



MGIT CULTURE

Module 2: INTRODUCTION

Date:

Venue:

Name:

Outline

- Cause of epidemic
- Transmission
- Burden
- Introduction to culture



Cause of the epidemic

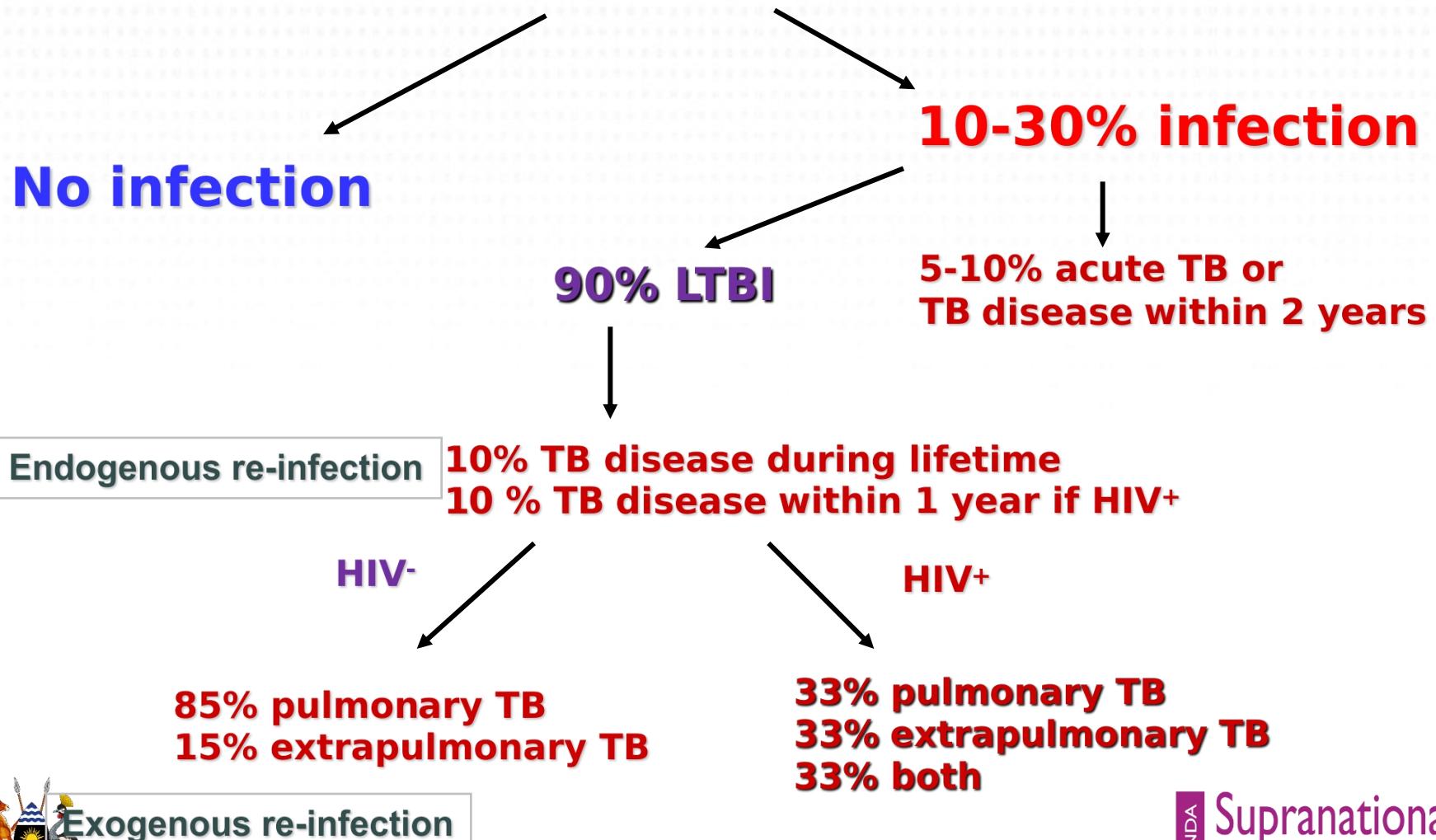
- Bacterial infection is caused by *Mycobacterium tuberculosis* complex

Transmission

- Spread person to person through airborne particles that contain *M. tuberculosis*, called droplet nuclei
- Transmission occurs when an infectious person coughs, sneezes, laughs, or sings
- Prolonged contact needed for transmission



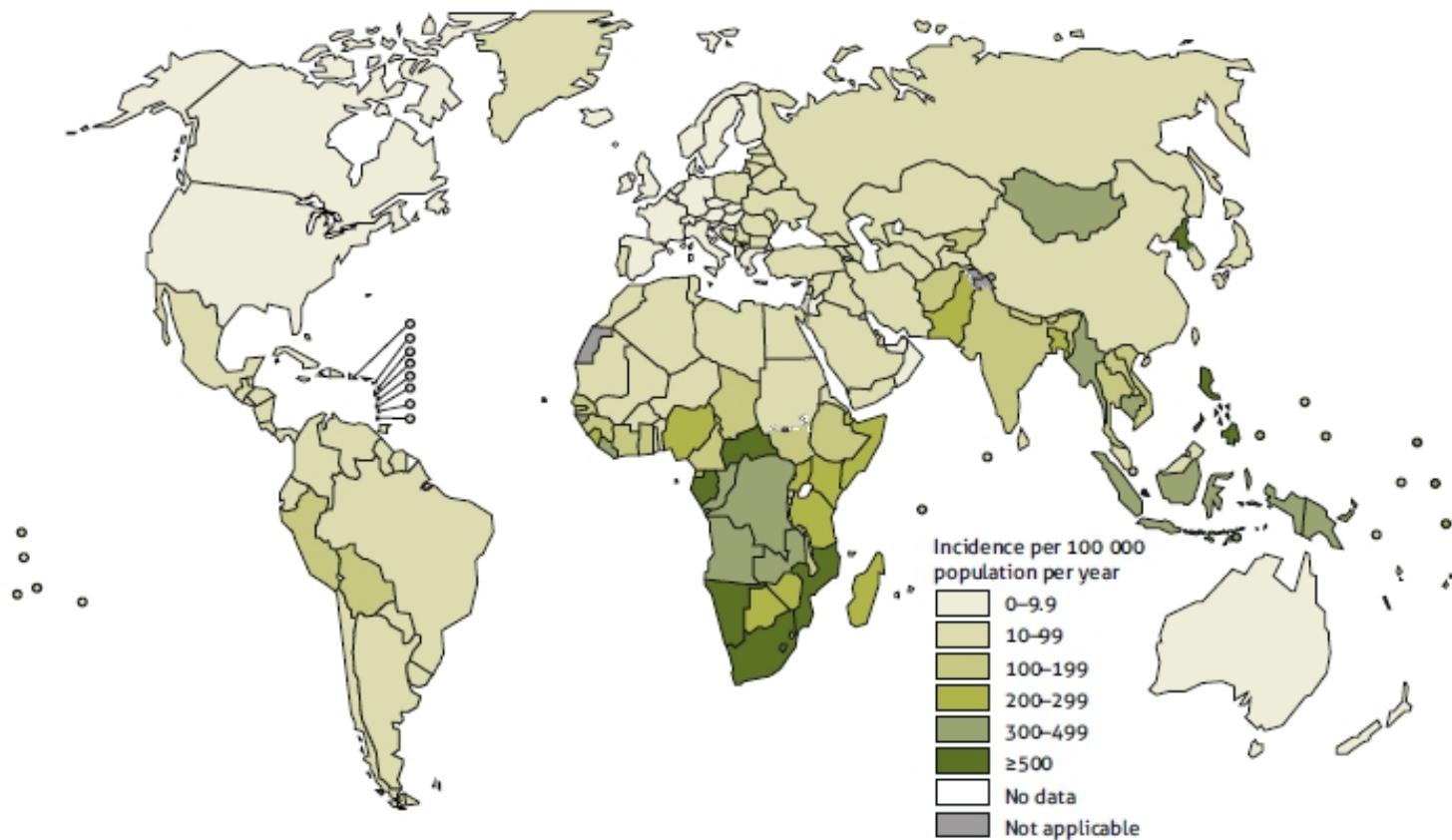
Transmission: inhalation (1–5mm Ø) of droplet nuclei aerosols



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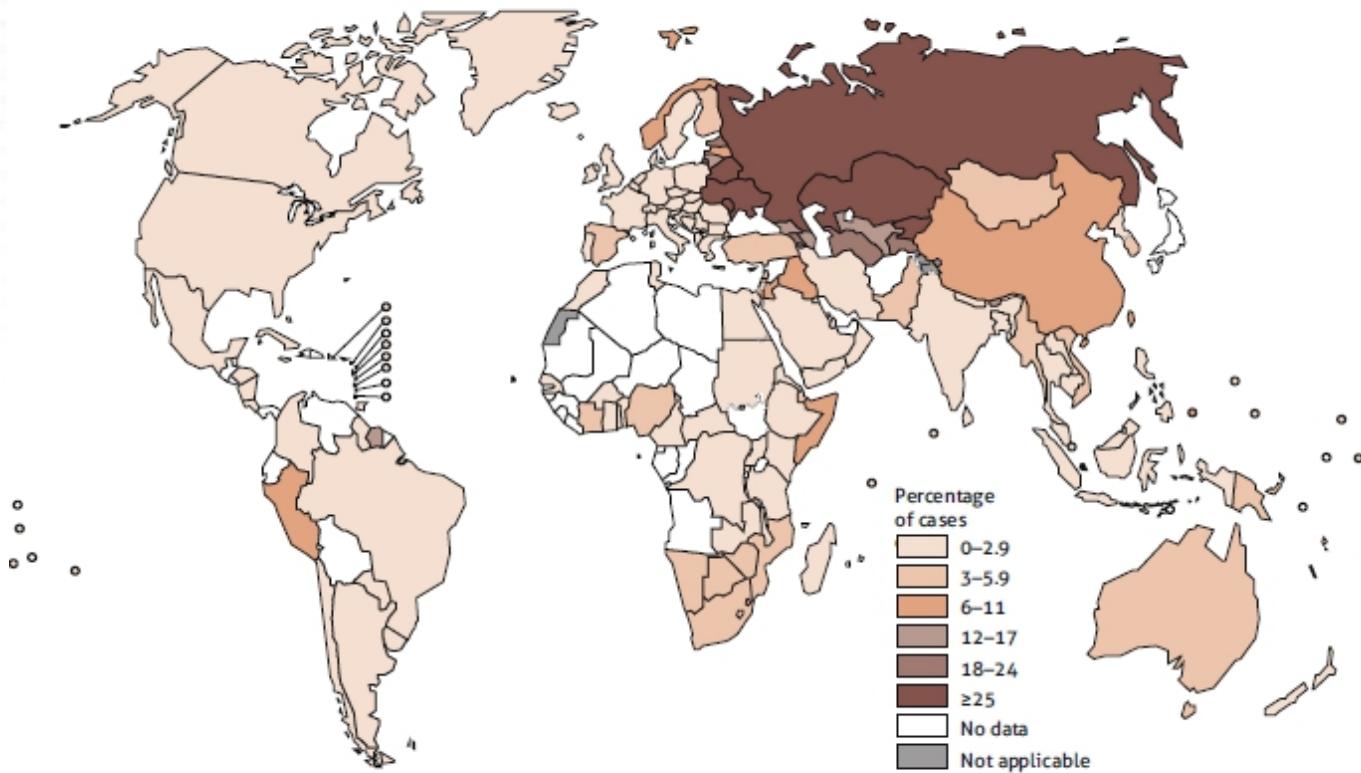
GLOBAL TB BURDEN

Estimated TB incidence rates, 2018



THE GLOBAL MDR/RR-TB SITUATION-2018

Percentage of new TB cases with MDR/RR-TB^a

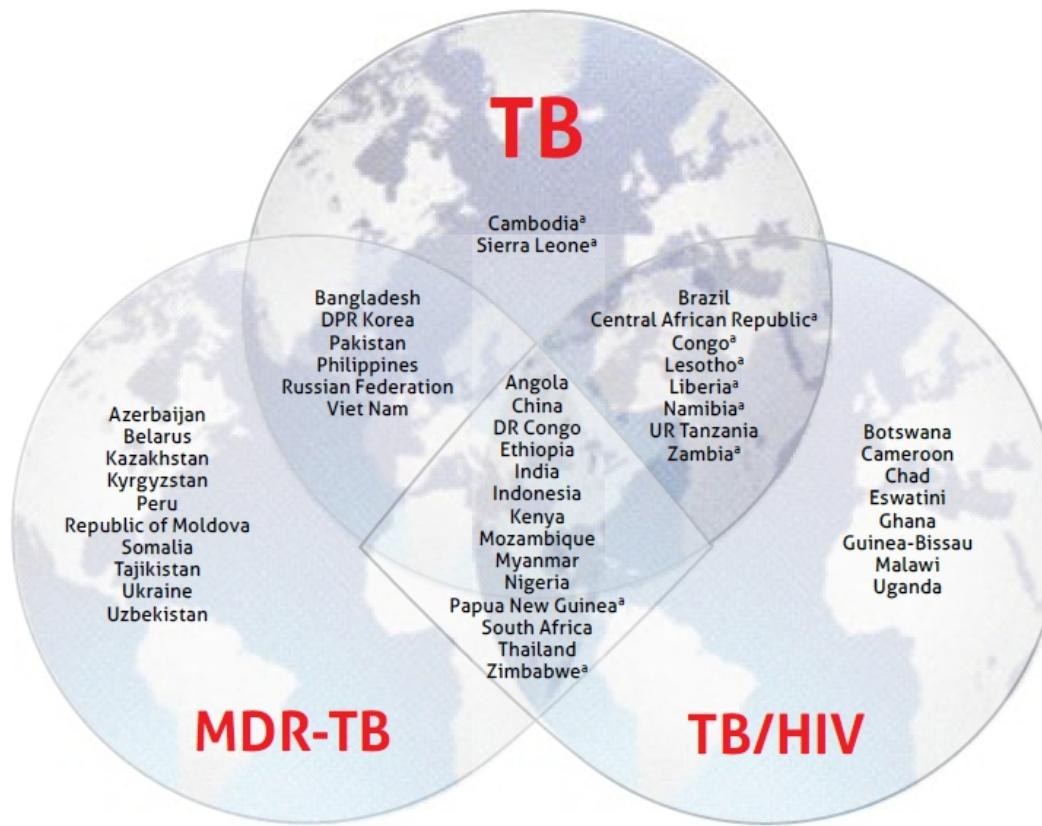


* Percentages are based on the most recent data point for countries with representative data from 2004 to 2019. Model-based estimates for countries with data before 2004 are not shown. MDR-TB is a subset of RR-TB.



TB/HIV GLOBAL BURDEN

The three high-burden country lists for TB, TB/HIV and MDR-TB defined by WHO for the period 2016–2020, and their areas of overlap



^a Indicates countries that are included in the list of 30 high TB burden countries on the basis of the severity of their TB burden (i.e. TB incident cases per 100 000 population per year), as opposed to the top 20, which are included on the basis of their absolute number of incident cases per year. Also see [Table 2.4](#).



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TB Burden in uganda

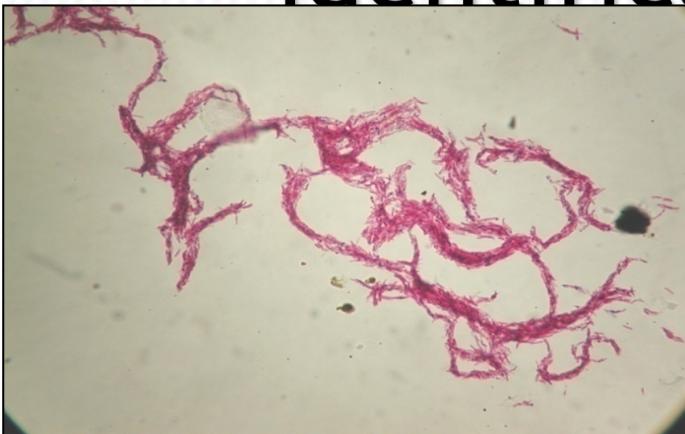
Estimates of TB burden ^o , 2018	Number (thousands)	Rate (per 100 000 population)
Total TB incidence	86 (50–130)	200 (118–304)
HIV-positive TB incidence	34 (20–52)	81 (47–123)
MDR/RR-TB incidence ^{oo}	1.5 (0.82–2.3)	3.5 (1.9–5.4)
HIV-negative TB mortality	8.6 (4.8–14)	20 (11–32)
HIV-positive TB mortality	11 (6.4–16)	25 (15–38)
Estimated proportion of TB cases with MDR/RR-TB, 2018		
New cases		1% (0.91–1.2)
Previously treated cases		12% (6.5–19)
TB case notifications, 2018		
Total new and relapse		55 835
- % tested with rapid diagnostics at time of diagnosis		46%
- % with known HIV status		98%
- % pulmonary		93%
- % bacteriologically confirmed ^{ooo}		56%
- % children aged 0–14 years		12%
- % women		31%
- % men		57%
Total cases notified		57 756



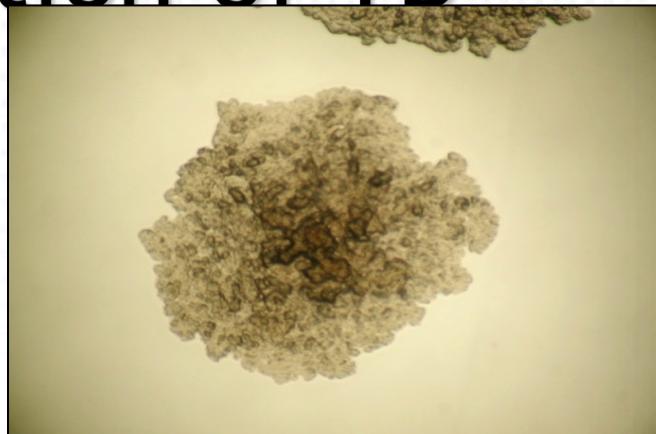
Exercise

- Describe the risk factors that can pre-dispose an individual to TB infection.

Culture for detection and identification of TB



Liquid medium - 7 days (1000X)



Solid medium – 14 days (100X)

- ❖ Culture more sensitive than microscopy
 - ❖ Can detect as few as 10–100 viable bacteria/ml
 - ❖ Important for HIV+ individuals who often have low bacillary loads in sputum specimens
- ❖ Processing of sputum prior to culture
 - ❖ Digestion of mucus
 - ❖ Decontamination of normal flora
 - ❖ Concentration by centrifugation
- ❖ Inoculation of liquid and solid media
 - ❖ Detection of growth
 - ❖ Characteristic cording following growth in liquid medium
 - ❖ Confirm ID of AFB as *M. tuberculosis* – conventional and newer methods
- ❖ Rapid speciation methods (e.g. Capilia)

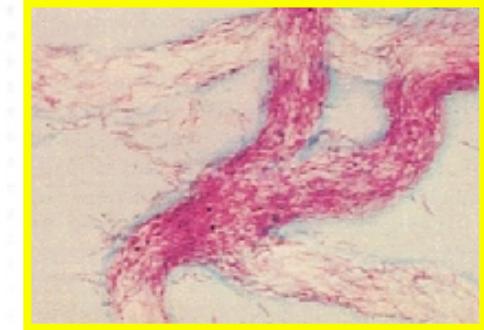
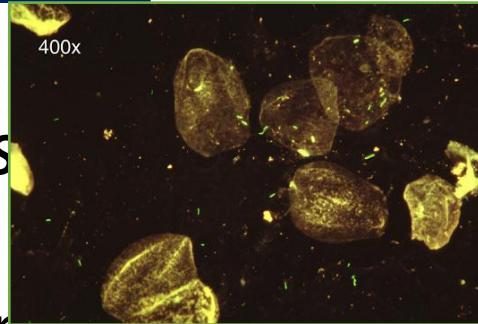
Mycobacterium tuberculosis complex (MTBC)

- Human pathogens

● *M. tuberculosis*

● *M. africanum*

● *M. canetti* (rare)



- Rodent pathogen

● *M. microti* (rarely in humans)

- Wide host range - humans, cattle, deer, seals, elephants, etc.

● *M. bovis*

- Vaccine strain, *M. bovis* BCG

● *M. tuberculosis* ssp. *caprae* (goats)

● *M. pinnipedii* (seals)



Advantages of TB culture

- Detects small numbers of organisms (as few as 10 bacilli)
- Confirms diagnosis of TB in HIV+ patients
- Allows species identification
- Allows drug susceptibility testing and DR surveys
- Allow epidemiological studies



Limitations of TB culture

- Slow growth of MTB: long turn-around time
- Expensive, limited number of laboratories
- Essential needs
 - Biosafety procedures and Adequate infrastructure
 - Training of qualified staff
 - Equipment with continuous supply of media and reagents
 - Specimen transport system



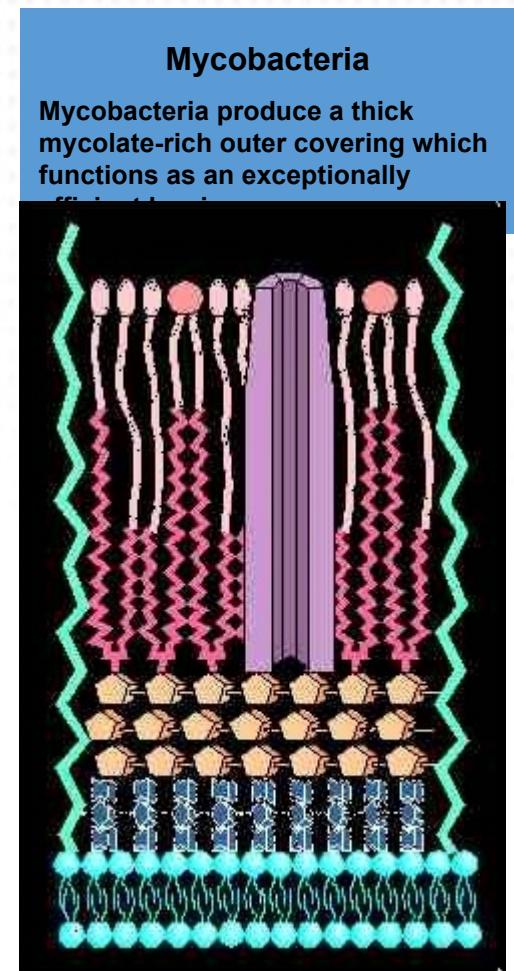
The bacterial cell wall

- Mycolate-rich outer coating serves as an efficient barrier and can endure unfavorable conditions

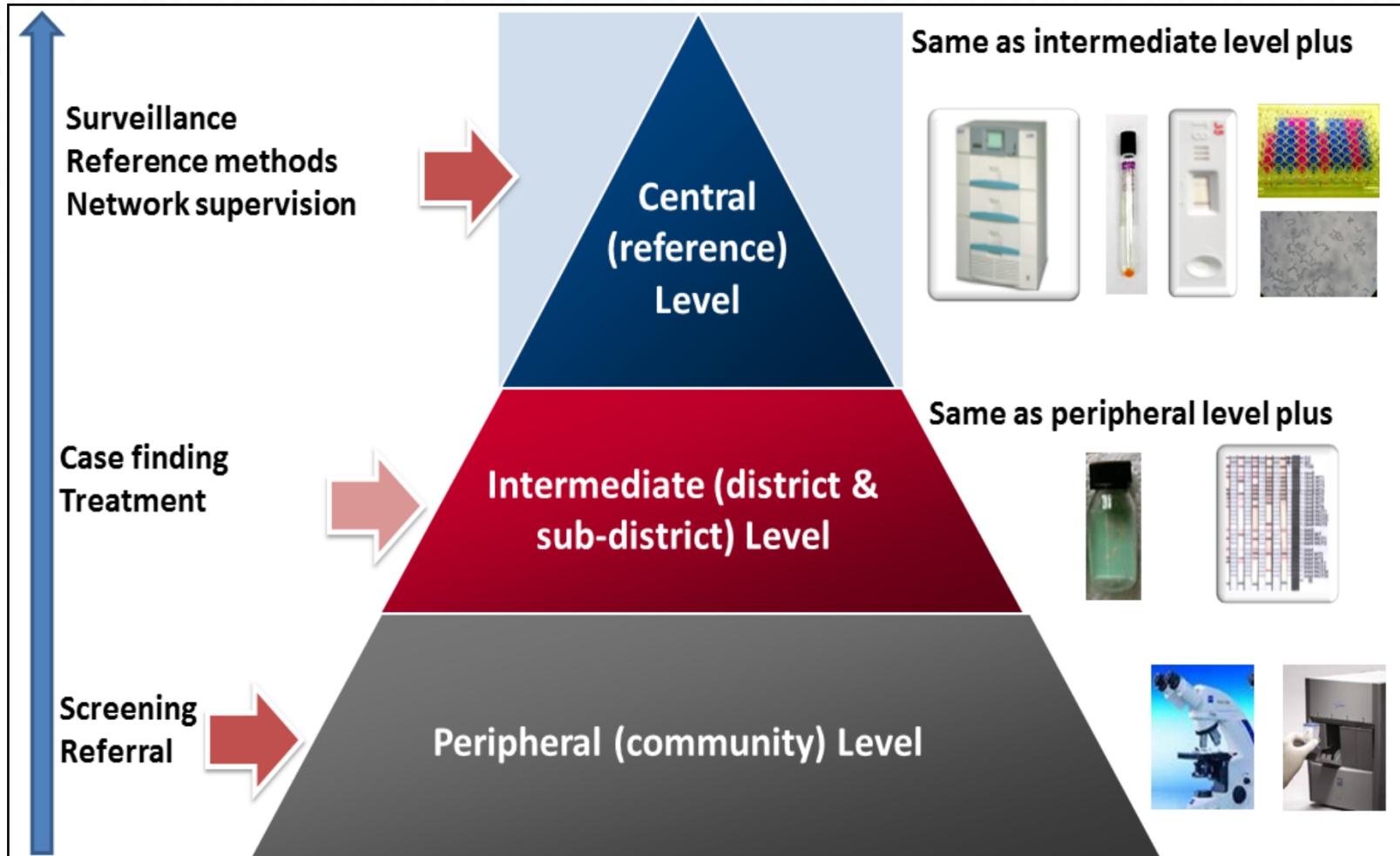
● Disinfectants

● Many drugs

● NaOH treatment during specimen processing



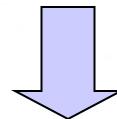
TB Laboratory Network



Ensuring safety of the laboratory staff

Laboratory staff need to:

Control procedures producing aerosols (droplets containing TB suspended in the air)



Prevent inhalation of infectious droplet nuclei

Laboratory staff working with TB specimens and cultures should be aware of the increased risk for those who are HIV infected.



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ASSESSMENT

- What is TB and how it is transmitted?
- Give five risk factors that predispose an individual to TB?
- What are the advantages of TB culture?
- What are the limitations of TB culture?



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References

- GLI TB training package
<http://www.stoptb.org/wg/gli/trainingpackages.asp>
- GLI Practical guide to TB Laboratory strengthening
- WHO global TB report 2018

Acknowledgments



USAID
FROM THE AMERICAN PEOPLE

 **K N C V**
TUBERCULOSIS FOUNDATION
To eliminate TB

CHALLENGE>TB



CDC



MG/PP/002, Version 1.0, Effective date: 01-Jun-2019

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