



THE TB SAMPLE REFERRAL SYSTEM (TSRS) TRAINING

Module 3

Biosafety in the laboratory and a TB Sample referral system

xXth -xXth MONTH YEAR

NAME OF PRESENTER

OUTLINE

- Transmission of TB
- Biohazards in a TB laboratory
- Risk assessment in a TB laboratory
- Essential biosafety measures for TB laboratories
- Personal protective equipment
- Disinfectants active against *M. tuberculosis*
- Emergence preparedness Plan

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 μm in diameter.
- Droplet nuclei of this size, containing 1-3 bacilli, can remain suspended in the air.

Transmission of Tuberculosis...cont

- Following inhalation, droplet nuclei are able to reach deep i



Source: CDC

Exercise (10 minutes)

1. How do you ensure that you're not exposed to TB disease as you perform your duties as a:

- Laboratory worker
- Sample transporter

Biohazards in a TB 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

Risk assessment in a TB lab

- A combination of the likelihood and consequences of an event related to a specific hazard
- Risk assessment is the process of evaluating the risk or risks arising from a hazard or hazards, taking into account the adequacy of existing control measures; the process also includes deciding whether the risk is acceptable.
- The analysis of aerosolization risks has led to the development of minimum biosafety requirements necessary for performing procedures in TB laboratories.

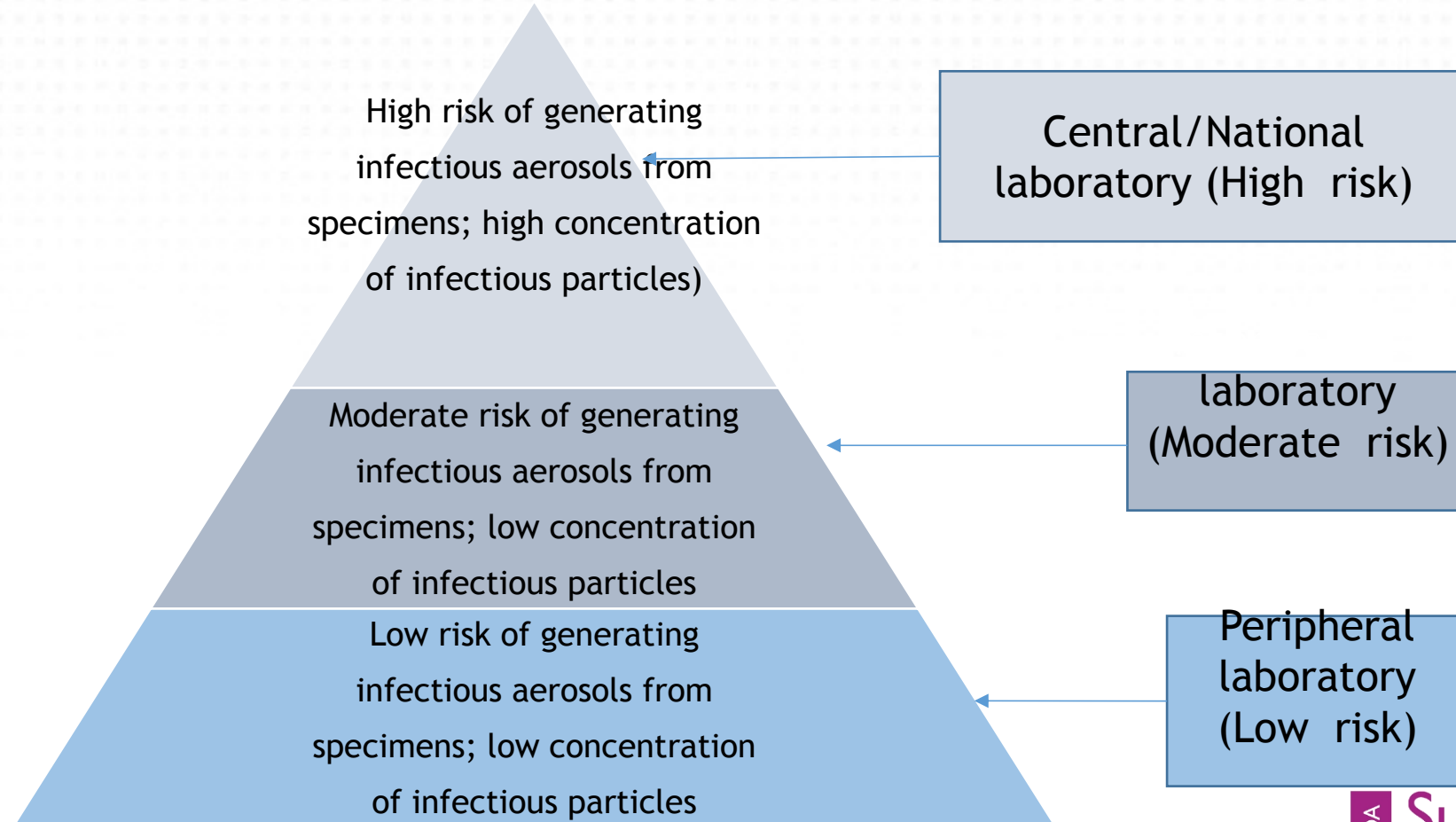
Considerations for risk-assessment approach for a TB laboratory

- The bacterial load of materials (such as sputum specimens and cultures), and the viability of TB bacilli;
- Route of transmission of TB;
- Whether the material handled and the manipulations required for each procedure are likely to generate infectious aerosols;
- The level of experience and the competence of the laboratory's technicians;
- The health of the laboratory's workers (especially HIV-positive technicians).

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 (Determine the suitability of the physical structure, Evaluate the staff's proficiency in following safe practices and evaluate the integrity of safety equipment
- Record your findings and implement them
- Review your assessment and update it if necessary.

Description of risk levels for TB laboratories, by activity and associated assessment of risk



Essential biosafety measures for TB laboratories

- Codes of practice
- Equipment
- Laboratory design and facilities
- Health surveillance
- Training
- Waste handling

Disinfection

Disinfectants recommended for a TB lab are those containing:

- Phenol: 5% in water
- Phenol Derivatives e.g. Lysol (5%)
- Chlorine: Sodium hypochlorite 1 or 5 g/l;
- Alcohol: ethanol (denatured ethanol, methylated spirits) or isopropanol are used at 70%.
- Peracetic acid (2%)

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.
- 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)

Equipment	Potential Hazard	Safety features
Laboratory coats	Contamination of street clothes	<ul style="list-style-type: none">• long sleeves and fasten in the front to cover street clothes• Used for activities where there is a low-risk of becoming infected with TB
Laboratory gowns	Contamination of street clothes	<ul style="list-style-type: none">• Long sleeves and an elasticized cuff (at least 30 mm long)• Gowns should open in the back• Gowns should cover street clothing

Personal Protective Equipment (PPE)...cont

Equipment	Potential Hazard	Safety features
Respirators	Inhalation of aerosols	<ul style="list-style-type: none">• Designs available include the N95 (United States standard) and FFP2 (European standard)• Full-face or half-face air purifying models;
Gloves	Direct contact with microorganisms	<ul style="list-style-type: none">• Disposable microbiologically approved latex, vinyl or nitrile

Can you identify the PPEs and their use?



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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

Emergency preparedness plan

- Establish a fixed assembly point bearing the sign (emergency assembly point) at the lab facility
- Contacts of persons to reach for in case of emergency should be displayed on lab notice board and pathways always
- All labs should have spill kits with all the relevant materials and instructions for handling a spill.

Summary

- Risk assessment in the lab is very important as it allows one to either accept or reject the use of certain techniques in the lab
- Risk assessment also ensures the development of procedures, facility designs/equipment and knowledge to mitigate risks from particular hazards
- Use of gloves and lab coats is the minimum requirement for working in any laboratory

Assessment

1. How is TB transmitted?
2. List some of the sources of biohazards in TB lab?
3. Describe the steps you would take to carry out a risk assessment in a TB lab?
4. What disinfectants are used in a TB lab?

References

- GLI TB training package
<http://www.stoptb.org/wg/gli/trainingpackages.asp>
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GLI guide to TB specimen referral systems and integrated network
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- TUBERCULOSIS LABORATORY BIOSAFETY MANUAL
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Acknowledgments

