Module 2: Safety Precautions for Tuberculosis Microscopy

Learning Objectives

At the end of this module, you will be able to

- Explain airborne transmission of TB
- Describe the risks when collecting sputum
- Describe personal health and safety practices
- Describe why there should be 3 areas in the TB laboratory
- Describe methods for the disposal of contaminated material
- Describe chemical safety precautions in the laboratory

Content Overview

- Transmission of TB bacilli
- Proper collection of sputum
- Laboratory Arrangement
- Safe work practices in the TB microscopy laboratory
- Safe disposal of infectious waste
- Chemical Safety

Importance of Laboratory Safety

- Prevents laboratory-acquired infection
- Specialized equipment may aid good laboratory practice but does NOT replace it

Transmission of TB Bacilli

- *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 indefinitely in the air
  - Following inhalation, droplet nuclei are able to reach deep into the lungs to produce infection

Aerosol Formation: Spread of droplets

Coughing

Singing

Sneezing

Talking

Relative Risk from Exposure to Infectious TB Case

Doctors, nursing staff in TB ward

Specimen collection

Sputum smear preparation

Safe Specimen Collection

- If a patient presents to the laboratory, and is coughing, ask the patient to cover his or her mouth
- Collect specimens outside where
  - air movement will dilute droplet nuclei
  - sunlight will rapidly inactivate TB bacilli
- Stand clear of patients when specimens are collected

Never Stand in Front of the Patient During Collection

Safety Practices: Airflow

- Establish airflow in working areas that will direct potentially infectious particles away from personnel
  - air is exhausted into a remote area
  - extraction fans can be useful
  - laboratory coats will not help against infection with TB

Personal Protective Equipment

- Masks
- Gloves
- Lab Coats

Personnel Protective Equipment: Masks

- Surgical masks do not filter out infectious droplet nuclei

Personnel Protective Equipment: Gloves

- Not necessary to perform sputum microscopy
- Lack of availability does NOT mean that sputum smears cannot be prepared!
- Wearing gloves can give technicians a false sense of safety
- Do not re-use gloves
- Remove gloves before using or operating equipment to avoid contamination (e.g., microscope or telephone)
- Never wear gloves outside the laboratory

Personnel Protective Equipment: Laboratory Coats

- A lack of laboratory coats does NOT mean that sputum microscopy cannot be performed
- If laboratory coats are worn:
  - Leave at worksite for organization to clean
  - Tie at the back, not the front
  - Use appropriate size
  - DO NOT wear outside of the laboratory

Laboratory Design: Working Area

- Record keeping and storage [Clean]
- Smear preparation and staining [Dirty]
- Performing microscopy [Clean]

Laboratory Design: Bench Area

- Record keeping and storage [Clean]
  - area for entering data into the register and for storing slides
- Smear preparation and staining [Dirty]
  - should be well lit area
  - near an open window to ensure adequate ventilation during smear preparation
  - sink with running water also required

Laboratory Design: Microscopy Bench

- Microscopy area [Clean]
  - Use a flat bench or stable table for microscope
- Place microscope in area where lighting is subdued, preferably
- If no electricity is available:
    - Use daylight as the light source
    - Place the microscope directly in front of a window

Biological Safety Cabinets

- Not required for performing sputum smear microscopy
- Are only necessary for cultures and drug susceptibility testing (DST)
  - large amount of organism being handled
- BSC are very expensive to purchase and maintain
  - Require yearly maintenance
  - Require filter replacement

Waste Disposal

- Discard specimens by one of the following methods:
  - burning
  - burying
  - autoclaving

All materials used should be considered contaminated!

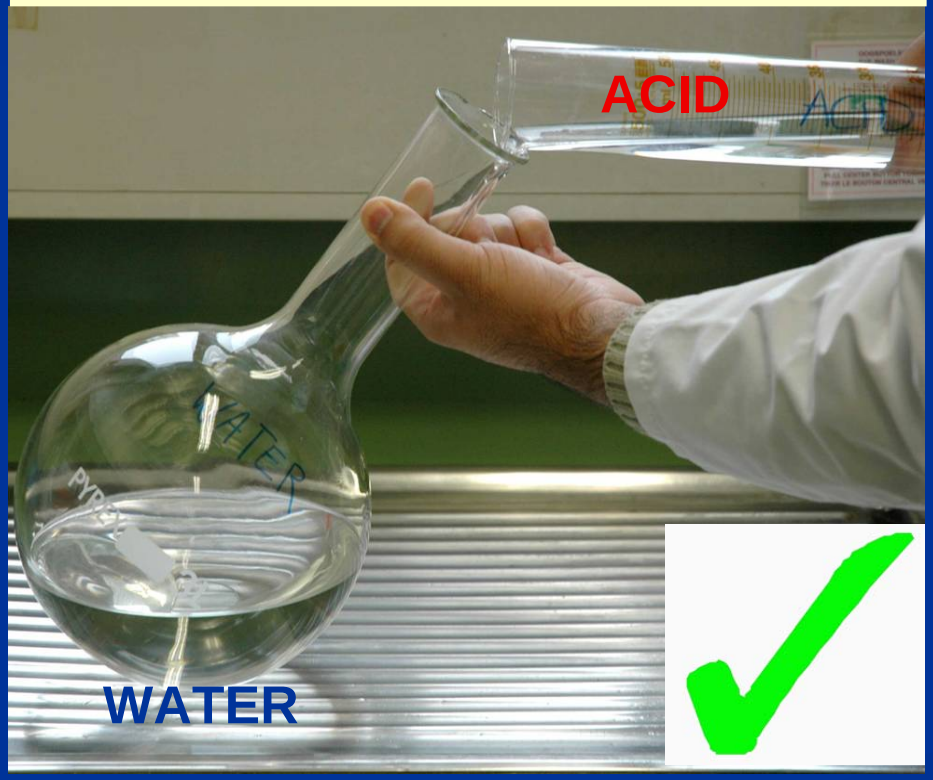
Chemical Safety

- Alcohols are flammable; avoid flame
- Phenol is toxic
  - Avoid direct contact with the skin or mucus membranes
  - Reduce exposure to fumes, work in ventilated area
- Acids are corrosive
  - Use personal protection equipment while handling acids
  - Work in ventilated area
  - Avoid direct contact with the skin, mucus membranes, clothes and paper

Chemical Safety: Handling Acids

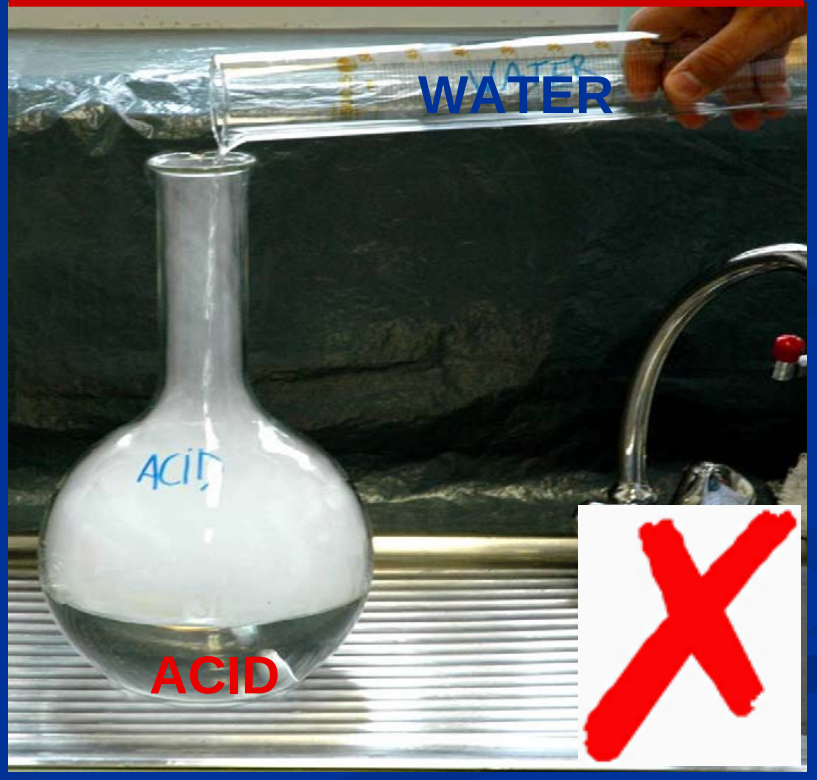
ALWAYS ADD

ACID TO WATER



NEVER ADD

WATER TO ACID



Summary

- How is TB transmitted from person to person?
- What precautions must be taken when collecting sputum specimens?
- What universal precaution must you take when handling specimens?
- Why do lab coats, gloves and surgical masks offer little protection?
- What precautions must you take when handling acids?