

# Laboratory Biosafety and Biosecurity Current Situation in Lebanon

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# Safety and Technical Standards for Licensing a Medical laboratory

## Lebanese Ministry of Public Health

- Work areas is 7.5 m<sup>2</sup> per worker
- Average area  $\geq 100$  m<sup>2</sup>
- Sections and services:
  - Biochemistry
  - Serology
  - Hematology
- Sections must be distributed in a separate or connected pattern where the average area is not less than 60 m<sup>2</sup>
- Work benches  $\geq 30$  m
  - Distance between benches is  $\geq 3$  m
  - Height not exceeding 78 cm sitting and 90 cm standing



# Safety and Technical Standards for Licensing a Medical laboratory

## Lebanese Ministry of Public Health

- **Work benches:** resistant to bacteria, acids, and alkali, with a width  $\geq 70$  cm and adequate illuminations
- Two UPS sockets must be available for every 2 meters and two water outlets, one hot and one cold and one natural gas outlet for every section of the
- **Walls and ceiling:** coated with washable and humidity resistant
- **Floors:** Acids, salts, alkali and slippery resistant..
- **Heating and ventilation:** adequate ventilation must be available at least 12 changes of air per hour .Working temperature must be between 22 and 24 degree Celsius.



# Safety and Technical Standards for Licensing a Medical laboratory

## Lebanese Ministry of Public Health

- **Electrical network:** Outlets earthed/grounded. Sufficient number of outlets
- **Drainage:** resistant to acids with chemical treatment instruments.
- Distance between the ceiling and the floor  $\geq 2.8$  m
- Width of the external doors  $\geq 1.2$  and the internal doors  $\geq 90$  cm
- Easily accessible by handicapped
- UPS system enough for all equipment emergency lightning stations
- Gas lines within work benches and the cylinders are secured
- **Lightening:** the general illumination must be (800-1000 LUX) in work areas



# Health and Safety of Staff

## Licensing Medical Laboratory

### Lebanese Ministry of Public Health

- Appropriate equipment, measures and instructions should be available to protect from the hazards resulting from chemicals, infections and radiation
- Prevent leakage of biologic wastes to the municipal sewage system
- Specify evacuation areas in case of fire in all units of the laboratory
- Exit sign must automatically illuminate according to ISO standards
- Signs to control unauthorized access to the laboratory must be present



**Health and safety of staff**  
**Licensing Medical laboratory**  
**Lebanese Ministry of Public Health**

<b>Personal protective equipment</b>	Emergency showers within a distance not exceeding 30 meters Eye-wash stations Safety glasses or goggles
<b>Fire extinguishers</b>	Water sprays Fire –fighting equipment: Dry powder extinguishers Carbon dioxide fire extinguishers Place the extinguisher near the exit
<b>Chemical storage</b>	Storage facilities must be available and located in specific areas to assure the safety of laboratory workers

# Safety and Technical Standards for Licensing a Medical Laboratory-Microbiology Lebanese Ministry of Public Health

- Separate, and near washing and sterilization rooms
- Area  $\geq 18 \text{ m}^2$
- Working benches  $\geq 4 \text{ m}$  with specialized exhaust fan
- Adequate illumination and ventilation
- Sterilization and tube washing room equipped with a sink not less than 3 m in length
- Physician office
- Rest room
- Storage room
- Reception and waiting room
- One toilet for employees & Two toilets for visitors.
- Technical room to store the gas cylinders or others.



# Required Equipments for Licensing Microbiology Laboratory Lebanese Ministry of Public Health

- Incubator 37 °C → 54 °C
- Microscope Objectives 10 – 20 - 40/50 - 100 immersion
- Fume Hood
- Refrigerator
- Freezer -30 ° - 300 L
- Centrifuge
- Water distiller 4l/h
- Biologic safety cabinet
- Water bath
- Slide warmer
- Vortex
- Shaker
- Incinerator (electric or gas)
- Autoclave
- Incubation jars

# Work Organizing Standards

## Licensing Medical laboratory

### Lebanese Ministry of Public Health

- Services delivered as per certification
- Define working hours
- Define procedures and protocols
- Estimate work load in every unit. Identify type of work conducted in every unit: manual, mechanical or automatic
- List all the equipments in the Lab
- Maintain a paper logbook indicating (other modern means of recording are acceptable): Name of patient name of physician and required tests with full information and results. Laboratory owner is responsible for safekeeping of the record and patient confidentiality.
- Human staff should be qualified to use the equipment.



# Clinical Laboratory

## American University of Beirut Medical Center

- Handling Human specimen only
- Biologic safety cabinet for handling brucella isolates
- Personnel Safety: gloves, masks and gowns
- Disinfectant jars, autoclavable bags
- Lockable freezer (-21 °C)
- Only authorized personnel have access to the Freezer



# Clinical Laboratory

## Islamic Hospital Tripoli-Lebanon

- All personnel working in the Laboratory wear gloves
- Class B safe cabinet in Bacteriology section
- Soap / Antiseptic gel
- Predefined protocol for accidents



# Rafik Hariri University Hospital (RHUH) Laboratories

- Clinical Laboratory (>500 m<sup>2</sup>)
  - Chemistry
  - Serology
  - Endocrinology
  - Bacteriology & Parasitology
  - Mycobacteriology
  - Hematology & Coagulation
  - Blood Bank
  - Molecular Biology (opening soon)
- Research Laboratory (300m<sup>2</sup>)
  - PCR Technique



# Gap Analysis at RHUH Laboratories

By

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Biomedical Engineer



## Checklist according to BSL 1 Standards

- Laboratory Manuals
- Laboratory Design
- Gas cylinders storage
- Chemicals storage
- Refrigerators/freezers
- Status electrical equipment
- Personal protective equipment
- Waste management
- General practices
- General laboratory housekeeping
- Fire protection

## Gap analysis according to BSL 1 Standards

- Some equipment are not properly labeled
- Some shelves are not secured
- Insufficient storage space
- Unavailable refrigerator for human consumption
- Some freezers and refrigerators are not locked
- Few missing personnel protection items
- Improper control on waste segregation
- Waste disposal procedures are not posted
- Inappropriate storage of decontaminated glass containers



# Checklist according to BSL 2 Standards

- Biological Safety Cabinet (BSC)
- Laboratory regulations
- Decontamination procedures
- Handling of contaminated waste
- Personal protection
- Work practices
- Facility design

## Gap analysis according to BSL 2 Standards

- Biological Safety Cabinet not well maintained
- Restricted Access to laboratory is verbally implemented
- Missing biohazard signs
- Accidents are reported but not documented
- One type of disinfectant is available
- Management of infectious and chemical wastes need improvement
- Culture stocks are handled improperly
- Additional personnel self protection training is required
- Transportation of infectious specimen to be regulated
- Washbasin is unavailable at the laboratory exit

# Checklist according to BSL 3 Standards

- Facility Design
- Personnel protection
- Hand protection
- Respiratory protection
- Work practices

## Gap analysis according to BSL 3 Standards

- Facility is not designed according to BSL 3 Standards
- Automatic/Hand/foot/elbow controlled sinks are not available
- Waste is not autoclaved prior to disposal
- Annual updates/training for procedural changes are inadequate
- Additional personnel self protection training is required

# Gap analysis according to Biosecurity Standards

## Physical security

### Limited and exclusion area access control:

- Escort policies are available:
  - not universally implemented
  - no visitor records are maintained
- Personnel is trained to inform supervisor on intruders but no written policy for subsequent action

### Performance testing and maintenance:

- Security procedures and performance test plan are not available
- No policy for periodic testing of equipment



# Gap analysis according to Biosecurity Standards

## Physical security

- Need to implement training policies and take corrective actions
- Pathogens are stored and used within specified area but unlocked
- The laboratories are not equipped with Electronic Intrusion Detection System
- Inappropriate training and exercises for security guards

# Gap analysis according to Biosecurity Standards

- Transport Security

Policies are available but not rigorously applied

- Information Security

Clinical laboratory: Linked to central servers

Research laboratory: Independent IT system

**Thank you for your Attention**