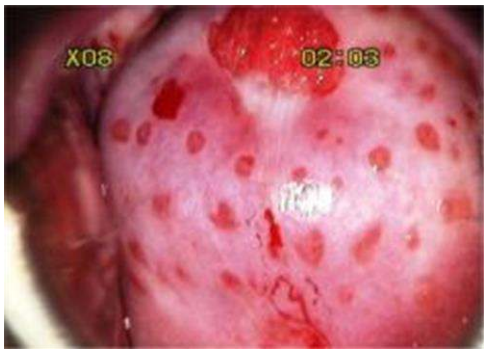
- Asymptomatic Carrier state
- Parasite resides in Prostate

WOMEN

- Optimum vaginal pH for infection: >6.0
- Parasite reside in vagina
- Persistent Urethritis (pyuria, dysuria)
- Persistent Vaginitis (yellow-green malodorous discharge)
  - **strawberry cervix**
  - **Dyspareunia**

COMPLICATIONS:

- Neonatal infection during birth
- Cervical cancer
- Predisposition to HIV
- **Neonatal infection**: conjunctivitis, respiratory infection.



SPECIMENS FOR IDENTIFICATION

URINE (SOC)

- Vaginal Secretions
- Vaginal Scrapings
- Cervical Swabs
- Prostatic Secretions
- Wet mount examination should be done within 10-20 minutes from sample collection.

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DIAGNOSIS

- Examination of saline wet prep
- Papanicolaou smear (Best) or Giemsa smear
- Urinalysis (seen during microscopic exam)
- Culture: InPouch TV (3 days), Modified Diamond medium, Feinberg-Whittington medium
- Monoclonal antibody assays, Enzyme immunoassays
- Fluorescent stains
- PCR Molecular techniques: Affirm VPIII (DNA)

TREATMENT

- Metronidazole: DOC
- Treatment of sexual partners is recommended

PREVENTION AND CONTROL

- Practice safe, monogamous sex and good personal hygiene
- Prompt treatment of cases and asymptomatic male patients
- Public education

TRICHOMONAS TENAX

Trichomonas tenax (Trophozoite)	
PARAMETER	**DESCRIPTION**
Size Range:	5-14 um long
Shape:	**oval or pear-shaped**
Motility:	**Rapid, jerky**
Nuclei:	One, ovoid nucleus; consist of vesicular region filled with **chromatin granules**
Flagella:	5 total, all originating anteriorly 4 extended anteriorly 1 extends posteriorly
Other structure:	Undulating membrane **extending 2/3 of body length** with accompanying costa Thick axostyle curves around nucleus extends beyond body length Small anterior cytostome opposite to undulating membrane

Trichomonas tenax	
Epidemiology	• The exact mode of transmission is unknown • Some evidence suggesting that the use of contaminated dishes and utensils • Introducing droplet contamination through kissing
Diagnosis	Specimen of choice is mouth scraping. Wet mount smear.
Clinical Symptoms	Asymptomatic but is known to invade the respiratory tract
Treatment	No treatment is necessary
Prevention and control	Proper and good oral hygiene

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