

Tikrit University

College of Nursing

Basic Nursing Sciences



Second Year - 2023-2024

Microbiology

(Toxoplasma gondii)

by: assistant lecturer

Abdullah Musaa Kadhim

Toxoplasma gondii

Learning objectives:

At the end of this lab the students should be able to:-

1. Describe the morphology forms of bradyzoites, tachyzoites, & oocyst.
2. Briefly describe the life cycle of *Toxoplasma gondii*.
3. Identify the laboratory diagnosis of *Toxoplasma gondii*
- 4-List the modes of transmission, prevention and control. Phylum: Apicomplex

Class: sporozoa

The name Toxoplasma is derived from its crescent shape, in Greek (Toxo=Arch , Plasma= shape) .Toxoplasma is an obligate interacellular parasite that causes the disease toxoplasmosis.

Morphology:-Five stages occur in the life cycle of *Toxoplasma gondii* 1-

Tachyzoite

2-Bradyzoite

3-Unsporulated oocyst

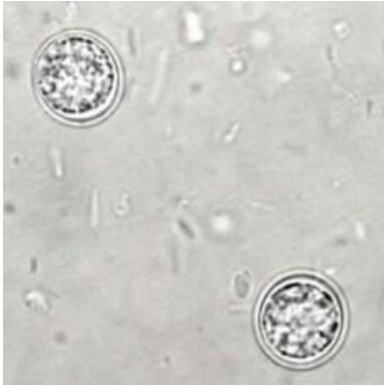
4- Sporulated oocyst

5-Sporozoite

Although all five stages are occur in cats, only two stages are found in human ,other mammals and birds. These two stages are:-

1-Tachyzoite(tachy=rapid also called trophozoite or proliferative form) usually seen during acute infection(asexual stage).

2-Bradyzoite(brady=slow also called zoitecyst or tissue cyst) that is found during chronic or latent infection(asexual stage).



Unsporulated *T. gondii* oocyst in an unstained wet mount

Life cycle:- The life cycle includes two phases:

1-Intestinal or enteroepithelial phase (sexual phase) occurs in cats (as well as other members of felines) and produce oocysts.

2-Extraintestinal phase (asexual phase) occurs in human and warm-blooded animals (including cats) and produce tachyzoites and eventually bradyzoites.

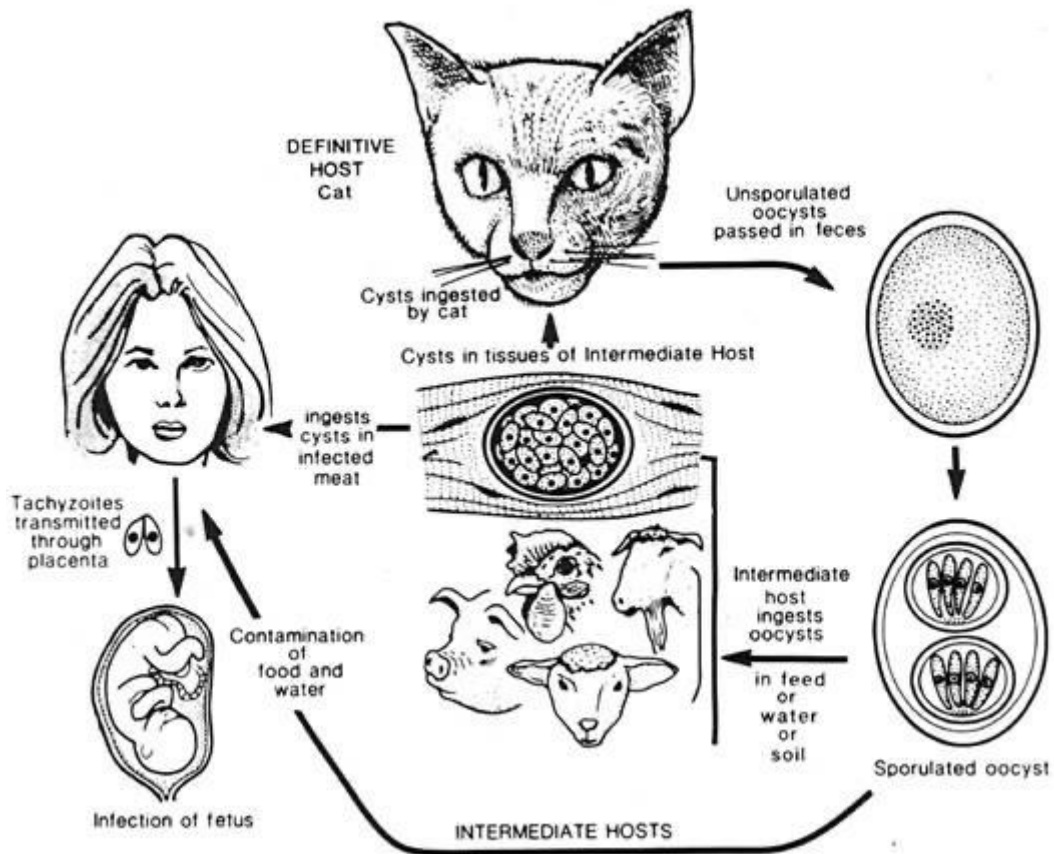
The life cycle is direct if oocyst is the infectious stage and indirect if bradyzoite is the infectious stage. *T. gondii* primarily exists in three forms: sporozoites (in oocysts), tachyzoites (in pseudocysts), and bradyzoites (in tissue cysts). Oocysts are only produced in the definitive host, members of the family Felidae. When passed in feces and then ingested, the oocysts can infect humans (that is an accidental host also intermediate host) and other

intermediate hosts. They develop into tachyzoites, which are the rapidly multiplying trophozoite form of *T. gondii*.

They divide rapidly in cells (Macrophage), causing tissue destruction and spreading the infection. Tachyzoites in pregnant women are capable of infecting the fetus. Eventually tachyzoites localize to muscle tissues and the CNS where they convert to tissue cysts, or bradyzoites. This is thought to be a response to the host immune

reaction. Ingestion of cysts in contaminated meat is also a source of infection, as bradyzoites transform back into tachyzoites upon entering a new host.

Life cycle of *Toxoplasma gondii*



Life cycle of *Toxoplasma gondii*

Diagnosis:- Laboratory diagnosis of *T. gondii* infection may be established by

(1) Detection of the parasite directly in sections of biopsy specimens or in preparations of body fluids (CSF) using histological or immunological staining methods.

(2) Isolation of *T. gondii* from blood, body fluids or tissues from patients by inoculation in mice or tissue culture cells. A Sabin–Feldman dye test:- is a **serologic test** to diagnose for **toxoplasmosis**. The test is based on the presence of certain antibodies that prevent **methylene blue** dye from entering the **cytoplasm** of *Toxoplasma* organisms. Patient serum is treated with *Toxoplasma* trophozoites and complements as activator, and then incubated. After incubation, methylene blue is added. If anti-Toxo antibodies are present in the serum, because these antibodies are activated by complements and lyse the parasite membrane, *Toxoplasma* trophozoites are not stained (positive result); if there are no antibodies, trophozoites with intact membrane are stained and appear blue under microscope (negative result).

(3) Serological methods for the detection of a *T. gondii* specific antibody titre rise in paired sera or for the demonstration of *T. gondii*-specific IgM antibody.

(4) PCR

Transmission:

1- Acquired route

Toxoplasmosis is generally transmitted through the mouth when *Toxoplasma gondii* oocysts or tissue cysts are accidentally eaten.

Transmission may also occur during the solid organ transplant process or transfusion by blood (rare).

2-Congenital route

Congenital transmittance from mother to fetus can also occur. Oral transmission may occur through:

- 1) Ingestion of raw or partly cooked meat
- 2) Ingestion of unwashed fruit or vegetables that have been in contact with contaminated soil containing infected cat feces.
- 3) Ingestion of cat feces containing oocysts: This can occur through hand-to-mouth contact following gardening and cleaning a cat's litter box.
- 4) Ingestion of untreated, unfiltered water through direct consumption or utilization of water for food preparation
- 5) Ingestion of unpasteurized milk and milk products, particularly goat's milk.