Phylum: Apicomplexa
class: Sporozoa
subclass: Coccidia
order: Eurococcidina
suborder: Eimeriina
ex: *Toxoplasma gondii*

Toxoplasma gondii causes toxoplasmosis

Morphology: *T. gondii* occurs in 3 forms –trophozoite, tissue cyst and oocyst.

The trophozoite and tissue cyst represent stages in asexual multiplication (schizogony) while the oocyst is formed by sexual reproduction (gametogony or sporogony)

1-Trophozoite:

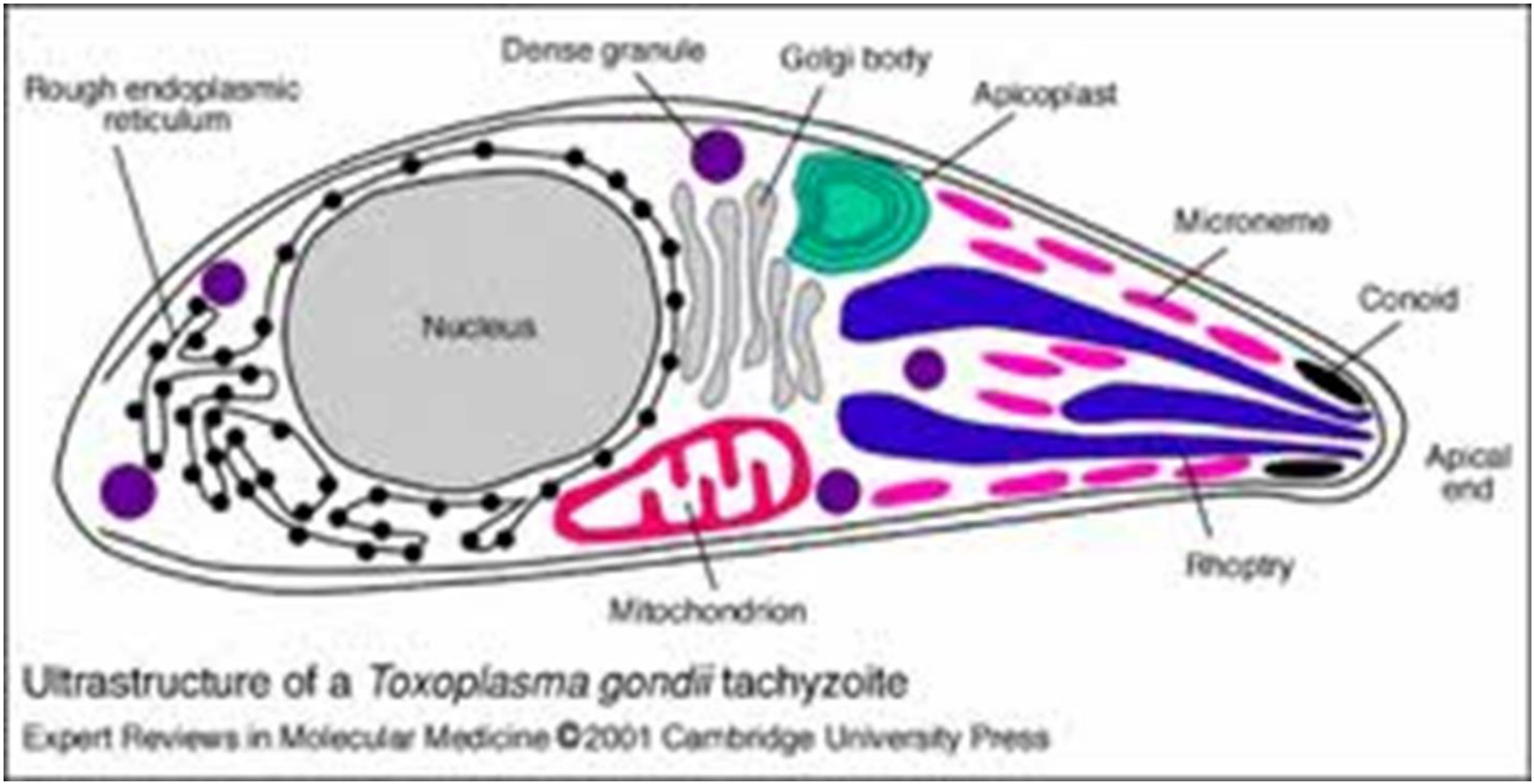
-it is crescent or oval shaped ,with one end pointed and the other rounded
- measures 4-6 um length by 2-3 um breadth.
-the nucleus is spherical and situated closer to the rounded than to the pointed end.
- they are found in tissues and invade all mammalian cells except non nucleated erythrocytes. It can be seen extracellulary .
-multiplication takes place by endodyogeny (internal budding)

= two terms are used for the trophozoite of *T. gondii*

A-Tachyzoites : the rapidly proliferating trophozoites in acute infection are called, tachyzoites , responsiple for initial spread of infection and tissue destruction. -during the acute infection the proliferating trophozoites within a host cell may appear rounded and enclosed by the host cell membrane called (pseudocyst or colony)

B- Bradyzoites: the slowly multiplying forms inside tissue cyst seen during latent and chronic infection.

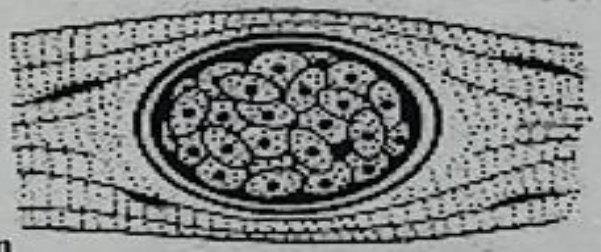
morphology



Ultrastructure of a *Toxoplasma gondii* tachyzoite

2-Tissue cyst:

-the cyst is round or oval in shape-it ranges in size from 10-200um
-it is formed during the chronic phase of infection and can be found in any organ of the body, particularly in skeletal and heart muscles , brain and eye.
-the parasite multiplying slowly within the host cell produces a cyst wall within the host cell membrane
-these cysts remain viable in tissues for several years
-they are important in transmission of infection and source of recrudescent disseminated infection in immunocompromised individuals



Cyst containing bradyzoites in tissues of intermediate host

3- Oocyst:

-it is spherical or ovoid in shape

-measures approximately 9-11um in width by 11-14um in length.

-mature oocyst contain two sporocyst, each of which enclose four sporozoites.

-oocyst develop only in definitive hosts (cat and members of feline family)

life cycle: It either direct require one host which is the cats or indirect require two kinds of hosts:

a- in cat (enteric cycle) or any member of cat family

b-in man ,mouse and other animals (exoenteric cycle)

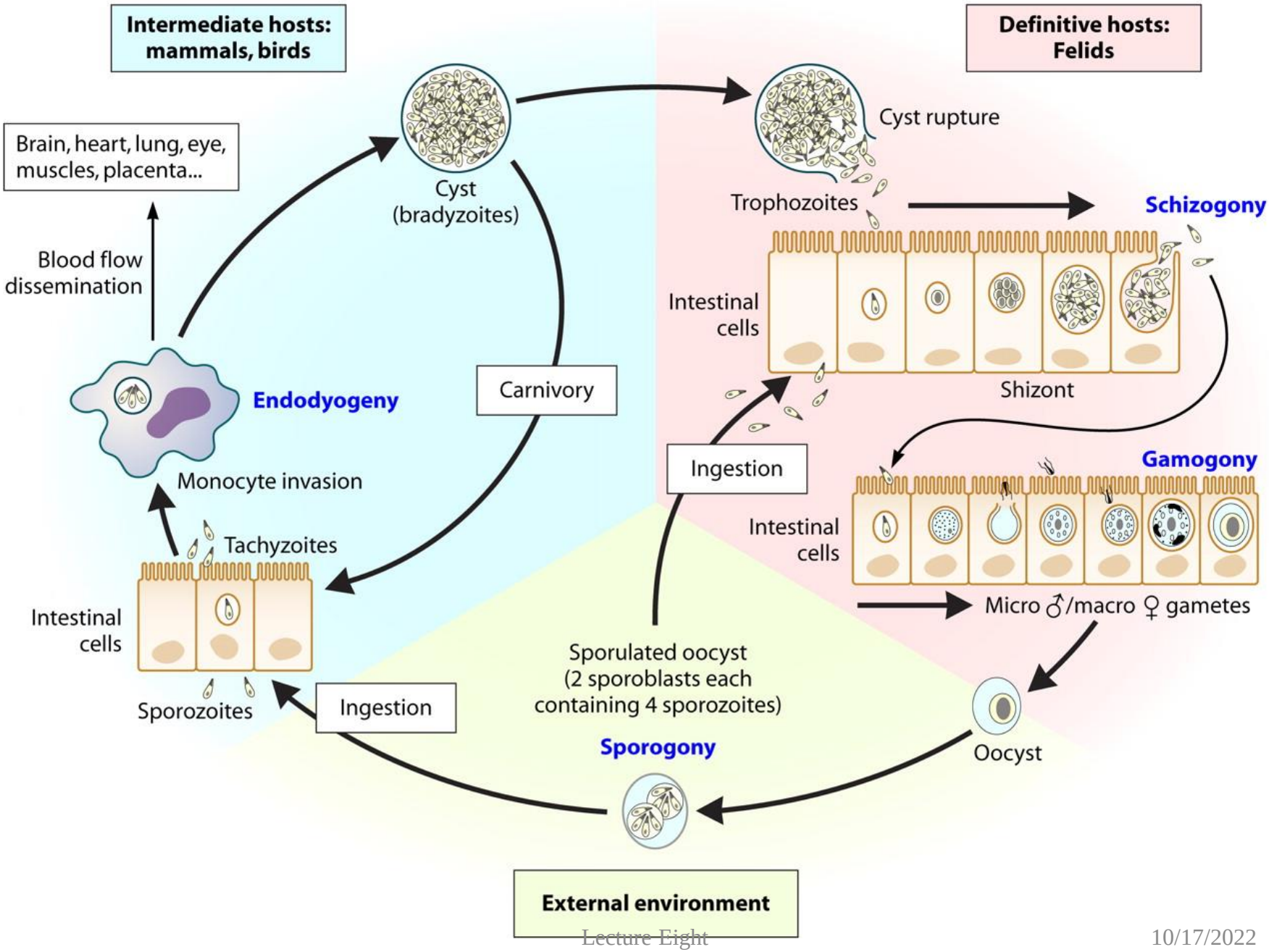
Development in cat (enteric cycle)

the sporozoites released from the ingested mature oocyst, penetrate the epithelial cells of the small intestine. They round up and grow within the host cells and asexual form of divisions occurs first leading to the formation of merozoites. some enter extra-intestinal tissues resulting in the formation of tissues cysts in other organs of the body. Other merozoites are transformed in to sexual stage initiating gametogony. Resulting in the formation of an oocyst which pass in the feces ,they develop into infective forms in soil or water .

Note: in cats both schizogony (asexual)and gametogony or sporogony (sexual) take place in the small intestine.

Development in man (exoenteric cycle)

infection occurs after ingestion oocyst from the cat or by eating improperly cooked meat containing cysts . Only asexual development occurs in man and the oocyst not formed in the intestine. There is no enteroepithelial development; the sporozoites enter a host cell and begins multiplying by endodyogony. These develop quickly and produce tachyzoites. About 8-32 tachyzoites are formed in each infected cell. As infection becomes chronic, the tachyzoites multiply more slowly, they are called bradyzoites, they are retained in the tissue cyst for month even years after infection.


Intermediate hosts: mammals, birds
Definitive hosts: Felids
Brain, heart, lung, eye, muscles, placenta...
Cyst (bradyzoites)
Cyst rupture
Trophozoites
Schizogony
Blood flow dissemination
Intestinal cells
Shizont
Endodyogeny
Carnivory
Monocyte invasion
Ingestion
Gamogony
Tachyzoites
Intestinal cells
Micro ♂/macro ♀ gametes
Intestinal cells
Sporulated oocyst (2 sporoblasts each containing 4 sporozoites)
Sporozoites
Ingestion
Oocyst
Sporogony
External environment

Mode of infection:

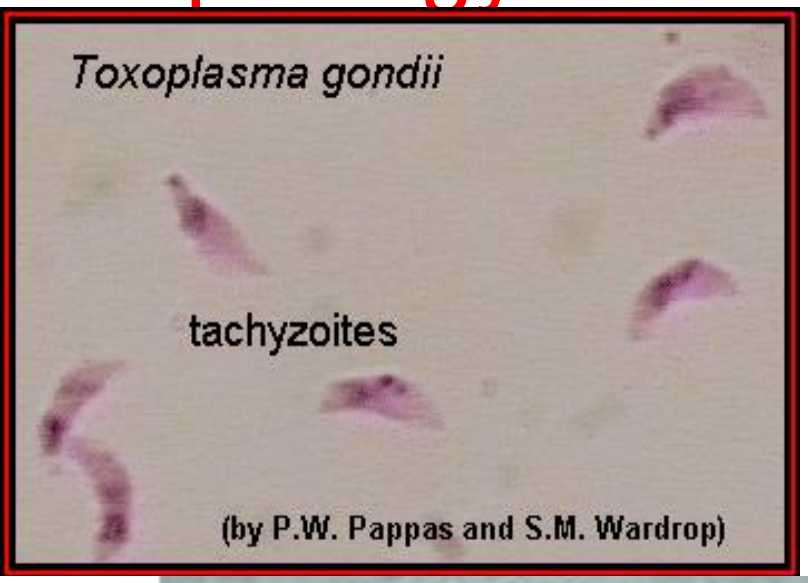
1-Ingestion of mature oocyst through a- Directly by fingers contaminated with cat feces b-Indirectly by contaminated food and water.

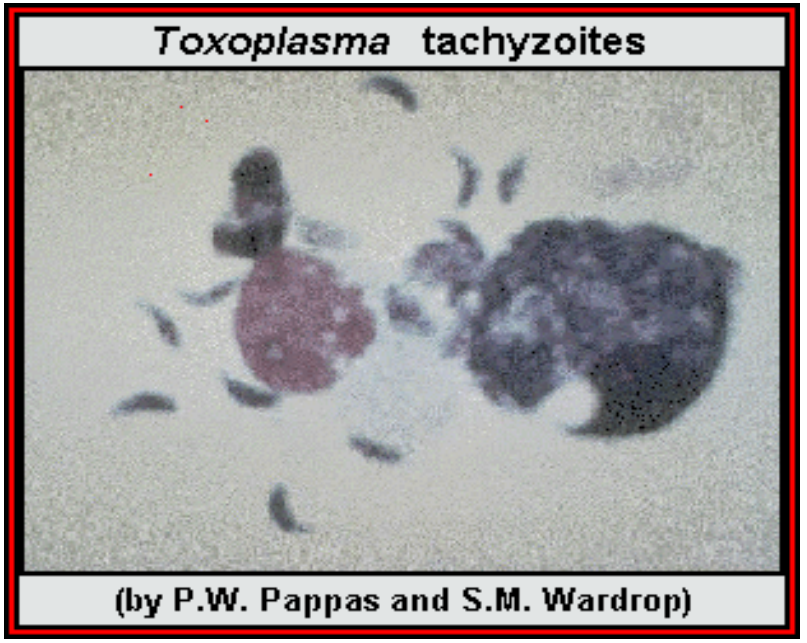
2-Eating uncooked or undercooked infected meat containing tissue cysts

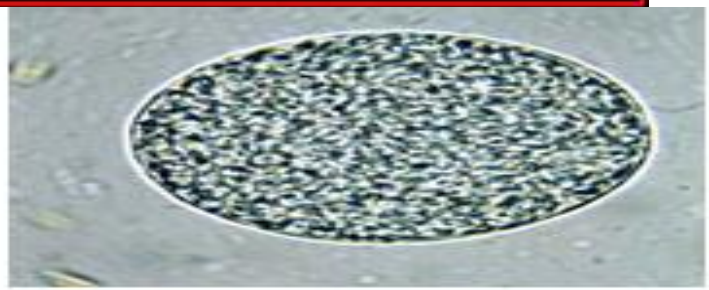
3- Transplacental transmission to the fetus

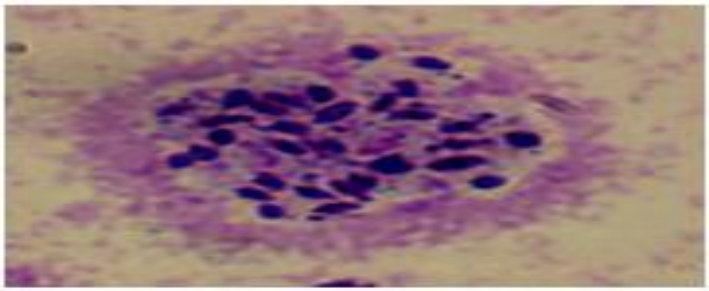
4- Rarely by blood transfusion or organ transplantation from infected donor.

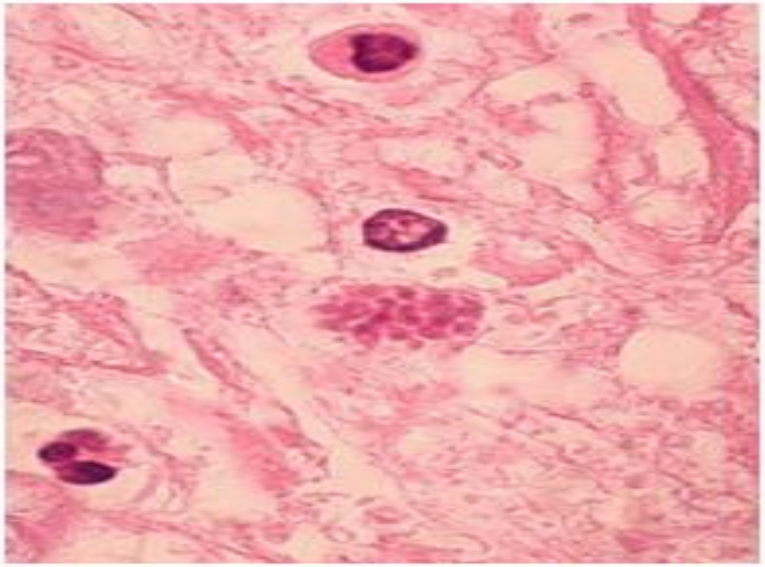
Morphology









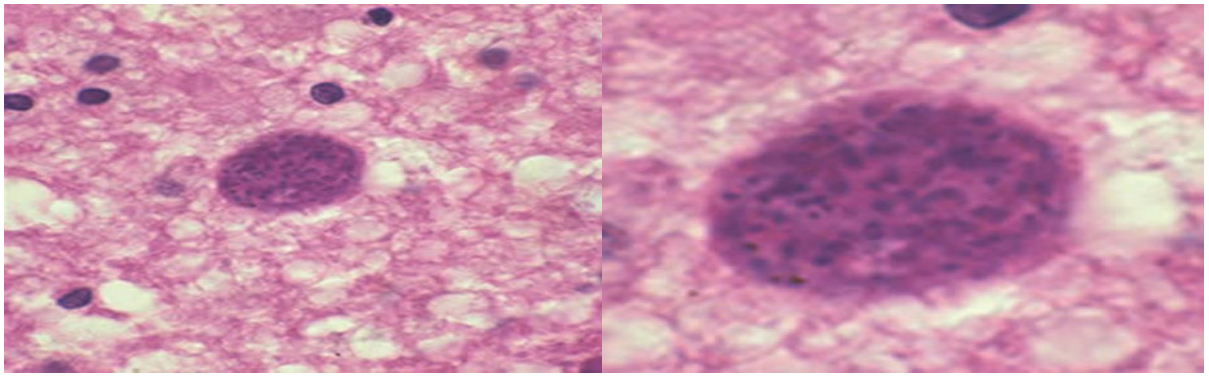


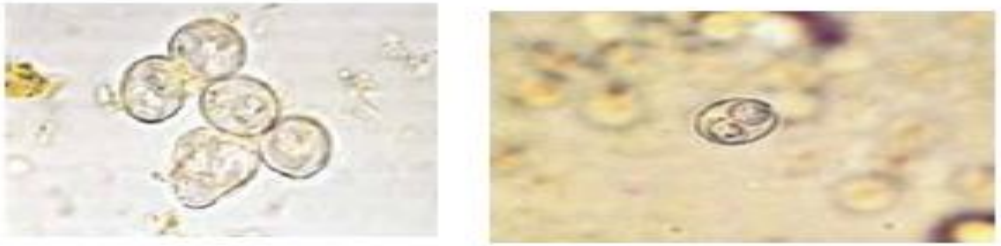
T. gondii, cyst with Bradyzoite, biopsy and autopsy (X1000)

Note : the tissue section (Brain, eyes, muscles)

B: Toxoplasma gondii cyst in brain tissue stained with hematoxylin and eosin.

C: Higher magnification of Figure B





T. gondii Oocyst faeces smear from final host

Lab. Diagnosis:

1-Finding or demonstration the parasites in the body fluids or tissue by microscopic examination. a- stain smears from body fluid with Giemsa stain
b- histological stained section of the tissue as lymph nodes, spleen ,liver brain and bon marrow

2-Isolation of the parasites from a patient by animal inoculation
3-Serological and intradermal tests
a-Sabin and Feldman day test : this is done by taken parasite from peritoneal of infected mice, making suspension in buffer solution in small test tube with few drops of patient serum , then adding few drops of methylen blue dye and after 30 minutes or more we take one drop of the suspension putting on slide and exam it.
If the parasite not taking the dye , the reaction is positive
#If the parasite taking the dye , the reaction is negative
b-IFA, IHA, ELISA, LA, CF,

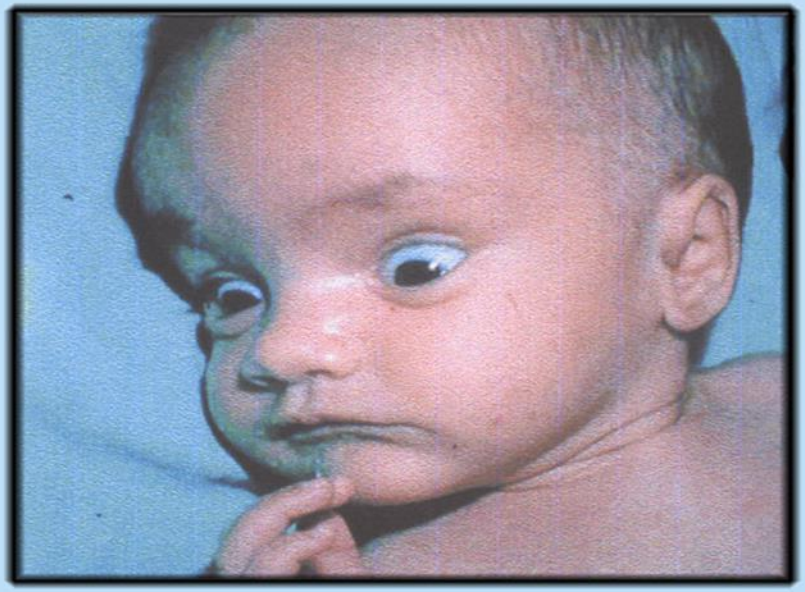
-<u>Latex agglutination test:</u>

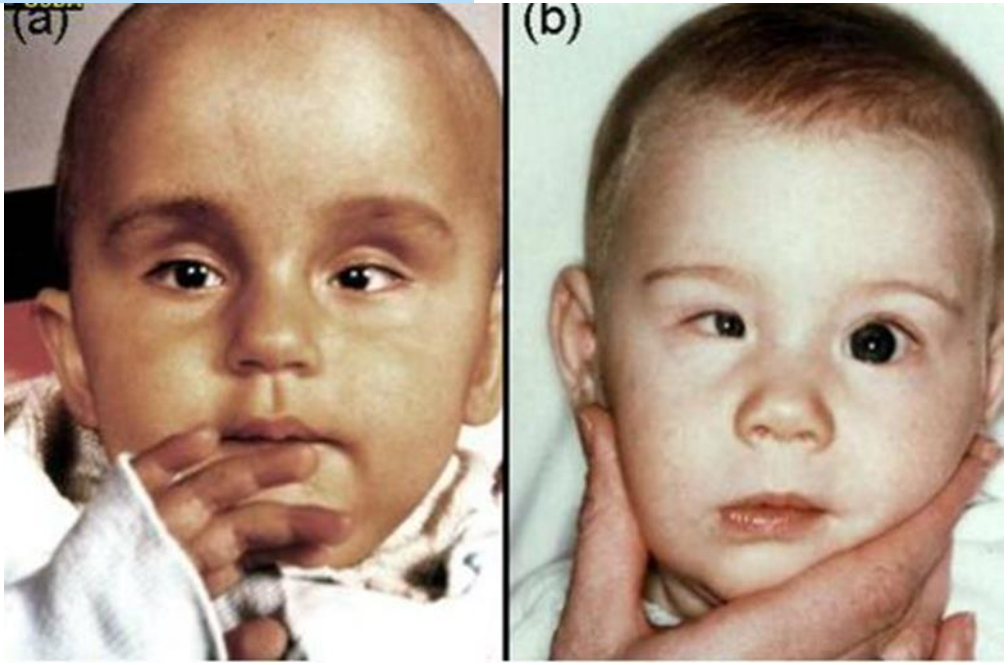
It is a simple test. It shows 94 % agreement with the dye test. The latex particles are coated with inactivated *T. gondii* soluble antigen. This test does not require heat inactivation of serum samples.

The most common method of laboratory diagnosis is by serology. Several serological tests are available. Indirect immunofluorescence, indirect haemagglutination, complement fixation ,ELISA.

The standard test used now is ELISA, separately for IgM and IgG antibodies. The presence of IgM antibody in the absence of IgG denotes current infection, IgM antibody with high titre IgG suggests infection in the recent past; Negative IgM with positive IgG indicates past infection. This is subject to individual variation.

In some cases IgM antibody may persist up to 18 months. Serial ELISA provides better information than a single test.




(a)
(b)