

# PROTOZOA

## AMOEBA

### Sarcodina:

- 1- *Entamoeba histolytica*.
- 2- *Entamoeba coli* .
- 3- *Entamoeba gingivalis*.
- 4- *Entamoeba dispar*.
- 5- *Endolimax nana*.
- 6- *Dientamoeba fragilis* .
- 7- *Naegleria fowleri* .
- 8 - *Acanthamoeba spp.*

### *Entamoeba histolytica*

Causes amoebiasis , an infection of large intestine in man .  
The causative agent of amoebic dysentery, Three stages have been described in to the morphology of *E.histolytica* , There are trophozoite , precyst ,cyst.

### Morphology of trophozoite

The size of troph 8-65  $\mu$ m, the shape is round and have one nucleus . Also have one pseudopodia ,therefore movement is unidirectional.

The cytoplasm are finely granular , karyosome is central, and peripheral chromatin is evenly distributed . Red blood cell in the cytoplasm are considered diagnostic because *E. histolytica* is only intestinal amoeba to exhibit this characteristic

### **Cyst:**

From 2 -4 nuclei depending on maturity level and Diameter of cyst 10- 15  $\mu$ m. The karyosome is also central .

### **Life cycle :**

The quadrinucleate cyst is the infective form of parasite and is resistant to chlorination ,gastric acidity and for desiccation And can survive in moist environment several weeks.

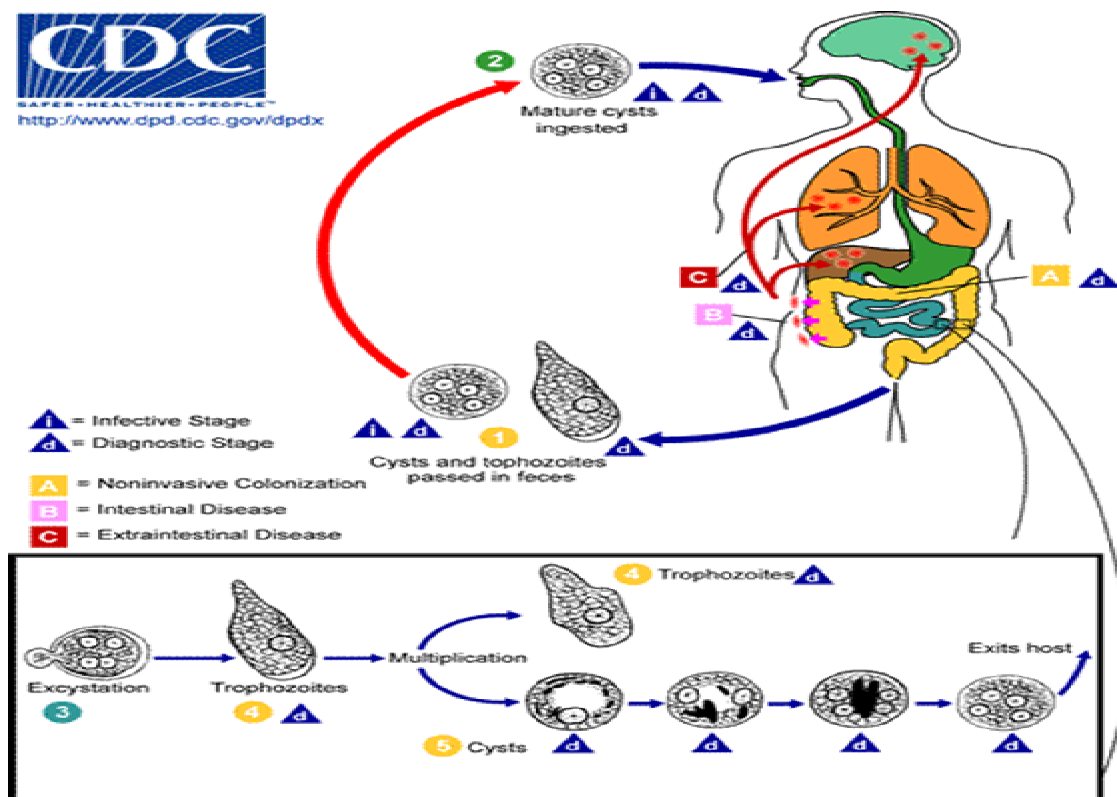
Infection with *E. histolytica* occurs due to fecal- oral spread with fecally contaminated food and water . the excystation of cyst occurs in the small intestine, where the cyst undergoes nuclear and cytoplasmic division to form eight trophozoites .

the trophozoites can colonize and / or invade the large bowel, Cysts are never found within invaded tissues, Invasion of the colonic intestinal epithelium by trophozoites lead to the formation of the classically described flask – shaped ulcers.

hepatic abscesses are thought to occur due to migration of the parasite via the portal vein .

All infections with *E. histolytica* are not alike, and whether infection results in colonization or invasion may be influenced by the *E. histolytica* strain and its interaction with bacterial flora.

In some patients, the trophozoites invade the intestinal mucosa (intestinal disease) or through the blood stream, extra intestinal sites such as the liver, brain, and lung (extra intestinal disease) with resultant pathogenic manifestation.



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## **amoebiasis**

Cause by *E.histolytica* lead to diarrhea, The stool is present with RBC(bloody) ,Presence of scanty pus , Presence of mucous in stool and The stool should contain troph or cyst .

### **Intestinal amoebiasis types:**

Amoebic dysentery .

Non- dysenteric colitis .

Amoebic appendicitis .

Amoeboma .

Post – dysenteric colitis .

### **Extra intestinal amoebiasis types:**

Amoebic hepatitis .

Amoebic liver abscess .

Pulmonary amoebiasis.

Cerebral amoebiasis.

Cutaneous amoebiasis.

Splenic amoebiasis .

Urogenital tract amebiasis.

## **Pathology:**

Initial amoebic lesions occur in epithelium , The penetration is facilitated by motility of the trophozoites, when the troph reach the sub mucosa coat , they will rapidly multiply ,increase in number form colonies ,destroy the tissue and use the cytolyses material as their food .

Amoeba destroy area of the sub mucosa , leading to abscess formation which break down to form the ulcer.

## **Clinical findings:**

### **Symptomatic intestinal amoebiasis :**

The major clinical features of amoebiasis vary from mild diarrhea and fatal dysentery , The stool are usually loose and are often flecked with blood , Also they may be abdominal pain , anorexia , nausea , and vomiting.

Chronic amoebiasis is characterized by recurrent attacks of dysentery with intervening periods of mild or moderate gastrointestinal disturbance and constipation .

### **Symptomatic extra -intestinal amoebiasis**

E. histolytica troph that migrate in to the blood stream are removed by taken up residence in the liver .causes liver abscess or amoebic hepatitis .

In addition to the liver , the trophs have known to migrate and infect other organ , including lung , pericardium , spleen , skin ,and brain .

### **Treatment of amoebiasis**

Assymptomatic patients showing only cyst in the stool may be treated with furamide ( diloxanide furamate ) , Where as in those patient showing cyst and troph iodoquinol or flagyl may use .

### **Symptomatic :**

Chloroquine plus iodoquinol or flagyl for amoebic colitis . Amoebic dysentery responds to dihydroemetin hydrochloride , Flagyl or dihydroemetin + chloroquine is suggestive with liver abscess .

### **Note:**

1-The infection of *E. histolytica* is mostly luminal , however flask shape ulcer can be formed when the trophs invade the mucosa and sub mucosa .

2- in formed feces , the cyst is mostly present in semi – formed stool and in sever infection , the troph is predominant .

3- some times, the troph and cyst are present in the formed stool without clinical symptoms.

## **EMTAMOEBA DISPAR**

Non invasive protozoan , has recently been separated from *E. histolytica* . The two parasite are morphologically identical species but genetically distinct species . Is predominant cause of colonization in many asymptomatic (cyst passers ) in developing countries ,as well as in sexually active male homosexuals in developed countries .

### **Morphology :**

The are two species of entamoeba only one of these caused disease in human , Other non pathogenic , species *E. dispar* .

The inability to differentiate between these two species by morphological or biological means until recently led to significant debate on this topic .

Isoenzymes typing could be used to distinguish the pathogenic from non – pathogenic species of *Entamoeba* Today the two species are classified as *E.histolytica* and *E. Dispar*

### **Pathogenesis:**

*E. dipar* has never been documented to cause colitis or liver abscess Because *E. dispar* colonization is more common than *E. histolytica* infection and not need treated .

an important clinical advance has been the development of Ag detection test that differentiate between them Stating that the *E. Dispar* infection does

not need to be treated ,and *E. dispar* is capable of killing target cells such as neutrophils .

### **Clinical features:**

Although colonization with *E. Dispar* is known to occur , the organism has never been known to cause disease .

In patients with HIV infection no correlation has been established between the presence of *E. dispar* and gastrointestinal symptoms.

### **Diagnosis:**

*Entamoeba dispar* a non-pathogen is indistinguishable by microscopy and is a much more common intestinal protozoan than *Entamoeba histolytica*.

Antigen capture and PCR tests can distinguish *E. dispar* from *E. histolytica* in heavier infections.

## **ENTAMOEBIA GINGIVALIS**

General characterized :

- 1- was the first amoeba of man to be described .
- 2- it is global in distribution .
- 3- this type is seen in tooth .
- 4- no cyst in stool .



## **morphology:**

This species of amoeba is no cyst stage is seen Only troph of this parasite are seen .

## **Morphology of troph**

The troph is 10 -20 mm in diameter , Actively motile with multiple pseudopodia .The cytoplasm contains food vacuoles with ingested bacteria . ingested Leukocytes and epithelial cell . The nucleus is round , with central karyosome and nuclear membrane is lined with evenly chromatin granules . Only *E. Gingivalis* ingest W.B.Cs.

## **Clinical diseases:**

It is commensal organism , and not considered to cause any disease ,It lives in the gingival tissues . It has been misdiagnosed in various condition .

A- in periodontal disease where it is just accidentally present and has no pathogenic role .

B- it multiplies in bronchial mucosa and appears in sputum where it might be mistaken for *E. Histolytica* from a pulmonary abscess .

C- it has been recovered from vaginal and cervical smears of woman using intrauterine devices but has no pathogenic role.

# **Naegleria fowleri**

*Naegleria fowleri* is an amoeba that inhabits warm fresh water and soil. *Naegleria fowleri* causes a deadly infection in humans. While infections of *Naegleria fowleri* have happened all over the world, over half of the infections have occurred in the United States. *N. fowleri* can invade and attack the human nervous system, although this occurs rarely, such an infection will nearly always result in the death of the victim.

## **Morphology**

The only type of amoeba with three morphologic forms .

1- amoeboid troph .

2- flagellated troph.

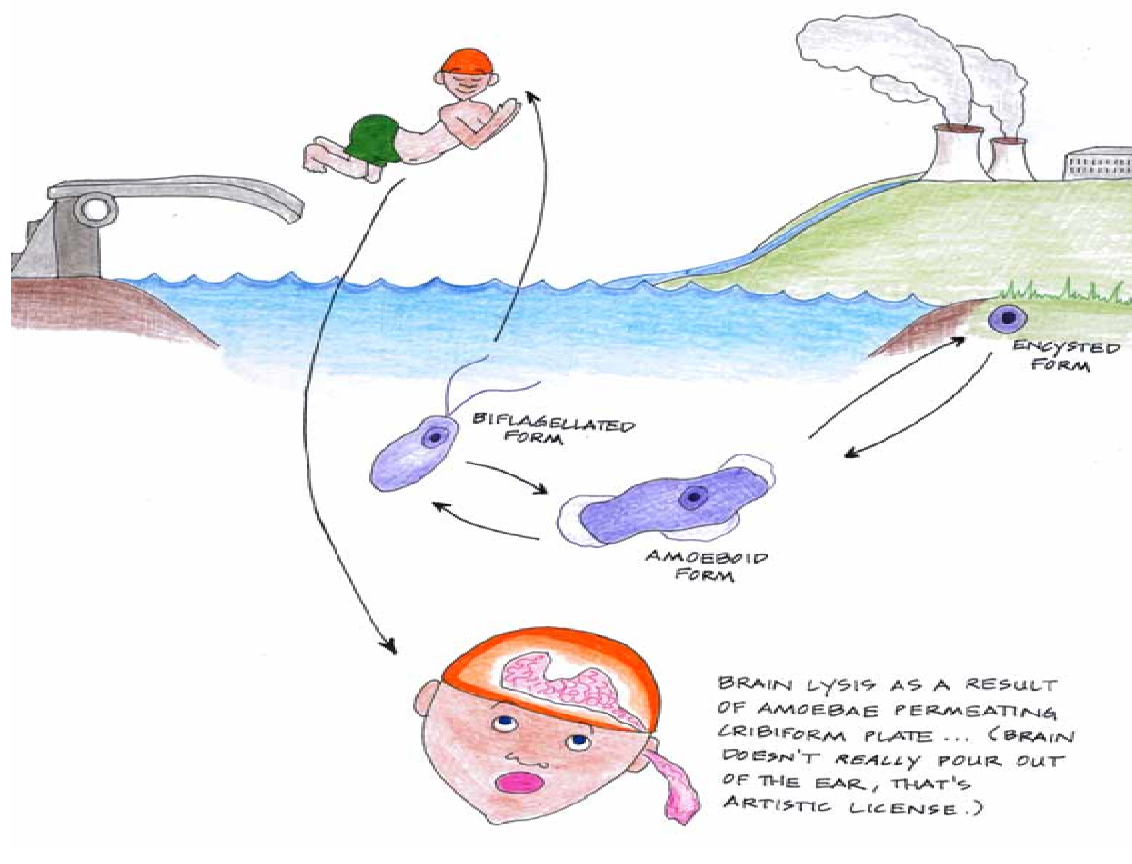
3- cyst .

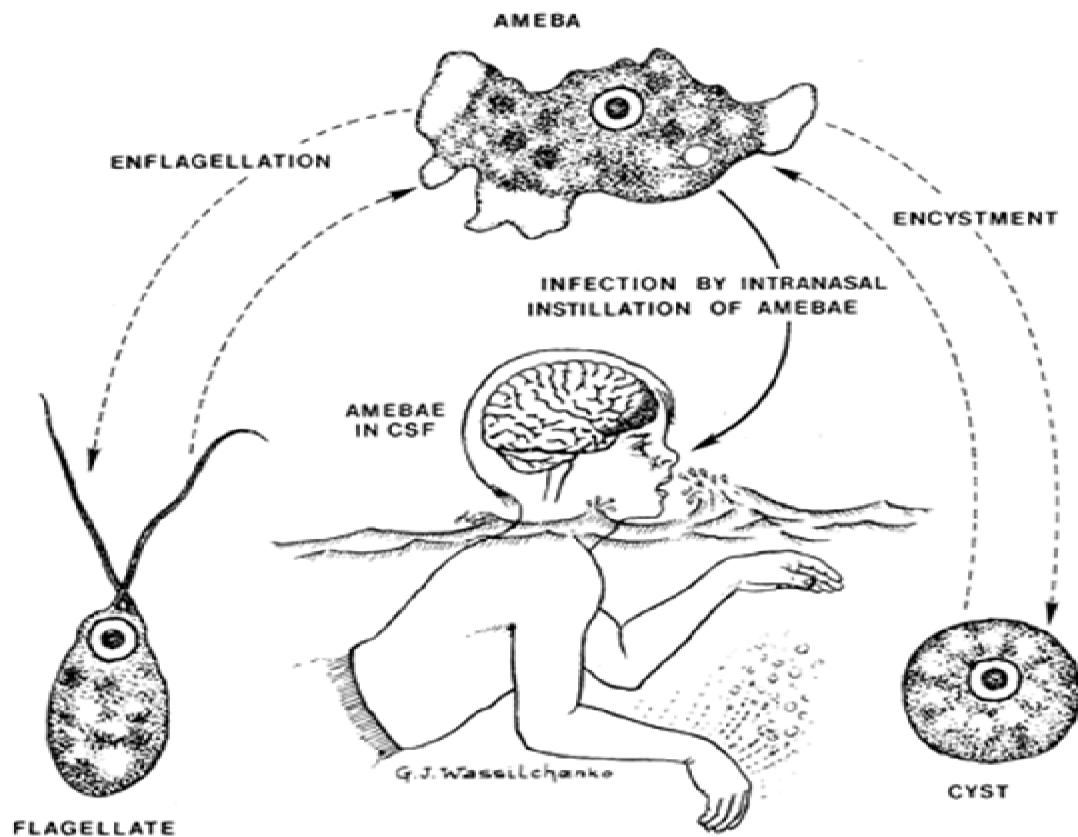
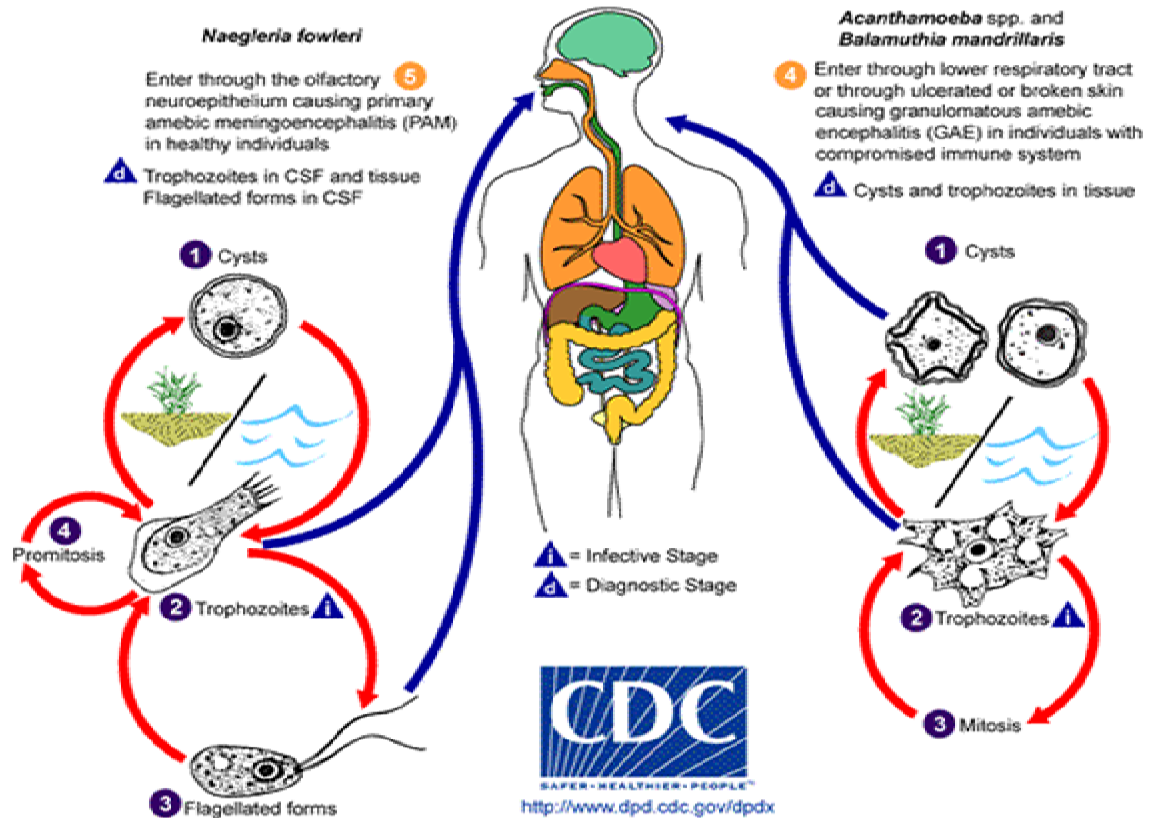
The amoeboid troph are active and change size and shape they measure about 10 to 15µm in diameter, one nucleus with large central karyosome ,and The cytoplasm is finely granular , Numerous vacuoles are usually visible in the cytoplasm. The trophozoites travel by producing broadly rounded processes (lobopodia), which are clear initially but fill with granular cytoplasm When exposed to distilled water, trophozoites can convert within a few minutes to a flagellated form.

The cysts are spherical, 8 to 12 µm in diameter, with a smooth, single-layered wall ,and The cytoplasm of the cyst is finely granular, with a characteristic central nucleus.

## ***Naegleria fowleri*** Multiplication and Life Cycle

*Naegleria fowleri* is a free-living inhabitant of fresh water and soil. The amoeboid trophozoite form reproduces by binary fission and also gives rise to the encysted and flagellated forms, which do not reproduce. *Naegleria fowleri* is thermophilic, preferring warm water and reproducing successfully at temperatures up to 46°C. In temperate climates, the amebas overwinter as cysts in bottom sediments of lakes, swimming pools and rivers





## **pathogenesis**

In humans, *N. fowleri* can invade the central nervous system via the nose, more specifically the olfactory mucosa and nasal tissues.

The penetration initially results in significant necrosis of and hemorrhaging in the olfactory bulbs. From there, amoebae climb along nerve fibers through the floor of the cranium via the cribriform plate and into the brain. it then becomes pathogenic, causing primary amoebic meningoencephalitis (PAM or PAME).

## **Clinical Manifestation**

*Naegleria fowleri* is the agent of primary amebic meningoencephalitis, a fulminating, rapidly fatal disease. More than 150 cases of this disease have been recorded worldwide . The disease usually affects children and young adults. In almost all cases, the victims contact the amebas by swimming in infected fresh water. The amebas enter the brain via the olfactory tract after being inhaled or splashed onto the olfactory epithelium. The incubation period ranges from 2 to 3 days to as long as 7 to 15 days, depending partly on the size of the inoculum and the virulence of the strain.

## **Clinical findings**

The disease appears with the sudden onset of bifrontal or bitemporal headache, fever, nausea, vomiting, and stiff neck . Symptoms progress rapidly to lethargy, confusion,

and coma. In all of the recorded cases, the patient died within 48 to 72 hours.

## **Treatment**

Only three patients have survived primary amebic meningoencephalitis. In these patients, the disease was diagnosed early and treated aggressively with high doses of amphotericin B. Amphotericin B and miconazole appear to be the drugs of choice.

The chance of catching the disease can presumably be reduced by properly chlorinating swimming pools, whirlpools, and Jacuzzis, and by not diving or splashing in warm water ponds.

## **ENTAMOEBA COLI**

Non pathogenic amoeba (can not produce virulent factor ). Found in healthy stool . Normally present in intestine . That very closely resembles *Entamoeba histolytica* .

### **Morphology:**

There are three stages in this type:

Trophozoites. Pre cyst. Cyst.

## **Characterized of trophozoites**

The troph range in size from 15 – 50 mm . There is single nucleus with enteric karyosome and unevenly distributed peripheral chromatin . The cytoplasm is granular .

The troph move by short multiple pseudopodia( multi – directional). No RBC are present. Ability to ingested multiple type of bacteria can be causes many disease.

## **Characterized of pre cyst and cyst**

1- pre cyst :

This stage is very transitory

2- cyst

- measure 10 – 35 mm in diameter . The average diameter is definitely greater than the cysts of the nucleus vary in number from 1 – 8 pathogenic amoeba . The karyosome can be frequently distinguish even in unstained amoebae . Peripheral Chromatin are unevenly distributed.

## **Life cycle**

Human infected occurs through ingestion of food or water contaminated by cyst bearing faeces . Eight nucleated metacyst is excycted in intestine , After a series of cytoplasmic division eight to fewer metacystic trophozoites are formed and develop in to mature troph in caecum , Troph multiply by binary fission .

## **Clinical features :**

**Entamoeba coli** is non – pathogenic No clinical manifestation – result in from in to infection – to man .

## **ENDOLIMAX NANA**

Non pathogenic amoeba , classified within intestinal amoeba , They are found only in lumen cavity of the intestinal tract, These nonpathogenic protozoa do not causes any disease.

## **Morphology**

The troph exhibit non progressive motility which is achieved by blunt hyaline pseudopodia . The single nucleus may or not be visible in stained preparation , The karyosome is typically large and irregularly shaped , and is often described as “blot like “ in appearance . Absence of peripheral chromatin is key in trophs identification.

The cytoplasm is granular , vacuolated and usually contains bacteria .

Non pathogenic amoeba , classified within intestinal amoeba , They are found only in lumen cavity of the intestinal tract. These nonpathogenic protozoa do not causes any disease .

Infection with this parasite by ingesting food or water that is contaminated with feces. This is called fecal-oral transmission.



# **DIENTAMOEBA FRAGILIS**

## **Amoebic – flagellated parasite**

This parasite is classified as an amoeba because this organism moves by pseudopodia and does not have external flagella .

### ***Morphology***

Only troph is present in the life cycle . The troph is irregular and roundish in shape . Motility is progressive and accomplished by broad hyaline pseudopodia , The trophic troph has 2 nuclei each consisting of 4-8 centrally located massed chromatin granules , No peripheral chromatin is present .

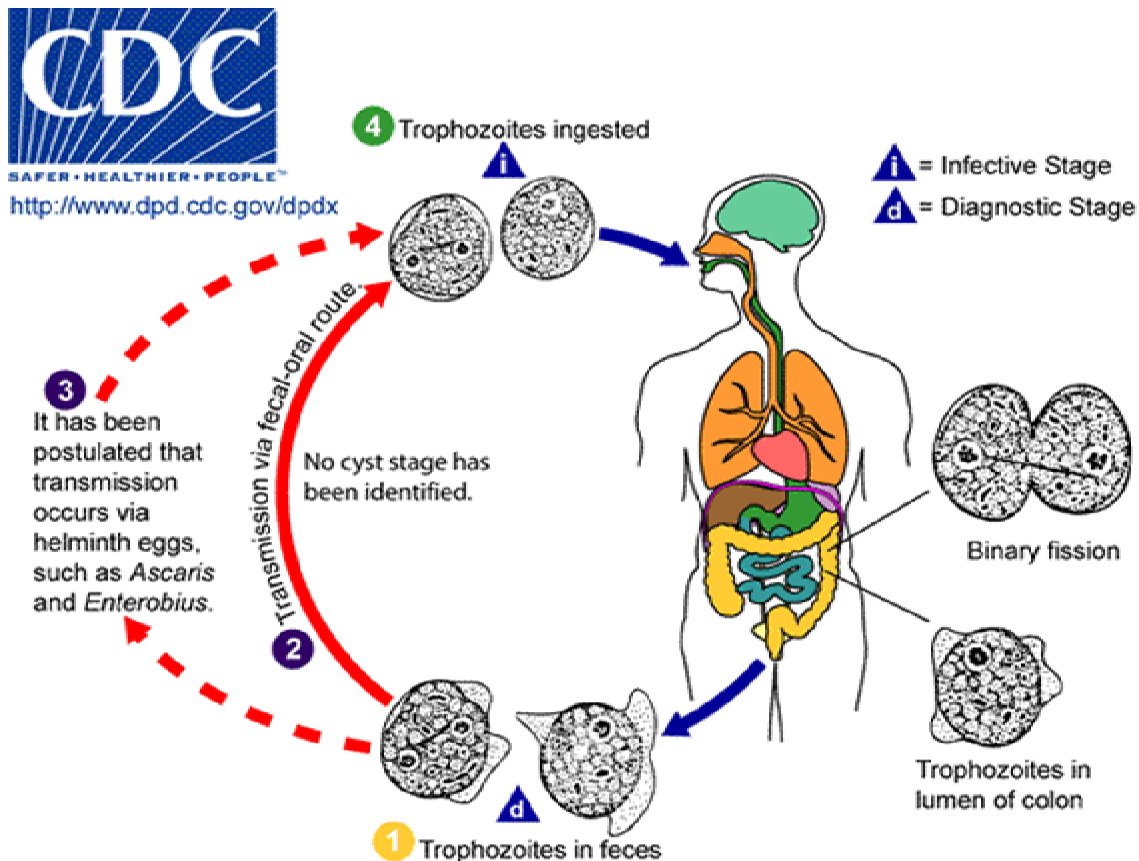
most troph are binucleated , therefore this parasite named Dientamoeba . Vacuoles containing bacteria may be present in the cytoplasm of these troph .

No cyst is seen The specimen of choice for recovery Dientamoeba is the stool . It is known that this parasite resides in the mucosal crypts of the large intestine . There is no evidence to suggest that D . Fragilis troph invade their surrounding tissues, and has only rarely been known to ingest R.B.Cs . It is estimated that the majority of persons with D. fragilis infectious remain asymptomatic

## Life cycle

the cyst stage has not been identified in *D. fragilis* life cycle, and the trophozoite is the only stage found in stools of infected individuals .

*D. fragilis* is transmitted by fecal-oral route and transmission via helminthes eggs (e.g., *Ascaris*, *Enterobius* spp.) .



## Clinical feature

Trophozoites of *D. fragilis* have characteristically one or two nuclei , and it is found in children complaining of intestinal (diarrhea, abdominal pain) and other symptoms ( nausea, anorexia, fatigue, malaise, poor weight gain). Other documented symptoms that may occur include bloody or mucoid stools Some patients experience diarrhea with constipation .

## Treatment

The drug are used in this infection is Iodoquinol .

## Acanthamoeba species

*Acanthamoeba* species are classified into two morphologic groups.

Group I has large cysts with rounded outer walls (ectocysts) that are clearly separated from the inner walls (endocysts).

Group II cysts are smaller, with variable endocyst shapes.

The major human pathogens belong to Group II

## Morphology

*Acanthamoeba* exists in two forms: an active, infective trophozoite and environmentally hardly cyst.

Trophozoites measure approximately 25 to 50  $\mu\text{m}$  in diameter with a single nucleus, , and consist of large karyosome , no peripheral chromatin is seen , and cytoplasm appears granular and vacuolated , and filamentous projections called acanthopodia.

Trophozoites reproduce by binary fission and feed on a variety of organisms, including cyanobacteria, bacteria, fungi, and other protozoa *Acanthamoeba* can survive for years under adverse conditions such as extreme temperatures and pH, , and chemical exposure. Cyst is round shape and with double cell wall . The inner smooth cell wall is surrounded by an outer cell wall . Single nucleus contain large central karyosome with no peripheral chromatin .

## Life Cycle

The acanthamoeba life cycle is not well defined . It is presumed that most infection with acanthamoeba invade the CNS , known CNS infections From the lower respiratory tract or the skin .

Contamination by cyst which be up taken by inhalation , it considers as the mode of transmission .

## Clinical disease

A- Granulomatus amoebic encephilitis (GAE) Infection with acanthamoeba , symptoms of this condition include , headaches , stiff neck nausea ,and vomiting .

**Granulomatus lesions of the brain are characteristic and contain both the troph and cyst.**

## **Treatment**

**Early diagnosis is essential for effective treatment of *Acanthamoeba* keratitis Current treatment usually include a topical cationic antiseptic agent such as polyhexamethylene (0.02%) or chlorhexidine (0.02%) propamidine (0.1%) or hexamidine (0.1%). The duration of therapy may last six months to a year.**

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# PROTOZOA

## AMOEBA

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