

Slide Set — Introduction to Tuberculosis Genotyping

Text Only Version

Slide 1: Introduction to Tuberculosis Genotyping

(Name, degree, organization)

CDC/NCHHSTP/DTBE logo

Slide 2: Objectives

At the end of the course participants will be able to

1. Explain the basics of tuberculosis (TB) genotyping
2. Describe how TB genotyping can be useful in TB control
3. Explain how genotyping results are obtained

Slide 3: QUESTION: What is TB genotyping?

- a. Laboratory method to detect TB infection
- b. A blood test to detect drug-resistant TB
- c. Laboratory approach to analyze genetic material (DNA) of *Mycobacterium tuberculosis*
- d. Tool to help understand transmission of *M. tuberculosis*
- e. Both c and d

DNA = deoxyribonucleic acid

Slide 4: ANSWER: TB Genotyping is

- a. Laboratory method to detect TB infection
- b. A blood test to detect drug-resistant TB
- c. **Laboratory approach to analyze genetic material (DNA) of *Mycobacterium tuberculosis***
- d. **Tool to help understand transmission of *M. tuberculosis***
- e. **Both c and d**

DNA = deoxyribonucleic acid

[Image: One double helix DNA molecule; the last bullet is circled.]

Slide 5: TB genotyping

- Only for culture-confirmed TB
 - The technique requires material from a culture result
- Matching genotypes might indicate that cases are related

[Image: Two double helix DNA molecules with arrows pointing to each other.]

Slide 6: Genotypes and transmission of M. tuberculosis

- Genotyping helps us understand transmission relationships between cases
- We expect genotypes from transmission-related cases to match

[Image: Two women with an arrow pointing from one to the other (indicating potential exposure); stars beside each head (indicating cough or bacteria); each with a matching double helix DNA molecule over their heads (indicating bacteria with matching genotypes).]

Slide 7: Matching game – Do the pictures match?

[Image: Pictures of 12 frogs; six are the same (orange) and have a green boundary around them; three frogs are green and have a blue boundary around them.]

Slide 8: Genotype clusters

[Image: Pictures of 12 double helix DNA molecules; six are the same (green) and have a border around them; three molecules are pink and have a border around them.]

Slide 9: How can genotyping be useful in TB control? (1)

- Assist with contact investigations
 - Confirm or refute patient connections
- Find previously unidentified contacts
- Detect and prevent outbreaks
- Refute outbreaks

[Image: Two double helix DNA molecules with arrows between them pointing to each other.]

Slide 10: How can genotyping be useful in TB control? (2)

- Distinguish relapse from new infection
- Detect false-positive culture results

[Image: Laboratory beakers and bubbles.]

Slide 11: Case scenario #1: A household (1)

- TB patients spent most of their time together at the same house
 - Likely related by transmission

[Image: A woman and a boy are inside a house; an arrow links the woman inside the house to a woman outside the house.]

Slide 12: Case scenario #1: A household (2), Genotype results for patients linked to household

Mother - Genotype 1

Son - Genotype 1

Neighbor - Genotype 1

[Image: Three matching double helix DNA molecules to the right of each “Genotype 1”, indicating that the genotypes match.]

Slide 13: Case scenario #1: A household (3), Interpretation of genotyping results

- All cases had matching genotypes
- All spent time together in the same house
- These cases were likely transmission-related

http://wwwdev.cdc.gov/mmwr/preview/mmwrhtml/mm6048a3.htm?s_cid=mm6048a3_w

Slide 14: Case scenario #1: A household (4), Back to the Household: Genotype 1

- Neighbor did not identify any other contacts aside from this family
- Contact investigation did not find any other cases
- Two other family members were diagnosed and treated for TB infection

[Image: House with two adults (one male one female) and two children (one girl and one boy).]

Slide 15: Case scenario #1: A household (5), Review of genotype data for County A – 2013

Mother - Genotype 1

Son - Genotype 1

Neighbor - Genotype 1

Patient A - Genotype 1

Patient B - Genotype 1

[Image: Five matching double helix DNA molecules to the right of each “Genotype 1,” indicating that the genotypes match.]

Slide 16: Case scenario #1: A household (6), What do the genotype results indicate?

- Five cases with matching genotypes within 6 months
- Cases might all be related by transmission
 - When?
 - Where?
- More information is needed

Slide 17: Case scenario #1: A household (7), Next steps

- Investigate to understand relationship of Patient A and Patient B to the other patients in the cluster
 - Identify likely locations of transmission
 - Determine if there are missed contacts
- Review
- Public health records
- Contact investigation logs
- Estimated infectious periods
- Re-interview TB patients and contacts

Slide 18: Case scenario #2: A workplace (1)

- Within a single month
 - Three women diagnosed with TB
 - All work at the same casino
 - All work on the same evening shift
- One woman’s boyfriend also diagnosed with TB

[Image: Three women connected by decks of playing cards; an arrow connects the third female to a man; each has stars above their heads (indicating cough or bacteria).]

Slide 19: Case scenario #2: A workplace (2), QUESTION: Are these TB cases related by transmission?

- Yes
- No
- Maybe

[Image: Same as previous slide but images are smaller.]

Slide 20: Case scenario #2: A workplace (3), ANSWER: Are these patients related by transmission?

- Yes
- No
- Maybe!

[Image: Same as previous slide except the last bullet is circled.]

Slide 21: Case scenario #2: A workplace (4), Genotype results for patients linked to casino

Employee 1 - Genotype 2

Employee 2 - Genotype 3

Employee 3 - Genotype 4

Boyfriend - Genotype 5

[Image: Four different double helix DNA molecules beside “Genotype 2,” “3,” “4,” and “5,” indicating that the genotypes are different.]

Slide 22: Case scenario #2: A workplace (5), QUESTION: How to interpret these genotype results?

- a. The genotype data are wrong
- b. The genotype data could be wrong, since cases are linked epidemiologically
- c. These cases are not related by transmission
- d. I don't know

Slide 23: Case scenario #2: A workplace (6), ANSWER: How to interpret these genotype results?

- a. The genotype data are wrong
- b. The genotype data could be wrong, since cases are linked epidemiologically
- c. These cases are not related by transmission
- d. I don't know

Slide 24: Case scenario #2: A workplace (7), Interpretation of genotype results

- Genotype results from all cases were different
 - These cases are not related by transmission
 - This was a coincidence
- Four contact investigations are needed

- Three in same work site
- Not an outbreak

Slide 25: How are genotyping results obtained?

Person with suspected TB ◇ Specimen ◇ TB isolated from culture ◇ TB genotype test

[Image: Picture of a male with stars above his head (indicating cough), arrow to person with stars (cough) holding a specimen cup and a picture of a test tube; pictures of three petri dishes; and arrow pointing to smiling scientist holding test tube and a DNA molecule.]

Slide 26: Take home points

- TB genotyping can be useful in TB control
 - Find additional contacts
 - Detect and prevent outbreaks
 - Refute outbreaks
- Interpreting genotyping results can be as simple as, “Do the pictures match?”

[Image: Picture of two double helix DNA molecules and two orange matching frogs.]

Slide 27: CDC Resources on Genotyping

- CDC TB genotyping website
[www.cdc.gov/tb/programs/genotyping/default.htm](http://wwwdev.cdc.gov/tb/testrdsite/publications/slidesets/genotyping/default.htm)(<http://wwwdev.cdc.gov/tb/testrdsite/publications/slidesets/genotyping/default.htm>)
- TB genotyping best practices
www.cdc.gov/tb/publications/factsheets/statistics/Genotyping_BestPractices.pdf
- Tuberculosis Genotyping Information Management System (TB GIMS)
<https://ajtv-nifm-web2.cdc.gov/TBGIMS/>
- Email CDC
tbgenotyping@cdc.gov

Slide 28: THANK YOU!

CDC contact information, TB Genotyping contact information, and CDC/NCHHSTP/DTBE logo