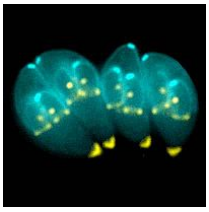
BioMaterial Fact Sheet: *Toxoplasma gondii (Toxoplasmosis)*



Toxoplasma gondii (*T. gondii*) is a single-celled parasite that is generally acquired by ingestion or injection and causes a disease known as toxoplasmosis. Toxoplasmosis is found in humans worldwide and in many species of animals and birds. Cats are the definitive host of the parasite. Over 60 million people in the U.S. may be infected with this parasite; however, very few have symptoms because a healthy person's immune system prevents the parasite from causing illness and most will recover from an infection without treatment. Any active infection in a healthy individual, though, could be spread to others at home or other locations. Infected immunocompromised persons (those with HIV/AIDS, chemotherapy patients, and organ recipients) and/or pregnant individuals are therefore most susceptible.

Primary modes of transmission occur from eating undercooked, contaminated meats; through contact with contaminated soil; or from handling cat feces/cat litter that is infected with toxoplasma. In the laboratory, infection could occur from inhalation, injection, or contact with breaks in the skin. Toxoplasma cannot be absorbed through *intact* skin.

Most primary infections produce no symptoms; however, some afflicted may have "flu-like" symptoms such as swollen glands, muscle aches or pain that lasts for at least a month. Severe toxoplasmosis can cause brain, eye, and organ damage. Additionally, congenital defects or spontaneous abortion may result from a pregnant individual becoming infected.

Containment Level: Biosafety Level 2 (BSL2) criteria and animals infected with the agent should be handled and housed according to Animal Biosafety Level 2 criteria (ABSL2). *Concurrent approvals are needed from the Institutional Biosafety Committee (IBC) and the Institutional Animal Care and Use Committee (IACUC) prior to initiating work.*

Required Training: To work with *Toxoplasma gondii*, laboratory and animal staff must have completed the Bloodborne Pathogen (BBP) training offered by EHS as well as specialized *T. gondii* training which is coordinated with the IBC Administrator. In addition, staff should receive 'hands-on' training from their laboratory supervisor or animal facility manager prior to manipulating the agent. Training should cover the hazards associated with the work, required practices and procedures and, if manipulating infected animals, proper handling of bedding, caging, and all other husbandry materials associated with the experiment.

Personal Protective Equipment (PPE): Laboratory coat (or if in animal facility, PPE per building entry requirements); gloves; goggles/safety glasses with side shield OR face shield must be worn. A respirator is not required. PPE will be used one time only. If double gloving, the outer pair of gloves should be removed between cages and/or before exiting the biological safety cabinet for any other purpose. **If working with concentrated titers and highly aerosolizing procedures contact the Biosafety Officer 301-846-5038.**

Engineering Controls: In the research laboratory, the biological safety cabinet (BSC) shall be used for handling bulk cultures of organisms being grown for injection; however, counting can be done outside of a BSC at a microscope on the benchtop. In the animal facilities, animal injections and cage changes must occur within a BSC. **Animals must then be placed in ventilated caging racks maintained under negative pressure with HEPA-filtered supply and exhaust post-infection for the duration of the study. Depending on the life cycle stage of *T. gondii*, infectivity can range from <14 days (oocyst) to over 18 months (sporulated oocysts).** Alternative caging options may be determined and implemented on a case-by-case basis by the Animal Facility Manager in conjunction with EHS concurrence.

Additional Safety Practices (Laboratory):

- All vacuum lines must be fitted with a HEPA filter (an example is the "Vacushield ™" in-line hydrophobic filter, Product # 4402 from Gelman Science - http://www.labfilters.com/catalog/924_20077.asp).
- Centrifugation must be done in closed containers and accompanied by an intact aerosol ring using sealed rotor buckets with safety caps and samples in screw-cap tubes. Centrifuge containers must only be loaded and unloaded within a BSC **not** on the open bench.
- Aerosol-resistant tips must be used when pipetting.

Additional Safety Practices (Animal) *in addition to those listed above:*

- Infected animals may excrete *T. gondii* anywhere from 14 days to several months. Therefore, it is recommended by EHS that the dedicated lab personnel or animal husbandry technicians, *specifically trained on the handling of T. gondii infected animals*, be responsible for all animal husbandry practices throughout the study.
- Precautions must be taken not to create aerosols when emptying animal waste.
- Dirty cages, disposable or not, must be autoclaved first prior to cage washing.
- Cage with contaminated bedding and excreta must be bagged inside a BSC, immediately autoclaved, and disposed of according to facility requirements.
- After animal infection, cages should be labeled as infectious with the agent name.
- Post-animal infection, all tissue harvests / necropsies must be conducted within a BSC.
- All sharps (one-time use) must be immediately disposed of into sharps container (located *within* the BSC) at the end of each day's experiment as hazardous waste.
- Infected animals should not be handled with the hands, but rather with tongs. The tongs should then be sterilized via autoclaving or by soaking in freshly prepared 10% bleach.

Disinfection (Laboratory and Animal Facility): Disinfect all work surfaces and materials *both* prior to and immediately following all work practices and procedures. (also see *Biosafety Technical Bulletin: Decontamination*)

- Surfaces: Dispatch™ or 10% (1:10) bleach solution (made daily) with a minimum contact time of 10 minutes. Rinsing of surfaces with water is recommended after use of any chlorine-based disinfectant on metal surfaces to mitigate corrosion. Other EPA recommended disinfectants with a label claim for the agent can also be used.

- Liquid Waste: Bring liquid waste to a final concentration of 10% bleach. If aspirating into a 1L flask, flask should first be filled with ~100mL bleach and diluted down to 10% (1:10) with liquid waste. Contact time should be **a minimum of 30 minutes** prior to drain disposal (while tap water is running).

- Solid Waste: All solid wastes should be treated as hazardous waste according to NCI-Frederick handling procedures. Animal carcasses should be autoclaved.

Employee Exposure*:*

- Eye Exposure from splash or aerosols: Flush eyes for a *minimum* of 15 minutes in eyewash and then report to OHS immediately afterwards. Follow the NCI-Frederick Exposure Control Plan (http://home.ncifcrf.gov/ehs/ehs.asp?id=12) procedure for reporting occupational exposures to potentially infectious material. Dial 911 after-hours to report exposure and obtain assistance.
- Needlesticks and/or non-intact skin exposure: Wash contaminated skin for 15 minutes using a 10% povidone iodine solution (such as Betadine), a chlorhexadine scrub kit, or soap and copious amounts of water. Report to OHS immediately after scrub. If the exposure occurs after normal business hours contact the 911 emergency number. Follow NCI-Frederick Exposure Control Plan.

References:
BMBL 5th ed: http://www.cdc.gov/biosafety/publications/bmbl5/index.htm
http://www.cdc.gov/nczved/divisions/dfbmd/diseases/listeriosis/
MSDS for Infectious Agents: http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php
Gyles, Prescott, Songer. 2010 Blackwell Publishing. *Pathogenesis of Bacterial Infections in Animals* (pg 137-183)
The cat group: (infectivity) http://www.fabcats.org/cat_group/policy_statements/toxo.html