



Procedures To Follow In Case Of Emergency

Pusat Pengajian Sains Kesihatan

USM Kampus Kesihatan

Mei 2004

Note To Users of This Emergency Procedures

The Jawatankuasa Keselamatan dan Kesihatan Pekerjaan PPSK (JKKP-PPSK) has prepared this emergency procedure to ensure safety in laboratories. The health and safety policy of the university is to take every reasonable precaution to protect the health and safety of school, staff, students, and the public. Mandatory safety standards, as interpreted by the requirements and policies stated in safety manual and its supplements apply to school, staff, researchers, and students engaged in laboratory operations utilizing chemical, radioactive, biological materials, and in performing common laboratory procedures.

This procedure includes information concerning the use of personal protective equipment, and emergency procedures. This procedure covers emergency practices for labs in the chemical, biological and biomedical sciences. This procedure also covers hazard communication and incident response. This information is intended to help those in the laboratory to minimize hazards to themselves and their colleagues.

In view of the wide variety of chemical, radioactive and biological materials handled in laboratories, it should not be assumed that the precautions and requirements stated in this procedure are all-inclusive. School, researchers, and students are expected to learn about the hazards of chemical, radioactive and biological materials before handling them. It is expected that the JKKP-PPSK and Principal Investigators will append to this procedure any supplementary information pertinent to their specific areas.

Please contact the JKKP-PPSK for more information or for assistance.

Introduction

Responsibilities

Each individual conducting chemical reactions, using chemical, biological and radioactive materials, or performing laboratory procedures is required to have proper training in the safe handling and disposal of all materials he or she uses. Each is responsible for conducting activities in a manner that will not endanger him self or herself and each must comply with the applicable requirements of state and federal law as well as with University policies and procedures described in this manual.

Oversight responsibility for ensuring that laboratory activities involving hazardous chemicals conform to prescribed standards is assigned as follows:

School – Wide Safety Responsibilities

The Dean of the PPSK has ultimate responsibility for safety within the school.

Jawatankuasa Keselamatan dan Kesihatan Pekerjaan PPSK

- Provide training to laboratory personnel.
- Conduct periodic and unannounced laboratory inspections to assure compliance with federal, state and local regulations, as well as the policies and procedures contained in this manual and those contained in any supplementary information developed in the school in response to specific activities or areas of research.
- Undertake necessary enforcement actions to insure full compliance with all institutional safety policies, up to and including independent authority to shut down laboratories for violations of these policies. Approval of the Dean is required.
- Provide hazardous waste disposal services.
- Provide hazardous material spill response services. The Emergency Response Team is available on campus during normal business hours and responds to after-hours spill emergencies on a call back basis.
- Review laboratory construction, modification and renovation plans safety design.
- Conduct fume hood survey and testing.
- Perform exposure monitoring upon request to determine if the permissible exposure limit or action level has been exceeded. Notification shall be provided to laboratory supervisor.
- Provide guidance for maintaining compliance with federal, state, and local regulations, as well as the procedures stated in this manual.
- Conduct laboratory safety evaluations when requested by laboratory supervisors or department/unit head.
- Provide assistance in obtaining personal protective equipment.
- Maintain copies of medical consultations and examinations for possible exposures from hazardous chemicals.

Emergency Equipment

First-Aid kit :

- Antiseptic solution (Acriflavin for wounds and Savlon for washing)
- Antiseptic cream (Burnol)
- Ammonia salt (smelling salt); Eye Mo
- Gauze; Bandages; Cotton wool; Plaster
- Forceps and scissors
- Instruction manual; accident report form / book

Eye Wash kit :

- Eye wash bottle; Eye cup
- Sterile distilled water
- Instruction manual, accident report form / book

Biological Spill Clean-up Kit :

- Latex gloves, protective clothing and safety glasses
- Tape/ marking pencil; Forceps
- Biohazard spill notice (keep out signs); Biohazard bags
- Disinfectant 5% - 10 % Chlorox / Lysol
- Absorbent materials (cloth rags or paper towels)
- Accident report form / book; Spill clean-up procedure

Chemical Spill Clean-up Kit :

- Latex gloves, protective clothing, vapour respirator and safety glasses/safety shield
- Tape/ marking pencil; Forceps; Scop
- Biohazard spill notice (keep out signs); Biohazard bags
- Absorbent materials (vermiculite or others)
- Accident report form / book; Spill clean-up procedure

Radioactive Spill Clean-up Kit :

- Latex gloves, protective clothing, vapour respirator and safety glasses/safety shield
- Tape/ marking pencil; Forceps; Scop
- Radiohazard spill notice (keep out signs); Radiohazard bags
- Disinfectant 5% - 10 % Chlorox / Lysol
- Absorbent materials
- Accident report form / book; Spill clean-up procedure

Fire Extinguisher :

- **Ordinary combustion** (Foam; loaded stream; dry chemicals).
- **Flammable liquids and gases** (Carbon dioxide; dry chemical such as sodium bicarbonate; foam; loaded stream; Halon 1301/1211).

- **Energized(live) electrical equipment** (ABC-type dry chemical; Carbon dioxide; Halon 1301 / 1211).
- **Combustible and reactive metals** (Sand; dry powder media).

Fire Blanket

Emergency Shower

- Every personnel should know the location of emergency shower.
- The shower should be test for every month.
- Always in good condition.

Personal to Contact:

- Officer Incharge of the particular laboratory or Safety Officer
- Head of Department/Technical Advisor
- Security Office
- JKKPU Kampus Kesihatan
- JKKP-PPSK
- Jabatan Pembangunan

The telephone numbers and addresses of the above mentioned should be prominently displayed near all telephones.

In Case of Emergency

- Following an accident, panic is often the first reaction to trauma, especially when staffs have not received education in the correct procedure. Don't panic.
- Safety shower - Staff should know the nearest location and instructed in its use. It should provided within any laboratory where dangerous chemical substances are handled regularly.
- Eye washes equipment - In the form of an eye wash bottle or continuous flow facility. Know the location.
- Familiarize with the content of fire plan for working area.

Emergency Planning

An emergency occurs when safety controls fail and unforeseen circumstances occur. Damage and injury can be limited if emergency procedures are practiced regularly, updated, and if adequate emergency equipment as well as trained personnel are available for warning, rescue and damage control. Every laboratory must have a comprehensive, widely distributed and approved emergency plan. Laboratory working with infective biological agents should determine and institute the safety precautions appropriate to the hazard of the agents in use.

General Emergency Procedure for Respective Laboratories.

A written emergency plan for laboratory accidents is a necessity which should be posted in a conspicuous place in the each laboratories for immediate reference. The following components should be included in the procedure:

- Accidental injections, cuts and abrasions.
- Accidental ingestion of potentially hazardous material.
- Potentially hazardous aerosol release other than in a safety cabinet.
- Broken and spilled cultures.
- Breakage of tubes containing hazardous material in a centrifuge.
- Emergency evacuation procedure(fire, flood and natural disaster).

Procedures to Follow for a Chemical Splash to the Eye or Body

- Effected eye should be washed immediately in gently flowing cold water for a minimum of 15 minutes (Avoid warm water because it can cause of absorption of chemicals into eye).
- The eye must be kept open during flushing and the colleague should seek medical advice about any possible hazard associated with contaminating chemical. SPEED is very important! Avoid wearing contact lenses in laboratories because chemicals or bacterial and viral aerosols can dissolve in tears and become trapped beneath a contact lens causing variety of eye disorders.
- NEVER flush an eye with dilute acid or alkali to neutralize a chemical, they can cause more severe damage. SEEK MEDICAL ADVICE.
- Chemical splash to the body, flush the area with cold water for 15 minutes or if the large area, wash the victim with a safety shower or hose for a minimum of 15 minutes. ALL clothing should be removed while the victim is under the shower. SEEK MEDICAL ADVICE.

Procedure to Follow In Case of Fire or Explosion

- Every staff have to be familiarize themselves with the content of the fire plan for their working area and also the location of all fire safety equipment. Always follow the routes to the nearest, quickest and safest area on evacuation. ALWAYS FOLLOW THE INSTRUCTION AND PROCEDURE.

Emergency First- Aid

It is essential that the laboratory staff should have some knowledge of basic first aid because the minute immediately following an accident, first aid should be performed to minimize the injury or even save a life. All accidents, incidents involving injuries and 'near misses' should be reported to and recorded by the departmental safety officer.

The following procedures should observed in any serious accident:

- Check for danger
- Summon for a first aider to take charge of the casualty until medical aid arrives.

- If no response is obtained, call for the Accident/Emergency Unit (A/E):
- state your location in detail
- nature of emergency
- your name and other essential information.

The Most Common and Expected Laboratory Emergency Injuries.

These are as follows :

- Eye injuries from explosion, chemical burns or particles from shattered glass or equipment.
- Thermal and chemical burns.
- Cuts and wounds from glass or metal with chemical contamination.
- Poisoning through the skin or by ingestion or inhalation.
- Chemical or electric asphyxiation.

General rules for administering First -Aid:

DO

- Act quickly
- Immediately alleviate respiratory arrest and severe bleeding, then focus on other injuries, wounds, fractures, burns.
- Send for medical assistance.
- Calm and reassure the victim.
- If possible, find out from the victim and witnesses what actually occurred.
- Keep the victim breathing and stop the bleeding with direct pressure.
- Use artificial resuscitation to keep the victim breathing.
- Know where emergency supplies are kept and where eye washes, fire blankets and emergency showers are located.
- Move the victim away from a life-threatening situation.

DO NOT

- Panic
- Move the victim, unless it is necessary for his safety or your own.
- Leave the victim unattended.
- Give the victim food, liquids or medications until you determine the nature of the injury or illness.
- Administer oxygen unless you are trained in the use of the equipment.
- Attempt to straighten joints or bones.
- Remove an object from the victim's eye with your finger.
- Remove embedded objects from open wounds
- Break blisters on burns.
- Tie a bandage or tourniquet around the victim's neck.

First-Aid measures

Respiratory Emergencies

Respiratory Emergencies are emergencies in which normal breathing is reduced or stopped and oxygen intake is insufficient to support life. Laboratory causes of respiratory emergencies can be physical accident, circulatory failure due to shock, electric shock and poisoning.

Signs of breathing impaired by a foreign object in the throat are as follows:

- Gasp for air
- Violent fits of coughing
- Turning blue
- Inability to talk or breathe

First - Aid Treatment :

- Open the victim's mouth and grasp to remove the object.
- Place the head lower than the body or roll the victim onto his side and slap him on the back.
- Stand behind the victim and place your arms above the victim's navel and below his rib.
- Lean the victim forward in a hanging position. Grasp your own wrist and exert sudden strong pressure against the victim's abdomen to expel the obstruction.

Signs when breathing is impaired from other causes :

- No detectable rise and fall of chest or abdomen.
- No detectable expulsion of air from the nose or mouth.

First - Aid Treatment :

- Mouth- mouth (mouth-to-nose) resuscitation.
- Work quickly and continue until the victim breathes normally .
- Place the victim on his back, chin up.
- Use your fingers to remove any possible obstruction, making sure that the victim's tongue is not blocking the airway.
- Pinch the nose to form an airtight seal and breathe into the mouth until the chest expands. Breathe three times. Repeat the process.
- If no air exchange begins, turn the victim onto his side and slap him between his shoulder blades.
- Check the mouth for any obstruction and repeat the whole breathing procedure.
- Do not forget to remove your mouth after each breath to allow the air to escape.

Circulatory Failure

Circulatory failure is a result of the lack of pumping action by the heart. It can occur as a consequence of other emergency conditions such as electric shock, respiratory obstruction or heart attack.

Signs

- No breathing
- No pulse

First - Aid Treatment.

- Work quickly - cardiac arrest may mean death to the victim.
- Check for responsiveness, airways and breathing.
- If the victim is not breathing, give mouth-to-mouth resuscitation.
- Check a major artery to find a pulse, if none begin the Cardiac-compression procedure.

Cardiac - compression procedure.

- Kneel at the victim's side.
- The pressure point for cardiac compression is two fingers' distance above the tip of the sternum.
- Place the heel of the hand at this point and the other hand over the first one.
- Positioning your shoulders over the victim's sternum, rock your weight downward depressing the sternum 1.5 inches to 2 inches, making the depressing and releasing of equal length of time.
- Compressions should be continued at rate of approximately 60 compressions per minute, with an artificial resuscitation breath every 15th compression.

Bleeding

Bleeding results from a wound or break in the body tissue and may be internal or external. In the laboratory, bleeding usually results from mishandling of sharp objects, falling, or being struck by glass fragments.

Signs of external bleeding :

- Blood will be spurting, flowing or oozing from an artery, vein or capillar

First - Aid Treatment:

- Cover the wound with the cleanest cloth available and apply direct pressure to the wound.
- If there is no fracture, elevate the limb as pressure is applied.
- Digital pressure may also be applied if the wound is an arterial wound and the bleeding is severe.
- Pressure should be applied where the main artery supplies the wound as close as possible to the wound and between the wound and the heart.
- Hold the pressure point tightly for approximately 5 minutes.
- If there is a skull injury and direct pressure cannot be applied, use the pressure points.
- A tourniquet should be used as a last resort and should be applied near the wound, between the wound and the point at which the limb is attached to the body.

- Do not tie it too tightly ; tie it just tightly enough to stop the bleeding.
- Never apply a tourniquet directly over a wound.
- Open wounds should be protected from infection by covering them with a clean fabric.

Sign of internal bleeding

- Cold, clammy skin, weak
- Rapid pulse, eyes dull and pupils enlarged
- Thirst, nausea, vomiting and pain.

First - Aid Treatment :

- Treat for shock.
- Give nothing by mouth.
- Get medical help quickly.

Shock

Shock is a condition resulting from depression of vital body functions, it may be life threatening and may result from a loss of blood, reduced blood flow or insufficient oxygen supply. Traumatic shock results from an injury; anaphylactic shock results from an allergic reaction to a foreign substance.

Electric Shock

- Results from the passage of an electric current through any part of the body.

Signs depends on the amount of current received :

- Unconsciousness.
- Visible burns where contact occurred.
- Shallow breathing, as in shock.
- Irregular heart rate, fibrillation.
- Central nervous system damage.

First - Aid Treatment :

- Shut off the current or cautiously, using an insulator (e.g. hand inside a glass beaker), separate the victim from the current.
- Begin artificial respiration.
- Keep the victim warm.

Poisoning

Poisoning is due to any substance that impairs health or causes death when introduced into the body or onto the skin surface. In the laboratory, poisoning is due to ingestion, inhalation or absorption through the skin,

Signs

- Telltale odour on breath, burns around the mouth
- Wide variety of signs depending on the poison and the mode of ingestion or intoxication (e.g. dilated pupils, nausea, impaired breathing).

First - Aid Treatment

Poisoning through ingestion of toxic substance

- Dilute or neutralize the poison.
- If the poison is ingested and is noncorrosive, dilute it with milk or water by mouth.
- Induce vomiting unless the poison is a petroleum product.
- If feasible, administer the correct antidote.
- For corrosive poisons, do not induce vomiting; give milk or water.
- If necessary, treat for shock.

Poisoning through inhalation of toxic substance

- Remove the victim from the area.
- Loosen clothing.
- Clear the airways.
- Initiate artificial respiration.
- Keep the victim warm.

Poisoning through skin contact with a toxic substance.

- Remove the victim's clothing and drench the victim.
- Wash contaminated skin with soap and water for a minimum of 5 minutes if tissues have not been badly destroyed.
- Administer artificial respiration if required.

Bone and Joint Injuries

Broken bones or fractures are either simple (no open wound) or compound (associated with an open wound and protruding bone). Injuries to the skeletal system and joints, ligaments and soft tissues are common in major accidents.

Signs

- Broken bones, with no open wound.
- Open fracture, deformity, swelling, discoloration.
- Separation of two bones - deformity, pain, loss of function.

First - Aid Treatment :

- Leave the injury alone - do not attempt to straighten the limb.
- Try to immobilize the victim in a comfortable position.
- Obtain assistance.
- Stop the bleeding.

Burns

A burn is an injury resulting from contact with heat, chemicals or radiation. The goals are to reduce pain, prevent contamination and treat for shock.

Signs

- Red skin - first degree.

- Red skin, blisters - second degree.
- Skin destroyed, tissues charred and damaged - third degree.

First - Aid Treatment:

First degree burns

- immerse the burn in cold water and apply ice.

Second degree burns

- cut away the clothing, cover the burn with cold, moist dressings and treat for shock. Do not disturb blisters

Third degree burns

- Cut away loose clothing that is not attached to the wound.
- Cover the wound with sterile, cold, moist dressings, taking care to keep burned areas from contact with each other.
- Do not apply ointments, ice or salves on open blisters.
- For chemical burns, remove clothing and flood the area for at least 15 to 20 minutes.

Eye Injuries

Eye injuries are a common laboratory emergency. All personnel should know where eye washes are located. Contact lenses should not be allowed when there is a chemical-splash hazard. Protective eye glasses should be used in the laboratory.

Signs of Injury due to a foreign object or chemical in the eye:

- Redness.
- Burning.
- Tearing.
- Blinking.

First - Aid Treatment

- Do not rub the eye.
- Remove contact lenses at once because they may retain the chemical or object and prevent adequate flushing.
- Have the victim flush eyes well for at least 15 minutes with assistance, holding eyelids open and apart.
- If possible, remove the foreign object with sterile gauze. If you are unable to do so, cover the eye (but not with cotton) and obtain medical assistance.

Signs due to Impaled object in the eye:

- Object may be visible protruding from eye.
- Blinking , tearing.
- Bleeding and pain.

First - Aid Treatment

- Do not attempt to remove the object.
- Cover the injury eye lightly with a gauze bandage.
- Place covering over both eyes (because both eyes move synchronously to stop movement).
- Calm the victim and obtain medical assistance.

General Emergency Procedures for Working With Chemical Hazard

First Aid

- **Inhalation** - remove person from source of contamination if safe to do so. Get medical attention. Keep person warm and quiet and do not leave unattended.
- **Ingestion** - remove person from source of contamination. Get medical attention and inform emergency responders of the name of the chemical swallowed.
- **Skin Contact** - remove person from source of contamination and take immediately to an emergency shower or source of water. Remove clothing, shoes, socks, and jewelry from affected areas as quickly as possible, cutting them off if necessary. Be careful not to get any chemical on your skin or to inhale the vapors. Flush the affected area with water for a minimum of 15 minutes. Get medical attention.
- **Eye Contact** - remove person from source of contamination and take immediately to an eyewash or source of water. Rinse the eyes for a minimum of 15 minutes. Have the person look up and down and from side to side. Get medical attention. Do not let the person rub their eyes or keep them tightly shut.

Personal Protective Equipment.

Always wear the proper gloves when working with acids. Neoprene and nitrile gloves are effective against most acids and bases. Polyvinyl chloride (PVC) is also effective for most acids. A rubber coated apron and goggles should also be worn. If splashing is likely to occur, wear a face shield over the goggles. Always use corrosives in a chemical fume hood.

First Aid.

If someone is seriously injured the most important step to take is to contact emergency responders as quickly as possible. This is best accomplished by directly calling them at (#). Explain the situation and describe the location clearly and accurately. If someone is severely bleeding, apply a sterile dressing, clean cloth, or handkerchief to the wound. Then put protective gloves on and place the palm of your hand directly over the wound and apply pressure and keep the person calm. Continue to apply pressure until help arrives. If a person's clothes are on fire, he or she should drop immediately to the floor and roll.

If a fire blanket is available, put it over the individual. An emergency shower, if one is immediately available, can also be used to douse flames. If a person goes into shock, have the individual lie down on their back if safe to do so and raise the feet about one foot above the floor.

Personal Protective Equipment

Wear appropriate personal protective clothing while working with highly reactive materials. This might include: impact resistant safety glasses or goggles, a face shield,

gloves, a lab coat (to minimize injuries from flying glass or an explosive flash), and a shield. Conduct work within a chemical fume hood as much as possible and pull down the sash as far as is practical. While the experiment does not require you to reach into the fume hood, keep the sash closed. Barriers can offer protection of personnel against explosions and should be used. Many safety catalogs offer commercial shields which are commonly polycarbonate and are weighted at the bottom for stability. It may be necessary to secure the shields firmly to the work surface.

General Emergency Procedures for Working With Biological Hazard

In this section, some specific instructions will be given for the clean up of a biological spill. Some biological materials when spilled or released can lead to significant infection exposures of personnel. This is particularly hazardous when the agent spilled or released is classified as a BSL2 agent or higher. The following emergency procedures that must be followed are determined by the Biosafety Level of the agent involved.

Spills or Releases Involving BSL1 Agents:

- Wear a lab coat and disposable gloves.
- Soak a paper towel(s) in an appropriate disinfectant such as a fresh 1:10 bleach solution and place over the spill area.
- Place the paper towels and gloves into a biohazard bag.

Spills or Releases Involving BSL2 Agents:

- If an accident occurs that may generate aerosols or droplets of an infectious agent, leave the area, close the door, decontaminate clothing and shower. Allow at least 30 minutes for the droplets to settle and for the aerosol concentration to decrease.
- Wear appropriate personal protective clothing such as gloves, lab coat, and approved respiratory equipment, if needed.
- Cover the spill area with paper towels, pour a 1:10 bleach solution around the edges of the spill and then into the spill. Allow 10 minutes contact time.
- Working from the outer edges into the center, use paper towels to clean the area. Clean the spill area with fresh towels soaked in a disinfectant. Be sure to decontaminate any areas or surfaces that you suspect may have been effected by the spill. Place all clean up materials and gloves into a bag for decontamination, preferably by autoclaving. Wash thoroughly.
- A small spill of material that did not result in a significant generation of aerosols, or contamination of a person, can be cleaned up following steps two through four above.

Spills or Releases Involving BSL3 Agents:

- If the spill occurs in a biological safety cabinet, keep the cabinet running, and clean the spill following steps two through four from Spills or Releases Involving BSL2 Agents, except that personal protective clothing appropriate for a BSL3 lab should be worn. If the spill in the cabinet is quite substantial, it may be necessary to decontaminate the cabinet's fan, filters, and airflow plenums. This should be done by a qualified outside company. Call the OSHC, PPSK, for assistance.
- If a minor spill occurs outside of a biological safety cabinet, follow steps two through four from Spills or Releases Involving BSL2 Agents, except that personal protective clothing appropriate for a BSL3 lab should be worn.
- If anything other than a minor spill occurs outside of a biological safety cabinet, leave the area immediately and notify appropriate personnel including the EHSC, PPSP. A specially designed decontamination procedure may be necessary.

Note: Whenever bleach is used to clean up spills of an infectious agent, a fresh solution should be prepared. After about one week, a bleach and water solution will lose its effectiveness for decontamination.

General Emergency Procedures for Working With Radioactive Hazard

All users of radioactive materials should be thoroughly familiar with these procedures before any emergency arises.

When an accident involving radiation occurs, address the greatest hazard first; lifesaving measures always take precedence over decontamination or other concerns. Advise personnel working nearby of any hazard or accident as soon as possible, and prevent them from entering the hazardous area. Always notify the RSO (Assoc. Prof. Ahmad Zakaria)

Specific Emergency Procedures for Spills

- Inform the occupants of the laboratory about any spill.
- Put on protective clothing such as shoe covers, gloves before starting containment and clean up of the spills.
- Cover the spill with absorbent material as quickly and completely as possible to prevent spreading. To localize the contamination, wipe inward toward the center of the spill. Do not wipe back and forth or in a random fashion.
- Have someone who is not contaminated call the OSH immediately.
- If a biological agent is involved, soak the area with a disinfectant for 30 minutes to inactivate the agent, and wash your hands and arms thoroughly with soap or an appropriate disinfectant. Scrub your hands for several minutes and rinse them thoroughly.
- If you leave the contaminated area, remove your gloves, shoes, and laboratory coat; segregate them as radioactive waste before leaving the laboratory.
- After removing protective clothing wash and rinse your hands thoroughly without breaking the skin.
- Monitor all personnel before allowing them to leave the area.
- Do not restart work in the laboratory without the approval of the RSO.
- Monitor all personnel involved in incident before allowing them to leave the area. Follow up monitoring will also be required.

End--