# Pomona College Biosafety Program

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## Introduction

In order to ensure student and employee safety, regulatory compliance, and proper handling of biohazardous materials, all work with biohazardous materials must be performed in compliance with the Pomona College Biosafety Program.

The CDC and NIH publication [Biosafety in Microbiological and Biomedical Laboratories](https://www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf) (BMBL, 5th edition) should be used as the main guidance document for determining proper handling of biohazardous materials and a reference for best practices.

## Scope

This program applies to all laboratory work with biohazardous materials on the Pomona College campus. All laboratory personnel or visitors working in Pomona College spaces, regardless of affiliation, must adhere to its requirements.

The biosafety program is superseded by the Chemical Hygiene Plan (CHP); adherence to the CHP is required for all laboratory personnel handling biohazardous material. All practices and procedures specified in the CHP should be followed in addition to those in this program.

The specific guidelines and practices in this program are applicable only for work with materials falling under Biosafety Level 1 (BSL-1), Biosafety Level 2 (BSL-2), Animal Biosafety Level 1 (ABSL-1), or Animal Biosafety Level 2 (ABSL-2). No work with agents above these levels is currently permitted at Pomona College.

## Roles and Responsibilities

The Environmental Health & Safety Officer (EHSO) will develop the biosafety program and update it as needed; additionally, the EHSO shall:

* Assist in developing SOPs for biohazardous materials
* Perform annual inspections to ensure laboratory safety
* Provide general laboratory safety training to all personnel working in laboratories with biohazardous materials
* Provide specific trainings on biosafety topics as requested
* Ensure proper signage for and documentation of biohazardous work
* Investigate spills, exposures, or injuries that occur in the laboratory
* Maintain Pomona College’s regulatory reports and training records
* Ensure that medical surveillance or immunizations are made available to laboratory personnel if needed

Faculty and Laboratory Supervisors will serve as the responsible person (RP) for the laboratory space and laboratory personnel working with biohazardous materials. The responsible person (RP) for the laboratory shall:

* Develop appropriate procedures for work with biohazardous materials
* Ensure that laboratory personnel are familiar with the biosafety program, the relevant SOPs, and adhere to the Chemical Hygiene Plan
* Ensure that laboratory personnel attend general laboratory safety training prior to beginning work in the laboratory
* Inform the EHSO upon beginning or concluding work with biohazardous materials, or if a significant change in the hazards posed by biohazardous work occurs
* Ensure that proper engineering controls and PPE are available to laboratory personnel, are in good working condition, and are used as needed

## Exposure Control

### Routes of Exposure

Inhalation, or exposure through the lungs, is the most common exposure source for laboratory-acquired infections (LAIs); frequently, this is due to inhalation of aerosolized particles containing infectious agents. Exposure via inhalation can be prevented by avoiding aerosol-generating processes or working in a biosafety cabinet.

Injection, or exposure caused by breaking through the skin, is usually the result of a needle stick or a cut from broken glass, but can be caused by any sharp object in a laboratory. Exposure via injection can be prevented by reducing the use of glassware for biohazardous work and properly handling and disposing of sharps.

Ingestion, or exposure through the digestive system, can result from improper handwashing, or as a result of eating or drinking in the laboratory. Exposure via ingestion can be prevented by careful hand-washing after lab, decontaminating surfaces frequently, and not having food or drink in laboratory areas.

Absorption, or exposure through the skin and mucus membranes, can occur when biohazardous material is splashed in the eye, on mucus membranes, or on broken skin. Exposure via absorption can be prevented by wearing proper PPE and ensuring that contaminated PPE does not come in to contact with the eyes, nose, and mouth.

### Sharps and Glassware

Sharps (syringes, needles, very narrow/sharp plastic pipette tips, razor blades, scalpels, etc.) and glassware (particularly glass pipettes) can potentially cause both exposure via injection and general laboratory injuries. Sharps and glassware may **never** be disposed of in regular laboratory trash **for any reason**. Reusable sharps must be stored such that they do not pose a cut or puncture hazard to laboratory personnel. Never manually re-cap needles. Never pick up broken glass by hand; use tongs or other tools.

Sharps waste containers should be present within easy reach of a sharps work area to prevent benchtop storage of sharps waste. Self-closing sharps containers are ideal for ensuring that all hazardous waste containers are closed when not in active use. Once a sharps container is 75% full, it should be firmly closed, taped shut, and disposed of through the College’s hazardous waste vendor at the next hazardous waste pickup.

Broken glass waste containers should be present in the laboratory for the disposal of **non-contaminated** glass that poses a cut or puncture hazard. Contaminated glassware (such as glass pipettes) should be disposed of as biohazardous or chemically hazardous sharps waste. Once a broken glass container is 75% full it should be taped shut and disposed of in the regular trash as solid lab waste.

### Biosafety Cabinets (BSCs)

Biosafety cabinets, when functioning properly and used with good technique, ensure that biohazardous materials and aerosols inside the cabinet do not pose an inhalation hazard to laboratory personnel. However, biosafety cabinets function only when maintained, used, and decontaminated following best practices. Work with biohazardous materials in a biosafety cabinet should only be performed if:

1. The biosafety cabinet is well maintained and has been certified at least annually with the testing date posted visibly on the cabinet exterior.
2. Chemicals, radioisotopes, and biohazardous materials that enter the biosafety cabinet are appropriate for the cabinet and experimental setup.
   * Note that Class I biosafety cabinets provide no protection from ambient air for samples, which may result in contamination of sterile materials.
3. The biosafety cabinet has been turned on for 10 minutes before use and is decontaminated with an appropriate disinfectant when work is completed.
   * Remember to organize cabinet work and decontamination processes ‘from clean to dirty’ in a single direction to prevent contamination.
4. Storage inside the biosafety cabinet is minimized, and the front and rear grills are kept clear at all times to ensure appropriate airflow.
5. Movement in and out of the biosafety cabinet is minimized to prevent disruption of airflow.

### Aerosol-Generating Processes

The use of many common pieces of equipment in research with biohazardous materials can increase the risk of aerosol generation and inhalation exposure. Any mechanical processing of biohazardous materials (e.g. centrifuging, lyophilizing, sonicating, grinding, blending) should be done in sealed containers (e.g. a tightly capped centrifuge tube). Aerosol-generating procedures on open samples should only be done in a biosafety cabinet.

## Administrative Controls

### Signage and Labeling

All laboratories containing biohazardous material must post the universal biohazard symbol on the laboratory entrance. For BSL-1 materials, posting the biosafety level, RP name, and RP phone number is recommended but not required. For BSL-2 materials, posting the biosafety level, RP name, RP phone number, and entering/exiting procedures is **required**.

### Training & SOPs

Laboratory personnel working with biohazardous materials are required to attend annual general laboratory safety training **prior** to beginning work. Laboratory personnel who will be using an autoclave should additionally receive hands-on training on proper autoclave use.

All work with biohazardous materials should be associated with a lab-specific, agent-specific written procedure (e.g. laboratory manual or SOP). SOPs are required for BSL-2 work and should include a detailed description of the hazards posed by the specific agents involved in the process, a step-by-step procedure for handling biohazardous materials, and clear instructions on proper PPE, disposal, and decontamination procedures.

### Medical Consultation

Personnel working with BSL-2 materials should additionally complete a Biohazard Use Risk Assessment (see Appendix) based on input from their laboratory supervisor prior to beginning work and submit it to the EH&S Officer. If consultation with a medical professional is requested, the attached healthcare provider portion of the form should be completed and returned to the EH&S Officer. These forms will be kept electronically in a private Box folder accessible only to the EH&S Officer and the Dean of the College’s office.

## Decontamination

All solutions, equipment, supplies, and surfaces that have potentially come into contact with biohazardous materials must be decontaminated according the appropriate procedures for the agent in use. Written procedures should specify the type of decontamination and the specific parameters (e.g. time exposed to bleach, autoclave temperature) necessary.

Common methods of decontamination include autoclaving, exposure to 10% bleach, and exposure to ≥70% ethanol. Ethanol should not be used for decontamination of equipment or surfaces where there is a potential for exposure to heat, sparks, or other ignition sources.

### Autoclave Usage

Laboratory personnel who will be using an autoclave should additionally receive hands-on training on proper autoclave use. Autoclaves must be tested monthly to ensure proper function. All autoclave users must also:

1. Fill out the autoclave log **before** beginning a cycle.
2. Never autoclave materials that are not specifically determined to be autoclave-safe.
3. All containers of liquid for autoclaving should have loose or vented caps to prevent over-pressurization of the container.
4. Use **autoclave-safe** secondary containment for all materials.
5. Ensure the autoclave is running on the proper temperature and cycle for the materials being autoclaved.
6. Use heat-resistant gloves when handling hot or potentially hot materials from the autoclave. Let hot materials (particularly liquids) cool after opening the autoclave to prevent burns or over-boiling.

## Spills & Exposure

### Personnel Exposure

If a laboratory worker is exposed to biohazardous material, they should immediately rinse the affected area with soap and water. If there is a potential for a laboratory-acquired infection based on the material and the route of exposure, the supervisor should contact the EHSO immediately. The EHSO and supervisor may recommend that the laboratory worker consult with a medical professional to determine if additional treatment is necessary. Follow the injury reporting guidelines of the Chemical Hygiene Plan for injuries involving biohazardous work.

### Spill Cleanup

Small biohazardous spills may be cleaned up by applying the appropriate decontamination procedure (e.g. bleach exposure or ethanol exposure) to the area of the spill. Ethanol should not be used to clean up spills near electrical outlets or near equipment that may generate heat or sparks.

Large biohazardous spills that cannot be easily or safely cleaned up by a single person should be reported to the EHSO (or Campus Safety if the EHSO is unavailable). The area should be evacuated until the spill is cleaned up, either by the EHSO and supervisor or by an external hazardous waste contractor.

## Biohazardous Waste

Solid Waste

BSL1 Waste that does not fall under the definition of infectious or biohazardous medical waste (e.g. yeast plates, petri dishes with non-toxin producing *E. coli*, fly vials, waste containing *C. elegans*) can be stored in a clear autoclave bag, autoclaved with indicating tape to ensure sterilization, and disposed of as regular laboratory trash.

BSL2/Medical Waste (e.g. human cell lines, pathogenic *E. coli*) should be stored in red biohazard bags in a rigid container with the universal biohazard symbol on all four sides. When full, these bags should be sealed, marked with autoclave tape and autoclaved (if appropriate for the agent in use), and placed in a rigid container in the hazardous waste pickup area for the department.

Liquid Waste should be either exposed to bleach or autoclaved, as appropriate for the agent in use, and disposed of either down the sink (for non-hazardous solutions) or as chemical waste (for solutions containing hazardous chemicals).

## Appendix: Biohazard Use Risk Assessment Form

All laboratory personnel working with biohazardous material classified as Biosafety Level 2 (BSL-2) must be informed about the potential health hazards and risk factors associated with their work in order to determine if there are additional health risks that require medical consultation or work practices accommodations.

Faculty and staff may consult with their personal physicians or with an occupational health provider recommended by the College. Students may consult with a medical provider at the Student Health Center (Tranquada) or with their personal physicians. Any out-of-pocket costs for visiting a medical provider will be reimbursed through the College’s Chemical Hygiene Program.

Based on the protocol and agents involved in the planned work, laboratory personnel and their supervisors should determine the risk of exposure to biohazardous agents and the potential health effects. Fill out the first two pages and indicate whether or not you would like to consult with a medical professional prior to beginning work, if so, have the medical professional complete the third page.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student/Staff ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Role (e.g. student, faculty, facilities): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Supervisor Phone (self if PI): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Agent(s) in Use: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Extent of Exposure to Agent(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Potential Health Effects of Agent(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Biohazard Use Risk Assessment (BURA)**

Working with biohazardous materials can present additional risks for personnel with certain medical conditions, taking some medications, or who have other risk factors. The College recommends that if any of the following points apply to you, you should consult with a medical professional to determine if your planned work is appropriate and safe within your personal medical context. **You are not obligated to provide personal medical information, including the presence or absence of any health conditions, to anyone except a medical professional of your choosing.**

|  |  |
| --- | --- |
| **Medical Conditions:** | |
| * Immune system disorders * Skin disorders resulting in cracked or bleeding skin (e.g. eczema, ichthyosis) | * Pregnancy or breastfeeding * Organ or skin transplant * Other serious chronic disease |
| **Medications/Treatments:** | |
| * Immunosuppressant medications * Chemotherapy | * Radiotherapy * Steroid treatments |
| **Other:** | |
| * Prefer to consult with a medical professional for any reason * Unsure if one of the above points applies | * Hepatitis B vaccination not received (work with human blood or tissue) * Vaccine needed for specific agent in use |

Based on the potential risk factors listed, or personal preference, would you like to consult with a medical professional prior to beginning biohazardous work? If you later decide that you would like to consult with a medical professional, you may do so at any time.

|  |  |
| --- | --- |
| * **Yes** | * **No** |

By signing below, you indicate that you have read all of the information above, including the risk factors, and that you understand that if you choose not to receive a medical evaluation despite having at least one risk factor, you may be at risk of serious injury or harm as a result of working with biohazardous materials.

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Print Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Please return this form to the EH&S Officer (in person or via email).

**Biohazard Use Risk Assessment (BURA)**

Dear Health Care Professional,

Your patient will be conducting laboratory work with Biosafety Level 2 (BSL-2) agents at Pomona College. The potential health hazards and effects of this work have been described on Page 1 by their laboratory supervisor. Your patient has requested to see a medical professional to evaluate the potential risks of biohazardous work. You are asked to assess your patient’s ability to work safely with the agent in question and advise them of the potential risks in the context of their own health conditions. Please review and complete this form, and return it to the patient so that s/he may return it to the Environmental Health & Safety Officer for the College.

Patient Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**To be filled out by Health Care Professional:**

Based on this consultation and the information above, the patient:

* **Can** proceed with their planned biohazardous work
* **Cannot** proceed with their planned biohazardous work
* **Can** proceed with their planned biohazardous work, given the following accommodations or alterations to their work:

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Print Name of Medical Professional: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Appendix: Classifications of Biohazardous Materials

Definitions from BMBL, 5th edition.

### Biosafety Level (BSL)

Biosafety Level 1 (BSL-1)refers to work with “well-characterized agents not known to consistently cause disease in immunocompetent adult humans, [which] present minimal potential hazard to laboratory personnel and the environment.”

Biosafety Level 2 (BSL-2)refers to work with “agents that pose moderate hazards to personnel and the environment.”

Biosafety Level 3 (BSL-3) refers to work with “indigenous or exotic agents that may cause serious or potentially lethal disease through the inhalation route of exposure.”

Biosafety Level 4 (BSL-4) refers to work with “dangerous and exotic agents that pose a high individual risk of aerosol-transmitted laboratory infections and life-threatening disease that is frequently fatal, for which there are no vaccines or treatments, or a related agent with unknown risk of transmission.”

### Animal Biosafety Level (ABSL)

Animal Biosafety Level 1 (ABSL-1) refers to “work in animals involving well-characterized agents that are not known to cause disease in immunocompetent adult humans, and present minimal potential hazard to personnel and the environment.”

Animal Biosafety Level 2 (ABSL-2) refers to “work involving laboratory animals infected with agents associated with human disease and pose moderate hazards to personnel and the environment.”

Animal Biosafety Level 3 (ABSL-3) refers to “work with laboratory animals infected with indigenous or exotic agents, agents that present a potential for aerosol transmission, and agents causing serious or potentially lethal disease.”

Animal Biosafety Level 4 (ABSL-4) refers to “work with animals infected with dangerous and exotic agents that pose a high individual risk of aerosol-transmitted laboratory infections and life threatening disease that is frequently fatal, for which there are no vaccines or treatments; or a related agent with unknown risk of transmission.”

### Risk Group

Risk Group 1 is defined by the NIH as “agents not associated with disease in health adult humans.”

Risk Group 2 is defined by the NIH as “agents associated with human disease that is rarely serious and for which preventive or therapeutic interventions are often available.”

Risk Group 3 is defined by the NIH as “agents associated with serious or lethal human disease for which preventative or therapeutic interventions may be available.”

Risk Group 4 is defined by the NIH as “agents likely to cause serious or lethal human disease for which preventative or therapeutic interventions are not usually available.”