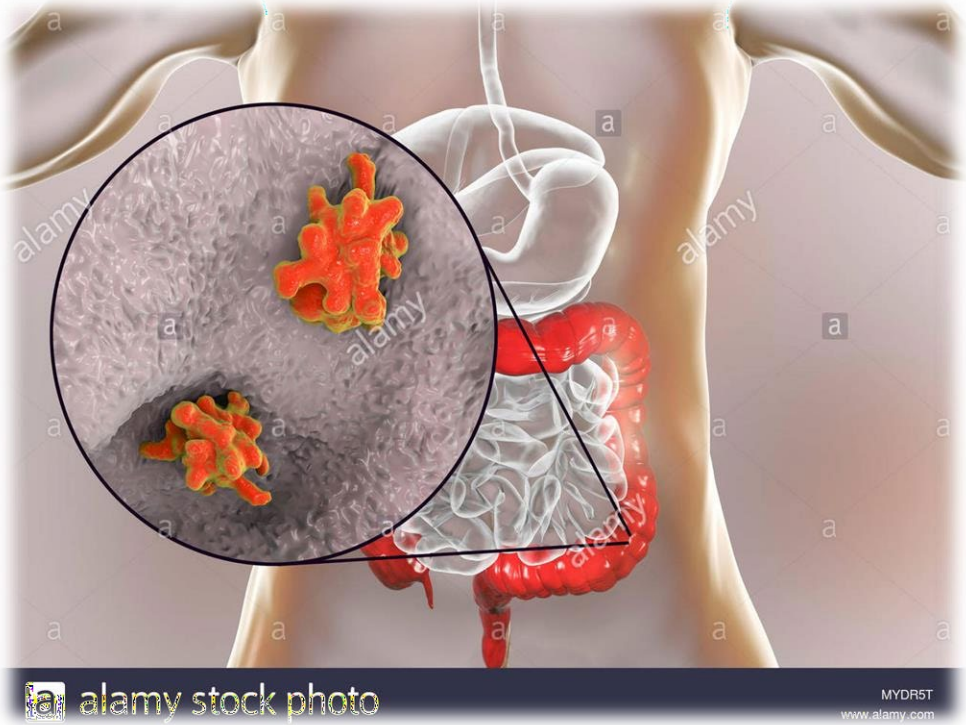
Protozoology
Genus Entamoeba



4th stage –Biology Dept.

2024-2025

Lecture 2

Protozoa:

Is defined as a microscopic unicellular eukaryotes organisms.

The single cell has a relatively complex internal structure and it performs various complex metabolic activities such as

digestion, reproduction, respiration, excretion, etc.

- **Reproduction: Asexually** and **Sexually**
- Asexual reproduction by **binary fusion, multiple fusion** or **budding**.
- Sexual reproduction by **conjugation** or by **fusion of gametes (syngamy)**.
- Life history often completed with **alternation** of asexual and sexual phases.
- **Encystment** is a common **protective phase**, commonly occurs to resist the unfavorable conditions of food.

- Nutrition by absorption of nutrients or ingestion of solid particles by the help of pseudopodia or cytosome.
- Respiration through diffusion of gases (aerobic and anaerobic).
- Excretion through diffusion through the body or by excretory vacuoles.

Systematic classification

The protozoa are classified into six phyla. This classification is based on the morphology of the protozoa as demonstrated by light and scanning electron microscopy.

Three of them important phyla, which contain species of medical important causing disease in human, and these are:

Phylum 1: Sarcomastigophora
(Flagella / psedopodia)

Phylum 2: Apicomplexa

Phylum 3: Ciliophora (Ciliated)

Genus Entamoeba

Numerous amoebic protozoa can inhabit the gastro-intestinal tract of humans.

Entamoeba histolytica is the only species pathogenic to human.

Other species are non-pathogenic (*Entamoeba dispar, E. hartmanni, E. polecki, E. coli* and *E. gingivalis*).

Entamoeba histolytica

Schaudinn, 1903

Classification of the amoebae

The amoebae belongs to the

Phylum: Sarcomastigophora

Subphylum: Sarcodina

Class: Lobosea

Order: Amoebida

Genus: Entamoeba

E.g.: *Entamoeba histolytica*

Disease*:*

Entamoeba histolytica causes intestinal amoebiasis.

The infection is worldwide in distribution.

The parasite is the third leading parasitic cause of death in the developing countries. Also it's a causative agent of amoebic dysentery and amoebic liver abscess.

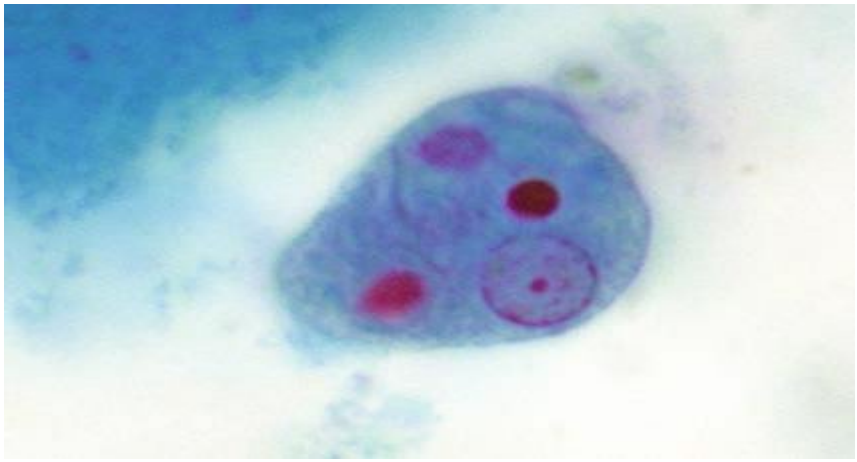
Habitat

The trophozoites of *Entamoeba histolytica* are present in the lumen and in the mucosa and submucosa of the large intestine.

Morphology

The parasite occurs in 3 stages:

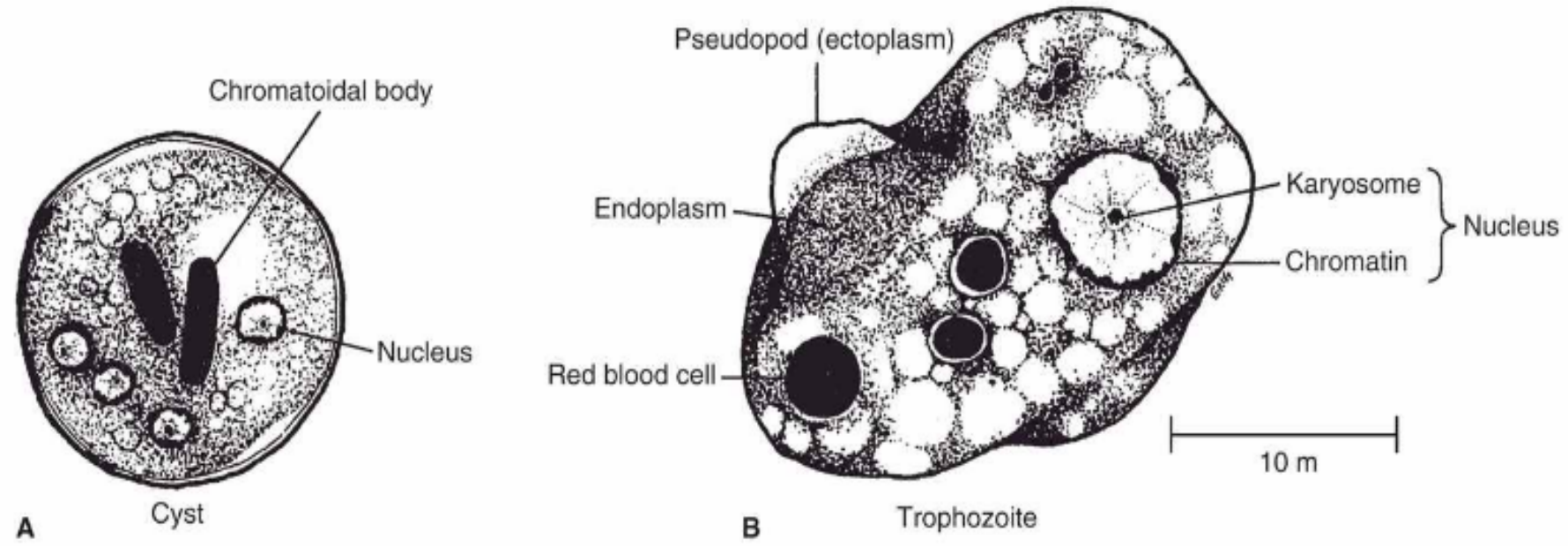
- Trophozoite
- Pre-cyst
- Cyst

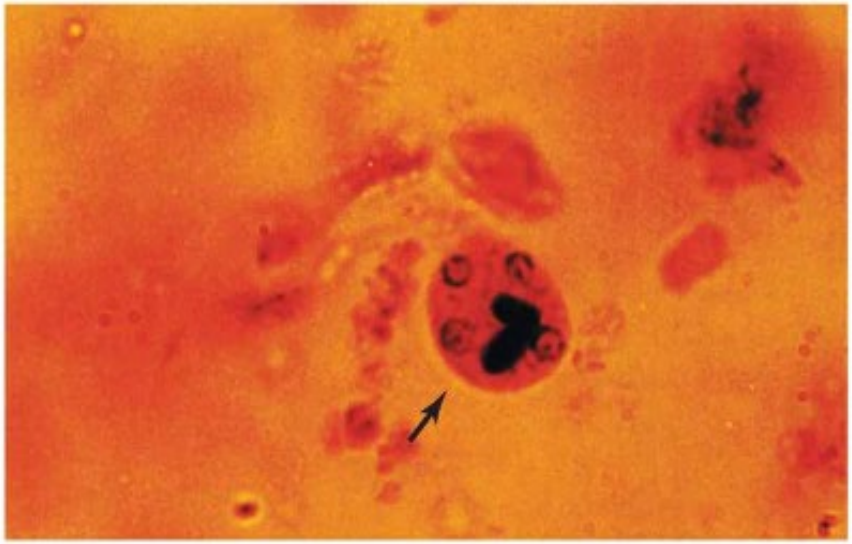


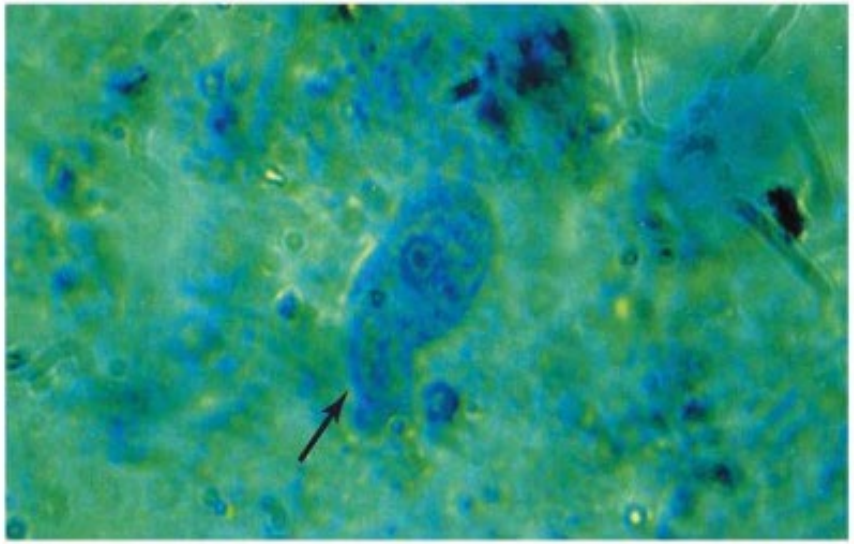
Morphology

- **Cyst (Infective form)**

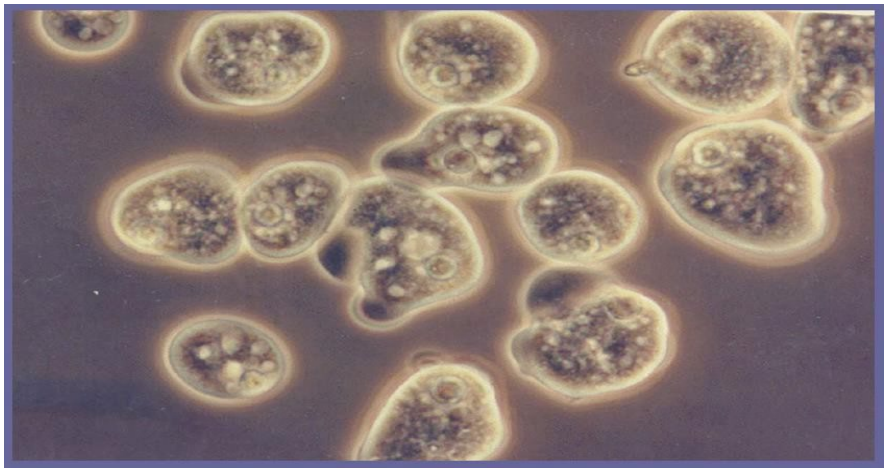
It is small and spherical, measures (10-16)µm in diameter. The mature cyst (quadrinucleate) contains four nuclei but does not contain any red blood cells or food particles..

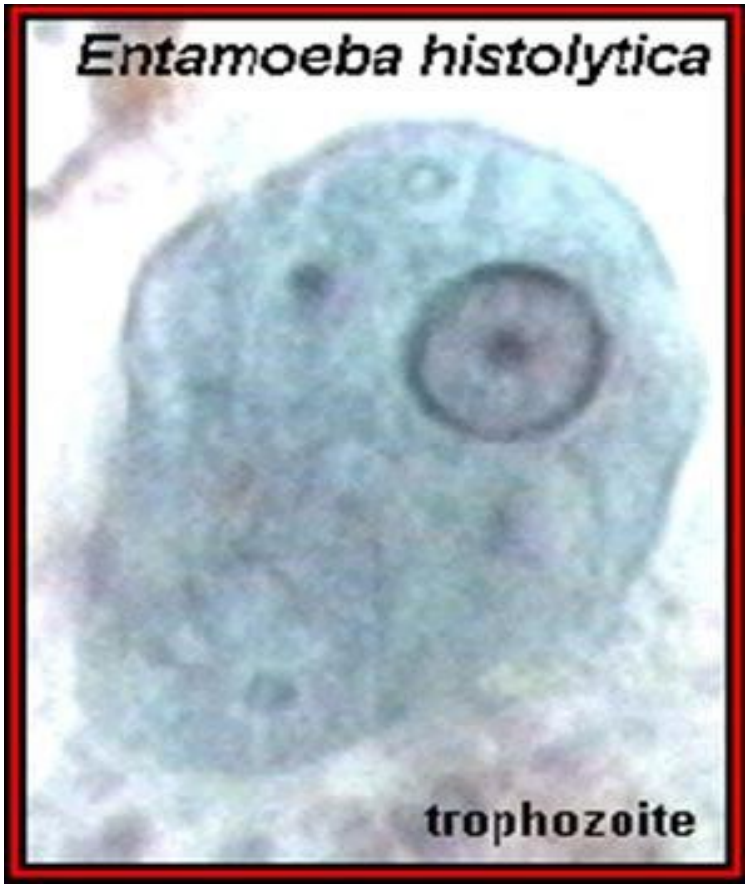

Chromatoidal body
Nucleus
A
Cyst
Pseudopod (ectoplasm)
Endoplasm
Red blood cell
Karyosome
Chromatin
Nucleus
10 m
B
Trophozoite

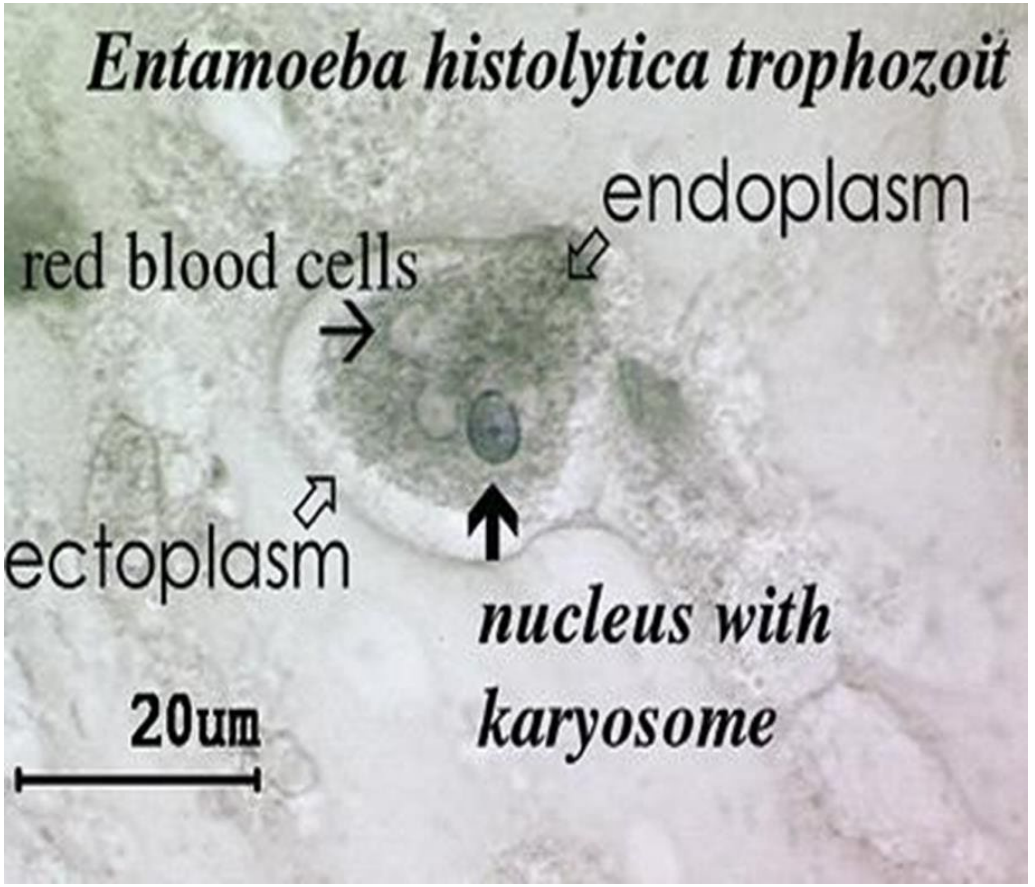




Morphology

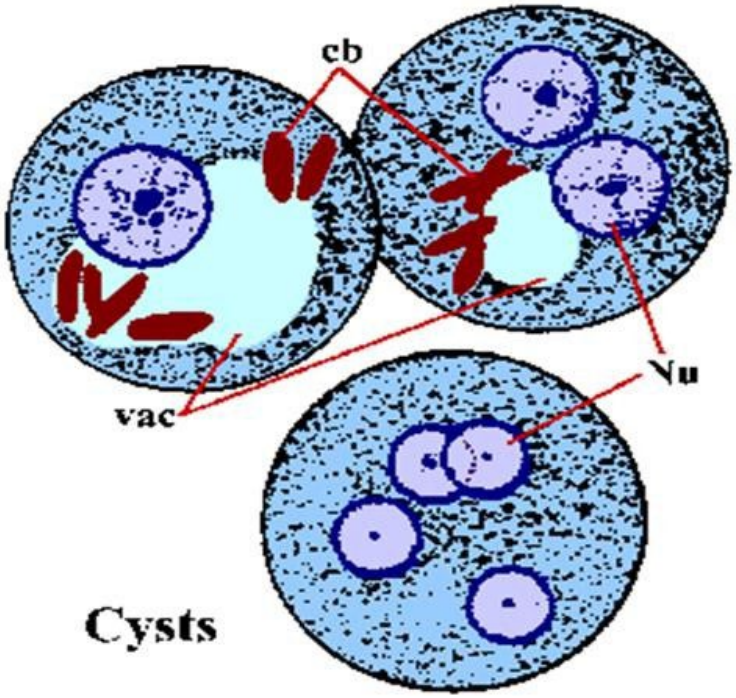


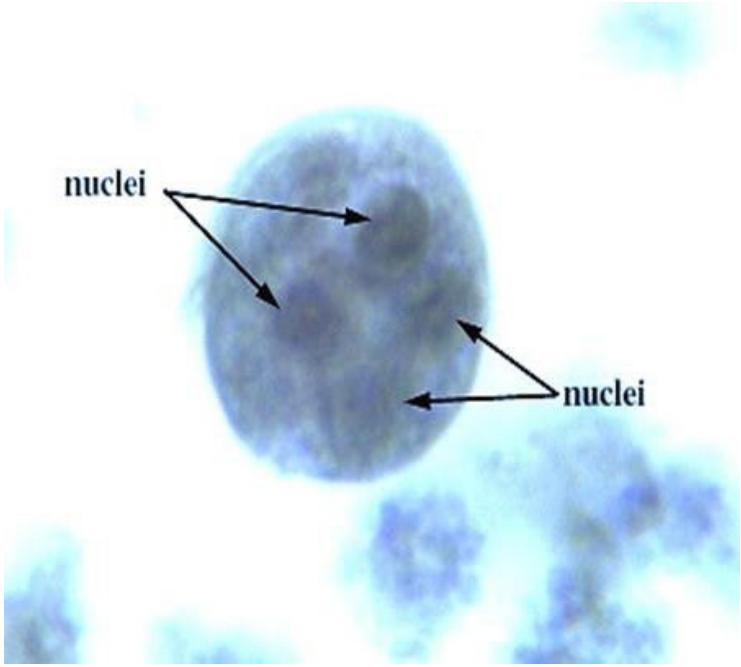

Entamoeba histolytica
trophozoite

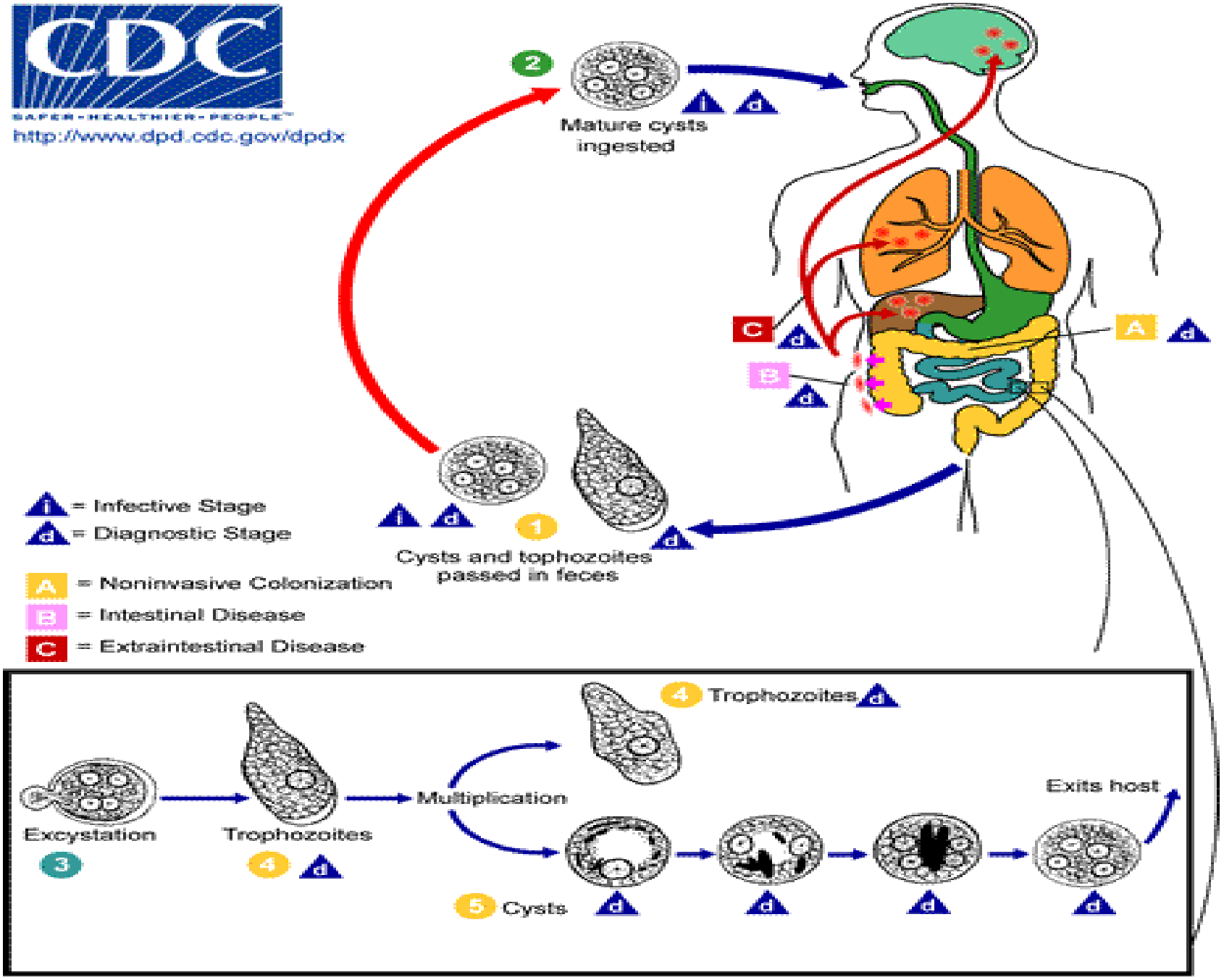

Entamoeba histolytica trophozoit
endoplasm
red blood cells
ectoplasm
nucleus with
karyosome
20um

Morphology

Cyst (Infective form)






CDC
SAFER·HEALTHIER·PEOPLE™
http://www.dpd.cdc.gov/dpdx
2
Mature cysts ingested
i
d
C
d
A
d
B
d
i
d
1
Cysts and tophozoites passed in feces
d
i = Infective Stage
d = Diagnostic Stage
A = Noninvasive Colonization
B = Intestinal Disease
C = Extraintestinal Disease
4 Trophozoites d
Excystation
3
Trophozoites
4
d
Multiplication
5 Cysts
d
d
d
d
Exits host

Life cycle

It is simple and is completed in a single host (human). Human acquires infection by ingestion of water and food contaminated with mature quadrinucleate cysts.

On ingestion, cysts excyst in the small intestine, liberating a single trophozoite with four nuclei (*excystation*).

Which they grow and multiply by simple binary fission in the large intestine. Then they colonise on mucosal surfaces and in crypts of the large intestine.

Pathogenesis and pathology

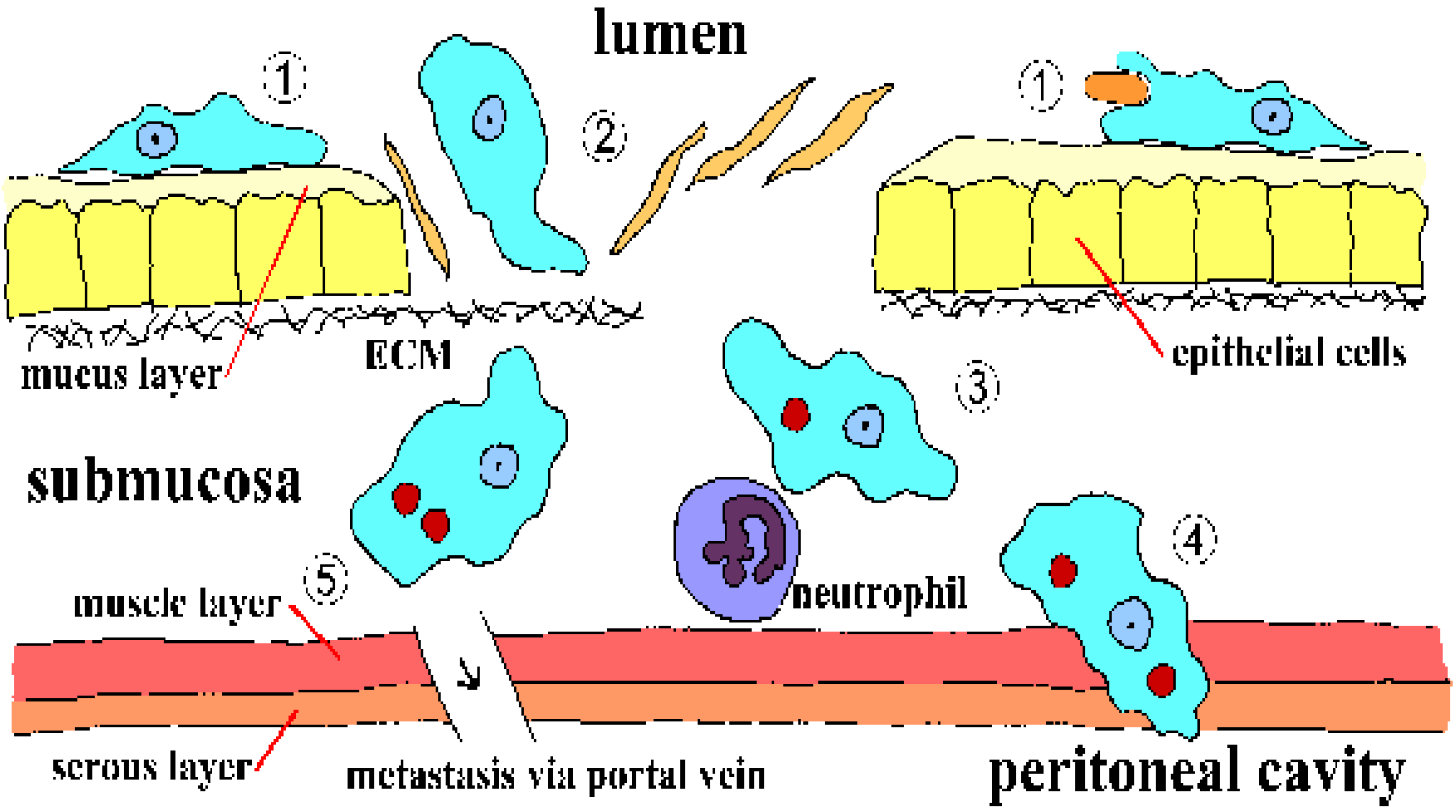
Trophozoites of *E. histolytica* can affect almost all tissues of the human body.

the intestinal mucosa and the liver are most commonly affected, followed by the lung, brain, skin, even cartilage and bone.

Virulence factors of *E. histolytica*

E. histolytica produces following virulence factors:

1. Amoebic lectin: It is a surface protein, which mediates in the adherence of amoebae to the intestinal mucosa.
2. Ionophore-like protein: This causes a leakage of ions i.e., Na+, K+, Ca+ from the target cells.
3. Hydrolytic enzymes: It consists of a number of hydrolytic enzymes including phosphatases, proteinases, glycosidases and an RNAse that cause proteolytic destruction of the tissues.
4. Toxins and haemolysins.


lumen
1
2
1
mucus layer
ECM
epithelial cells
3
submucosa
4
5
neutrophil
muscle layer
serous layer
metastasis via portal vein
peritoneal cavity

Pathology of extra-intestinal invasive amoebiasis

The extra-intestinal invasive amoebiasis includes:

- The amoebic liver abscess
- Less frequently the pulmonary amoebic abscess
- Rarely the cerebral, cardiac, cutaneous and splenic amoebic abscesses.

Amoebic liver abscess

The abscess of the liver may be single or multiple and can occur in any part of the liver. The abscess is commonly found in the right lobe.

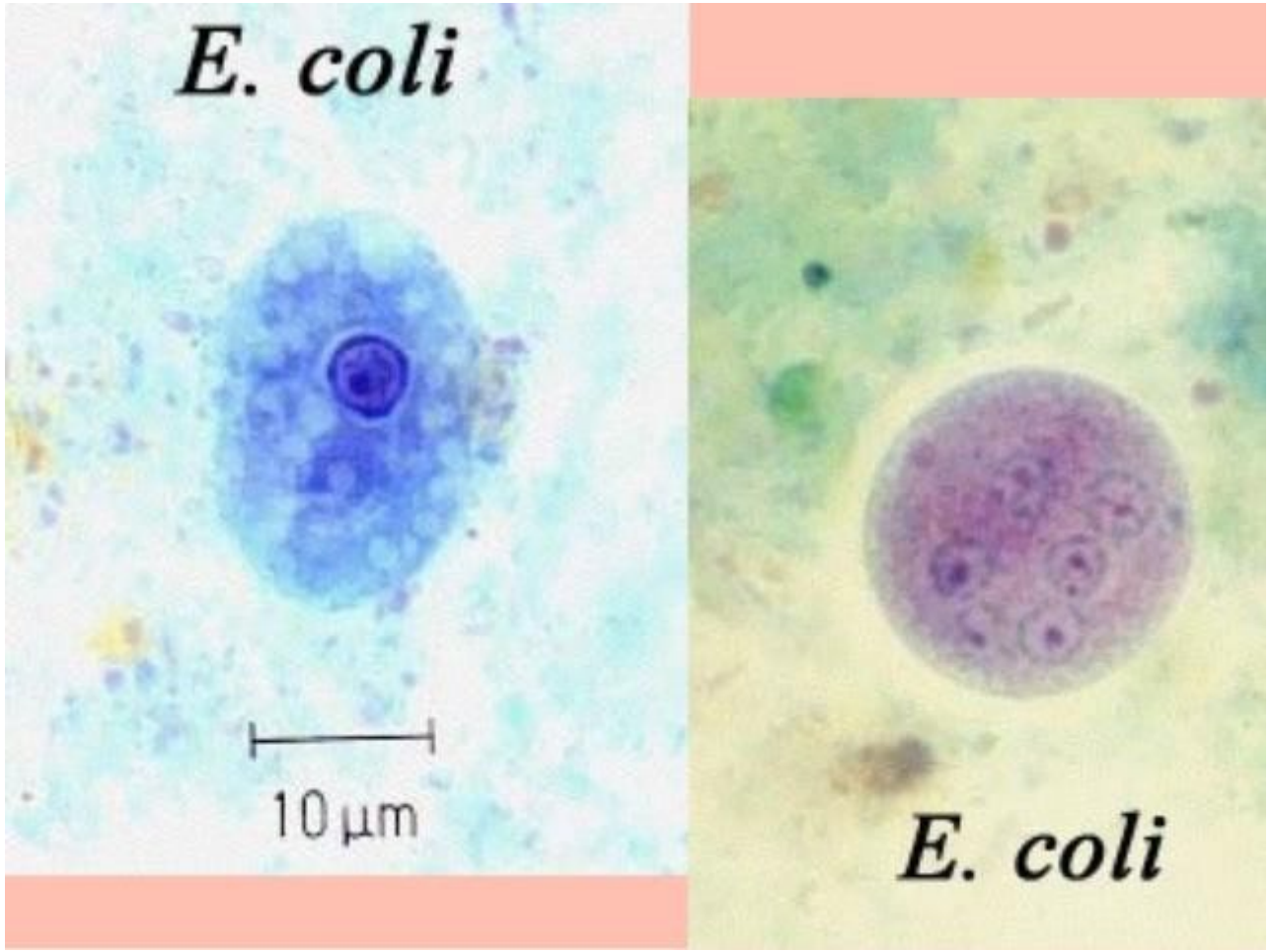
Reservoir, source and transmission of infection

Food and water contaminated by human faeces that contain cyst are the main sources of infection.

Infection is transmitted from one person to another by following methods:

1. Faecal-oral route: Amoebiasis is transmitted orally by ingestion of water, vegetables and food contaminated by faeces containing quadrinucleate cysts.
2. Vectors: Flies and cockroaches mechanically may transmit cyst from the faeces to the unprotected food and water.
3. Sexual contact

Entamoeba coli



Trophozoite

cyst

Entamoeba coli

Trophozoite of *E. coli* is the largest amoeba present in the large intestine of human.

Cytoplasm is granular and contains bacteria and cellular debris. It never contains any red blood cells (RBCs), unlike *E. histolytic*, it never lyses hosts tissue. It shows sluggish movement by pseudopodium.

Pseudopodium is blunt and granular, not finger and hyaline like pseudopodia of *E. histolytica*.

Methods of examination:

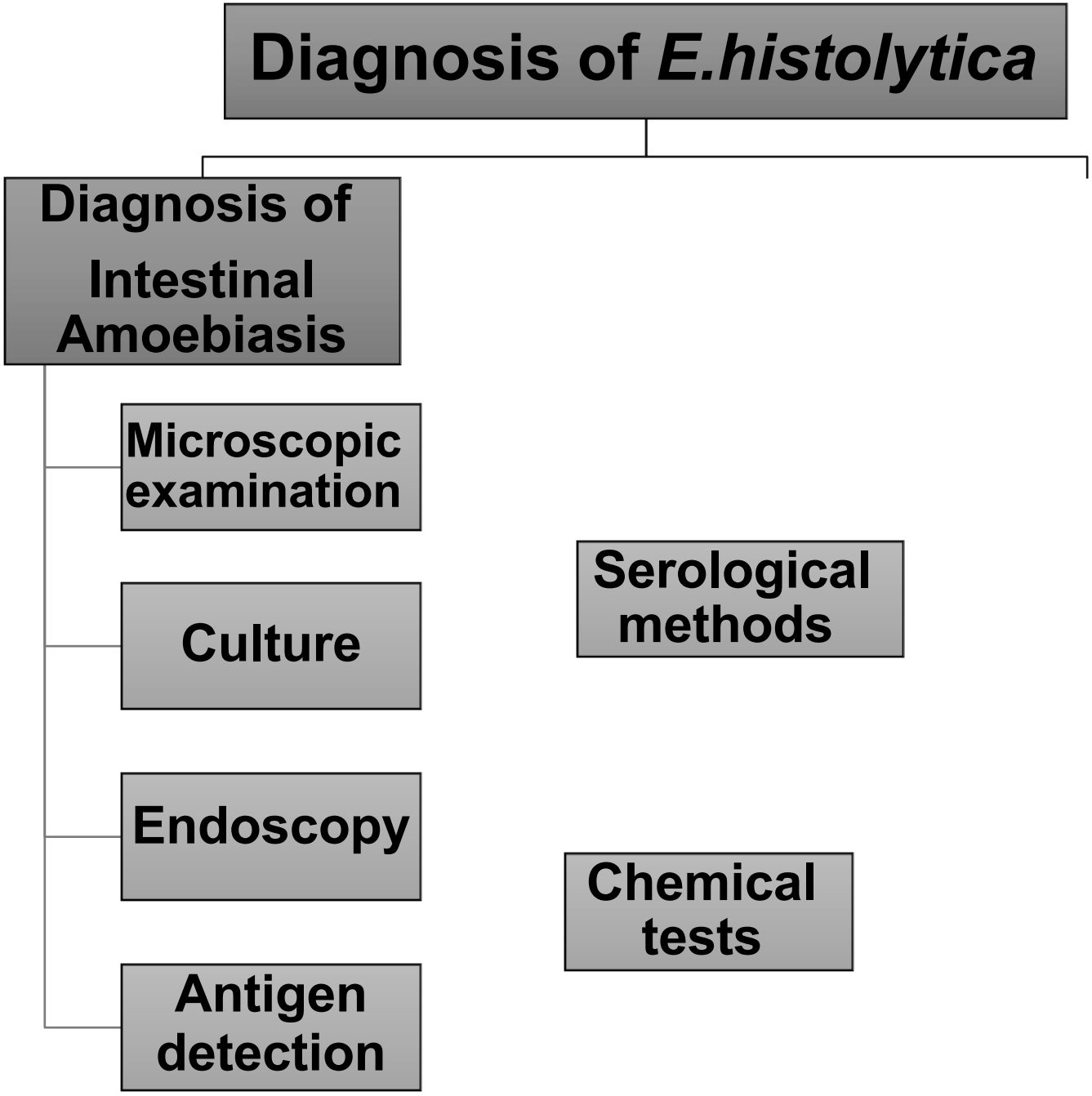
1. Stool examination: this includes

A. Stool microscopy

B. Stool antigen detection

C. Stool culture

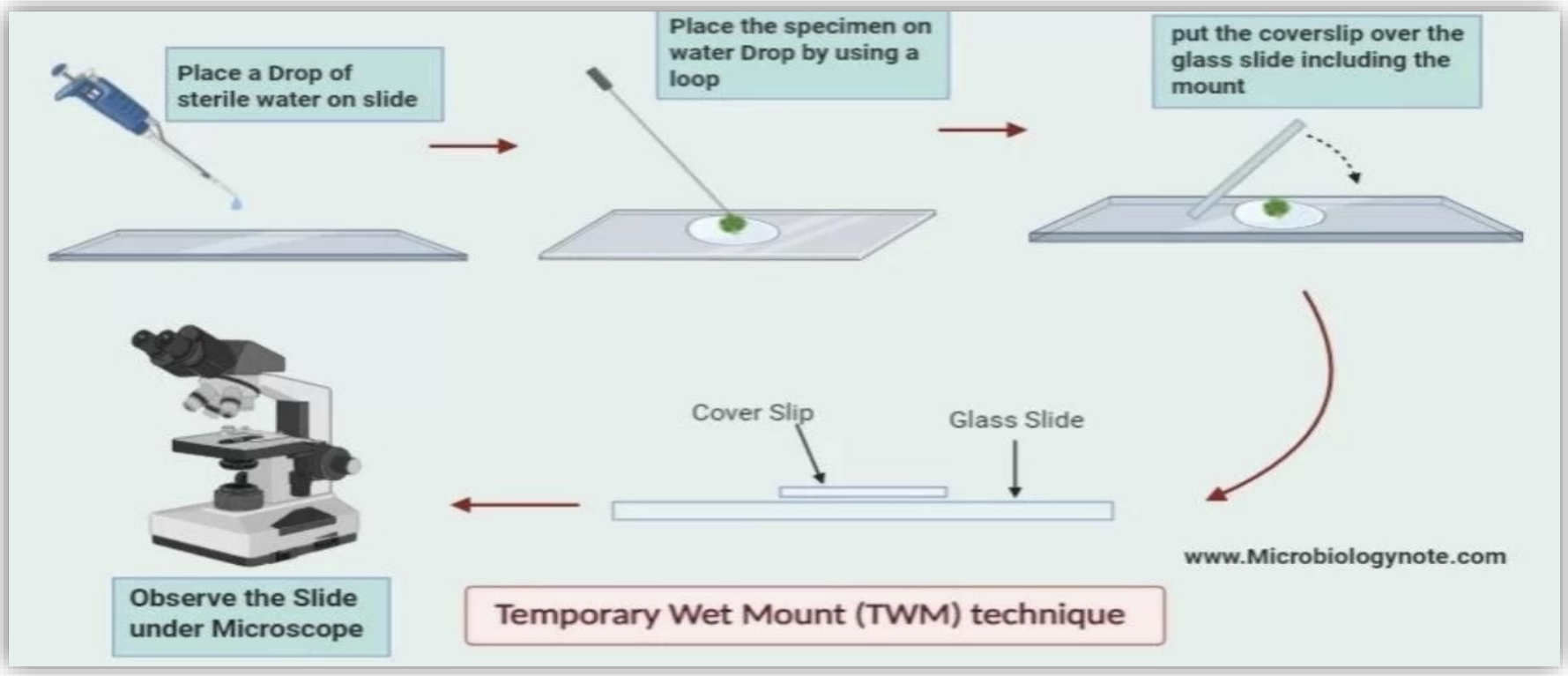
The diagnosis is based on demonstration of the amoebae (both trophozoites and cysts) in stool specimens.


Diagnosis of *E.histolytica*
Diagnosis of Intestinal Amoebiasis
Microscopic examination
Culture
Endoscopy
Antigen detection
Serological methods
Chemical tests

Entamoeba histolytica

A. Wet mount preparation:

(saline wet mount preparation – Logul's iodine wet mount preparation - Buffered methylene blue)




THANK YOU