# Biological Agent Reference Sheet (BARS)

**Agent:** *Pseudomonas aeruginosa*

## Agent Characteristics

### Risk Group (RG)

<table>
<thead>
<tr>
<th>RG-2</th>
<th>RG-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td>associated with human disease, rarely serious; preventive or therapeutic interventions often available</td>
<td>associated with serious or lethal human disease; preventive or therapeutic interventions may be available</td>
</tr>
</tbody>
</table>

### Agent Type

- Bacteria
- Biohazard: ☒

### Description

The genus *Pseudomonas*, of the *Pseudomonadaceae* family, are motile gram-negative aerobic bacteria. These 2-4 μm long plump-shaped rods have polar flagella that have an important role in pathogenicity. They are non-spore forming and can produce pigments, such as pyocyanine (green-blue) and pyorubrin (yellow-green) fluorescence. *P. aeruginosa* can produce a large variety of extracellular toxins, including exotoxin A and enterotoxins. Other substances such as hydrocyanic acid, proteolytic enzymes, toxic surface slime, and hemolytic substances may also contribute to the pathogenicity of this species. Toxins combined with harmful substances are determinant factors in the high virulence of *P. aeruginosa* in a variety of different hosts.

### Host Range

- Humans, animals (wild, domestic, livestock), and plants (flora and fungi).

### Host Shedding

- ☐ Blood
- ☒ Direct contact
- ☒ Feces
- ☒ Other:
- ☒ Saliva
- ☒ Urine
- ☒ 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

- Unknown

### Incubation Period

- Varies according to infection; eye infection can appear 24-72 hours after infection.

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1Based 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](#)

### Immunosuppression

- ☒ Available
- ☐ Not Available

### Prophylaxis

- ☒ Available
- ☐ Not Available

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*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: moist heat ≥ 121°C for 15 minutes or longer; dry heat at ≥ 170-250°C for 30 minutes or more

### Survival Outside Host

*Pseudomonas* can survive for months on dry surfaces and inanimate objects, and are one of the bacteria most frequently isolated from patients with nosocomial infections; growth observed in distilled water can survive up to months with minimal nutrients; humidity can improve persistence

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## 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

- None reported to date.

## Laboratory Handling Guidelines

### Laboratory Biosafety Level (BSL)

<table>
<thead>
<tr>
<th>BSL-2</th>
<th>☒ with special practices</th>
</tr>
</thead>
</table>

### Attenuated Strain Alternatives

- None available.

### Training

| ☒ EHS Laboratory Safety Training [(CULearn #2555)](https://uat.culab.cornell.edu/com) |
| ☐ EHS Bloodborne Pathogens Training [(CULearn #1070)](https://uat.culab.cornell.edu/com) |
| ☒ Lab-specific protocol training |
| ☒ BARS [(CULearn #2277)](https://uat.culab.cornell.edu/com) |

### Lab Engineering Controls

- ☒ Benchtop
- ☒ Safety Cabinet (for aerosol containment)
- ☒ Chemical Fume Hood
- ☒ 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
- ☒ 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

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*Final Biosafety Level designation will be assigned upon a case-by-case review by the Institutional Biosafety Committee.*

*Recommended in addition to closed toe 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)

<table>
<thead>
<tr>
<th>☒ ABSL-1</th>
<th>☒ ABSL-2</th>
<th>☐ ABSL-3</th>
</tr>
</thead>
</table>

### 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

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**BARS – *P. aeruginosa***

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Controlled document if viewed online. Uncontrolled if viewed in print.

EHS/Biosafety Page 1
**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>

**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**

<table>
<thead>
<tr>
<th>Personal Hygiene</th>
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</thead>
<tbody>
<tr>
<td>Remove PPE before leaving the lab – avoid wearing PPE in public spaces.</td>
</tr>
<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>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Microbiological Practices</th>
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</thead>
<tbody>
<tr>
<td>In addition to standard BSL1 practices:</td>
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<tr>
<td>Biohazard signs and labels on equipment.</td>
</tr>
<tr>
<td>Use a biological safety cabinet (BSC), such as a Class II Type A2, for manipulations that can generate infectious aerosols.</td>
</tr>
<tr>
<td>Use aerosol containing devices for high-energy activities which 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.</td>
</tr>
<tr>
<td>Vacuum lines are protected with liquid disinfectant-filled traps and 0.45 micron filters.</td>
</tr>
<tr>
<td>Sharps handling and safety practices are implemented.</td>
</tr>
<tr>
<td>Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.</td>
</tr>
<tr>
<td>Chemically disinfect all surfaces and equipment.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>Windows in BSL-2 labs remain closed.</td>
</tr>
</tbody>
</table>

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<tr>
<th>Special Practices</th>
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</thead>
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<tr>
<td>All persons entering the laboratory are advised of the potential hazards and meet specific entry/exit requirements.</td>
</tr>
<tr>
<td>The laboratory supervisor ensures that lab personnel demonstrate proficiency in standard and special microbiological practices before working with such agents.</td>
</tr>
<tr>
<td>Laboratory equipment are routinely decontaminated, as well as, after spills, splashes or other potential contamination.</td>
</tr>
<tr>
<td>Spills involving infectious materials are contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material.</td>
</tr>
<tr>
<td>Equipment is decontaminated before repair, maintenance, or removal from the laboratory.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Regulated Medical Waste (RMW)</th>
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<tbody>
<tr>
<td>Soft waste:</td>
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<tr>
<td>All materials that come into contact with this agent must be placed in a biohazard waste bag.</td>
</tr>
<tr>
<td>If working in a BSC, have a biohazard waste bag inside the BSC for waste collection.</td>
</tr>
<tr>
<td>All equipment, tubes, and waste bags that are brought out of the biosafety cabinet are wiped with appropriate disinfectant.</td>
</tr>
<tr>
<td>Place smaller red bag waste from BSC into larger red bag outside the BSC for transport.</td>
</tr>
<tr>
<td>Sharps waste:</td>
</tr>
<tr>
<td>Place in leak proof sharps container labeled with the biohazard symbol. If working in a BSC, place a sharps container in the BSC.</td>
</tr>
<tr>
<td>Liquid waste:</td>
</tr>
<tr>
<td>Add EHS-approved disinfectant to appropriate concentration, hold for contact time specified per manufacturer’s guidelines, and then gently pour down the drain.</td>
</tr>
</tbody>
</table>

**Special Considerations**

> 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.