

PROCEDURE: SELECTION AND USE OF PERSONAL PROTECTIVE EQUIPMENT AND ATTIRE IN LABORATORIES

This Procedure describes how to implement Yale University's (University) *Personal Protective Equipment Policy* (Policy) in a laboratory. For convenience, parts of the Policy are restated below in language pertinent to laboratories.

INTRODUCTION

A wide variety of hazardous materials, conditions and processes are present in University laboratories,¹ and care must be taken to protect faculty, staff, students, affiliates and visitors from exposure to these hazards. To protect against contamination or exposure, all individuals in a University laboratory are required to wear the personal attire and personal protective equipment (PPE) necessary

RESPONSIBILITIES

All faculty, staff, students, affiliates and visitors who work in a University laboratory are responsible for wearing personal attire and PPE that minimizes the risk of exposure to hazards. Appropriate laboratory personal attire and PPE will vary depending on the hazards present and the activities being performed, but must always include: a) closed-toe, solid top shoes; b) clothing that covers the legs; c) safety glasses or protective prescription glasses; and d) gloves (if touching potentially contaminated or hazardous materials). Personal attire that does not offer adequate protection must not be worn in a laboratory. Examples of such personal attire that may not be worn in a laboratory are shorts, short skirts, open-toed shoes and other attire that may result in skin exposure to hazards.

Principal Investigators (PIs), lab managers, supervisors and instructors are primarily responsible for safety in their laboratory. These safety responsibilities include ensuring that all staff, students, affiliates and visitors wear appropriate personal attire and required PPE while in their laboratory.² No activity or experiment may be conducted if the required personal attire is not worn, or the required PPE is not available and used. Further, faculty and senior staff are responsible for modeling the use of appropriate personal attire and hazard-appropriate PPE. Specifically, PIs, lab managers, supervisors and instructors (or their designees) are responsible for:

- Performing, documenting and certifying a PPE hazard assessment for all laboratory staff, students, affiliates and visitors before they first enter the laboratory, begin an activity, or are potentially exposed to a hazardous material, condition or process;
- Reviewing and updating the assessment when a new hazardous material, condition or process is introduced into the laboratory;
- Ensuring that staff, students, affiliates and visitors are aware of the laboratory's hazardous materials, conditions and processes;
- Ensuring that staff, students, affiliates and visitors receive applicable PPE information and training prior to exposure to laboratory hazards;
- Providing additional laboratory-specific safety training;

¹ This procedure is applicable to teaching, research, clinical and testing laboratories.

² Facilities management is responsible for ensuring that Facilities staff understand and comply with PPE requirements before work commences in laboratories.

- Supplying required PPE at no cost to affected staff and students;³
- Communicating, monitoring and enforcing standards for appropriate personal attire and minimum PPE, as well as the use of PPE specified by a PPE hazard assessment, work environment or activity performed; and
- Notifying the Office of Environmental Health and Safety (EHS) laboratory materials, conditions or processes that may require individuals to wear additional or different types of PPE.

EHS will assist by providing guidance on the selection and use of PPE, reviewing PPE assessments, and providing safety training. Any questions regarding PPE should be directed to the EHS Safety Advisor assigned to the laboratory.

PPE HAZARD ASSESSMENT REQUIREMENTS

To meet the above responsibilities PIs, lab managers, supervisors and instructors must complete the on-line Laboratory PPE Hazard Assessment Tool (via <https://ehsis.yale.edu/EHSIntegrator/Survey/LabPPE>) for all activities that occur in their laboratory. The Tool aids in the identification of typical hazards found in a laboratory and specifies PPE necessary for protecting individuals from these hazards. The Tool must be updated whenever a new hazardous material, condition or process is introduced into the laboratory. Please contact your EHS Safety Advisor for assistance.

Upon completing the Tool, PIs, lab managers, supervisors and instructors must communicate the required personal attire and PPE to all individuals who enter the laboratory. EHS will review the assessment Tool with laboratory staff periodically, generally during a laboratory inspection.

Exceptions and alternate PPE requirements may be proposed in the Tool. If less stringent, *any proposed exceptions or alternate PPE requirements must be approved by EHS before being implemented*. If not approved by EHS, the PI, lab managers, supervisors or instructors may request further review by the Chemical and Laboratory Safety Committee, the Biological Safety Committee, the Radiation Safety Committee or the University Safety Committee, as appropriate.

TRAINING REQUIREMENTS

Individuals who may potentially be exposed to hazardous materials, conditions or processes must be trained on proper procedures, material handling and the means to protect themselves, including the proper selection, use, care and limitations of PPE. This training must occur prior to exposure to a hazard. This training is provided via several methods, including instructor-led sessions, computer-based training courses, written programs, or by the PI, lab manager, supervisors or instructor.

Prior to working in a laboratory, all individuals must complete EHS' Laboratory Chemical Safety training. Additional PPE information is provided in other EHS training programs, including Radiation Safety, Biosafety, Bloodborne Pathogens, Noise and Hearing Conservation, Respiratory Protection, Formaldehyde Safety, Organolithium Compounds, and Hazardous Chemical Waste Management.

³ Exception: An undergraduate student enrolled in a laboratory course is required to purchase his or her laboratory coat. Unless it becomes contaminated, s/he is responsible for the care and maintenance of the laboratory coat by following the manufacturer's instructions.

In many cases, an individual's PPE training requirements are assigned via the University's Training Management System (TMS) assessment, and PPE training is documented in TMS.

CARE AND USE OF PPE

It is the responsibility of the user to clean and maintain their assigned PPE. Any PPE found to be defective, cut or otherwise damaged must be immediately replaced. Immediately discontinue using contaminated PPE. Contaminated lab coats must be decontaminated prior to laundering. If contaminated, other re-usable PPE must be decontaminated prior to reuse. Disposable PPE must never be reused. Laundering of lab coats must be done through an approved laundry service or facility. (See the University Buying Guide at <http://buying-guide.yale.edu/> for more information.)

Gloves and lab coats must not be worn in common areas, such as cafeterias, lunch rooms, conference rooms, offices and libraries. For laboratories in which human pathogens are used, lab coats may not be worn outside of the laboratory. In other types of laboratories, a lab coat may be worn when traveling in a corridor between laboratories or support rooms, such as a cold room or an instrument room.

Door handles, elevator buttons, telephones, computers or other clean surfaces or items must not be touched with gloved hands. An individual may wear a single glove when traveling in a corridor between laboratories or support rooms, such as a cold room or an instrument room.

REFERENCES

[Yale University Personal Protective Equipment Policy](#)

[Gradations of Risk Table for Biosafety Levels](#)

[Personal Protective Equipment Assessment Table/Tool for Laboratories](#)

APPENDIX A

Laboratory PPE Hazard Assessment Tool (*This tool is available online at <https://ehsis.yale.edu/EHSIntegrator/Survey/LabPPE>*)

Check all Activities/Jobs/tasks that apply to your laboratory, and note any changes to personal protective equipment in the table and document their rationale at the end of this tool.

Personal Protective Equipment to be worn at all times:

Applies	Activities/Jobs/Tasks	Potential Exposures Addressed by PPE	Personal Protective Equipment Requirements
√	Working in a laboratory where hazardous materials are used <i>(exception: safety glasses are not required when sitting at a desk in the lab that is separated from the bench and there is minimal possibility of contamination)</i>	<ul style="list-style-type: none"> Contamination (feet, leg, clothing, eyes, hands) 	<ul style="list-style-type: none"> Closed-toe, solid top shoes Clothing that covers the legs Safety glasses or prescription glasses Gloves if touching potentially contaminated equipment

Additional Personal Protective Equipment Requirements:

Applies	Activities/Jobs/Tasks	Potential Exposures Addressed by PPE	Personal Protective Equipment Requirements
	Directly handling hazardous materials	<ul style="list-style-type: none"> Chemical, biological or radioactive material contamination (hands, eyes) Contamination of personal clothing or skin (body) 	<ul style="list-style-type: none"> Safety glasses Gloves—exam style—nitrile preferred (highly permeable, highly toxic materials may require different gloves—contact EHS) Lab coat
	Working with larger volumes (>1L) of corrosive or toxic liquids	<ul style="list-style-type: none"> Splashing (eyes, face) Contamination/burns to unprotected skin (hands, wrists, body) 	<ul style="list-style-type: none"> Chemical goggles Face shield if under pressure or outside fume hood Gloves—utility grade nitrile or neoprene over nitrile exam style Lab coat

Applies	Activities/Jobs/Tasks	Potential Exposures Addressed by PPE	Personal Protective Equipment Requirements
	Working directly with pyrophoric and water reactive chemicals	<ul style="list-style-type: none"> • Burns (clothing, eyes, face, hands, body) 	<ul style="list-style-type: none"> • Wear non-synthetic clothing • Work only inside a chemical fume hood or glove box • Safety glasses or chemical goggles • Face shield if splashing can occur • Nitrile gloves • Flame resistant gloves (larger volumes) • Flame resistant lab coat • Portable blast shield as necessary
	Working with cryogenic materials	<ul style="list-style-type: none"> • Cold burns (eyes, face, hands, body) 	<ul style="list-style-type: none"> • Safety glasses • Face shield (larger volumes) • Thermal insulated gloves • Lab coat, apron or equivalent (larger volumes)
	Working with hot objects or equipment	<ul style="list-style-type: none"> • Burns (eyes, face, hands, body) 	<ul style="list-style-type: none"> • Safety glasses • Face shield as necessary • Heat resistant gloves • Lab coat, apron or equivalent
	Working with apparatus under high pressure	<ul style="list-style-type: none"> • Cuts from glass/ material fragments (face, hands, body) • Chemical contamination (eyes, face, hands, body) 	<ul style="list-style-type: none"> • Safety glasses or goggles • Face shield • Utility gloves • Rubber apron as necessary • Portable blast shield as necessary
	Working with highly reactive or explosive chemicals	<ul style="list-style-type: none"> • Cuts from glass/ material fragments (face, hands, body) • Chemical contamination (eyes, face, hands, body) • Fire 	<ul style="list-style-type: none"> • Work only inside a chemical fume hood • Goggles • Face shield • Utility grade gloves—neoprene, butyl, nitrile, nomex, cut resistant, as appropriate • Flame resistant lab coat when fire hazard exists • Rubber apron • Portable blast shield as necessary
	Minor chemical spill cleanup (if <1 liter of low hazard chemical, and respiratory protection is not required)	<ul style="list-style-type: none"> • Chemical contamination (shoes, eyes, hands, clothing) 	<ul style="list-style-type: none"> • Shoe covers as necessary • Safety glasses or goggles • Double nitrile gloves or utility grade gloves over nitrile exam gloves • Lab coat

Applies	Activities/Jobs/Tasks	Potential Exposures Addressed by PPE	Personal Protective Equipment Requirements
	UV light sources	<ul style="list-style-type: none"> • Burns (eyes, face, neck, hands, wrist) 	<ul style="list-style-type: none"> • Full face shield (polycarbonate) over safety glasses • Nitrile gloves (wrists fully covered) • Lab coat
	Handling animals in a laboratory	<ul style="list-style-type: none"> • Animal blood and other potentially infectious materials (eyes, hands) • Bites, scratches (hands, forearms, body) • Allergens (respiratory or transfer to mucous membranes of the eyes, nose or mouth) • Anesthetic agents (respiratory) 	<ul style="list-style-type: none"> • Safety glasses • Gloves • Gown or lab coat • Refer to YARC for additional PPE requirements, which may differ depending on species, engineering controls, and hazardous agents used
	Working with radioactive materials	<ul style="list-style-type: none"> • Contamination of personal clothing (body) • Radioactive material contamination (eyes, hands, wrists, skin) 	<ul style="list-style-type: none"> • Safety glasses • Gloves (double gloves recommended) • Lab coat • Personal radiation badge as appropriate • Survey meter as appropriate • Bench-top radiation shielding as appropriate
	Performing an iodination with volatile radioactive sodium iodide inside an approved radioiodine fume hood	<ul style="list-style-type: none"> • Contamination of personal clothing (shoes, body) • Radioactive material contamination (eyes, hands, wrists, skin) • Inhalation of volatile material (respiratory) 	<ul style="list-style-type: none"> • Shoe covers • Safety glasses • Double gloves • Sleeve covers • Lab coat • Personal radiation badge • Survey meter with scintillation probe • Benchtop radiation shielding
	Working at a microscope in the laboratory	<ul style="list-style-type: none"> • Hazard material contamination (hands) • Contamination of personal clothing (body) 	<ul style="list-style-type: none"> • (If necessary, safety glasses may be temporarily removed while viewing materials via a microscope) • Gloves if touching potentially contaminated material • Lab coat or gown

Applies	Activities/Jobs/Tasks	Potential Exposures Addressed by PPE	Personal Protective Equipment Requirements
	Operating analytical or diagnostic x-ray generating equipment (fluoroscopy, XRD, XRF, patient procedures, etc.)	<ul style="list-style-type: none"> • Radiation exposure (body) • If patient or human subject, standard precautions • If laboratory animals, allergens (respiratory or transfer to mucous membranes of the eyes, nose or mouth) 	<ul style="list-style-type: none"> • Lead apron or use of structural radiation shielding as appropriate • Personal radiation badge and ring if assigned • Survey Meter as appropriate • Gloves, as appropriate • Lab coat, gown or approved uniform, as appropriate
	Working with open table Class 3B or 4 Lasers	<ul style="list-style-type: none"> • Ocular and skin exposure (eyes, face, hands, body) 	<ul style="list-style-type: none"> • Protective eyewear of proper optical density • Face shield for UV Lasers • Appropriate gloves for UV lasers • Lab coat for UV lasers • No jewelry or reflective items worn
<p>Biohazard experiments are classified based on risk. The starting point for risk assessment is the assignment of a biohazard to a specific Risk Group. There are 4 Risk Groups (RGs) based on risk to the individual and the community. RG1 is the lowest risk and RG4 is the highest. Risk Group assignments for human pathogens can be accessed at: http://www.absa.org/riskgroups/index.html</p> <p>For other experiments, researchers can refer to the Gradations of Risk Table referenced in this document.</p>			
	Work with Risk Group 1 materials that do not cause disease in humans (i.e. non-pathogenic strains of <i>E. coli</i> , <i>Bacillus subtilis</i> , <i>Saccharomyces cerevisiae</i> , rodent cell lines)	<ul style="list-style-type: none"> • Risk Group 1 materials could represent a risk to individuals with compromised immunity or who may have allergies to the materials (eyes, hands, respiratory, body) 	<ul style="list-style-type: none"> • Safety glasses • Gloves • Lab coat • Surgical mask or respirator, if specified
	Working with human blood, tissues, body fluids, human cell lines, or Risk Group 2 bloodborne pathogens, utilizing Universal Precautions and BSL2 containment.	<ul style="list-style-type: none"> • Potentially infectious materials by splash (to mucous membranes of the eyes, nose or mouth, or through non-intact skin) • Puncture by contaminated sharps (skin—percutaneous) 	<ul style="list-style-type: none"> • Safety glasses • Mask or face shield if splashing is possible • Gloves—nitrile exam and/or cut-resistant • Lab coat or gown • Surgical mask or respirator, if specified • Additional PPE may be required based on risk to the individual

Applies	Activities/Jobs/Tasks	Potential Exposures Addressed by PPE	Personal Protective Equipment Requirements
	<p>Experiments involving Risk Group 2 agents, that represent a moderate risk to the individual and may cause disease of varying severity. Examples of Risk Group 2 agents include <i>Plasmodium falciparum</i>, <i>Salmonella typhimurium</i>, Herpes Simplex Virus and <i>Cryptococcus neoformans</i>)</p>	<ul style="list-style-type: none"> • Exposure to agent (eyes, hands, skin) • Puncture by contaminated sharps (skin—percutaneous) • Ingestion (eyes, nose or mouth) • Aerosol production can create potential risk of inhalation and contamination of surrounding surfaces (respiratory) 	<ul style="list-style-type: none"> • Safety glasses • Gloves • Lab coat or gown • Respirator, if specified • Additional PPE may be required based on risk to the individual • Confine aerosols as close as possible to their point of generation • Use a biosafety cabinet or other engineering control
	<p>Experiments with Risk Group 3 agents (i.e. West Nile Virus, <i>Mycobacterium tuberculosis</i>, <i>Histoplasma capsulatum</i>) in cell culture or animal laboratories</p>	<ul style="list-style-type: none"> • All RG2 routes of exposure may be applicable (eyes, nose, mouth, hands, respiratory, skin) • Inhalation is of particular concern for pathogens classified at Risk Group 3 (respiratory) 	<ul style="list-style-type: none"> • All work with RG3 agents must be conducted under primary containment using BSL3 containment practices. Specialized laboratories are required for this work. • All procedures with RG3 agents must be approved by the Yale Biological Safety Committee • Full face protection—face shield or safety glasses and mask • Gloves—exam, two pairs • Gown—back-fastening • Additional PPE may be required based on risk to the individual, such as respiratory protection, protective sleeve covers, booties, jump suits, etc.
	<p>Performing work with Risk Group 4 agents (i.e. Ebola virus, Marburg virus) or work that requires BSL4 containment. Risk Group 4 agents represent a very high risk to the individual and are also a risk to the community.</p>	<ul style="list-style-type: none"> • All routes of exposure (percutaneous, inhalation, ingestion, and via facial mucous membranes) may be involved with these experiments. 	<ul style="list-style-type: none"> • Work with Risk Group 4 Agents is not allowed at Yale University.

CERTIFICATION STATEMENT

I have performed a PPE hazard assessment of the work being conducted in areas under my responsibility and will implement requirements based on this assessment.

Print Name of Principal Investigator/Lab Manager/Supervisor/Instructor:	
Signature	Date
Note any proposed exceptions or alternate PPE requirements here, and forward to EHS for approval. EHS approval is required before implementing any less stringent exceptions or alternate PPE requirements.	
Signature of EHS Approver :	Date of Approval: