The VDH TB & Newcomer Health Programs Are Counting Down to TB Elimination

World TB Day 2021
POLLING QUESTIONS

Visit: www.ttpoll.com

Session ID
AGENDA

- Program Updates and Announcements: Jasie Hearn
- Epi Update: Laura Young and Jane Tingley
- What are you?  Show me your ID!
  - Dr. Eric Houpt and Dr. Scott Heysell
- Questions
PROGRAM UPDATES

- New TB Program Manager: Jasie Hearn
- Hiring a contract monitor and administrative support
- Continued support of COVID-19 response
HOW MUCH TIME ARE YOU SPENDING ON THE COVID-19 RESPONSE?

A. 0% - 25%
B. 26% - 50%
C. 51% - 75%
D. 76% - 100%
TRAINING OPPORTUNITIES

- New TB Nurse Training – Virtual
  - April 28, 2021
  - September 29, 2021
  - November 4, 2021
  - Registration: [VDH TB Program Training Page](#)
- Lab Training – May 14, 2021, 1 – 2 PM
- QuantiFERON-TB Gold Plus Training – April 22, 2021, 10:30 – 11:30 AM
- Biennial Nurse Meeting and Biennial TB Outreach Worker Meeting – Postponed (2022)
- Special opportunity for nurses to attend the virtual National TB Conference (June/July)
- RVCT/VEDSS and EDN Training
- Webinars
- On-demand Courses
WHAT TRAINING TOPICS ARE YOU INTERESTED IN?

- weight lifting
- bungee jumping
- jogging
- running
- rock climbing
- hiking
- video games
- kayaking
- ice fishing
- swimming
HOW MUCH TIME DO YOU THINK YOU WILL HAVE IN THE NEXT FEW MONTHS TO ATTEND TRAINING, IF OFFERED?

A. Little to none
B. A couple of hours sporadically
C. A few hours/month
D. I can attend at any time
OPPORTUNITIES FOR ENGAGEMENT

❖ Workload Evaluation Project
❖ Case Review
❖ Cohort Review
PROCESS IMPROVEMENT

- Second line drug approval process
  - New web-based form
- Alternative Housing and Incentives Program
- T Spot and QuantiFERON-TB Gold Plus Testing
- Send information via encrypted email instead of faxing
  - tuberculosis@vdh.virginia.gov
NEW AND NOTEWORTHY

- Treatment advancements
  - BPaL
  - LTBI Testing and Treatment: Clinical Recommendations
  - Shorter-course Treatment Regimen for TB Disease (Clinical Trials)
RESOURCES FOR DISTRICTS

- Guidance and Website updates
  - Sputum Collection Recommendations
  - Therapeutic Drug Monitoring Guidance
  - Orientation Plan for Public Health Nurses
  - Treatment Summary Templates
  - EDN Guidance
  - Annual TB Education Template

- Data and Reports
  - 2019 Virginia TB Fact Sheet
  - 2019 Virginia TB Annual Report

- GTBI
  - ID Crowd

- UVA Consultants

Don’t forget about incentives and enablers for your clients!

Are there resources you are looking for?
GOING ABOVE AND BEYOND

- Assisting another state on the weekend by tracking down a critically ill TB client’s family member – saved the patient’s life!
- Working with non-compliant clients
  - French fries and applesauce
  - Client traveled out of the country without clearance
- Ensuring clients receive medications
  - Coming in early
  - Staying late
  - Meeting them in various locations and settings
- Conducting large contact investigations in the midst of COVID-19
  - Then finding out the person didn’t have TB.
- Linking patients with resources to ensure their needs are met and they receive the medical care/services they need.
  - Supplies and support for a new baby
- Using all available means to ensure children are evaluated.
- Ensuring client safety and wellbeing
- Finding creative ways to incentivize clients
- Participating in cohort and case reviews
- Participating in the workload evaluation project
Thank you
Tuberculosis Epidemiology: A Global, National and Virginia Update

LAURA R. YOUNG, MPH, CIC
TB EPIDEMIOLOGIST/SURVEILLANCE COORDINATOR
JANE TINGLEY, MPH
LTBI EPIDEMIOLOGIST
MARCH 24, 2021
Overview

Global Tuberculosis (TB) Update
National TB Update*
State TB Update*
LTBI Update*

*Please note that all 2020 data is provisional
Global Tuberculosis Incidence

- In 2019 there were an estimated 10 million new TB cases.
- TB is the leading cause of death worldwide from a single infectious agent.
- Eight countries accounted for two thirds of the global total: India, Indonesia, China, the Philippines, Pakistan, Nigeria, Bangladesh and South Africa.
- Nearly one in ever four people in the world is infected with latent TB.

Global COVID-19 Pandemic and TB

• Modelling has suggested that the number of people developing TB could increase by more than 1 million per year in 2020–2025

• Estimated increases in TB deaths could be 0.2-0.4 million in 2020 alone

• The economic impact is predicted to worsen at least two of the key determinants of TB incidence: GDP per capita and undernutrition
Pediatric Tuberculosis

- Children accounted for an estimated 12% of TB cases in 2019
- Among HIV-negative TB-related deaths in 2019, 16% were children and among HIV-positive TB-related deaths, 17% were children
- Globally in 2019, an estimated 1.3 million children aged under 5 years were household contacts of bacteriologically confirmed pulmonary TB cases

Global MDR/RR-Tuberculosis

- There were an estimated 465,000 incident cases of MDR/RR-TB in 2019
- Nearly 50% of cases were in India (27%), China (14%) and Russia (8%)
- There were about 182,000 deaths from MDR/RR-TB in 2019
Tuberculosis in the United States, 2020
(2020 data is embargoed until 3/25/2021)

• Provisional 2020 United States case count: ?
• Provisional 2020: United States case rate: ?
• Likely the lowest rate and number of TB cases on record

*Based on provisional NTSS data as of 2/17/2021
Tuberculosis in Virginia, 2020

- 168 cases in 2020
- Rate of 2 per 100,000 population
Tuberculosis Incidence Rate, Virginia and the United States, 2011-2020

Rate per 100,000 Population

- VA Rate
- U.S. Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>VA Rate</th>
<th>U.S. Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>2012</td>
<td>3.2</td>
<td>3.2</td>
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<tr>
<td>2013</td>
<td>3.0</td>
<td>3.0</td>
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<tr>
<td>2014</td>
<td>3.0</td>
<td>3.0</td>
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<tr>
<td>2015</td>
<td>3.0</td>
<td>3.0</td>
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<tr>
<td>2016</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>2017</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>2018</td>
<td>2.8</td>
<td>2.8</td>
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<tr>
<td>2019</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>2020</td>
<td>2.2</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Tuberculosis Cases by City/County, Virginia, 2020
Tuberculosis Cases by Race and Ethnicity Among Non-U.S.-Born Case, Virginia, 2011-2020

- White
- Multi-Race
- Black or African American
- Asian
Tuberculosis Cases by Race and Ethnicity Among U.S.-Born Cases, Virginia, 2011-2020
County of Birth of Tuberculosis Cases, Virginia, 2020

- U.S.: 22 cases
- Philippines: 13 cases
- India: 17 cases
- Ethiopia: 14 cases
- Vietnam: 15 cases
Countries of Birth of Tuberculosis Cases, Virginia, 2016-2020
Number and Percent of Tuberculosis Cases with Diabetes, Virginia, 2011-2020

Number of Cases:
- 2011: 13.6
- 2012: 12.4
- 2013: 14.5
- 2014: 16.7
- 2015: 21.2
- 2016: 15.8
- 2017: 15.7
- 2018: 17.1
- 2019: 18.3
- 2020: 19.0

Percent of Cases:
- 2011: 13.6
- 2012: 12.4
- 2013: 14.5
- 2014: 16.7
- 2015: 21.2
- 2016: 15.8
- 2017: 15.7
- 2018: 17.1
- 2019: 18.3
- 2020: 19.0

Graph showing the number and percent of tuberculosis cases with diabetes in Virginia from 2011 to 2020.
Tuberculosis Cases with HIV Co-infection, Virginia, 2011-2020

Number of Cases/% of Total Cases

2011: # 9, % 4.1
2012: # 12, % 5.1
2013: # 10, % 5.6
2014: # 10, % 5.1
2015: # 7, % 3.3
2016: # 8, % 3.9
2017: # 3, % 1.5
2018: # 4, % 2.0
2019: # 5, % 2.6
2020: # 3, % 1.8

Chart shows a decrease in both the number of cases and percentage of HIV co-infections from 2011 to 2020.
Drug Resistance Among Tuberculosis Cases, Virginia, 2011-2020

Number of Cases/% Total Cases

Firstline  MDR  %Total Cases

2011  17  3  100
2012  18  2  100
2013  20  5  100
2014  16  4  100
2015  11  3  100
2016  13  3  100
2017  12  2  100
2018  14  2  100
2019  15  2  100
2020  8  1  100
LTBI in Virginia
New Reported Cases of LTBI By District of Residence, Virginia, 2020

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Number of Records. The marks are labeled by sum of Number of Records and District. Details are shown for First Dist. The data is filtered on Case Status1 and MMWR Year1. The Case Status1 filter keeps Confirmed, Probable and Suspect. The MMWR Year1 filter ranges from 2020 to 2020.
LTBI Cases in Virginia, 2019-2021

Number of Cases

Year

2019: 6620
2020: 5502
2021: 1121
LTBI Cases by Case Status, Virginia, 2019-2020

<table>
<thead>
<tr>
<th>Year</th>
<th>Suspect</th>
<th>Confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>6067</td>
<td>553</td>
</tr>
<tr>
<td>2020</td>
<td>5266</td>
<td>236</td>
</tr>
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</table>
LTBI Case Distribution by Region, Virginia, 2019-2020

<table>
<thead>
<tr>
<th>Region</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>608</td>
<td>522</td>
</tr>
<tr>
<td>Eastern</td>
<td>825</td>
<td>627</td>
</tr>
<tr>
<td>Northern</td>
<td>4166</td>
<td>3534</td>
</tr>
<tr>
<td>Northwest</td>
<td>499</td>
<td>453</td>
</tr>
<tr>
<td>Southwest</td>
<td>522</td>
<td>366</td>
</tr>
</tbody>
</table>
LTBI Cases by Sex, Virginia, 2019-2020

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>3499</td>
<td>2753</td>
<td>368</td>
</tr>
<tr>
<td>2020</td>
<td>3066</td>
<td>2335</td>
<td>101</td>
</tr>
</tbody>
</table>

Legend:
- Red: 2019
- Orange: 2020
Top Five Reporters for LTBI - 2020

1. LabCorp (1,970)
2. Quest Teterboro (1,320)
3. Quest Diagnostics – Chantilly (472)
4. Fairfax Public Health Laboratory (365)
5. Quest Diagnostics – Atlanta (175)
Questions?

Contact Us:
Laura R. Young, MPH, CIC
TB Epidemiologist
laura.r.young@vdh.virginia.gov
804-864-7922

Jane C. Tingley, MPH
LTBI Epidemiologist
jane.tingley@vdh.Virginia.gov
804-864-7921
References


COVID-19 and Tuberculosis

The coronavirus (or COVID-19) pandemic has made the focus on tuberculosis (or TB) prevention and treatment more necessary and urgent in the state of Virginia.

COVID-19

- Is a respiratory illness caused by a virus that can spread from person-to-person
- Additional COVID-19 Symptoms
  - Symptoms may develop 2-14 days after exposure
  - Other possible symptoms:
    - New loss of taste or smell
    - Sore throat
    - Congestion or runny nose
    - Nausea or vomiting
    - Muscle or body aches
    - Diarrhea
    - Bilateral abnormalities on chest x-ray

TB

- Is a serious and sometimes deadly illness caused by bacteria that usually attacks the lungs, but can also affect other parts of the body
- Additional TB Disease Symptoms
  - Symptoms may develop after weeks to years if not treated for latent TB infection
  - Other possible symptoms:
    - Night sweats
    - Coughing up blood or phlegm
    - Weight loss
    - Unilateral abnormalities on chest x-ray

Both COVID-19 and TB may cause:
- Cough
- Shortness of breath
- Fever
- Chills
- Fatigue
- Chest pain
- Abnormal chest x-ray

Both can spread when an infected person coughs, sneezes, sings, or talks

Who is at a Higher Risk for TB?

- People who have lived in or visited another country other than the United States, Canada, Australia, New Zealand, or Western and Northern Europe
- Those who have a weakened immune system (e.g., HIV, organ transplant, cancer, diabetes, etc.)
- History of close contact to someone who has TB disease
- People who have experienced homelessness or been incarcerated

Recommendations

- Test for TB in individuals with TB risk factors
- Encourage and initiate appropriate treatment
- Test for COVID-19 in individuals with a new cough
- Encourage physical distancing and wearing a mask when around others
- Encourage frequent hand washing and surface disinfection
- Encourage COVID-19 vaccination

Where to Get Tested/More Information

- Have questions? Call the VDH hotline 877-ASK-VDH3 (877-275-8343)

Virginia Department of Health
www.vdh.virginia.gov
Adapted from Los Angeles County Department of Public Health “COVID-19 & Tuberculosis” Handout

Revised 02/2021
Nontuberculous Mycobacteria

With over 190 species and subspecies, nontuberculous mycobacteria (NTM) are on the rise. It is more important than ever to learn about these organisms and how to handle them.

What are they?

NTM are environmental opportunistic pathogens.

NTM are organisms that generally live in water, soil, and air. They can cause human infection, particularly of the lung, but can also be laboratory contaminants. M. gordonae is usually a contaminant.

Clinical Manifestations

Most common: NTM pulmonary disease
- Chronic/recurrent cough, sputum production, fatigue, malaise, dyspnea, fever, chest pain, weight loss

Lymphatic
- Involved nodes enlarge rapidly, may rupture, not tender

Skin/soft tissue and bone
- Localized drainage/abscess at puncture site
- Nosocomial infections: long-term catheters, surgical wound infections

Disseminated disease
- Seen in immunocompromised hosts:
  - Fever, night sweats, weight loss, abdominal pain, diarrhoea

NTM are grouped by their growth rate in subculture.

Rapid-growing
- Growth within 7 days
- Most common examples:
  - M. abscessus complex
  - M. chelonae, M. fortuitum

Slow-growing
- Growth after 7 days
- Most common example:
  - M. avium complex includes M. avium, M. intracellulare, M. kansasi, M. xenopi

NTM with Highest Clinical Significance

1. M. avium complex (MAC)
   - Most common NTM lung disease is the most common presentation, particularly in elderly females with lung nodules and bronchiectasis

2. M. kansasii
   - Closely resembles tuberculosis

3. M. abscessus
   - Causes lung disease and other infections, extremely resistant to antibiotics, common in those with cystic fibrosis or non-cystic fibrosis bronchiectasis, including those without smoking history

Higher rates of NTM are found in the south and southeastern United States than in other regions.
"What are You? Show me your ID!"

The overlap of tuberculosis (TB), non-tuberculous mycobacteria (NTM), and COVID-19

Scott Heysell MD, MPH
Associate Professor of Medicine
Infectious Diseases and International Health

Eric Houpt MD
Professor of Medicine
Chief, Infectious Diseases and International Health
We are grateful for our public health services!
20% increase in TB deaths worldwide in 5 years after the pandemic compared to pre-pandemic.
University of Virginia Health changes in TB care during the pandemic

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTBI tests</td>
<td>837</td>
<td>350</td>
</tr>
<tr>
<td>LTBI positive tests</td>
<td>84</td>
<td>42</td>
</tr>
<tr>
<td>Active TB inpatients</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Active TB outpatients</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>TB deaths</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

*Far less* LTBI care, but doubling of people with active TB seen in inpatient and outpatient settings

Courtesy of Dr. Tania Thomas
Preliminary analysis suggests→

TB and COVID-19 were frequently diagnosed simultaneously, complicating and often delaying diagnosis in some participants.

SARS CoV-2 infection may amplify the progression to active TB disease.

SARS CoV-2 can develop in patients treated/cured of TB often in setting of chronic lung disease.

People co-infected with TB and SARS CoV-2 had a high impact on the health system.

COVID-19 has disrupted TB services globally.

Virginia participating in multi-country study with World Health Organization to understand COVID in people with current and prior TB

33 centers in 16 countries on 5 continents→
attendance for TB care was lower during the first 4 months of the pandemic in 2020 than for the same period in 2019
A more common scenario in Virginia...

Why is she *unlikely* to be suffering from COVID-19?

- Nasopharyngeal SARS-CoV-2 PCR was negative
- Two separate sputum specimens obtained for bacterial and AFB culture → Both with AFB (*smear negative, culture positive*)

68 year old woman

- Chronic non-productive cough
- Shortness of breath
- Mild malaise

- Possible h/o allergic bronchopulmonary aspergillosis
- No other known immunocompromising conditions

- CT with peribronchovascular infiltrates, nodules (no bronchiectasis)
COVID?

Seems unlikely...

Probably not...

COVID
## Non-tuberculous mycobacteria

### Rapidly growing mycobacteria
- *M. chelonae–abscessus complex*
  - *M. abscessus subsp. abscessus*
  - *M. abscessus subsp. bolletii*
  - *M. abscessus subsp. massiliense*
  - *M. chelonae*
- *M. fortuitum*
- *M. smegmatis*
- *M. vaccae*

### Slowly growing mycobacteria
- *M. marinum*
- *M. ulcerans*
- *M. avium complex*
  - *M. avium*
  - *M. intracellulare*
  - *M. chimaera*
- *M. haemophilum*
- *M. xenopi*
- *M. kansasii*
- *M. simiae*
- *M. terrae complex*
- *M. gordonae*
- *M. tuberculosis complex*
- *M. leprae*

### Legend
- True pathogens
- Opportunistic pathogens
- Saprophytes*

*can be detected in clinical samples and need retesting to confirm infection*
Example: *Mycobacterium abscessus* pathogenicity

- **Possible sources of M. abscessus infection in humans**
  - Biofilm
  - Water sources
  - Amoebae
  - Fomites

- **Host risk factors**
  - Genetic disorders
  - Lung disease and structural abnormalities
  - Co-infections
  - Lifestyle choices

- **Recruitment of immune cells and granuloma formation**

- **Unknown factors**
  - Smooth-to-rough transition, granuloma breakdown and cording

- **Recruitment of adaptive immune cells and containment of infection**

*Johansen et al, Nature Rev Micro 2020*
“I resist anything but temptation.”

Lord Darlington- Act 1

“Experience is the name everyone gives to their mistakes.”

Mr. Dumbly- Act 3

1892- Oscar Wilde
Not all positive NTM sputum cultures require treatment

<table>
<thead>
<tr>
<th>Clinical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pulmonary symptoms, nodular or cavitary opacities on chest radiograph, or a high-resolution computed tomographic scan that shows multifocal bronchiectasis with multiple small nodules</td>
</tr>
<tr>
<td>and</td>
</tr>
<tr>
<td>2. Appropriate exclusion of other diagnoses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Microbiologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Positive culture results from at least two separate expectorated sputum samples (If the results from the initial sputum samples are nondiagnostic, consider repeat sputum acid-fast bacillus (AFB) smears and cultures)</td>
</tr>
<tr>
<td>or</td>
</tr>
<tr>
<td>2. Positive culture results from at least one bronchial wash or lavage</td>
</tr>
<tr>
<td>or</td>
</tr>
<tr>
<td>3. Transbronchial or other lung biopsy with mycobacterial histopathological features (granulomatous inflammation or AFB) and positive culture for NTM or biopsy showing mycobacterial histopathological features (granulomatous inflammation or AFB) and one or more sputum or bronchial washings that are culture positive for NTM</td>
</tr>
</tbody>
</table>

Symptoms + imaging
Exclude other diagnoses
2 or more separated sputum samples (or one bronchoscopy specimen)

ATS/IDSA Guidelines 2007 (repeated in 2020 treatment guidelines)
TB or Not TB?... that is the question

**M. tuberculosis complex**

* M. tuberculosis
* M. bovis (almost all pyrazinamide resistant)
* M. africanum (more W. Africa)
* M. microti
* M. canetti

**Non-tuberculous mycobacteria**

>140 species
~25 known to cause human disease

**Almost always disease**

* M. kansasii

**Intermediate**

* M. avium complex (MAC)

**Possible contaminant**

* M. chelonae
* M. simiae

**Likely contaminant**

* M. gordonae

For example: MAC and *M abscessus* group account for >90% of all NTM in cystic fibrosis
Recall our 68 year-old woman....

AFB species: 
*M. abscessus*
Functional *erm* gene 
(subsp. *abscessus*)

DST:
- Amikacin **Susceptible**
- Clarithromycin **Resistant**
- TMP/Sulfa **Resistant**
- Linezolid **Intermediate**
- Doxycycline **Resistant**
- Minocycline **Resistant**
- Tigecycline **Susceptible**
- Imipenem **Intermediate**
- Cefoxitin **Resistant**
- Clofazimine **Susceptible**
Cystic Fibrosis, screening rates and positive cultures (tip of the iceberg)

Most predictive factor for **NTM positivity** among patients with cystic fibrosis, was the **saturated vapor pressure of their zip code**

Adjimean, *AJRCCM* 2014
Prevalence of pulmonary disease caused by non-tuberculous mycobacteria (NTM) is increasing worldwide

Environmental factors

Increased surveillance / more sensitive diagnostics

More immunosuppressed patients, living longer

Outbreaks of clonal strains with increased transmissibility or favorable environment

1000-1,000,000 cells/cubic meter near surface air

2 sites in Colorado
~25% of bioaerosol bacteria are Actinobacteria (mycobacteria)

Adjimean et al, AJRCCM 2012
Bowers, Env Science Tech 2013
Large nosocomial outbreak of *Mycobacterium abscessus* at Duke (2 clonal strains)

Baker et al, *Clin Infect Dis* 2017
NTM treatment principles

*Unlike TB*, culture conversion to negative is not always possible

Occasional disease recurrence (depends on the host, the specific NTM species, and the multidrug treatment with the first episode)

Some NTM treatment without antibiotics (surgery common for extrapulmonary disease)

*Unlike TB*, the minimum duration is 12 months (usually 12 months beyond culture conversion for pulmonary disease)

Treatment ranges from three drugs for *Mycobacterium avium* complex (MAC) to five drugs with IV induction phase for drug-resistant NTM like *Mycobacterium abscessus*
New or repurposed mycobacterial drugs

- Bedaquiline
- Delamanid
- Pretomanid
- Clofazimine
- Tedizolid
- Sutezolid
- Omadacycline

Increase phospholipase A2 → accumulation of lysophospholipids
This is what a complete treatment regimen looks like over time for a complicated NTM (*M. abscessus*) → a lot like MDR or XDR-TB!

Side effects and treatment modification are the norm.
Irkutsk, Siberia: modern day surgery pursued for difficult mycobacterial cases

Photos with permission.

Thoracoplasty with rib resection
Resected pulmonary “tuberculoma”
So we will never forget about COVID-19....

Non-tuberculous mycobacteria (NTM) can mimic tuberculosis and are increasing worldwide.

Diagnostic testing in the pandemic should consider mycobacterial disease (NTM and TB), particularly with chronic cough and/or extrapulmonary symptoms.

Unlike TB, not all NTM require treatment and unlike rifampin-susceptible TB, when NTM require treatment it is often long (12 months or more) and may necessitate surgery.
MAC
M. avium complex
Eric Houpt
Professor and Chief
Infectious Diseases, UVA
NTM infections increasing in US

Fig. 1. NTM infections increasing over time in Virginia. Left, Virginia had overall 36% skin test reactivity to M. intracellulare among 3280 young male Navy recruits in 1958 (1). Right, mycobacterial infections over time at UVA Hospital (M. gordonae excluded) led by MAC (red). Bottom, A search of CT scan radiology reports reveals a higher appreciation for “NTM” on the differential diagnosis.
Example 1

- 71 y.o. female with progressive nodular bronchiectasis
- On therapy for years, including standard triple therapy: Azithromycin, Rifampin, Ethambutol
## Example 2

**MDR TB patient, cavity in RUL measuring 9.6 cm**

<table>
<thead>
<tr>
<th>Date</th>
<th>Site</th>
<th>SMEAR</th>
<th>Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/16/19</td>
<td>Sputum</td>
<td>Many AFBs</td>
<td></td>
</tr>
<tr>
<td>12/16/19</td>
<td>Sputum</td>
<td>Rare AFBs</td>
<td></td>
</tr>
<tr>
<td>12/20/19</td>
<td>Sputum</td>
<td>4+</td>
<td></td>
</tr>
<tr>
<td>12/23/19</td>
<td>Sputum</td>
<td>4+ 3+ M.tb</td>
<td></td>
</tr>
<tr>
<td>12/30/19</td>
<td>Sputum</td>
<td>3+ 2+ M.tb</td>
<td></td>
</tr>
<tr>
<td>1/6/2020</td>
<td>Sputum</td>
<td>2+</td>
<td>M. avium</td>
</tr>
<tr>
<td>1/13/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>1+ M.tb</td>
</tr>
<tr>
<td>1/21/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>11-25 colonies M.tb</td>
</tr>
<tr>
<td>1/27/2020</td>
<td>Sputum</td>
<td>Negative</td>
<td>M.Tb</td>
</tr>
<tr>
<td>2/3/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>Negative</td>
</tr>
<tr>
<td>2/7/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>Negative</td>
</tr>
<tr>
<td>2/12/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>Negative</td>
</tr>
<tr>
<td>2/18/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>Negative</td>
</tr>
<tr>
<td>2/21/2020</td>
<td>Sputum</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>2/28/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>MAC</td>
</tr>
<tr>
<td>3/4/2020</td>
<td>Sputum</td>
<td>1+</td>
<td>MAC</td>
</tr>
<tr>
<td>3/9/20</td>
<td>Sputum</td>
<td>1+</td>
<td>negative</td>
</tr>
<tr>
<td>3/18/2020</td>
<td>Sputum</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>3/20/2020</td>
<td>Sputum</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>3/23/20</td>
<td>Sputum</td>
<td>Negative</td>
<td>MAC</td>
</tr>
</tbody>
</table>

Clinically doing well. Assessment: probably MAC colonization of cavity, probably no MAC treatment, refer nonurgently post MDR TB-rx to Pulmonary or Infectious Disease MD.
Recommendation

• If multiple sputum/respiratory specimens culture positive for the same Mycobacterium, refer non-urgently to ID/Pulmonary MD

<table>
<thead>
<tr>
<th>Date</th>
<th>Client 1</th>
<th>Client 2</th>
<th>Client 3</th>
<th>Client 4</th>
<th>Client 5</th>
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</thead>
<tbody>
<tr>
<td>AFB culture 1</td>
<td>negative</td>
<td>negative</td>
<td>M. gordonae</td>
<td>MAC</td>
<td>M. abscessus</td>
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<tr>
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<td>negative</td>
<td>negative</td>
<td>negative</td>
<td>negative</td>
<td>M. abscessus</td>
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<td>MAC</td>
<td>MAC</td>
<td>MAC</td>
<td>M. abscessus</td>
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<tr>
<td></td>
<td>Nothing to do</td>
<td>Nothing to do</td>
<td>Nothing to do</td>
<td>Refer</td>
<td>Refer</td>
</tr>
</tbody>
</table>

• Can always call or refer to Houpt/Heysell UVA (434 982 1700) or someone more local

• NTMinfo: https://ntminfo.org/united-states-of-america/
New VDH-UVA-VT NTM Project

• January 2021 – December 2025
• Focusing on the two most common NTM:
  • M. avium complex
  • M. abscessus
Project

• 1. Sequencing of MAC and abscessus from patients and environmental sources

• 2: Among newly treated NTM lung disease patients, perform serum drug levels to see if low drug levels predict poorer clinical outcome
Workflow

VDH identifies possible NTM lung disease cases = multiple respiratory cultures positive for the same NTM

- VDH/UVA connect with the ordering physician office to enroll participant if interested
- OR, refer to UVA

- Enrollment
  - Quarterly follow-up x 5 years
  - Environmental testing
  - If starting therapy, serum drug levels
Team

• UVA
  • Eric Houpt, Scott Heysell, Suzanne Stroup, Amy Mathers, Hardik Parikh, Suporn Pholwat, Girija Ramakrishnan, Michael Hanley
  • Main contact: Lisa Johnson: SFJ8N@hscmail.mcc.virginia.edu

• VDH
  • Jasie Hearn, Laura Young

• Virginia Tech
  • Joe Falkingham