

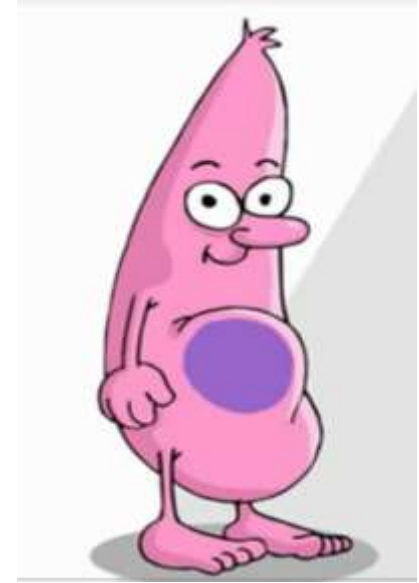
TOXOPLASMOSIS



Toxoplasmosis

- Is a disease of cats as well as other mammals and birds. It is important as all warm-blooded animals, including man, can become infected with it.
- Caused by a parasite called *Toxoplasma gondii* (*T. gondii*).
- Toxoplasma infection is common & is wide world distribution
- Domestic, wild, & feral cats can transmit toxoplasma infection to humans.
- This parasite infect large number of the vertebrates host including man , mammals, birds and reptile (has very low host specificity)
- Vertebrates are the **intermediate host**
- Domestic cat and other felidae are the **definitive host**
- Habitual: epithelial cells of small intestine or other tissue of the host.

Toxoplasma



Phylum: Apicomplexa

Class: Sporozoa

Subclass: Coccidia

Genus : Toxoplasma

➤ *Toxoplasma* is an obligate intracellular parasite.

➤ Its life cycle includes two phases called :-

1- **Intestinal (or enteroepithelial)** which occurs in cats only (wild as well as domesticated cats) and produces "oocysts."

2- **Extraintestinal phases:-** The extraintestinal phase occurs in all infected animals (including cats) and produces "tachyzoites" and, eventually, "bradyzoites" .

Cellular stages :-

During life cycle ,individual parasites convert into various cellular stages with each stage characterized by a distinct cellular morphology ,biochemistry ,and behavior ,these stages include:-

- 1- **Oocysts** (containing sporozoites), which are shed in the cat feces .
- 2- **Tachyzoites**, rapidly multiplying organisms found in the tissues.
- 3- **Bradyzoites**, slowly multiplying organisms found in the tissues .
- 4- **Tissue cysts**: walled structures, often found in the muscles and central nervous system (CNS), containing dormant *T. gondii* bradyzoites. It can remain infectious for weeks in body fluids at room temperature, and in meat for as long as the meat is edible and uncooked.

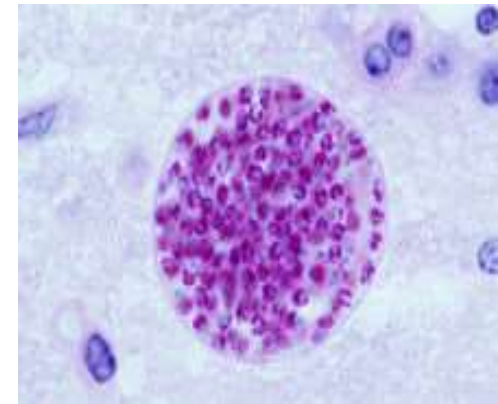
Name of disease: Toxoplasmosis

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...etc) this found in fresh passed stool sample . The immature oocysts will develop sporoblast and the mature oocysts have 2 sporocysts each with 4 crescentric sporozoites.



b) **Tachyzoites with pseudocyst:** 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 sporozoites.



c) **Bradyzoites with true cyst** contain large number of 50 or more, it is present in chronic stage of the parasite.

Toxoplasma gondii FORMS

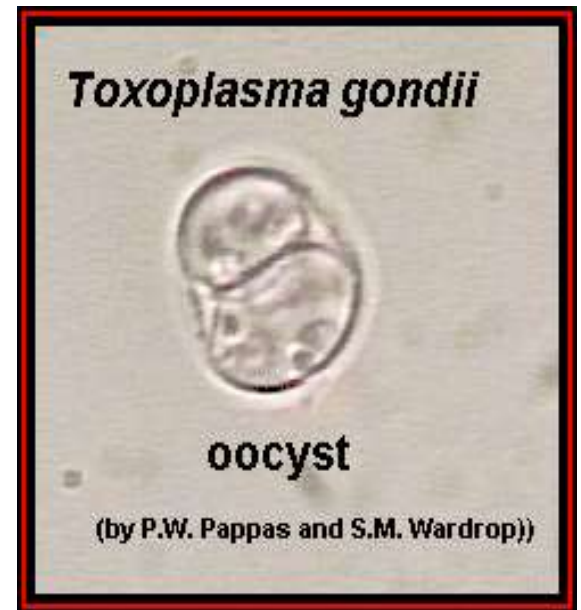
- TACHYZOITES
- BRADYZOITES
(TISSUE CYSTS)
- OOCYSTS



Oocysts- Only members of the cat family shed oocysts. Cats become infected by **ingesting** either **oocysts** from fecal contamination or **tissue cysts** present in flesh of eaten animals.

Oocysts are highly resistant to environmental conditions and can remain infectious for as long 18 months in water or warm, moist soils. They do not survive well in arid, cool climates.

Oocysts are formed as a result of fertilization between male and female gametocytes and are found in the epithelial cells of the intestines of definitive host. They are oval and 10-12 μm in diameter



- Sporozoite crescent shaped with one pointed end and the other rounded end, and measure approximately 3-7 μ m
- It released from the ingested oocysts, invade epithelial cells of the intestinal tract of the host
- Disseminate via blood and lymph to most of the organs.



- Invade all mammalian cells except nonnucleated erythrocytes and are found extracellularly as well as intracellularly in various organs.
- Multiply in a host cell by a process known as endodyogeny or internal budding.
- The rapidly proliferating sporozoite, as known as tachyzoites.
- The sporozoite are either eliminated by the immune system of the host or by a drug or they are transformed into cysts.

Life cycle

A. Sexual cycle in Cat (Intestinal phase)

□ Cats become infected by ingesting:-

i. Oocysts from fecal contamination.

ii. Tissue cysts present in flesh of eaten animals.

In the small intestine of the cat the sporozoites are released. Some of these sporozoites will initiate the (asexual & sexual multiplication). The sporozoites will continue one or more schizogony cycle and these will continue to form both male and female gametocytes, so there will be male gametocyte that will divided a lot of (large number of male gametes) while the female gametocyte will form one ovum only. Male gamete will fertilize the ovum and form the zygote which surround themselves by a wall to form the immature oocysts and then shed out of epithelium lining of small intestine and go out with feces to outside where maturation take place.

Both of (sexual and asexual cycle need 21-24 days) . Once outside of the cat body, sporogony occurs for up to (2-5 days), resulting in the development of infectious oocysts.

B. Asexual cycle in Man & Animals (Extra-intestinal cycle):

The Infective stage for man:

sporozoites, comes from three forms:

1. Sporozoites within mature oocyst:

- This is found in feces of cat and other feline.
- each with 4 crescentic sporozoites.

2. Tachyzoites within pseudocyst:

It is found in the acute stage of the parasite in any reticuloendothelial system or parenchymal tissue of mammals,

3. Bradyzoites:

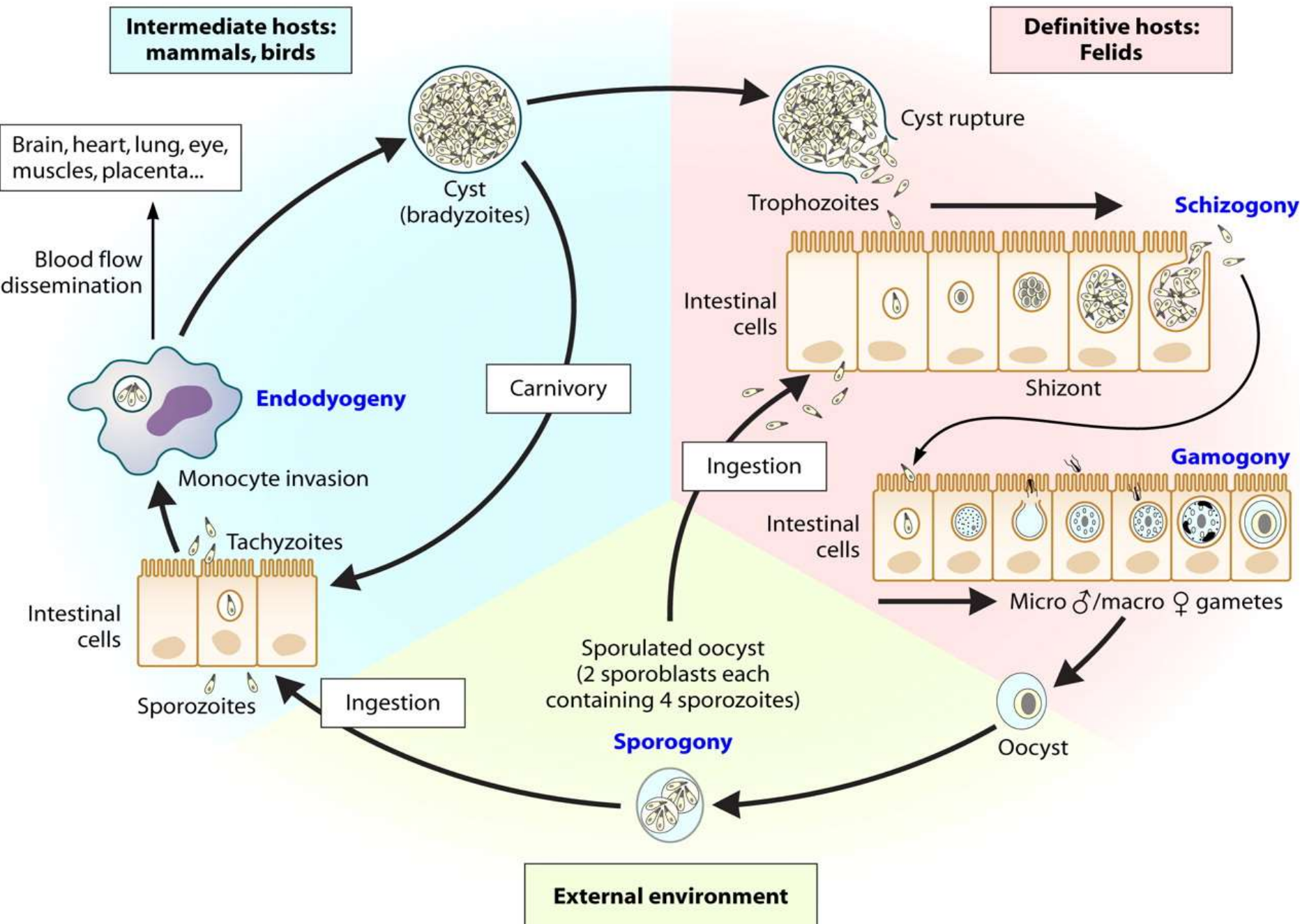
Within true cyst contain ,it is present in chronic stage of the parasite.

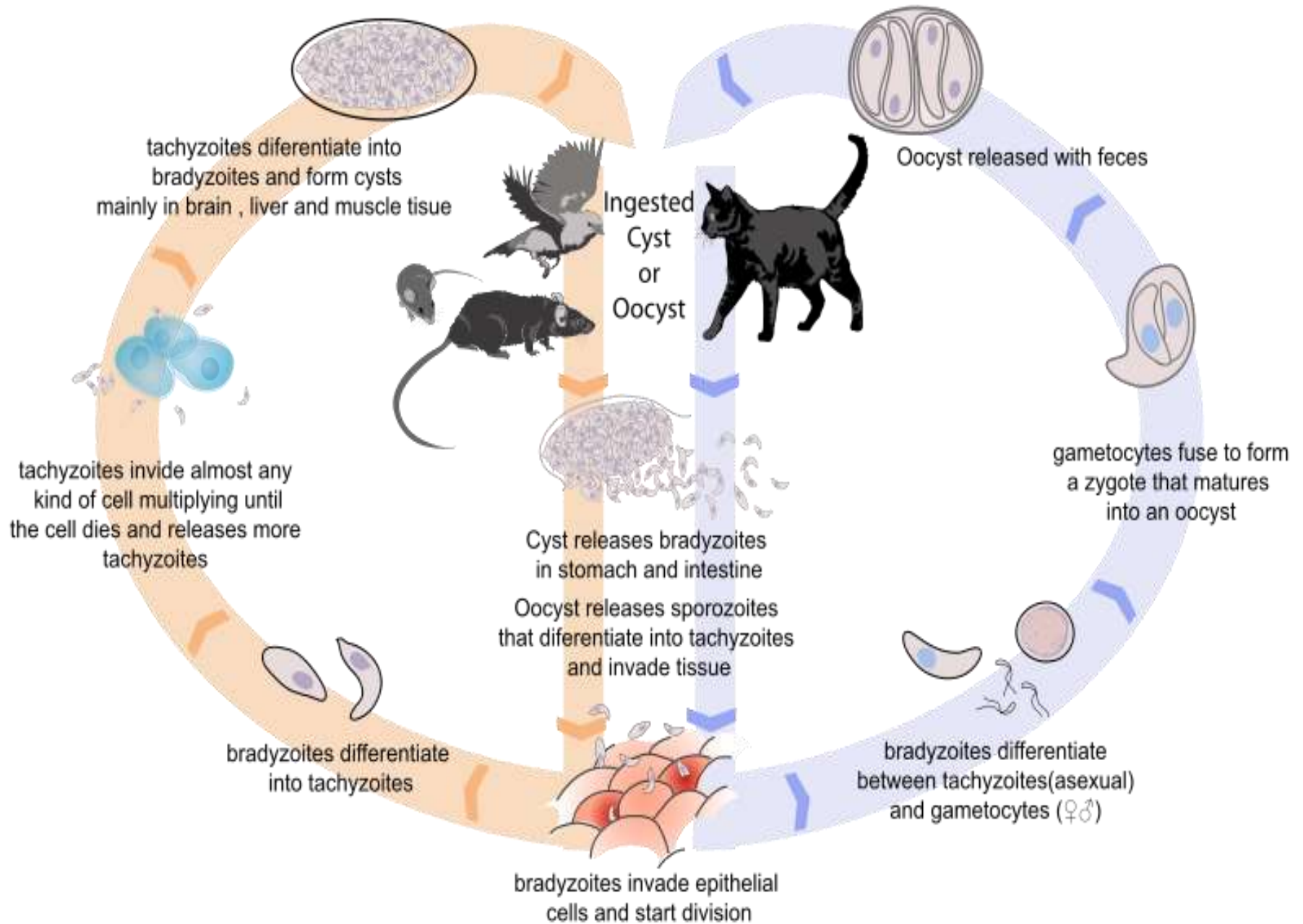
Extra intestinal life cycle:- it starting by other sporozoites take their way through intestinal wall & go by blood stream, At acute stage ,they go to paranchymal cell & RES (Mcrophage, Neutrophil & Monocytes), in these cells , they divide to form **Tachyzoites** (pseudocyst) contain multiplied asexual (contain 6-16) & again invade other paranchymal cells or RES with development of immunity this usually occur in the acute stage.

The multiplication of Tachyzoites will ceased down & form **bradyzoites** surrounded by a cystic wall & contain 50 or more) in chronic stage form in Brain ,Eye, muscle Lung of infected cat, & other mammalians , it viable for about one year .

Mature oocyst **of** undercooked meat cow and sheep containing true and pseudocyst, = infective stage

Enter the intermediate host (man & other mammlian = rapture = Liberation of sporozoites = sporozoites penetration of to epithelial cells of intestine and traveled various organs of the body such as brain, heart, liver, muscle then will develop of both tachyzoites & then bradyzoites





The cat and its family considered as complete host because both (intestinal and extra-intestinal take place in it). In case of man and other mammals are called incomplete host because only asexual life cycle occur

Major Routes of Transmission:

1. Ingestion of under-cooked meat contaminated with *T. gondii* (cyst stage, pseudocyst or true cyst).
2. Ingestion of contaminated food or water (oocyst).
3. Transplacental transmission from mother to fetus, when *T. gondii* is contracted during pregnancy.

Minor Routes of Transmission.:

1. Blood transfusion from donors to recipient
2. Organ transplantation.
3. Drinking of non-pasteurized milk from infected cow

Pathogenesis:

1. Congenital Toxoplasmosis

- Focal lesion develop in the placenta.
- The infection is firstly generalized, later the parasite is cleared from the viscera and localizes mainly in the CNS & eye.
- Ocular Lesion start by proliferation of parasite and retina inflammation lead to “Retinochoroditis”

Severity is dependent on :

- Protective immunity of the mother.
- Age of the fetus at the time of infection

Infection during pregnancy lead to:

- Loss of the fetus (abortion or still birth).
- Full Term baby with complication (hydro or microcephaly)



Pathogenesis

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

Sign & Symptoms:-

Most adult cases are asymptomatic

The symptoms are divided into two main groups:

a-Neonatal (Congenital) Toxoplasmosis

b-Acquired (Postnatal) Toxoplasmosis

a-Neonatal Toxoplasmosis: If the fetus get infected transplacentally from asymptomatic mother during 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 ,these are:

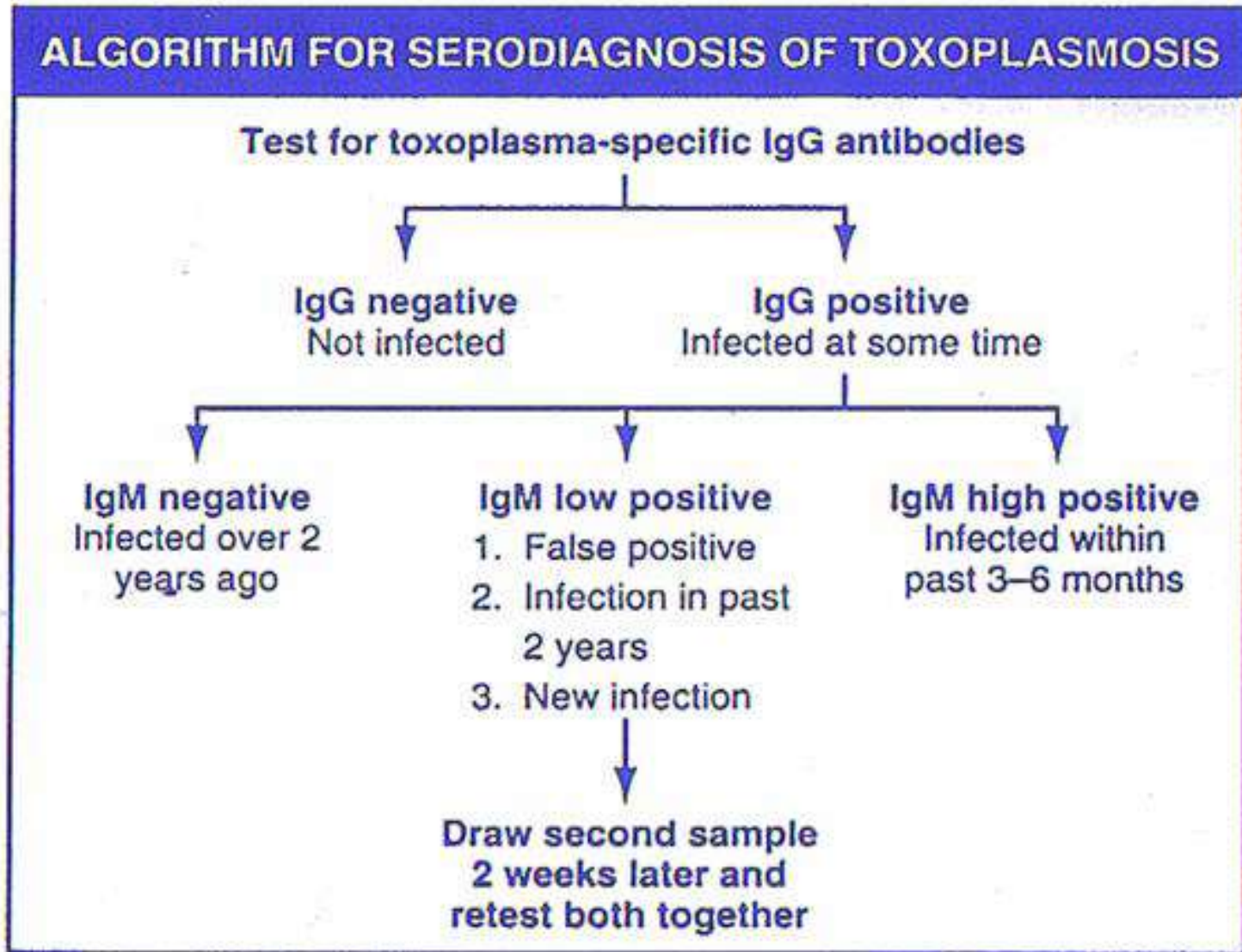
- 1-Intracerebral calcification
- 2-Hydrocephalous
- 3-Microcephalous
- 4-Generalized convulsion

b-Acquired (post-Natal) Toxoplasmosis

Acquired (post-Natal) Toxoplasmosis: 90% of man & animals, show no symptoms or signs and the other 10% have the most common signs Lymphadenitis with fever, headache, the lymph nodes is either superficial or deep & mostly the L.N of the neck region, also **after** (1-2 weeks) , Splenomegaly, Erythematous rash & in rare cases , primary involve CNS & death occur

Diagnosis :

1. Serological tests – IHA, IFA, ELISA (IgM/IgG)



2. Microscopic Examination

Diagnosis can be made by direct observation of the parasite in stained slide from biopsy of bone marrow, lymphoid or spleen.

3. Animal Inoculation

Control :

1. Avoid undercooked meat & proper cooked meat
2. Proper washed of fruits and vegetables before consumption.
3. Prevent exposure of pregnant women to infection
4. Screening of pregnant women for Toxoplasma antibodies.
5. Avoid contact with materials contaminated with cat feces, handling cat litter boxes.
6. Wear gloves during gardening.