Introduction to TB Genotyping Information Management System (TB GIMS)

Molecular Epidemiology Activity
Surveillance, Epidemiology and Outbreak Investigations Branch
Division of TB Elimination

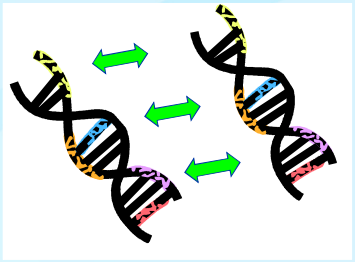
National Center for HIV/AIDS, Viral Hepatitis, STD , and TB Prevention
Division of Tuberculosis Elimination

Agenda

- What is genotyping?
- Genotype nomenclature
- NTGS methods
- Overview of TB GIMS
- TB GIMS data flow
- TB GIMS User roles
- Applying genotyping using TB GIMS

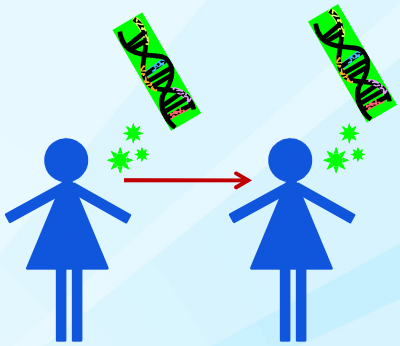
What is TB Genotyping?

- Examines tiny DNA variations to determine genetic relatedness of TB strains from different patients
- Only performed with culture-positive cases



* Citations, references, and credits – Myriad Pro, 11pt

Genotypes and Transmission



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

Genotype cluster

- Two or more patients with matching TB genotypes are considered part of a genotype cluster
  - Usually restricted by place and time
- Patients in a genotype cluster are more likely to be in the same chain of transmission
- Transmission among patients in a genotype cluster may not be
  - Recent
  - Direct

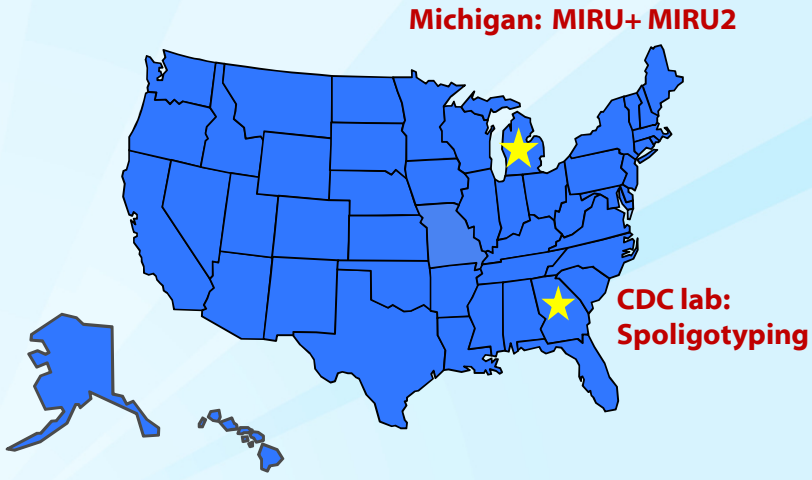
National TB Genotyping Service (NTGS)

- Started in 2004
- States voluntarily submit TB isolates for genotyping
- Genotype one isolate from every culture-positive TB patient in the United States
  - "Universal Genotyping"
- In 2015, 96% of culture-positive TB patients in the U.S. had a TB genotype result

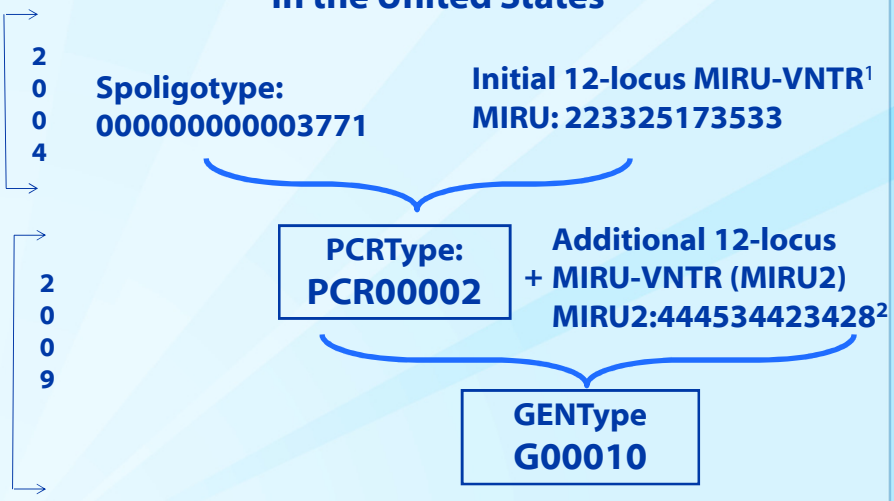
NTGS Genotyping Methods

- Two Polymerase Chain Reaction (PCR) methods
- Spacer oligonucleotide typing (Spoligotype)
  - Spoligotype: 777777477760771
- Mycobacterial Interspersed Repetitive Units (MIRU)
  - MIRU: 232234253322
  - MIRU2: 334564611872

Genotyping Laboratories



Definition for Tuberculosis Genotyping in the United States



[1] Mycobacterial interspersed repetitive unit–variable number tandem repeat

[2] The complete set of 24 loci is referred to as 24-locus MIRU-VNTR and is used for GENType designation for genotype in the U.S.

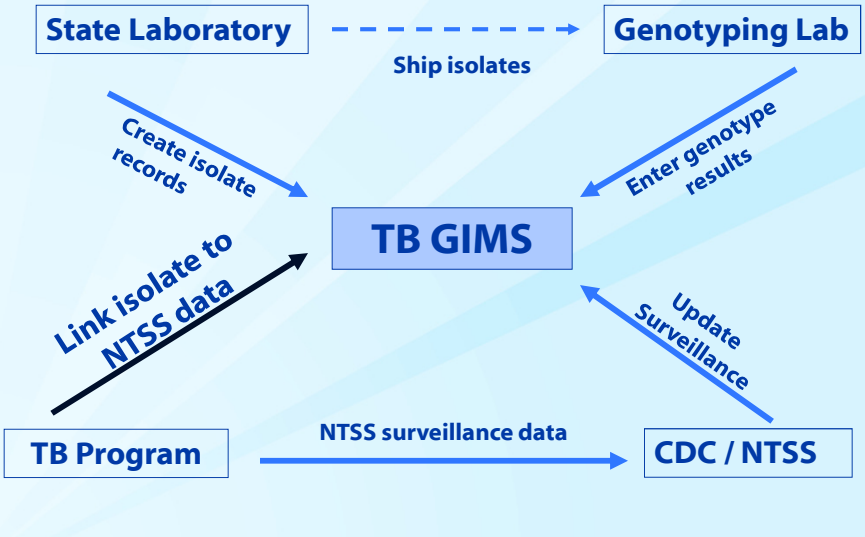
TB Genotyping Information Management System (TB GIMS)

- Launched March 2010
- Secure web-based application
- Designed to improve dissemination, management, and application of genotyping data
- As of May 2016, TB GIMS contains genotype results for over 100,000 patients

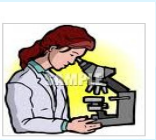
TB GIMS Functions

- Receive and update genotyping results from genotyping laboratories
- Link genotype results from NTGS to patient-level surveillance data from National TB Surveillance System (NTSS)
- View national, state, and local maps of cases in a genotype cluster
- Examine and compare demographic, clinical and risk characteristics of patients in genotype clusters
- Tools for outbreak detection

TB GIMS Data Flow



State Laboratory Super User



TB GIMS Home
- Search
  - Genotype Results
- Records
  - New Isolates
  - Edit Isolates
  - Submit Isolates
  - Import Data
- Reports and Tools
  - Generate Reports
  - Templates
- Additional Testing
  - Submit Requests
  - View Pending Results
- Directory
  - View Users

- Primary responsibility is to ensure that isolates are genotyped
- Create, submit, and edit isolate records
- Search for genotype results
- Request additional testing

TB Program Super User

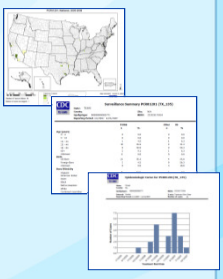
TB GIMS Home
- Search
  - Genotype Results
  - Patient Results
  - Blank State Case Numbers
  - Blank Surveillance
- Records
  - Edit Isolates
  - Find Duplicates
  - Import Data
- Reports and Tools
  - Generate Reports
  - Export Data
- Additional Testing
  - Submit Requests
  - View Pending Results
- Directory
  - View Users

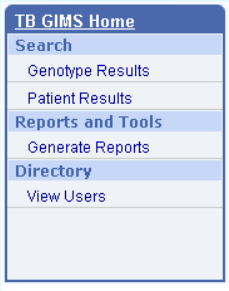
- Primary responsibility is data management
  - Link genotype results to patient records
  - Manage patient records with multiple genotype results
- Access, search, and export genotype and patient records
- Request additional testing

TB Lab and Program Super User

- For states with 1 or 2 TB GIMS Super Users who perform both Lab and Program functions
- Primary responsibility is to ensure that isolates are genotyped and linked with surveillance records
- Create, submit, edit, link and manage all TB GIMS records
- Request additional testing

Program Standard User

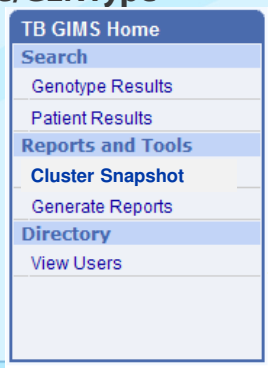




- Primary users of genotyping data
- Access, search, and export genotype and patient results

All Users

- Cluster snapshots
- Watch List
- Generate reports and maps by PCRType/GENType
  - Epidemic curves
  - Surveillance summary report
  - National distribution of genotypes
  - Lists of county-level alerts
  - National, state, and local maps
- TB GIMS Directory



Applying Genotyping Using TB GIMS

- Patient Level
  - Distinguish relapse from new infection
  - Detect false-positive cultures

Applying Genotyping Using TB GIMS

- **Patient Level**
  - Distinguish relapse from new infection
  - Detect false-positive cultures
  - **Confirm known epidemiologic links**
  - **Find unknown epidemiologic links**

Applying Genotyping Using TB GIMS

- Patient Level
  - Distinguish relapse from new infection
  - Detect false-positive cultures
  - Confirm known epidemiologic links
  - Find unknown epidemiologic links
- **Population Level**
  - **Detect outbreaks**
  - **Define scope of outbreaks**
  - **Monitor outbreaks over time**

CDC TB GIMS Website

http://www.cdc.gov/tb/programs/genotyping/tbgims/

TB Genotyping

Tbgenotyping@cdc.gov

TB GIMS Help Desk

dtbesupport@cdc.gov

(888) 300-4261

For more information please contact Centers for Disease Control and Prevention

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