## Safe Work Practices in Molecular Biology

**PURPOSE**

Many hazards are encountered from the time the specimen is collected to the time the specimen is discarded. Standard precautions recognize that all patient specimens are potentially infectious and capable of transmitting disease. Since great risks are associated with processing specimens, it is important to exercise standard precautions and safe work practices to prevent the transmission of infectious agents, injury or harm that include PPE, safety devices and the proper decontamination and disposal of contaminated materials.

**POLICY STATEMENT**

* All testing personnel are responsible for adhering to safe work practices
* All testing personnel are responsible for completing the online safety training annually

**ABBREVIATIONS**

PPE: personal protective equipment

BSC: biosafety cabinet

UV: ultraviolet light

Area/Room 1: Clean room

Area/Room 2: Processing room

Area/Room 3: Amplification room

**Procedure A:** Follow the activity in the table below for handling specimens

**Handling of Specimens**

| Protection | Step | Work Practice | Related Doc |
| --- | --- | --- | --- |
|  | 1 | Wear gloves throughout sample testing and decontamination processes  Change gloves frequently  If contaminated at any time, replace with new gloves |  |
| **PPE** | 2 | Wear lab coats at all times throughout testing  Wear dedicated disposable coats in rooms 1 and 3; change weekly  Wear standard lab coat in room 2 and general lab areas; change weekly |  |
|  | 3 | Remove gloves and lab coats immediately upon contamination  Discard gloves in trash  Place standard lab coat in designated laundry bag for cleaning  Place disposable lab coats in trash | MB 2.02 Biohazard Containment |
|  | 4 | Use N95 mask and protective eye wear (face shield or goggles) when handling specimens containing high risk pathogens |  |
|  | 5 | Wash hands after gloves are removed and before leaving the laboratory. |  |
|  | 6 | Do not wear PPE outside of the laboratory |  |
|  | 7 | Do not store used lab coats in clean areas |  |
|  | 8 | Do not wash or reuse gloves |  |
| **Specimen Transport** | 1 | When transporting specimens to the Mpls/StP laboratories for testing, place specimens in plastic biohazard bags and then in a leak-proof transport container with the biohazard symbol | MB 2.03 Biohazardous Spills |
|  | 2 | Do not accept grossly contaminated specimens. Notify the unit submitting the specimen and follow the specimen rejection policy | MB 1.02  Specimen Rejection Criteria |
|  | 1 | Centrifuge tubes must be intact and properly balanced before centrifugation. |  |
| **Centrifuges** | 2 | Clean and disinfect centrifuge if there is tube leakage/breakage during processing |  |
|  | 3 | Use sealed safety cups for centrifuging potential BSL-3 emerging pathogens |  |
|  | 4 | Open centrifuge safety cups in a BSC |  |
|  | 5 | Do not place tabletop centrifuges in BSC because air turbulence can allow aerosols to escape |  |
| **Tubes** | 1 | Carry tubes in racks |  |
|  | 2 | Use plastic tubes when possible |  |
|  | 3 | Uncap tubes in BSC to contain aerosols; use orange barrier protector when necessary |  |
| **Sharps** | 1 | Discard all sharps in a puncture-proof container with a biohazard symbol |  |
| **Hand washing** | 1 | Perform hand washing immediately after removing gloves  After obvious contamination  After completion of work  Before leaving the laboratory  Before hand contact with nonintact skin, eyes or mucus membranes |  |
|  | 2 | Use antiseptic soap followed by thorough hand washing for accidental skin contamination |  |
|  | 3 | Use nonirritating soap or alcohol based gel for routine washing |  |

# Procedure B: Follow the activity in the table below for processing specimens

**Processing Specimens**

|  |  |  |  |
| --- | --- | --- | --- |
| Activity | Step | Work Practice | Related Doc |
|  | 1 | Plan work tasks to minimize exposure to known hazards |  |
|  | 2 | Process all primary specimens in a BSC following standard precautions |  |
| **Processing** | 3 | Use N95 mask and protective eye wear (face shield or goggles) when handling specimens that may contain high risk pathogens such as avian influenza, MERS or SARS coronavirus, or similar pathogens | MB 2.02 Biohazard Containment |
|  | 4 | Transfer specimens by using plastic dispo-pipettes or Pipette-Aid |  |
|  | 5 | Open only one tube at a time when transferring or aliquotting specimens to prevent cross-contamination |  |
|  | 6 | Cap tubes when vortexing to prevent cross-contamination |  |

# Procedure C: Follow the activity in the table below for housekeeping and miscellaneous safety practices

**Miscellaneous Safety Practices**

| Activity | Step | Work Practice | Related Doc |
| --- | --- | --- | --- |
| **General** | 1 | Always work with bacterial isolates in the microbiology lab | MB 5.02  Standards of Practice |
|  | 2 | Clean and disinfect all work counters after spills and at the end of each work shift | MB 2.03 Biohazardous Spills |
|  | 3 | Clean and disinfect BSC and contaminated equipment in-between assays, after spills and at the end of each work shift   * Refer to assay specific decontamination protocols for additional information | MB3.01 Engineering Controls |
| **General cont.** | 4 | Always wear gloves in Molecular areas 1, 2 and 3, changing gloves frequently and in-between work areas |  |
|  | 5 | Always wear lab coats in Molecular areas 1, 2 and 3  Use dedicated disposable coats in rooms 1 and 3  Use standard lab coat in Processing room, 2 and general lab |  |
|  | 6 | Automatic and mechanical pipetting devices are available; mouth pipetting prohibited |  |
|  | 7 | Keep all work areas neat and uncluttered   * Do not store personal items in the work area. * Do not store large quantities of disposable items in the work area |  |
|  | 8 | Must comply with all local, state and federal laws, regulations and requirements for:  Packing and shipping of infectious substances  Storage, treatment and disposal of regulated waste  Storage, handling and disposal of chemicals | [Lab Policies and Procedures](http://khan.childrensmn.org/Manuals/Lab/SOP/Gen/General.asp)  Support Services  and General Manual |
|  | 1 | Following standard precautions, handle all patient samples as potentially infectious | [Policy #912](http://khan.childrensmn.org/Manuals/Policy/900/005312.asp)  *Hazardous waste/Waste Management*  Policy [#912.02](http://khan.childrensmn.org/Manuals/Policy/900/005313.asp) *Hazardous Spills* |
| **Infectious waste** | 2 | Dispose of all infectious waste in biohazard waste containers that are:  Closable  Constructed to prevent leakage, puncture-proof  Labeled with biohazard symbol |
|  | 3 | Infectious waste containers are picked up weekly by a licensed disposal service |  |
|  | 1 | Be familiar with the MSDS information located on the Children’s Home Page, [Emergency/Safety](http://intranet.childrensmn.org/emergency-and-safety/index.htm) and Disaster Plan flip chart located on the Safety bulletin board |  |
| **Chemicals** | 2 | Label all reagents with:  Content and quantity, concentration or titer  Storage requirements  Date prepared, filtered or reconstituted  Appropriate hazard warnings using the MSDS information  Expiration date | Intranet Tab: [Emergency/Safety](http://intranet.childrensmn.org/emergency-and-safety/index.htm) References  Disaster Flip Chart  Laboratory Chemical Inventory |
|  | 3 | Wear appropriate PPE when handling hazardous chemicals, i.e., lab coat, gloves, protective goggles or face shield |
|  | 4 | Store flammable and combustible liquids in fire-safety cabinet and explosion-proof refrigerator |
|  | 5 | Store all hazardous chemicals including reagents below eye level   * Only store volumes on the bench necessary for daily work * Store in plastic bottles when appropriate |  |
|  | 6 | Refer to Organizational Policy And Procedure Manual for proper management of chemical waste   * Place chemical waste in the Flammable and Hazardous Waste room, B2 030 (located by Materials Management) until final disposal | [Policy #912](http://khan.childrensmn.org/Manuals/Policy/900/005312.asp)  *Hazardous waste/Waste Management* |
|  | 1 | Do not expose eyes and skin to direct UV light.  **Note:** UV radiation generated by the germicidal UV lamp in the BSC can cause injury with only a few seconds of exposure. |  |
| **Ultraviolet (UV) light** | 2 | Wear protective eye wear (ANSI Z87.1 – 1989 UV certification) located in molecular areas 1, 2 and 3.  **Note:** Ordinary eyeglasses do not block UV radiation |  |
|  | 3 | Wear a fully buttoned lab coat if there is potential for skin exposure. |  |
|  | 4 | UV light should not be relied upon as the sole decontaminating agent in BSC. Additional disinfecting should be performed before and after BSC use |  |
| **Emergency Response** | 1 | In the event of a hazardous material spill, fire or explosion, call **5-7777** in Minneapolis. Emergency numbers are located on the emergency badge card, intranet and on each telephone. The security department will respond to the call. | [Lab Policies and Procedures](http://khan.childrensmn.org/Manuals/Lab/SOP/Gen/General.asp)  General Lab - Safety |
| **Fire info** | 2 | Remember the basic fire emergency procedures, **RACE** (rescue, alert, confine, extinguish) and **PASS** (Pull, aim, squeeze, sweep)**.** |  |

# REFERENCES

1. Gerald A. Denys, Section editor, Biohazards and Safety, *Risk Assessment* 15.2. InLynne S. Garcia (ed) *Clinical Microbiology Procedures Handbook,* Third edition2010, American Society for Microbiology, Washington, D.C.
2. Garcia, Lynne S., *Clinical Laboratory Management,* Laboratory Safety, Chapter 26*,* 2004, ASM Press, Washington, D.C., pg. 446 – 472
3. Children’s Hospitals and Clinics of Minnesota, Organizational Policy and Procedure Manual

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| Historical Record | | | |  |
|  | **Version** | **Written/Revised by:** | **Effective Date:** | **Summary of Revisions** |
| 1.0 | P. Ackerman | 10/1/87 | Initial Version |
| 1.1 | P. Ackerman | 9/13/99 |  |
| 1.2 | P. Ackerman | 9/03/03 |  |
|  | 1.3 | P. Ackerman | 7/24/04 |  |
|  | 1.4 | P. Ackerman | 9/02/05 |  |
|  | 1.5 | P. Ackerman | 8/11/07 | Chemical Safety, C.3, added reference to HAZARDOUS WASTE MANAGEMENT IN THE MICROBIOLOGY/VIROLOGY LABORATORY |
|  | 1.6 | P. Ackerman | 6/6/09 | Revised title to “Molecular Diagnostics”; reformatted, modified content. Removed Baywest Corp. as an emergency backup for Biohazardous spills. |
|  | 7 | P. Ackerman | 9/7/11 | Reformatted procedure, Changed version designation to whole number; |
|  | 8 | P. Ackerman | 5/27/16 | Reformatted procedure for CMS upload; added N95 mask use in Proc. A, B; removed needle and syringe section; updated logo |
|  | 8 | J. Laramie | 5/27/16 | Biennial review: JL 6.1.18 |
|  | 9 | J. Laramie | 9/03/18 | Updated chemical labeling procedure |