

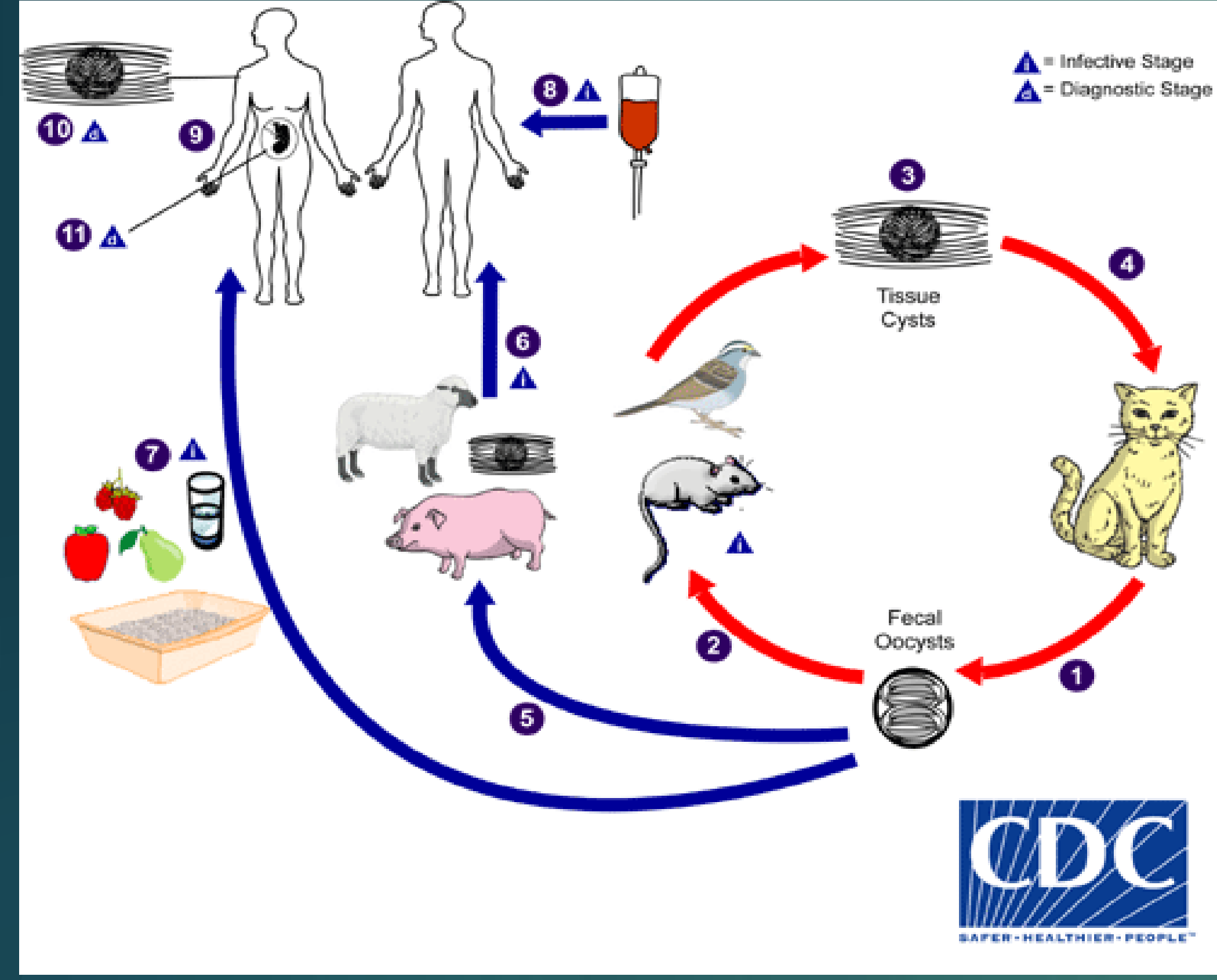
Abstract

Toxoplasma makes up *Toxoplasma gondii*, a parasitic disease. The disease affects more than half of the world's population. The asymptomatic disease is of significance due to the birth defects caused when a infected mother spreads the disease to the fetus. There is a treatment for the disease but further research needs to be done into preventing the disease from spreading and the effect the disease has on a person's mental well being. Cats and other feral animals are the main spreaders of the disease.

Background

Toxoplasma gondii is spread by eating poorly cooked food that contain cysts, exposure to infected cat feces, and from a mother to a child during pregnancy if the mother becomes infected as can be seen in figure 1. It was first discovered in 1908 by Charles Nicolle and Louise Manceaux There are three stages to the disease: Acute, Latent, and Cutaneous. The most challenging part of the disease is diagnosing due to its asymptomatic nature.

Figure 1: Transmission sources for Toxoplasmosis



Source: Center for Disease Control (USA)
The parasite *Toxoplasmosa gondii* can be found in feral animals such as cats and mice. Humans can be infected by eating infected livestock or touching infected soil from feral cat feces.

Methodology

T. Gondii typically has no symptoms and the symptoms it does have mimic other infections so it is difficult to diagnose. It can be detected in blood, amniotic fluid, or cerebrospinal fluid by using polymerase chain reaction. A serological test is usually performed to measures immunoglobulin G (IgG) (CDC, 2018). Immunofluorescence microscopy can also be used to identify the parasite as seen in figure 2.

Figure 2: Immunofluorescence microscopy of Toxoplasmosis

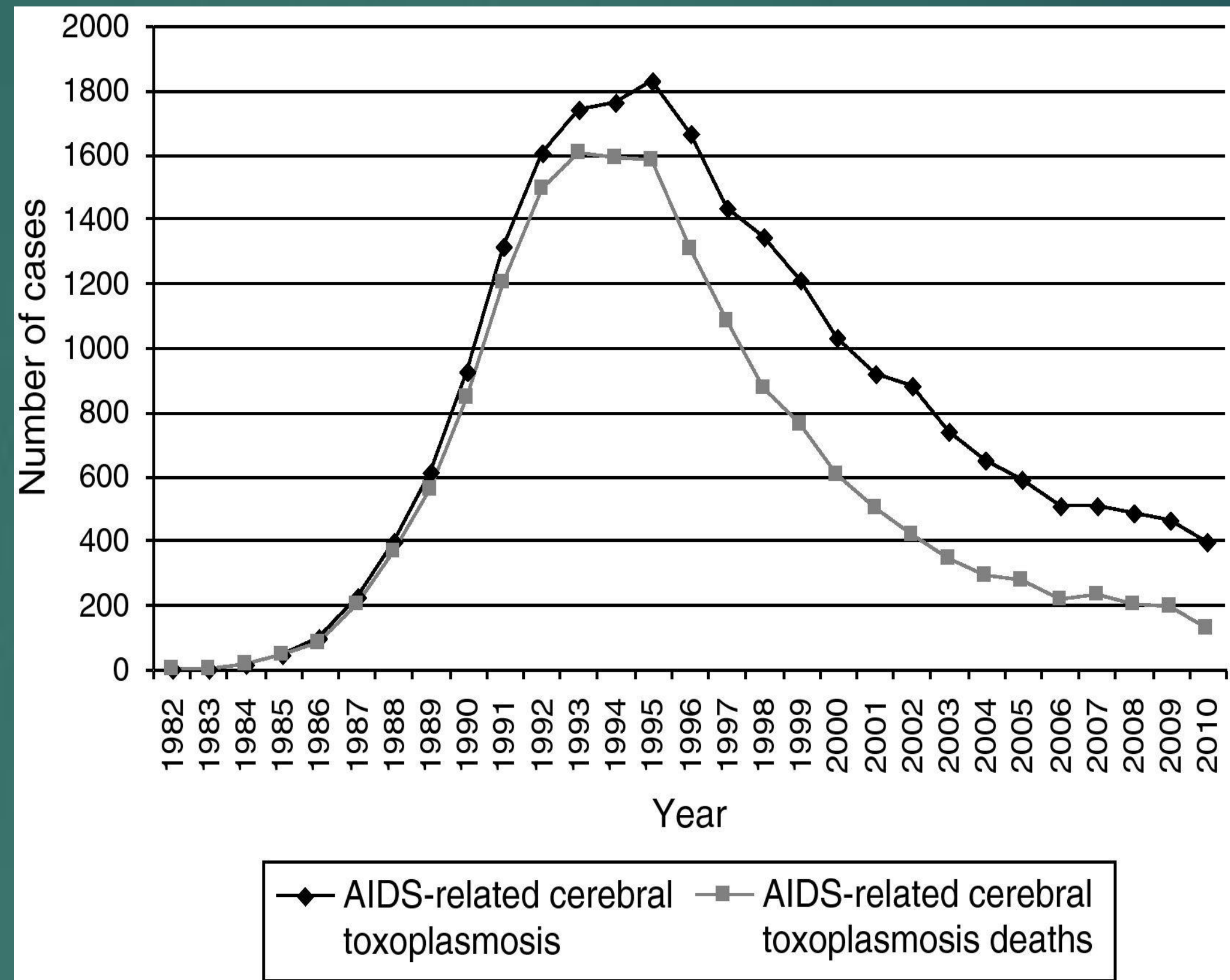


Source: Center for Disease Control (US)
A Toxoplasma-positive reaction, stained by immunofluorescence (IFA). This method can be used when other tests do not yield results

Results

Researchers have discovered that *Toxoplasma gondii* is a facultatively heteroxenous, polyxenous protozoon that has several pathways for transmission (Tenter et al, 2000). The disease is passed from mother to fetus by tachyzoites via the placenta (Tenter et al, 2000). The rate of contamination has gone down significantly from food to human due to increased health standards for farms but increased from environment to human. Figure 3 demonstrates how immunocompromised individuals with AIDS are at a higher risk for toxoplasmosis than those with a healthy immune system (Vidal et al, 2012).

Figure 3: AIDS-related cerebral toxoplasmosis cases and deaths in Sau Paolo, Brazil



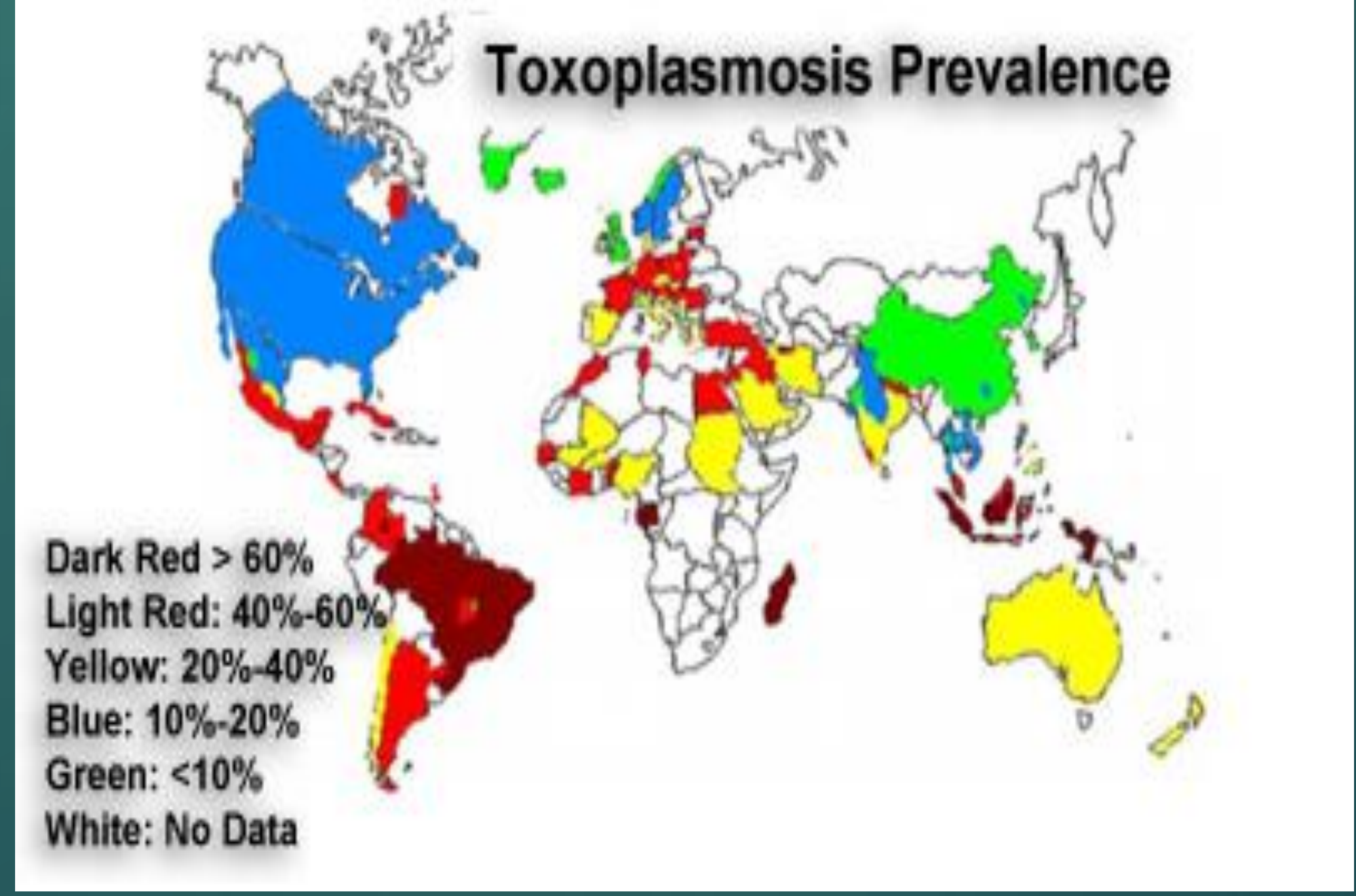
Source: Jose Vidal et al- Brazil Journal of Infectious Diseases
In immunocompromised individuals such as those with AIDS, toxoplasmosis can cause death. In healthy individuals, the immune system is able to fight toxoplasmosis and keep it from causing harm but when the immune system is weakened, the disease can take over and cause death.

Future Work

Potential mothers have begun to be tested for the disease. Research has also begun to look at the link between toxoplasmosis and schizophrenia along with traffic accidents. The rates of these increase almost by 2.6x when a person is a carrier of toxoplasmosis (Webster & McConkey, 2010). Further research needs to look at the link between the parasite and the how it affects the brain of those infected.

Furthermore, climate change has begun to effect how the disease spreads. Colder regions such as Canada have begun to see an increase in the disease as figure 4 demonstrates (Yan et al, 2016). More research has to be done into preventing the disease and treating wildlife infected with it.

Figure 4: Rates of Toxoplasmosis by country

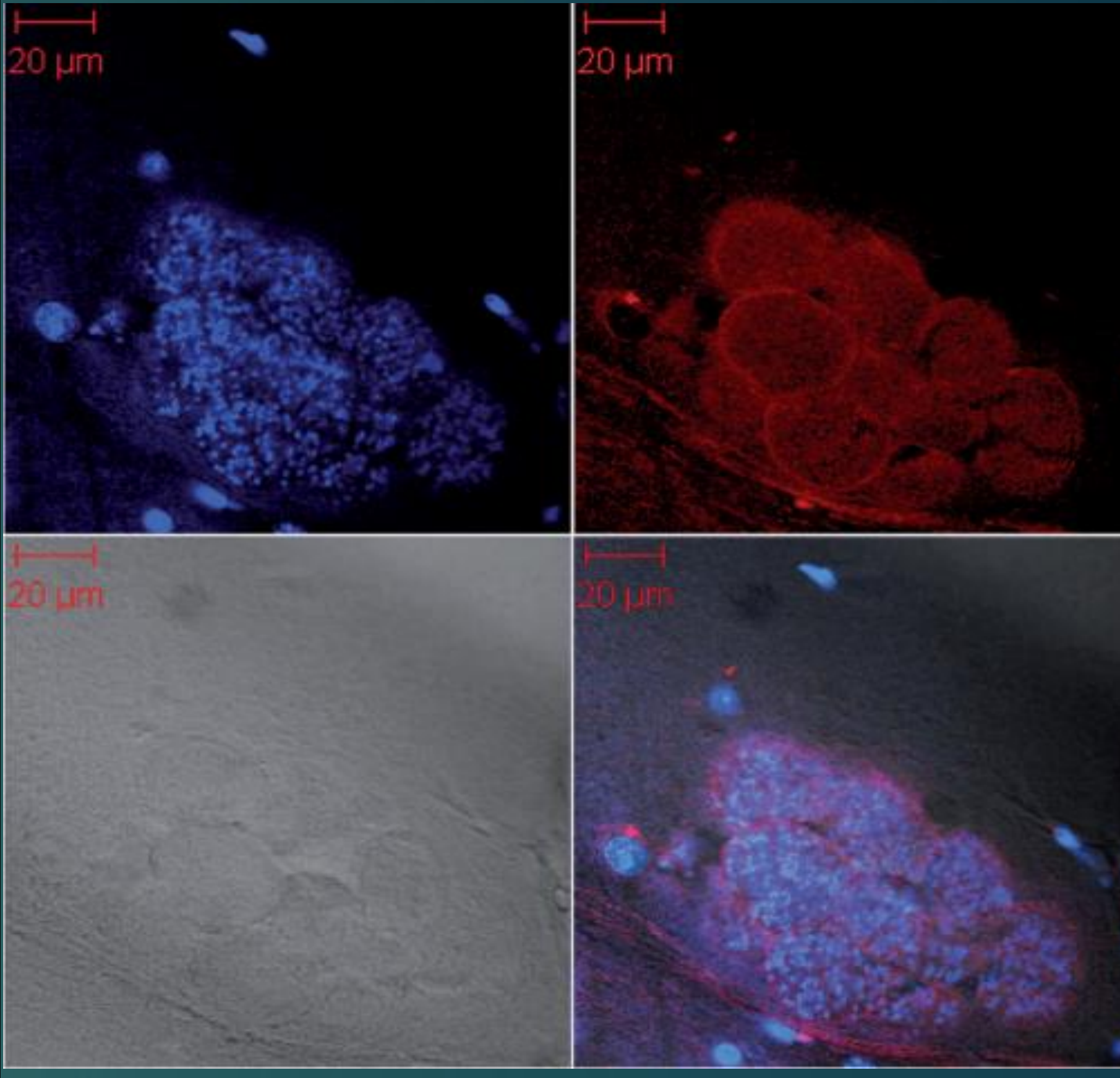


Source: retinavitreous.com
Toxoplasmosis tends to infect those in warmer climates and less developed countries. South America is a particularly infected region due to the climate and wildlife.

Conclusions

Healthy individuals can recover from Toxoplasmosis with no medication, varying antibiotics are used to treat those who cannot recover. Those at risk include pregnant women and immunocompromised individuals. Results have shown that even those who have no symptoms may be under duress from the disease. Mental illnesses and increased rates of traffic accidents are factors thought to be caused cysts resulting from toxoplasmosis as seen in figure 5 (Webster & McConkey, 2010).

Figure 5: Brain tissue from latent Toxoplasma gondii-infected mouse



Source: Joanne Webster & Glenn McConkey
This image shows a brain scan of an infected mouse, the cysts shown in blue result from toxoplasmosis and caused erratic behavior in the mouse.

Although Toxoplasmosis infects nearly 3.5 billion people, the disease is rarely spoken about. Prevention and recognition are important factors in limiting the effect this disease can have on humans. Those who are at risk must make sure their meat is cooked properly and that someone else handles their cat's feces. The disease will continue to kill people so long as there is little known about it. More research must be done to understand how to prevent the disease.

References

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