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Biohazard Emergency Response Procedures

University of Missouri-Columbia

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Environmental Health and Safety
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I. INTRODUCTION

This document is a biohazard emergency response guide for laboratory personnel at the University of Missouri Columbia Campus (MU). Principal investigators, laboratory supervisors, laboratory biological safety officers and workers should use this document as a reference to reduce the risk of exposure from a spill or release of Biological Safety Level 2 agents in their laboratory. For agents that have a higher level of risk please contact the Biological Safety Professional (BSP) at Environmental Health and Safety (EHS) @ 882-7018.

Section II is a list of actions that need to be preformed immediately and reviewed routinely, by all laboratory staff. Section III is a response guide that should be used as a reference during laboratory personnel training and for emergency preplanning.

II. IMMEDIATE BIOHAZARD EMERGENCY RESPONSE

A. Immediate Emergency Response Actions

If you drop, become aware of, or otherwise release a container of microorganisms (Biosafety Level 2 agents)

1. Hold your breath. Leave the room. Close the door behind you. Get assistance if available.
2. Access the required biosafety kit/station outside the laboratory.
3. Remove and place contaminated protective garments (including shoes) into a red biohazard bag at the door immediately after exiting.
4. Place a warning sign on the door handle, and isolate the area.
5. Wash hands and face or, if facilities are available, shower. Use germicidal soap.
6. Notify the supervisor responsible for the area immediately using emergency contact information on laboratory entry door.
7. Call for assistance: Biosafety Professional (EHS) @ 882-7018 (weekdays), MU Police @ 882-7201 (nights, weekends & holidays).

B. Follow-up Response and Disinfection Actions

When the above immediate actions are accomplished, disinfection and clean-up will be directed by the supervisor responsible for the area.

1. Before reentering the affected area, wait a minimum of **30 minutes** to permit reduction of airborne particles by ventilation changes. Verify the biosafety cabinet is operational.
2. Review available protective equipment/materials, required biosafety kit/station, and personnel resources. Develop and communicate response and decontamination clean-up plans.
3. An appropriate disinfecting solution (example: 1 part household bleach (5.25% sodium hypochlorite) and 9 parts water) shall be used to treat the spill area. To minimize aerosols, do not spray the disinfectant. Pour it gently, directing its flow into the spill area. Cover the area with absorbent paper or cloth. Allow **20 minutes** of contact time.
4. Using an autoclavable (or expendable) dustpan and squeegee, transfer all materials from the spill area to a deep autoclave pan including, finally, the dustpan and squeegee. Cover

the pan with foil or other means for transfer to an autoclave. Remove, leave in the autoclave, the rubber gloves worn to that point and don a fresh pair.

5. Wash and mop the spill area and adjacent areas with disinfecting-detergent solution.
6. Before leaving the immediate area, the disinfecting team shall wash their rubber boots with disinfectant solution, remove and bag respirator(s) (separately) and then cap, gown, and rubber gloves for appropriate disinfection or autoclaving. The boots should be exchanged for conventional disposable booties before leaving the area.
7. Someone shall be assigned responsibility to verify \ ensure that all waste, equipment, and clothing are properly disinfected and accounted for. Replenish biosafety kit/station supplies for future use.

C. Air flow and Power Failures of Biosafety Cabinets

If airflow in a biosafety cabinet changes abruptly or the power fails more than momentarily while working with BL2 agents the following procedures are recommended:

1. Terminate working with the agent, taking care not to create aerosols.
2. Leave the laboratory and assure that others have also left.
3. Secure the laboratory to entry by other personnel.
4. If the agent poses a health hazard to humans, contact the Biosafety Professional @ 882-7018 (weekdays) or MUPD @ 882-7201 (nights, weekends & holidays).
5. When power is restored wait **30 minutes** to reduce airborne particles, verify the operation of the biosafety cabinet, then disinfect the work area as necessary based on the activity that was in progress. Consult with the Biosafety Professional at 882-7018 if there are questions in this regard.
6. Replenish biosafety kit/station and used resources (gloves, garments, disinfectants, etc.) outside the laboratory for future use.

D. Emergency Contact Information

The biosafety emergency contact sign shown on the following page is an example of the information to be posted on the outside of all laboratories in which Biosafety Level 2 agents are stored and used. Contact the Biosafety Professional for additional information and the "MU Expert Microbiologist Response Listing".

Biosafety Emergency Contact Listing

Location: Building _____ **Room** _____
Department: _____
Responsible Investigator: _____(Phone #_____)
Alternate Lab Contact: _____(Phone #_____)
Laboratory Hazards/Restrictions:_____
_____
Special Procedures/Precautions: _____
_____
_____

Laboratory Emergency Contact Listing (Prioritized):

Lab Contact Name	Title or Designation	Bldg.	Room	Work Phone	Home Phone
	Lab Biosafety Officer (BSO)				
	Alternate Lab BSO				
	Decontamination Team				
	Decontamination Team				
	Accident Invest. Contact				
	Accident Invest. Alternate				
	*Expert resource				

MU Emergency Contact Listing:
Biosafety Professional (EHS): 882-7018 (Weekdays)
MU Police Department: 882-7201 (Nights, Weekends & Holidays)

*MU Expert Microbiologist / Toxicologist and Contact # for biohazard agents used in the Laboratory.
Note: MU Expert Microbiologist Resource listing available through EHS Biosafety Professional.

Date: _____

III. DETAILED BIOHAZARD EMERGENCY RESPONSE

A. General Comments on Emergencies

Safety is an essential component of each laboratory and/or other biohazard operation. Work is planned so that exposures to potentially hazardous agents will not occur. In spite of this, accidents that create hazards do occur. These may involve spills that can release potentially infectious agents. In addition, failure of important equipment and facility safeguards may place workers at a risk of accidental exposure. Likelihood of severe injury or infection can be reduced if plans for emergencies are established and well known to all needing to know.

Professional standards and the National Institutes of Health (NIH) Guidelines require the preparation of emergency plans for laboratories and facilities involved in biohazard activities. It is the laboratory principal investigator or supervisor's responsibility:

- To develop and communicate specific emergency plans for their laboratory.
- Post and update the emergency notification signage.
- Maintain a biosafety kit/station outside the laboratory.

Principal Investigators or supervisors are responsible for training laboratory personnel in laboratory emergency procedures and how they should be followed in their specific area. The following basic principles are useful in developing specific procedures for dealing with accidental spills or releases of biohazardous material:

- Render assistance to persons involved and remove them if necessary.
- Warn personnel of the potential hazards to their safety and evacuate the area if necessary.
- Control area to allow only authorized persons to enter. Do not allow re-entry to the area without proper controls/training or until hazards are eliminated.

B. Reporting of Biohazard Emergency Incidents

1. Serious Biohazard Emergency Accidents

a. Fatality
b. Hospitalization or medical treatment (beyond first-aid)
c. First aid treatment of five (5) or more persons. Emergency fires, explosions and personal exposures.
d. Property damage exceeding $1000.00.
e. Biohazard exposure resulting in lost time or accidental release of biohazards with a potential for involving the public or exposure of non-involved persons.

If a serious accident occurs, call for assistance:
Ambulance (911) MUPD (882-7201) EHS (882-7018)

The following information should be provided:

a. Where and what type of incident that has occurred.
b. Assistance needed, if not obvious, e.g. Firefighters for a fire.
c. Nature and type of any injured or trapped persons.
d. What has happened since the incident: e.g., building evacuation has been started, etc.

e. Identity of caller and location from which he/she is calling and who and where someone will be to meet and/or assist response personnel upon their arrival.

2. All Other Biohazard Accidents

a. First aid and treatment of less than 5 people
b. Non emergency fires, explosions, personnel exposures, injuries
c. Failure of biohazard containment
d. Releases of biohazard material
e. Escape of infected animals

Report as soon as possible to the laboratory Principal Investigator (PI) or supervisor.

3. Specific Biohazard Accident Reporting

a. The person involved or someone on his/her behalf must immediately report the accident to his/ her supervisor, PI or department head.
b. The Principal Investigator or supervisor must report the employee injury or illness to the Worker's Compensation program on a "Report of Injury- UMWC3" form within 24 hours of the injury. If urgent care is needed, proceed directly to the Urgent Care Center at University Hospital and Clinics, this may be in consultation with the Principal Investigator, supervisor or Biosafety Professional if necessary. For emergency care, the employee may proceed to the nearest medical facility for treatment.
c. Students who have a non-emergency injury or made ill because of a biohazard activity should call 882-7481, or report to the Student Health Services. The nurse and patient will determine the course of action, this may be in consultation with the Principal Investigator, supervisor, Biosafety Professional, or EHS, (882-7018) if necessary.
d. Each person involved in or supporting biohazard work shall report to his/her PI or supervisor:
   - Each spill, release, etc. (both injury causing and those without injury).
   - Each unsafe condition observed having the potential for either injuring or endangering the health of people and/or causing damage to property.
e. The laboratory PI or supervisor for any biohazard accident shall contact the Biosafety Professional as soon as practically possible. The Biosafety Professional will coordinate the response to animal related accidents with the Office of Animal Research (OAR).
f. All external reports, other than those of an immediate nature such as summoning the fire department in case of a fire, are made by or through the Director of Environmental Health and Safety (882-7018).

C. Biohazard Emergency Response Procedure

1. Introduction

All biohazardous equipment, facilities, residue, or other material must be properly disinfected, contained, secured, and transported in a safe and legal manner. Preplanning immediate actions and decontamination procedures to cope with biohazard releases is the responsibility of the laboratory PI or supervisor. Preplanning includes, but is not limited to:

a. Laboratory area and program survey
b. Developing laboratory specific emergency plans
c. Provide and maintain a biosafety kit/station (refer to III G.)
d. Training of laboratory personnel in emergency response

2. Laboratory Area and Program Survey

It is critical, in developing laboratory specific action protocols to be used in the event of biohazard spills, that PI or Supervisors survey the laboratory and adjacent areas in relation to the research program. All potential exposure pathways need to be identified. Airborne microbes generated during a spill in a hallway may be quickly dispersed into adjoining laboratories. Spilled biohazard materials may contaminate a floor drain or be tracked over a wide area. Clean up with disinfectants becomes a formidable task and disrupts the laboratory effort.

a. A written assessment providing information on exposure prevention of personnel, environment, property, with preparations to contain and disinfect the release.
b. Types and levels of potential research program risks must be known and assessed.
c. Decontamination practices must be established for the type of biohazards involved and disinfectant agents.
d. A good understanding of the air handling systems such as: HVAC units serving laboratory, supply/return vents, general lab air movement, air particulate filter types, laboratory hood and biosafety cabinet ventilation.
e. Layout of lab furniture, sinks, floor drains, and emergency equipment.
f. Storage locations and security of biohazard materials.
g. Primary and secondary routes for evacuation & assembly area.
h. Maintain a biosafety kit/station outside the laboratory area.
i. Familiar with building specific Emergency Action Plan.

Once there is a good understanding of these facts, appropriate action protocols can be developed. These actions can be taken in the event of a laboratory accident, release, or spill which will safely evacuate personnel from areas affected, disinfect without affecting adjacent areas or destroying valuable stock of biological material, and render assistance in the event of fire, flooding or other emergencies. A copy of the Laboratory Area and Program Survey shall be forwarded to the EHS Office (Biosafety Professional) upon completion by the laboratory PI or supervisor.

3. Laboratory Specific Emergency Plan

Immediate action protocols are the step-by-step written procedures to be followed by laboratory workers immediately after the occurrence of a biohazard spill. The primary objectives are to protect personnel and prevent spread of the microorganism to the environment or property. The protocols should be brief, forceful and informative, leaving little room for ignoring or misinterpreting the required actions under the stress of the unanticipated event. The laboratory PI or supervisor is responsible for training laboratory personnel in laboratory specific emergency plans and specific responsibilities. A copy of the Laboratory Specific Emergency Plan and additional directives shall be forwarded to the EHS Office (Biosafety Professional) upon completion by the laboratory PI or supervisor.

a. Biohazard Releases <u>Outside</u> Biological Safety Cabinets

Spills outside biological safety cabinets are complex events. They may involve amounts of material ranging from less than a milliliter up to several hundred milliliters or more. The amount spilled, the physical characteristics of the material, and how the spill occurred are important factors in determining the area of involvement. Each spill is composed of three somewhat overlapping fractions of the spilled material.

1. The first of these is the bulk of the material that remains in a more or less confluent puddle.
2. The second is that portion separating from the main body of material in large drops and rivulets.
3. The third is that portion which can separate from the main body in airborne particulates of various sizes.

The ratios of the various fractions to the whole will be directly affected by interrelations among such factors as energy input into the system, viscosity and surface tension of the biological preparation. The first two portions comprise the greatest bulk of material that must be disinfected. The third represents only a small portion of the overall bulk, but the very small particles have very low settling rates and once airborne can remain so for relatively long periods of time. The hazard represented by airborne particulates containing oncogenic viruses remains largely unknown; however, these small particles have been shown to represent a significant hazard when they contain certain of the known human pathogens. For some of these, **ten or fewer** viable particles can cause human infection. The airborne particles emanating from a biological spill are responsible for the preliminary phase of the decontamination procedure. This is a passive phase in that the only required action is to isolate the area to allow the occurrence of physical settling and air dilution of the particles. A minimum of **30 minutes** should be sufficient to achieve a reduction of airborne particles per unit volume permitting the actual decontamination effort to proceed.

Containment biohazard bags and personal protective equipment are the major component of the required biosafety kit/station located outside the laboratory. Laboratory personnel responsible for the decontamination of a spill should be provided minimally with a long-sleeve gown, respiratory protection -particulate mask (NIOSH N95), medium- or heavy-duty rubber gloves. Keep in mind chemical resistant gloves may be needed due to the disinfectant used or chemicals with the release. The gown should be worn over conventional two-piece or jumpsuit type laboratory clothing. Knee-length rubber boots are also useful because they are more easily disinfected than conventional footwear and provide greater protection to the wearer against the chemical action of strong decontaminating solutions. Non-laboratory type outer garments should not be worn under the gown. This is not only to preclude potential removal of infectious materials from the laboratory on personal clothing, but also in recognition of the strong bleaching action of the hypochlorites often used in decontaminating spills.

When properly clad and in possession of the equipment and an effective disinfectant (be sure to review compatibility if other reactive chemicals are included with the release) required for the cleanup, decontamination personnel should enter the spill area and quickly survey the extent of the spilled materials. Particular attention should be given to splashed materials to avoid tracking the agent about the laboratory. If the spill resulted from a container dropped from some height to the floor or the material dropped to the floor by overrunning the top of a laboratory bench or front of a biosafety cabinet, the area contaminated may be quite large. Starting from the outer perimeter of the area encompassed by the splashed as well as the major bulk of the spilled material, liquid disinfectant should be gently poured around the spill area and allowed to flow into the spilled

material. Paper towels soaked with the liquid disinfectant may be used to cover the area. Avoid spraying or pouring disinfecting solutions directly onto the spilled materials or other abrupt actions that may create airborne particles containing the spilled agent. Allow the disinfectant to remain in contact with the spilled agent for at least **20 minutes**. Make sure that the amount and concentration of the disinfectant used is sufficient to overcome the inactivating action of proteinaceous media or tissues that may be intimately associated with the agent.

During the 20-minute disinfectant contact time, the surrounding area should be observed to locate potential areas that may harbor the spilled agent. If these are extensive and/or cannot be readily reached by the liquid disinfectant, consideration should be given to a follow-up disinfection with paraformaldehyde gas. Except in the case of the higher risk infectious agents, materials in areas difficult to obtain disinfectant solution contact may not pose a particular hazard for personnel. However, media and other suspending components may provide a haven for spore-forming fungi and bacteria growth that may subsequently prove troublesome in preserving the integrity of experiments.

Decontamination of laboratory spills should also involve common sense. Obviously, all spills do not present the same degree of risk. The following discussion is most applicable to relatively large spills of biological materials or for those where a few viable particles any cause infection. Minor spills do occur, however, and may involve very small quantities of agent materials without involving container breakage or significant splashing. In addition, it is most likely that aseptic techniques were being used and the spill will occur on a surface protected with an absorbent covering dampened with an effective disinfectant.

Immediate donning of respiratory protection (see EHS web site: (http://web.missouri.edu/~muehs/respirator.htm) if not already in use is advisable. Isolation of the area may be less important, unless the agent is suspected to have a high degree of infectious potential. Additional liquid disinfectant should be added immediately but gently to the absorbent surface covering; rubber gloves should be worn. Potentially contaminated objects should be wiped down with disinfectant and set aside. All nearby surfaces should be similarly wiped down. The absorbent surface covering should be gently rolled into a compact package, along with the rubber gloves, placed in a container of disinfectant solution or in an appropriate covered container for autoclaving. The investigator should then wash hands and face with germicidal soap, change to fresh laboratory clothing, and bag the used clothing for autoclaving. All laboratory personnel involved in the spill/release should place special attention to follow up housekeeping procedures to assure complete disinfecting treatment of surfaces and proper removal of all disposable objects and material involved in the spill.

b. Biohazard Releases <u>In</u> Biological Safety Cabinets

The function of safety cabinets is not only to provide a work area free from background contaminants, but also to contain any microorganisms or other infectious material released by various manipulations. Many routine laboratory procedures produce airborne microorganisms. For example, operations such as centrifuging, blending, and homogenizing tissues, in particular, should be regarded as producers of "controlled releases", these must be added to the potential for an overturned or broken primary container of concentrated infectious material; an example is an overturned stack of infected tissue culture plates. Potential contamination resulting from routine procedures is normally dealt with following completion of an experimental procedure or at the conclusion of a work session. A biological spill occurring in the biological safety cabinet should be disinfected immediately and the cabinet airflow maintained. The operator should have available at all times within the cabinet a supply of an effective disinfectant so that it is not

necessary (barring operator injury) to withdraw the arms before proceeding with decontamination. If the operator's hands and arms have come into direct contact with the biological material, disinfectant should be liberally applied to them. (NOTE: Some laboratories provide a plastic over-sleeve that prevents spilled materials being absorbed by garments.) Then the area of the spill should be gently flooded with disinfectant sufficient to cover the top tray, drain pans and catch basin below the work surface. While waiting for the elapse of **20 minutes** contact time, the walls, any work surface, equipment, and recoverable supplies not previously treated should be wiped down with a cloth or sponge saturated with disinfectant. Excess disinfectant from the tray and drain pans should be dumped into the cabinet base. Lift out the removable bench tray and exhaust parts. Wipe down all surfaces of these with disinfectant and replace in position. Place all used cleaning materials in a suitable container and autoclave or treat with a strong hypochlorite solution, (if this is an appropriate disinfectant for the agent(s). Drain liquid disinfectant from cabinet base into appropriate container(s) and autoclave according to standard procedures. If sodium hypochlorite or an iodophor disinfectant was used, add sufficient thiosulfate to inactivate the oxidant immediately before autoclaving.

If the cabinet contained instruments or other equipment not compatible with a liquid disinfectant, this may present problems in assuring penetration by the liquid disinfectant and modification of the procedures will be required. The bulk of the spilled material should be gently flooded with disinfectant as before. Salvageable biological materials in intact containers should be surface disinfected and placed in a covered container. The secondary container is surface disinfected and removed to another biosafety cabinet to continue the experiment or to ready the materials for appropriate storage, pending continuation of the experiment. The contaminated safety cabinet is then disinfected by the paraformaldehyde gas procedure. Alternatively, small instruments may be placed in plastic bags, the bags sealed, surface disinfected, and removed to an autoclave equipped for dry instrument sterilization. The wet chemical decontamination can then proceed as before.

Spills occurring in total containment cabinets need not be as disruptive for work schedules. Spills in these can usually be flooded with a liquid disinfectant, wiped up (taking care not to cut or otherwise damage gloves with broken glass or other sharp materials present), and cleaning materials placed in a covered container of liquid disinfectant. Remaining materials can then be surface disinfected and with adherence to aseptic techniques, and then the experiment can continued. Total decontamination of the cabinet may thus be delayed until the end of the work session.

c. Additional Laboratory Directives

Additional directives may be required such as: a) Location of spill alarm, if available; b) How room ventilation is handled; c) Activation of UV lamps, if available; d) Prevention of inadvertent entry into the contaminated area; e) handling special research equipment. The supervisor should coordinate beforehand with medical personnel those actions that might require departure from protocol in the event that personal injury accompanies the mishap.

Prominent display of the immediate action protocol at strategic locations within the laboratory is required if transient personnel frequently use the laboratory. The laboratory PI or supervisor is responsible for training laboratory personnel in laboratory specific emergency plans and specific responsibilities. A copy of the Laboratory Specific Emergency Plan and additional directives shall be forwarded to the EHS Office (Biosafety Professional) upon completion by the laboratory PI or supervisor.

D. Re-entry After Biohazard Incidents

1. Introduction

The Biosafety Professional and\or EHS emergency responder(s) with assistance from the department's PI or supervisor will make the determination that an area/facility/room is safe for reentry after a biohazard incident. Others are not to enter or reenter the area without the consent of the Biosafety Professional and\or EHS emergency responder(s) for any reason until the area is released. The Biosafety Professional and\or EHS emergency responder(s), if appropriate, will allow authorized people to re-enter and monitor, control, investigate, remove, rebuild, reinforce, perform temporary fixes for the facility as necessary before others have access to the area.

Universal precautions shall be used when there is a potential exposure to body fluids or wastes. A hazard evaluation of the site by the Biosafety Professional and/or EHS emergency responder(s) can identify areas of potential exposure to laboratory and cleaning personnel. The hazard evaluation will identify the hazardous areas to be decontaminated, followed by cleaning methods to remove the released material.

2. Criteria for Re-occupancy of Area

The supervisor, upon completion of appropriate decontamination procedures, should have assurance that the decontamination has been effective to the degree required by the risk category of the biological material released. As the supervisor defines a level of assurance required, the conditions will be established under which the spill area can be reoccupied for continuation of the research effort. Obviously, the greater the infectious potential of the spilled or released agent the more stringent will be the requirements allowing re-occupancy of the spill area.

Personal supervision of the application to the spill area of a known effective chemical disinfectant in sufficient concentration with adequate contact time may be the criterion selected by some supervisors for allowing the research to be resumed following the spill of an agent having little potential as a human pathogen. Other supervisors may delegate this responsibility to an appointed safety officer. This approach, in preparation for re-occupancy, may be entirely adequate for spills of low risk agents, particularly if the area has been isolated for a sufficient time to allow air dilution and settling of airborne particulate before the decontamination process. A critical criterion affecting decisions to reoccupy facilities following a spill, therefore, is personal knowledge by the responsible supervisor or safety officer that a prescribed decontamination procedure has been accomplished. This criterion is usually adequate for spills confined to properly operating Class II and Class III safety cabinets.

As the degree of potential hazard to humans increases, the supervisor may add a refinement, such as swab sampling of surface areas for residual viable agents following disinfection. Alternatively, strategically located cloth or paper patches seeded with resistant microorganisms, such as spore of B. subtilis var. niger are effective indicators of disinfection efficacy. Such refinements are not achieved without some sacrifice of time because of incubation requirements to confirm the absence of viable indicator microorganisms. Swab sampling for the agent can only be relied upon to accurately reflect the extent of residual agent material if actual laboratory tests have established the reliability of sampling and assay methodologies and quantitative relationships between sample recoveries and actual level of contamination. Such methodologies are established and available for spores of indicator microorganisms, but their use during wet chemical disinfection

restricts selection of a chemical disinfectant to those effective for the more resistant spores. This may not be consistent with other laboratory restrictions on the use of disinfectants having the undesirable properties often associated with sporicidal contaminants. The spore indicators are, however, particularly effective for determining the efficacy of gaseous disinfection procedures. Use of spore indicators with the criterion that no viable organisms are recovered, are recommended for determining when laboratory operations may resume following a major spill of more hazardous agents in the open laboratory.

E. Accident Investigation

Accidents in laboratories and/or clinics and infections resulting from work with infectious biohazards must be promptly reported to the Biosafety Professional. Prompt and thorough investigations of these incidents can identify their causes so that appropriate actions can be taken to prevent similar occurrences. The IBC Accident Investigation Team is established, as a subcommittee of the IBC, to conduct an investigation of these accidents (using resources such as the PI or supervisor, MU Expert Microbiologist Resources, EHS, and other emergency response personnel). The PI, supervisor and laboratory personnel shall provide the IBC Accident Investigation Team with all necessary information and support needed to successfully complete the accident investigation.

It is important to investigate any serious, unusual, or extended illness of a biohazard worker or any accident that involves ingestion, inhalation or inoculation of infectious organisms or those containing rDNA molecules through the skin. If an infectious organism or one containing recombinant DNA molecules were to acquire the capacity to infect and cause disease in humans, the first evidence of this potential may be demonstrated as a laboratory-acquired infection. Verification that an infection is associated with such work or research will provide sufficient warning for evaluation of hazards and initiation of additional precautions to protect other MU workers and the public.

The investigation for reporting of all accidents associated with infectious agents or rDNA research should establish the circumstances leading to the accident, including a review of techniques, procedures, types and uses of equipment that may have been involved in the accident. The IBC Accident Investigation Team report by the Biosafety Professional to the Institutional Biosafety Committee (IBC) shall provide recommendations for preventing similar occurrences.

F. Risk Assessment Resources/Information

The laboratory supervisor should periodically review information developed from research conducted in the home laboratory, as well as that reported by other investigators, that may affect current concepts of risk factors associated with potential biohazards in the laboratory.

1. Laboratory Biological Safety Officers

Laboratory Biological Safety Officers will be required in buildings which house 3 or more BL2 laboratories or have 15 or more investigators / staff involved in research with BL2 biological hazardous materials.

Biological releases/spills must be dealt with immediately and often require decisions that cannot be delayed by referral to "professional" safety personnel located some distance from actual laboratory operations. Designation of a Laboratory Biological Safety Officer (LBSO), and a sufficient number of trained alternates from the research staff is helpful in the management of complex laboratory operations. The LBSO will provide a constantly available on-site authority for dealing with the disinfection of biological spills, as well as other immediate questions of operational safety. This structure will help research groups with complex laboratory operations and transient work forces that lack on-site authority for dealing with the disinfection of biological spills. The EHS Biosafety Professional and the Institutional Biosafety Committee are available as a resource for clear and credible direction.

2. Decontamination Team

The most effective way of meeting decontamination requirements arising from a biological spill or to accomplish periodic facility repairs or modifications is a team effort. The knowledge of the PI, supervisor and biohazard workers using their skills as a team will provide the most effective means to respond to any emergency event in their laboratory. All the decontamination team members will need appropriate training, equipment and supplies to handle emergency releases based on the specific emergency plan for the laboratory.

3. Accident Investigation Team

The IBC Accident Investigation Team consists of four members appointed by the IBC (not necessarily from its membership). Three of these members shall be permanent and appointed University faculty/staff for a minimum of two years, the fourth shall be the head of the department or agency in which the laboratory or clinic being investigated belongs. Three permanent members shall consist of:

a. A senior supervisory scientist who is familiar with toxicology and microbiology and who does (or supervises) mostly "bench work".
b. A physician or veterinarian who has done research in addition to clinical work.
c. Biosafety Professional (EHS) or alternate.

The Team's overall responsibility is to make the University's laboratories and clinics safer places in which to work. This will be accomplished by:

- Reviewing techniques, kinds and uses of equipment involved in accidents or infections.
- Establishing the circumstances leading to and causing accidents, injuries, infections or other illnesses.
- Review facts and minimize assumptions to determine how similar incidents can be prevented from recurring in the future.

NOTE: This investigation is in addition to supervisory investigations already required. The Team may however use the supervisory investigation and its recommendations as part of its overall evaluation of incidents but should take a possibly broader look at circumstances.
The Team will not assign responsibility or recommend disciplinary action. Recommendations will be made to the IBC and/or ACUC.

The Biosafety Professional will aid this Accident Investigation Team by:

- Selecting accidents/infections for further investigation (a minimum of one investigation per year).
- Coordinate, centralize, assist, and expedite the accident investigation process.
- Provide clerical assistance needed by the Accident Investigation Team.
- Contact Other Resources (MU Expert Microbiologists, State Health Department, etc.)
- Provide periodic status reports to the IBC.

G. Biosafety Spill Kit/ Station

1. Information required on biosafety spill station:

a. Principal investigator and Supervisor phone number
b. Environmental Health and Safety (882-7018) - to report **ALL** releases and Blood Borne Pathogen exposures.
c. MU Expert Microbiologist and Contact # for biohazard agents used in the Laboratory.

Note: Label and place near the main exit on the **outside** of the laboratory and keep accessible to all personnel. A Biosafety Spill Kit is required for all laboratories using Biosafety Level 2 or higher agents. Annually, check all supplies to determine if they are still usable. Household bleach and containers of liquid disinfectant, rubber gloves, etc. will deteriorate over time.

2. Biosafety Spill Station Inventory Check List

a. Personal Protective Equipment

1. Gloves (Nitrile, rubber gloves, extra large size or sized to each kit user)
2. Face shield, safety goggles or safety glasses with side shields)
3. Disposable coveralls / jump suit, caps
4. Particulate mask (NIOSH N95)
5. Rubbers boots and shoe covers.

b. Cleanup supplies

1. 2-red bags, 2-clear bags, brush, roll of clear tape and barrier tape
2. Household bleach or liquid disinfectant, paper towels, absorbent-vermiculite and scoop, paper towels.
3. A mechanical means for dealing with broken glass such as forceps, and small dustpan and broom (considered disposable). Manila file folders (File folders are cheap, disposable tools for picking up broken glass and debris).
4. A puncture resistant bucket to contain broken glass. Directions and instruction sheet for the use of equipment and chemicals.
5. Warning Sign- provide Biohazard warning sign with barrier tape to mark the entrance to the laboratory or any potentially contaminated area.

3. Basic Biological Spill Kit- for use at individual work areas

a. Disinfectant (5.25 % sodium hypercloride bleach 1:10 dilution, prepared fresh-weekly minimum)

b. Absorbent Material (absorbent pads and paper towels)
c. Waste Container (biohazard bags, sharps containers)
d. Personal Protective Equipment (lab coat, gloves, eye and face protection - such as face shield)
e. Mechanical Tools (forceps, small dustpan and broom)

4. Shelf life of Disinfectants

One integral part of the required biosafety kit/station is disinfectants. After selection of a chemical disinfectant that is effective against the microbes or agent being investigated, the laboratory supervisor will need to devise schedules for regular procurement of bulk concentrate and for maintenance of an adequate supply of appropriate concentrations for use in the laboratory. The effective disinfectant will often be the same as that used in routine laboratory housekeeping and as adjuncts to routine sterile technique and have a way of being depleted when most needed. One way to assure a continuous supply is to maintain two sources of disinfecting solution, i.e., one for immediate use and the other reserved for emergency use. As the immediate-use supply is depleted, the emergency-use lot replaces it and a freshly prepared solution becomes the emergency-use supply. This assures the availability of freshly prepared disinfectant for emergencies. In small laboratories, effective shelf life of use-concentrations of a disinfectant may be exceeded before the working supply is exhausted through normal activities. Supervisors must devise schedules for disposal of ineffective residual disinfectants and replenishment with fresh solutions. Economics must not take precedence over provision of adequate quantities to cope with concentrated microorganisms /agents spilled in the laboratory.

H. Transportation of Materials - High Risk

The need for frequent transit of infectious materials, as listed in the NIH/CDC guidelines, is a primary risk factor in the occurrence of biohazard releases. The dropping and breaking of primary agent containers is of particular concern. Protective secondary containers for transporting materials are effective in containing such spills. These secondary containers are easily devised from stock items. The use of secondary protective containers is required for all infectious materials during transit within the corridors serving the laboratories, and transporting to another building(s) on campus. It is a mistake for individual laboratory workers to ignore the need for secondary containers, particularly if: (a) transit distances are short; (b) the agent is thought to be harmless to humans; (c) use of secondary containers tends to interfere with the desired pace for completing a phase of the experiment.

I. References

Biosafety Guidelines:
Centers for Disease Control / National Institutes of Health guidelines (Biosafety in Microbiological and Biomedical Laboratories (BMBL- 4th Edition) http://bmbl.od.nih.gov/

Recombinant DNA and Gene Transfer:
http://www4.od.nih.gov/oba/rac/guidelines/guidelines.html

Bloodborne Pathogens:
Occupational Safety & Health Administration
http://www.osha-slc.gov/SLTC/bloodbornepathogens/index.html