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**University of North Dakota**

**Biosafety Level** **X  Laboratory Manual**

**Lab PI NAME**

**This lab-specific manual applies to the following BSL-X agents:**

1. Agent one

2. Agent two

3. Agent three

4. Agent four

**August 2023**

Prepared by the University of North Dakota Office of Safety

**Laboratory of Dr. (PI's Last Name****)**

**Department:**

**Building(s):**

**Room Number(s):**

According to federal guidelines, all laboratories designated as Biosafety Level 2 (BSL-2) and above must have a ***lab-specific biosafety manual.*** This manual must be adopted as policy and be accessible to all laboratory personnel. To assist Principal Investigators (PIs) in complying with these requirements, the Office of Safety at University of North Dakota (UND) has developed this template. The ***PI is responsible*** to develop a ***Laboratory Specific Biosafety Manual*** with instructions to safely handle and manipulate a particular agent or agents under Biosafety Level 1 or 2 (BSL-1 or BSL-2) laboratory conditions. Developing and maintaining this Manual is ***required for all BSL-2 labs,*** and is ***encouraged for BSL-1 labs*** at UND.This Lab Specific Biosafety Manual will become part of the ***annual laboratory safety audit*** process at UND and a copy (electronic is preferred) needs to be sent to the Biological Safety Officer (UND.safety@UND.edu; Room 202, 3851 Campus Rd Stop 9031, Safety Office Building).

The ***PI is responsible*** for including basic background information for each infectious agent, writing an exposure risk, detailing surface decontamination, and writing standard operating procedures (SOPs) for experiments where safety is of an important concern (see “Safety SOP example” on page 14). Similarly, please provide ***lab-specific*** information where you see ***highlighted text fields*** throughout this template. This template has been provided as a starting point. Additions/changes to this template that will render the final manual more useful for the laboratory’s safety needs are strongly encouraged.

In addition to this manual, whenever working with recombinant or synthetic DNA, the UND Institutional Biosafety Committee (IBC) requires all labs to adhere to the National Institutes of Health (NIH) Guidelines for Research Involving Recombinant DNA Molecules, which can be found here :(https://osp.od.nih.gov/wp-content/uploads/NIH\_Guidelines.pdf )It is also strongly encouraged that you use and follow the guidelines provided in the CDC’s Biosafety in Microbiological and Biomedical Laboratories (BMBL), 6th Edition (<http://www.cdc.gov/biosafety/publications/bmbl5/>). Many of the requirements provided in these two documents will be utilized in the annual laboratory safety audits. You can also find a copy of these handbooks on the Office of Safety website under the section Biological Safety (Subheading: Biosafety Handbooks/Guidelines). <https://campus.und.edu/safety/public-safety/biological.html#d56e100--13>

This template was originally developed and adopted by the Oregon Health and Science University, Duke University, Northern Arizona University, Michigan State University, and North Dakota State University. However, the original template has been modified/edited to meet the requirements of UND researchers.

The Biosafety Procedures and Safety section of the manual has been adapted from a number of resources including: BMBL 6th edition, World Health Organization Laboratory Biosafety Manual, and Canadian Biosafety Standards and Guidelines.

It is recommended the PIs use a ***loose-leaf binder*** for maintaining and organizing this ***Laboratory Specific Biosafety Manual.*** This will render the PIs to accommodate any changes or add new materials when required.

It is important that **all lab personnel’s** read the contents of this manual. This manual must be updated and reviewed by laboratory personnel annually. By signing this page, lab personnel agree to abide by the safety precautions and procedures discussed herein.

*I have read, understand, and agree to adhere to the biosafety procedures contained within:*

**Principal Investigator:**

|  |  |  |  |
| --- | --- | --- | --- |
| Typed Name | Title | Signature | Date |
| First, Last | Principal Investigator |  |  |

**Laboratory Staff:**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Job/Title | Signature | Date |
| First, Last | Enter info |  |  |
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# LAB CONTACTS AND TRAINING

|  |  |
| --- | --- |
| **Principal Investigator:** | First, Last |
| **Lab Location:** | Enter Room Number/Building |
| **Office Phone:** | Enter number |
| **24/7 contact (Cell Phone):** | Enter number |
| **IBC Protocol #(s):** | Enter number(s) |
| **IACUC Protocol #(s) (if applicable):** | Enter number(s) |

**Training Courses.** Courses required of ***all laboratory researchers*** should be listed below. Other courses may be added if they relate to the work conducted in your specific lab, for example ***Animal Care and Use Training or Bloodborne Pathogens Training.*** Copies of completed training certificates should be included in **Appendix IV.**

|  |
| --- |
| **Lab Personnel** |
| **Name** | **Bloodborne Pathogens**  **Training (Annual)** | **Laboratory Safety** | **Animal Care and Use Training** | **(Other Trainings)** |
| First, Last |  |  |  |  |
| First, Last |  |  |  |  |
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***Agent(s)*-specific Training.** Laboratory personnel are not allowed to work with agent(s) until they have been trained by the PI who supervises their work, or other designated laboratory personnel with technical expertise. The worker should demonstrate good microbiological skills and an understanding of this manual prior to being permitted to work with agent(s).

# BACKGROUND

*Describe the known risks to be considered when working with each agent. Include supplemental background information regarding biological traits that are essential to consider prior to experiments with the agent. An example for* Listeria monocytogenes *is provided below. Describe the Laboratory safety and containment recommendations suggested for the agent(s) being worked with in the lab. This section should be designed to be taken with laboratory workers to health care providers should they require care for suspected laboratory acquired infections (LAIs).*

**You might find it helpful to reference:**

* BMBL, 6th Edition: <http://www.cdc.gov/biosafety/publications/bmbl5/>
* Canadian Pathogen Safety Data Sheets: <http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php>
* CDC A-Z Index: <https://www.cdc.gov/health-topics.html>

*Insert text here*

**REFER TO THE EXAMPLE BELOW**

***Listeria monocytogenes***

*Listeria monocytogenes* is a gram-positive, non-spore-forming, aerobic bacillus; that is weakly beta-hemolytic on sheep blood agar and catalase-positive. The organism has been isolated from soil, animal feed (silage) and a wide range of human foods and food processing environments. It may also be isolated from symptomatic/asymptomatic animals (particularly ruminants) and humans. This organism is the causative agent of listeriosis, a food-borne disease of humans and animals with symptoms of infection being fever and gastroenteritis. Pregnant women and their fetuses, newborns and persons with impaired immune function (i.e. diabetes, alcoholism, liver/kidney disease, cancer, HIV) are at greatest risk of developing severe infections including sepsis, meningitis and fetal demise. In pregnant women, Listeria infections occur most often in the third‐trimester and may precipitate labor. Transplacental transmission of the bacteria poses a grave risk to the fetus.

***Occupational Infections***

Cutaneous listeriosis, characterized by pustular or papular lesions on the arms and hands, has been described in veterinarians and farmers. Asymptomatic carriage has been reported in laboratory workers.

***Natural Modes of Infection***

Most human cases of listeriosis result from eating contaminated foods, notably soft cheeses, ready-to-eat meat products (hot dogs, luncheon meats), paté and smoked fish/seafood. Listeriosis can present in healthy adults with symptoms of fever and gastroenteritis, pregnant women and their fetuses, newborns, and persons with impaired immune function are at greatest risk of developing severe infections including sepsis, meningitis, and fetal demise.

***Laboratory Safety and Containment Recommendations***

BSL-2 practices, containment equipment, and facilities are recommended when working with clinical specimens and cultures known or suspected to contain the agent. Gloves and eye protection should be worn while handling infected or potentially infected materials. ABSL-2 practices, containment equipment and facilities are recommended for activities involving experimentally or naturally infected animals. Due to potential risks to the fetus, pregnant women should be advised of the risk of exposure to *L. monocytogenes*.

***Additional Safety Practices (Laboratory):***

All vacuum lines must be fitted with a HEPA filter (an example is the "Vacushield ™" in‐line hydrophobic filter).

# EXPOSURE RISK

*Describe how laboratory personnel could be exposed to the agent(s). Include practices that pose potential for exposure, such as those that could create aerosols. An exposure risk example for Listeria monocytogenes is shown below.*

If uncertain if your procedures would provide an exposure risk, contact the Biological Safety Officer (701-777-2444)UND.safety@UND.edu) to discuss potential exposure risks. Also, as stated in the example, immunocompromised or medically concerned individuals (including women who are or may become pregnant) are encouraged to self-identify prior to working with BSL-2 agents.

*Insert text here*

**REFER TO THE EXAMPLE BELOW**

*Listeria monocytogenes* may be found in feces, Cerebrospinal fluid (CSF), and blood, as well as numerous food and environmental samples. Naturally or experimentally infected animals are a source of exposure to laboratory workers, animal care personnel and other animals. The most probable route of exposure for work with *Listeria monocytogenes* is ingestion. Listeria can also cause eye and skin infections following direct contact with the organism. Immunocompromised individuals are encouraged to self-identify prior to working with *Listeria monocytogenes.*

# INACTIVATION AND SURFACE DECONTAMINATION

*Describe the reagents and/or processes used to inactivate the agent(s) and the method to decontaminate surfaces. See Appendix VII. of this manual for a suggested disinfectant chart (Page 25). An example for Listeria monocytogenes is below.*

*Insert text here*

**REFER TO THE EXAMPLE BELOW**

*Listeria monocytogenes* can be inactivated with a number of reagents, including 10% (1:10) household bleach solution (made daily) with a minimum of 10 minutes contact time (final concentration of 0.5% sodium hypochlorite), 5% Amphyl (phenolic), and 0.5% Wescodyne (iodophor). This SOP has been written for the use of bleach, but alternative disinfectants can be used, as long as they are known to be effective for Listeria.

**NOTE:** Household bleach is effective and inexpensive, but it is also volatile and corrosive. Bleach-soaked paper towels should not be autoclaved because autoclaving:

* Releases chlorine, a chemical hazard, and
* Will corrode the autoclave over time.

10% (0.5% final concentration sodium hypochlorite) household bleach solutions should be prepared fresh at least weekly. If 10% bleach is used to decontaminate a spill within the Biosafety Cabinet (BSC), once the spill has been absorbed on paper towels and disinfected with 10% bleach, the BSC should be wiped down with 70% ethanol in order to remove residual bleach to prevent corrosion.

# BIOSAFETY REQUIREMENTS AND PROCEDURES

1. **Physical Containment.** All work with agent(s) must be performed in a properly maintained BSL-2 laboratory. Appropriate signage must be posted at the entrance to the laboratory. This sign must include the biosafety level (BSL-1, BSL-2, and BSL-3), a biohazard symbol, the name of the agent(s) in use, the name and phone number of the PI or lab supervisor, and required procedures for entering and exiting the lab. A sign that meets these requirements is available on the Office of Safety website.

https://campus.und.edu/safety/\_files/docs/safety-information-card-med-biology.pdf

https://campus.und.edu/safety/\_files/docs/safety-information-card-all-departments.pdf

Additionally, incubators and freezers must bear **biohazard warning labels** if they contain BSL-2 agents ***(If you need the Biohazard stickers contact the Office of Safety).*** Doors to the laboratory must be locked when not attended. Laboratory windows that open to the outdoors must be fitted with fly screens

1. **Safety Equipment.**
2. **Biosafety Cabinet:** An ***annually certified class II Biosafety Cabinet (BSC)*** must be used to contain any experiments that may generate aerosols or splashes from a BSL-2 agent. Common techniques that generate aerosols include pipetting, centrifuging, grinding, blending, shaking, sonicating, open containers of infectious materials, inoculating animals intranasally, and harvesting infected tissues from animals or eggs. BSCs must be positioned in a BSL-2 lab such that fluctuations of the room air supply and exhaust do not disrupt the proper airflow within the BSC. The best placement of a BSC is a location with minimal walking paths and away from doors and windows. ***All BSCs must be certified annually.*** ***Note that HEPA filtered exhaust air from a Class II BSC can be safely re-circulated back into the laboratory.*** The BSC exhaust can also be fed to the laboratory room exhaust via canopy or direct connection. If the blower on the BSC is not left on continuously, it should be turned on and allowed to run for 5 minutes to facilitate several complete exchanges of air before work begins. At the beginning of the work session, plastic-backed absorbent paper can be placed on the work surface (optional), but must not obstruct air flow. The work area should be segregated into clean and contaminated sections, with contaminated material being located at the rear of the cabinet workspace. Discarded material should be added to a small, red biohazard bag within the cabinet. Work with all materials 4-6 inches inside the sash. Keep containers of liquids capped when not in use. At the end of the work session, all items to be removed from the BSC must be decontaminated. The surface of the BSC must be wiped down with 70% EtOH, and the sash lowered.
3. **Vacuum lines:** Vacuum lines to be used for aspiration must be equipped with an in-line HEPA filter and a vacuum flask ***(two flasks connected in series are recommended, but not required),*** containing an appropriate disinfectant in a volume sufficient to provide the recommended final concentration for that disinfectant when the flask is full. All the flasks should be kept in a secondary enclosure.
4. **Centrifuges:** If agent(s) will be concentrated in an ultracentrifuge, rotors must be equipped with features (e.g., sealing o-rings) to minimize the risk of aerosol generation when necessary. Low-speed swinging-bucket centrifuge buckets must be equipped with aerosol-tight safety covers when necessary. Microcentrifuges must have aerosol-tight rotors capable of being removed while sealed so that the rotor can be unloaded in the BSC when necessary.
5. **Personal Protective Equipment (PPE**)**.** The following PPE must be worn when working with agent(s):

Please check appropriate boxes by clicking and selecting “checked.”

Gloves  Safety glasses  N95 Respirator  Shoe covers

Face shield  Surgical mask  Medical scrubs  Lab coat

Hair net

***List other required PPE not mentioned above, optional PPE, and other helpful suggestions to achieve the highest level of personal protection from this agent(s)*** (**Examples:** use of double gloves, tucking cuffs of lab coat into sleeves, etc.). Add separate sections as necessary if PPE requirements differ for each agent. When working, be cognizant to remove potentially contaminated gloves and replace them with new gloves before touching anything such as the refrigerator, centrifuge, incubator, etc. to prevent contamination or lab work surfaces.

Certain procedures may require additional PPE. Contact the Biological Safety Officer (701-777-2444) UND.safety@und.edu () if you would like to discuss PPE requirements.

***BSL-2 Personal Protective Equipment recommendations by agent***

*Bacteria: Gloves, Lab coat, Safety glasses when working with bacteria outside a BSC.*

*Viruses: Gloves, Lab coat, Safety glasses when working with virus outside a BSC.*

*Toxins: Gloves, Lab coat, safety glasses when working with toxin outside a BSC or when using powder form of toxin.*

1. **Spill Kit.** The lab must have a spill kit readily accessible in the event of a spill ***(Plastic Pails for the spill kit can be purchased from ULINE [Model Number: S-7914, S-20541]).*** The spill kit should have:

* an easy-to-read outline of the spill response SOP
* gloves
* surgical masks
* safety glasses or goggles
* clean lab coat or disposable gown
* paper towels to absorb contaminated liquids
* disinfectant appropriate for agents used in the lab (e.g. bleach)
* tongs or forceps to pick up broken glass
* a biohazard waste container large enough to handle wet, contaminated paper towels

**NOTE: It is a good idea during the Annual Review of this Manual to take the extra time to practice the spill procedure.**

1. **General Procedures for working with agent(s).** Standard safe microbiological practices should be employed, conforming to the BMBL 6th edition, including a prohibition of eating, drinking, food storage, handling of contact lenses, applying lipstick, cosmetics or lip balm, mouth pipetting, and a requirement of appropriate PPE.

**Additional practices include the following recommendations:**

1. Whenever possible, work with agent(s) during normal working hours, to enable adequate response to a severe adverse incident. If the laboratory PI/supervisor determines that it is safe for you to do work outside of normal working hours, employ the buddy system, or schedule a call-in time with someone to ensure safety.
2. **Sharps** should be avoided whenever possible in a BSL-2 laboratory. ***Plastic aspirating pipettes (e.g., Corning cat. # 4975; Fisher Cat # 13-675-123)*** should be substituted for glass Pasteur pipettes if possible. Needles with safety devices are recommended wherever possible. If conventional needles are required, they must never be re-capped, and must be disposed of in a rigid, red sharps waste container located near the workspace. Never reach into a sharps container to retrieve discarded items. Do not allow a sharps container to become more than ¾ full.

**Reminder:** Syringes with or without the needle needs to be discarded in the biohazard sharps container.

1. **Solid Waste:** Everything that contains agent(s) or contacts agent(s)-containing solutions or vessels must be deposited into a biohazard waste container and handled as solid biohazard waste according these procedures: {lab specific procedure}.
2. **Liquid Waste** should be aspirated into a vacuum flask containing an appropriate disinfectant in a volume sufficient to provide the recommended final concentration for that disinfectant when the flask is full. Be mindful of the discarded liquid level before and after aspirating liquid waste to prevent overfilling. At the end of the work session, aspirate a small volume of concentrated disinfectant through the vacuum tubing, into the vacuum flask. The vacuum flask must sit for a minimum time of 30 minutes prior to drain disposal. Liquid waste that is not aspirated must be treated with disinfectant at the recommended final concentration, allowing a minimum time of 30 minutes to inactivate the agent(s).
3. **Centrifugation:** Centrifuging is a procedure that can create aerosols. When concerned about aerosols, use rotors with aerosol tight lids or buckets, and open rotors or buckets in the BSC. At the end of any procedure that involves centrifuging agent(s), it is good practice to decontaminate all rotors and/or buckets.
4. **Storage:** Agent(s) stocks must be in closed, secondary containers in a freezer clearly marked with a biohazard sign or sticker.
5. **Spills and Accidents**
6. **Spills:** The different kinds of spills in the laboratory should be handled as mentioned below. For your convenience **cue cards** to handle different spills in the laboratory are provided **(See Page 18-20)**. These should be posted in highly visible areas.
   1. ***Small spills inside the BSC:*** First, wait 5 minutes to allow the blower to move aerosols through the HEPA filter. Check to see if the spill is fully contained within the BSC, if any PPE has become contaminated, or if any breach of containment has occurred (e.g., a splash where droplets have escaped the BSC and fallen on the floor). If there has been a breach of containment, response should be as for a spill outside the BSC. Small spills (<25 ml) can be decontaminated by layering paper towels soaked in appropriate disinfectant on top of the spill, allowing 30 min. for the disinfectant to inactivate the agent, then depositing the paper towels in the biohazard waste bag in the BSC. If using bleach, residual bleach can be wiped off with paper towels sprayed with 70% EtOH, and the towels deposited in the biohazard waste bag. Small spills inside the BSC that do not involve an exposure do not require notification of Biological Safety Officer, but do require notification of the PI, who will direct further training (e.g. retraining on pipetting techniques, or organization of materials and instruments in the BSC) to minimize the risk of recurrence.

**NOTE:** A spill of media or buffer not containing the agent does not represent a biohazard, but paper towels used to wipe it up should still be deposited in the biohazard bag in the BSC.

* 1. ***Large spills inside the BSC (spills over 25 ml, with likely splatter droplets outside the BSC):*** Large spills should be treated more cautiously. Leave the BSC running. Remove PPE and any contaminated clothing (check the sleeves of your lab coat) and place it in sealable plastic container or a biohazard bag. Notify the PI. If you must leave the room to do so, close the door to the room as you leave - make sure you have removed your gloves before you touch the door knob. If you are absolutely sure that there has been no exposure and no breach of containment, proceed as for a small spill inside the BSC. If there has been overt exposure (e.g., actual contact of bare skin with agent(s)), wash skin with soap and water for 15 minutes, and contact the campus Biological Safety Officer at 701- 777-2444. After hours, contact the UND Police & Office of Safety (701-777-2591) for assistance. Allow 30 min. for any potential aerosols to settle from the spill. clean PPE, cover the spill with paper towels, soak with appropriate diluted disinfectant, starting at the perimeter and working inward toward the center. Allow 30 min. contact time with the disinfectant to inactivate the agent. Deposit-soaked towels in biohazard waste. The interior of the BSC should be decontaminated by wiping down the walls, sash, and equipment with disinfectant. Autoclavable equipment (e.g., racks, some pipettors, and tube containers) should be autoclaved, if feasible. If the spill has entered the BSC drain pan, more extensive decontamination must be performed. The drain pan should be emptied into a collection vessel containing disinfectant. A hose barb and flexible tube should be attached to the drain valve and be of sufficient length to allow the open end to be submerged in the disinfectant within the collection vessel. The drain pan should be decontaminated, flushed with water and the drain tube removed. After decontamination with corrosive disinfectants (e.g., bleach), remember to wipe down the BSC with 70% EtOH to remove residual chemicals. If no overt exposure has occurred, and the spill was completely contained within the BSC, the Biological Safety Officer does not need to be informed. The PI should review the incident to revise procedures to minimize the risk of recurrence.
  2. ***Small spills outside the BSC.***A small spill, in this circumstance, is defined as a spill with low potential to aerosolize, presents no inhalational hazard, and no endangerment to people or the environment. As a practical consideration, volumes less than 10 ml fall into this category. First, ascertain the extent of the spill. Simply dropping a 150 mm dish contained inside a closed secondary container does not constitute a spill outside the BSC, since there is no breach of containment-as long as the secondary container stays closed. If other personnel are present, alert them immediately. Keep in mind: spills generate aerosols. Quickly check to ascertain the extent of the spill: Is PPE is contaminated? (Gloves, lab coat, pants cuffs, shoes?). Is bare skin exposed? Has liquid splashed over a large area? If shoes are visibly contaminated, decontaminate them with appropriate disinfectant, then evacuate the room, closing the door. Remove gloves before touching the door knob. Remove any potentially contaminated PPE, place it in a biohazard bag, wash hands and face thoroughly. Post a sign on the door warning personnel not to enter. Allow 30 min. for aerosols to settle. During this time, notify the PI (and the Biological Safety Officer if you require assistance 701-777-2444). After hours, contact the UND Police & Office of Safety (701-777-2591) for assistance. After 30 min., don fresh PPE, re-enter the room, use tongs to remove any sharps in the spill and transfer them to a biohazard sharps container, cover the spill with paper towels, then soak them with disinfectant starting at the periphery and moving inward toward the center. Be sure to check for and decontaminate small splashes beyond the main affected area. Leave the soaked towels in place for 20 min. to inactivate the agent(s). After the 20 min. inactivation time, transfer soaked paper towels to biohazard waste. Wipe up the residual spill with more paper towels. Give the area a final wipe-down with paper towels using the appropriate disinfectant.
  3. ***Large spills outside the BSC***. A large spill, in this circumstance, is defined as a spill that spreads rapidly, presents an inhalational hazard, endangers people or the environment, and/or involves personal injury or rescue and should be handled as an emergency. In practical terms, this might be a spill of more than 10 ml splattering over a large area, thus presenting the possibility of aerosolization and widespread contamination. If other personnel are present, alert them immediately. Keep in mind: spills generate aerosols. Ascertain the extent of the spill: possible overt exposure, splash on shoes or soles of shoes, contamination of PPE. If shoes are contaminated, disinfect them before evacuating the room (if shoes are extensively contaminated, you should remove them as you leave the room). After removing gloves evacuate the room, closing the door as you leave. Remove PPE. Wash hands and face thoroughly. Post a sign on the door warning personnel not to enter. Allow 30 min. for aerosols to settle. During this time, notify the PI. If the spill is too difficult to manage alone, seek help from the Biological Safety Officer (701-777-2444), or the UND Police & Office of Safety if it is after hours (701-777-2591). After 30 min. don fresh PPE, re-enter the room. If there is any broken glass associated with the spill, pick it up with tongs or forceps, and transfer it to a biohazardous broken glass container. Cover the spill with paper towels, and soak the towels with appropriate disinfectant, working from the outside toward the center. Allow 30 min. for agent(s) to be inactivated. Pick up soaked paper towels, and transfer to a biohazard bag. Give the area a final wipe-down with paper towels using the appropriate disinfectant. All spills outside of the BSC that involve breach of containment, regardless of exposure, should be reported to Biological Safety Officer (701-777-2444; UND.safety@und.edu).

1. **Accidents:** Accidents include the release of agent(s) due to equipment failure (e.g. tube failure in the centrifuge), needle-sticks, or other injuries concomitant with a breach of containment of agent(s).
   1. ***Centrifugation.*** If tube failure is suspected (sudden clunking or automatic shut-down due to imbalance), leave the centrifuge lid closed for 30 min. to allow aerosols to settle. During this time, notify the PI. Open the lid cautiously to check the integrity of the rotor/tubes. If the rotor looks intact, spray the rotor with 70% EtOH, and transport it into the BSC before unloading centrifuge tubes. If a tube has cracked or collapsed within a swinging bucket (e.g., SW28), decontaminate the tube and bucket inside the BSC. (Use your own judgment regarding recovery of agent(s)). If there appears to be a leak or spill inside the centrifuge, decontaminate the centrifuge chamber by cautiously opening the centrifuge, adding paper towels to soak up any contaminated liquids, then liberally spraying disinfectant onto the walls and inside the lid of the centrifuge, so that disinfectant pools at the bottom of the chamber. (e.g., about 0.5-1 liter). Close the centrifuge for 30 min. Clean up the soaked paper towels as for a major spill outside the BSC. In the event of a catastrophic failure in the centrifuge (e.g., swinging bucket coming off the rotor at 22,000 rpm, damaging the centrifuge, and releasing agent(s) into the centrifuge chamber), keep the centrifuge lid closed for 30 min. During this time, notify the PI and if the contamination is too extensive to manage alone, ask the Biological Safety Officer for assistance (701-777-2444). Decontamination is similar to a major spill outside the BSC. Lay paper towels inside the centrifuge chamber, and soak with 10% bleach (or other appropriate disinfectant). Spray the inside of the centrifuge jacket with 70% EtOH. Close the lid for 30 min. Clean up following the same procedure as for a major spill outside the BSC.
   2. ***Sharps*** should be avoided whenever possible for work with agent(s) production, manipulation, and delivery. However, if there is a needle-stick, briefly bleed the wound (squeeze it to produce a couple of drops of blood), then wash thoroughly with soap and water for 15 min. Report the incident to the PI and the Biological Safety Officer (701-777-2444).
   3. Other accidents might include slips, falls, or collisions with other personnel, leading to spills of agent(s). Additional help may be required in the event of personal injury, in which case assisting personnel must be made aware of the presence of uncontained agent(s) so that they can respond appropriately. In the event of a major spill involving serious personal injury or requiring rescue, call Office of Safety (701-777-3341), and contact the PI. You may always dial 911 for Emergency Assistance\*

**NOTE:** The incident reporting form can be found on the Office of Safety website:

<https://campus.und.edu/safety/resources/forms.html>

# SAFETY SOPS FOR THE *PI NAME* LABORATORY WHEN USING BSL-2 AGENTS

*The purpose of this section is to develop SOPs that specifically outline instances during protocols where consideration for safety with a BSL-2 agent is paramount.* ***Detailed, step-by-step protocols describing entire experiments with materials and methods are not necessary.*** *Examples of SOPs where safety is emphasized are bulleted below:*

* *Safety when injecting a research animal with a BSL-2 agent*
* *Experiments/Procedures that require PPE in addition to a lab coat and gloves*
* *How to properly vortex or sonicate a viable BSL-2 agent*
* *Safety concerning the handling of human or non-human primate primary cell lines or tissues*
* *Propagation of Viruses*

***Please enter Safety SOPs under separate headings.***

*Insert text here*

**AN EXAMPLE (SOP) OF RESEARCH USING STREPTOZOTOCIN IS GIVEN BELOW:**

**BACKGROUND**

Streptozotocin (STZ) is used in animal research to induced diabetes. It is also used in the medical field as a chemotherapeutic drug. The compound is a light yellow, crystalline solid derived from *Streptomyces achromogenes.* It presents the highest exposure risk in the forms of powder and aerosols, as it is toxic and carcinogenic, but not volatile. It is most commonly prepared as a solution for injection, and is typically prepared immediately prior to a procedure.

**TOXIC EFFECTS**

* **Acute effects:** Irritant to eyes, skin and respiratory tract. The lethal dose when delivered intravenously to mice was 275 mg/kg (LD50) and orally >3000 mg/kg (LD50). The toxic dose low (TDL) for humans is 1044 mg/kg/5days.
* **Chronic effects:** STZ is carcinogenic, mutagenic, and possibly teratogenic in humans. Prolonged or repeated exposure to STZ either through inhalation or ingestion can damage the blood and bone marrow. It can damage the kidneys and liver or cause cancer. It can affect the pancreas and cause diabetes.
* **Local effects:** Very hazardous in case of eye or skin contact, inhalation, or ingestion. Can cause gastrointestinal tract irritation with nausea and vomiting. If inhaled, symptoms similar to those resulting from ingestion can be expected.
* **Systemic effects:** The substance is harmful, but chronic exposure is not well understood. Repeated or prolonged exposure to the substance can damage target organs including the reproductive system, pancreas, liver, kidneys, and blood.

**EXPERIMENTAL PROCEDURES**

* Once a month, dose 16 rats with STZ. Weigh enough STZ to dose each rat into 16 separate screw-caped tubes (25-100 mg/kg body weight). For a 200 mg rat, therefore, STZ weights in the tubes would range from 10 to 40 mg.
* At animal facilities, add 1 ml of citrate saline to the Streptozotocin sample, weigh the animal and inject the appropriate amount of solution into the animal (0.5 ml/200 mg body weight).
* Dispose the empty, uncapped needle and syringe directly into a yellow chemotherapeutics sharps container.
* COLLECT ALL RESIDUAL LIQUID FOR DISPOSAL AS HAZARDOUS CHEMICAL WASTE.DISP OSE THE EMPTY TUBES AND RESIDUAL MATERIAL IN YELLOW BAGS AS CHEMOTHERAPEUTIC WASTE.
* Handle all STZ solutions over plastic backed absorbent sheets and dispose sheets in yellow chemotherapeutic waste bags when work is completed.

**EXPOSURE ASSESSMENT**

**ROUTE**

* **Inhalation:** As the procedure calls for solid material to be weighed, inhalation of the aerosolized powder is possible. Once the solid is in solution, the solution is injected and not intentionally aerosolized. As the solution is not volatile, the potential for inhalation exposure at this stage of the procedure would be essentially negligible.
* **Eye absorption:** Accidental aerosolization of the solid STZ during weighing would also pose a hazard for eye contact and absorption. Once in solution, researchers would only need to be concerns about small spills or splashes from the screw capped vial or flicked from the end of a syringe.
* **Skin Contact:** Accidental aerosolization of the solid STZ during weighing would also pose a hazard for skin contact and absorption. Contact with the solution could also result in adverse health effects.
* **Ingestion:** No eating or drinking is permitted in the laboratory. Therefore, ingestion is unlikely.
* **Injection:** As needles are used with this compound, accidental injection is possible.

**Duration**

* **Frequency:** Once a month, weighing out up to 500 mg of STZ.
* **Length:** < 1 hr to prepare a set of 16 tubes, and ~5 minutes to dissolve the appropriate amount of solid and administer the dose to a single rat.

**RISK ASSESSMENT**

STZ is shown to have serious local, systemic, acute and chronic effects. The Exposure Assessment section noted high potential for exposure due to inhalation of accidently aerosolized powder or absorption of the compound through skin or eye contact with the solution. High risks also exist for exposure of skin, eye or the respiratory system due to accidental contact with the powder or solution. Since both the hazards of the compound and the exposure potentials are high, health risks due to inhalation, skin and eye contact are also high and must be controlled. Control measures are documented in the following section.

**CONTROL PLAN**

**General:**

* Prior to working with STZ, you should prepare your work area. Any work with STZ needs to be done over absorbent spill pads. You can purchase disposable laboratory benchtop pads, on which to conduct your procedure.
* Any laboratory equipment or surfaces that have come in contact with STZ should be decontaminated or disposed of. This can be done by wiping them down with soap and water and paper towels.
* Non-porous materials, such as glassware, can be decontaminated by soaking in bleach for 24 hours.
* PI will train staff on hazards and proper handling procedures.
* Cages of animals injected with STZ will be clearly labeled as such.
* The **first cage change** after each drug administration is to be done by research staff **no sooner than** **3 days after the administration.**
* Bedding will be put in red biohazard bags for collection and managed as hazardous waste.
* After this first cage change there is no need for further special precautions to be taken regarding the animals or the cages as long as the animals have not received any more STZ.

**Inhalation/Contact/Injection:**

* To prevent skin exposure, wear personal protective equipment (PPE) when handling any amount of STZ. Wear a disposable gown made of polyethylene-coated polypropylene material (which is a nonabsorbent). Make sure the gown has a closed front, long sleeves, and elastic or knit closed cuffs. Do not reuse gowns.
* Use two pairs of powder-free, disposable chemotherapy gloves, with the outer one covering the gown cuff whenever there is risk of exposure to hazardous drugs.
* Wear goggles and a face shield when splashes to the eyes, nose, or mouth may occur and when adequate engineering controls (such as the sash or window on a ventilated cabinet) are not available.
* To prevent inhalation, solid/crystalline forms of STZ must be handled or weighed out in a chemical fume hood or similar exhausted enclosure. If air currents making handling difficult, a safety shield may be positioned in front of the balance to divert air around the equipment.
* If you do not have a hood, you must wear an N-95 respirator and participate in the University of Dakota’s Respiratory Protection Program.

**Waste Management Procedures:**

* Dispose of excess STZ solid and solutions as hazardous chemical waste.
* Collect used or empty disposable lab supplies in red biohazard bags.
* Needles and sharps must be collected in puncture-resistant, container.
* Contaminated bedding and carcasses will be disposed of in biohazard bags

**ACCIDENT PROCEDURES**

**Spill Cleanup**

* **Solid:** If source container drops and breaks (1-100 grams max), avoid raising dust-do not sweep up dry material. Evacuate spill area, restrict other from entering the area and from a safe spot, call 911.
* If a small amount (<250 mg) spills outside of spill containment, ensure personal protective equipment (PPE) is appropriate (an N-95 respirator if outside of the hood, double-nitrile gloves, goggles, and a lab coat), cover material with paper towels, spray lightly with bleach water solution (10% bleach) and carefully scoop material and paper towels into container for appropriate disposal. For amounts in between, use prudent judgment to decide whether to attempt cleanup, or call for spill response.
* **Solution:** IfSTZ solution should spill, prevent liquid from entering sewer. Apply absorbent pads for larger amounts of liquid and, using appropriate PPE, carefully scoop wetted absorbent material into container for appropriate disposal.

**ACCIDENTAL EXPOSURES**

* **Inhalation:** Allow the victim to rest in a well ventilated area. Apply first aid if not breathing. Seek immediate medical attention.
* **Eye absorption:** Check for and remove any contact lenses. Rinse eyes for 15 minutes in the eyewash. Seek medical attention.
* **Skin Contact:** If the chemical contacts the clothed portion of the body, remove the contaminated clothes as quickly as possible. Bag clothing for appropriate disposal. If the chemical contacts exposed skin, gently and thoroughly wash with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and mucous membranes. If irritation persists, seek medical attention.
* **Accidental ingestion:** Seek immediate medical attention.
* **Accidental injection:** Seek immediate medical attention.

**REFERENCES**

<http://www.dehs.umn.edu>

<http://www9.georgetown.edu/gumc/ehs/chemsafe/forms/Streptozocin%20SOP.doc>

<http://www.ouhsc.edu/iacuc/documents/ApprovedSOPforSTZ.doc>

<http://en.wikipedia.org/wiki/Streptozotocin>

<http://www.cdc.gov/niosh/docs/2004-165/pdfs/2004-165sum.pdf>

# APPENDIX I: IMPORTANT CONTACT INFORMATION

**FOR EMERGENCY SERVICES**

**You may always dial 911 for Emergency Assistance\***

UND Police 701-777-3491

Operations Call Center 701-777-2591

**OFFICE OF SAFETY**

Associate Director of Safety 701-777-3759

Biological Safety Officer

Biological spills 701-777-2444

Environmental Health & Safety Manager

Hazardous Chemical/Substance Spill 701-777-5931

Environmental Health & Safety Technician

Fire Safety 701-777-6044

Radiation Safety Officer

Radioisotope spills 701-777-5931

**PUBLIC HEALTH AND SAFETY**

Chief of Police701-777-3391

**FACILITIES MANAGEMENT**

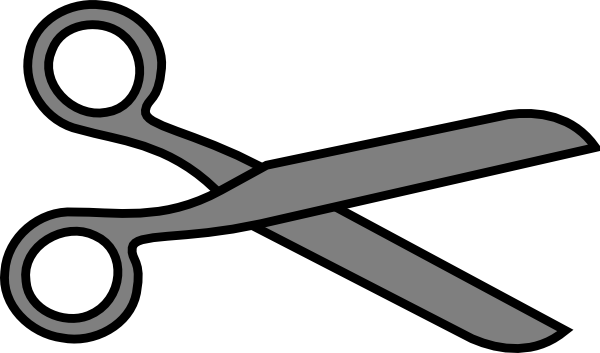
Facilities Main Desk 701-777-4137

**MEDICAL SERVICES**

Occupational Health - Altru 701-780-1546

# APPENDIX II: SPILL RESPONSE CUE CARDS

***Cut out cue cards and post in a highly visible work area***



**SPILLS OUTSIDE THE BIOSAFETY CABINET**

**Small Spill (<10 mL, localized to small area)**

1. Alert personnel in the vicinity.

2. Check for contaminated clothing, including shoes. Decontaminate if necessary.

3. Evacuate the room. Close door. Discard potentially contaminated PPE, remove and decon any contaminated clothing. The contaminated PPE goes in the biohazard bag. Wash hands.

4. Notify PI. Wait for 30 minutes to allow for aerosols to settle.

5**.** If assistance is needed, notify the Biological Safety Officer (777-2444).

6. After 30 min don fresh PPE: lab coat or gown, gloves, mask, eye protection.

7. Pick up sharps with tongs & place in biohazard sharps container then cover spill with paper towels.

8. Soak paper towels with the appropriate disinfectant, from perimeter toward the center.

9. Allow 30 min. of contact time to inactivate the agent.

10. Discarded towels go in biohazard bags.

11. Wipe down spill area one final time with appropriate disinfectant.

12. Wash hands thoroughly.

**SPILLS OUTSIDE THE BSC**

**Major Spill (>10 mL, localized to small area)**

1. Alert personnel in the vicinity.

2. Check for contaminated clothing, including shoes. Decontaminate if necessary.

3. Evacuate the room. Close door. Discard potentially contaminated PPE and remove any contaminated clothing. The contaminated PPE goes in the biohazard bag. Wash hands thoroughly.

4. Post warning sign: **“DO NOT ENTER: Biological spill!”**

5. Wait 30 min. Meanwhile, notify PI.

6**.** If assistance is needed, notify the Biological Safety Officer (777-2444).

7. Don fresh PPE: lab coat or gown, gloves, mask, eye protection.

8. Re-enter the room, pick up sharps with tongs & place in sharps biohazard

container, cover spill with paper towels.

9. Soak paper towels with appropriate disinfectant, from perimeter toward the center.

10. Allow 30 min. of contact time. (Use a contact time that is appropriate for the disinfectant and the organism).

11. Discarded towels go in biohazard bags.

12. Wipe down spill area one final time with appropriate disinfectant.

13. Wash hands thoroughly.

14. With PI, write up a report and submit to the Biological Safety Officer. Or, alternative, schedule a meeting to discuss the events with the BSO.

**SPILLS INSIDE AN INCUBATOR**

Decontaminate water pan via autoclave.

1. Alert personnel in the vicinity.

2. Evacuate the room for at least 30 min. Close door. Discard potentially contaminated PPE and remove any contaminated clothing. Wash hands thoroughly.

3. Notify PI.

4. Don fresh PPE: lab coat or gown, gloves, mask, eye protection.

5. Pick up sharps with tongs & place in biohazard sharps container.

6. Cover spill with paper towels.

7. Soak paper towels with appropriate disinfectant, from perimeter toward the center.

8. Allow 30 min. of contact time (use a contact time that is appropriate for the disinfectant and the organism).

9. Discarded towels go in biohazard bags.

10. Wipe down spill area one final time with appropriate disinfectant.

11. Wash hands thoroughly.

**SPILLS INSIDE A CENTRIFUGE**

1. Close centrifuge immediately. Assume an aerosol has been generated. The incident must be treated as a potential exposure.

2. Alert personnel in the vicinity. Evacuate room.

3. Wait 30 min. Meanwhile, notify PI.

4. After 30 min. open lid of centrifuge slowly.

5. If there has been no breach of containment, spray rotor with 70% EtOH.

6. If inside of rotor is contaminated, decontaminate in the BSC. As a precautionary measure, decontaminate the centrifuge chamber.

7. If rotor buckets are damaged, open lid slowly and add paper towels. If assistance is needed, notify the Biological Safety Officer (777-2444).

8. Spray walls of chamber and rotor with 70% EtOH.

9. Close centrifuge lid for 30 min. contact time.

10. Finish centrifuge clean-up as for major spill outside the BSC. Transport rotor to BSC.

11. Open and decontaminate rotor/buckets in the BSC.

12. Wash hands thoroughly.

13. For a major spill inside a centrifuge with PI, write up a report and submit to Biological Safety Officer.

**SPILLS DURING TRANSPORT**

**If a spill occurs in a public area:**

1. Don’t attempt cleanup without proper supplies.

2. Contact Office of Safety (701-777-3341) for assistance during office hours M-F 8.00 am to 4.30 pm.

**If a spill occurs in a vehicle:**

1. Leave the vehicle with closed windows and locked doors.

2. Contact Office of Safety (701-777-3341) for assistance.

After hours, contact the UND Police & Office of Safety (701-777-2591) for assistance.

# APPENDIX III: DOOR SIGNAGE

***Please go to this website:*** [***https://campus.und.edu/safety/resources/forms.html#d56e89--18***](https://campus.und.edu/safety/resources/forms.html#d56e89--18)

***and find/download/fill-out the appropriate sign for your lab. Display a copy of the sign on the main entrance(s) to the lab.***

# 

# APPENDIX IV: TRAINING CERTIFICATES

***Following this page, please insert copies of training certificates for each person who has completed a training course listed in the table on page 5.***

# APPENDIX V: IBC PROTOCOL AND APPROVAL

***Following this page, please insert a copy of the lab’s IBC-approved protocol(s) and a copy of the IBC Approval Letter(s).***

Please note: All work with your BSL-1 and BSL-2 agent(s) must be pre-approved by the UND IBC before experiments can begin.

# APPENDIX VI: IACUC PROTOCOL AND APPROVAL

***Please insert a copy of the IACUC-approved protocol(s). Also include a copy of the IACUC Approval Letter.***

**Please note:**  All work with animals must be pre-approved by the IACUC before experiments can begin.

# APPENDIX VII: DISINFECTANTS

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUMMARY OF PRACTICAL DISINFECTANTS FOR USE IN BIOLOGICAL RESEARCH** | | | | | | | | | | | | | |
| **DISINFECTANTS** | | **PRACTICAL REQUIREMENTS** | | | | | **INACTIVATES** | | | | | | |
|  | **Contact Time**  **(Minutes)** | |  |  |
| **TYPE** | **CATEGORY** | **USE DILUTION** | **LIPO-VIRUS** | **BROAD SPECTRUM** | **TEMP.**  **(°C)** | **RELATIVE HUMIDITY (%)** | **VEGETATIVE BACTERIA** | **LIPOVIRUSES** | **NON-LIPID VIRUSES** | **BACTERIAL SPORES** | **TB** | **HIV** | **HBV** |
| LIQUID | Quaternary Ammonium Compounds | 0.1-2.0% | 10-30 | - |  |  | **+** | **+** | **-** | **-** | **-** | **+** | **-** |
| Phenolics, Amphyl | 1.0-5.0% | 10-30 | - |  |  | **+** | **+** | **\*** | **-** | **+** | **+** | **\*** |
| Chlorine Bleach | 5% | 10-30 | 30 |  |  | **+** | **+** | **+** | **+** | **+** | **+** | **+** |
| Iodophor, Wescodyne | 0.5-10% | 10-30 | 30 |  |  | **+** | **-** | **+** | **+** | **+** | **+** | **\*** |
| Alcohol, Ethyl | 70-85% | 10-30 | - |  |  | **+** | **-** | **\*** | **-** | **-** | **+** | **\*** |
| Alcohol, Isopropyl | 70-85% | 10-30 | - |  |  | **+** | **+** | **\*** | **-** | **-** | **+** | **\*** |
| Formaldehyde | 0.2-8.0% | 10-30 | 30 |  |  | **+** | **+** | **+** | **+** | **+** | **+** | **+** |
| Gluteraldehyde | 2.0% | 10-30 | 30 |  |  | **+** | **+** | **+** | **+** | **+** | **+** | **+** |
| GAS | **Ethylene Oxide** | 8-23g/ft3 | 60-240 | 60 | 37 | 30 | **+** | **+** | **+** | **+** | **+** | **+** | **+** |
| Paraformaldehyde | 0.3g/ft3 | 60-180 | 60 | >23 | >60 | **+** | **+** | **+** | **+** | **+** | **+** | **+** |

**+ Positive Effect; - No Effect; \* Variable Effect** **Main Reference: NIH Safety Monograph, 1979; BMBL 5th Edition, 2009; WHO Laboratory Safety Manual, 2004**

# APPENDIX VIII. CATALOG OF ORGANISMS LOG (INVENTORY)

***Consider using this form for -80°C Freezers, Liquid Nitrogen Containers, and Refrigerators***

**Researcher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Emergency Contact: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Building: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Room: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Contact on call: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**IBC Registration #:**

**Freezer or Liquid Nitrogen Container Description: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date Inventory Performed**: **Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| --- | --- | --- | --- |
| **Type of Biological Material** | **Name of Material**  **(Please include Genus and Species where applicable)** | **OPTIONAL** | |
| **Type of Containers** | **Quantity of Containers** |
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**TYPE OF BIOLOGICAL MATERIAL:** Bacteria, bacterial toxins, viruses, fungi, rickettsia, prions, protozoans, parasites, genetically-modified organisms, recombinant or synthetic nucleic acid molecules, human blood or materials of human origin, etc.

**TYPE OF CONTAINERS:** Conical tubes, centrifuge tubes, vials, Petri dishes, -80°C freezer, -20°C freezer, Liquid N2 Dewar, etc

# APPENDIX IX. CHEMICAL AND TOXIN INVENTORY

**Researcher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Emergency Contact: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Building: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Room: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Contact on call: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date Inventory Performed:**   **Notes:**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Item ID** | **Chemical Name** | **Manufacturer** | **Concentration** | **Quantity** | **Unit (L, kg, cyl, lb.)** | **CAS#** | **Storage Location** |
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\*\*\* Please utilize the chemical inventory template available on the Office of Safety website (<http://und.edu/finance-operations/office-of-safety/biological-safety.cfm>) Need to be sure about this link