**Hazard Assessment and Mitigation Tool: VIU Biosafety Program**

**Instructions:**

**Step1**: Check all activities that may expose faculty, staff and students to hazards within the course or research project. Select all hazards from the list below that may be encountered during the course/project.

**Step 2**: Review the types of controls that have been identified for the hazards selected.

**Step 3:** Incorporate the identified controls into your methodology/procedure/course manual if they haven’t been already.

**Health Hazards:** Any hazard that may produce serious and immediate (acute) health effects or long term (chronic) health problems (e.g. exposure to a known toxic chemical leading to cancer later in life, etc.)

**Safety Hazards:** Any hazard that can cause an injury if an incident occurs (e.g. a cut received from a knife/scalpel, fall from a ladder, etc.)

The [VIU Hazard Identification, Risk Assessment and Control](https://adm.viu.ca/health-and-safety/hazard-identification-risk-assessment-and-control) program is available to help you understand the terminology being referenced throughout.

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| **BIOLOGICAL HAZARDS** |
|[ ]   Do you work with, or could you be exposed to, infectious biological agents?Consider: Bacteria, Viruses, Fungi, Parasites, Zoonotic Pathogens, Prions, Biological Toxins, Biotechnology/Recombinant DNA, Human/Animal Cell lines, Human blood, tissue, and/or bodily fluid, Animal blood, tissue, and/or bodily fluids |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Exposure to biologically infectious materials/zoonotics | In lab: lab coat, long pants, closed foot shoes (heel/toe), glovesFace shield (if required)N95 respirator (if required) | * Obtain approval for work from the Institutional Biosafety Committee;
* Work in a certified biological safety cabinet when aerosol generation is expected,
* Use safe microbiological practices
* Refer to the VIU Biosafety Procedures Manual for approved safe handling procedures.
 | [VIU approved Biosafety courses](https://training-formation.phac-aspc.gc.ca/):**Public Health Agency of Canada Videos:** -Biosafety 101-Containment Level 2: Operational Practices**Public Health Agency of Canada Online courses:**-Introduction to Biosafety-General Safety for Containment Laboratories-Containment Level 1 Physical Design and Operational PracticesContainment Level 2 Operational Practices-Personal Protective Equipment-Biological Safety Cabinets-Decontamination in the Laboratory-Chemical Disinfectants |
|[ ]  Do manipulations of the biohazardous materials produce droplets or aerosols?Consider: Centrifuge use, Vortex use, Syringe/Needle aspirations |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Exposure to biologically infectious materials/zoonotics | In lab: lab coat, long pants, closed foot shoes (heel/toe), glovesFace shield (if required)N95 respirator (if required) | * Obtain approval for work from the Institutional Biosafety Committee
* Work in a certified biological safety cabinet when aerosol generation is expected,
* Use safe microbiological practices to reduce aerosol generation
* Refer to the VIU Biosafety Procedures Manual for approved safe handling procedures.
 | [VIU approved Biosafety courses](https://training-formation.phac-aspc.gc.ca/)**Public Health Agency of Canada Videos:** -Biosafety 101-Containment Level 2: Operational Practices**Public Health Agency of Canada Online courses:**-Introduction to Biosafety-General Safety for Containment Laboratories-Containment Level 1 Physical Design and Operational PracticesContainment Level 2 Operational Practices-Personal Protective Equipment-Biological Safety Cabinets-Decontamination in the Laboratory-Chemical Disinfectants |
|[ ]  Are sharps used?Consider: Needles, Syringes (with needles), IV tubing with needles attached, Syringes without needles when removed from their original packaging, Lancets, Scalpel blades, Knives, Broken glass, Razor blades, Glass tubes, Glass vials, Glass ampoules, Pasteur pipettes, Glass slides and cover slips |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Sharps, needle sticks, punctures, cuts Exposure to biologically infectious materials/zoonotics | In lab: lab coat, long pants, closed foot shoes (heel/toe), glovesFace shield (if required)N95 respirator (if required) | * Refer to VIU Biosafety Procedures manual
* Become familiar with [VIU Biosafety Program](http://www.ehs.iastate.edu/publications/policies/sharps.pdf) [requir](http://www.ehs.iastate.edu/publications/policies/sharps.pdf)ements.
* Become familiar with VIU Chemical Safety Procedures
* Use only puncture-proof and leak-proof containers that are clearly labeled.
* Never re-cap needles
* Ensure containers are only used for “sharps” disposal
* Do Not Overfill sharps containers: Replace sharps containers when materials hit the “Fill To Here” line (approx. ¾ full)
* Use safety-engineered sharps (self-sheathing needles, retractable syringes, needleless systems, etc.) when possible.
* Do not pick up sharps or other items by hand.
 | [VIU approved Biosafety courses](https://training-formation.phac-aspc.gc.ca/)**Public Health Agency of Canada Videos:** -Biosafety 101-Containment Level 2: Operational Practices**Public Health Agency of Canada Online courses:**-Introduction to Biosafety-General Safety for Containment Laboratories-Containment Level 1 Physical Design and Operational PracticesContainment Level 2 Operational Practices-Personal Protective Equipment (PPE)-Biological Safety Cabinets-Decontamination in the Laboratory-Chemical Disinfectants |
|[ ]  There is a possibility that a splash may occur? |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Exposure to biologically infectious materials/zoonotics | In lab: lab coat, long pants, closed foot shoes (heel/toe), glovesFace shield (if required)N95 respirator (if required) | * Obtain approval for work from the Institutional Biosafety Committee;
* Work in a certified biological safety cabinet when aerosol generation is expected,
* Use safe microbiological practices
* Refer to the VIU Biosafety Procedures Manual for approved safe handling procedures.
 | [VIU approved Biosafety courses](https://training-formation.phac-aspc.gc.ca/)**Public Health Agency of Canada Videos:** -Biosafety 101-Containment Level 2: Operational Practices**Public Health Agency of Canada Online courses:**-Introduction to Biosafety-General Safety for Containment Laboratories-Containment Level 1 Physical Design and Operational PracticesContainment Level 2 Operational Practices-Personal Protective Equipment (PPE)-Biological Safety Cabinets-Decontamination in the Laboratory-Chemical Disinfectants |
|[ ]  Do you have, or could you have, contact with animals and/or invertebrates? (teaching, research, wild) |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Exposure to biologically infectious materials/zoonotics | In lab: lab coat, long pants, closed foot shoes (heel/toe), glovesFace shield (if required)N95 respirator (if required) | * Obtain approval for work from the Institutional Biosafety Committee;
* Obtain approval for work involving animals from the VIU Animal Care Committee;
* Work in a certified biological safety cabinet when aerosol generation is expected,
* Use safe microbiological practices
* Refer to the VIU Biosafety Procedures Manual for approved safe handling procedures.
* Refer to approved VIU Animal Care Standard Operating Procedures
 | [VIU approved Biosafety courses](https://training-formation.phac-aspc.gc.ca/)**Public Health Agency of Canada Videos:** -Biosafety 101-Containment Level 2: Operational Practices**Public Health Agency of Canada Online courses:**-Introduction to Biosafety-General Safety for Containment Laboratories-Containment Level 1 Physical Design and Operational PracticesContainment Level 2 Operational Practices-Personal Protective Equipment (PPE)-Biological Safety Cabinets-Decontamination in the Laboratory-Chemical Disinfectants  |
|  | Outdoors: Long sleevesLong pants | * Use insect repellent particularly in the evenings or when near standing water.
* If appropriate, Anti -malaria tablets should be taken.
* Carry anti-histamine tablets in case of bites. Be aware that some forms of anti-histamine can cause drowsiness. If affected do not continue with fieldwork.
* Clean and cover any bites to reduce risk of infection.
* To remove ticks safely, wear plastic gloves and preferably use a tick removal tool. Follow instruction how to remove tick
* Do not handle the tick with bare hands, even if it is dead.
* Should any symptoms occur, seek medical advice without delay. Photograph any rashes
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| Bites/scratches | In lab: lab coat, long pants, closed foot shoes (heel/toe),Face shield (if required)N95 respirator (if required)Bite-resistant gloves | * Safe Handling Procedure to prevent bites and scratches
 | Animal handling proceduresPPE training |

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| **CHEMICAL HAZARDS** |
|[ ]  Will chemicals be acquired, stored, used, and disposed of? Consider:[ ]  Flammable and Combustible Materials[ ]  Oxidizers[ ]  Compressed Gas (Gas under pressure)[ ]  Corrosive Materials[ ]  Toxic Materials (chemicals)[ ]  Highly Reactive and Explosive Chemicals[ ]  Anesthetic drugs |
|[ ]  Do you have, or could you have, contact with animals and/or invertebrates? (teaching, research, wild)Consider:Chemicals/pharmaceuticals used for anesthetics or euthanasia (Inhalant chemical agents (carbon dioxide, carbon monoxide, nitrogen), non-inhalant chemical agents (TMS, MS222)  |
|[ ]  Will you be conducting fieldwork/studies?Consider:Transportation of dangerous goods (chemicals, etc.)Disposal of hazardous materials |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Chemical exposure  | Minimum required PPEb  | * Obtain approval for work involving animals from the VIU Animal Care Committee;
* Review SDS for chemicals used for specific chemical control information including the appropriate PPE, engineering controls (ventilation), exposure limits, etc.,
* Refer to [VIU Chemical Safety Procedures Manual](https://adm.viu.ca/health-and-safety/chemical-safety);
* Develop Safe Work Procedures for specific chemicals in use;
* Store chemicals properly per the procedures manual, TDG, and BC Fire Code
* Dispose of chemicals as per federal, provincial and municipal regulations and bylaws
* Emergency response plan (spills, know when and how to contact provincial emergency response officials, etc.)
* First Aid – per chemical exposure; means to summon emergency help
 | Chemical Safety trainingWHMISHazardous Waste disposal Transportation of Dangerous Goods |
| Allergens, dust | Fit-tested N95 mask | * Become familiar with this [Laboratory Animal Allergies](http://www.ehs.iastate.edu/sites/default/files/uploads/publications/factsheets/animalallergies.pdf) [factsheet.](http://www.ehs.iastate.edu/sites/default/files/uploads/publications/factsheets/animalallergies.pdf)
* Perform animal manipulations within ventilated hoods or safety cabinets when possible.
* Avoid wearing street clothes while working with animals and leave work clothes at the workplace.
* Make sure cages and animal areas are kept clean.
* Use absorbent pads or corncob bedding instead of sawdust to minimize dust and particulates.
* Reduce skin contact with animal products such as dander, serum, and urine by using gloves, lab coats, and approved particulate respirators with face shields.

Individuals are fit-tested for respirators annually | Subject Specific [Training](https://training.ehs.iastate.edu/IowaSU/site/) should be provided on the advice of Health and Safety Services, in consultation with personnel who have experience with this hazard. i.e., Veterinarians, lab managers, technicians, researchers, etc.  |

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| **PHYSICAL HAZARDS** |
|[ ]  Do you lift or move things weighing over 50lbs? |
|[ ]  Do you perform repetitive tasks or uses certain pieces of equipment repetitively (pipettes, etc.)?  |
|[ ]  Do you work around machinery? (pumps, filtration systems, power tools, etc.) |
|[ ]  Do you work in or around water? |
|[ ]  Do you work in areas with low light or no light? |
|[ ]  Do you work in areas (e.g. outdoors, boiler rooms), with equipment (e.g. autoclaves, ovens), or with materials (e.g. liquid nitrogen, etc.), that are extremely hot or extremely cold? |
|[ ]  Do you work in areas where there are slip and/or trip hazards? (e.g. water, electrical cords) |
|[ ]  Do you work from height or elevation? (Ladder, scaffolding, elevated platforms, etc.) |
|[ ]  Do you use an autoclave? (High pressure systems) |
|[ ]  Do you work by yourself (after hours, weekends) or in isolation from others? (i.e. If emergency assistance is required it may be difficult to obtain)  |
|[ ]  Will you be conducting fieldwork/studies?Consider:Transportation of peopleTransportation of equipmentWildlife encountersBoatingActivities occurring in or around water  |
|[ ]  Do you have, or could you have, contact with animals and/or invertebrates? * (teaching, research, wild)

Consider: Handling/encountering animals  |
| **Hazard** | **PPE Requirements** | **Other Controls** | **Training Needs** |
| Crush, kicks, step | Required PPE as identified | Obtain approval for work involving animals from the VIU Animal Care Committee; Develop Safe Work Procedures for the species you will be working with. [Consider](https://www.hseni.gov.uk/articles/animals-working-safely-livestock)  | Safe Work Procedure trainingPPE training |
| Ergonomic hazards | Required PPE as identified | * Refer to:

<https://adm.viu.ca/health-and-safety/ergonomics> and <http://www.hr.ubc.ca/wellbeing-benefits/workplace-health/ergonomics/lab-ergonomics/> * Evaluate each tasks to eliminate poor ergonomics.
* Factors that affect the likelihood of injury are repetition, poor lifting angles, and awkward posture.
* Train workers to recognize these factors and to avoid changing elevation and twisting while lifting.
* Take time to observe workers occasionally and try to spot poor techniques or methods of material handling.
* Contact H&SS for an ergonomic assessment, if necessary.
* Use mechanical lifting and carrying devices such as pallet jacks and hand trucks whenever possible.
* Make sure floors are smooth and free of cracks or lips that could catch or trip.
* Inspect equipment routinely to ensure good mechanical condition. Pay special notice to the castors.
 | Task-specific training (proper lift technique, equipment, etc.)PPE training |
| Machinery | Required PPE as identified | * Refer to User Manual for specific equipment requirements
* Develop Safe Work Procedure
 | Machine-specific training (provided by supervisors or equipment experts) |
| Noise | Required PPE as identified Hearing protection | * Noise assessments
* Noise monitoring
* Annual hearing tests
 | PPE training |
| Working on or near water/ Drowning | Required PPE as identified [Personal Floatation D](https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-08-personal-protective-clothing-and-equipment#SectionNumber:8.26)evice (PFD) | [Written rescue and evacuation procedures](https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-32-evacuation-and-rescue#SectionNumber:32.9) | Train all on the written rescue proceduresPPE training |
| High pressure systems | Required PPE as identified Safety gogglesFace shield | * Follow manufacturer instruction on how to safely use the equipment
* Ensure autoclave doors and gaskets are firmly locked into place before operating the autoclave (interlocks help prevent sudden release of high pressure steam)
* If no interlocking mechanism, take additional precautions to ensure the door is closed
* Never stack or sore combustible materials near an autoclave
* Never autoclave oxidizing materials (e.g., bleach)
 | **PPE training** |
| Temperature extremes | Required PPE as identified Heat-resistant glovesSafety goggles and a face shieldRubber apron | * Only handle materials while wearing appropriate PPE.
* Post warning signs (Hot Surface – Keep Away)
 | Train staff to be aware of the dangers of coming into contact with the equipment and materials and how and when to wear appropriate PPE. |
| Electricity (electrocution) | Required PPE as identified | * Read and follow manufacturer’s instructions for electrophoresis equipment
* Consult with supervisor prior to initial use of equipment. Discussion should include special hazards and safety precautions.
* Equip all electrical power outlets in wet locations with ground fault circuit interrupters, or GFCI, to prevent accidental electrocutions.
* Extension cords. Do not use these as a substitute for permanent wiring. The cord insulation should be in good condition and continue into the plug ends. Never repair cracks, breaks, cuts, or tears with tape. Either discard the extension cord or shorten by installing a new plug end. Take care not to run extension cords through doors or windows where they can become pinched or cut. Always be aware of potential tripping hazards when using them. Use only grounded equipment and tools, and never remove the grounding pin from the plug ends. Also, do not use extension cords in series, just get the right length cord for the job.
* Check electrical pendants for proper strain relief and type of box used. The box should be totally closed and without any holes.
* Protect all lights within seven feet of the floor to guard against accidental breakage. Slip plastic protective tubes over florescent bulbs prior to mounting or install screens onto the fixtures.
 | Inspection trainingEquipment trainingPPE training |
| Radiation exposure (UV) | Required PPE as identifiedWear appropriate skin and eye protection when working with UV radiation (lasers). | * Light boxes and handheld lamps are often used in visualizing ethidium bromide gels and pose potential exposures to UV radiation.
 | **PPE training** |
| Fall from height | Required PPE as identified in fall protection plan | * Develop [fall protection plan](https://www.worksafebc.com/en/resources/health-safety/toolbox-meeting-guides/written-site-specific-fall-protection-plan?lang=en) for all work that occurs above 10 ft.
* Use a fall protection system when a fall from a height of 3 m (10 ft.) or more could happen, or where a fall from a lesser height could result in a serious injury.
* Work [Per WorkSafeBC requirements](https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-11-fall-protection)
 | Fall protectionLadder Safety PPE training |
| Working Alone/Isolation |  | Develop a procedure that:* Specify dates and times of departure and return
* If your plans change, inform someone as soon as possible.
* Clarify the well-being check-in process (who calls who, frequency of check-ins, what happens if check-in doesn’t happen) and is based on the hazards/risks of the work to be done on your own/in isolation
* Define the emergency response needed to summon help in the event of an emergency? (Call to campus security, check-in person physically goes to see if worker/student is OK, Call to 911, other).
* Where possible work, as a minimum, in pairs.
* If remote, GPS or Satellite phones to be used if not in cellular service range
* [Per WorkSafeBC requirements](https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-guidelines/guidelines-part-04%22%20%5Cl%20%22SectionNumber%3AG4.20.1)
* Use the [VIU Nanaimo Campus procedure](https://adm.viu.ca/health-and-safety/resources) to get you started, but adjust check-in frequency and to whom the check-in is with, as needed).
 | Occupational First AidWilderness First Aid |
| Weather (heat, cold, wind) | Required PPE as identified PPE/clothing suitable for the weather conditions. | * Consult a daily weather forecast before setting out. Check Met Office forecast,
* Wear clothing suitable for expected weather conditions. However, be prepared for sudden changes and where possible take a change of clothes.
* Strong winds and cold weather reduce energy levels; take adequate food and drink supplies.
* Be aware of places to seek shelter when necessary
* Allow extra time for travelling in adverse weather conditions.
* Be aware of high winds on cliff tops - do not stand closer to the edge than is necessary.
* Take frequent breaks in a comfortable and dry place.
* Hydrate by drinking water, clear fluids or sports drinks.
* In cold weather encourage warm, high-calorie foods such as hot pasta and soup to help workers warm up.
* In hot weather encourage foods high in potassium, electrolytes, and a little sugar to help someone recharge.
* Use the buddy system. Make sure your team looks out for each other.
 | Occupational First AidWilderness First AidTrain staff to be aware of the dangers of extreme temperatures in their work environment.PPE training |
| Fire |  | * Participants will not enter active forest fire areas or areas under evacuation orders.
* Participants will be briefed on any and all active fires within the travel corridor.
* In the event that the group encounters a forest fire, the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development and the RCMP will be immediately contacted and briefed of the fires, its location, extent, and condition.
* In the event that the group encounters and active forest fire, it will be removed to and held in a safe area that is well away from the fire until the authorities arrive.
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| Marine conditions | Required PPE as identifiedSlip resistant footwearGlovesOther, as needed for specific tasks being done |

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| * Check for soft or crumbling ground near cliff edges.
* Where necessary approach cliff edges on all fours to spread the body weight.
* Do not stand and peer over the edge of cliffs.
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| * Take special care on slippery rocks. Always look ahead at ground when walking around the water's edge.
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| * Be aware of incoming tides. Check tide tables before commencing work and ensure your escape route is not blocked.
* Water rescue procedures
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 | **PPE training** |
| Boats | Required PPE as identified [Personal Floatation D](https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-08-personal-protective-clothing-and-equipment#SectionNumber:8.26)evice (PFD)Slip resistant footwearGlovesOther, as needed for specific tasks being done on the boat | * Water rescue procedures
 | **PPE training** |
| Dangerous terrain  | Required PPE as identified Wear footwear suitable for the conditions. (Ankle protection, etc.)Wear strong gloves to protect hands against cuts and grazes.  | * Plan route carefully to avoid most uneven ground.
* Ensure you can see where you are putting your feet before walking.
* Avoid working in poor light conditions.
* Do not jump over or off anything. If there is a drop or ditch that has to be negotiated, lower yourself slowly or use existing bridges, steps etc.
* Be aware that landing "heavily", thus jarring the spine, can lead to basal fractures of the skull or concussion. In the event of such an injury, medical attention must be sought immediately.
* Be aware that agricultural land is often ploughed and therefore deeply rutted.
* Do not jump over drainage ditches. Always use existing bridges etc.
* Do not jump off ledges etc.
* If working close to fences etc. avoid working with your back to the fence, in case you back into it.
* Do not climb over fences - use gates or stiles
* Rocky outcrops are extremely slippery when wet, avoid walking on them whenever possible.
* When walking down hill, walk across the slope and not down the steepest path, keeping your weight on the back foot as much as possible - if you slip you should try to fall backwards, not forwards!
* Wherever possible follow existing paths.
* There is a higher risk of sunburn at high altitude - use a higher factor sunblock.
* If you are feeling tired or yawning this may be due to lack of oxygen, not sleep.
* Seek specialist advice on climbing to and working at high altitude.
 | Occupational First AidWilderness First AidPPE training |
| Working on or near roadways | Wear brightly coloured, conspicuous clothing. Required PPE as identified | * Avoid having your back towards the traffic flow
 | **PPE training** |
| Wild animal encounters |  | * Make noise when walking in the bush (talk loudly and shout)
* When arriving at an instrument location by vehicle, sound the vehicle horn before going into the bush.
* Travel in pairs, or a larger group, where possible
* Do not run away from a bear
* Stand ground or back away slowly from the bear
* Use bear spray only when charged
* In the event of an attack, assess injuries and administer first aid if needed
* Call emergency numbers if needed to report a confrontation
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