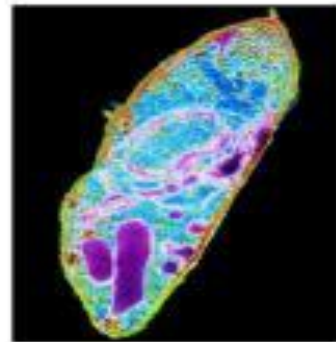
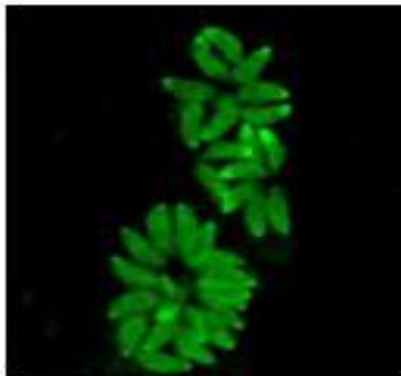


TOXOPLASMOSIS

History of Disease

- Toxoplasmosis gondi was first observed in rodents by Nicolle and Manceuax in 1908.
- Identified as an agent of infectious disease in 1932.
- First case that was document occurred in a congenitally infected infant.
- In 1968 it became recognized as a severe and fatal disease of adults after more cases were found in patients with hematological cancers.
- It then became more widely recorded as a cause of morbidity in immune deficient patients, including AIDS patients beginning in 1983.
- It continues to be an important disease in the modern world, especially in pregnant women and immune compromised patients.



What causes Toxo?

- A single-celled coccidian parasite called *Toxoplasma gondii* causes a disease known as toxoplasmosis.
- Eating undercooked, contaminated meat (pork, lamb, and venison).
- Eating food contaminated by knives, utensils, cutting boards and other foods that have had contact with raw, contaminated meats.
- Drinking water contaminated with *Toxoplasma Gondii*.
- Swallowing the parasite through contact with cat feces that contain *Toxoplasma*. This might happen by cleaning a cats litter box when the cat has shed *Toxoplasma* in its feces.
- Touching or ingesting anything that has come into contact with cat feces that is contaminated.
- Ingesting contaminated soil (e.g., not washing hands after gardening or eating unwashed fruits and vegetables from a garden).

What is Toxo?

- Mother-to-child (congenital) transmission.
- Receiving an infected organ transplant or infected blood via transfusion, though this is rare.
- *Toxoplasma gondii*, being a protozoan, is a small organism that lives inside the cells of the host animal or person.
- Since its discovery it has been found in virtually all warm-blooded animals including most pets, livestock and human beings.

Cause of Toxoplasmosis

- Toxoplasmosis is an infection caused by a single celled microscopic parasite called *Toxoplasma gondi*.
- More than 60 million people in the United States carry the *Toxoplasma* parasite.
- Toxoplasmosis can cause severe illness in infants infected before birth (mothers newly infected during pregnancy) or in in persons with a weakened immune system.
- Cats spread toxoplasmosis when they eat small animals or anything contaminated with feces from another cat that is releasing the parasite.



Cause of Toxoplasmosis

- After a cat has been infected, it releases the feces. The parasite can live in the environment for many months and contaminate, soil, water, fruits, vegetables, sandboxes, grass where animals graze for food, litter boxes, or any place where an infected cat may have defecated.
- People become infected with toxoplasmosis through several ways:
 - Eating food, drinking water or accidentally swallowing soil that has been contaminated with infected cat feces

Raw meat infected with toxoplasmosis

Causes of Toxoplasmosis

- Eating raw or undercooked meat from animals (especially pork, lamb, venison) that have been infected with toxoplasmosis
- Eating food contaminated by knives, utensils, cutting boards and other foods that have had contact with raw, contaminated meats.
- Drinking water contaminated with *Toxoplasma Gondii*.
- Directly from pregnant woman to unborn child when the mother becomes infected with toxoplasmosis during pregnancy.
- Touching or ingesting anything that has come into contact with cat feces that is contaminated.
- Ingesting contaminated soil (e.g., not washing hands after gardening or eating unwashed fruits and vegetables from a garden.



A fetus may contract toxoplasmosis through the placental connection with its infected mother

The mother may be infected by:

Improper handling of cat litter



Handling or ingesting contaminated meat



Signalment

- Can be found in cats of all ages and sex
- More common in adult cats
- In cats there are two tissues that are involved, the lungs and the eyes, whereas in dogs the gastrointestinal, neurologic and the respiratory system are infected.
- Toxoplasmosis infections are rare in dogs.
- Intermediate host is all other warm blooded animals
- Dangerous for pregnant women and unborn fetus as well as people with compromised immune systems

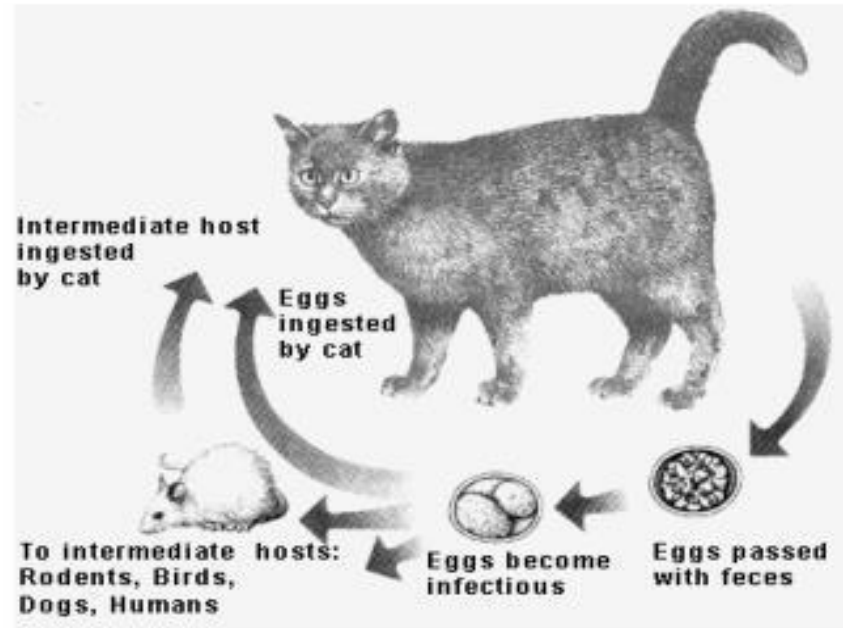
Transmission

- Eating infected meat: Primary source of transmission to humans
- Ingestion of recently infected feces
- Transmission of mother to fetus (it is zoonotic)
- 2 infection stages
 - Latent: bradyzoites in nervous tissue
 - Acute: flu like symptoms
 - swollen lymph nodes (neck, axillae, groin)
 - Pain lasting month or longer

Who is at risk?

- Most species of animals and birds can contract Toxo. Although cats are the definitive host of the parasite.
- People who are most likely to develop severe toxoplasmosis include infants born to mothers who are newly infected with *Toxoplasma gondii* during or just before pregnancy.
- Persons with severely weakened immune systems, such as individuals with HIV/AIDS.
- Those taking certain types of chemotherapy.
- Those who have recently received an organ transplant.

Lifecycle of Toxoplasmosis



Life Cycle - 1

- Life cycle: When a cat ingests an infected prey (or other infected raw meat) the parasite is released into the cat's digestive tract. The organisms then multiply in the wall of the small intestine and produce oocysts during what is known as the intractestinal infection cycle. These oocysts are then excreted in great numbers in the cat's feces. Cats previously unexposed to *T. gondii* will usually begin shedding oocysts between three and 10 days after ingestion of infected tissue, and continue shedding for around 10 to 14 days, during which time many millions of oocysts may be produced. Oocysts are very resistant and may survive in the environment for well over a year.

Life cycle - 2

- During the intrainestinal infection cycle in the cat, some *T. gondii* organisms released from the ingested cysts penetrate more deeply into the wall of the intestine and multiply as tachyzoite forms. These forms then spread out from the intestine to other parts of the cat's body, starting the extraintestinal infection cycle. Eventually, the cat's immune system restrains this stage of the organism, which then enters a dormant or "resting" stage by forming cysts in muscles and brain. These cysts contain bradyzoites, or slowly multiplying organisms.

Lifecycle - 3

- Other animals, including humans, are intermediate hosts of *Toxoplasma gondii*. These hosts can become infected but do not produce oocysts. Oocysts passed in a cat's feces are not immediately infectious to other animals. They must first go through a process called sporulation, which takes one to five days depending on environmental conditions. Once sporulated, oocysts are infectious to cats, people, and other intermediate hosts. Intermediate hosts become infected through ingestion of sporulated oocysts, and this infection results in formation of tissue cysts in various tissues of the body. Tissue cysts remain in the intermediate host for life and are infectious to cats, people and other intermediate hosts if the cyst-containing tissue is eaten.

Clinical signs

- Most primary infections produce no symptoms.
- Time between exposure to the parasite and symptom development is 1-2 weeks.
- Mostly in severely immunocompromised or very young animal.
- Cats: Lung and eye; In muscles : protozoal myositis
- Dogs: GI, neurologic and respiratory

Symptoms

- Most infections produce no symptoms. The time between exposure to the parasite and system development is 1-2 weeks. The disease can affect the brain, lung, heart, eyes or liver.
- Symptoms in persons with otherwise healthy immune systems.
 - Abortion (especially in 1st and 2nd trimester)
 - Fetus can have hydrocephalus
 - Enlarged lymph nodes in the head and neck
 - Headache
 - Mild illness with fever, similar to mononucleosis
 - Muscle pain
 - Sore throat

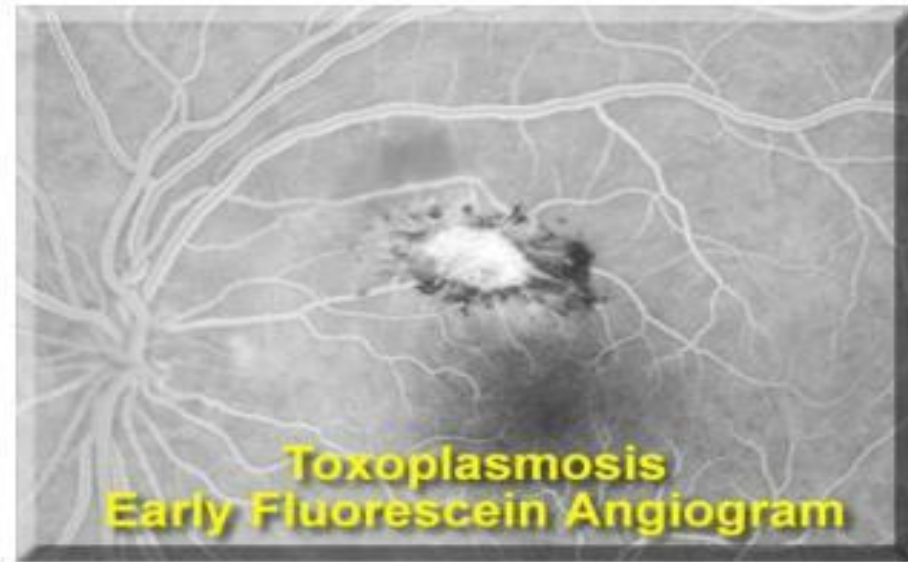
Symptoms

- Symptoms in immune suppressed persons:
 - Confusion
 - Fever
 - Headache
 - Retinal inflammation that causes blurred vision
 - Seizures



Diagnostic tests and expected results

- Antibody titer for toxoplasmosis
- Fecal examination for toxoplasma oocysts
- Cranial CT scan
- MRI of head
- Slit lamp exam
- Brain biopsy
- ELISA
- Fulton test
- Indirect Fluorescent Antibody test



Recommended treatment

- No treatment is required for a healthy person, symptoms go away within several weeks to months.
- Sulfadiazine and Pyrimethamine are used in the acute state of toxoplasmosis.
- In difficult cases spiramycin is used
- Clindamycin is the treatment of choice for dogs/cats.
- Antibiotics do not destroy the infection. It is an infection you live with the rest of your life.

Prevention

- Wash your hands with soap and water after exposure to soil, sand, raw meat or unwashed vegetables.
- Cook your meat thoroughly
- Wash and/or peel all fruits and vegetables before eating them.
- Wear gloves when gardening or handling sand from a sandbox. Wash hands well afterwards.

Prevention

- Avoid drinking untreated water especially in less developed countries.
- If you are pregnant:
 - Have someone else change your litter box if possible. If not then wear disposable gloves and wash your hands thoroughly.
 - Change the litter box daily because the parasite does not become infectious until 1-5 days after it is shed in the feces.
 - Never feed a cat raw meat.
 - Keep indoor cats indoors.
 - Avoid stray cats, especially kittens.