



جامعة البصرة كلية التربية \القرنة

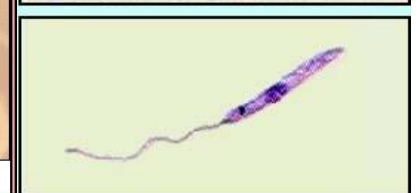
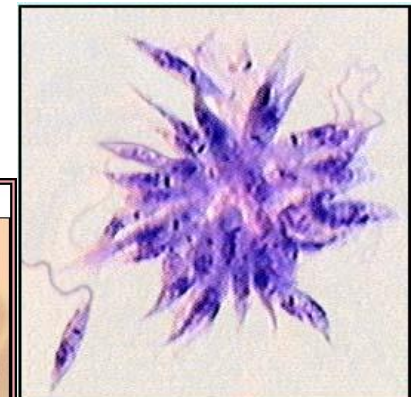
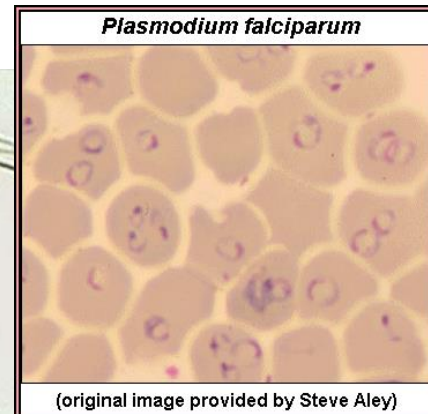
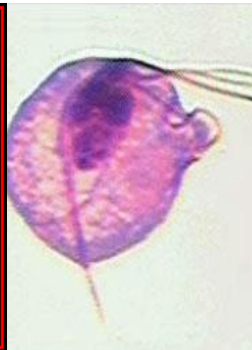
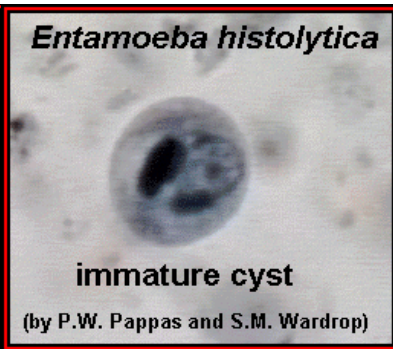
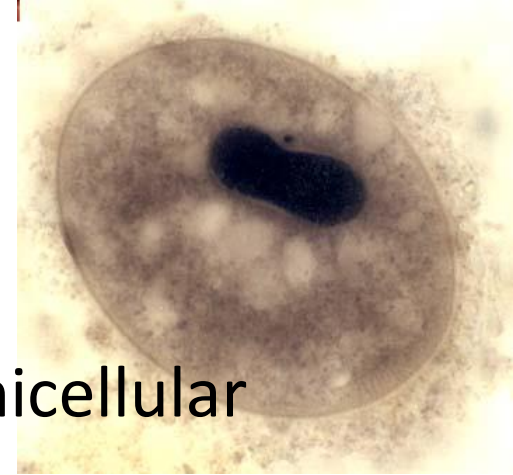
قسم علوم الحياة

Protozoa

أ.د. علي ضرب شعبان

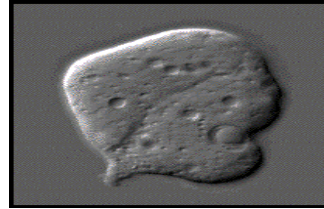
General fetures

- One-cell animal – monocellular or unicellular organisms with full vital functions
- Species – total named species:65,000; parasitic: around 10,000
- Locomation
- Feeding
- Secretion

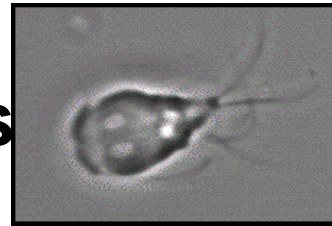


Classification of protozoa

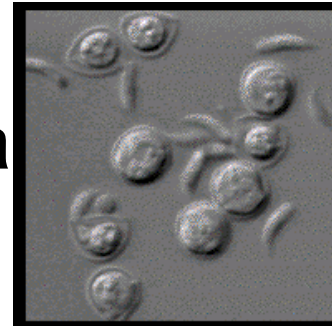
Amoebae



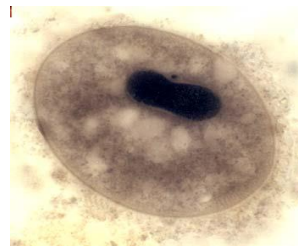
Flagellates



Sporozoa



Ciliates





Life cycle patterns

One-host form

1. One stage form – Trophozoite
2. Two stage form – Trophozoite & Cyst

Two-host form

1. Mammals  mammals
2. Mammals  insect vectors

Mode of Reproduction

- Asexual Reproduction
 - Binary fission – result in 2 daughter cells
 - Schizogony – **multiple fission** result in multiple cells
 - Budding
 - Exogenous budding - by external budding result in multi-cells
 - Endodyogony - by internal budding result in 2 cells
- Sexual Reproduction
 - Conjugation – exchange of nuclear material of 2
 - Gametogony – sexually differentiated cells unite -- zygote

Pathogenesis

- Host Resistance
 - Innate immunity
 - Acquired immunity
- Parasite Invasion
 - Toxin
 - Mechanically damage
 - Immune impair
 - Immune inhibition
 - hypersensitivity



Opportunistic & Accidental
(protozoa) infections

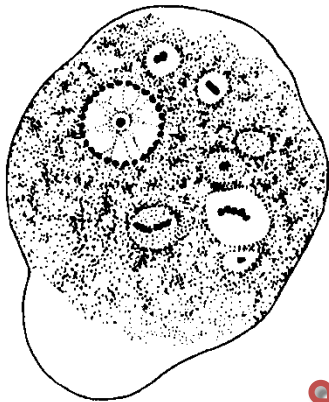
Opportunistic parasites

- **Opportunistic infection**
 - **An infection by a microorganism that normally does not cause disease but becomes pathogenic when the body's immune system is impaired and unable to fight off infection**

Amoebic Infections

Atrial amoeba

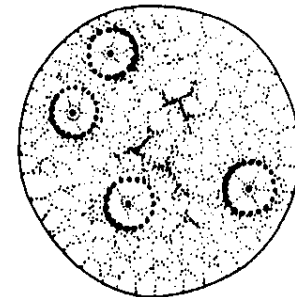
Intestinal amoebae



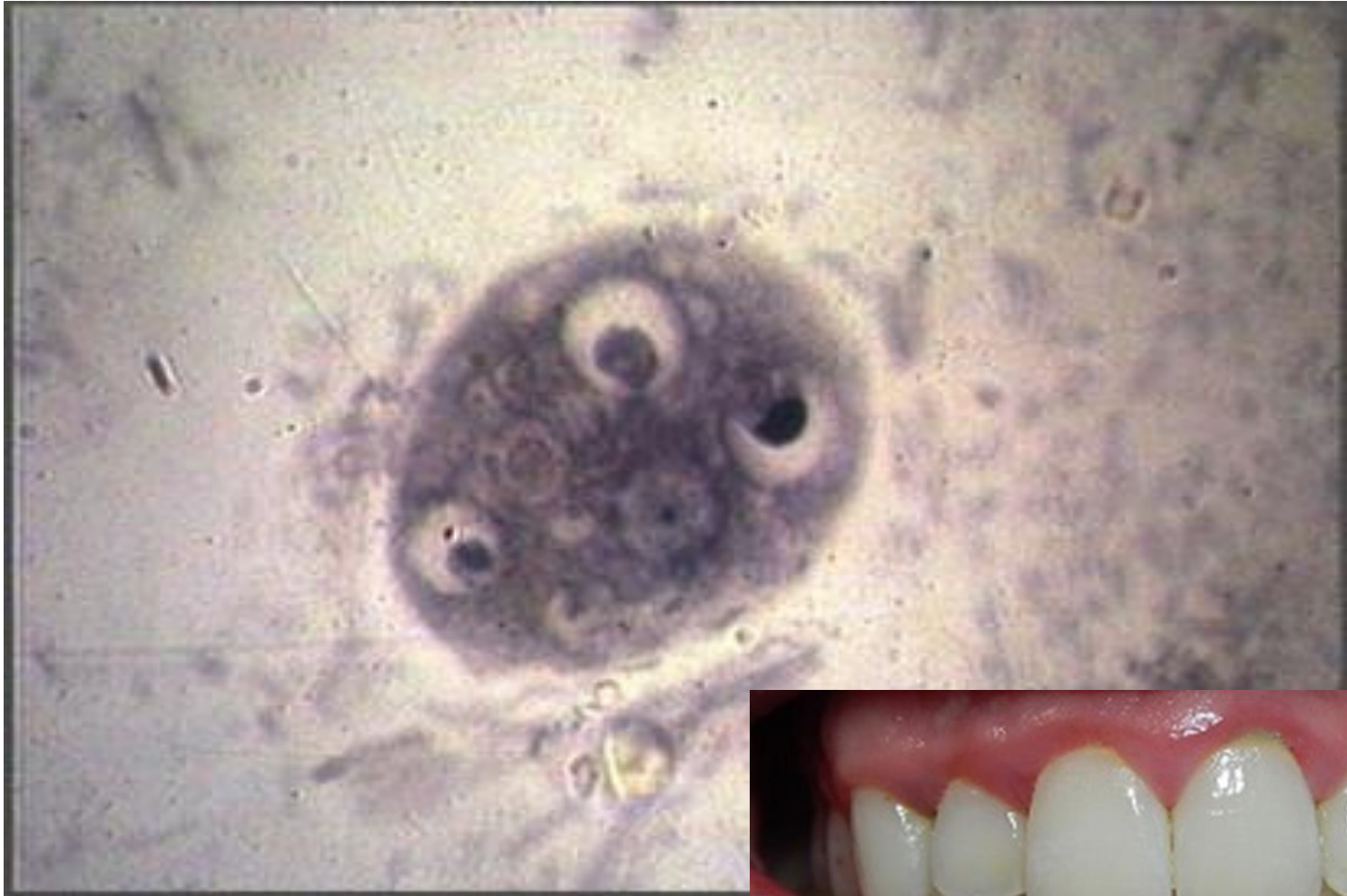
⌘ *Entamoeba histolytica*

⌘ *Acanthamoeba*

⌘ *Naegleria*

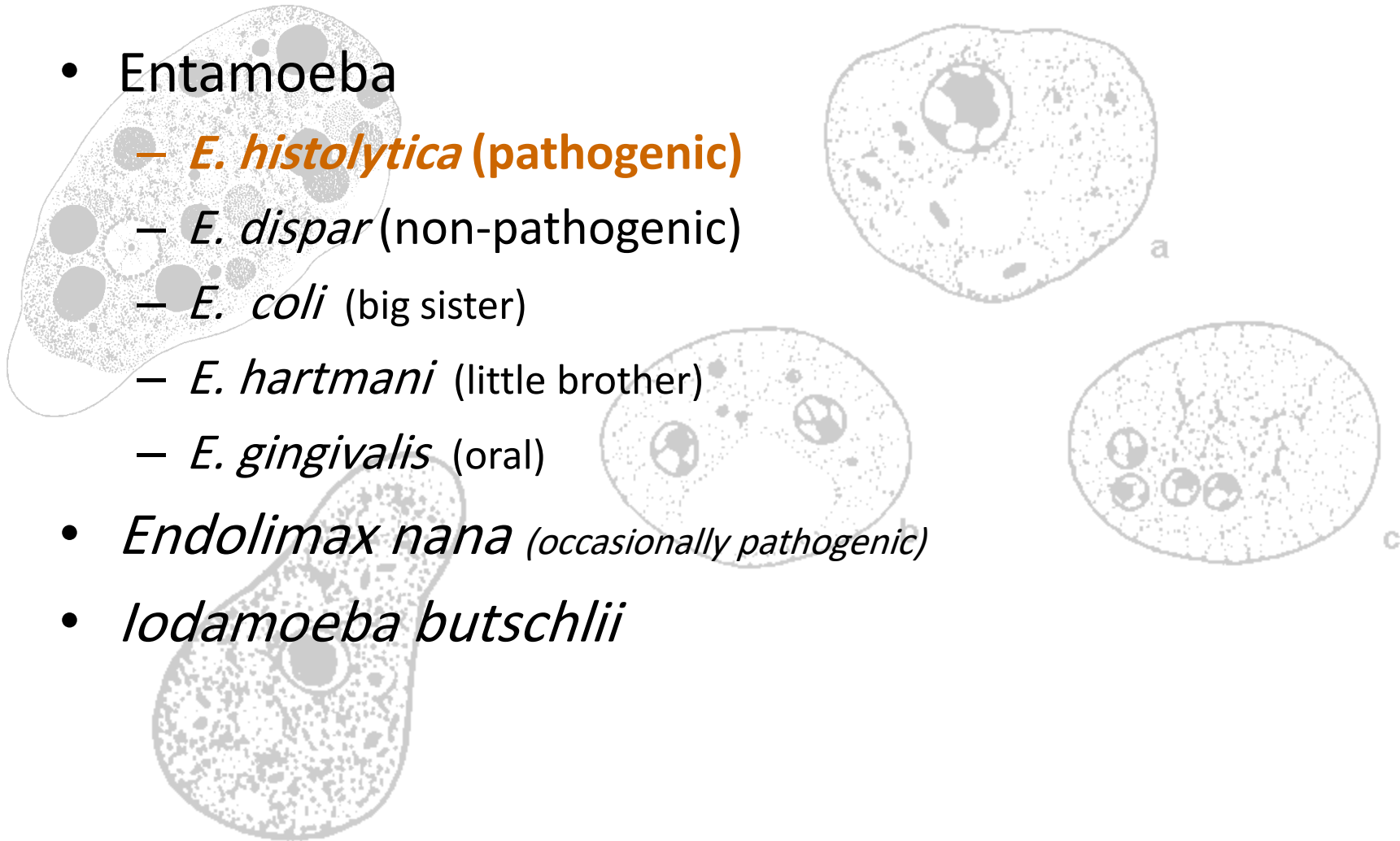


Entamoeba gingivalis



Amoeba in alimentary tract

- Entamoeba
 - *E. histolytica* (pathogenic)
 - *E. dispar* (non-pathogenic)
 - *E. coli* (big sister)
 - *E. hartmani* (little brother)
 - *E. gingivalis* (oral)
- *Endolimax nana* (occasionally pathogenic)
- *Iodamoeba butschlii*



Morphology

Entamoeba histolytica

Cysts

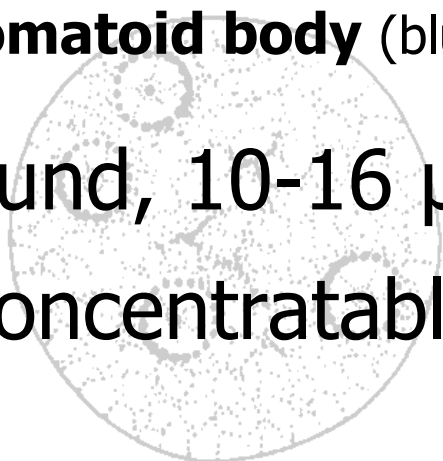
Thick wall

1-4 ring-like nuclei

Chromatoid body (blunt)

Round, 10-16 μm

Concentratable



Trophozoites

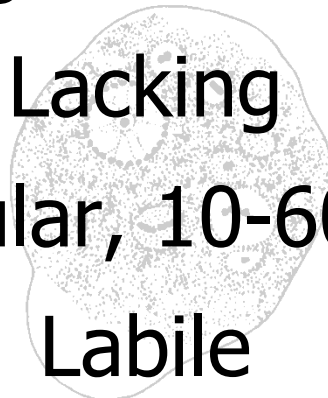
Plasmalemma (thin)

1 ring-like nucleus

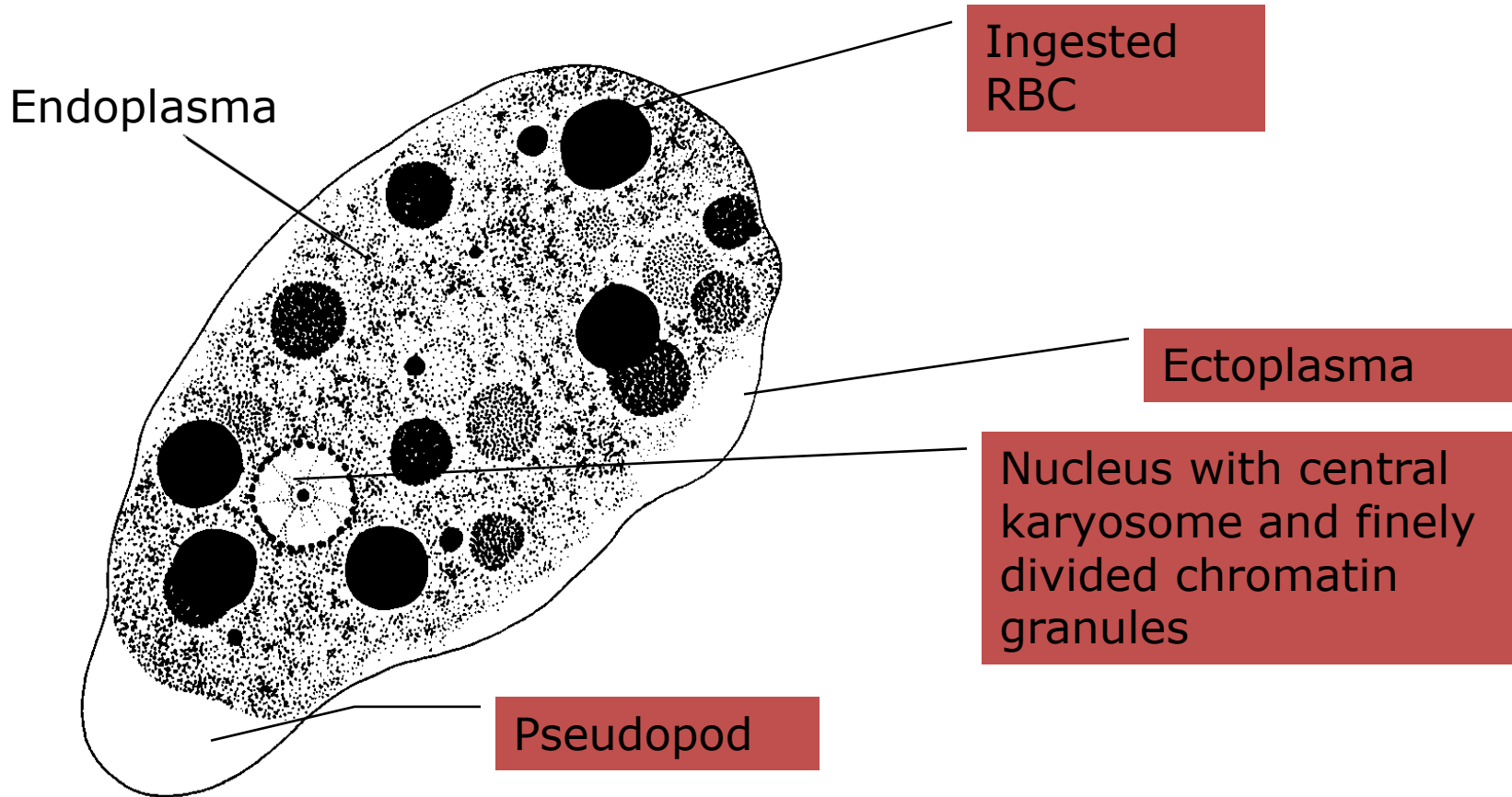
Lacking

Irregular, 10-60 μm

Labile

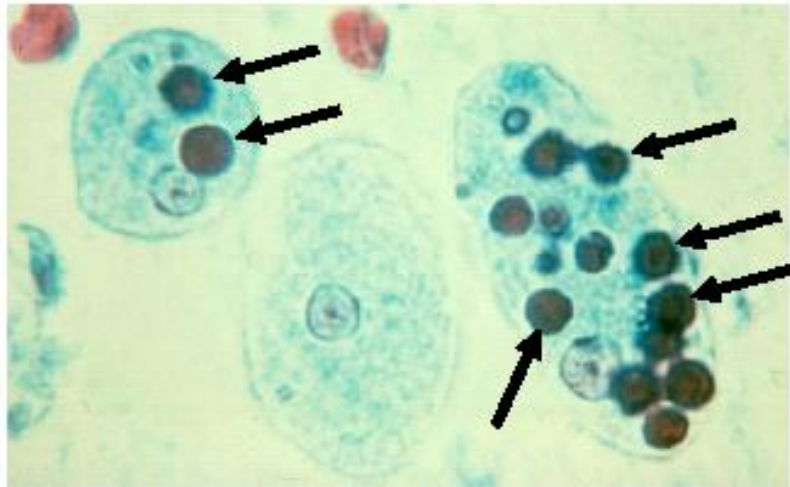


Morphology

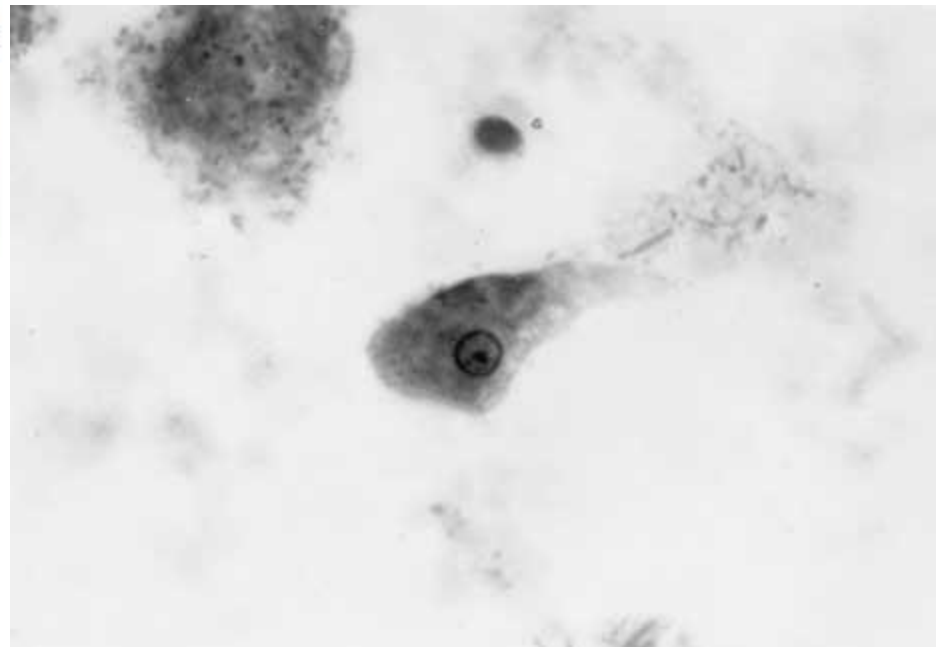


E. histolytica trophozoite

Morphology



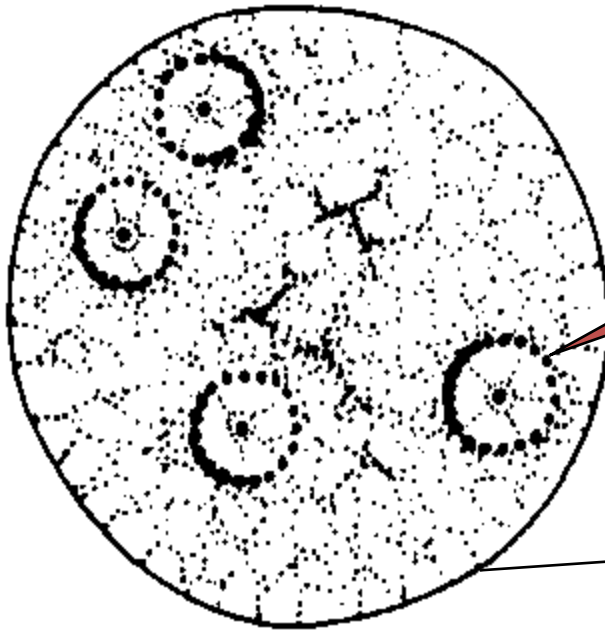
Three *Entamoeba histolytica* trophozoites, two with ingested RBCs (arrows).



Trophozoites

Single nucleus with a central,
dot-like karyosome

Morphology

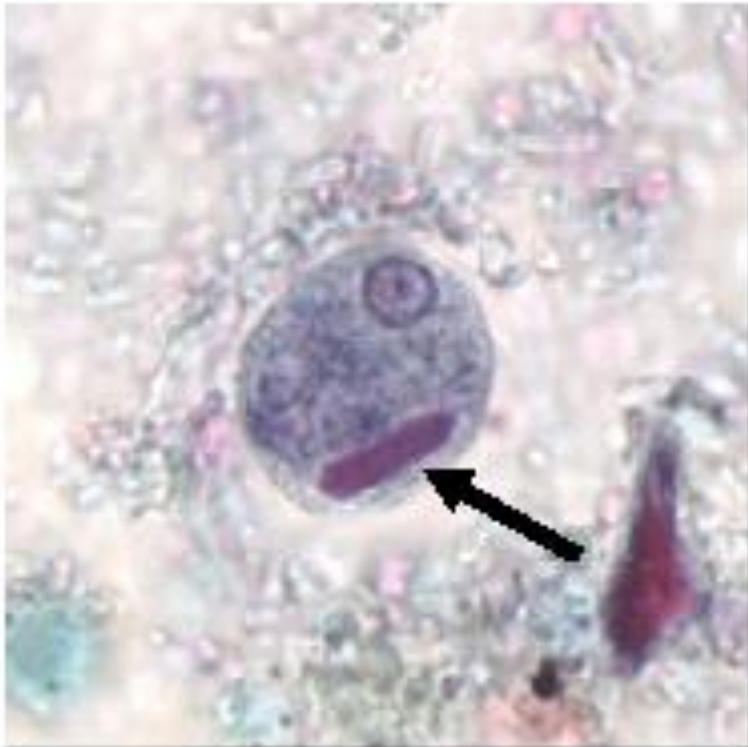


1-4 ring-like nuclei
with finely divided
peripheral chromatin

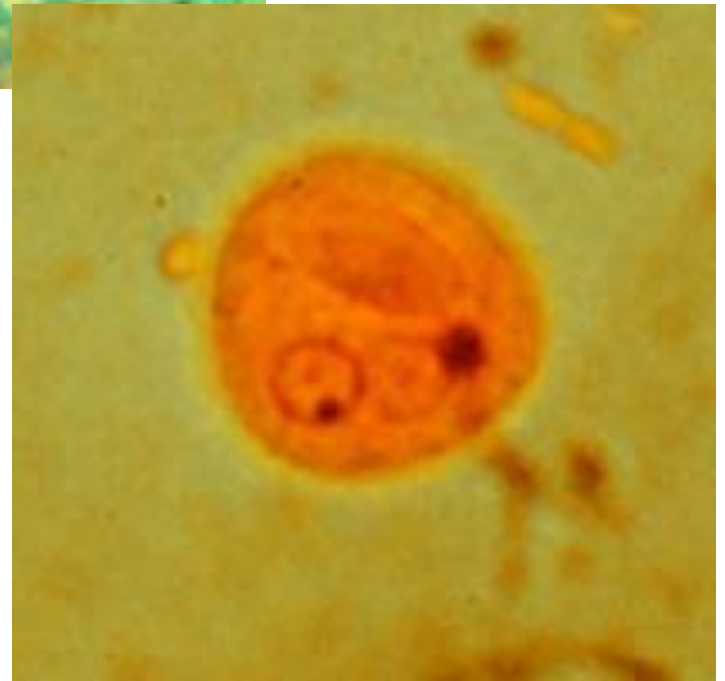
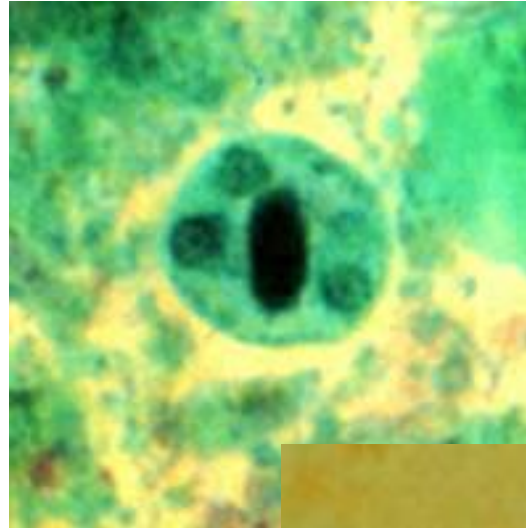
Cyst wall and
round shape

Mature *E. histolytica* **Cyst**

Morphology



Entamoeba histolytica/dispar cyst showing a chromatoid body with bluntly rounded ends (arrow)



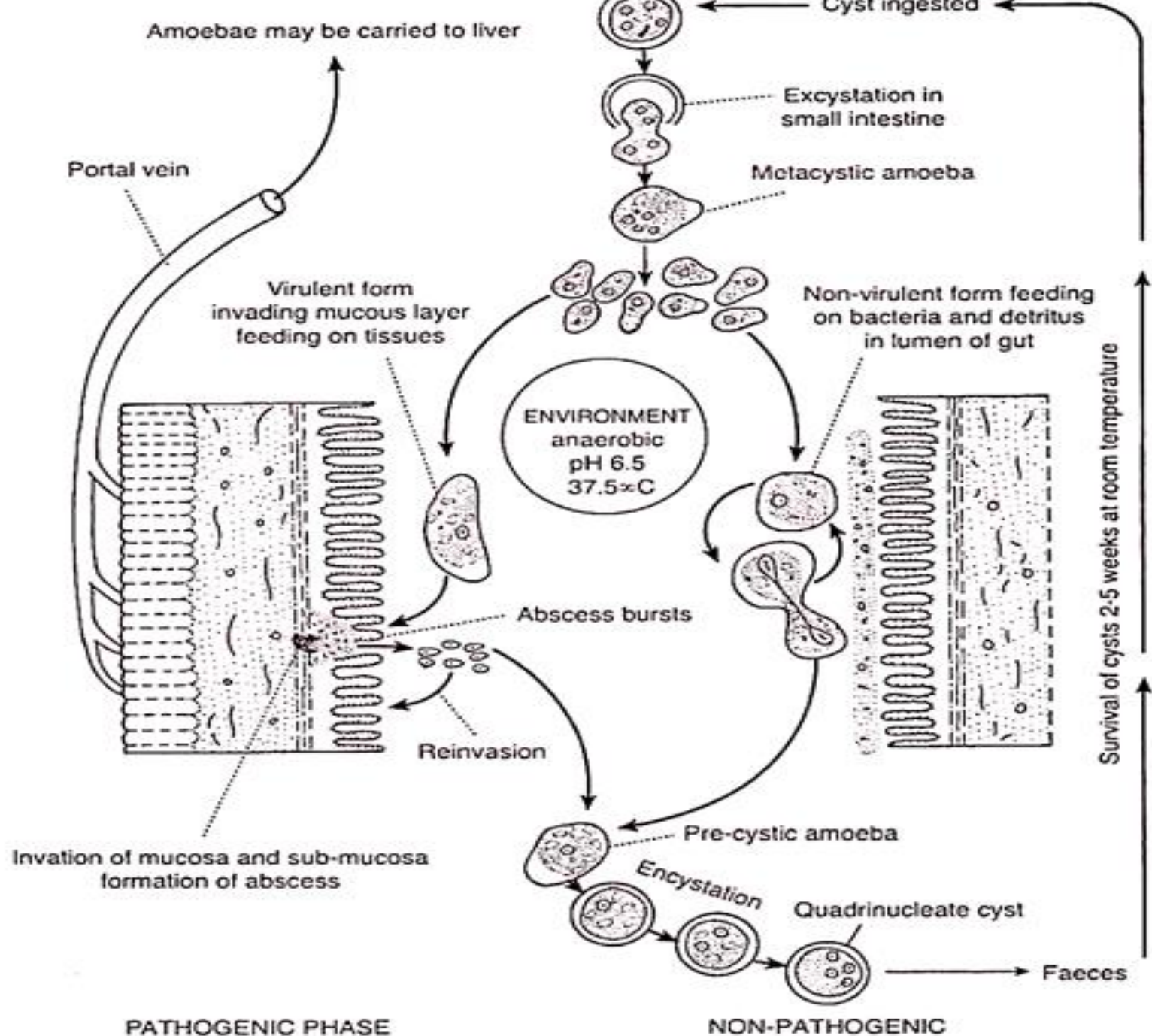
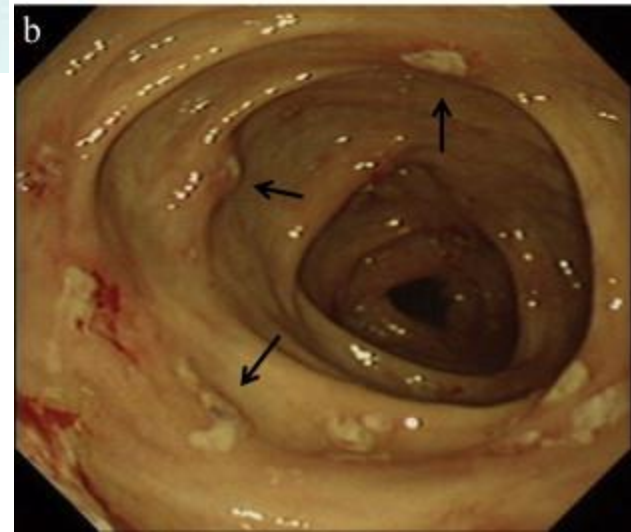
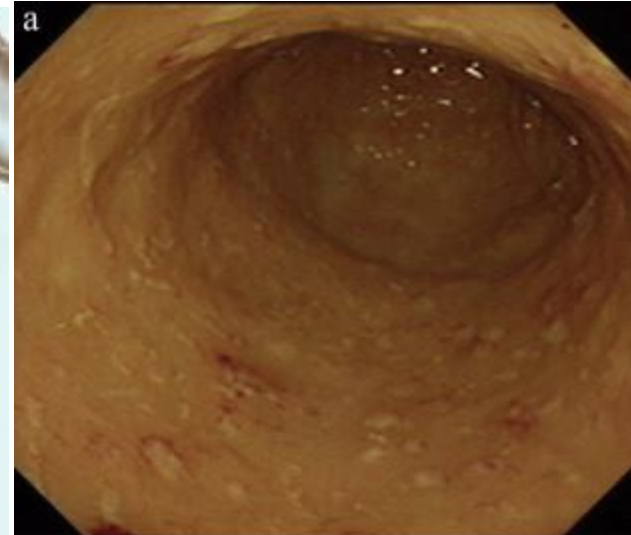
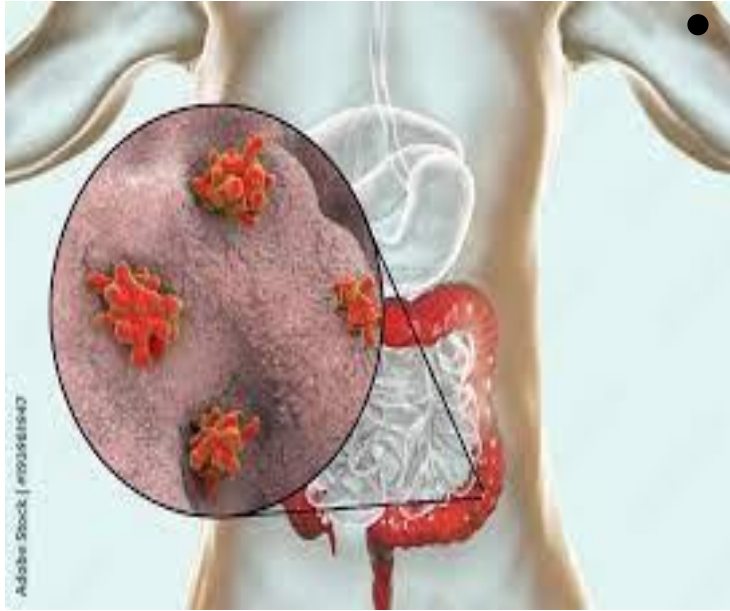


Fig. 6.2: Life cycle of *E. histolytica* in man

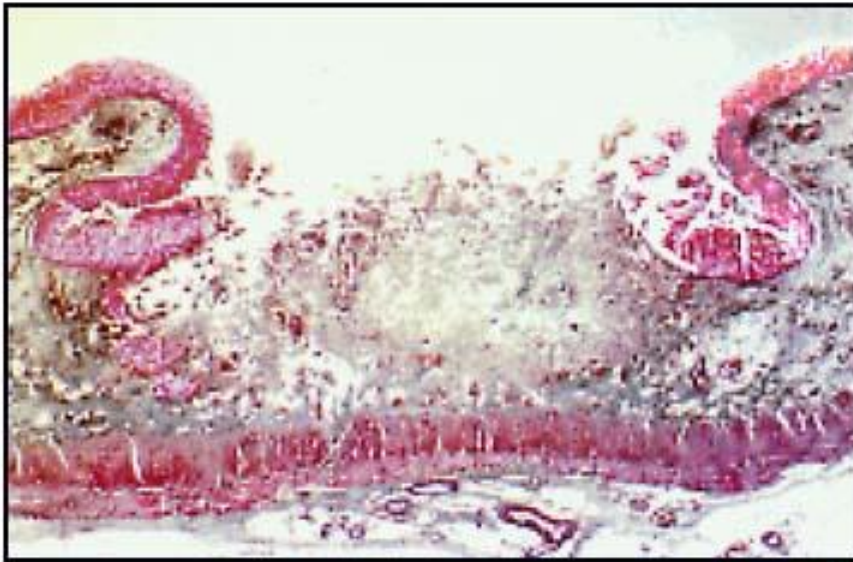
التأثير المرضي والاعراض

Pathology and symptomaiology



Clinical manifestation

- Pinpoint lesion on mucous membrane
- Flask-shaped crateriform ulcers

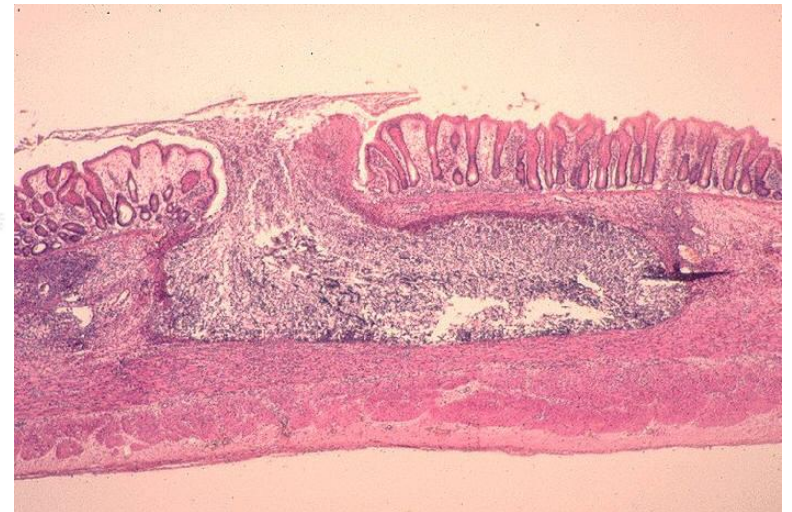


放大

阿米巴痢疾病人肠病理切片

Characteristic flask-shaped ulcer in the large intestine

肠溃疡呈烧瓶状, 溃疡区可见坏死组织, 嗜酸性粒细胞及大量滋养体。



Pathological changes in large intestine



Ulcers caused by invasion of *E. histolytica* into the liver.

Clinical manifestation



阿米巴肝脓肿破溃部位的皮肤可出现炎症反应，皮肤红肿，甚至破溃。

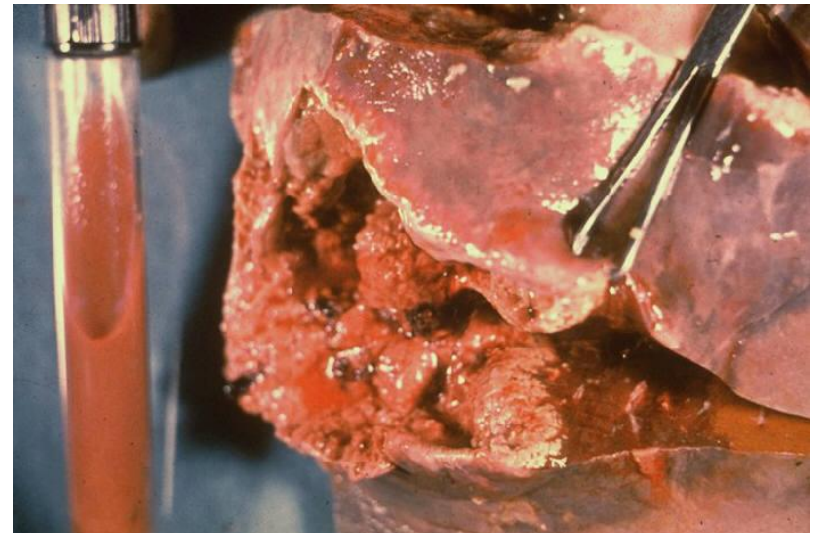
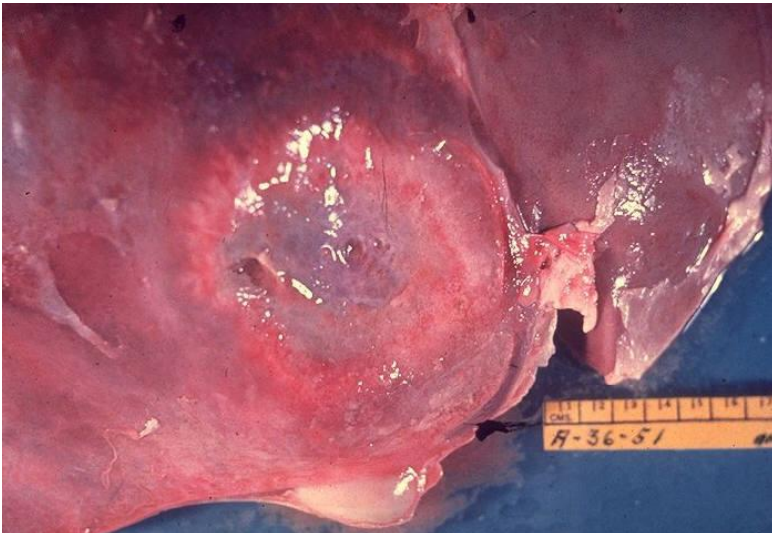
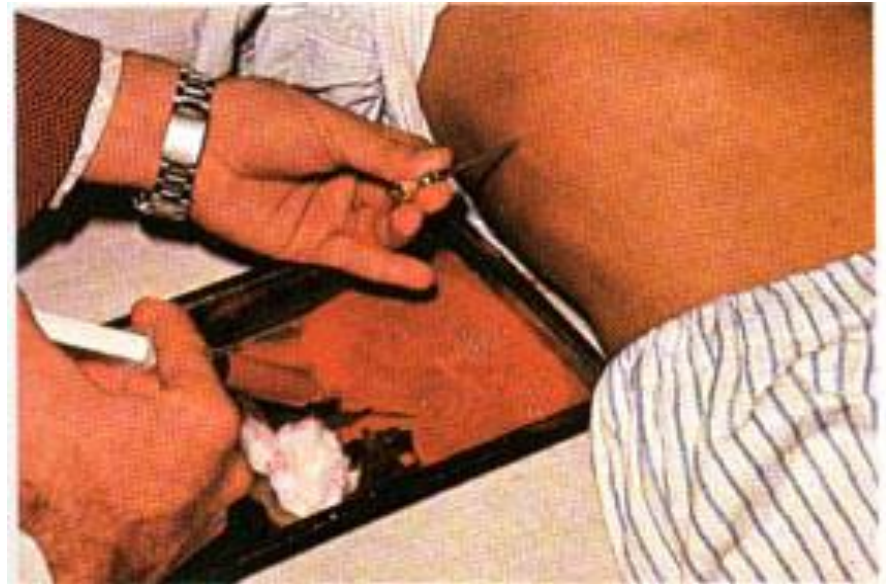
阿米巴肝脓肿病人照片

An Amoebic Liver Abscess Being Aspirated.

Note the reddish brown color of the pus ('anchovy-sauce'). This color is due to the breakdown of liver cells.

•

Gross pathology of amoebic abscess of liver.
Tube of "chocolate" pus from abscess.

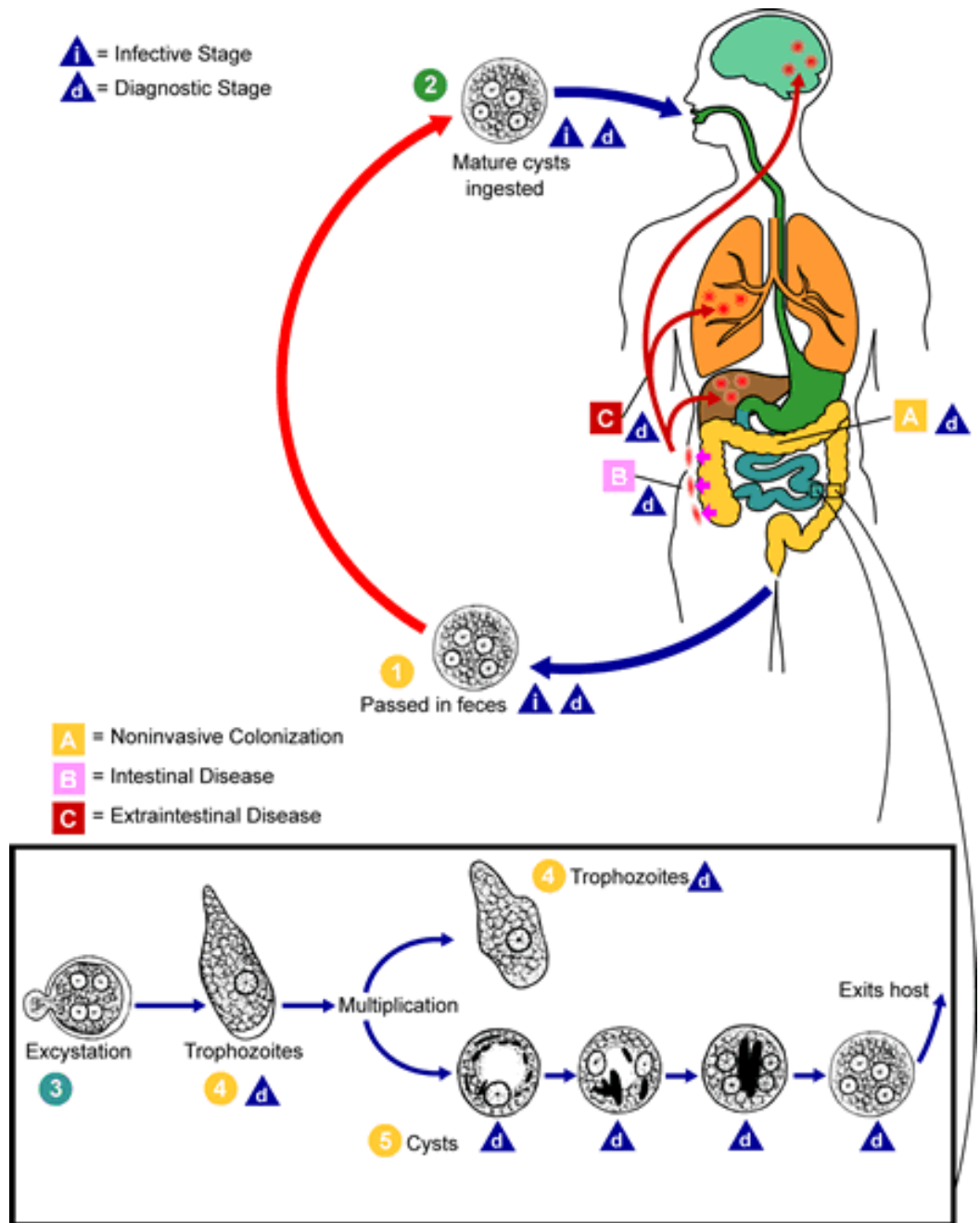


E. Coli cysts

Morphology

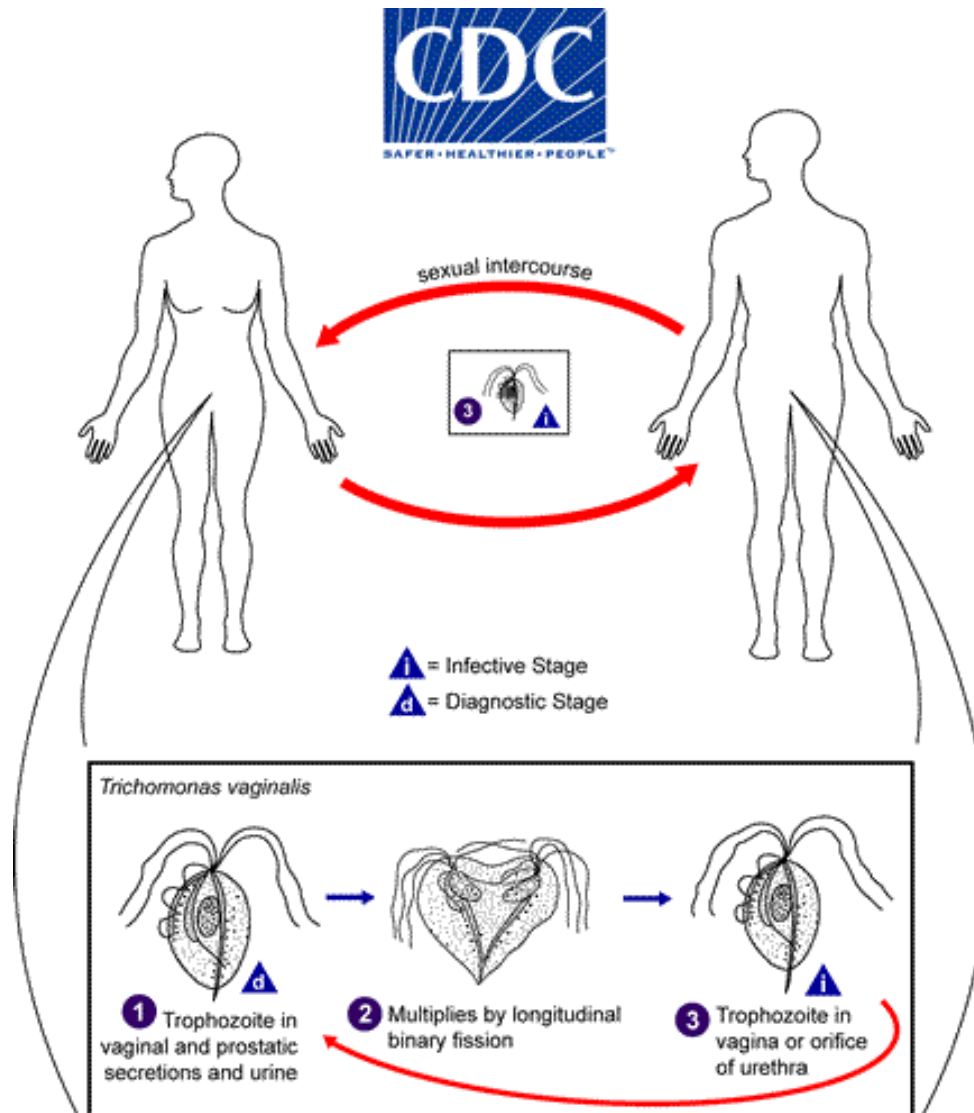


Life cycle

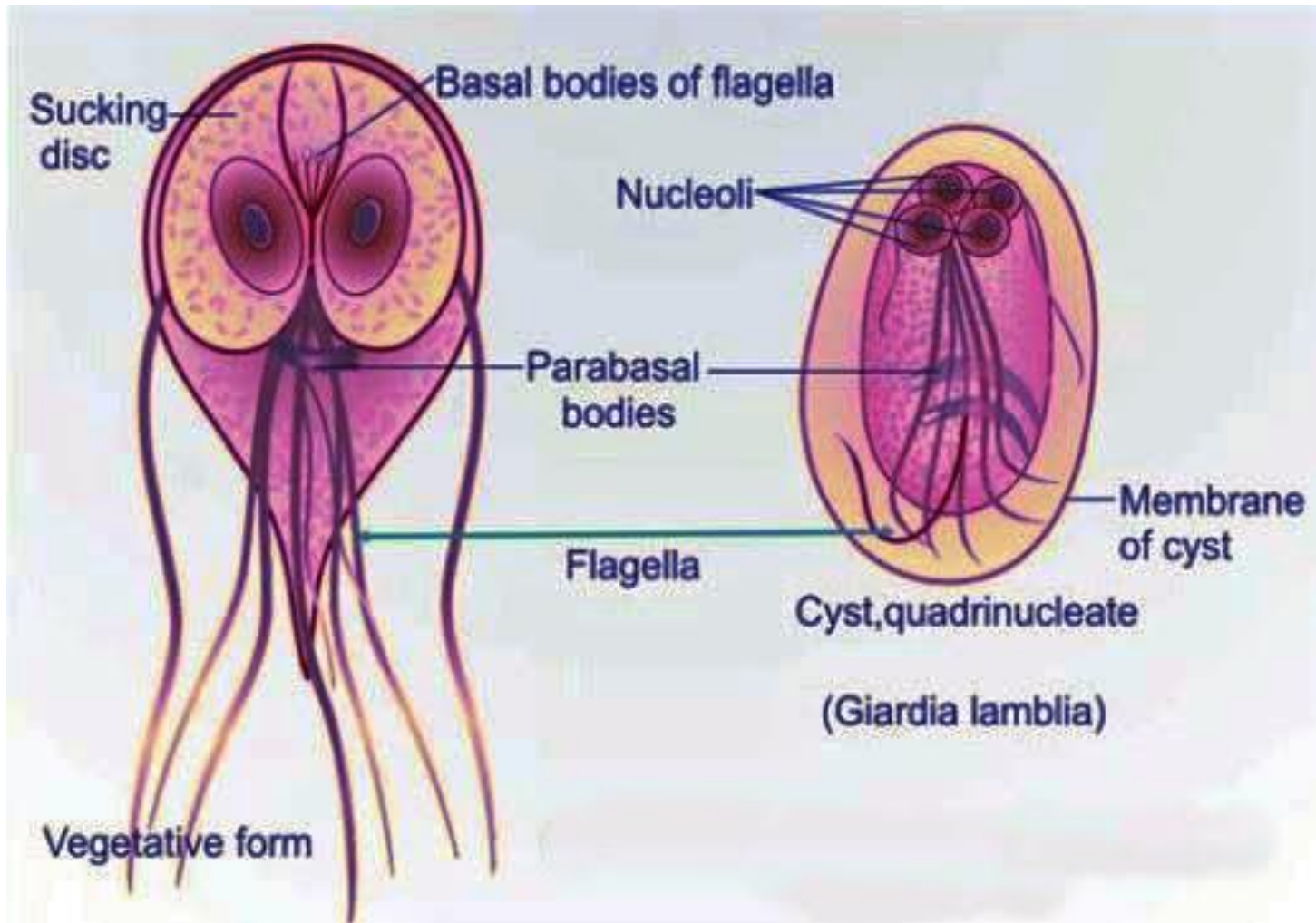


Parasitic flagelates

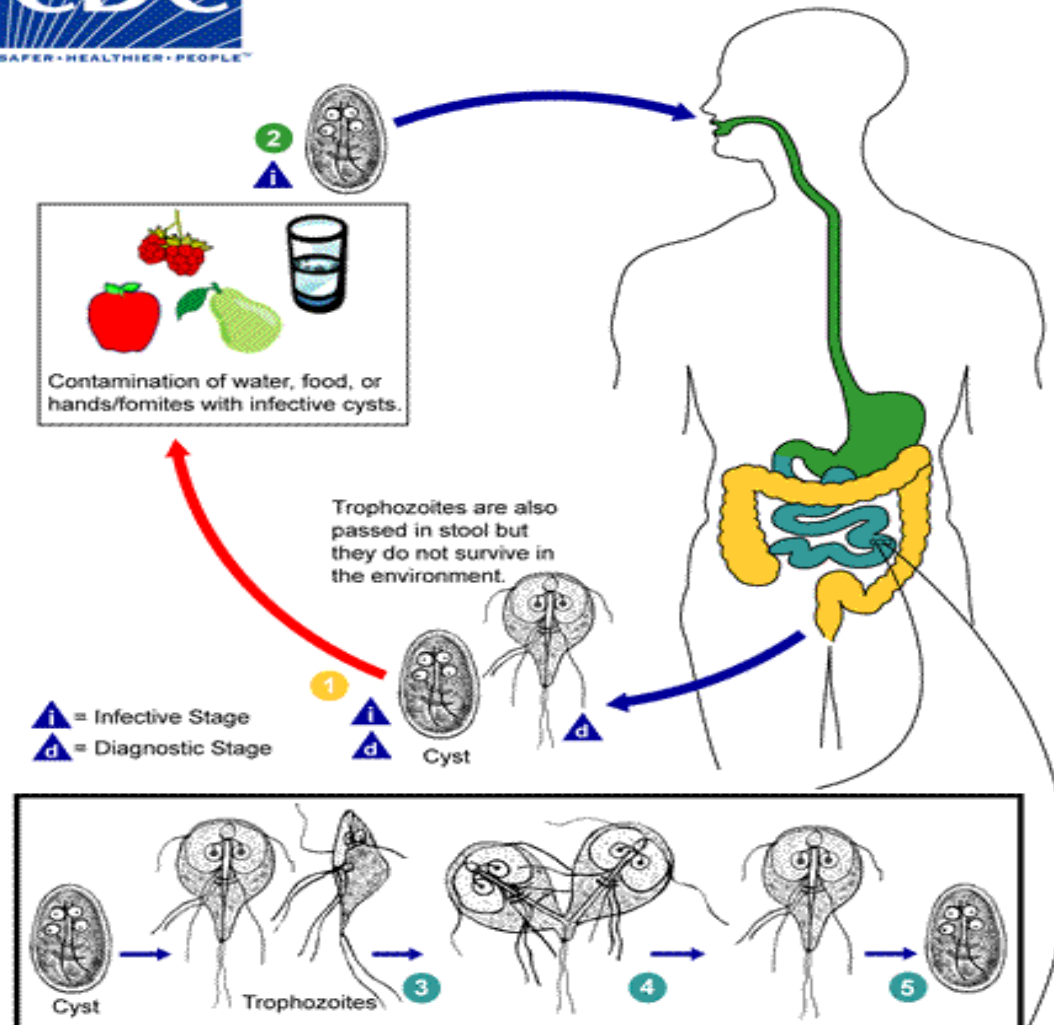
Trichomonas vaginalis

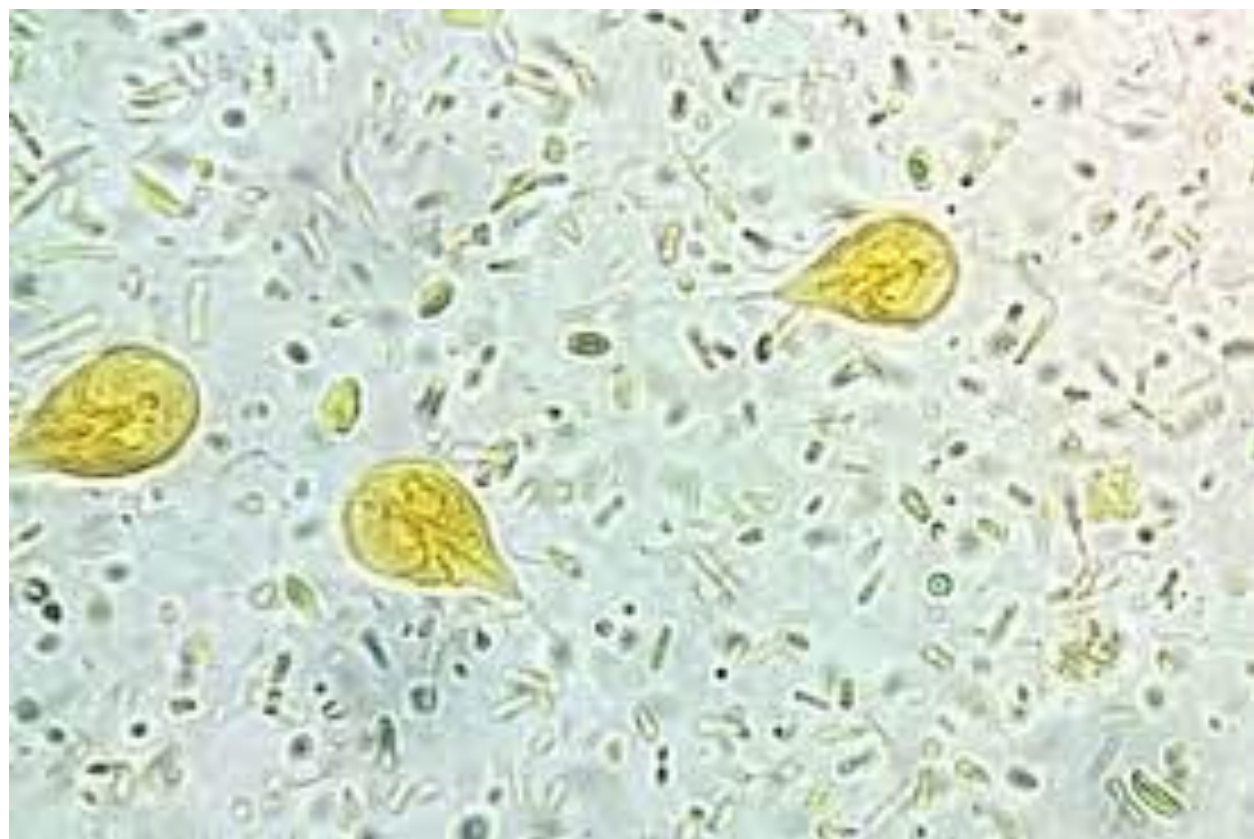


Giardia lamblia

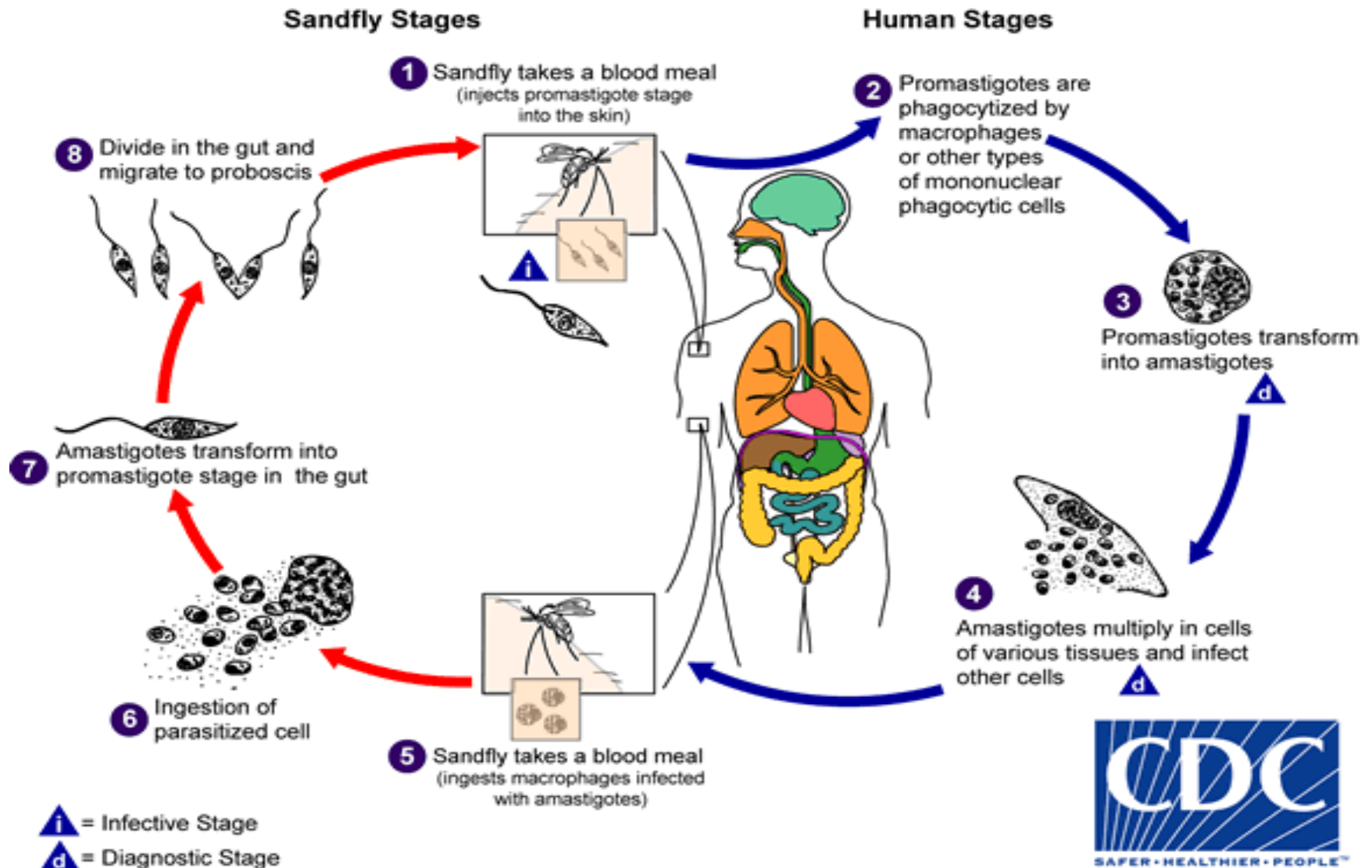


Lyfie cycle





Genus *Leishmania*



Leishmania donovani



Leishmania tropica



Leishmania braziliensis

Mucocutaneous Leishmaniasis



nasal mucosa and septum are involved

Leishmania braziliensis

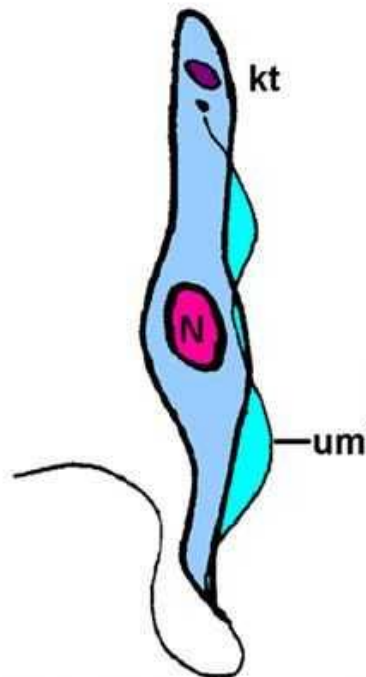
Trypanosoma

- Amastigota
- Promastigota(leptomonad)
- Choanomastigot(Crithidial)
- Trypmastigota (Trypanosomal)

Trypanosomatidae

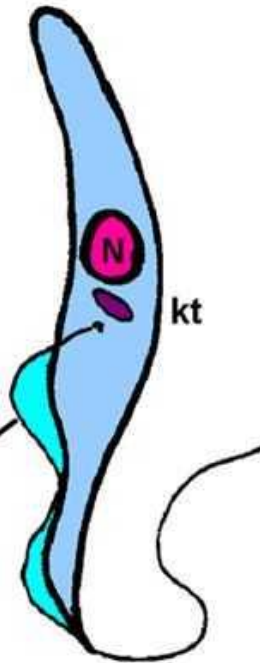
Stages:

trypomastigote



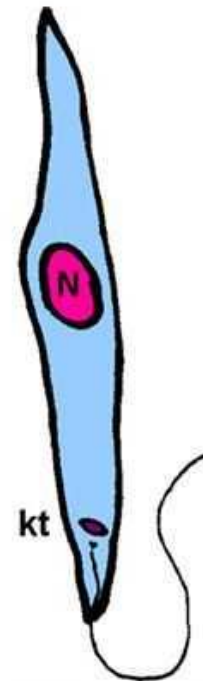
Trypomastigote:
blood stream form;
infective form
replicative

epimastigote



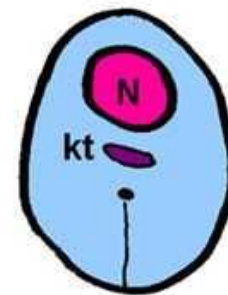
Epimastigote:
replicative stage
in insect

promastigote



Promastigote:
infective stage of
Leishmania spp.

amastigote



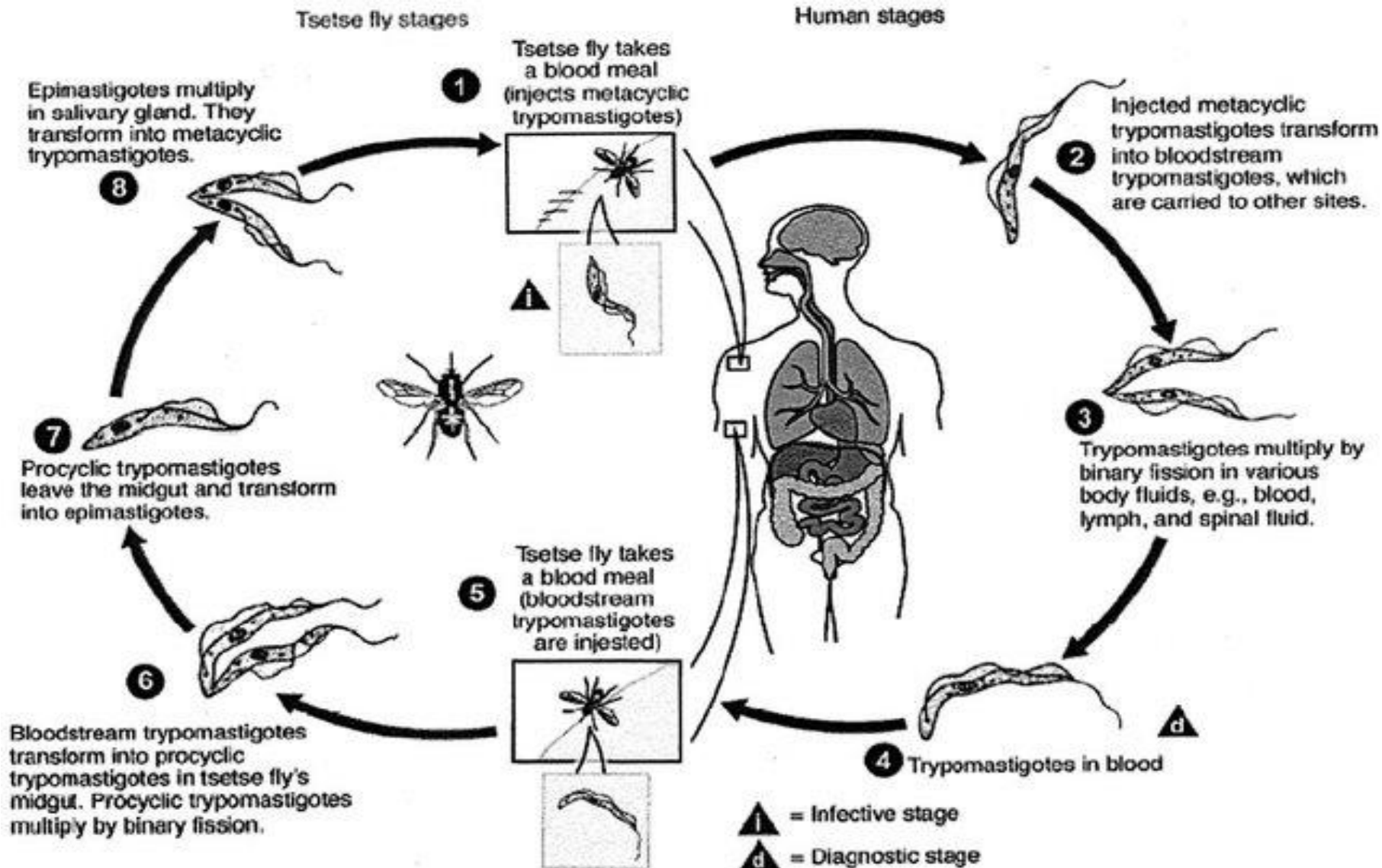
non-motile, intracellular

↓ direction of movement

Amastigote:
non-motile;
intracellular,

stage in vertebrate muhadharaty.com

Trypanosoma gambiense



العلاج

- Suramin sodium
- Berenil
- Tryparsmide

Trypanosoma rhodesiense



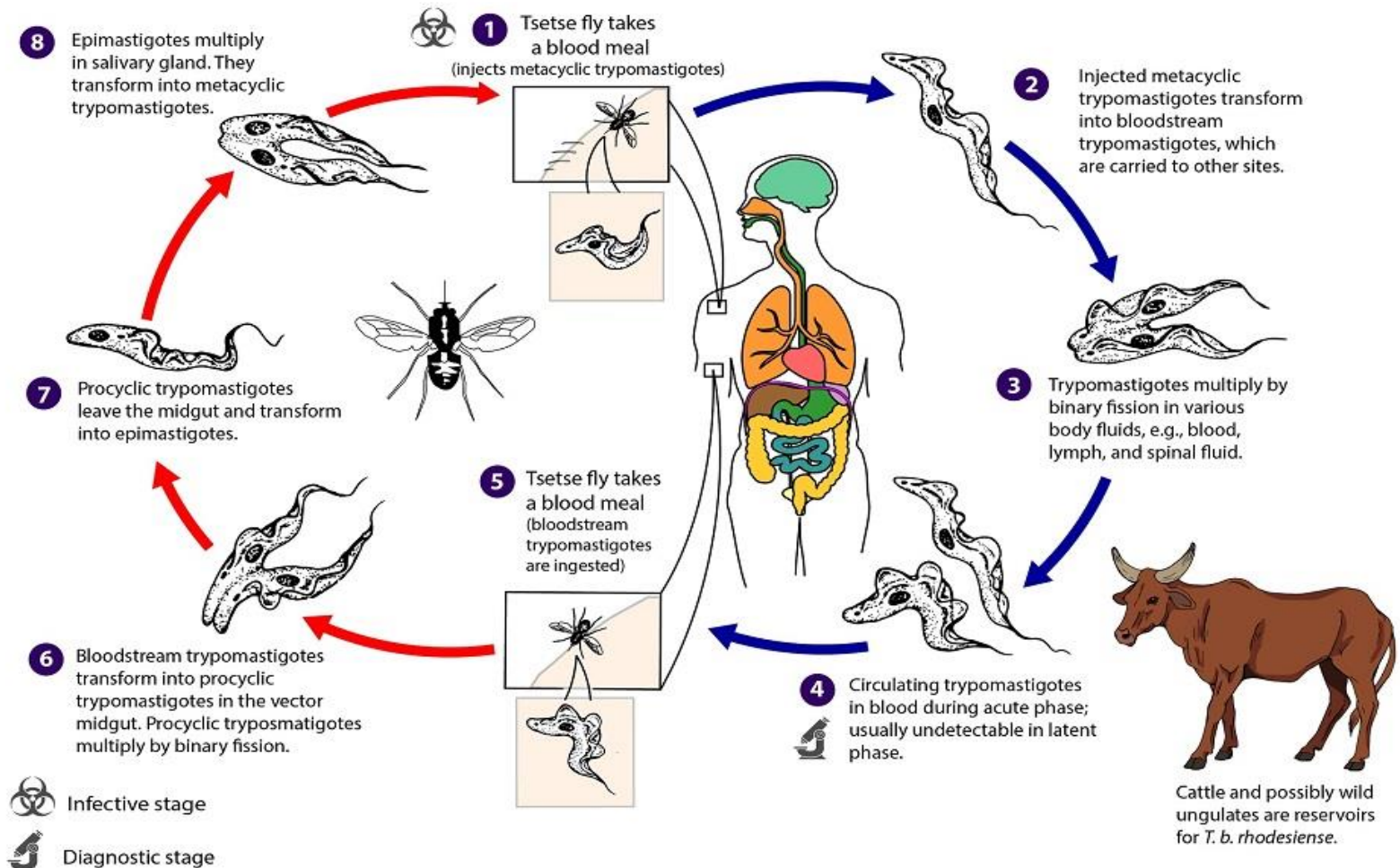
African Trypanosomiasis

Trypanosoma brucei gambiense & *Trypanosoma brucei rhodesiense*

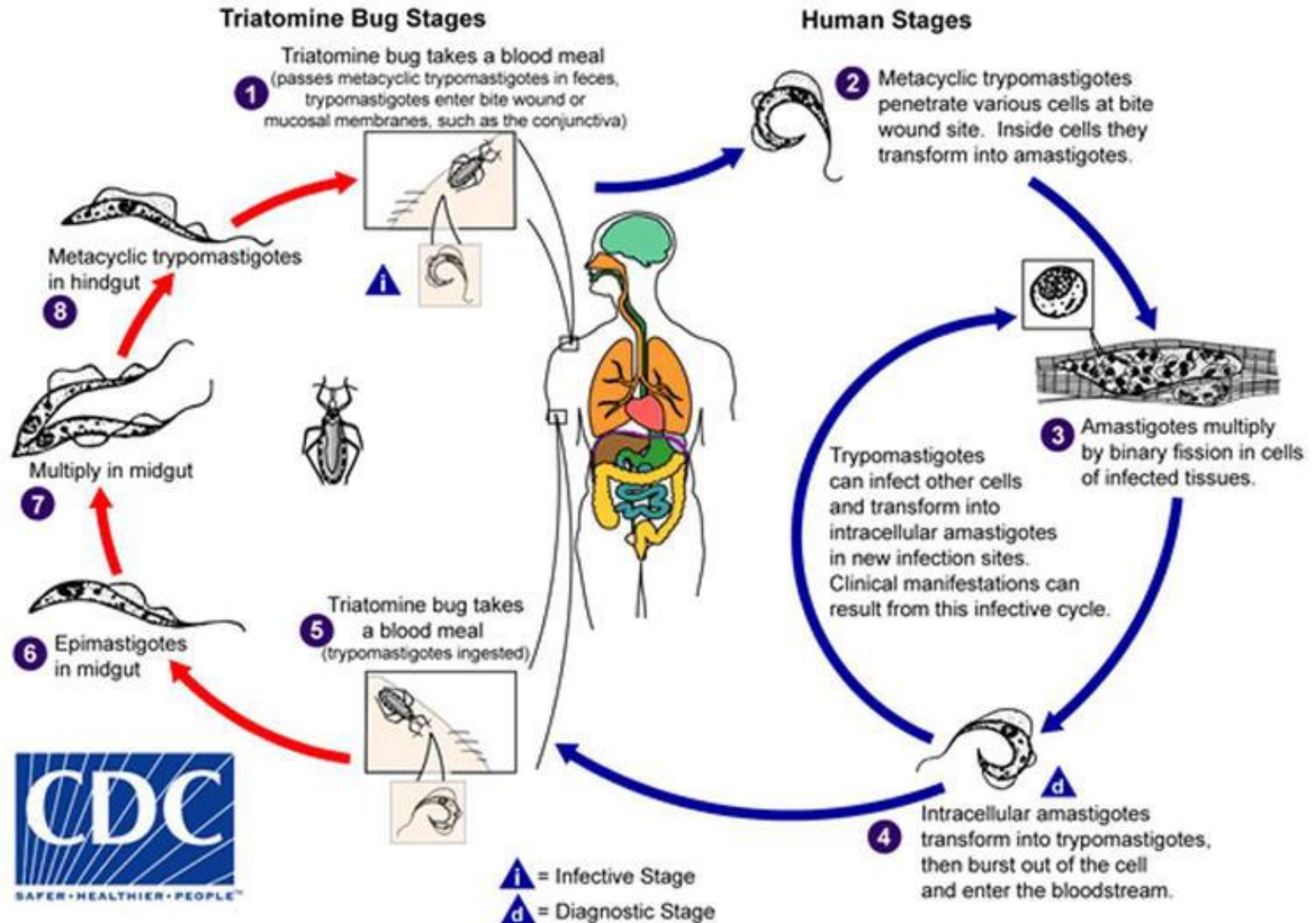


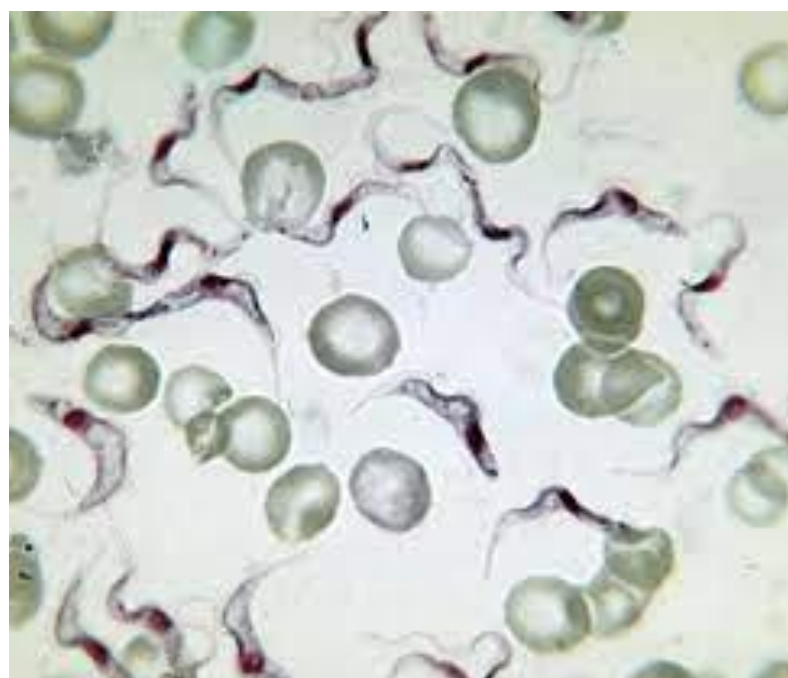
Tsetse Fly Stages

Mammalian Stages

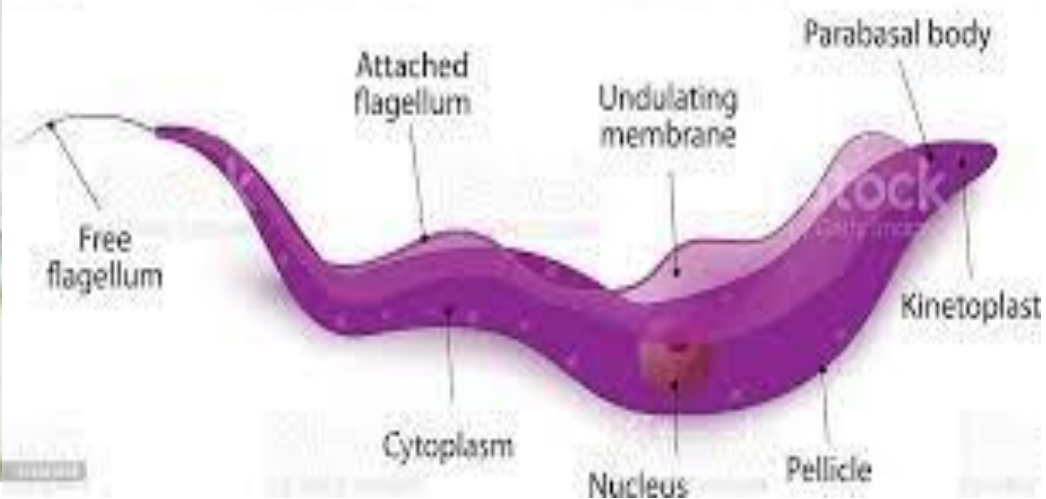


Trypanosoma cruzi



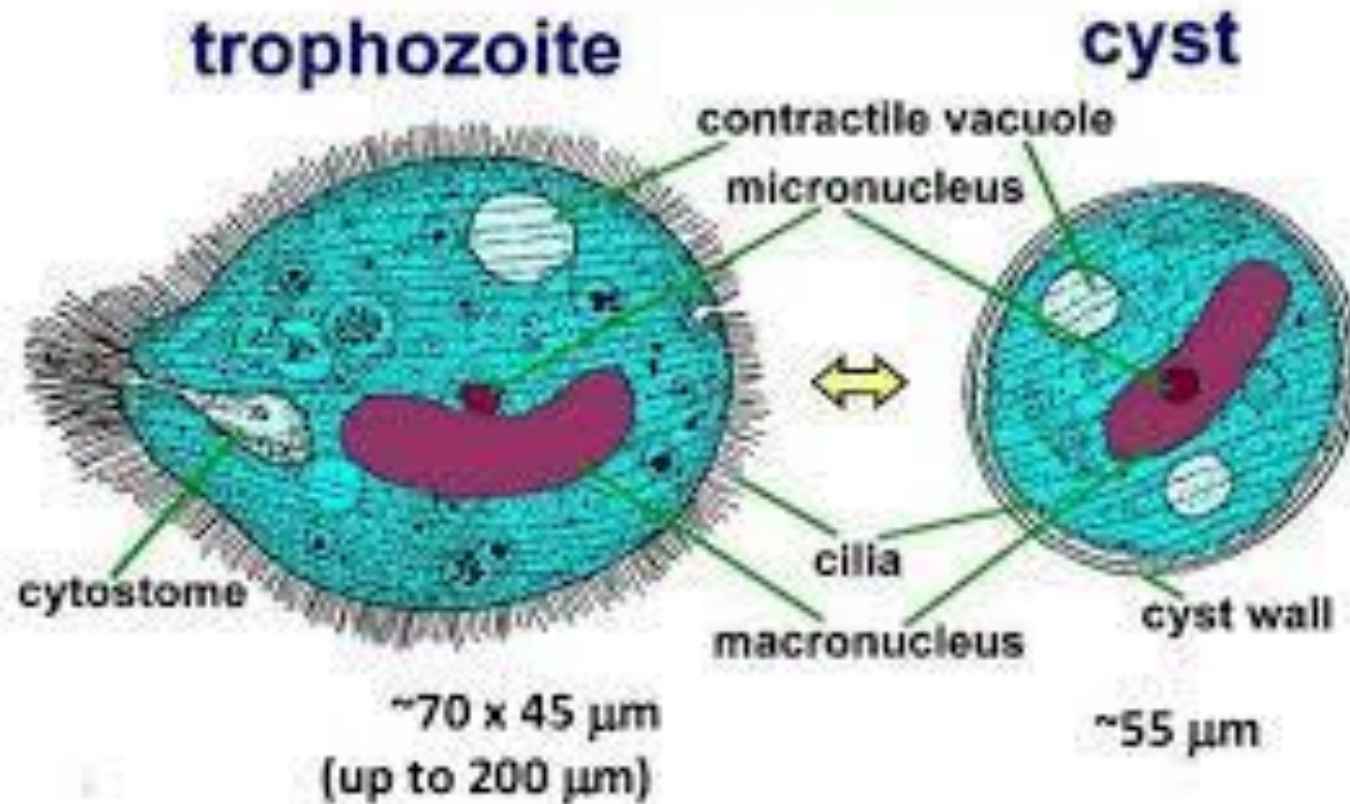


Trypanosoma brucei



Balantidium coli

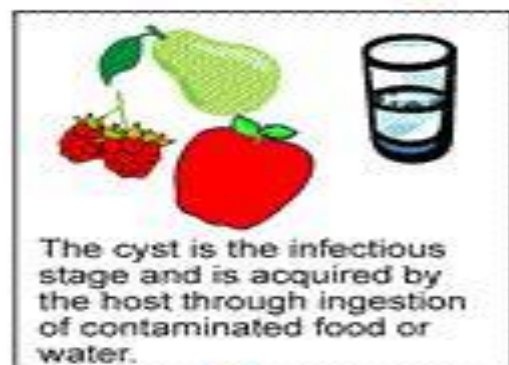
Balantidium coli



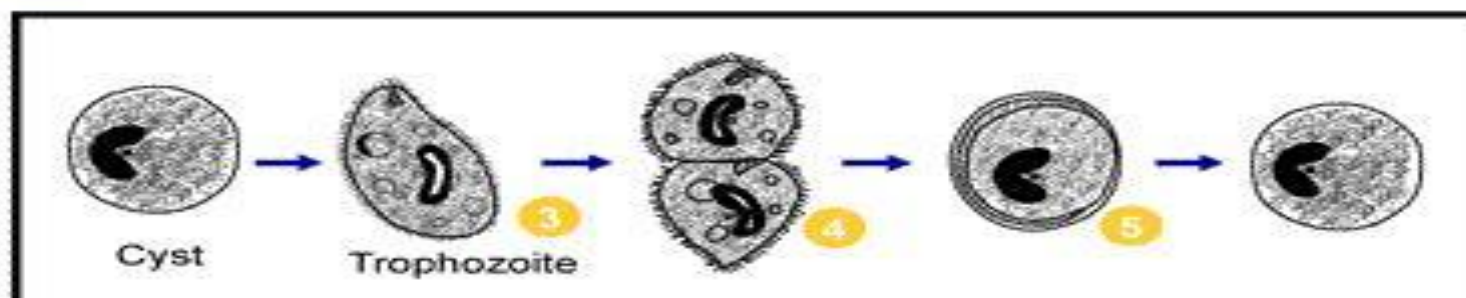


SAFER • HEALTHIER • PEOPLE™

<http://www.dpd.cdc.gov/dpdx>

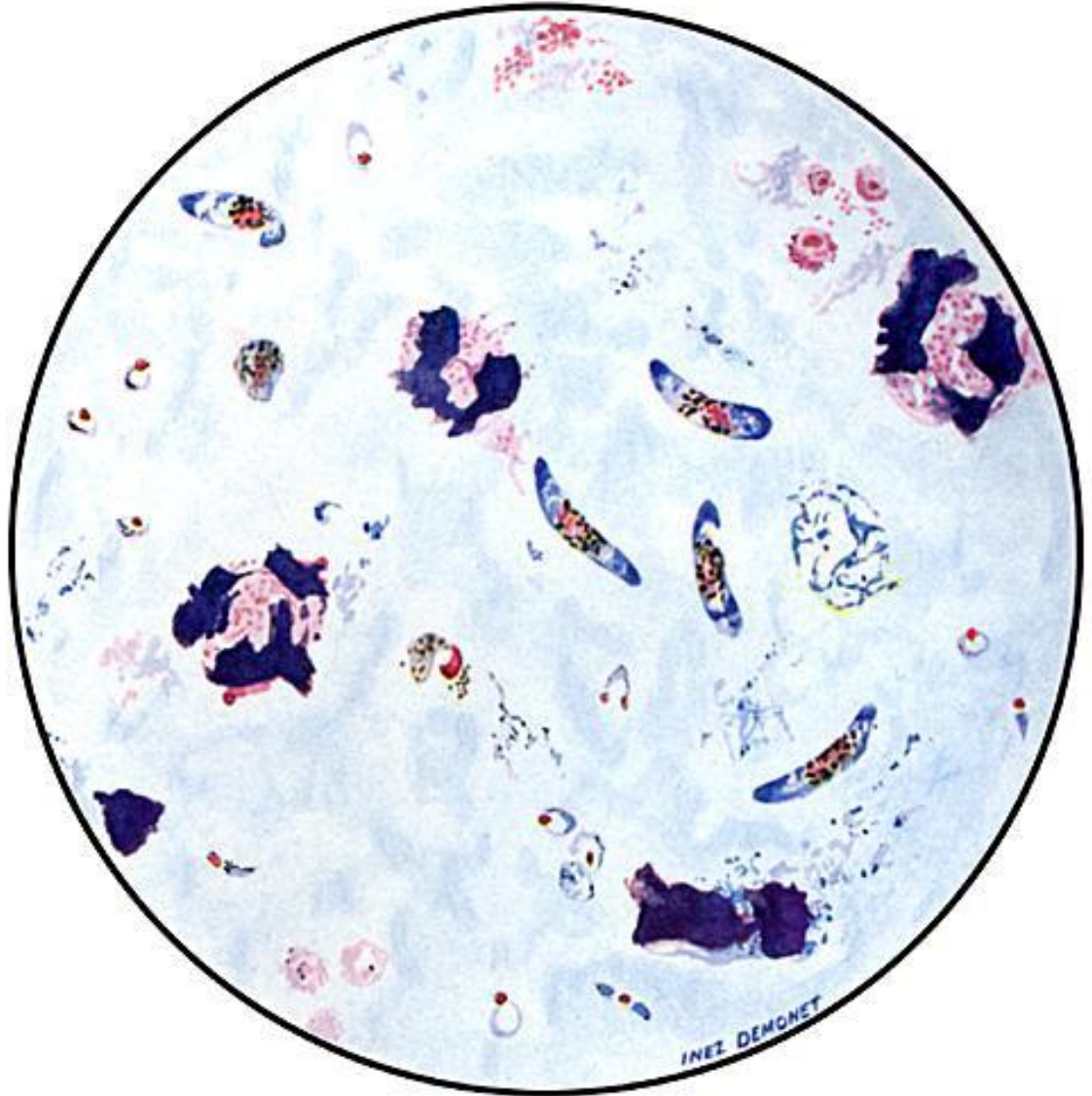
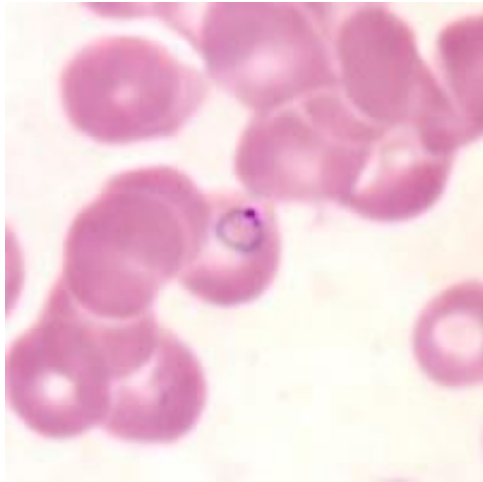


i = Infective Stage
d = Diagnostic Stage



Some trophozoites invade the wall of the colon.

Plasmodium (疟原虫)



History

Malaria is an old infectious disease. The first ◆
documentation about it is at 1500BC.

Until the end of the 19th century, it was commonly ◆
thought that malaria was caused by breathing bad air
(*mal-aria*) and was associated with swamps



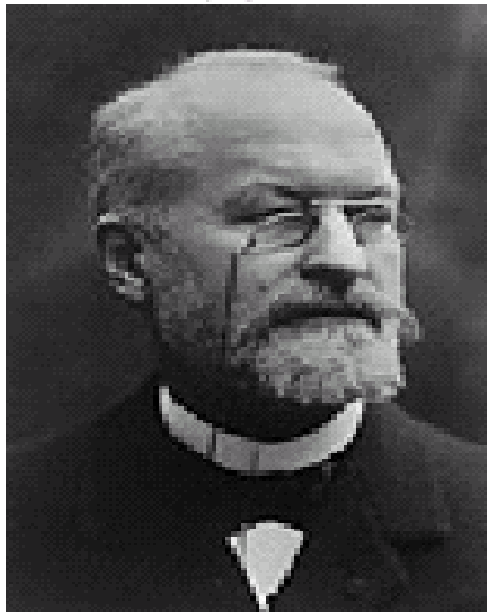
History

◆ Important application of the knowledge about malaria: W. Gorgas successfully implemented control strategies for malaria and yellow fever during the construction of Panama Canal

Important Discoveries in Malaria Research

The Nobel Prize in Physiology or Medicine

1907



1880: Charles Louis Alphonse Laveran observed parasite development in erythrocytes and the exflagellation of microgametocytes

1902

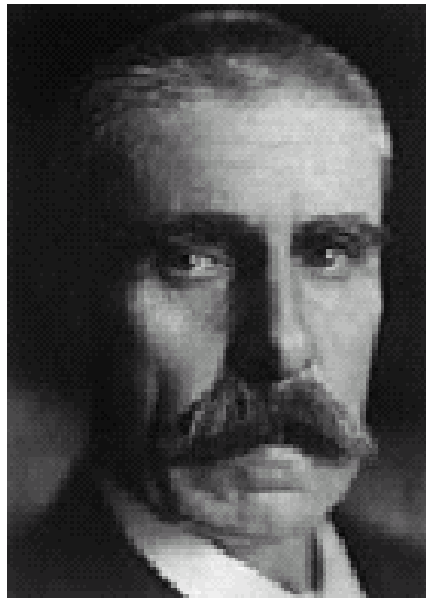


1897: Ronald Ross observed the mosquito stages of *Plasmodium* (*P. relictum*)

Important Discoveries in Malaria Research

The Nobel Prize in Physiology or Medicine

1927

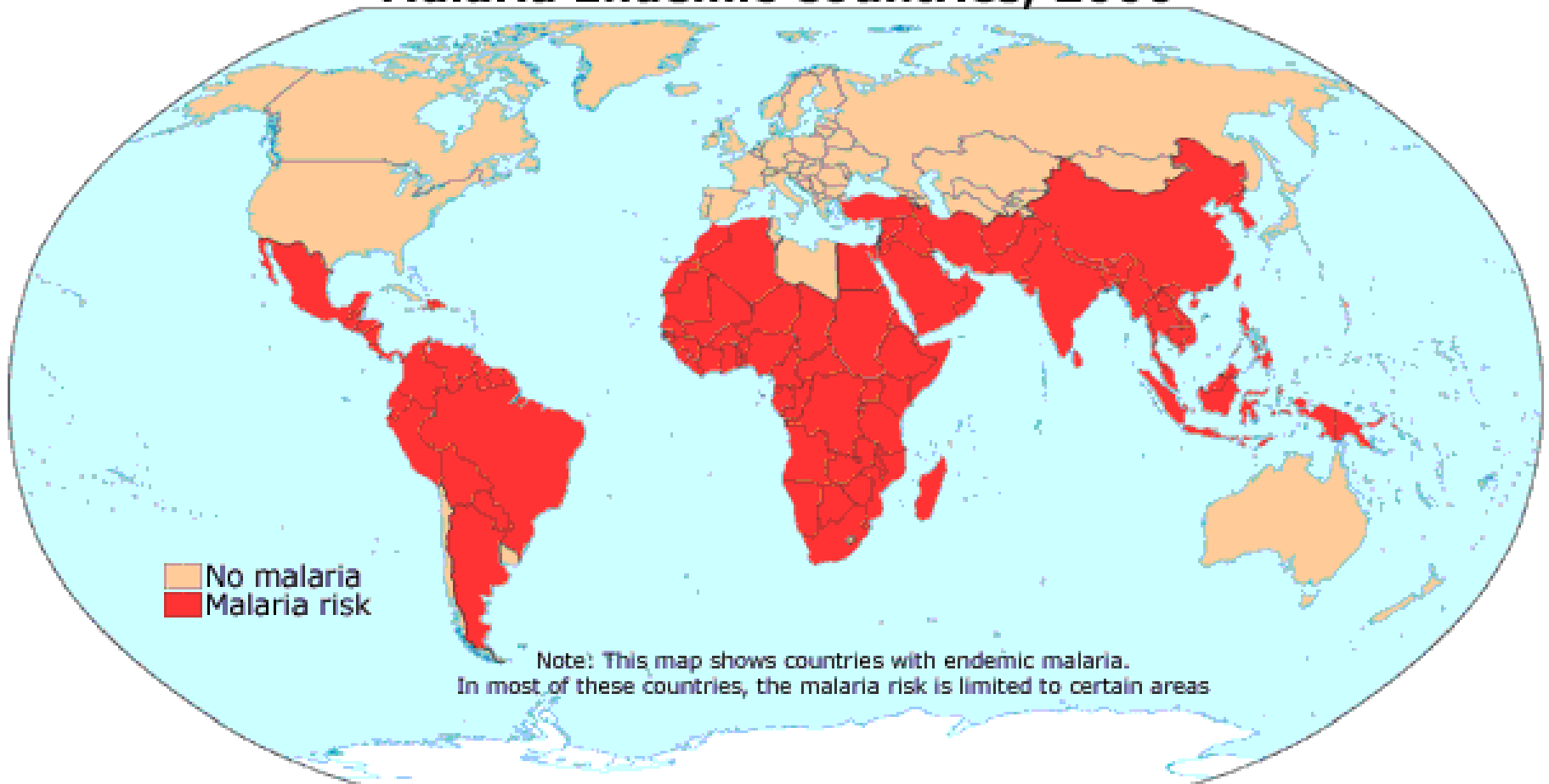


- ◆ 1938: James and Tate found exoerythrocytic stage (EE) for *Plasmodium gallinaceum*
- ◆ 1948: Shortt and Garnham found EE for *P. cynomolgi* and *P. vivax*
- ◆ 1980: W. Krotoski found *P. vivax* hypnozoites (dormozoites) in liver cells

Early 1900s: Julius von Wagner-Jauregg used malaria to treat late stage syphilis

Global distribution

Malaria Endemic Countries, 2000



Plasmodium that infect human

Human malaria: *P. falciparum*-malignant tertian (48 hr): 50%
P. vivax-benign tertian: 43%
P. ovale-mild tertian: <1%
P. malariae-quartan (72 hr): 7%

Simian parasites infecting humans:

P. cynomolgi-vivax-like
P. knowlesi-quotidian (24 hr)

Malaria current status

- ◆ Number of people at risk: >40% of the world population
- ◆ Number of cases/year: ~450 million
- ◆ Number of deaths/year: >1 million (90% in sub-Saharan Africa)

Roll Back Malaria as the new international effort: distribution of bed nets; vaccine development; rational drug design, parasite genome sequencing. Goal: 50% reduction in deaths by 2010

Morphology

- Plasmodium is the one-cell parasite, so the basic morphology is a nucleus (chromatin), cytoplasm and cell membrane
- Wright or Giemsa stain gives the Cytoplasm – bluish; Chromatin - red to red-purple while the malarial pigments are yellow-brown
- There are **three stages and six main** forms of plasmodium **in RBC**

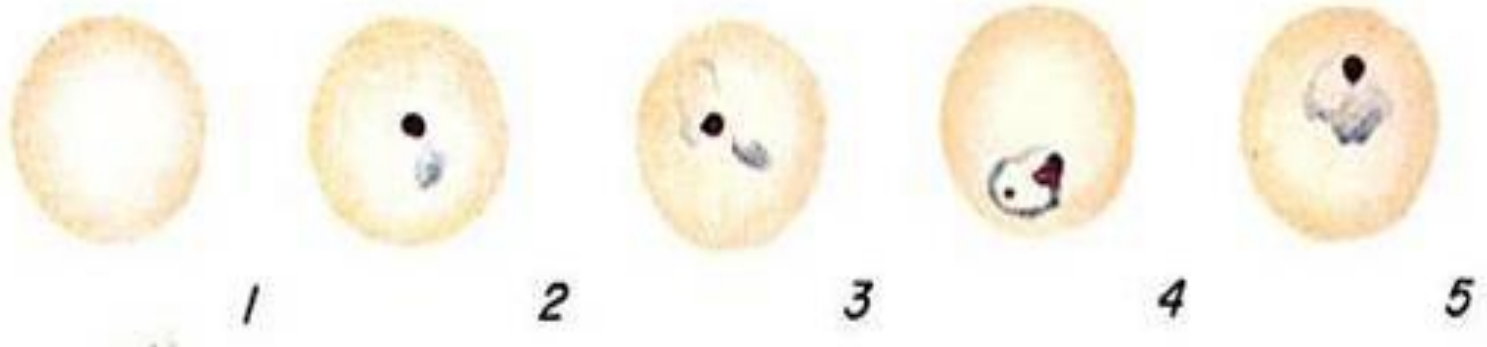
Plasmodium in RBC

Trophozoites (滋养体期): ring form and developing trophozoites

Schizonts (裂殖体期): immature and mature -- merozoites

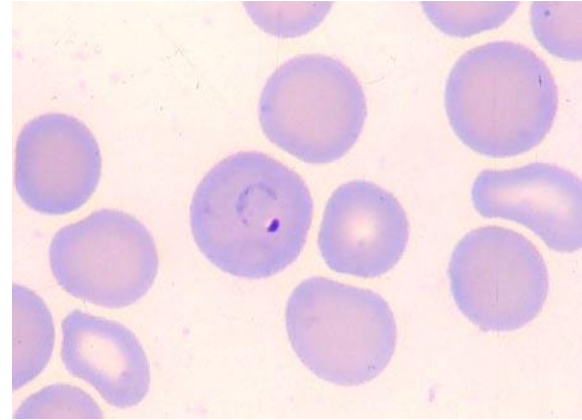
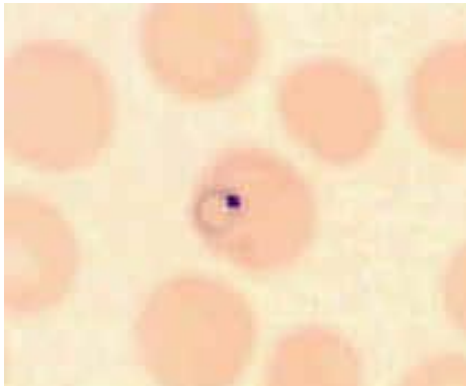
Gametocyte (配子体期): Microgametocytes and macrogametocytes

Trophozoites



**Fig. 1: normal red cell; Figs. 2-5: ring stage •
parasites (young trophozoites)**

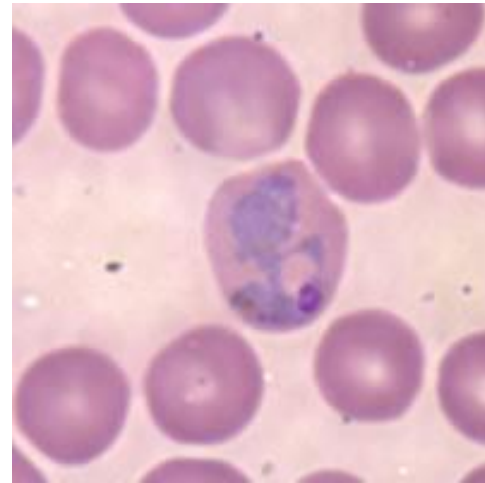
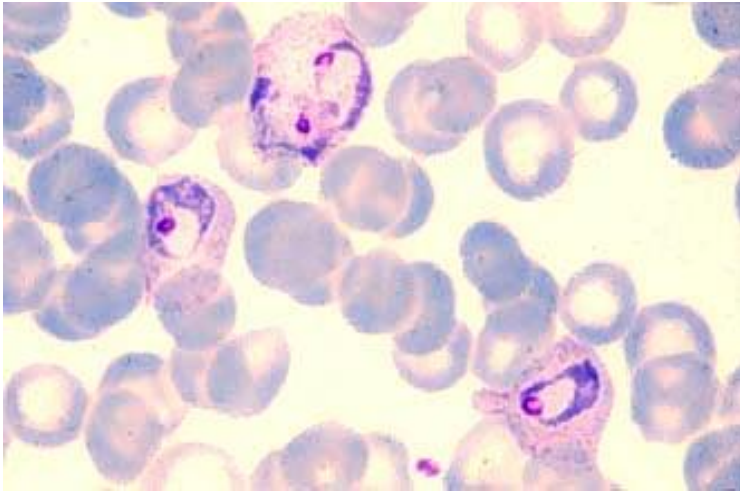
Ring form trophozoites



Thin blood film (Giemsa stained)

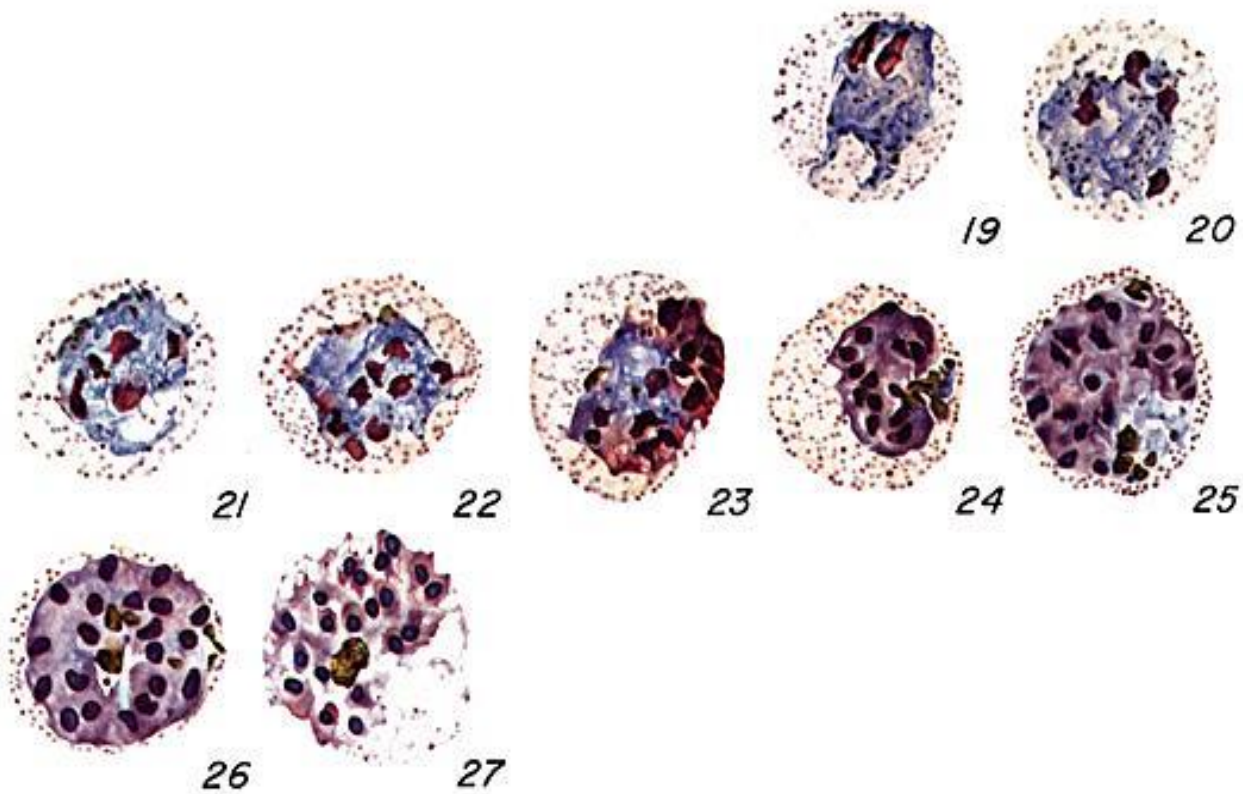
Ring like plasma with one nucleus at one side •

Mature trophozoites (amoeboid form)



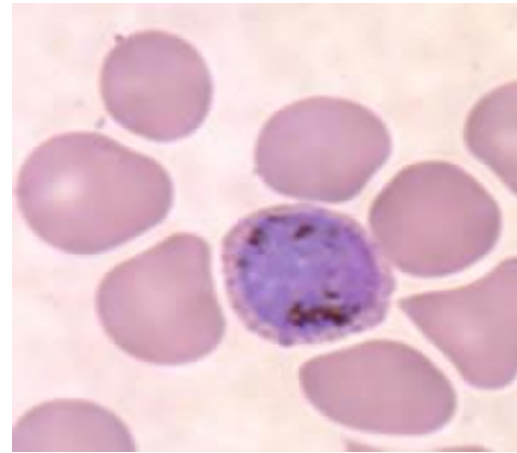
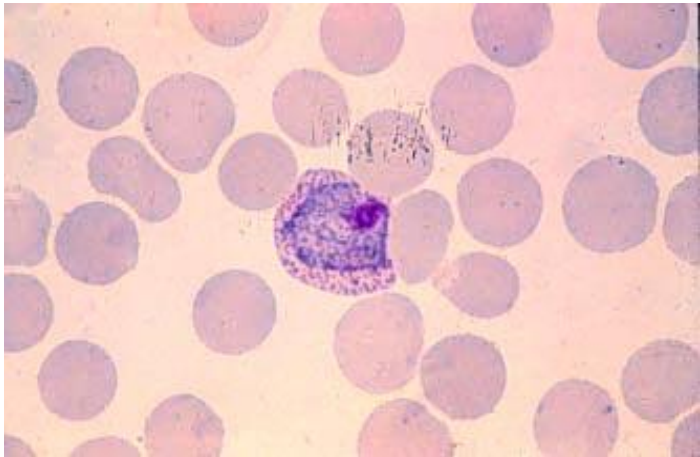
- The plasmodium grow with pseudopods, more cytoplasm and malarial pigment presented in the plasma
- Red blood cell enlarged and became pale with Schüffner's dots(薛氏小点)

Schizonts



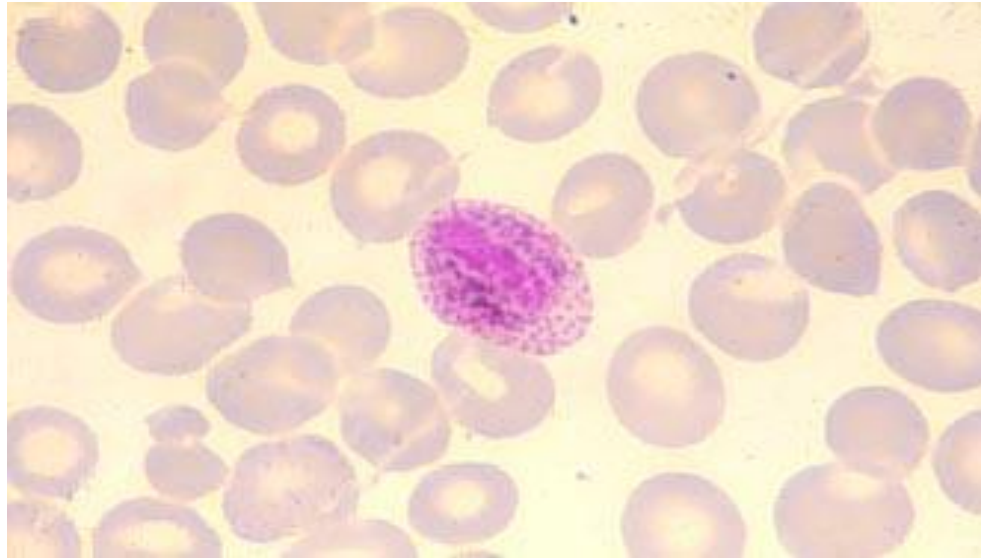
Figs.: increasingly mature schizonts •

Macrogametocyte (female gametocyte) of *P.v*



- Giemsa staining
- compact nucleus, usually at edge of the parasite
- scattered pigment granules
- The gametocyte is completely filling its host cell

Microgametocyte (male gametocyte) of *P.v*

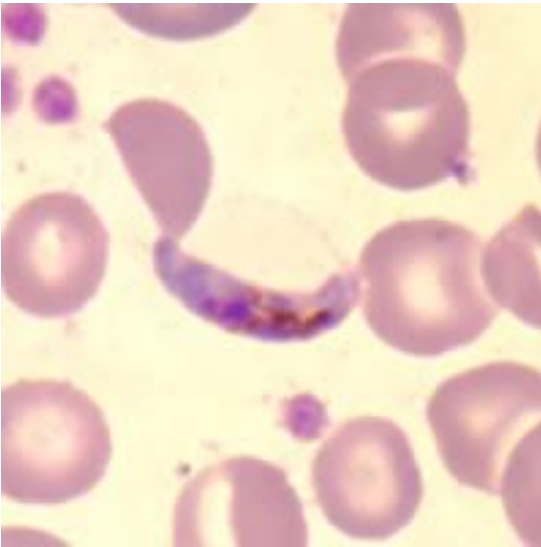


Giemsa staining

large nucleus at the center of the cell

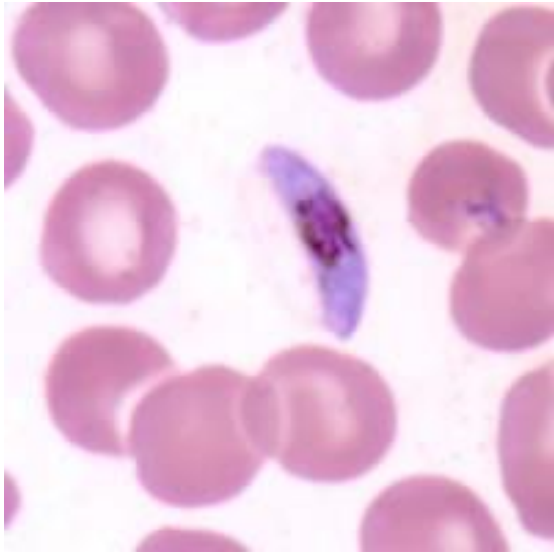
scattered pigment granules

Macrogametocyte of *P. f*



- The crescent-shaped gametocytes of *P. falciparum* are very distinctive, but tend to only appear late in the infection
- Compact nucleus, red, usually at the center of the cell
- Malarial pigments around the nucleus

Microgametocyte of *P. f*



- Sausage-shaped with two blunt end
- Large nucleus at the center
- Sometimes hard to distinguish from the female gametocytes

P. vivax



ring form



mature ring form



trophozoite



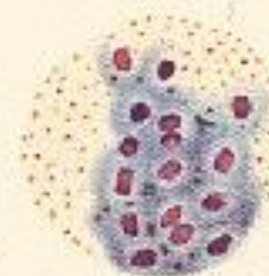
trophozoite



early schizont



schizont



mature schizont



developing gametocyte



female gametocyte



male gametocyte

P. falciparum



marginal form



ring form



double dotted rings



ring form



young trophozoite



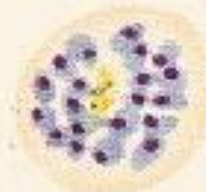
trophozoite



early schizont



schizont



mature schizont

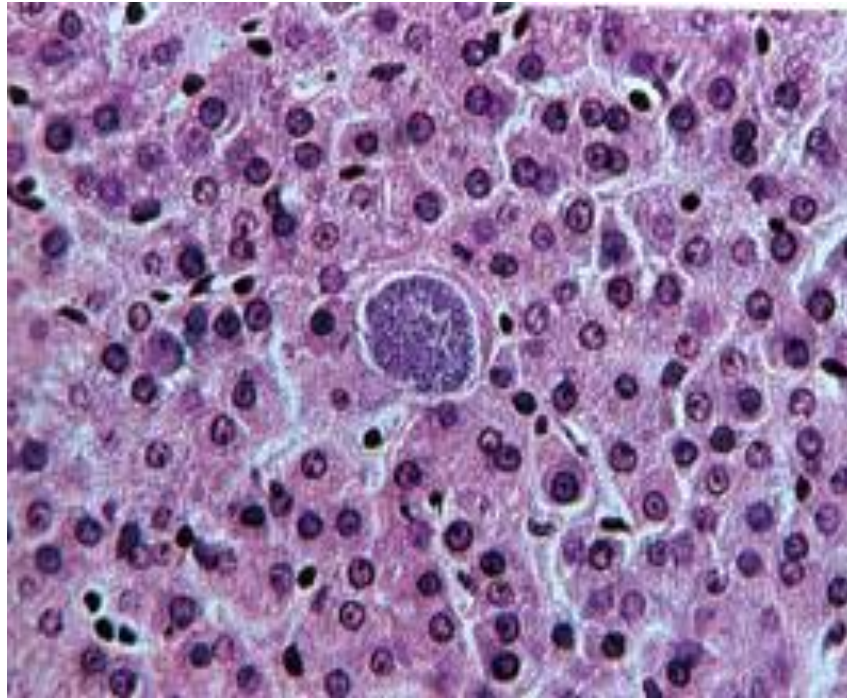


female gametocyte



male gametocyte

exo-erythrocytic stage—

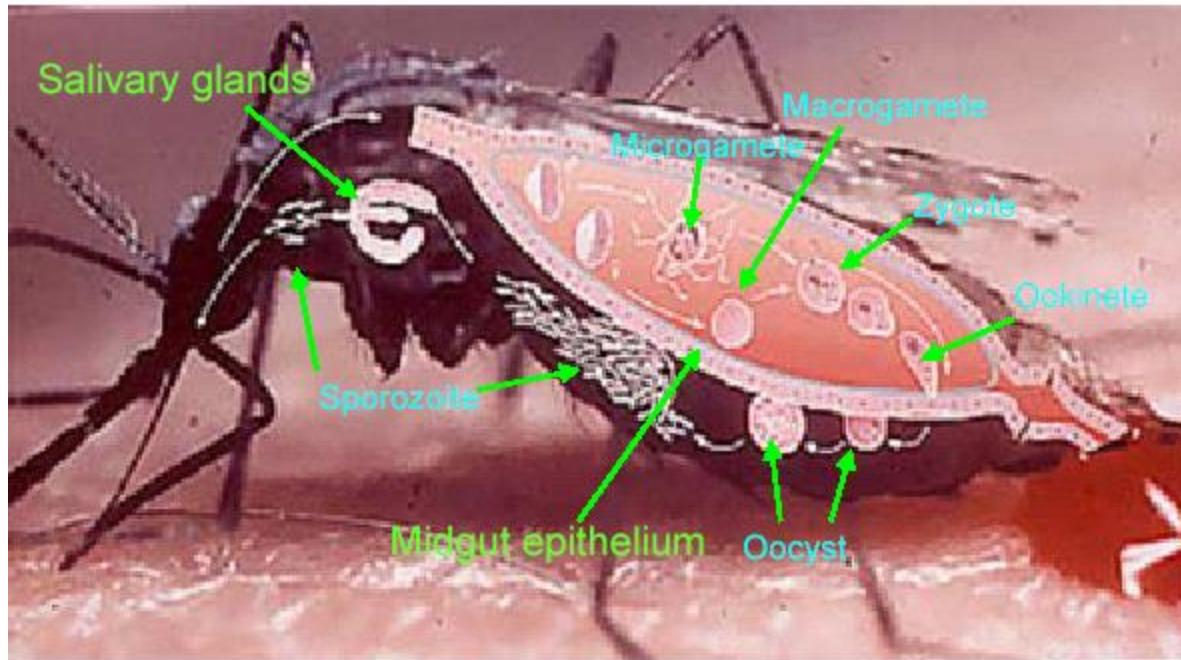


merozoites in liver cells

The vector – female *Anopheles*



Development in the vector



Gametocytes → zygote → oocyst → sporozoites

Life Cycle

