Indiana Department of Health

TUBERCULOSIS (TB)

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NBS/SURVEILLANCE

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Tuberculosis

- Tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis*
- Usually affects the lungs, but can attack any part of the body
- Divides at a slow rate
- Can persist as **latent** infection
- Requires a complex and extended treatment course

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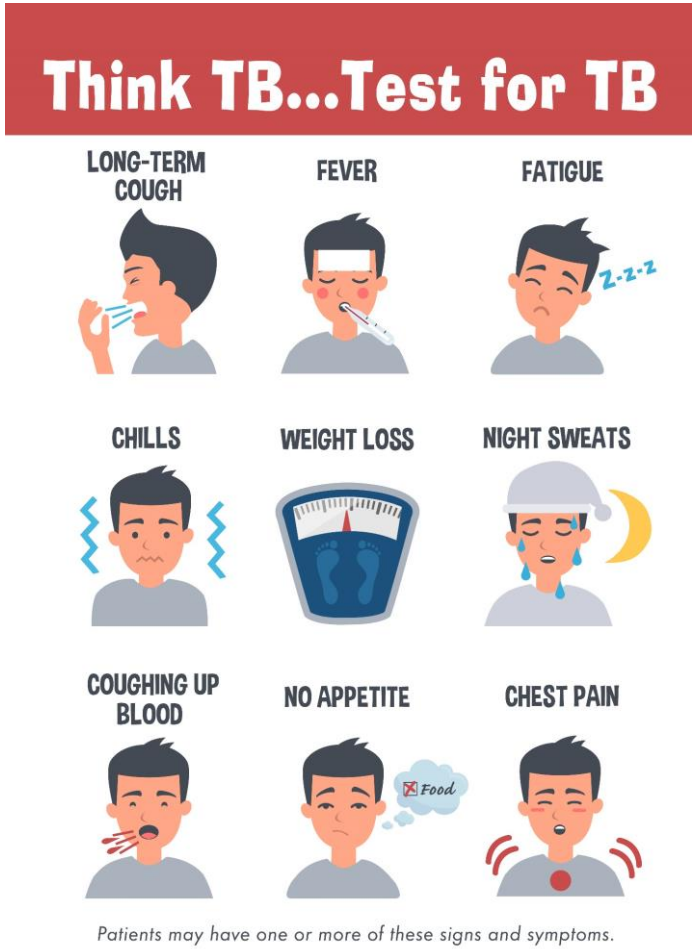
TB disease basics

- How does it spread?
  - Person-to-person through the air
  - The bacteria is expelled via coughing, speaking, or singing

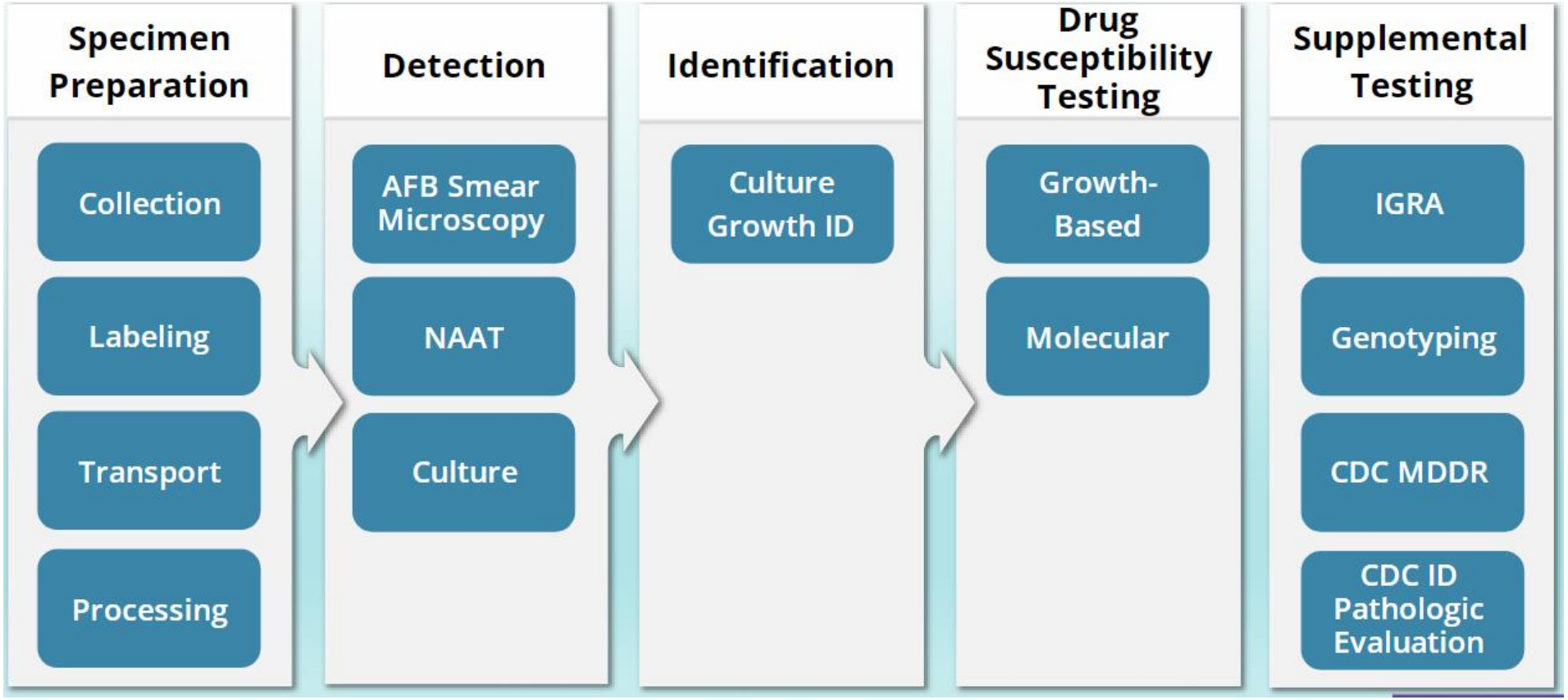
- Signs and symptoms of TB?
  - Cough longer than three weeks
  - Illustration to the right shows other symptoms



LTBI compared to TB disease

Person with LTBI	Person with TB Disease
Has a small amount of TB bacteria in their body that are alive but **inactive**	Has TB bacteria that are **active** in their body
Cannot spread TB bacteria to others	May spread TB bacteria to others
Does **not** feel sick	May feel sick and may have symptoms such as a cough, fever, and/or weight loss
Usually has a **positive** TB skin test or TB blood test result indicating TB infection	Usually has a **positive** TB skin test or TB blood test result indicating TB infection
Chest radiograph is typically **normal**	Chest radiograph may be **abnormal**
Sputum smears and cultures are **negative**	Sputum smears and cultures may be **positive**
Should consider treatment for LTBI to prevent TB disease	Needs treatment for TB disease
Does **not** require respiratory isolation	May require respiratory isolation

TB testing



Source: APHL Understanding TB Lab Testing

IGRA results and interpretation

- Blood test that measures a person's immune reactivity to *M.tb*
- Two FDA approved IGRAs available
  - QuantiFERON®-TB Gold Plus (QFT)
  - T-Spot®.TB test (T-Spot)
- Positive IGRA indicates infection with TB, but does ***NOT*** differentiate between latent TB infection and TB disease
  - False-negatives are very common, especially among patients with immunosuppressive conditions or advanced TB disease
  - Positive result requires chest imaging and medical evaluation

Acid-fast bacilli (AFB) smear microscopy

- Rapid and inexpensive method performed to detect AFB
- Specially stained specimen smears are examined under microscope to determine if acid-fast organisms such as *Mycobacterium tuberculosis* complex (MTBC) and nontuberculous mycobacteria, or NTM, are observed
- Low sensitivity and not specific for MTBC
- Reliability depends on the number of AFB present in the specimen

AFB Smear Microscopy Result Reporting
No AFB Seen *or* Negative
1-2 bacilli seen; Order repeat specimen
1+ *or* Rare
2+ *or* Few
3+ *or* Numerous
4+ *or* Many

Source: APHL Understanding TB Lab Testing

AFB smear result interpretation

- Positive sputum smear results = infectious patient**
  - More bacteria, more concern for exposure of others
  - **Assuming smear is positive for MTB complex (not NTM)
- Positive smears in non-sputum samples can be an indicator for disease burden/progression
  - Bacillary load in non-sputum samples is usually low
- Smear negative samples does not rule out disease
  - Always set up all samples for culture

Nucleic acid amplification test (NAAT)

- Molecular test that detects MTBC-specific DNA if present in the specimen
  - MTBC is more likely to be detected in a NAAT when specimens have a higher bacilli load as indicated in the AFB smear
  - Should be performed on specimens collected prior to initiation of TB disease treatment
    - Cannot differentiate between live and dead organisms
  - Does not replace the need for AFB smear and culture
- Reporting language
  - *Mycobacterium tuberculosis* detected
  - *Mycobacterium tuberculosis* not detected
- NAATs can also provide early detection of rifampin drug resistance.
  - Rifampin is one of the first-line drugs used to treat TB disease

Culture result interpretation

- MTBC is a slow growing organism and can take weeks to grow
- Culture is the gold standard to confirm TB disease, and important as it is the first step in:
  - Growth-based drug susceptibility testing
  - Genotyping
- Culture negative results do not necessarily mean patient does not have TB disease. Diagnosis depends on
  - Symptoms
  - Imaging (especially chest x-ray/CT)
  - Other testing (TST, IGRA, Smear)
  - Response to treatment

Drug susceptibility testing (DST)

- Performed to assess susceptibility or resistance to drug treatment options
  - ***It is crucial to identify drug resistance as early as possible to ensure effective treatment.***
- Two types of DST for MTBC
  - Growth-based (aka phenotypic or conventional) DST
    - Determines susceptibility or resistance by assessing growth (or no growth) of inoculated mycobacteria in, or on, media containing a particular drug
    - Usually have four first-line anti-tuberculosis drugs: Rifampin, Isoniazid, Pyrazinamide, and Ethambutol
  - Molecular DST
    - Not all labs perform molecular DST, but testing is available through some larger state labs and CDC
    - Reporting language: Mutation not detected, or mutation detected along with susceptible or resistant
- DST may be repeated if the patient remains culture positive after two to three months or if the patient is failing to respond to treatment

Source: APHL Understanding TB Lab Testing

Additional testing available

- One isolate from each MTB positive patient should be submitted to IDOH lab for genotyping with CDC
- Consider submitting specimens for molecular DST at IDOH lab if your laboratory does not have it available
- IDOH lab can arrange further testing via CDC for non-sputum specimens or specimens requiring specialized testing

Repeat samples

- Patients with TB disease (especially pulmonary) generally will have multiple sets of sputum collected over time to monitor for disease progression
- Infectious (sputum smear-positive) patients will remain in isolation until sputum smears convert to negative
- Culture conversion (point in time where sputum cultures come back negative) is monitored to determine total treatment length
  - If culture conversion takes longer than 60 days once treatment is started, treatment length is usually extended from six months to a minimum of nine months

TB Prevention and Care Program

Eleven full-time staff: director, lead nurse, four field-based regional nurse consultants, Lake County TB PHN, two TB epidemiologists, public health administrator, health educator

TB Program Staff

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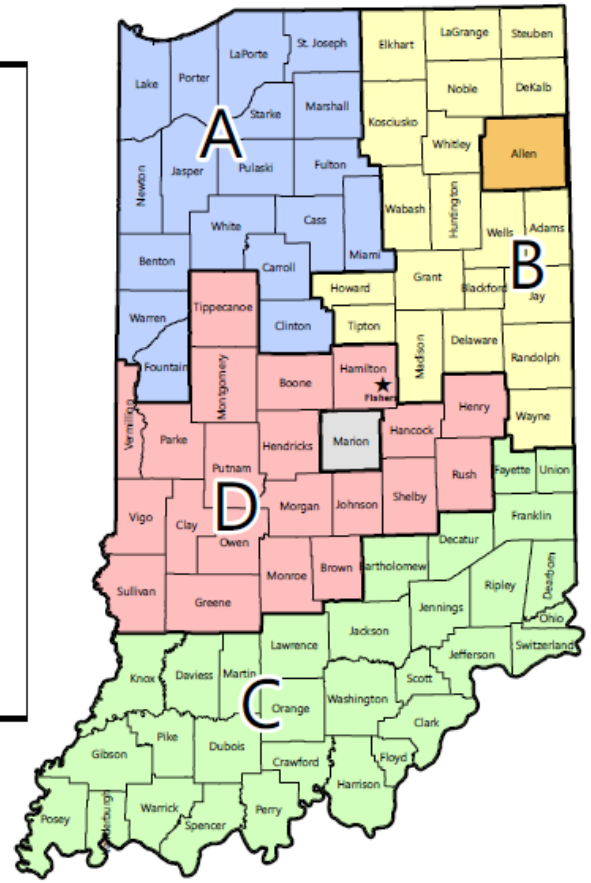

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TB program key activities

- Provides oversight and consultation to LHDs on TB and LTBI case management, treatment, and investigation
- Provides access to TB and LTBI medications through Purdue Pharmacy
- Provides access to medical consultation with TB medical consultant and CDC TB Center of Excellence
- Resource for TB/LTBI training and educational needs
- Conduct surveillance and reporting for TB and LTBI

Questions?

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