



ISM
Higher Institute for
Scientific and Medical
Research

ISM Laboratory

HEALTH AND SAFETY MANUAL

By:

André Domche, Linda Djune Yemeli and Rolph Bamou

Approved by:

Dr. Hugues Nana Djeunga

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1. Introduction

People working in scientific laboratories are exposed to a variety of hazards, it is the most common biological risk. Most workplaces have well-known hazards (such ordinary fire) and well-defined measures to prevent them and/or to control their impact. However, laboratories present a wider range of possible hazards and some of these hazards require precautions that are not always available. In the following, we present safety practices for a variety of procedures in the Immunobiology Platform (IBP) at the ISM laboratory. This health and safety manual is intended for all permanent members of the PBI, trainees and visitors who have been granted permission to enter the laboratory as well.

1.1. General safety and operational rules in IBP Platform

Some general guidelines that should always be followed include:

Rule#1: Working alone in laboratory is prohibited for research purposes, particularly involving hazardous chemicals and experimental procedures.

Rule#2: Running or jumping in a laboratory is prohibited.

Rule#3: Items or equipment must be well stored and shall not block access to the laboratory, safety equipment, or other emergency items.

Rule#4: Eating or drinking, chewing gum, or applying cosmetics in laboratory is not permitted.

Rule#5: No food or beverage may be stored in laboratory refrigerators, or any other place in the lab.

Rule#6: Working core hours in IBP are 7:30am – 8pm (Mon.-Sat.). Permission for trainers and staff to work outside of the core time should be granted by the platform supervisor.

Rule#7: Clothing worn in the laboratory should offer protection from splashes and spills, should be easily removable in case of an accident. It is required that lab coats, gloves, and closed shoes are worn. Coats should have snap fasteners rather than buttons so that they can be readily removed. These coats are to be fastened closed while working and removed prior to exit from the laboratory. It is highly recommended

that no sandals or open-toed shoes shall be worn in the laboratory. Laboratory clothing should be kept clean and replaced when necessary.

Rule#8: Mouth pipetting is never allowed. This may give rise to ingestion of chemicals or inhalation of their vapor. A suction bulb should be used for pipetting purposes.

Rule#9: Chemical containers that have been emptied have to be cleaned off remaining residues by triple rinsing with water or other suitable solvent and air-dried before disposal.

Rule#10: In case of a chemical contamination, lab coats, gloves, and other personal protective equipment (PPE) should immediately be removed. Further chemical exposure may propagate from this equipment.

Rule#11: Once contaminated PPE is removed, affected area should vigorously be washed with water for at least 15 minutes.

Rule#12: Before leaving the lab, lab coat, scrubs, gloves, and other PPE (gloves particularly) should be removed. PPE should not be worn outside laboratory area, particularly in the places where food and drink are served.

Rule#13: Wash your hand after removing the gloves and before leaving the laboratory. Do not touch other items such as phone, turning doorknobs or do not use elevator before washing your hands.

Rule#14: Laboratory coats must not be cleaned at home.

Rule#15: Smoking is prohibited in all laboratory areas.

1.2. General guidelines on the safe handling, transportation and storage of chemicals

Working with potentially harmful chemicals is an everyday occurrence in a laboratory. Lab team is requested to inform themselves about toxicity, and procedures for handling and storing chemicals used. For most commercially available substances, detailed instructions are available in the Material Safety Data Sheets (MSDS). These sheets must be archived in a specified folder; all lab team must know where it is kept. This MSDS log must be updated at regular intervals.

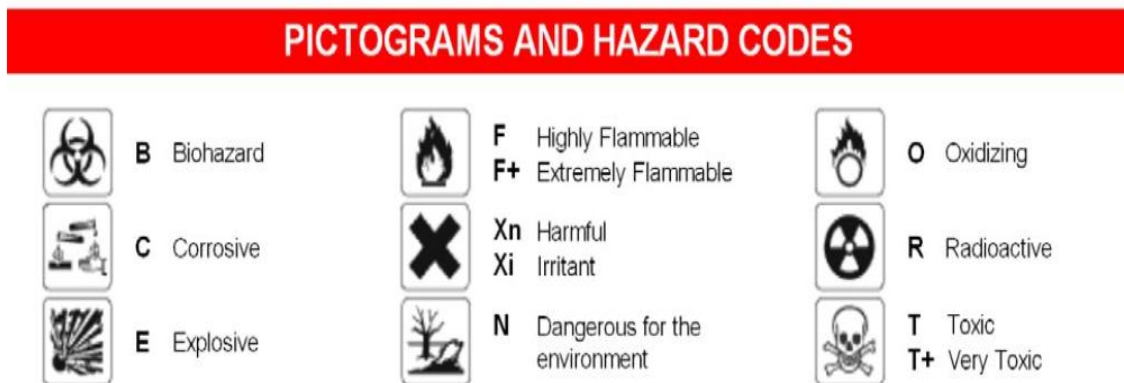


Figure 1: Pictograms and Hazard codes

Many laboratory accidents occur by carrying chemicals from one place to another or transferring them from one container to another. The chemicals used in a laboratory are often corrosive, toxic, or flammable and any accident involving these has the potential for personal injury. Therefore, it is good practice to assume that all chemicals are potentially hazardous. When large bottles of acids, solvents, or other liquids are transported within the laboratory without a cart, only one bottle should be carried at a time. The bottle should be carried with both hands, one on the neck of the bottle and the other underneath. Do not hook a finger through the glass ring on top of the bottle, allowing it to dangle while being transported. Never carry or attempt to pick up a bottle by the cap.

Proper storage of chemicals is necessary to maximize employee safety with regard to chemical compatibility, spill control, fire/explosion control, to provide security, identification, and provide a "user friendly" system with respect to point-of-use.

Some rules:

Rule#1: All containers used for storage (even short term) shall be labeled.

Rule#2: Quantities greater than one liter of highly flammable liquids (Methanol, Chloroform) should be stored in specified metal cabinets. Quantities smaller than or equal to one liter of chemicals may be held at individual workstations but only one of the same kinds. Chemicals should be stored as close as feasible to the point of use in order to maximize efficiency and minimize transport distance.

Rule#3: Out-of-date chemicals shall be disposed of on a periodic basis to reduce overall hazard potential and minimize inventory tracking and updating.

Rule#4: Reduce large inventory of chemicals in the laboratory.

NB: Any chemical is a possible threat to your personal health and team members. In case of accident causing the release of hazardous chemicals a calm and determined action is required to prevent an escalation of the emergency situation. Thus, for any individual incident, isolation of the spill and/or securing the area is best prior to or simultaneously with contacting concerned personnel. This should be done according to all available information on the chemical nature of the spill. Under all circumstances, a laboratory coat, safety glasses, and gloves should be used for self-protection.

1.3. Medical/health surveillance

Health surveillance programmes should be tailored to the biohazardous materials and organisms used, the laboratory programmes and the risks involved in handling them. The Biosafety and Biosecurity Officer, assisted by the IBP Unit Supervisor, should carry out the assessment of exposed persons.

○ **Criteria for the selection of persons at risk**

- Handling human blood or its components/derivates (plasma, serum, etc.);
- Handling of human tissues or organs;
- Handling of primary cell culture of human origin;
- Handling of hepatitis B virus;
- Handling of sharps that may contain human blood, blood components or blood derivatives;
- Handling animals infected with the hepatitis B virus;
- Persons who work with persons who may be carriers of such a disease in the course of their studies or research;
- Persons handling zoonotic infectious organisms (transmissible from animals to humans and vice versa);
- People who work with wild animals that may be infected with rabies as part of their studies or field research.

Following the assessment of the risk to the handler, a vaccination program will be established.

- **Immunization/Vaccination**

The IBP center frequently uses human specimens for research purposes. It is necessary to have an internal immunization policy in place to prevent communicable diseases. Possible immunizations include:

- **Hepatitis B**

Research staff, students handling blood, tissue or fluids of human origin may come into contact with viruses such as hepatitis A, B and C, HIV, etc. ISM managers should ensure that staff and students have access to hepatitis B vaccination.

Safe working procedures should therefore be in place before handling such substances. Hepatitis B vaccination involves 3 doses and serology testing to determine serum antibody levels.

- **Rabies**

Staff, students working with wild animals, birds, etc. in the context of field research activities may be exposed to certain risks such as rabies. An effective vaccine against rabies exists. The animals most frequently infected with rabies are wild land carnivores (raccoons, foxes and skunks), cattle, bats and wild dogs and cats. Pre-exposure vaccination consists of three doses given over a 1-month period. If a person is subsequently exposed to rabies, they will need two further doses. People who are always at risk of exposure, such as certain laboratory workers, veterinarians, wildlife and pet control officers should have their serum rabies antibody levels checked every 2 years.

1.4. General Guidelines on the Safe Handling transportation and storage of biological agents

There is a wide variety of micro-organisms, both pathogenic and non-pathogenic. One of the most important tools for microbiological risk assessment is the establishment of risk groups for different microbial agents. This classification takes into account several parameters, including the risk groups, of which there are 4:

- **Risk Group 1** (low or no risk to individuals or the community): Micro-organism that is not likely to cause disease in humans or animals.

- **Risk Group 2** (moderate risk to individuals, low risk to the community): A pathogen capable of causing human or animal disease, but unlikely to pose a serious risk to laboratory personnel, the community, livestock, or the environment. A laboratory exposure is likely to result in a serious infection, but which can be effectively treated or cured. A laboratory exposure is likely to result in a serious infection, but which can be effectively treated or prevented, and the risk of spreading the infection is limited.
- **Risk Group 3** (high risk to individuals, low risk to individuals, low risk to the community): A pathogen that generally causes severe disease in humans or animals but does not generally spread from person to person. Effective treatment and preventive measures are available.
- **Risk Group 4** (significant risk to individuals and the community): A pathogen that usually causes severe disease in humans or animals and can be easily transmitted from one individual to another, directly or indirectly. There is generally no effective treatment or preventive measures.

It is clear that the risk group of microorganisms handled at IBP/ISM is group 1 or 2. Nevertheless, as the laboratory grows, it is important to provide equipment that is adapted to the risk level of the microorganism.

The primary principle of biological safety is containment. This refers to a series of safety procedures which have to be conducted to reduce or eliminate human and environmental exposure to potentially harmful biological agents. The different containment level, corresponding the hazard risk groups are listed below:

- **Containment level 1:** applies to laboratories for the handling of risk group 1 agents. risk group 1 agents. No special procedures other than basic health and safety rules are required for this type of laboratory are required for this type of laboratory. The residual materials generated. The waste material generated must still be decontaminated before disposal.
- **Containment level 2:** applies to laboratories handling risk group 2 agents. risk group 2 agents. Although these agents are not usually transmitted by air, it is important to Although these agents are not usually transmitted by air, it is important to avoid aerosol or splash formation since mucous membranes are

the main route of infection. Thus, the use of biological safety cabinets centrifuges with sealed rotors or buckets and the use of gloves, lab coats and goggles provide adequate protection. The waste materials generated should be decontaminated before disposal.

While working in IBP one might handle specimens, cultures and agents without full knowledge of the biohazard risk; these materials may contain infectious agents. To minimize exposure, observe universal precautions when handling any biological specimen.

While working, it is required that any team member at IBP/ISM Lab to follow the regulations listed below:

A. Wash your hands thoroughly:

- Before and after working with any biohazard
- After removing gloves, laboratory coat, and other contaminated protective clothing
- Long hair must be securely tied back in the laboratories, it must be worn in such a way that it cannot be snagged, excess fabric parts must be tied back in the same way as hair
- Before leaving the laboratory area
- Do not touch your face when handling biological material
- Never eat, drink, smoke, or apply cosmetics in the work area

B. Clothing Guidelines:

- Always wear appropriate lab coats and gloves when working with biological agents.
- Wear gloves over gown cuffs.
- Remove gloves by peeling them from the inside out.
- Never wear contact lenses when dealing with infectious agents.
- Do not wear potentially contaminated lab coat outside the laboratory area.

- Additional appropriate protective clothing should be selected and worn based upon the task and degree of exposure anticipated.

C. Handling Procedures liquid infectious materials:

- Use mechanical pipetting device (examples; pipette aid, pipetteman or bulb).
- Use only closed tubes for centrifuging procedures. Inspect the tubes before use.
- Avoid using syringes and needles whenever possible. Special care has to be taken when usage of needles is not avoidable:
 - Use a needle-locking or disposable needle unit.
 - Take care not to stick yourself with a used needle.
 - Place used syringes into a pan of disinfectant without removing the needles.
 - Do not place used syringes in pans containing pipettes or other glassware that require sorting.
 - Do not recap used needles.
 - Dispose of needles in an approved sharps container.

D. Work Area:

- For the safety of all, it is important that the noise level in a laboratory remains moderate. Headphones are not allowed in laboratories as they carry a risk of ear infection.
- Keep laboratory doors shut when experiments are in progress.
- Limit access to laboratory areas when experiments involving biohazardous agents are being performed.
- Ensure that warning signs are posted on laboratory doors. These signs should include the universal biohazard symbol and the approved biosafety level for the laboratory.
- Transport contaminated materials in leak-proof containers.
- Keep miscellaneous material (i.e., books, journals, etc.) away from potentially contaminated working areas.

- It is essential that each member of the IBP platform is familiar with the location of fire extinguishers and their operation.
- A first aid kit should be available in each laboratory. Each user of the laboratory should know the location of the kit. It is managed by the laboratory managers, who must keep a regular inventory of the kit and ensure that its contents are renewed as necessary.
- Follow a rigorous disinfection plan:
 - Completely decontaminate equipment before having maintenance or repair work done.
 - Decontaminate work surfaces daily and after each spill.
 - Decontaminate all potentially contaminated equipment.
 - Decontamination should only be performed with these disinfection solutions such as 70% Ethanol or 2.6% Sodium hypochlorite (bleach) solutions

E. Emergency Procedure

If a person witnessing an incident can intervene, and only if they feel comfortable doing so, they should be able to minimize the consequences of the incident without exposing those around them to further risk, they are encouraged to do so. In all cases, and whatever the situation, it is important to look after your own safety first.

- Medical emergencies: Wound (sting, cut, scrape)
 - Follow the instructions given in the event of an accident
 - a. Stop work in progress
 - b. Make the wound bleed gently without touching it directly
 - c. Rinse and lather for 15 minutes
 - d. inform the head of the laboratory and the head of the Health and Biosafety Department
 - e. If necessary, go to the hospital emergency department
 - Provide first aid, if possible.
 - Provide the following information:
 - Your name.
 - Date and time of the incident

- The nature of the problem
 - Stop experiments in progress if this would cause additional risk.
- Fire, smoke or fire odors
 - Warn your laboratory colleagues and remove all persons from the danger zone.
 - Inform the PBI unit manager and the laboratory coordinator.
 - Provide the following information:
 - Your name.
 - Date and time of the incident
 - The nature of the problem
 - Follow the fire instructions.
 - If you can, try to extinguish the fire with a fire extinguisher.
 - If the fire cannot be contained, leave the area and call the fire brigade.
 - Close all doors in your path.
 - Leave the building by the nearest exit.
- Spillage of biological material (over 1mL)
 - Allow aerosols to settle for at least 2 minutes.
 - If you have been contaminated, change your lab coat and wash your hands.
 - Cover the liquid with absorbent paper.
 - Spray the disinfectant liberally, working in circles from the outside inwards.
 - Leave for 30 minutes.
 - Dispose of the paper in the regular waste.
 - Clean the surface with soapy water and rinse.
- Accident involving hazardous materials

You may have to respond to a small chemical spill if none of the following factors of the following factors endanger your health: quantity, toxicity and volatility of the chemical, and if containment and absorption equipment is available. If in doubt, evacuate the area and call for security as described below:

- Warn those present and, if necessary, evacuate the area immediately.

- Notify the IBP unit supervisor.
- Give the following information:
 - Your name.
 - Date and time of the incident
 - The location of the incident
 - The nature of the problem
 - Type of product: gas, liquid, solid
 - The name of the product and the quantity if possible
 - Your expertise in relation to the product
 - Potential hazards (injuries, poisoning, contamination)

Follow the instructions of the Safety Services Division representative.

- Theft / loss of equipment
 - Notify the laboratory manager, the unit supervisor and the Biosafety and Biosecurity Officer
 - Investigate jointly
 - Record the event in the register

N.B: In case of biological spills on the body, you must: (i) remove contaminated clothing; (ii) apply disinfection solution, vigorously wash exposed area with soap and water for one minute; (iii) obtain medical attention and (iv) report the incident to the Laboratory Manager.

If a chemical should come into contact with the eyes, face or any other part of the body, (i) the eyewash or safety shower should be used without delay. (ii) The affected parts should be rinsed for at least 15 minutes. (iii) It is essential that the area around eyewash stations and safety showers is kept clear at all times.

If a person has been splashed with a hazardous chemical, help them remove their contaminated gown and direct them to the nearest safety shower. It is important to rinse the skin for at least 15 minutes before seeking medical attention. If splashed in the eyes, also rinse for at least 15 minutes with eyewash, keeping the eyelids apart if possible. If possible, keep the eyelids apart