Cornell University
Environmental
Health and Safety

Biological Agent Reference Sheet (BARS)
Agent: *Cryptosporidium* spp.

Agent Characteristics	
Risk Group (RG)[1]	☒ **RG-2** *associated with human disease, rarely serious; preventive or therapeutic interventions often available* ☐ **RG-3** *associated with serious or lethal human disease; preventive or therapeutic interventions may be available*
Agent Type	Parasite
Description	Cryptosporidium "Crypto" is an intracellular apicomplexan parasite. The oocyst is the infectious form that resides in the environment. After entry into the vertebrate host, the oocyst leaves the oocyst form (excystation) and sporozoites are released. The latter forms target epithelial cells of the gastrointestinal or, in extremely rare cases, respiratory tract. Gastrointestinal infection with Cryptococcus can occur as result of aerosol exposure, and gastrointestinal symptoms last around 1-2 weeks in non-immunocompromised individuals. Within the epithelial cell, new schizogony and merogony develop. Male and female gametogonia also develop within the epithelial cell and upon fertilization, new oocysts are formed. The thick-walled oocyst is excreted from the host and the thin- walled oocyst perpetuates the infection in the host. Oocyst are infective upon excretion permitting direct fecal-oral transmission. Since oocysts are shed in fecal materials, they are frequently in the presence of other microbes which may be harmful to human or animal health.
Host Range	Multiple species of cryptosporidium infect both humans and animals
Host Shedding	☐ Blood ☐ Saliva ☐ Direct contact ☐ Urine ☒ Feces ☐ Other:
Routes of Exposure to Humans	☐ Aerosol/Inhalation ☐ Animal Bites ☐ Arthropod Vectors ☐ Contaminated Items ☐ Direct Contact ☒ Ingestion ☐ Mucous Membranes ☐ Percutaneous ☐ Vertical Transmission ☐ Broken skin
Infectious Dose	132 oocysts
Incubation Period	2-10 days, 7 days average

[1]Based on NIH definitions. Final Risk Group (RG) designation will be assigned upon a case-by-case review by the Cornell University Institutional Biosafety Committee (IBC).

Health Hazards
Signs and Symptoms
☒ Flu-like symptoms (i.e. fever, headache, dehydration, weight loss, lethargy)
☐ Cutaneous symptoms (i.e. skin lesions, rash)
☒ Gastrointestinal symptoms (i.e. loss of appetite, nausea, vomiting, diarrhea)
☐ Respiratory symptoms (i.e. coughing, sneezing)
☐ Neurological symptoms (i.e. loss of sensation, ataxia)
☐ Musculoskeletal symptoms (i.e. joint and muscle pain)
☐ Lymphoreticular symptoms (i.e. enlarged internal organs or lymph nodes)
☐ Reproductive Health concerns (i.e. abortion, fetal abnormalities) – request a Reproductive Health Consultation
☐ Other:

Immunizations[2]	☐ Available ☒ Not Available
Prophylaxis[2]	Treatment with nitazoxanide

[2]Formal medical advice is obtained during medical consultations with Cornell Health or primary healthcare provider as needed.

Agent Viability	
Disinfection	☐ 1:10 Bleach Dilution ☐ 70% Ethanol ☒ Other: 6% Hydrogen peroxide with 20 minutes of contact time. Cryptosporidium is resistant to chlorine-based disinfectants.
Inactivation	6% Hydrogen peroxide with 20 minutes of contact time.
Survival Outside Host	Long term survival outside the host and it is resistant to chlorine disinfection.

Laboratory Hazards	
☒ High energy-creating activities (centrifugation, sonication, high pressure systems, vortexing, tube cap popping) ☒ Handling of sharps (needles, scalpels, microtome blades, broken glass, etc.) ☒ Splash/droplet-creating activities (shaking incubators, liquid culturing, mechanical pipetting) ☒ Equipment contamination ☒ Exposed skin/uncovered wounds	
Laboratory Acquired Infection History	Multiple LAIs reported, numerous outbreaks amongst veterinary students.

Laboratory Handling Guidelines	
Laboratory Biosafety Level (BSL)[3]	☒ **BSL-2** ☐ **with special practices**
Attenuated Strain Alternatives	
Training	☒ EHS Laboratory Safety Training (CULearn #2555) ☐ EHS Bloodborne Pathogens Training (CULearn#1074) ☒ Lab-specific protocol training ☒ CULearn BARS Course #2277.64
Lab Engineering Controls	☐ Benchtop ☒ Biosafety Cabinet ☐ Chemical Fume Hood ☒ Centrifuge lids or safety cups; samples are loaded/unloaded inside the BSC ☐Use of safety-engineered sharps ☐ Other: _____
Personal Protective Equipment (PPE)[4]	☐ Eye protection ☒ Single gloves ☒ Additional gloves (recommended) ☒ Snap-front lab coat with cinch cuffs ☐ Disposable solid front gown ☐ Additional mucous membrane protection ☐ Disposable outer sleeves ☒ Other: Work with large animals may require PPE modification as determined by risk assessment.
Waste Management[5]	Regulated Medical Waste (RMW)
Shipping Guidance	Refer to EHS Biological Materials Shipping

[3]Final Biosafety Level designation will be assigned upon a case-by-case review by the Institutional Biosafety Committee.
[4]Recommended in addition to closed toed shoes and long pants
[5]BSL containment practices and waste management requirements are provided on the next page.

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Animal Vivarium Guidance	
Animal Housing Biosafety Level (ABSL)	☐ **ABSL-1** ☒ **ABSL-2** ☐ **ABSL-3**
Animal Biosecurity	☒ Experimental animals are housed separately ☐ Information not available

Perform Inoculations	☐ Benchtop ☐ Cage Changing Station	☒ Biosafety Cabinet
Change Cages	☐ Benchtop ☒ Cage Changing Station	☒ Biosafety Cabinet

Exposure and Spill Procedures	
Mucous Membranes	Flush eyes, mouth or nose for 15 minutes at eyewash station. See: responding to exposures.
Other Exposures	Wash with soap and water for 15 minutes (open wounds, sores, etc.) and a minimum of 20 seconds of soap and water for areas with intact skin. See: responding to exposures.
Small Spills	Notify others working in the lab. Don appropriate PPE. For spills involving fecal material, cover area of the spill with paper towels, working from the perimeter toward the center, use the paper towels to remove the spill and associated organic material. Discard contaminated paper towels. For spills involving fecal material and all other spills apply (or re-apply) 6% hydrogen peroxide on the spill site, Allow 20 minutes of contact time. After 20 minutes use paper towels to remove the 6% hydrogen peroxide. See: spill cleanup.
Large Spills	Request assistance from the EHS Spill Team by calling CUPD dispatch. Call 911 from a campus phone or 607-255-1111 from a mobile phone.
Incident Reporting	Immediately report the incident to supervisor and complete the EHS online injury/illness report as soon as possible.

Medical Follow Up		
During Business Hours Cornell Health 607-255-5155 (24-hour phone consultation line)	After Hours Care: Cornell Health Services 24-hour phone consultation line or local urgent care as listed on above webpage.	Emergencies: Call 911 from a campus phone or 607-255-1111 from a mobile phone.

Biosafety Level 2 Containment Requirements Summary	
Personal Hygiene	• Remove PPE before leaving the lab – avoid wearing PPE in public spaces. • Wash hands frequently with soap and water after removing gloves, handling samples, leaving lab, etc. • Change gloves frequently while working, and before removing samples from the biosafety cabinet to minimize potential contamination of equipment and surfaces within the lab.
Standard Microbiological Practices	*In addition* to standard BSL1 practices: • Biohazard signs and labels on equipment. • Use a biological safety cabinet (BSC), such as a Class II Type A2, for manipulations that can generate infectious aerosols. • Use aerosol containing devices for high energy activities which may generate infectious aerosols. For example, centrifugation of agents which may generate infectious aerosols will use gasketed rotors or buckets. Rotors or buckets will be removed and opened inside a BSC. Centrifuge tubes will be filled and opened in a BSC. • Vacuum lines are protected with liquid disinfectant-filled traps and 0.45 micron filters. • Sharps handling and safety practices are implemented. • Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant. • Chemically disinfect all surfaces and equipment. • Potentially infectious materials are placed in durable, leak proof, labeled primary containers during collection, handling, processing, and secondary containers during storage, or transport within a facility. • Windows in BSL-2 labs remain closed.
Special Practices	• All persons entering the laboratory are advised of the potential hazards and meet specific entry/exit requirements. • The laboratory supervisor ensures that lab personnel demonstrate proficiency in standard and special microbiological practices before working with such agents. • Laboratory equipment are routinely decontaminated, as well as, after spills, splashes or other potential contamination. • Spills involving infectious materials are contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material. • Equipment is decontaminated before repair, maintenance, or removal from the laboratory.
Regulated Medical Waste Guidance	Regulated Medical Waste (RMW) *Online RMW Pickup Request* Soft waste: • All materials that come into contact with this agent must be placed in a biohazard waste bag. • If working in a BSC, have a biohazard waste bag inside the BSC for waste collection. • All equipment, tubes, and waste bags that are brought out of the biosafety cabinet are wiped with appropriate disinfectant. • Place smaller red bag waste from BSC into larger red bag outside the BSC for transport. Sharps waste: • Place in leak proof sharps container labeled with the biohazard symbol. If working in a BSC, place a sharps container in the BSC. Liquid waste: • Add EHS-approved disinfectant to appropriate concentration, hold for contact time specified per manufacturer's guidelines, and then gently pour down the drain.

Special Considerations	
Experiment-Specific Requirements	**See lab protocols for additional information, any deviations from this BARS, and for lab-specific expectations.**

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