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Preventing Infection with *Toxoplasma gondii*

Background

Toxoplasmosis results from an infection with the protozoan parasite *Toxoplasma gondii*. All mammals and birds are variably susceptible. Infection among humans is common worldwide. Data from the Centers for Disease Control and Prevention (CDC) suggest that approximately 15% of U.S. residents have antibodies to the parasite; this prevalence has not changed significantly over the past 10 years.¹ Antibody testing of sera collected from Alaska Natives in the 1960s and 70s yielded a similar prevalence.² Toxoplasmosis is neither a nationally nor a state-mandated reportable condition; therefore detailed statistics about the disease are limited.

T. gondii has existed naturally in Alaska wildlife, including marine mammals, for at least 30 years. *Toxoplasma* antibodies were recently detected in a sea otter from Seward.

Parasite Lifecycle³

Members of the cat family are the only known definitive host for the sexual stages of *T. gondii* and serve as the main reservoirs of infection. Cats become infected from eating meat containing *T. gondii* oocysts. Once ingested, oocysts release viable organisms and invade epithelial cells of the small intestine where they undergo an asexual followed by a sexual cycle to form oocysts, which are then excreted. An unsporulated oocyst becomes infective 1 to 5 days after excretion. Oocysts can survive in the environment for several months and are resistant to disinfectants, freezing or drying, but are killed after being heated to 70°C (~158°F) for 10 minutes.

Routes of Transmission

Humans can be infected by *T. gondii* through three principal routes: ingesting raw or insufficiently cooked meat or foods that have come into contact with infected meat; ingesting oocysts from cat feces directly or indirectly via soil or other items that have been in contact with cat feces; or through vertical transmission from a mother to her fetus. CDC estimates that 50% of the toxoplasmosis deaths (~750 each year) result from infection from insufficiently cooked meat, similar to the estimate of meat-associated cases given by the U.S. Department of Agriculture.⁴

Symptoms

Many persons are asymptomatic. For those who do exhibit symptoms, toxoplasmosis infection results in mild illness, including lymphadenopathy, fever, and malaise, which usually resolve within weeks to months without specific treatment. Once in the body, the parasite forms tissue cysts that may remain lifelong.

Persons with immune-compromised conditions and fetuses, however, may be profoundly affected by the parasite. Immunodeficient persons often display central nervous system disease, but may also have chorioretinitis or pneumonitis. Immunosuppression may also result in reactivation of past toxoplasmosis infection. Signs suggestive of congenital infection in the fetus include chorioretinitis, intracranial calcifications, and hydrocephalus. Most infants infected in utero are born with no obvious signs of toxoplasmosis, but many develop learning and visual disabilities later in life.⁴

Diagnosing Toxoplasmosis in Humans

Toxoplasmosis is most often diagnosed through routine serology. Commercial test kits evaluate *Toxoplasma*-specific IgG and IgM levels. Detectable IgG indicates exposure to the parasite at some point in time. Detectable IgM usually indicates acute infection; however, IgM levels may remain detectable for over a year after initial infection.⁴ Other more technically challenging methods exist for diagnosing toxoplasmosis, but these are not readily available.

Toxoplasma Titers in Alaska Wildlife

Since testing began on samples collected from Alaska wildlife in the 1970s, antibodies against *T. gondii* have been detected in a wide variety of species, including lynx, black bears, grizzly bears, wolves and even some herbivores.⁵⁻⁷ Lynx are the only wildlife species known to pass *T. gondii* oocysts in feces.⁸ Among marine mammals, antibodies have been detected in walrus; Steller sea lions; harbor, ringed, spotted and bearded seals.⁹

Toxoplasmosis and Water

Recent studies in California have implicated toxoplasmosis as a possible cause of illness in Southern sea otters. Otters that inhabited waters closer to the shore and freshwater outflows tended to have a higher prevalence of antibodies as compared to those in more remote waters.¹⁰ Researchers concluded that the source of the otters' exposure was related to contamination of coastal waters by freshwater run-off containing infective cat feces. Although bivalves (e.g., mussels and oysters) have been shown to filter and concentrate the parasite, transmission of toxoplasmosis via ingestion of shellfish is not believed to be an efficient or common route of transmission. Waterborne transmission of the parasite to humans, however, has been documented, underscoring the importance of appropriate and ongoing filtration and treatment of municipal water systems.¹¹

Preventing Toxoplasmosis

1. To prevent toxoplasmosis, food should be cooked to safe temperatures. See Alaska Food Safety Safe Temperatures http://www.state.ak.us/dec/eh/fss/consumers/safe_food_temperatures.htm. Fruits and vegetables should be peeled or thoroughly washed before eating. Cutting boards, counters, utensils, and hands should be washed with hot soapy water after contact with raw meat, poultry, seafood, or unwashed fruits or vegetables.
2. Pregnant women should consult their obstetricians about specific serologic testing recommendations. Pregnant women and immunodeficient persons should refrain from eating raw meat, and should wear gloves when gardening and during any contact with soil or sand where cat feces may be present. Additionally, these persons should avoid scooping or changing cat litter if possible. If no one else is available to change the litter, use gloves, then wash hands thoroughly. Cat litter boxes should be scooped or changed daily because oocysts require 1-5 days to become infective.
3. Trappers should take special caution to minimize their exposure to feces when trapping and skinning lynx as lynx serve as the only Alaska wildlife source of *Toxoplasma* oocysts.

References

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