THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH

UGANDA Supranational® Reference Laboratory

Timely Accurate Diagonostics for a TB-Free Africa

Training on *Mycobacterium tuberculosis* drug susceptibility testing (MGIT DST – Liquid Method)

Module 1: Biosafety in DST laboratories

Date:

Uganda Supranational Reference Laboratory

Content Outline

- Transmission of TB
- Biohazards in a TB DST laboratory
- Risk assessment in a DST lab
- Minimum WHO recommendations for TB culture / DST facilities
- Standard safe practice in a TB laboratory
- Personal protective equipment
- Disinfectants active against *M. tuberculosis*
- Emergence preparedness Plan
- Assessment
- Summary

Transmission of tuberculosis

Mycobacterium tuberculosis is almost always transmitted by patients with active pulmonary disease:

- TB patient expels bacilli in small droplets of respiratory secretions.
- Secretions quickly evaporate leaving “droplet nuclei” less than 5 m in diameter.
- Droplet nuclei of this size, containing 1–3 bacilli, can remain suspended in the air.
- Following inhalation, droplet nuclei are able to reach deep into the lungs to produce infection.

Biohazards in the DST laboratory

Inhalation hazards: handling of liquids containing TB bacilli generates infectious aerosols:

- Pipetting
- Working with loops
- Vortexing suspensions
- Inoculation hazards
- Shaking
- Centrifugation
- Grinding
- Pouring
- Opening tubes at non-ambient temperatures or pressures

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Risk assessment in a TB DST lab

Risk is the combination of the likelihood that:

- A specific hazard will be encountered and
- The consequences of an event related to that specific hazard.

The analysis of aerosolization risks has led to the development of minimum biosafety requirements necessary for performing procedures in TB laboratories.

Factors to consider for Risk assessment

Factors relevant to all TB laboratories

- Pathogenicity, does and transmission route
- Infectious dose, risk group persons
- High-burden settings (MDR and XDR)

Factors related to procedure or type of laboratory

- Direct sputum-smear microscopy
- Processing specimens for culture
- Manipulate cultures

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How to conduct risk assessment for TB laboratory

- Identify the inherent hazards
- Decide who might be harmed and how
- Evaluate the risks and decide on precautions
- Record your findings and implement them.
- Review your assessment and update it if necessary.

Disinfection

Disinfectants recommended for a DST lab are those containing:

- Phenol: 5% in water;
- Chlorine: Sodium hypochlorite 1 or 5 g/l;
- Alcohol: ethanol (denatured ethanol, methylated spirits) or isopropanol are used at 70%.

These are usually selected depending on the material to be disinfected.

Medical fitness of laboratory staff

In accordance with national laws and practices, health surveillance of TB laboratory workers should be performed:

- before enrolment in the TB laboratory;
- at regular intervals thereafter;
- after any biohazard incident.

Medical fitness of laboratory staff

- Workers should be educated about the symptoms of TB and provided with ready access to free medical care if symptoms arise.

- Confidential HIV counselling and testing should be offered. Reassignment of HIV-positive workers away from high-risk environments should be considered.

Personal Protective Equipment (PPE)

Laboratory coats:

- long sleeves and fasten in the front to cover street clothes
- where there is a low-risk of becoming infected with TB

Laboratory gowns

- long sleeves and an elasticized cuff (at least 30 mm long)
- open in the back and should cover street clothing

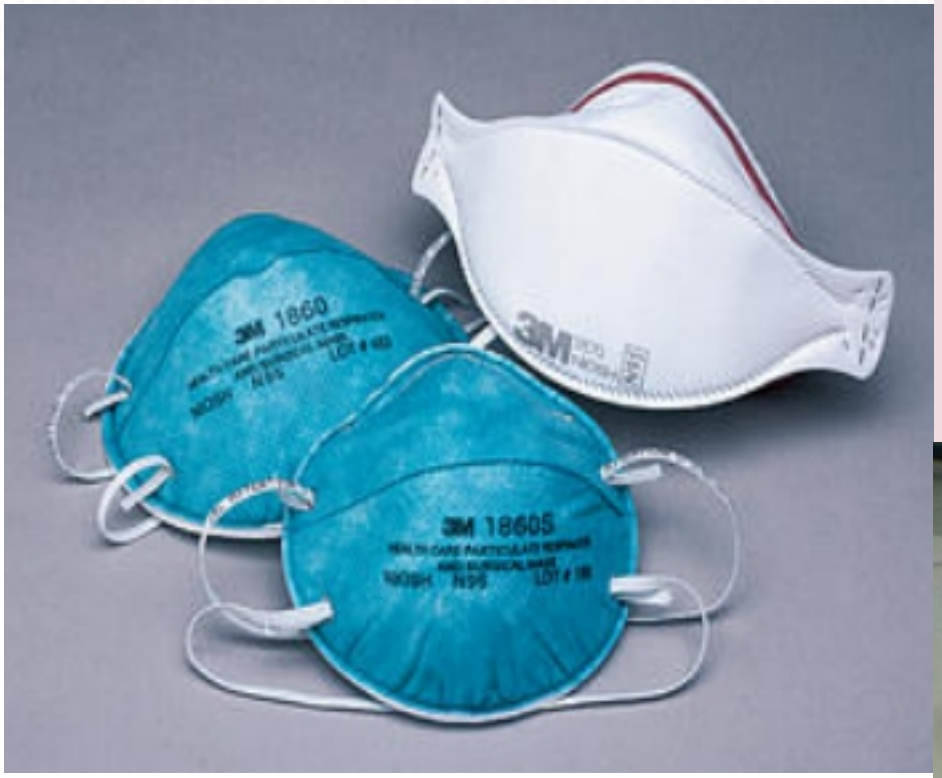
Respirators

- N95 and FFP2 (Filtering Face Piece)

Gloves

- Disposable microbiologically approved latex, vinyl or nitrile

Respirators



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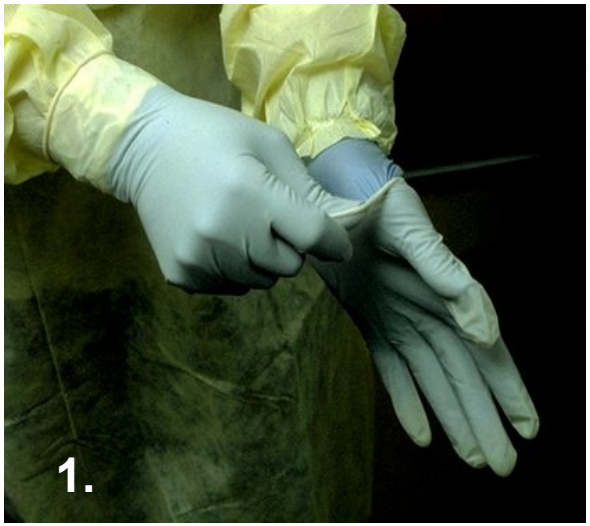
PPE

- **Respirators**
  - Not required in low- and moderate-risk TB laboratories
  - May be required in high-risk TB laboratories following risk assessment
- **Surgical masks**
  - Not designed to protect the user from inhaling infectious aerosols and therefore should not be used for respiratory protection
- **Gloves**
  - Required in low- , moderate- and high-risk TB laboratories

Laboratory Gown

- Gowns should be worn for specimen processing, TB culture and DST
- Gowns should close and tie in the back
- Gowns must be long-sleeved and cuffed
- Gloves should be pulled over the cuff for maximum protection
- Fabric should be water-resistant

Example: Doffing Gloves



Emergency preparedness plan

The plan should provide operational procedures for:

- responses to natural disasters, such as fires, floods, earthquakes or explosions
- risk assessments associated with any new or revised procedure
- managing exposures and decontamination
- emergency evacuation of people from the premises
- emergency medical treatment of exposed and injured persons
- medical surveillance and management of persons exposed to an incident
- epidemiological investigation
- continuing operations after an incident.

Emergency preparedness plan

In developing this plan the following items should be considered for inclusion:

- location of high-risk areas and identification of at-risk personnel and populations
- identification of procedures according to the level of risk
- identification of responsible personnel and their duties
- treatment and follow-up facilities that can receive exposed or infected persons
- transport for exposed or infected persons
- how emergency equipment will be provided

GROUP EXCERCISE

- Define a biological spill?

Scenario;

- David a laboratory technician has accidently dropped down an *Mtb* positive LJ isolate in the containment. Describe the procedure he would follow to manage such an incidence?

Spill clean-up kit

Two spill response kits should be prepared: one placed outside the containment laboratory and one placed inside the laboratory.

The kits should include the items listed below:

- Hypochlorite, 70% Ethanol respirators (1 box), gloves (1 box)
- Laboratory gowns (4-6 disposable gowns)
- Dustpan and brush (for disposal if necessary)
- Chloramine tablets (10 tablets), paper towels
- Soap, sharps container, biohazard bags and goggles (2pairs).

Assessment

- How is TB transmitted?
- List some of the sources of biohazards in a TB DST lab?
- Describe the steps you would take to carry out a risk assessment in a TB DST lab?
- What disinfectants are used in a TB DST lab?
- What are the components of a spill kit?

Summary

- TB is transmitted trough aerosols
- Conduct an appropriate risk assessment for a DST TB lab prior to selection of the appropriate PPE.
- 5% Lysol should freshly be prepared.
- Good lab practice should be maintained at all times.
- Having an emergence preparedness plan in place is key in effective occurrence management.

References

GLI TB training package
http://www.stoptb.org/wg/gli/trainingpackages.asp

Acknowledgement