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Toxoplasma gondii

Standard Operating Procedure

All research involving the materials described in this SOP must be documented and approved in a Biological Use Authorization (BUA) prior to use.

RISK GROUP 2

Approved BUA # _____

BUA Expiration Date _____

Safety Precautions for Working with *Toxoplasma gondii*

Toxoplasma gondii is an obligate intracellular protozoan parasite that can infect multiple tissue types in various animal species. Although *T. gondii* requires a cat host to complete its sexual cycle, asexual forms of the parasite are capable of infecting humans. There are three main routes of potential exposure:

1. **Ingestion of sporulated oocysts** from materials contaminated with infected cat feces.
2. **Ingestion of bradyzoites (tissue cysts)** from undercooked/raw meat obtained from infected animal hosts.
3. **Direct introduction of tachyzoites** from laboratory accidents, such as needle sticks, or eye exposure from splashes.

Toxoplasma gondii infection develops over days, not minutes. In case of suspected laboratory exposure, do not panic, but immediately contact ehsocchealth@ucr.edu and begin seeking medical care (see First Aid and Emergencies section).

Health Risks

In healthy individuals, infection is often asymptomatic due to effective immune response. Up to one-third of Americans may become infected during their lifetime -- commonly via gardening, changing litter boxes, or consuming undercooked meat -- without knowing it.

However, certain populations are at significantly greater risk:

- **Pregnant Individuals:** While not more susceptible to infection, transplacental transmission can lead to miscarriage or severe congenital defects.

- **Individuals with HIV/AIDS:** Reactivation of latent cycsts may cause toxoplasmic encephalitis, a major cause of mortality.
- **Immunocompromised Individuals:** Including those undergoing chemotherapy, organ transplants, or treatment for autoimmune conditions.

Even healthy individuals may experience severe disease from high-dose or virulent strains, particulatly in laboratory exposure.

Laboratory Safety Protocols

To Prevent Exposure in the Lab Environment, the Following Precautions Must Be Observed:

- **Approval Required (Biological Use Authorization):** Extra caution must be used when working with pyrimethamine-resistant strains.
- **Restrictions:** The following individuals should not work with live *Toxoplasma*:
  - Immunosuppressed
  - HIV-positive
  - Pregnant or planning pregnancy
  - Those uncomfortable with potential pregnancy termination in the event of an infection
- **Medical Consultations:** Individuals with weakened immune systems—including those who are pregnant, immunocompromised, or have pre-existing medical conditions—are strongly encouraged to consult their personal physician and/or Occupational Medicine before working with Toxoplasma gondii or potentially contaminated materials (e.g., cat feces, raw meat, or infected animals). To request a consultation or access Occupational Health services, please contact ehsocchealth@ucr.edu.
- **Containment:** Work with live parasites is restricted to the tissue culture room. Only authorized individuals may enter.
- **Use of Biosafety Cabinets:** All manipulations must occur in BL-2 biosafety cabinets within the tissue culture room.
- **Personal Protective Equipment (PPE):**
  - Gloves must be worn at all times.
  - Gloves should be discarded into autoclave bags or disinfected with 70% ethanol before exiting the tissue culture room.
  - Eye protection is required at all times, whether during manipulation or transport of parasites.
- **Decontamination:**
  - *Toxoplasma* is inactivated by either 70% ethanol or Vesphene.
  - All contaminated materials must be disinfected (alcohol, bleach) or autoclaved after use.
  - Filter assemblies should be soaked in distilled water for 20 minutes to lyse residual parasites.
- **Sharps Safety:**
  - Use blunt needles when harvesting parasites.
  - Discard all needles in designated sharps containers without recapping.

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In Case of Suspected Laboratory Exposure

- **Do not panic:** Infection develops over days, not minutes.
- **Immediately notify**:UCI Medical Center Infectious Disease Fellow on call at (714) 456-6011 for guidance and proceed to the nearest Emergency Department in your area.
- **Seek medical evaluation and treatment:**
  - Draw blood for CBC and *Toxoplasma* antibody titers.
  - Monitor CBC twice weekly for chemotherapy toxicity.
  - Retest antibody titers after 1-2 months.

Prophylactic Treatment (Standard Infection)

Start as soon as possible under physician guidance:

- 25mg **pyrimethamine** (Diaprim) once daily.
- 1g **sulfadiazine** (Lilly) four times daily.
  a. *Do not take if allergic to sulfonamides.*
- 5mg **folinic acid** (Ca-Leukovorin) once daily.
- **Duration:**
  - 1 week if patient is initially seropositive.
  - 2 weeks if seronegative.

Note: Sun sensitivity and allergic reactions are possible with sulfonamides. Discontinue and consult a physician if symptoms such as rash or breathing difficulties apopear.

Steps to Get Baseline Testing for *Toxoplasma*:

1. **Request an Antibody Titer Test**

- The test you're looking for is usually called a ***Toxoplasma gondii* IgG and IgM antibody test.** This will check:
  - **IgG antibodies:** Indicate past exposure/infection.
  - **IgM antibodies:** Indicate recent or active infection.

2. **Order the Test Through:**

- Your institution's **occupational health clinic** or employee health services.
- **Primary care physician** (if you're handling it independently).
- **Public health or university-affiliated labs**, especially for researchers working with *Toxoplasma.*

3. **Blood Draw & Lab Processing**

- A healthcare provider will draw a small sample of your blood and send it to a clinical lab for analysis.

4. **Results & Documentation**

- If **IgG positive,** you've been exposed before and likely have immunity.
- If **IgM positive,** further evaluation is needed to rule out active infection.
- **Both negative?** You care considered seronegative (no prior exposure), and special precautions should be taken if you're working with live *Toxoplasma*.

Key References

1. **Centers for Disease Control and Prevention (CDC)**

The CDC provides an overview of *Toxoplasma gondii,* routes of transmission, and testing methods:

- CDC - *Toxoplasmosis*
- "*Toxoplasma* antibody testing (IgG and IgM) is used to determine prior exposure or active infection."

2. **NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL) - 6th Edition**

- *Toxoplasma gondii* is considered a Biosafety Level 2 (BSL-2) agent.
- Recommends serologic testing for individuals working with organisms or concern, particularly those who are immunocompromised or pregnant.
- BMBL 6th Edition PDF (NIH)

3. Naomi Morrissette, PhD

- Associate Professor, Molecular Biology & Biochemistry
- UC Irvine School of Biological Sciences
- Principal Investigator: *Toxoplasma* and *Plasmodium* resistance to dinitroanilines.
- *Toxoplasma* replication is inhibited by MMV676477 without development of resistance.

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Acknowledgement

By signing below I acknowledge that I have read, understand, and agree to abide by the procedures and practices described in this document.

_____ _____

Principal Investigator **Date**

Name	Signature	Date