### Agent Characteristics

**Risk Group (RG)**
- ☒ 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**
- Bacteria
- Biohazard

**Description**
*Vibrio cholerae* is a Gram-negative, non-spore forming, curved rod bacterium. It has a single polar flagellum as well as pili and it is very motile. Some strains of *V. cholerae* cause the disease cholera. Serogroups O1 and O139 are primarily responsible for cholera outbreaks. Pathogenic serogroups produce cholera toxin, while nonpathogenic strains may or may not produce this toxin. Symptoms of infection include abrupt onset of watery diarrhea (a grey and cloudy liquid), occasional vomiting, and abdominal cramps. Dehydration ensues (thirst, dry mucous membranes, decreased skin turgor, sunken eyes, hypotension, weak or absent radial pulse, tachycardia, tachypnea, hoarse voice, oliguria, cramps, renal failure, seizures, somnolence, coma and death).

**Host Range**
- *V. cholerae*: This agent is known to infect or be carried by humans, water birds, shellfish, fish, and herbivores.

**Host Shedding**
- ☐ Blood
- ☒ Saliva
- ☒ 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**
The infectious dose ranges between 10<sup>6</sup> and 10<sup>8</sup> ingested vibrios (*V. cholerae*). The infectious dose depends on gastric acidity (lower acidity levels reduce the number of vibrios required for infection).

**Incubation Period**
- Ranges from a few hours to 5 days for symptoms to appear after infection.

*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).*

### 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**
- *V. cholerae*: 12 cases of infection with 4 deaths were reported up to 1979. The deaths were associated with mouth pipetting, contact with infectious feces and contaminated laboratory laundry.
- *V. parahaemolyticus*: The first laboratory-acquired infection was recorded in 1972 when a worker was subculturing different strains of the bacteria, and another infection was reported in 2002, and was caused through handling experimentally infected abalone.

**Laboratory Handling Guidelines**

**Laboratory Biosafety Level (BSL)**
- ☒ BSL-2 ☐ with special practices

**Attenuated Strain Alternatives**
- Infectious dose required to establish an infection range from 10<sup>6</sup> to 10<sup>11</sup> ingested vibrios (acquired form studies with healthy human volunteers).
- Regardless of the high infectious dose, attenuated strains exist and are recommended, especially while becoming familiar with laboratory work with *V. cholerae* or for new researchers lacking microbiological hands on experience.

**Training**
- ☒ EHS Laboratory Safety Training (CULearn #2555)
- ☒ EHS Bloodborne Pathogens Training (CULearn #1072)
- ☒ Lab-specific protocol training
- ☒ BARS CULearn #2277.34

**Lab Engineering Controls**
- ☒ Benchtop
- ☒ Biosafety Cabinet for product protection
- ☒ Chemical Fume Hood for aerosol containment
- ☒ Centrifuge lids or safety cups; samples are loaded/unloaded inside the BSC
- ☒ Use of safety-engineered sharps

**Personal Protective Equipment (PPE)**
- ☒ 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

**Waste Management**
- ☒ Regulated Medical Waste (RMW)

**Shipping Guidance**
- Refer to EHS Biological Materials Shipping

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

### 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
- ☐ Biosafety Cabinet

**Change Cages**
- ☐ Benchtop
- ☒ Biosafety Cabinet
Exposure and Spill Procedures

<table>
<thead>
<tr>
<th>Mucous Membranes</th>
<th>Other Exposures</th>
<th>Small Spills</th>
<th>Large Spills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush eyes, mouth or nose for 15 minutes at eyewash station. See: responding to exposures.</td>
<td>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.</td>
<td>Notify others working in the lab. Evacuate area and allow 30 minutes for aerosols to settle. Don appropriate PPE. Cover area of the spill with paper towels and apply disinfectant, working from the perimeter toward the center. Allow 30 minutes of contact time before disposal and cleanup of spill materials. See: spill cleanup.</td>
<td>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.</td>
</tr>
</tbody>
</table>

Incident Reporting

Immediately report the incident to supervisor and complete the EHS online injury/illness report as soon as possible.

<table>
<thead>
<tr>
<th>During Business Hours</th>
<th>After Hours Care; Emergencies:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cornell Health 607-255-5155 (24-hour phone consultation line)</td>
<td>Cornell Health Services 24-hour phone consultation line or local urgent care as listed on above webpage. Call 911 from a campus phone or 607-255-1111 from a mobile phone.</td>
</tr>
</tbody>
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Biosafety Level 2 Containment Requirements Summary

<table>
<thead>
<tr>
<th>Personal Hygiene</th>
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<tbody>
<tr>
<td>Remove PPE before leaving the lab – avoid wearing PPE in public spaces.</td>
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<tr>
<td>Wash hands frequently with soap and water after removing gloves, handling samples, leaving lab, etc.</td>
</tr>
<tr>
<td>Change gloves frequently while working, and before removing samples from the biosafety cabinet to minimize potential contamination of equipment and surfaces within the lab.</td>
</tr>
</tbody>
</table>

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 that may generate infectious aerosols. For example, centrifugation of agents that 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 (RMW)

- See lab protocols for additional information, any deviations from this BARS, and for lab-specific expectations.

References


Cornell EHS would like to thank Emory University for the use of their Biological Agent Reference Sheet (BARS) format and some content.