**Agent Characteristics**

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

<table>
<thead>
<tr>
<th>Agent Type</th>
<th>Biologically Derived-Toxin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carcinogen</td>
</tr>
<tr>
<td></td>
<td>Biohazard</td>
</tr>
</tbody>
</table>

**Description**

Aflatoxins are a family of poisonous and cancer-causing chemicals produced by certain fungi found on agricultural crops such as cassava, chili peppers, corn, cottonseed, millet, peanuts, rice, sorghum, sunflower seeds, tree nuts, wheat, and a variety of spices intended for human consumption. *Aspergillus flavus* and *Aspergillus parasiticus* are the main fungi that produce aflatoxins. The presence of these molds does not always indicate that harmful levels of aflatoxin are present, but does indicate a significant risk. The term “aflatoxin” is derived from *Aspergillus flavus*, the fungus in which the toxin was first identified. Laboratory work with most toxins, in amounts routinely employed in the biomedical sciences, can be performed safely with minimal risk to the worker and negligible risk to the surrounding community. Toxins do not replicate, are not infectious, and are difficult to transmit mechanically or manually from person to person. Many commonly employed toxins have very low volatility. At least 14 different aflatoxins are produced in nature. Aflatoxin B1 (AFB1) is considered the most toxic and is produced by both *A. flavus* and *A. parasiticus*. Aflatoxin M1 is present in the fermentation broth of *A. parasiticus*, but it and aflatoxin M2 are also produced when aflatoxin B1 and B2 are metabolized in the liver. Known aflatoxin types are: Aflatoxin B1 and B2, produced by *A. flavus* and *A. parasiticus*; Aflatoxin G1 and G2, produced by *A. parasiticus*; Aflatoxin M1, metabolite of aflatoxin B1 in humans and animals (exposure in ng levels may come from a mother's milk); Aflatoxin M2, metabolite of aflatoxin B1 in milk of cattle fed on contaminated foods; Aflatoxicol; Aflatoxin Q1 (AFQ1), major metabolite of AFB1 in *in vitro* liver preparations of other higher vertebrates.

**Host Range**

- Human, animal

**Host Shedding**

- ☒ Blood
- ☐ Direct contact
- ☐ Feces
- ☐ Other: Milk

**Routes of Exposure to Humans**

- ☐ Aerosol/Inhalation
- ☐ Arthropod Vectors
- ☐ Direct Contact
- ☐ Mucous Membranes
- ☐ Vertical Transmission

**Lethal Dose (LD50)**

- Between 0.03 (chick embryo) and 18 (female rat) mg/kg body weight, depending on species.

**Agent Viability**

- Inactivation: Treat with sodium hypochlorite at 1–2.5% (w/v) for 30 minutes (commercially available bleach solutions typically contain 3–6%); treat with a combination of 0.25% sodium hypochlorite and 0.25% sodium hydroxide for 30 minutes
- Survival: Outside Host - Aflatoxins are relatively stable to heat, and are not destroyed by boiling water, pasteurization, or autoclaving.

**Laboratory Hazards**

- ☒ High energy-creating activities (centrifugation, sonication, high pressure systems, vortexing, tube cap popping)
- ☒ Handling of sharps (needles, scalps, 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**

<table>
<thead>
<tr>
<th>Laboratory Biosafety Level (BSL)/</th>
<th>☒ BSL-2 ☐ with special practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attenuated Strain Alternatives</td>
<td>None</td>
</tr>
</tbody>
</table>

**Training**

- ☐ EHS Laboratory Safety Training
- ☒ EHS Bloodborne Pathogens Training
- ☒ Lab-specific protocol training

**Lab Engineering Controls**

- ☒ Benchtop
- ☒ Biosafety Cabinet (for aerosol containment)
- ☒ Chemical Fume Hood (for chemical extractions)
- ☒ 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
- ☒ Other: Respiratory Protection

**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

**Agent Vivarium Guidance**

<table>
<thead>
<tr>
<th>Animal Housing Biosafety Level (ABSL)</th>
<th>☒ ABSL-1 ☒ ABSL-2 ☐ ABSL-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Biosecurity</td>
<td>☒ Experimental animals are housed separately</td>
</tr>
<tr>
<td>Information not available</td>
<td></td>
</tr>
<tr>
<td>Perform Inoculations</td>
<td>☒ Benchtop</td>
</tr>
<tr>
<td></td>
<td>☒ Biosafety Cabinet</td>
</tr>
<tr>
<td>Change Cages</td>
<td>☒ Benchtop</td>
</tr>
<tr>
<td></td>
<td>☒ Biosafety Cabinet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immunizations</th>
<th>☐ Available ☒ Not Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prophylaxis</td>
<td><a href="https://www.cdc.gov/biomonitoring/toxins.html">https://www.cdc.gov/biomonitoring/toxins.html</a></td>
</tr>
</tbody>
</table>

*Formal medical advice is obtained during medical consultations with Cornell Health or primary healthcare provider as needed.
### Exposure and Spill Procedures

<table>
<thead>
<tr>
<th>Mucous Membranes</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other 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>
</tr>
<tr>
<td>Small Spills</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>
</tr>
<tr>
<td>Large Spills</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.

### 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
- 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.
- Shards 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)

**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.
- Place in leak proof sharps container labeled with the biohazard symbol. If working in a BSC, place a sharps container in the BSC.
- Add EHS-approved disinfectant to appropriate concentration, hold for contact time specified per manufacturer’s guidelines, and then gently pour down the drain.

**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.

### References
1. FDA Field Science and Laboratory guide, Aflatoxin analysis: [http://www.fda.gov/ScienceResearch/FieldScience/ucm172158.htm](http://www.fda.gov/ScienceResearch/FieldScience/ucm172158.htm)

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