

Toxoplasmosis—A Zoonotic Threat to Human Beings

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Abstract

*Toxoplasmosis is a congenital as well as postnatally acquired zoonosis characterized by retinochoroiditis and encephalitis. It causes abortion in pregnant women. Mostly it affects immune compromised individuals particularly very young and very old women. The major sources of human infection are ingestion of raw or lightly cooked meat containing live *Toxoplasma gondii* tissue cysts and ingestion of raw or lightly cooked vegetables contaminated with oocysts or exposure to oocysts derived from cat faeces. Feral cats are recognized as a significant reservoir whereas sheep and goats are the main nonfeline reservoir. The occurrence and prevention of this disease in animals and human are narrated in the article.*

Keywords: *Toxoplasmosis, zoonosis, abortion, women*

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INTRODUCTION

The word 'zoonoses' (zoonosis singular) was coined by a German physician Rudolf Virchow in 1885. The World Health Organization's Committee defined zoonoses as "Those diseases and infections which are naturally transmitted between vertebrate animals and man". At least 40 different diseases can be transmitted from pets to people. They may be acquired from direct contact with infected animals or from the animal's excreta. Infected pet can cause illness to humans sometimes just by breathing the air in the vicinity of man [1].

There is close association between domestic animals and human population (rural, urban, agricultural workers, veterinarians and butchers) and our binding towards pets is so great which leads to transmission of zoonotic diseases from animals to human beings.

Two thirds of the domestic animals are reservoirs for many zoonotic diseases. The incidence of zoonotic diseases depends on the number of infected animals, route of transmission, level of interaction between man and animals and existing preventive and control measures.

Two most important diseases transmitted to humans from cats are Toxoplasmosis and Rabies. Toxoplasmosis, a zoonotic disease causing abortion in women is discussed here in detail.

DEFINITION

Toxoplasmosis is a congenitally and postnatally acquired zoonosis, caused by *T.gondii*, an intracellular protozoan parasite. It is characterized by retinochoroiditis and encephalitis, and abortion in pregnant women (especially at first trimester). In animals, it causes abortion especially in sheep. It poses a well-publicized threat to human health, especially to pregnant women, and is also a significant pathogen in immune compromised individuals. The causative organism is transmitted by contact with, and ingestion of, material contaminated with cysts or oocysts, especially food or water.

DISEASE IN ANIMALS

The major source of infection is cat faeces or food and water contaminated with faecal matter. The definitive hosts for *T. gondii* in which it can complete its life cycle and produce sexual oocysts are the cats, either wild or domesticated [2, 3]. Feral cats are recognized as a significant

reservoir because they hunt and consume rodents carrying the disease.

Cats shed between 3 and 810 million of oocysts per infection in a period of 8 days on average, although this can be extended up to three weeks [4]; these become infective after a period of 24 h, and can remain infective under suitable environmental conditions for more than a year. Sheep and goats are the main nonfeline reservoir, especially pregnant or perinatal ewes, and their unpasteurized milk or cheese derived from the milk can be contaminated with the organism. Infection in sheep arises from grazing on pasture contaminated with cat faeces. Any other animal then infected, acts as an intermediate host [5].

TRANSMISSION

Faecal–Oral Route

- Ingestion of meat containing cysts or tachyzoites or ingestion of oocysts.

- Ingestion of food materials and water contaminated with faeces of animals.
- Eating of under cooked meat or raw meat containing cysts.
- Ingestion of raw milk.
- Ingestion of sporulated oocysts in the soil contaminated with faeces of animals.
- Experimental studies demonstrated that in soil, sporulated oocysts remain infectious over a period of 18 months depending on humidity, temperature and exposure to direct sunlight [6, 7].

LIFE CYCLE

1. Unsporulated oocysts are shed in the cat's faeces. Although oocysts are usually only shed for 1–2 weeks, large numbers may be shed. Oocysts take 1–5 days to sporulate in the environment and become infective.
2. Intermediate hosts in nature (including birds and rodents) become infected after ingesting soil, water or plant material contaminated with oocysts.

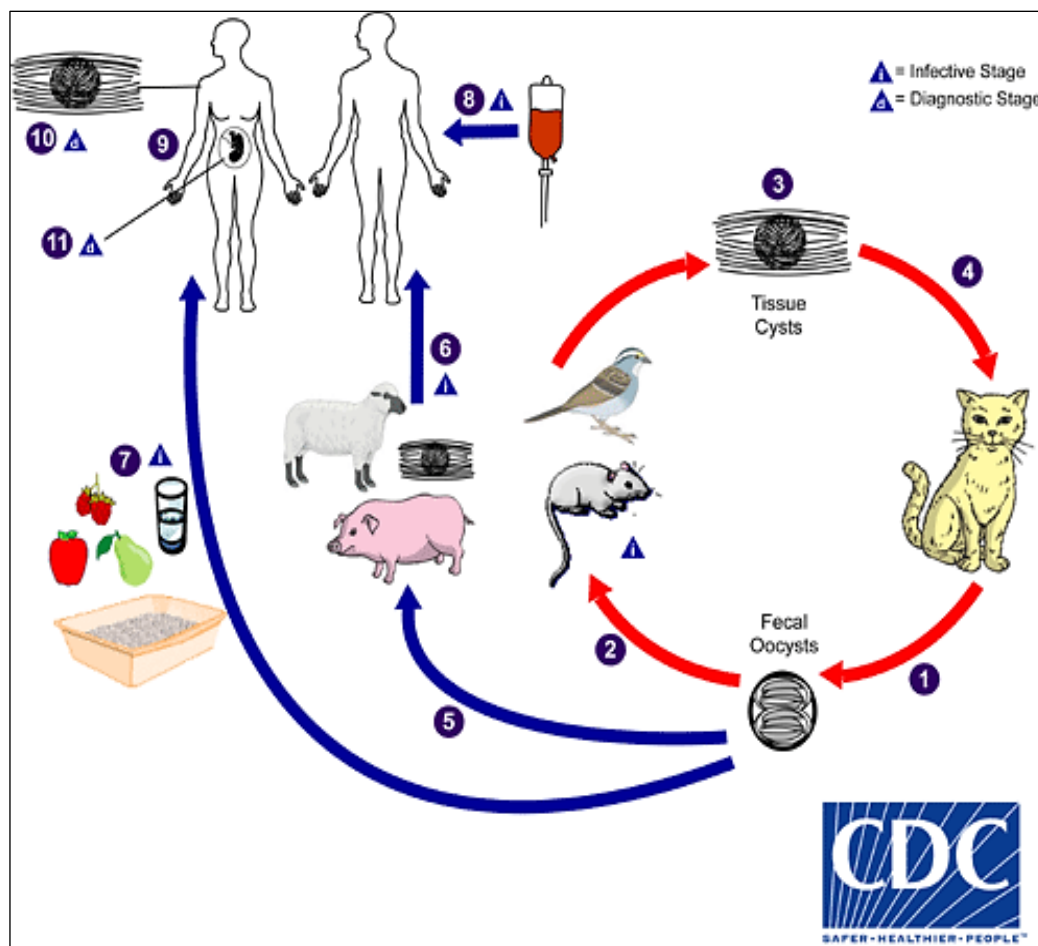


Fig. 1: Life cycle of *Toxoplasma* infection.

3. Oocysts transform into tachyzoites shortly after ingestion. These tachyzoites localize in neural and muscle tissue and develop into tissue cyst bradyzoites [8].
4. Cats become infected after consuming intermediate hosts harboring tissue cysts. Cats may also become infected directly by ingestion of sporulated oocysts.
5. Animals bred for human consumption and wild animals may also become infected with tissue cysts after ingestion of sporulated oocysts in the environment.
6. Humans can become infected by any of several routes:
 - Eating undercooked meat of animals harboring tissue cysts.
 - Consuming food or water contaminated with cat faeces or by contaminated environmental samples (such as faecal-contaminated soil or changing the litter box of a pet cat). Blood transfusion or organ transplantation.
 - Transplacental from mother to fetus.
7. In the human host, the parasites form tissue cysts, most commonly in skeletal muscle, myocardium, brain, and eyes; these cysts may remain throughout the life of the host. Diagnosis is usually achieved by serology, although tissue cysts may be observed in stained biopsy specimens.
8. Diagnosis of congenital infections can be achieved by detecting *T.gondii* DNA in amniotic fluid using molecular methods such as PCR.

DISEASE IN MAN

T. gondii readily infects human beings; however clinical illness is relatively uncommon. Those particularly at risk of developing clinical illness include pregnant women, as the parasite can pose a serious threat to the unborn child if the mother becomes infected for the first time while pregnant, and individuals who are immunosuppressed, such as tissue transplant patients, AIDS patients, patients with certain types of cancer and those undergoing certain forms of cancer therapy. These individuals are at risk of developing acute lethal infection if left untreated [3].

The very young and very old are more susceptible. On occasions, people with no apparent immune deficiency may develop an

illness characterized by general malaise, fever and lymphadenopathy. The most likely sources of human infection are ingestion of raw or lightly cooked meat containing live *T. gondii* tissue cysts [9–11], ingestion of raw or lightly cooked vegetables contaminated with oocysts or exposure to oocysts derived from cat faeces, such as may be encountered in gardens and children's sand pits. Toxoplasmosis is now also recognized to be a water-borne zoonosis. This method of transmission occurs where water treatment is ineffective or non-existent and there is a sizeable local field population that contaminates surface water with oocysts. Linked to this there is now also an appreciation that sea mammals are becoming infected by waters from contaminated land and from untreated urban sewage.

Clinical signs include fever, skin eruption, malaise, myalgia, arthralgia, cervical lymphadenopathy, pneumonia, myocarditis, meningoencephalitis and chorioretinitis.

DIAGNOSIS

- Serology with paired sera.
 - Indirect fluorescent antibody test
 - Sabin-Feldman dye test (most sensitive test, but rarely used)
 - ELISA
 - Complement fixation test
 - Latex agglutination test
 - Toxoplasmosis skin test for epidemiological studies.
 - Faeces floatation technique to identify oocysts. The demonstration of cysts does not establish a causal relationship to clinical illness, since cysts may be found in both acute and chronic infections. However, only finding tachyzoites in blood or body fluids confirm active infection.
 - TORCH test for the diagnosis of toxoplasma, rubella, cytomegalovirus and herpesvirus.

PROTECTION FROM ZOONOTIC DISEASES OF PETS

- OIE recommends to avoid eating raw or under cooked meat [12].
- Freezing of meat to -20°C for 2 days or -15°C for 3 days kills cysts.
- Cooking of meat to 60°C kills cysts.

- Acquire pets only from a reliable dealer who practices good sanitations.
- Do not attempt to take wild or sick animals or monkeys as pets.
- Keep your pets clean and properly housed.
- Practice good hygiene.
- Wash hands thoroughly after playing with or handling your pets.
- Wash hands after cleaning the cage or aquarium as well as after handling an animal or pet treats and before handling food or eating.
- Pregnant women should avoid cleaning of cats (carriers for toxoplasmosis) and its faeces and cages to avoid contacting of toxoplasmosis.
- Do not let it lick your face.
- Keep pet's utensils separate.
- Keep pets out of people's bed.
- Health education to the public should be given highest priority.
- The high risk group should be protected by administration of specific immunization.
- Infected pets and the areas where the pets commonly reside should be treated with appropriate insecticides for fleas, ticks, mites and their larvae.

CONCLUSION

Toxoplasmosis is a congenitally acquired zoonosis and also recognized as a water-borne zoonosis. It causes abortion in pregnant women and animals particularly in sheep. Hence hygienic management practices need to be followed to prevent the occurrence of this disease both in human and livestock.

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