Module 5

Laboratory Disaster Plan and Incident Management

1. Table of Contents

2. Purpose of the Training Module

This training module aims to increase the awareness of health professionals working in microbiology laboratories regarding biosafety and biocontainment practices during disasters and to improve their professional skills. The module seeks to help participants understand laboratory management processes before, during, and after a disaster, recognize potential risks, and develop effective intervention strategies.

Laboratory staff must act not only as technical personnel during disasters but also as public servants who make rapid decisions and bear institutional responsibility. Therefore, this module is supported by applied scenarios and interactive methods in addition to theoretical knowledge.

3. Objectives of the Training Module

Upon completion of this training module, participants are expected to gain the following competencies:

1. Systematically assess laboratory-specific hazards and risks.
2. Prepare and implement laboratory emergency response plans for pre-disaster, during-disaster, and post-disaster phases.
3. Apply safe intervention procedures in chemical, biological, and physical disaster scenarios.
4. Recognize disaster communication protocols and reporting obligations.
5. Ensure sample safety, equipment protection, and biosafety requirements under disaster conditions.
6. Explain the duties and responsibilities of laboratory personnel within the legal framework.
7. Understand the importance of drills and updating processes in disaster preparedness.

4. Learning Outcomes

Participants who successfully complete this module will be able to:

- Identify and prioritize risks specific to the laboratory environment.
- Independently implement protocols required before, during, and after a disaster.
- Use internal communication channels effectively and make notifications to appropriate individuals and institutions.
- Manage samples and equipment according to the relevant biosafety level.
- Fulfill their legal obligations under the regulatory framework during disasters.
- Actively participate in drills and updating processes.

5. Methods and Techniques

The module uses a combination of various teaching methods and techniques to support different learning levels and styles:

- **Direct Instruction**: Short presentation sessions are used to convey the basic concepts and legal framework.
- **Group Work and Oral Presentation**: Each group prepares solution proposals for the scenario and presents them to other participants. This process strengthens both communication skills and team collaboration.

6. Assessment

Assessment Criteria

1. Correctly identifies laboratory hazards and risk factors.
2. Lists and explains pre-disaster preparation steps completely.
3. Applies the emergency response protocol according to the type of disaster.
4. Correctly implements communication protocols during and after the disaster.
5. Determines priorities related to sample and equipment safety.
6. Applies biosafety requirements according to BSL level.
7. Accurately conveys legal responsibilities and regulations.
8. Plans the transition process back to operations after the disaster.

7. Scenario: Rising Waters

The following scenario is designed to allow participants to experience decision-making processes under disaster conditions. The scenario is presented in three consecutive phases.

Phase 1: Early Warning Due to heavy rainfall throughout the weekend, water begins to rise in the basement/ground floor where the laboratory is located. The first staff member arriving at the laboratory on Monday morning notices 5-10 cm of water in the corridor and water rapidly seeping in under the door.

Phase 2: Escalation of Crisis The water level has reached 20 cm. Acid bottles and waste containers in the ground-level cabinets are about to tip over due to the buoyancy of the water.

Phase 3: Recovery The water has started to recede; however, the laboratory floor is covered with mud and possibly leaking chemicals.

8. Pre-Disaster: Risk Assessment and Infrastructure Strengthening

Disaster preparedness begins long before the disaster occurs. For the laboratory disaster plan to be effective, risk assessment, physical strengthening, and documentation processes must be carried out meticulously.

8.1 Structural Preparedness

- Building seismic strength analysis
- Implementation of flood and inundation protection measures
- Securing critical equipment to the floor
- Arrangement of fire doors and evacuation routes
- Installation of emergency generators and UPS systems

8.2 Planning and Documentation

- Preparation of a written disaster response plan
- Backup and digital archiving of critical procedures
- Creation of an emergency communication tree
- Establishment of insurance and damage recording systems
- Planning of regular drills and staff training programs
- Preparation and updating of duty cards
- Integration with Hospital Disaster Plan (HAP) through notification management
- Establishment of sister laboratory cooperation

8.3 Equipment, Chemical, and Sample Safety

Chemical Inventory

- Keeping the SDS (Safety Data Sheet) archive up to date
- Preparation of chemical storage compatibility maps
- Keeping secondary containers and spill kits ready
- Compliance with flammable material quantity limits

Biological Samples

- Provision of cold chain backup and UPS infrastructure
- Installation of refrigerator temperature alarm systems
- Creation of sample backup protocols
- Storage plans appropriate to BSL (Biosafety Level) classification

Equipment Protection

- Preparation of critical device inventory
- Protective measures against humidity and voltage fluctuations
- Procurement of portable analyzer backups
- Cloud backup of calibration records

9. During Disaster: Emergency Response Protocols

Panic is the greatest danger during a disaster. Taking the right steps in the first 60 seconds directly affects both personnel safety and laboratory safety.

1. **STOP**: Immediately stop all experiments and chemical processes. Close fume hoods and gas valves.
2. **PROTECT**: Put on personal protective equipment. Close and lock biological and chemical containers.
3. **NOTIFY**: Call the safety supervisor, laboratory director, and 112. Activate the disaster communication tree.
4. **EVACUATE**: Proceed to the safe assembly point according to the evacuation plan. Do not use elevators.

9.1 Communication Protocol

- The disaster communication tree must be prepared in advance and communicated to all personnel.
- Emergency contact numbers of all team members must be recorded.
- Radios and alternative communication tools must be kept ready.
- Timely notification must be made to other institutions (hospital, provincial health directorate).
- Social media and press information protocols must be defined.

9.2 Crisis Management

- Initiate the incident management process according to the type of disaster.
- Carry out personnel task distribution according to duty cards.
- Ensure sample safety according to the priority list.
- Contact the sister laboratory and redirect priority tests.

9.3 Preventing Critical Losses

- Prepare mobile coolers for research samples.
- Check cloud backups to prevent data loss.
- Activate the portable generator waiting in a safe area.
- Cover vital devices (PCR, centrifuge) with protective covers.
- Place damaged chemicals in sterile bags and label them.

10. Post-Disaster: Damage Assessment and Decontamination

The post-disaster process must be managed with a systematic and phased approach. Hasty returns can create health hazards and increase equipment damage.

10.1 First 24 Hours

- Allow entry to the laboratory only with authorized and equipped teams.
- Conduct structural damage assessment with expert engineers.

- Check for hazardous material leaks.
- Mark and isolate areas with chemical and biological spills.

10.2 First 1–7 Days

- Activate the decontamination team.
- Perform electrical and mechanical safety checks on devices.
- Conduct biological hazard assessment according to BSL level.
- Record damaged materials and prepare disposal plans.

10.3 First 1–4 Weeks

- Implement laboratory re-opening protocol.
- Renew and verify calibrations.
- Initiate insurance and damage compensation processes.
- Provide psychological support to personnel and organize briefing sessions.

10.4 Biosafety Assessment and Sample Recovery

Biosafety Assessment

- Apply standard contact precautions for BSL-1/2 samples.
- Implement isolated evacuation procedures for BSL-3/4 samples.
- Perform microbiological environmental testing through air and surface sampling.
- Record and report biological waste disposal.
- Notify reference laboratories when necessary and request support.

Sample Recovery Priority Order

1. Critical research samples (irreplaceable)
2. Standard reference materials
3. Diagnostic samples (patient-based)
4. Other routine clinical samples

11. General Principles of the Disaster Plan

For a laboratory disaster plan to be effective, it must have the following basic qualities:

- **Simplicity**: The plan must be written in clear, plain language that all personnel can easily understand.
- **Clarity**: Responsibilities, procedures, and communication steps must be defined clearly and unambiguously.
- **Flexibility**: The plan must be designed to adapt to different types of disasters and conditions.
- **Adaptability**: It must be easily adaptable to different working hours and staff numbers.
- **Updatability**: The plan must be reviewed at regular intervals and kept current through testing with drills.

12. Legal Responsibilities of Personnel

Laboratory staff act not only as technical personnel but also as public officials during disasters. The following legal obligations apply in this context:

12.1 Sample Safety

Personnel are responsible for safely placing critical samples listed in the "priority sample list" (e.g., analysis samples related to an active outbreak suspicion) into a safe container and evacuating them during evacuation. This duty must be performed without endangering their own safety.

12.2 Reporting Obligation

In case of a biological leak or sample loss in the laboratory, personnel must report the situation to the Institutional Disaster Manager and the Provincial Health Directorate Communicable Diseases Unit as soon as possible.

12.3 Not Leaving Duty and Workplace

According to the Turkey Disaster Response Plan (TAMP), when an "S3" or "S4" level disaster is declared, all health personnel, including laboratory specialists, cannot take leave; they are obligated to remain at their duty station or report when called.

12.4 Relevant Legislation

- ISO 22301:2012 – Business Continuity Management System (accepted by 156 countries)
- May 25, 2021 – Regulation on Health Services in Disasters and Emergencies
- Regulation Article 6/l: Planning of mobile hospital services and staff training (at the Ministry level)
- Regulation Article 8: Continuation of routine health services without interruption
- 2025/42 Principle Decision: Rules to be followed by public officials in disasters and emergencies (ethical and social media sharing restrictions)
- TAMP – Recording of names and working periods of personnel participating in response operations

REFERENCES

- AFAD https://www.afad.gov.tr/
- AFAD 2024-2028 Stratejik Planı https://www.afad.gov.tr/stratejik-planları
- Türkiye Afet Müdahale Planı (TAMP) https://www.afad.gov.tr/turkiye-afetmudahale-plani
- Türkiye Afet Risk Azaltma Planı (TARAP) https://www.afad.gov.tr/kurumlar/afad.gov.tr/e_Kutuphane/Planlar/28032022-TARAP-kitap_V6.pd
- https://www.jove.com/v/10379/safety-guidelines-in-case-of-a-laboratory-emergency
- https://www.aphl.org/aboutAPHL/publications/Documents/QS_PracticalGuideFloods_62015.pdf
- https://www.cdc.gov/lab-training/php/courses/biothreat-rule-out-refer-exercise-1.html
- https://prepareiowa.training-source.org/training/courses/

- https://applications.emro.who.int/docs/EMROPub_2017_EN_20195.pdf