

جامعة الانبار

كلية : الصيدلة

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اسم المادة باللغة العربية: الطفيليات الطبية

اسم المدة باللغة الإنكليزية: **Medical Parasitology**

المرحلة: الثانية

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عنوان المحاضرة باللغة العربية: داء المقوسات

عنوان المحاضرة باللغة الإنكليزية: **Toxoplasmosis**

محتوى المحاضرة:

Toxoplasmosis -----A Risk in Pregnancy

What is Toxoplasmosis?

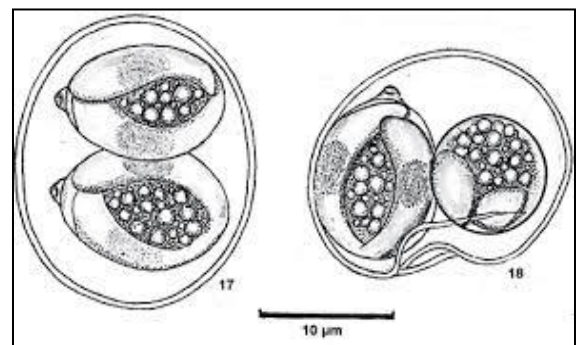
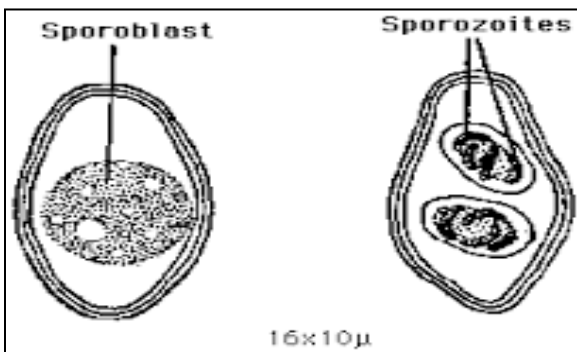
Toxoplasmosis: Is a disease of cats as well as other mammals and birds caused by a parasite called *Toxoplasma gondii* (*T. gondii*). *Toxoplasma* infection is common and cause intracellular infection. *T.gondii* is important because virtually all warm-blooded animals, including man, can become infected with it. Domestic, wild, & feral cats can transmit toxoplasma infection to humans. This parasite infects large number of the vertebrates host including man, mammals, birds and reptile.

Geographical distribution: Is wide world distribution.

Habitual: Epithelial cells of small intestine or other tissue of the host.

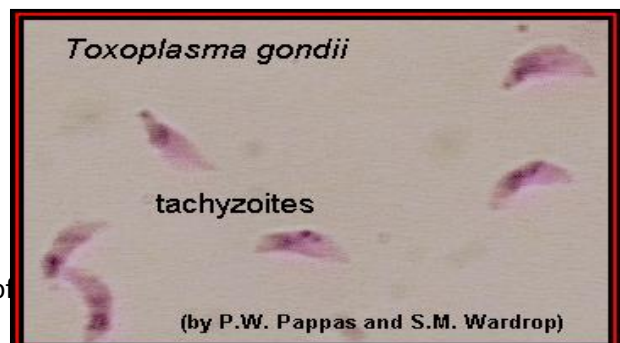
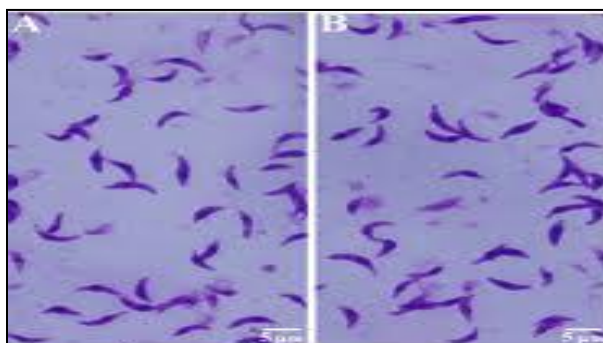
The Infective stage: Sporozoite comes from three forms:

a) Sporozoites within mature oocyst: This is found in feces of cat and other felidae family (including cats, tigers, pumas Jacques ...ext) this found in fresh passed stool sample of cat with double wall of sub-spherical sporoblast contain a nucleus and in soil outside the body, the immature oocysts will develop sporoblast and from mature oocysts with 2 sporocysts each with 4 crescentic sporozoites.



b) Tachyzoites with pseudocyst: (Crescent in shape) it is found in the acute stage of the parasite in any reticuloendothelial system or parenchymal tissue of man or other mammals, their number is usually 6-16 in one cell.

Tachyzoites can be found in any organ but occur most commonly in the brain, skeletal muscle, and heart muscle. Intracellular infection can occur in all mammalian cells except anuclear erythrocytes. Intracellular multiplication continues until host cells lyse or a tissue cyst is formed. In an immunocompetent host, tachyzoites are eliminated and tissue cysts form.



c) **Bradyzoites with true cyst:** (Tissue cysts) contain large number of 50 or more, it is present in chronic stage of the parasite. In case of mature oocyst, it found only in cat family, but other are found in other mammals including cats also. **Tissue cysts** are found most commonly in the brain, in skeletal and cardiac muscle but can occur in any organ. These cysts contain slowly growing trophozoites known as **bradyzoites**.

In an immunocompromised host, tachyzoite replication results in development of focal necrosis, such as necrotizing encephalitis, pneumonitis, or myocarditis. Tissue cysts usually are observed during the chronic or latent stage of infection, causing little, if any, inflammatory response. After ingestion, cysts are broken down by digestive enzymes which release the organisms, allowing them to invade the GI tract where they spread via blood and lymphatics.



Life cycle of *Toxoplasma gondii*:

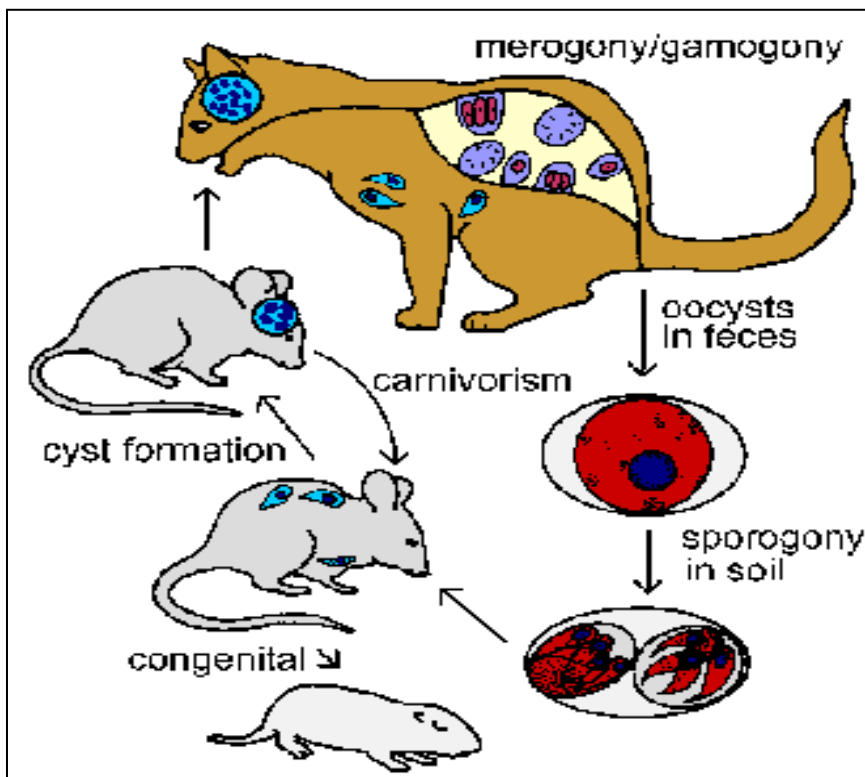
Divided into: Two phases:

a) **Intestinal or enteroepithelial or isosporian life cycle,** The **intestinal** phase occurs in cats only and produces "**oocysts**".

b) **Extra-intestinal or toxoplasma phase**, the extraintestinal phase occurs in all infected animals and produces “**tachzoites**” and eventually “**bradyzoites**”.

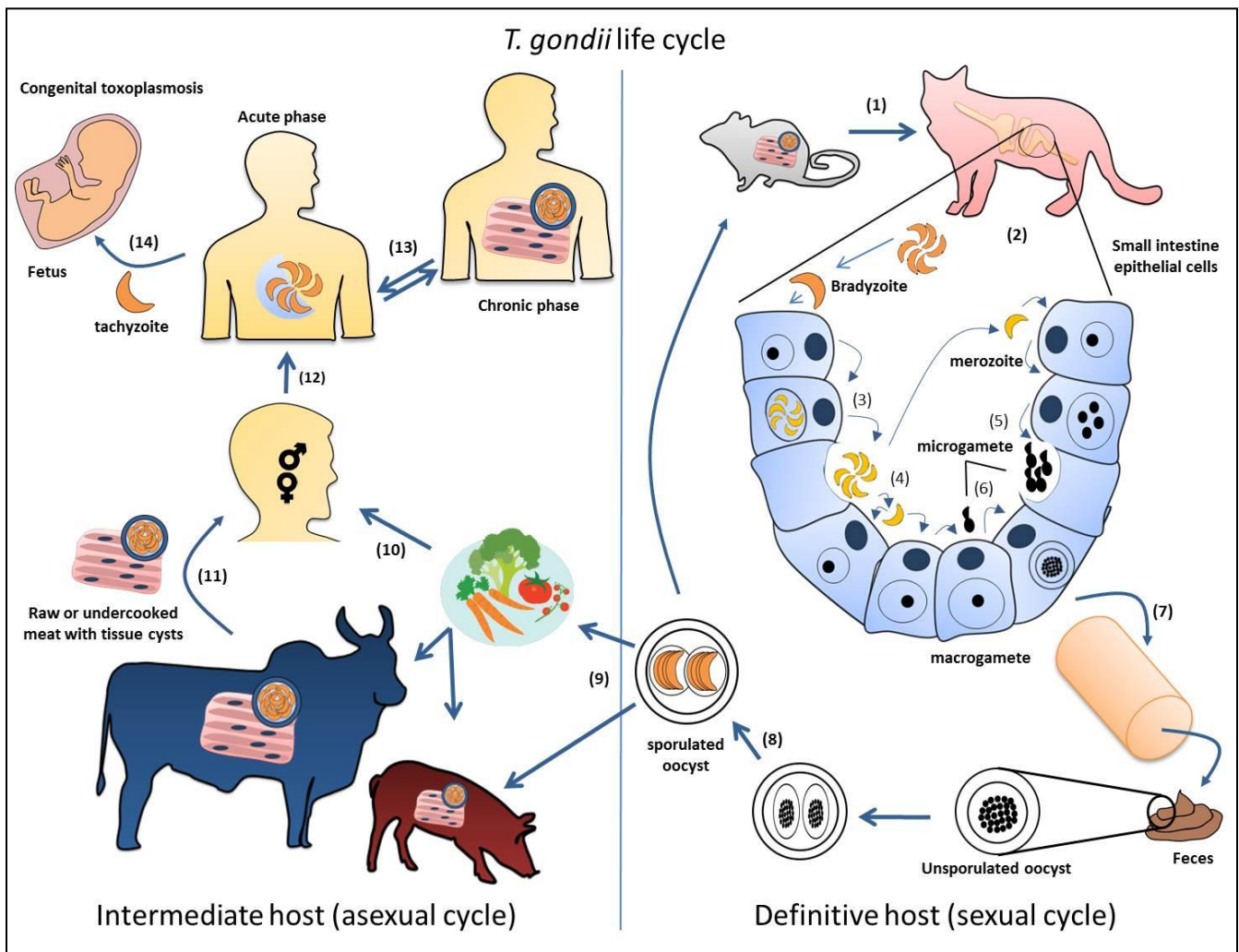
1- Intestinal life cycle: In cat and other felidae family only: they get infection by ingestion of mature oocysts from infected cat; in the small intestine of the cat the **sporozoites** are released. Some of these sporozoites will initiate the isosporian phase (asexual & sexual multiplication) .More or less resemblance to that of *Isospora belli*.

The merozoites will continue one or more **Schizogony** cycle and these continue to form both male and female **gametocytes**, so there will be male gametocyte that will divided a lot of (large number of male gametocytes) while the female gametocyte will form one ovum only. Male gametocyte will fertilize the ovum and form the **zygote** which secrete and surround themselves by a wall to form the **immature oocysts** and then shed out epithelium lining of small intestine and go out with feces to outside where maturation take place (sexual and asexual cycle need 21-24 days). & after maturation the oocysts is ready to infect other cats.



2- Extra intestinal life cycle: While the other **sporozoites** take their way through intestinal wall & go by blood stream. **At acute stage**, they go to paranchymal cell & RES (Macrophage, Neutrophil & Monocytes), in these cells , they divide to form **Tachyzoites** (pseudocyst) contain multiplied asexual (contain 6-16 Tachyzoites & again invade other paranchymal cells or RES with development of immunity, the multiplication of Tachyzoites will ceased down & form **Bradyzoites** surrounded by a cystic wall & contain 50 or more bradyzoites. In chronic stage form in brain, eye, muscle lung of infected cat, & viable for about one year ago to small intestine and release their sporozoites and cause intestinal and extra-intestinal phase maturation the oocysts is ready to infect other cats.

(Cats -----> final host mature oocyst -----> infective stage).



* In chronic s stage **Bradyzoites** is found in brain, eyes, muscle and lung of infected cats and remain viable for 1 year. So, the cat and its family considered as complete host because both (intestinal and extra-intestinal take place in it). If the mature oocyst from the cat is ingested by another host, man, other mammals, birds and reptile they become infected with the parasite of mature oocyst, in the small intestine is ruptured and sporozoites are released. All of the sporozoites will take their way through intestinal wall to any parenchymal and other RES, in the acute stage they will form tachyzoites and in the chronic stage they will form bradyzoites.

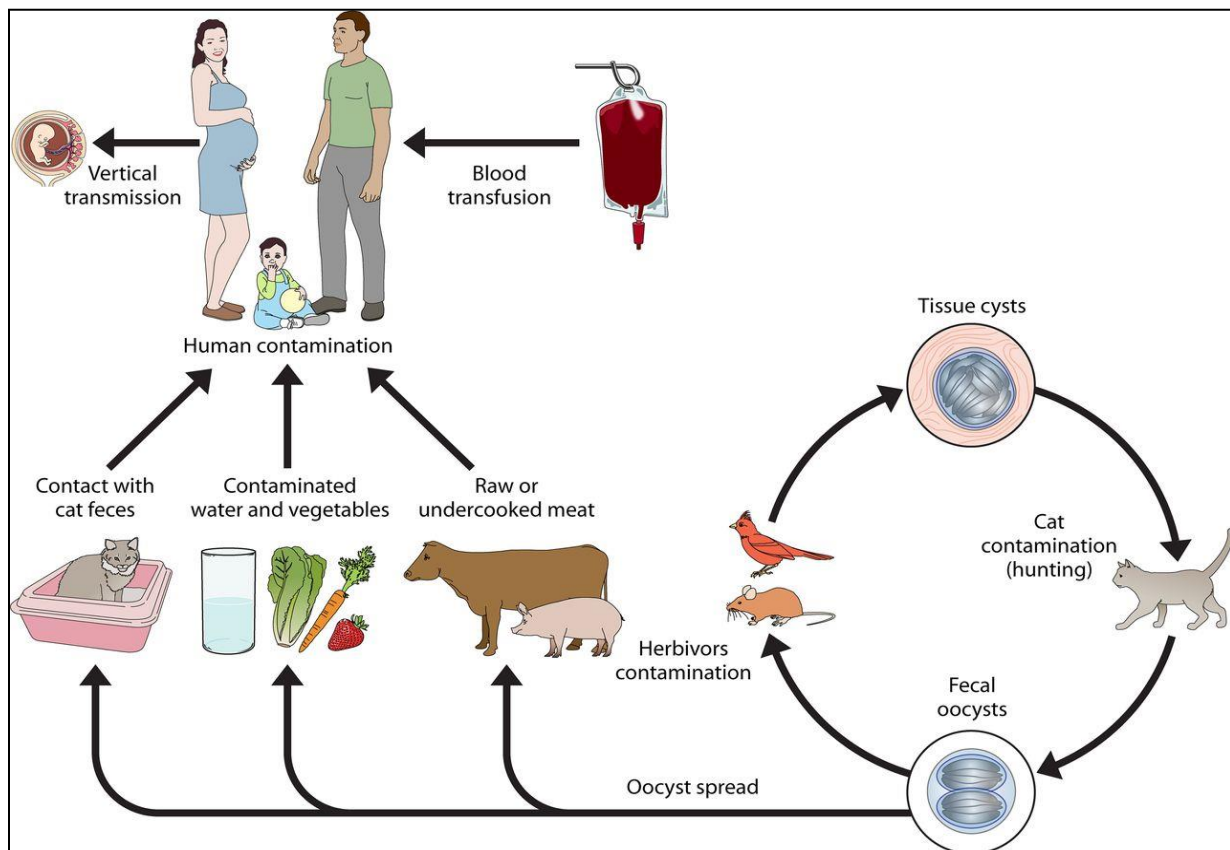
TRANSMISSION OF *T.gondii*

1- Major Routes of Transmission:

- 1- Ingestion of under cooked meat contaminated with *T.gondii*.
- 2- Ingestion of contaminated H₂O.
- 3- Because the parasite can cross transplacentally, so it can infect the fetus from infected mother.

2- Minor Routes of Transmission:

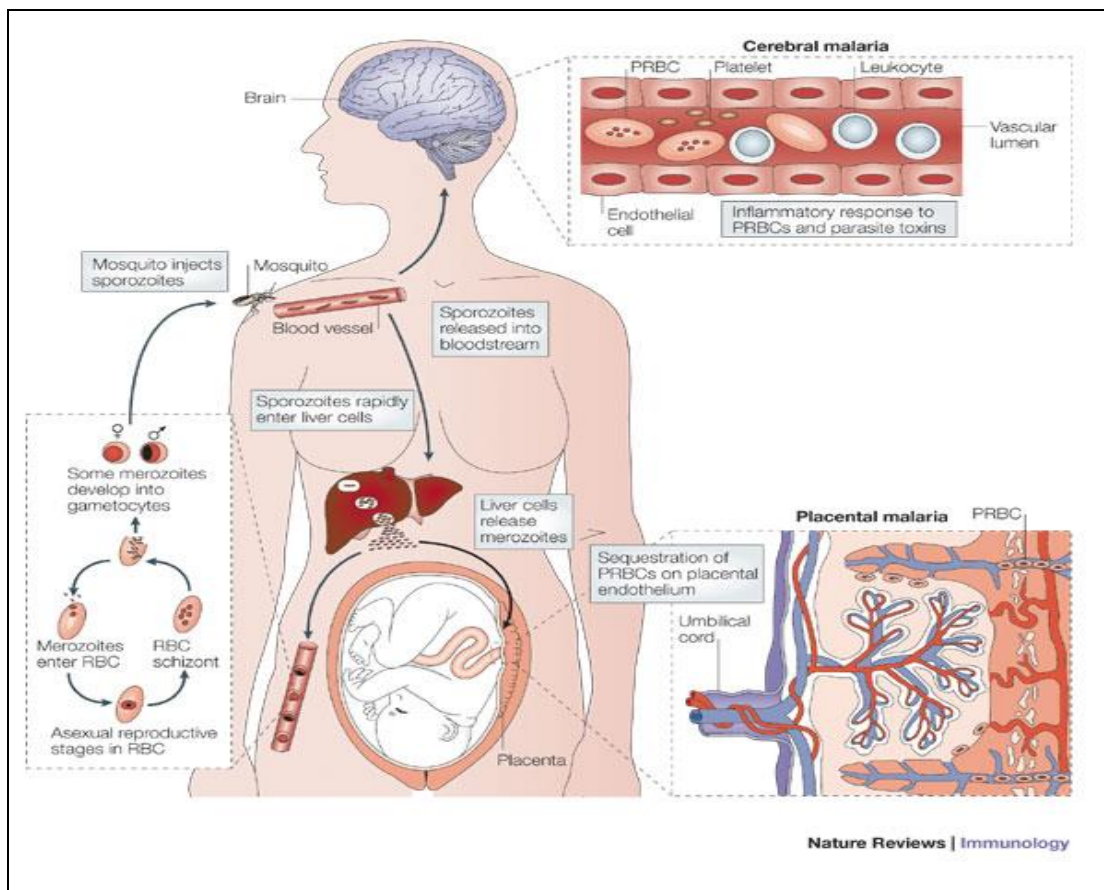
- 1- Blood transfusion from donors to recipient
- 2- Organ Transplantation.
- 3- Drink not pasteurizing milk from infected cow.



Pathogenesis of toxoplasmosis

Most cases of toxoplasmosis in human are probably acquired by the ingestion of either **tissue cysts** with infected meat or **oocysts** in food contaminated with cat feces. Bradyzoites from the tissue cyst & Sporozoite released from oocysts penetrate the intestinal epithelial cells & multiply in the intestine, *T. gondii* may spread both locally to mesenteric lymph nodes to distant organs by invading lymphatic's blood. The clinical picture is determined by the extent of injury to these organs, especially to vital & vulnerable organs, such as eye, heart & adrenals. *T. gondii* does not produce toxins, necrosis is caused by intracellular multiplication of Tachyzoites. Opportunistic toxoplasmosis in AIDS patients usually represents reactivation of chronic infection. The predominant lesion of toxoplasmosis, encephalitis in these patients is necrosis which results in multiple abscesses, some as large as a tennis ball.

Host defenses: The host may die from toxoplasmosis but much more often



recovers & acquires immunity. Inflammation usually follows necrosis. But about the third week after infection, *T.gondii* tachyzoite begins to disappear from visceral tissues may localize as tissue cyst in neural & muscular tissues. The tachyzoite may persist longer in the spinal cord the brain because immune responses are less effective in these organs. Chronic infection may be reactivated locally (for example, in the eye). Reactivation possibly results from the rupture of a tissue cyst. Probably tissue cysts rupture periodically during the life of the host, and the bradyzoites released are normally destroyed by the host immune response. This reaction may cause local necrosis accompanied by inflammation. Hypersensitivity is said to play major role in such reaction; however in immunocompetent hosts the infection usually subsides, with local renewed multiplication of toxoplasma in immunosuppressed patients rupture of a tissue cyst may result in renewed multiplication of bradyzoites into tachyzoites and the host may die from toxoplasmosis.

The cause of cyst rupture is not known. Chronic latent *T. gondii* infection can be experimentally reactivated by:

- 1- Excessive doses of corticosteroids
- 2- Anti-lymphocyte serum
- 3- Other immune-suppressive therapies.

Symptoms: The symptoms are divided into two main groups:

- a- Neonatal (Congenital) Toxoplasmosis
- b- Acquired (Postnatal) Toxoplasmosis

a- Neonatal Toxoplasmosis: If the fetus gets infected transplacentally from asymptomatic mother during 3rd trimester of pregnancy. At acute stage; it may lead sporadic abortion (only one) or still death, at birth or shortly after

that (1-2) weeks, the infant shows signs & symptoms of Sabine's Tetrad & these are:

- 1-Intracerebral calcification
- 2-Retino-choroditis (birth)
- 3-Hydrocephalous
- 4-Microcephalous
- 5-Psychomotor disturbance
- 6-Generalized convulsion

B-Acquired (post-Natal) Toxoplasmosis: 90% of man & animals show no symptoms or signs and the other 10% have the most common forms (4 signs)

a- Lymphadenitis with fever, headache & malacia, the lymph nodes is either superficial or deep mostly the L.N of the neck region, also (1-2 weeks), Splenomegaly, Erythematous rash.

b- Typhus like Xanthomeatus, disease produce Myocarditis, Meningocephalitis, Atypical pneumonia.....death occur.

c- In rare cases, primary involve CNS & death occur.

d- Retino-choraditis of non-congenital infection in which the ocular lesion begins in Retina & spread to the choroid and in sever rare cases it causes enucleation of the eye (one eye) while in congenital it involves both eyes.

Diagnosis:

1-Finding or demonstrating the parasite in body fluids or tissues by microscopically examination of:

a- Stained smear from CSF by leishmanstain (Sporozoite test)

b- Impression smear of L.N, spleen & liverpress on slide & stain.

c- Histological stain smears section, to find pseudo cyst & true cyst.

In(a .staining) the parasite appear Crescentric or fusiform in shape with nucleus of border ends & appear red while total parasite appear blue.

2- Isolation of parasite to find out it from man by animals inoculation. In this case,

a- We use small mice & take three of these laboratory mice & take Toxoplasma colony, and get body fluids of man or ground tissue of man & inoculate them intraperitoneally in mice and then kill the mice and examine by the same methods (stain smear).

b- Impression stain smear, for these (Tissue & also serum)

c- Histology stain smear, examination of the tissue of mice. If we find the parasite of *T. gondii* the patient has it & if the test is -ve, the patient is free from it.

3-Serological & intradermal test by:-

a- Sabin's Feldman dye test.

b -Indirect haemagglutination test (IHA)

c- Indirect fluorescent Ab test

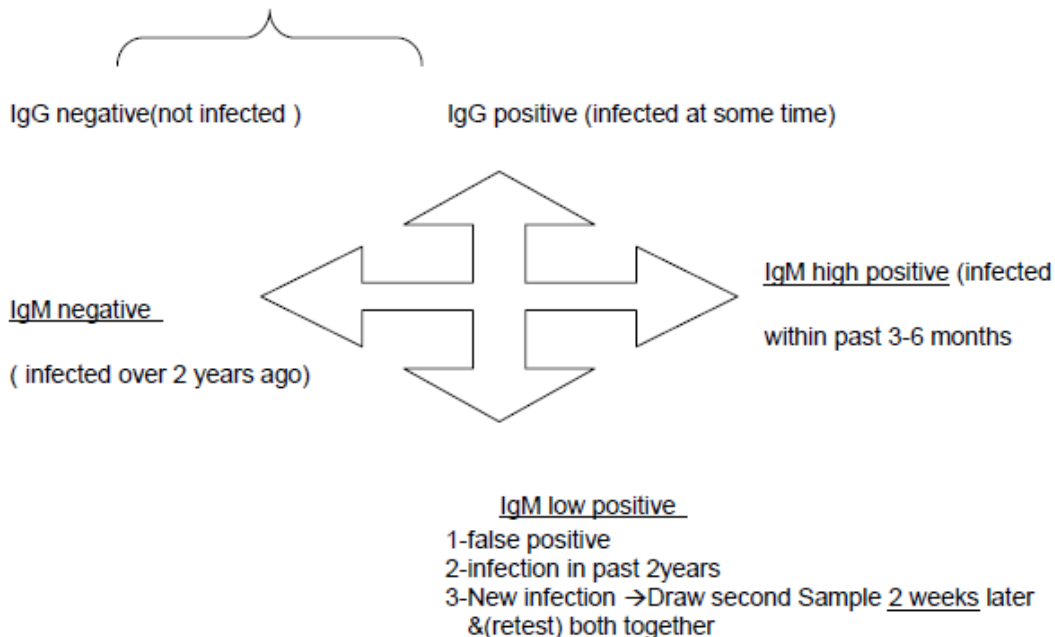
d- ELISA

e- Complement fixation test

f- Latex agglutination test

g-Toxoplasmine skin test

4-Test for toxoplasma – specific IgG Ab



Prevention & Control:

1-Human infection with toxoplasma may come either from consumption or handling of infected meat or from contact with cat feces in litter house or soil.

2-Meat should be heated throughout to (60C) before consumption, hands should be washed with Soap and water after handling uncooked meat.

3-In door cats that feed on dry, canned, or boiled food are unlikely to be infected, where is that can hunt or are feed uncooked food are liable to infection.

4-Such cats litter Paus should be cleaned daily &the Paus disinfected with boiling water.

5- Pregnant women, unless they have evidence of Toxoplasma infection, should avoid contact with cats whose source of food is not controlled & should not empty litter Paus.

6-Disposable gloves should be worn to clean litter boxes or work in soil contaminated with cat feces.

7-Childrens Sandboxes should be made cat proof.