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Review subject: Toxoplasma gondii

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Abstract

Toxoplasma is one of the most distribution in the world and occurs in numerous ways either as a result of eating mature eggs through water or vegetables contaminated with animal residues, or because of eating meat containing cyst stage , and in rare cases through blood transfusion or organ transplantation, In addition, the infection is transmitted from the mother with toxoplasmosis to her fetus for the first time during pregnancy. The most serious infection is congenital infection. (Dupont,etal.,2012(. Toxoplasmosis is one of the most important parasitic diseases caused by many health problems in both humans and animals. It can lead to abortion or congenital defects in the fetus and may affect the nervous system and affect the vital functions of the brain (pedersen, etal., 2012).

Key words : Toxoplasma ,Toxoplasmosis

Introduction

TOXOPLASMA GONDII It was discovered in 1908 by Nicolle and man ceaux, where it was isolated from gondi rats liver in Tunisia. In 1923, the first case of congenital malformations (cerebral ascites) was recorded in children, while the full knowledge of his life cycle was not fully known before 1970. Ling,etal..,(2011).

Phases of parasite

Trophozoites

Its measurement is about / 3-7 / micron, and its shape is crescent, oval or curved and one of the ends of the parasite is rounded, while the other end is an accurate sharp consisting of a cone from which fibers come out (it is useful in the process of access through tissues or cellular penetration) the nucleus is spherical placed near From the rounded end with a central nuclear body, it is seen within the cytoplasim , mitochondria, the Golgi device, the rough endoplasmic reticulum and the dark granules Montoy and Liesenfeld(2004).

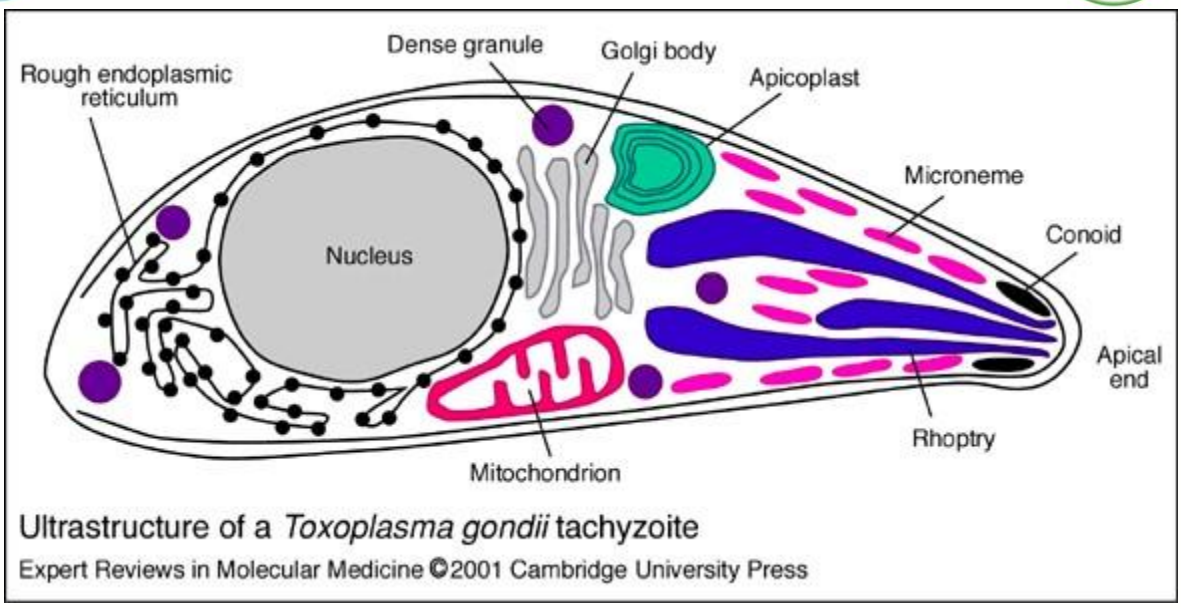


Figure (1) trophozoite

Cysts

You are seen inside the host's tissue cells and you may see inside the macrophage . We can distinguish with the following types of cysts

1- pseudo cysts
Watch at the end of the acute stage of the infection , measures about (10_100) microns
The pseudo cyst are formed by the parasite multiplication within a cell with the cell nucleus remaining. (Abdul Latif, 2003) These cysts are stained with ACID Schiff.

2-The true cysts

It formed in a response to the humoral and cellular immune mechanisms that occur in the host's body, where the trophozoite are aggregation to gather gather inside a membrane that it is produced by itself that protects it from the immune responses of the host, the cyst membrane has the same composition of the surface antigen of the parasite , the cyst contains several hundred and sometimes thousands of the trophozoite, which are compressed, into each other, consisting of spores. (Jones,etal, 2001)

Tissue Cysts:
The slow trophozoiute develop in the tissues to form the tissue cyst and it has a circular shape in the central nervous system and longed in the skeletal and cardiac muscles, and measures about (100 - 200) microns.
These cysts do not destroy the cell and continue within them the slow trophozoit and develop to the chronic stage, and the tissue cyst are infection stage that transport by the carnivores animal to humans, containing a number of slow trophozoite that exists in hundreds and thousands sometimes (Qassas Abdul Latif, 2003).

These tissues are stained with silver dye and killed with gamma rays and a temperature> 61 ° C for 4 minutes and with (-20)° C for 14 hours .

3-OOCYSTS

It has an oval shape and measures about (10-12) microns, located inside the mucous cells of intestinal of definitive host, and the oocysts contain sporozoit . Mature within 2-3 days under 24°C and 14-21 days under 4°C and remain infected for 18 months in wet soils, they are highly environmentally resistant as they are taken by animals or humans for permanent presence there. (Jones,etal, 2001).

Infection methods

1) Oral: Eating food contaminated with the feces of infected cats, which contain oocytes , which release from it in the human body sporozoite that maturation into trophozoit , Also, infected and uncooked meat, especially sheep meat and pork, while beef is less dangerous, as it contains pseudo cysts which release from it trophozoit , as wellas toxoplasma are isolated from the eggs. (paul,July1999).

Direct contact: With infected cats, especially contact with the feces of these cats. (Lymphadenopathy, etal., 2012_7_24)

3) Congenital: transferring the infection from the infected mother to the fetus and congenital toxoplasmosis occurs. (Dubey, etal., 2006).

4) Hematogenous: blood transfusions (where the parasite multiplies inside phagocytes) or after organ transplants (such as the liver, kidney, heart).

Parasites remain in the blood supplemented with citrate at 4°C for about 50 days, and infection is transmitted by whole blood transfusion or leukocyte transfusion (Randall, 2003). The infection may be transmitted from patients to health workers such as laboratories (inside the laboratory).

life cycle:

1) Asexual life cycle (in human):

This parasite is transmitted to humans in one of the following ways:

• The trophozoites or sporozoites (according to the method of transmission) turn inside the human body into trophozoite that multiply asexually (binary division) in a number of cells and they divide every 6 to 8 hours and develop inside a cytoplasmic vacuole When the cell is full, it dissolves and releases the trophozoites to infect other cells. (Klaus, etal., 2003).

Trophozoites are transmitted through the bloodstream from phagocytes to various areas of the body (wang, etal., 2009).

2) Sexual life cycle (in cats)

Cats are infected by:

A- Ingestion of oocysts containing sporozoites.

b - Swallowing tissue cysts when they prey on infected mice and birds.

The sporozoites attack the epithelial cells of the intestinal mucosa in cats where they transform into fast anthills, which in turn multiply to form the schizont, which multiply to form merozoites which in turn infiltrate the host's tissues. Wang, etal.., (2009)

Sexual reproduction begins with the union of the male and female gametocyte to form the zygote, which falls into the intestine and gives the oocyst, which after maturation gives two sporocysts containing four sporozoites (Laliberte and carruthers, (2008)).

The oocytes are expelled after 20-24 days of infection, and the expulsion of the oocytes continues for 1-3 weeks, and the number of oocytes excreted daily with the faeces is estimated at 10 million, which become mature after 1-3 days at a moderate temperature spent in the soil and water, and these oocytes can remain Several months are capable of causing infection under good environmental conditions (Toxoplasmosis,etal.,2004).

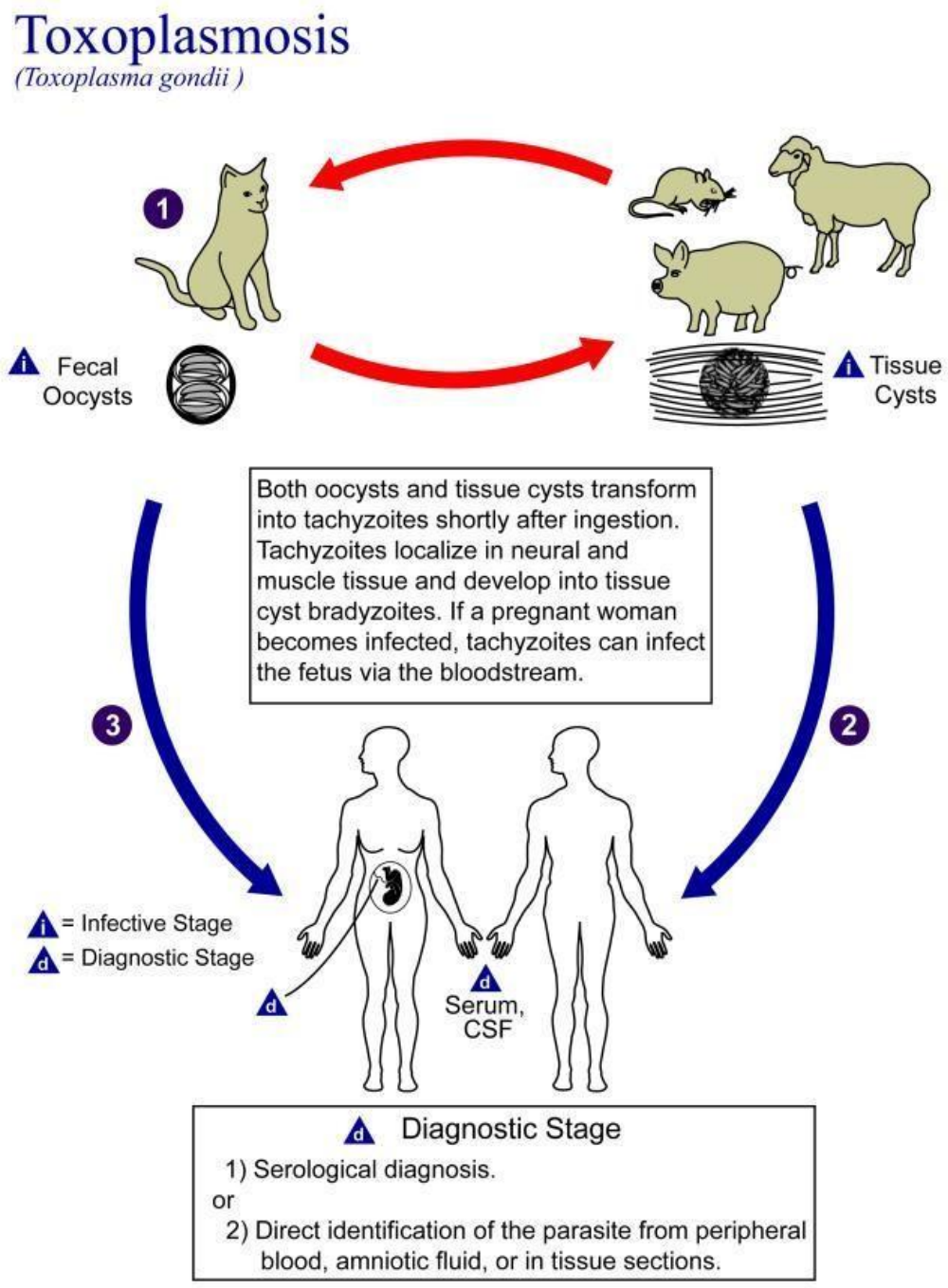
Pathogenesis:

The pathogenesis of toxoplasmosis is explained by the passage of the parasite through different tissues and the presence of pseudocysts within these tissues, and the accompanying inflammatory process, necrosis, insertions and infiltrations of inflammatory cells such as plasma cells and mononuclear cells.

(Jones and Dubey, 2012) The previous changes are accompanying the presence of pseudocysts in the heart, lung and kidney, but they occur especially in the muscles of the nervous system in addition to the lymph nodes and the eye. (North caroline etal.

The phagocytes in the lymph nodes are the first line of defense that the infectious forms encounter and through them they can go to different places and various tissues in the host (heart - lung - kidney - muscles - nervous system - eye - lymph nodes) 0 (parasites, etal., 2011).

If a necrotic focus of the placenta forms with pseudocysts, it can cause congenital sepsis resulting in miscarriage and rarely stillbirth or severe neonatal injury (Sterkers, etal., 2011).



Life cycle of *Toxoplasma gonidii*

Epidemiology:

The disease comes in either an individual form or an epidemiological form, and its danger lies in the fact that many infected individuals or animals may carry the parasite, but they do not show symptoms of disease except when a decrease in the level of immunity occurs in the body, and the so-called relapse occurs, and the acute form of the disease appears. (Cook, etal., 2000) These parasites have a global spread due to their presence in migratory birds, and no cases were recorded in

Antarctica, about a third of people were infected with this parasite, but few of them showed symptoms. (Cook,etal.,2000).

In addition to humans, reptiles, mammals and about more than (200) species of birds are infected, and the infection was observed in 50% of births in Western Europe, and the percentage in the humid tropics reaches 100% and less than that in the dry desert areas. (Boblc, etal., 1998)
The percentage of cats that secrete oocysts is estimated at 1%, where cats shed millions of infected oocysts a few days after they are infected for the first time, so young kittens are considered more infected than the elderly. (Jones,etal.,2009)
Sepsis is prevalent in humans and warm-blooded animals all over the world, where the seroprevalence in some areas reaches 80%, and increases with age. Congenital infections are observed in some areas in 3 / 1000 births.

The distribution of toxoplasmosis in most countries of the world is due to several factors, including:
1- The final host (cats): It is known that the cat family includes many species, and it has been found that toxoplasmosis oocysts are present in more than 17 species, and all cats include domesticated cats, wild cats, lions, tigers and leopards. (John and Robert,2002)
It was found that 75% of cats carry antibodies to toxoplasmosis, and the highest rate of infection is found in feral cats and those in rural areas. Ovo sacs are excreted from infected cats after the first infection in large quantities that may reach one hundred million oocysts from one cat. (John and Robert,2002). The initiation of oocyte from infected cats depends on the cause of infection. If the infection is by pseudocysts, the secretion of oocytes begins after 18-49 days and continues for ten days. If the infection is by oval sacs, it begins with secretion after 3-10 days and continues for twenty days.

If the infection occurs in the trophozoit , although this is rare, it begins with secretion after 15-17 days and continues for seven days. (Sukthana, 2006). Various insects such as flies, ants, and cockroaches, as well as air currents and rain, play a major role in contaminating human and animal food and the transfer of oocytes from one place to another and in large areas. It was found that only ten oocytes are sufficient to cause infection in th intermediate host, while at least 100 cysts are required to cause infection in the final host. (Kankovas, etal., 2007).

Pseudocysts and intermediate hosts: One of the main reasons for the spread of the disease in cats is the large number of intermediate hosts , especially mice, which are the main reservoir for Toxoplasma, due to the spread of predation among mice, where they eat each other, and infection occurs in them through the mucous membranes as well as the stomach, And often, the pseudocysts of Toxoplasma are not affected by the digestive juices in the stomach, and it was found that the pseudocysts in different meats are able to withstand refrigeration at a temperature of -4 ° C for a period of up to three weeks. While it does not bear more than one week at -8 ° C. (Johnand Robert,2002)
It was also found that it is not affected by the microwave, but it is quickly affected by the heat, so only four minutes are sufficient to kill the pseudocysts at a temperature of 67 degrees Celsius. The medium for transmission of infection, and

these various sources of transmission of infection reflect the extent of the impact of the geographical distribution of livestock on the rate of infection in humans per country. (Boblc, etal., 1998) we find that human infection with the disease is always related to the infection of domestic pets such as cats, as well as it was found that there is a relationship between infection of dogs and rabbits in homes and infection in humans, although the explanation of that relationship is not clear. It was also found that there is no clear difference in the rate of infection between males and females, and the percentage of human infection with acquired infections increases in ages over 20 years, especially in rural areas. Serological examination also shows that antibody levels are high in veterinarians, slaughterhouse workers, and farm workers. (Kankovas, etal., 2007). Clinically

Clinically, according to the course of the disease, the injury is divided into the following forms:

1_ Acute form:

Infection is often asymptomatic and is affected by the age of the host (older is more immunized), the virulence factor of the Toxoplasma strain, and the degree of host immunity. The incubation period is 5-18 days.

It may present with: lymphadenopathy and enlargement of the lymph nodes in about 5% to 100% of cases, especially the cervical nodes and to a lesser extent the inguinal and subclavian. It constitutes 3-7% of all clinical lymphadenopathy, and in general, it is three times more common in females. (Dalimi and Abdoli, 2011)

- Fever, headache and muscle-articular pain.

Less commonly:

o Intermittent abdominal pain with nausea and vomiting.

o Hepatosplenomegaly, rash and sore throat.

o An increase in the number of atypical lymphocytes of less than 10% of the total lymphocytes.

o An ocular injury in the form of unilateral retinopathy and choroiditis, while a double injury occurs when the infection is congenital.

Symptoms resolve spontaneously without the need for treatment in people with natural immunity. In immunocompromised patients, such as:

• Those taking immunosuppressive drugs.

• Children with congenital immunodeficiency.

• AIDS patients (the seroprevalence rate is 5-40% in the United States and has reached 96% in some European countries).

• Premature babies (the seroprevalence rate may reach 96% in Europe).

In these people, the infection is significant and may develop into encephalitis (1-5% of AIDS patients) or an eye or lung injury, and this disease is currently considered the first fatal disease for AIDS patients. (Wabster and mcconkey, June 2010)

2_ Chronic form:

After primary infection, the parasite is permanently present throughout life in the lymph nodes and central nervous system without clinical symptoms. (Wabster, may2007)

3- relapsing form:

When immunosuppression occurs, parasite activation occurs, which manifests clinically as encephalitis, and in healthy immune patients, activation may be associated with retinal and choroidal inflammation. (Montoya,etal..)

Toxoplasmosis and pregnancy

Toxoplasmosis in pregnant women:

Most cases of maternal infection are mild or asymptomatic, about 10-20% of pregnant women with severe toxoplasmosis show some clinical signs such as: localized lymph node enlargement

Rarely, pregnant women present with symptoms of chorioretinitis as a result of acute infection acquisition or due to reactivation in case of chronic infection (Crazy, etal., 2012_2_18).

In pregnant women who are not immunosuppressed, if the mother was infected before the current pregnancy (at least 6 months), there is no actual risk of transmission to the fetus, but if the infection occurs during pregnancy, the fetus is at risk regardless of whether the mother is accidental or not. As for pregnant women who are immunosuppressed, there is a risk of reactivating the latent infection and thus the risk of transmitting it to the fetus. (Animal planet, 2012_3_1

The percentage of vertical transmission increases with the increase in gestational age. In contrast, the clinical manifestations are more severe in fetuses that acquired infection early during pregnancy. (Fox and stuart, 2010) in some previously prevented pregnant women (lgG +) when histological cysts are present in the endometrium, they may activate during pregnancy, which explains the reversal seropositivity and the occurrence of infection and the increased risk to the fetus. (Crazy, etal., 2012_2_18

Congenital Toxoplasmosis

Occurs only if infection occurs for the first time during pregnancy, it can lead to severe harm to the fetus even in the event of asymptomatic progress in the mother (Korte and travis, 2012)

The risk to the baby varies depending on when the infection occurred during pregnancy:

• First trimester: the parasite is rarely crossed through the placenta (4-15%), but the manifestations are severe and are represented by: miscarriage or severe clinical symptoms in the newborn such as hydrocephalus with calcific foci, enlargement of the liver and spleen, neurological injuries, and unilateral or bilateral eye injuries such as retinitis and choroiditis. (Kathleen, march2012)

• The second trimester: the parasite transmission rate is higher and clinical manifestations are lower.

• The last trimester: the parasite's crossing is common across the placenta (60%) with complete absence of symptoms in the newborn or symptoms of little clarity and intensity. (Merritt, etal., 2011).

In 90% of cases, the child is asymptomatic and may develop it only after 20 years, or retinitis and choroiditis, deafness, epilepsy, or psychomotor delay, hence the importance of serological monitoring during pregnancy.

Prevention of toxoplasmosis

There are many studies conducted on vaccinating cats to prevent the formation and secretion of oocysts, using (T.263), which is a mutagenic parasite of slow-breeding bradyzoites. These studies have given good results, but it has not yet been determined the length of the immunity that is formed in cats. Also, there are Several experiments are under study to immunize farm animals in order to reduce the harmful effects of the disease on them and thus prevent the spread of the disease in humans. (Elmore, etal., April_2010

Primary prevention:

In humans:

1. Health education, especially in rural areas and among those who deal with cats, as well as taking great care among workers while dealing with animals or meat, especially pregnant women among them.
2. Cook meat well, especially grilled meat, bearing in mind that smoked meat or meat soaked in salt water or dried remains susceptible to infection .
3. Do not drink milk until after it has been boiled .
4. Paying attention to the rules of public health, such as washing hands well after touching cats or raw meat, as well as washing vegetables and fruits well. (Torrey, etal., 2012)
5. Automatically get rid of insects that may transmit disease to human food, such as flies and cockroaches.
6. Clean drinking water and its sources such as canals and rivers, and not throwing dead animals into them, especially cats.
7. Wash all utensils used for preparing raw meat with soap and water.
8. Wear gloves when doing gardening or touching soil, and after finishing, wash hands well. (Torrey and yolken 2007)

In cats and animals:

1. Getting rid of stray cats and not allowing them to roam among the herds of different animals.
2. Rodent control.
3. Taking care of the cleanliness of cats in homes and not providing them with uncooked meat, as well as taking care of the veterinary and periodic examinations on them.
4. Get rid of cat feces in homes directly without delay.

5. Isolation of aborted animals and safe disposal of aborted fetuses, membranes and fetal fluids.
6. Work to get rid of insects that may automatically transmit disease to animal feed.
7. Conducting a comprehensive survey with the various serological tests of animals, especially sheep and goats. (Torrey,etal., 2012)

Secondary prevention:

1. Conducting the necessary tests to detect infection with this parasite in pregnant women.
2. Treatment of infected cases.
3.Treatment of infected cats (members of the feline family) and avoid contact with them during pregnancy for those who are not contraindicated.
4. Taking care of meat by killing the parasite in it either by freezing it or by exposing it to a temperature >60°.)

5. Conducting studies on the spread of this parasite in livestock. (Torrey, etal., 2012).

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