

## Introduction

*Toxoplasma gondii* is a protozoan that lives in the nucleated cells of wild and domestic mammals and birds; cats are its definitive host <sup>(1)</sup>.

It is an obligate intracellular parasite that resides in a latent form in the human central nervous system. Infection with *Toxoplasma* drastically alters the behaviour of rodents and is associated with the incidence of specific neuropsychiatric conditions in humans <sup>(2)</sup>.

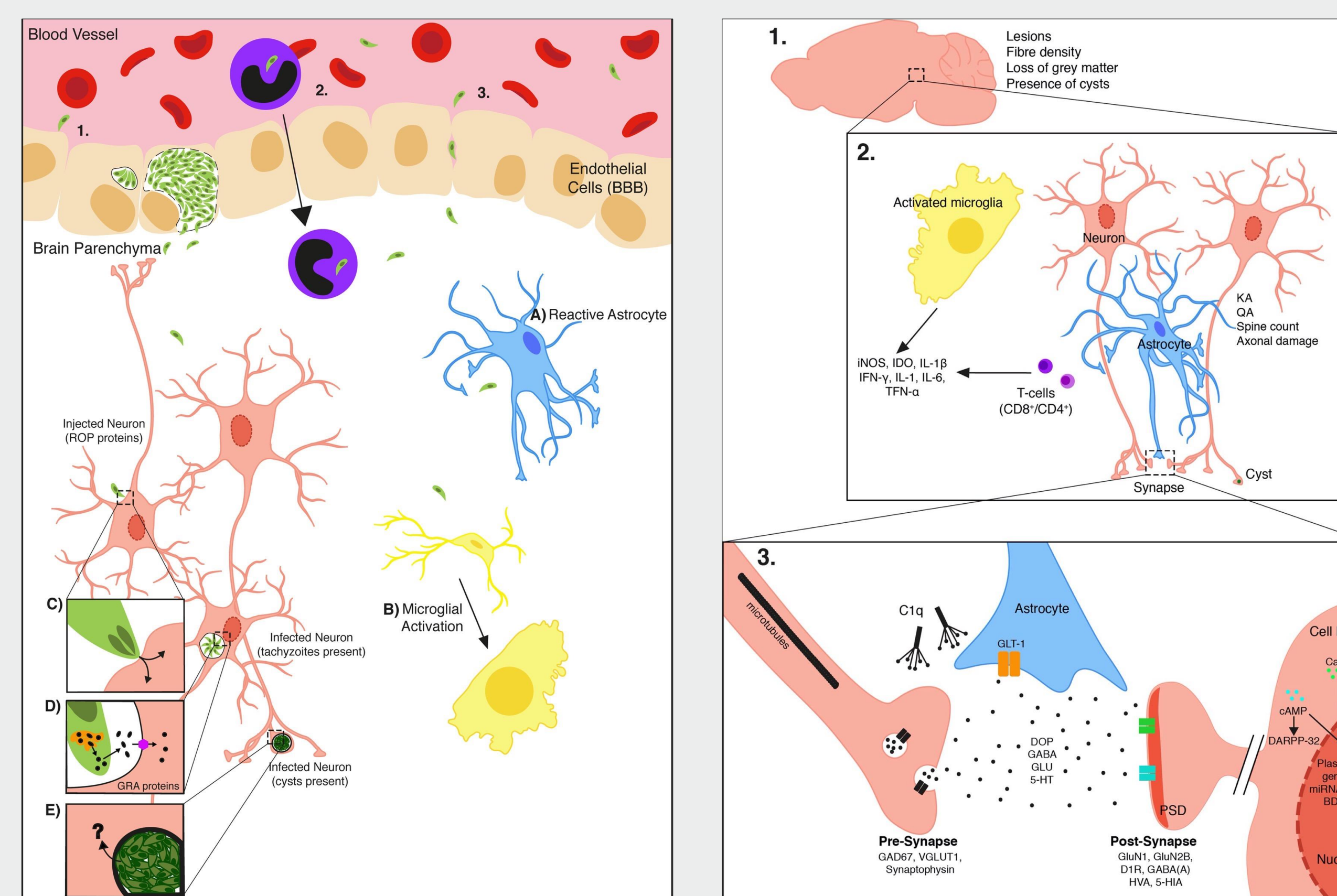
It is usually acquired by ingestion of cysts in uncooked meat or in food accidentally contaminated by cat feces, and its lifecycle is shown in figure(1).

The disease caused by *T. gondii* is called **toxoplasmosis** including congenital toxoplasmosis.

The infection after birth is most commonly asymptomatic or may cause a mild non specific flu-like illness<sup>(1)</sup>.

## Factors alter brain activity

Alteration of the brain activity in *T. gondii* infection is multifactorial, including the parasites, immune system and neurotransmitter effects as shown in figure(2,3) respectively.



Figure(2): the parasites effect on brain <sup>(2)</sup>.

Figure(2): the immune system and neurotransmitters effect on brain <sup>(2)</sup>.

## Behavioral changes of other parasites

Some parasites can manipulate their hosts' behaviour in a way that can increase their transmission into its definitive host, for example:

- *Plasmodium* infection makes humans more attractive to mosquitoes.
- *Rabies* increases aggression which is thought to aid more biting.
- Infection by parasitic worm *Echinorhynchus truttae* increases the respiratory rate of the fishes, forcing them into regions where they can be preyed upon <sup>(2)</sup>.

## Treatment & Prevention

Congenital toxoplasmosis is treated with a combination of sulfadiazine and pyrimethamine.

While acute toxoplasmosis in an immunocompetent individual is usually self-limited, but any patient with chorioretinitis should be treated <sup>(3)</sup>.

Prevention is by avoiding contamination with infected cat feces.

## Behavioural changes due to toxoplasmosis

The personality profiles of *Toxoplasma*-infected humans has revealed several changes in their psychology.

- Based on gender, infected men were found to be more suspicious and jealous, and had higher tendency to disregard rules. While infected women were more easy going and warm hearted than there uninfected counterparts. Further, both genders showed reduced novelty-seeking behaviors.
- Some studies have linked *Toxoplasma* infection to depression and epilepsy especially in pregnant women.
- Performance worsened proportional to the levels of anti-*Toxoplasma* antibodies.
- Increased incidence of road traffic accidents.
- Some studies have found an increased association between *Toxoplasma* antibody titer and homicide and suicide attempts.
- Higher seropositivity among prison inmates <sup>(2)</sup>.

## Conclusion

*Toxoplasma* infection has many effects on different parts of the body including the brain. And it is well known that contact with cats is the major cause of this infection, but do not be afraid that much of cats, but rather make sure to cook the meat well before eating it or feeding your cat with it.

## References

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- (2) Tyebji, S., Seizova, S., Hannan, A. and Tonkin, C. (2018). Toxoplasmosis: A pathway to neuropsychiatric disorders. *Neuroscience and Biobehavioral Reviews*, 96, pp.72-82. <https://doi.org/10.1016/j.neubiorev.2018.11.012>
- (3) Levinson, Warren. *Review of Medical Microbiology and Immunology*. 14<sup>th</sup> ed. The McGraw-Hill Companies, 2008. Chapter 52. Page (438-440).
- (4) Family Medicine and Community Health. (2017). *Toxoplasma gondii* as a possible inflammatory agent in the pathogenesis of type 2 diabetes mellitus in humans | *Family Medicine and Community Health*. [online] Available at: <http://fmch-journal.org/toxoplasma-gondii-possible-inflammatory-agent-pathogenesis-type-2-diabetes-mellitus-humans/> [Accessed 10 Jan. 2019].

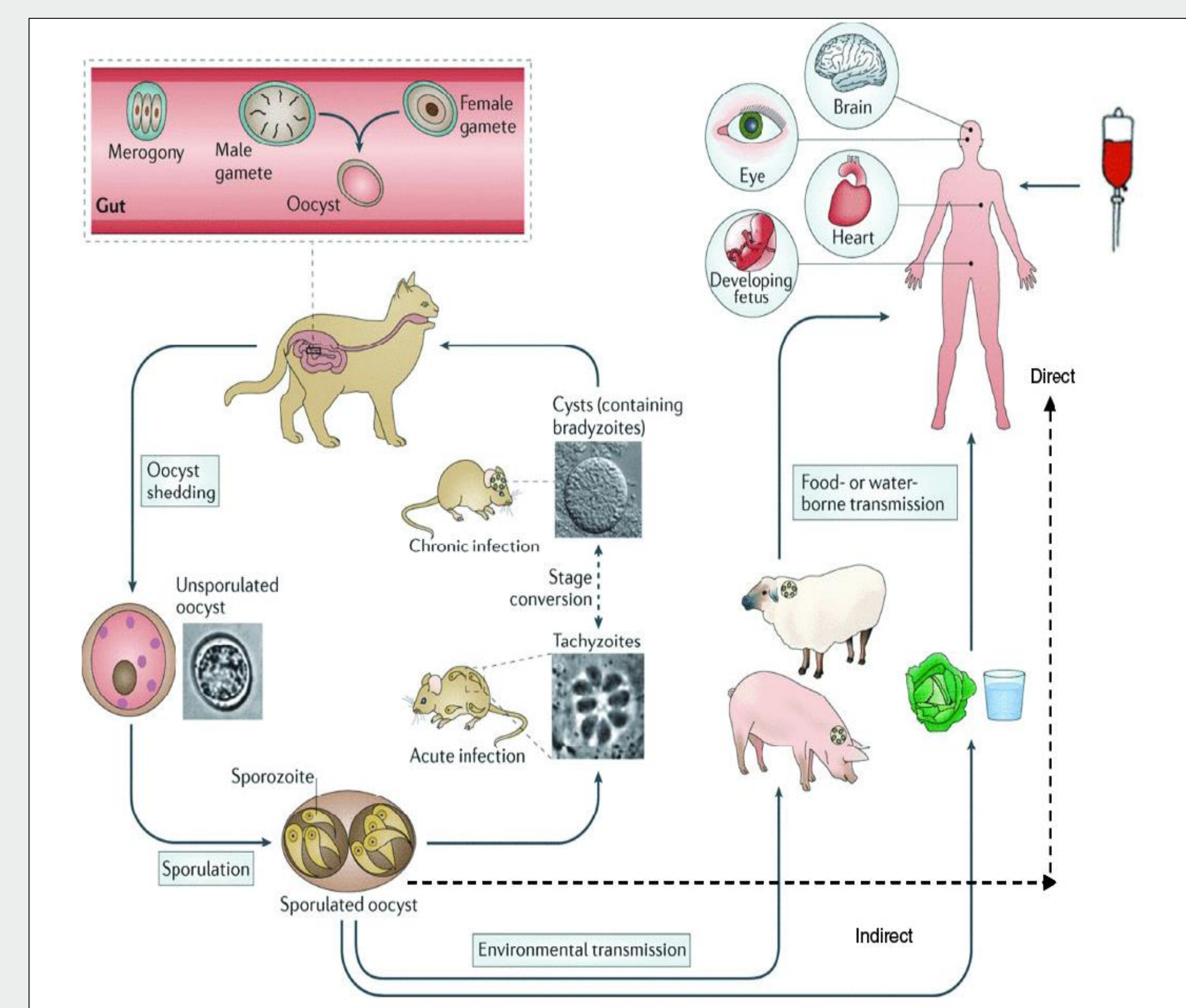


Figure (1): lifecycle and pathogenesis of *T.gondii* <sup>(4)</sup>

But the question remains: how does this pervasive human pathogen alter behaviour of the mammalian host?