

Introduction to Tuberculosis Genotyping

: National Center for
: Division of



Objectives

At the end of the presentation,
participants will be
able to

- 1) Explain the basics of tuberculosis (TB) genotyping
- 2) Describe how TB genotyping can be useful in TB control

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 = deoxyribonucleic**

acid (DNA) of *Mycobacterium tuberculosis*

ANSWER: TB Genotyping Is

- a. Laboratory method to detect TB infection
- b. A blood test to detect drug-resistant TB

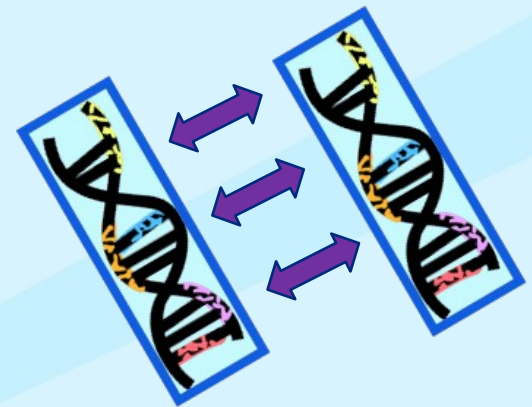
c. Laboratory approach to analyze genetic material

DNA = deoxyribonucleic acid
(DNA) of *M. tuberculosis*

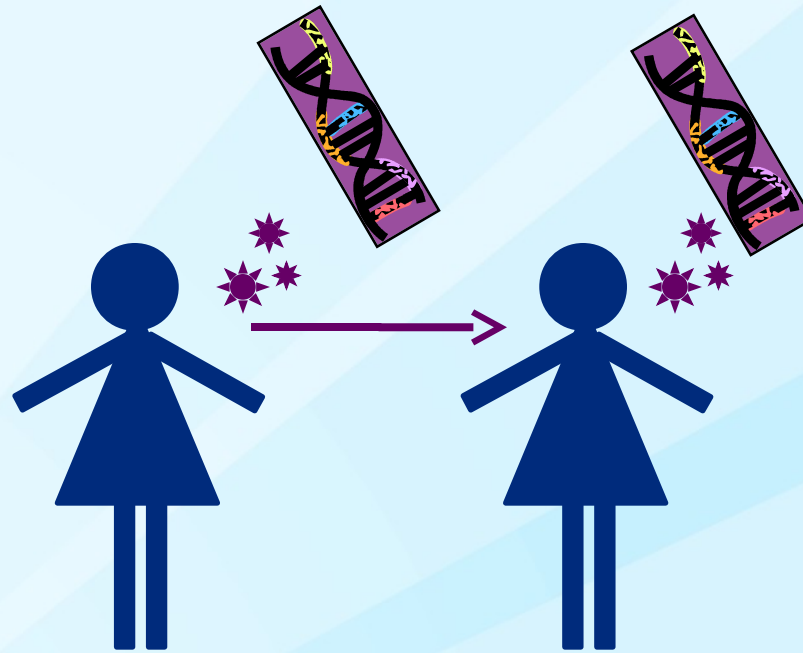


TB Genotyping

- ❑ **Only for culture-confirmed TB**
 - **The technique requires material from a culture**
- ❑ **Matching genotypes may indicate that TB cases are related**



Genotypes and *M. tuberculosis* Transmission

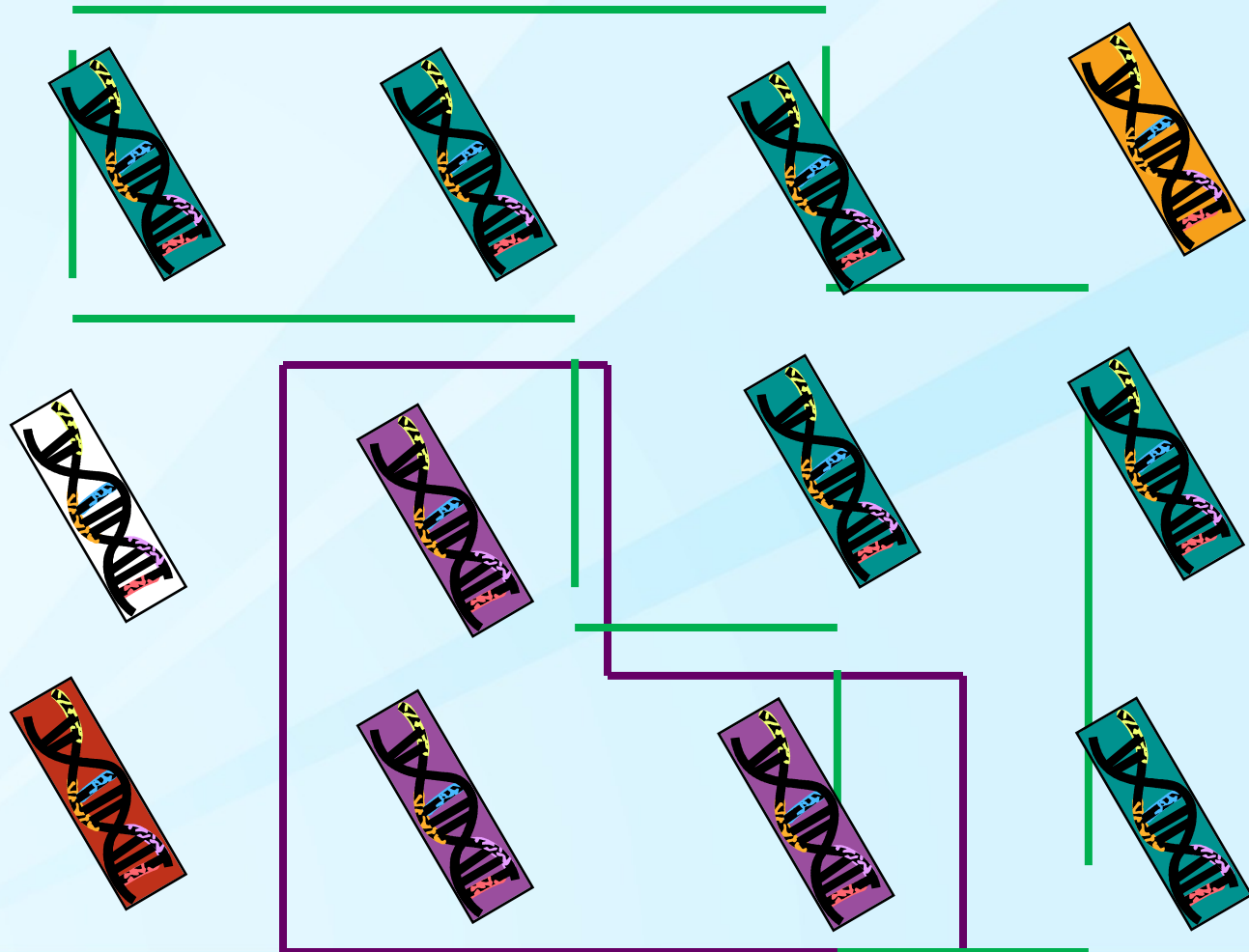


- Genotyping helps us understand transmission relationships between TB cases
- We expect genotypes from

Matching Game – Do the Pictures Match?

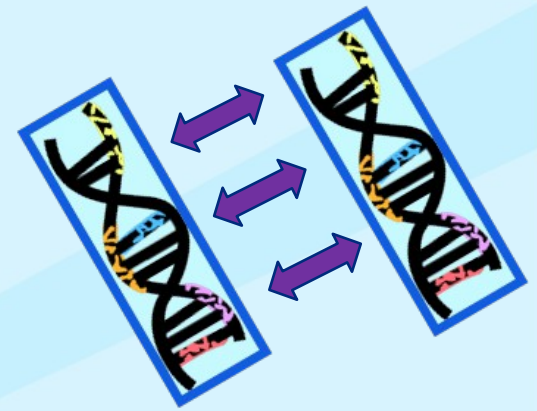


Genotype Clusters



How Can Genotyping be Useful in TB Control? (1)

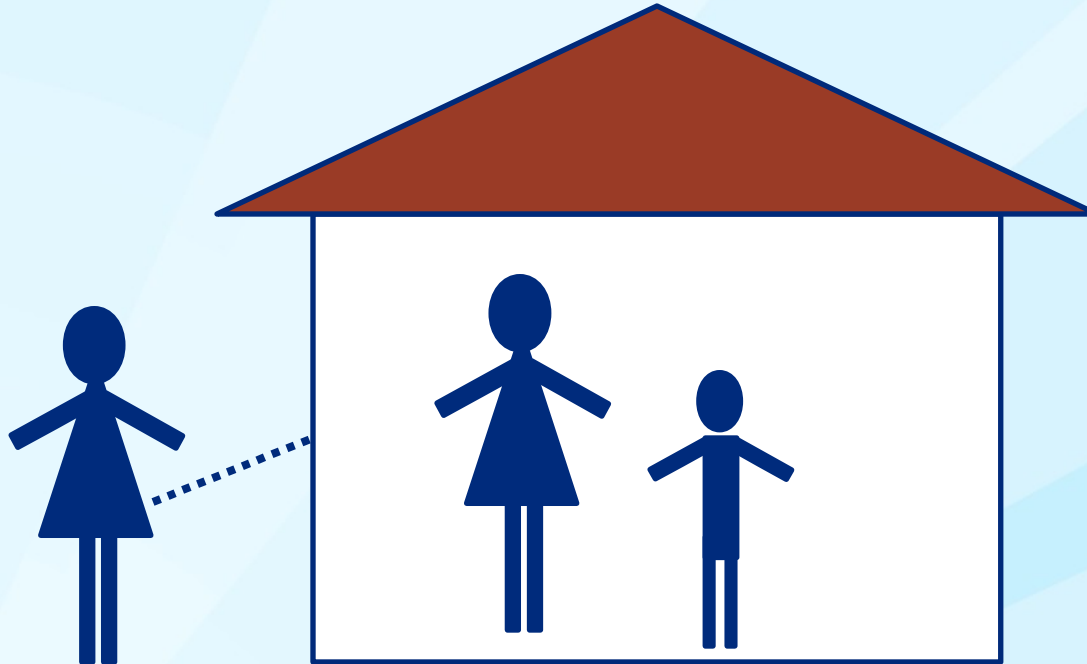
- Assist with contact investigations
 - Confirm or refute patient connections
- Find previously unidentified contacts
- Detect and prevent outbreaks



How Can Genotyping be Useful in TB Control? (2)

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

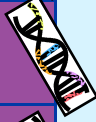
Case Scenario 1: A Household (1)



Persons diagnosed with TB spent most of their time together at the same house

Case Scenario 1: A Household (2)

Genotype results for TB cases linked to household:

Mother	Genotype 1	
Son	Genotype 1	
Neighbor	Genotype 1	

Case Scenario 1: A Household (3)

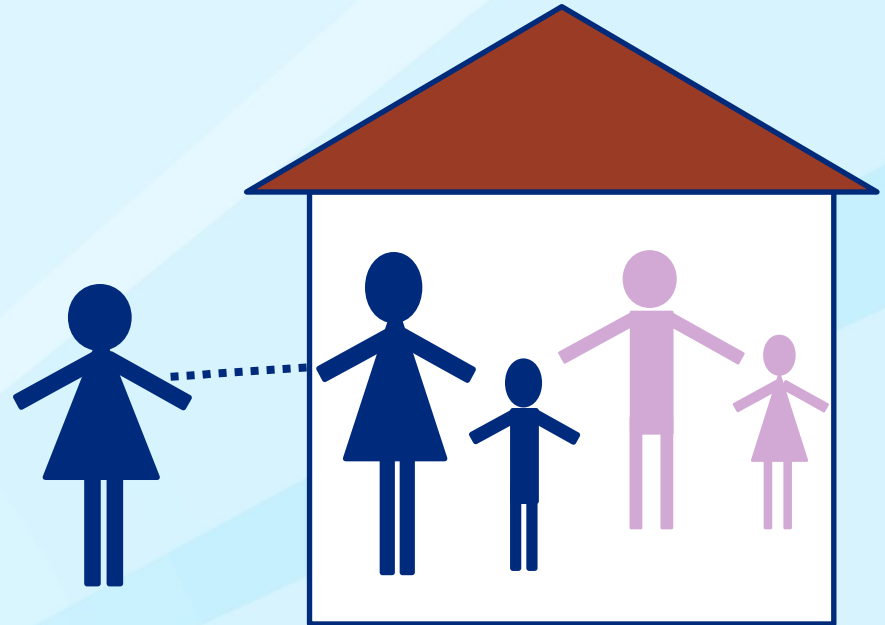
Interpretation of Genotyping Results

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

Case Scenario 1: A Household (4)

Back to the Household

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



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	

Case Scenario 1: A Household (6)

What do the Genotype Results Indicate?

- Five cases with matching genotypes within 6 months
- Cases may all be related by transmission, but
 - *When?*
 - *Where?*

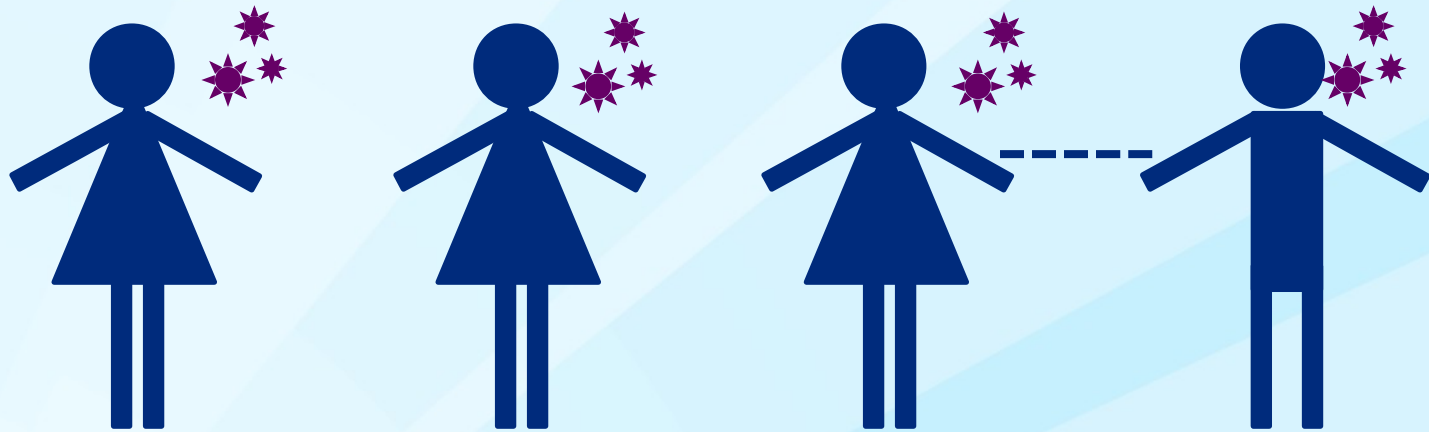
- More information is needed

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*

Case Scenario 2: A Workplace (1)



- Within one month
 - *Three women diagnosed with TB*
 - *All work at the same casino*
 - *All work on the same evening shift*

Case Scenario 2: A Workplace (2)

QUESTION:

Are these TB cases related by transmission?

a. Yes

b. No

c. Maybe



Case Scenario 2: A Workplace (3)

ANSWER:

Are these TB cases related by transmission?

a. Yes

b. No

c. Maybe!



Case Scenario 2: A Workplace (4) Genotype Results for TB Cases Linked to Casino

Employee 1	Genotype 2
Employee 2	Genotype 3
Employee 3	Genotype 4
Boyfriend	Genotype 5



Case Scenario 2: A Workplace (5)

QUESTION:

How to interpret the

- a. The genotype data are wrong
genotype results?
- b. The genotype data could be wrong,
since cases are linked
epidemiologically
- c. These cases are not related by
transmission

Case Scenario 2: A Workplace (6)

ANSWER:

How to interpret the

- a. The genotype data are wrong
genotype results?
- b. The genotype data could be wrong,
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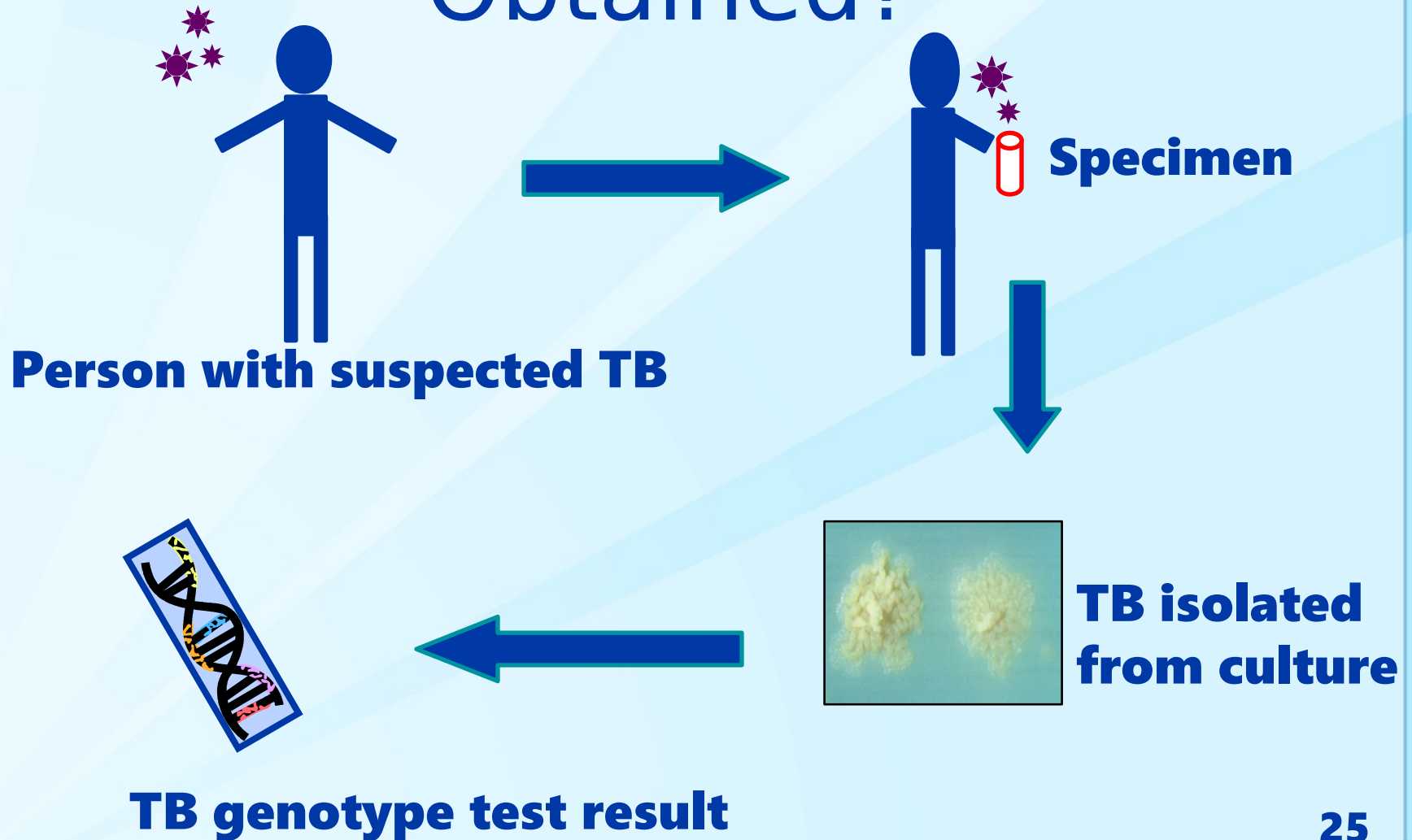
Case Scenario 2: A Workplace (7)

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*

How are Genotyping Results Obtained?



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 they match?”



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CDC Resources on Genotyping

- CDC TB genotyping website
 - *www.cdc.gov/tb/programs/genotyping/default.htm*
- TB genotyping best practices
 - *www.cdc.gov/tb/publications/factsheets/statistics/GenotypingBestPractices-FSTB.pdf*
- TB Genotyping Information Management System (TB GIMS)

Thank you!

For more information please contact the Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30329

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

Web: <http://www.cdc.gov>

Or TBCgenotyping@cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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