## 1. Background

The work at the Technion laboratories includes hazardous materials and procedures, which arepotentially dangerous. Human errors, equipment malfunction or system failure in a lab can develop to emergencies, such as: fire, chemical spills, injuries etc. In order to respond quickly and efficiently all individuals involved need to be prepared to handle emergencies. To minimize emergencies and injuries all lab personnel need to be knowledgeable regarding hazardous materials and protective equipment. It is of the essence that protection equipment will be functional and in located in its proper place.

## 2. Objective

This Emergency Action Plan outlines the responsibilities, personnel and authority in case of emergencies.

The purpose of this procedure is the depiction of the necessary actions, which should be implemented in cases of emergencies in chemical and/or biological laboratoriesin order to prevent injuries, property loss or environmental damage.

## 3. Definitions

3.1. Safety – Constant hazards' control in order to reduce risks in workplace, and/or during a specific process, all in an attempt to prevent accidents and occupational diseases.

3.2. Technion – The Technion consists of Israel Institute of Technology and of the Technion Research and Development Foundation, Ltd. (TRDF).

3.3. Unit – Faculty, department, institute, division, research center, Technion warehouse.

3.4. Technion Safety Unit (TSU) – Professional unit of occupational health and safety at the Technion.

3.5. Laboratory manager – A member of the Technion academic or administrative staff who has been appointed by the official Technion authorities as the manager or the *de-facto* of the laboratory .

3.6. Employees – Technion employees, including short-term workers, temporary workers, permanent workers, contract workers, Technion Research and Development Foundation (TRDF) employees and all those who function as part of the regular, internal framework of the Technion on behalf of the Technion and on its behalf (researchers, course participants, students), even in absence of a formal employment relationship.

3.7. Accident – A singular event causing damage to health, property and/or environment.

3.8. Risk – A probability or threat of damage, injury, liability, loss or any other negative occurrence caused by external or internal vulnaribilites and which may be avoided through preemptive action.

3.9. Risk Factor – A variable in a Factor or a situation bearing the potential to cause injuries and/or damage to health, property and/or environment or any combination of those.

3.10. Safety Equipment – Personal Protective Equipment (PPE), fire-fighting equipment, fire detectors, alarm systems, automatic fire-extinguishing systems, warning systems, and life-saving equipment and any additional equipment needed to work or to perform a task in a safety manner.

3.11. Emergency – A situation that poses an immediate risk to health, life, property and environment. Most emergencies require urgent intervention, examples: leaks, chemical and/or biological spills, exposure or burning of a hazardous material, or fire.

3.12. Medical Emergency – Acute injury or illness caused occupationally to Technion personnel posing an immediate risk to a person's life or long-term health, mostly necessitating medical care.

3.13. Hazardous Elements – Chemical, physical, mechanical, biological, ergonomic or electrical elements, which can cause - directly or indirectly - severe or continuous health damage to the laboratory employees and may cause property loss and/or damage to the environment.

3.14. Biohazards – A biological agent, such as infectious microorganisms or substances, which are a hazard to humans or the environment Biohazards include germs, fungi, viruses, parasites, toxins, blood and other human substances, cancer -cell cultures, recombinant substances from infectious sources, wild animals and infected laboratory animals.

3.15. Categories of Biosafety Levels – A set of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility. The U.S. National Center for Disease Control (CDC) and the National Institute of Health (NIH) categorized biohazards into four groups. The levels of containment range from the lowest biosafety level 1 (BSL-1) to the highest level 4 (BSL-4).

3.16. Laboratory categorized as BSL1 – Exposure to a biohazard agent not known to consistently cause disease in healthy adult individuals, posing minimal potential hazard to laboratory personnel and the environment.

3.17. Laboratory categorized as BSL2 – Exposure to a biohazard agent can cause disease. The biological agents have potential hazard to personnel and environment.

3.18. Aerosol – fine solid particles or liquid droplets in air.

## 4. Authorities and Responsibilities

4.1. The Technion Management

The Technion Management is responsible to comply with all safety regulations and law requirements regarding laboratories, and follow the TSU's instructions as well as provide resources for the safe occupational conduct of laboratories in the Technion to work safely, including the appropriate facilities as required by laws.

4.2. Deans of Faculties and Heads of Units

Responsible to comply with all safety requirements in the faculty/unit for which they are in charge of; also they are responsible for assuring that the work is performed in accordance with the law and the requirements of the Technion, taking steps to assure the implementation of these regulations by the researchers/staff and all personnel entering Technion laboratories.

4.3. Researchers and Laboratory Managers

Responsible to comply with all safety regulations and law requirements in the laboratories for which they are in charge of, as well as being responsible for assuring that the work, is performed in accordance with the law and with the Technion's requirements, and to take action to ensure the implementation of these regulations by the employees and by all who enter the laboratory for which they are responsible.

In addition, they are required to participate, and to ensure that the employees participate, in safety training as will be publicized from time to time.

4.4. Human Resources Unit (HR)
The Human Resources Unit (HR) is responsible for assuring that every new employee acquires a safety and signs the *Training for a new employee* leaflet as a part of the Technion orientation process. In addition, the HR Unit is responsible for referring laboratory employees to medical examinations and vaccinations, according to the TSU's instructions.

4.5. Employees
It is the responsibility of the Technion employee to comply with all safety regulations, law requirements and TSU's instructions, to participate in safety trainings and to report safety hazards and dangers.

4.6. Technion Safety Unit (TSU)
The Technion Safety Unit (TSU) is in charge of publicizing the information and the legal regulations regarding the following: operation of biological laboratories, executing risk assessments and instruction of corrective measures as needed.
The head of the Technion Safety Unit (TSU) has the authority to determine shutting down of a laboratory, in case work continuation can risk employees' health and safety, in coordination. The latter decision will be ccordinated with the Technion's Director General and the Assistant Director for Operations.
TSU is also responsible for advising the Technion management in all safety aspects, law and regulations.

## 5. Method

5.1. General
The routine work at the Technion laboratories includes potential hazards, which can develop into an emergency, such as:
a chemical or a biological spill, fire, gas leak or the need for medical care resulting from one of the latter events.
The main goal in any emergency is the prevention of injuries and human loss, equipment and facilities loss will always come second.

5.1.1. The sequence of reactions during an emergency is based on the following stages:

5.1.1.1. **Notification** - Notify all personnel around you about the emergency.

5.1.1.2. **Evacuation** - Evacuate all personnel from emergency area .

5.1.1.3. **Act** - Prevent spread of the emergency. Try to eliminate emergency safely and without any personal danger.

5.1.1.4. **Report** - (as detailed in section 5.2 herein) – It is essential to report accidents and unusual incidents in order to investigate draw future preventive conclusions.

5.1.2. Rapid and accurate reaction will prevent injuries and property loss. It is therefore essential that all laboratory personnel will be familiar with emergency procedures and the location of first-aid and firefighting equipment.

5.2. Reporting Emergencies at the Laboratory

5.2.1. All emergencies must be immediately reported at the emergency telephone line:

**5.2.2. Technion area Emergency phone number: 6000/2222.**

**5.2.3. Medical Sciences Faculty Emergency phone number: 5222.**

5.2.4. All emergencies must be reported to the laboratory manager, to the faculty administrator and to the Technion Safety Unit (2146/2147).

5.3. Chemical Spills

5.3.1. All chemical spills must be reported, regardless of spill magnitude. The report must contain the following details:

5.3.1.1. Date of event.

5.3.1.2. Time of event.

5.3.1.3. Place of event (laboratory, room or other).

5.3.1.4. Name of substances involved and the volume of the spill.

5.3.1.5. Names of personnel involved: workers, students and/or guests.

5.3.2. Chemical Spill – Emergency

A chemical spill will be considered as an emergency in the following cases:

5.3.2.1. Exposure to the chemical will necessitate medical care or can cause injury .

5.3.2.2. May cause a fire or an explosion.

5.3.2.3. Respiratory equipment, such as gas masks or SCUBA, will be required in order to handle hazard.

5.3.2.4. A hazardous material that pollutes public area.

5.3.2.5. May cause pollution of air passage ways so that local or general evacuation is required.

5.3.2.6. Laboratory personnel cannot handle the spill.

5.3.2.7. Causes damage to Technion equipment.

5.3.2.8. Any quantity of mercury in its metallic state.

5.3.2.9. Any spill, which cannot be cleaned and collected because of a lack of trained personnel, respiratory equipment or other equipment required to safely handle spill.

5.3.2.10. Requires long treatment or overnight handling.

5.3.2.11. Involves an unknown chemical or biological hazard.

5.3.2.12. Mayseep humans or into drinking water.

5.3.3. Handling emergency chemical spill

All chemicals spills must be handled according to the following (the directives can change considering the chemical's MSDS and specific circumstances).

Never **neutralize acids or bases!!** The hazardous material must be gathered or absorbed into a suitable container and in turn be evacuated to a designated waste warehouse.

5.3.3.1. Inform the laboratory manager. If necessary, call one of the emergency numbers listed in section 5.2.1.
Give details regarding the nature of the spill, its exact location and the people who were exposed or who are at risk.

5.3.3.2. If the spill poses an immediate danger to life and health, leave area immediately , notify personnel in the immediate surroundings strive for evacuation.

5.3.3.3. Remove contaminated clothing, wash skin and eyes for at least 15 minutes at nearest emergency shower or at nearest emergency eye-wash.
5.3.3.4. Put on protective equipment, including gloves and respiratory protection equipment, and only thereafter proceed to rescue a person from a contaminated area. In turn, evacuate all personnel to a fresh air area. Remember: do not endanger additional lives in order to rescue a life.
5.3.3.5. If explosive fumes are involved, do not turn on electric switches, lights or any other electrical equipment, which is not explosive-proof. All sources of heat must be shut down, if possible.
5.3.3.6. If the identity of the hazardous spill is unknown, put on full personal protective equipment, including respiratory protective measures (SCUBA).
5.3.3.7. Do not handle the hazardous material without personal protective equipment (PPE).
5.3.3.8. If the spill does not pose an immediate health risk , try to deal with the rate or the volume of the spill by closing tap or bottle, picking up the bottle or container in order to prevent continuing flow, close doors, remove equipment, limit spreading of the spill with the use of absorption gear.
5.3.3.9. Do not assume absence of toxic fumes due to lack of smell.
5.3.3.10. Increase ventilation: open hoods, open doors for ventilation of the non-toxic fumes.
5.3.3.11. Use absorption materials, sand included, to collect spills of hazardous materials and prevent their spread by blockage through absorption (as a kind of secondary containment).

5.3.4. Handling of a small-scale chemical spill

5.3.4.1. In case of personnel exposure to a small-scale chemical spill – follow instructions listed on section 5.3.3. Apply medical care to exposed individuals or apply use of respiratory equipment .
5.3.4.2. Any spill that does not comply with the criteria outlined in sections 5.3.2.1 to 5.3.2.12 will be considered as a small-scale chemical spill which does not constitute an emergency.
5.3.4.3. In case of a small-scale chemical spill please follow the detailed instructions:
5.3.4.3.1. Notify surrounding personnel regarding spillage.
5.3.4.3.2. All non-essential personnel should leave the area of the spill or the laboratory.
5.3.4.3.3. If the hazardous material is flammable, all sources of heat should be closed.
5.3.4.3.4. Wear personal protective equipment (PPE) such as: goggles, gloves and a long-sleeved lab coat.
5.3.4.3.5. Absorb spill using sand or other absorptive material. A small-small spill can be cleaned up with absorptive paper sheets, which can be disposed of.
5.3.4.3.6. Bottles or packaging of any kind, which have been sprayed with the hazardous material must be carefully cleaned.
5.3.4.3.7. If necessary, vacuum the spill with a HEPA vacuum cleaner.

5.3.4.3.8. If the hazardous material is especially volatile (acetone, alcohol, etc.) assist evaporation in hoods (discontinue the laboratory ventilation ).

5.3.4.4. Handling of a Solid Hazard

5.3.4.4.1. Generally, any low toxicity solid hazard, which has spilled, can be collected by sweeping it into a chemical waste bin, thereafter to be disposed of to a chemical waste warehouse. Wear appropriate respiratory protection equipment (breathing mask).

5.3.4.4.2. A highly toxic hazard can be vacuumed using a vacuum cleaner equipped with a HEPA filter.

5.3.4.4.3. In order to dispose of gloves, packaging remains, bags etc. follow disposal of a chemical and/or biological spill instructions.

5.4. Radioactive Spills

Occupational handling of radioactive materials could pose a danger of spills, fire or explosions. A spill, in turn, can spread and pollute areas and/or equipment, hence exposing personnel to ionizing radiation. Every incident involving radioactive materials must be reported (as depicted in section 5.2.1). The treatment will be according to the instructions of the Radiation Risk Supervision Unit.

5.5. Biological Agents Emergencies

Biological spills occurring outside the biological hood can spray aerosols throughout the laboratory. Spraying of aerosols could pose a serious danger, should the aerosol contain germs or other contagious agents. In case of an aerosol danger outside the biological hood – refrain from entering lab to neutralize or clean spillage source for at least 30 minutes following incident.

To prevent health dangers to lab personnel, apply following instructions:

5.5.1. Body Spillage:

5.5.1.1. Remove contaminated clothes.

5.5.1.2. To minimize skin exposure to biological agents immediately decontaminate with soap and water for at least one minute.

5.5.1.3. Seek medical help, if needed.

5.5.1.4. Notify lab manager and Technion personnel according to section 5.2.1.

5.5.2. Spray/Aerosol in Eyes:

5.5.2.1. Rinse out with eye wash for at least 15 minutes.

5.5.2.2. Keep eyes open during entire rinsing process.

5.5.2.3. Seek medical help, if needed.

5.5.2.4. Notify lab manager and Technion personnel according to section 5.2.1.

5.5.3. Spray in Orifices (Nose, Mouth), on Body or Hands:

5.5.3.1. Rinse thoroughly with disinfectant or soap.

5.5.3.2. Notify lab manager and Technion personnel according to section 5.2.1.

5.5.4. Stabbing from an Infected-Needle:

5.5.4.1. Rinse thoroughly with soap and water coupled to applying force of stab wound to promotebleeding.

5.5.4.2. Disinfect wound using iodine after rinsing.

5.5.4.3. Seek medical help, if needed.
5.5.4.4. Notify lab manager and Technion personnel according to section 5.2.1.

5.5.5. Vital Equipment for Biological Spill Handling:
5.5.5.1. Nitrile / Latex disposable gloves.
5.5.5.2. Hypochlorite Solution 0.5% (household chlorine diluted 1:10).
5.5.5.3. Spray bottle for preparation of a fresh 1:10 chlorine solution .
5.5.5.4. Tweezers, dustpan, squeegee stick and a brush – for picking up glass fragments, preferably such that can be autoclaved.
5.5.5.5. A package of absorptive paper sheets.
5.5.5.6. Biohazard disposable bags and needle-designated containers s.
5.5.5.7. Thick rubber gloves, shoe coverings, goggles and disposable lab coats.
5.5.5.8. Face mask suitable for protecting against aerosol particles (3M 8835, for example).

5.5.6. Handling BSL1 Biological Spills
5.5.6.1. Immediately inform all personnel on site.
5.5.6.2. Wear gloves, a lab coat, shoe coverings, goggles and a mask.
5.5.6.3. Blot spill with absorptive paper sheets.
5.5.6.4. Spill chlorine solution around and on top of absorptive paper sheets . Incubate thus at least 20 minutes.
5.5.6.5. Pick up broken glass fragments with tweezers, brush, and dustpan and place in a special needle-designated container.
5.5.6.6. Collect contaminated solid waste used for cleaning into biohazard waste bags.
5.5.6.7. Wipe spillage area using a disinfectant substance (chlorine solution, 1:10).
5.5.6.8. Remove contaminated gloves and lab coat into waste bin.
5.5.6.9. Wash hands with soap and water.
5.5.6.10. Notify laboratory manager and Technion personnel according to section 5.2.1.

5.5.7. Handling BSL2 Biological Spills:
5.5.7.1. As close as possible to spillage occurence - hold your breath and leave area.
5.5.7.2. Immediately inform all personnel on site; evacuate personel .
5.5.7.3. Close door upon exiting.
5.5.7.4. Post a warning sign on door.
5.5.7.5. Remove contaminated clothing, turn inside-out and throw into a biohazard disposal bag.
5.5.7.6. In case of exposure - wash skin thoroughly using water and antiseptic soap.
5.5.7.7. Allow aerosols to settle for at least 30 minutes prior to manning lab again.
5.5.7.8. Collect designated clean-up equipment : disinfectant substance, paper towels, biohazard waste bags and tweezers.
5.5.7.9. Wear personal protective equipment (PPE): lab coat, respiration mask type 3M 8835, gloves.
5.5.7.10. Wipe off and spray area and/or equipment with disinfectant.

5.5.7.11. Throw contaminated paper towels and clothes into disposal bags; autoclave.
5.5.7.12. Wash hands using antiseptic soap and water.
5.5.7.13. Notify lab manager and Technion personnel according to section 5.2.1.

5.5.8. Handling Biological Spill in Centrifuge:
5.5.8.1. Leave centrifuge closed for 30 minutes (allow aerosols to settle).
5.5.8.2. Unplug centrifuge power supply before commencing clean-up.
5.5.8.3. Remove head of centrifuge + adaptors; autoclave s in a biohazard waste bag. If possible, follow manufacturer's instructions.
5.5.8.4. If autoclave cannot be performed, spray interior of centrifuge with a disinfectant (section 5.5.6 and 5.5.7).

5.5.9. Handling Biological Spill Inside a Biological Hood
5.5.9.1. Wear personal protective equipment (PPE).
5.5.9.2. Do not turn off the biological hood during clean up.
5.5.9.3. Do not place your head or body inside the biological hood during clean up.
5.5.9.4. Blot spillage using paper towels; gently pour the disinfectant (chlorine 1:10 solution) on paper. Incubate at least 20 minutes.
5.5.9.5. Wipe/spray interior walls of the hood, the work bench and equipment using a disinfectant; incubate 20 minutes.
5.5.9.6. Pour disinfectant into the drain-holes of the biological hood; incubate 20 minutes.
5.5.9.7. Empty all liquids from drains into biological waste-collecting containers; rinse using plenty of water (preferably sterile water).
5.5.9.8. Elevate front section of the work bench to allow sterilization of all its components by wiping and/or spraying; incubation: 20 minutes.
5.5.9.9. Dispose of all into a biohazard waste disposal bag.
5.5.9.10. Collect all contaminated equipment, which can be autoclaved,into biohazard waste disposal bag.
5.5.9.11. Clean equipment, whichcannot be autoclaved using a disinfectant; incubation: approximately 20 minutes prior to removal from the biological hood.
5.5.9.12. Remove the PPE; wash hands thoroughly using soap and water.
5.5.9.13. Allow operation of the biological hood for at least 10 minutes following clean-up .
5.5.9.14. Notify all hood users of the spill and clean-up.
5.5.9.15. Notify the lab manager and Technion personnel according to section 5.2.1.

5.5.10. Handling of a Biological-Radioactive-Material Spill
5.5.10.1. Treat the biological substances with disinfectant and after that relate to the spill as a radioactive spill.
5.5.10.2. In accordance with the instruction of the Unit for Monitoring Radiation Hazard (PASAK), do not sterilize biological radioactive waste material in an autoclave sterilizer. All sterilization performed on the waste will be chemical sterilization only.
5.5.10.3. If the biological spill contains Isotope $I^{125}$ do not treat it with chlorine but with other disinfectant – consult with Technion Safety Unit.

5.5.10.4. Notify the laboratory manager and Technion personnel according to section 5.2.1.

5.6. Handling of a Gas Leak

5.6.1. Remove injured personnel into a fresh air area; assist with respiration/oxygen, as needed.

5.6.2. Report incident to one of the telephone numbers listed in paragraph 5.2.1.

5.6.3. Notify lab manager and Technion personnel according to section 5.2.1.

5.6.4. Seek medical care for injured personnel.

5.6.5. Handling of a Gas Leak from a Pipe or a Canister

5.6.5.1. Exit leakage area immediately; notify all other employees.

5.6.5.2. If possible, close canister valve or the main supply tap.

5.6.5.3. Activate a hood; and hood's acreen for ventilation.

5.6.5.4. Extinguish all sources of heat or electricity.

5.6.5.5. Do not return to the contaminated area until allowed to do so by authorized personnel.

5.6.5.6. Post sign on the room: "Gas leak. Do not enter."

5.6.5.7. A gas leak will be handled qualified personnel only.

5.6.5.8. Resume work only following a clear-cut permission of the head of the Technion Safety Unit.

5.7. Fires

Fires occurs occasionally in chemical and biological laboratories because of the nature of the substances and the equipment in use. Some of the materials are flammable.

Emergency action plan in case of a lab fire:

5.7.1. Assist personnel under immediate life threat, without endanger your own life.

5.7.2. Activate the fire alarm in faculty/unit building by pressing the nearest "Fire" button. The latter will immediately alert the safety and security center reagrding an on-going fire in building. It is preferable to call the emergency response team .

5.7.3. In case of a diminutive fire (i.e. the size of a small paper basket) - use the nearest fire-extinguisher.

5.7.4. Do not try to extinguish fire if one of the following situations unfolds:

5.7.4.1. Fire is too big or fire is unrestrained.

5.7.4.2. Fire could spread a toxic hazard through labair.

5.7.4.3. Fire is not extinguishable - leave area immediately.

5.7.5. Doors and windows should be closed, if possible, when last person leaves lab.

5.7.6. Do not use elevators. Leave building using stairs and/or emergency exits.

5.7.7. Upon hearing the fire alarm - immediately evacuate area.

5.7.8. The lab manager must ensure all lab personnel present at time of fire emergency, arrived to the evacuation assembly point, in accordance with procedure 07-0129 – Evacuation Technion Building Procedure.

5.7.9. Missing personnel must be reported to security personnel handling the emergency.

5.7.10. Returning to building following fireis permitted only by the head or the Technion Safety Unit (TSU).

5.7.11. Every incident of fire must be reported to TSU and will be investigated accordingly.

5.8. Medical Emergencies and First Aid

Injuries occur occesionally in laboratories. The bulk majority of injuries taking place in academic laboratories include mainly minor cuts and superficial burns. However, sometimes health implications may be serious due to exposure to chemical and/or biological and/or radioactive hazards.

In addition, heart attacks, strokes and other clinical conditions can pose more of a risk in the lab because of the inherently dangerous environment.

Initial responsibility to apply first aid measures belongs to lab personnel. One should act quickly but in a calm and safe manner.

Every incident necessitating first aid measures must be reported to TSU by the telephone, and will be investigated.

In medical emergencies apply the following instructions:

5.8.1. Obtain help ASAP by calling one of the emergency numbers listed in paragraph 5.2.1. Report following details: type of injury/incident, exact location, number of injured personnel and the type of assistance required (ambulance, paramedic, etc.).

5.8.2. A Lab representative should wait at the entrance of the building/laboratory to escort the emergency response team/paramedics/ ambulance to the incident area.

5.8.3. Do not move a person suffering from a back injury or one who does not present autonomous movement, unless there is exposure to an additional danger such as fire, spillage etc. In such cases, injured personnel will be carefully moved by number of a people to prevent further injuries.

5.8.4. Slight injuries and cuts can be treated with the first aid kit present in lab.

5.8.5. Slight injuries must also be reported to the lab manager, who, in turn, must report to TSU.

5.8.6. If evacuation to a hospital is of the essence, a laboratory representative should escort the injured person along with the hazardous material MSDS.

5.8.7. Personal Protective Equipment belonging to the first aid lab kit:

5.8.7.1. Minor cuts can be handled using disposable gloves.

5.8.7.2. In case of cuts which present a danger of causing harm by blood spurts or other biological agents - protection must include gloves, a lab coat, a face mask and breathing protection.

5.8.8. PPE is not needed for temperature or blood pressure measurements.

6. **Applicability and Validity**

6.1. All Technion units must follow this procedure. These regulations are intended to supplement other and/or prior regulations, and do not constitute a contradiction to past regulations or any other set of rules, unless specifically stated otherwise.

6.2. All questions or uncertainty regarding this procedure need be referred to TSU.

6.3. The procedures are valid from the day of the publication.

Laniado Zehava

Zehava Laniado
Deputy General of Operations