MDR TB Outbreak in Kansas

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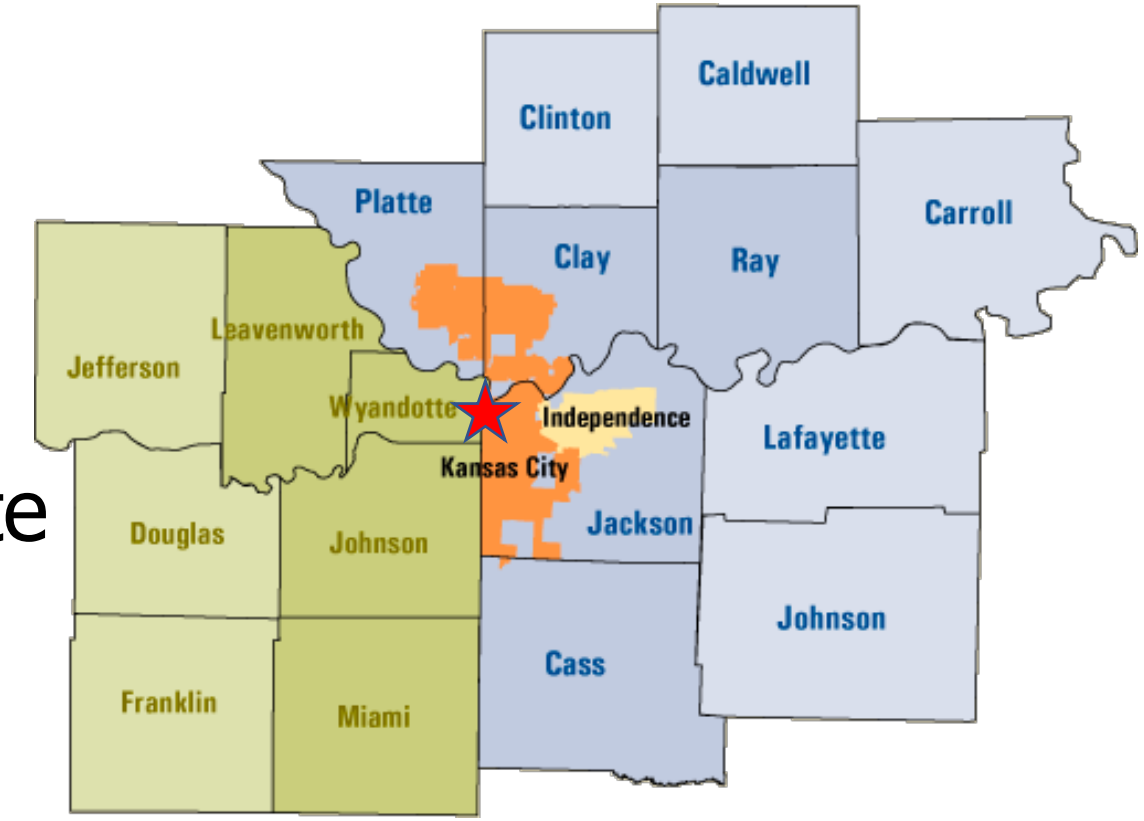
Unified Government Public Health Department

Background

- Wyandotte County, KS is part of Kansas City metro region
- KC is a bi-state metro—people cross state lines frequently
- Prior to this outbreak, Wyandotte averaged about 5-10 active TB cases a year

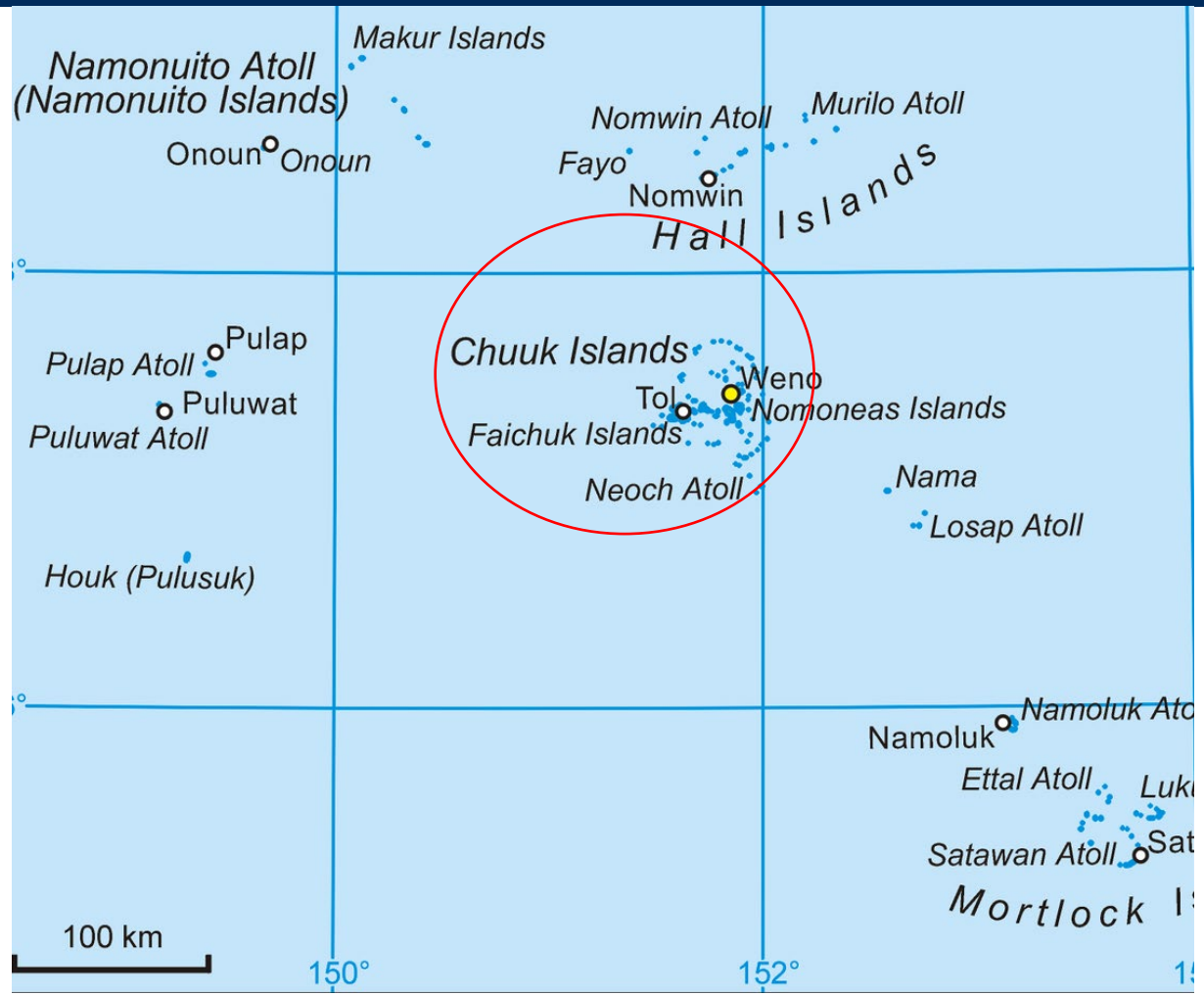


Background

- Federated States of Micronesia—island country consisting of 4 states and over 600 islands
- Was a U.S trust territory, now an independent nation
- High burden tuberculosis—100 per 100,000 in 2019
- Within Micronesia, the Chuuk islands
- Chuukese is spoken language

Background


Asia
Micronesia
Northern Mariana Islands
Guam
Palau
Federated States of Micronesia
Marshall Islands
Kirabati
Hawaii
Papua New Guinea
Nauru
West Papua
Solomon Islands
Tuvalu
Tokelau
Wallis & Futuna
Samoa
American Samoa
Melanesia
Vanuatu
Tonga
Fiji
Niue
Cook Islands
New Caledonia
Polynesia
Australia
Australasia
New Zealand
0
1,500 mi
0
1,500 km


Makur Islands
Namonuito Atoll (Namonuito Islands)
Onoun
Onoun
Nomwin Atoll
Murilo Atoll
Fayo
Nomwin
Hall Islands
Pulap
Pulap Atoll
Puluwat
Puluwat Atoll
Chuuk Islands
Weno
Tol
Nomoneas Islands
Faichuk Islands
Neoch Atoll
Nama
Losap Atoll
Houk (Pulusuk)
Namoluk Atoll
Namoluk
Ettal Atoll
Satawan Atoll
Mortlock Is
100 km
150°
152°

Timeline

1st Patient

- Nov 5, 2021: **8-month-old admitted to Children's Mercy with** possible **TB meningitis**; began RIPE treatment

Household Investigation

- Mid Nov 2021: ID two household contacts with active TB (pts 2 and 3), and two with latent TB
  Started on RIPE, then switched to BPaL+moxi later
- Contact investigation presumed over

Drug Resistance Discovered

- Late Nov 2021: initial CSF and trach aspirate from 1st patient confirmed TB and showed rifampin resistance

2nd, 3rd Patients

- Mid Dec 2021.: Patients 2 and 3 hospitalized due to severity of their medical condition

Patient 4

- Jan 2022: Missouri health department reported 13-month-old with possible pulmonary TB and scrofula;
- Connection made to Wyandotte County family

Contact Investigation

- Feb-May 2022: Contact investigation extended to 4 interconnected families living in Wyandotte County
- 8 additional patients with active MDR TB identified

Connections between patients

- Five families within four households within Wyandotte County from Micronesia
- Interconnected families who spent a lot of time together—work, school, shared transportation, social time
- Strong sense of community

Antibiotic Resistance

MTBC Agar Proportion Susceptibility*	% Resistant	Interpretation
Isoniazid 0.2 µg/mL	100 %	Resistant
Isoniazid 1.0 µg/mL	100 %	Resistant
Isoniazid 5.0 µg/mL	100 %	Resistant
Rifampin 1.0 µg/mL	50 %	Resistant
Ethambutol 5.0 µg/mL	25 %	Resistant
Streptomycin 2.0 µg/mL	0 %	Susceptible
Streptomycin 10.0 µg/mL	0 %	Susceptible
Rifabutin 2.0 µg/mL†	0 %	Susceptible
Ciprofloxacin 2.0 µg/mL	0 %	Susceptible
Kanamycin 5.0 µg/mL	0 %	Susceptible
Ethionamide 10.0 µg/mL	0 %	Susceptible
Capreomycin 10.0 µg/mL	0 %	Susceptible
PAS 2.0 µg/mL	0 %	Susceptible
Ofloxacin 2.0 µg/mL	0 %	Susceptible
Amikacin 4.0 µg/mL	0 %	Susceptible

Comments and Disclaimers

† See Report Comments and Disclaimers

* Susceptibility testing method: Indirect agar proportion, 7H10 medium. Resistance is defined as >1% (growth on drug-containing medium compared to drug-free medium).

MTBC Pyrazinamide Susceptibility*	Result
Pyrazinamide 100 µg/mL	Resistant

Comments and Disclaimers

* Susceptibility testing method: Mycobacteria Growth Indicator Tube (MGIT)

Public Health
Prevent. Promote. Protect.

Household 1, active

Date diagnosed	Age at diagnosis	Disease site	Smear result	Culture result	Treatment regimen
11/4/2021	8 months	Pulmonary and meningitis	Negative	Positive 11/4/21 (CSF); Positive 11/6/21 (trach aspirate)	Bedaquiline, Cycloserine, Levaquin, Linezolid, Ethionamid (d/c)
11/23/2021	16 years	Pulmonary, extrapulmonary	Negative	Positive 11/23/21	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin
11/23/2021	57 years	Pulmonary, extrapulmonary, *hilar lymphadenopathy, hoarseness (laryngeal), bladder wall thickening*	Positive 11/23/21	Positive 11/23/21	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin
5/6/2022	23 years	Pulmonary and extrapulmonary (hilar lymphadenopathy, pleural effusion)	Negative	Positive 5/6/22	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin
5/17/2022	19 years	Extrapulmonary *"scattered pulmonary nodules"*	Negative	Negative	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin

Household 1, latent

Diagnosis date	Age at diagnosis	Type of test	Treatment regimen
11/19/2021	58 years	TST	Moxifloxacin x6 months
11/17/2021	21 years	TST	Moxifloxacin x6 months
3/30/2022	29 years	QFT	Moxifloxacin x6 months
8/17/2022	28 years	QFT	Moxifloxacin x6 months

Household 2, active

Diagnosis date	Age at diagnosis	Disease site	Smear result	Culture result	Treatment regimen
1/11/2022	13 months	Pulmonary and extrapulmonary, scrofula	Negative	Positive 1/11/22 lymph node; Positive 1/13/22 gastric aspirate	Bedaquiline, Cycloserine, Linezolid, Levaquin
2/11/2022	20 years, pregnant	Pulmonary *"left and right patchy consolidations"*	Positive, 2/11/22	Negative	Bedaquiline, Clofazamine (d/c), Pretomanid, Linezolid, Moxifloxacin
3/24/2022	29 years	Pulmonary and extrapulmonary (pleural, abdomen)	Positive 3/24/22	Positive 3/24/22	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin
3/21/2022	42 years	Pulmonary, extrapulmonary (pleural, mediastinum and axillary lymphadenopathy)	Positive 3/21/22	Positive tissue 4/26/22	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin (d/c)
4/18/2022	10 years	Extrapulmonary, mesenteric lymphadenopathy	Negative	Negative	Bedaquiline, Linezolid, Delomanid, moxifloxacin
4/18/2022	9 years	Pulmonary and extrapulmonary *"mild patchy pneumonia", hilar adenopathy*	Negative	Negative	Bedaquiline, Linezolid, Delomanid, moxifloxacin

Household 3, active and latent

Diagnosis date	Age at diagnosis	Disease site	Smear result	Culture result	Treatment regimen
3/24/2022	13 years	Pulmonary and extrapulmonary (vasculitis)	Positive 3/24/22	Positive 3/24/22	Bedaquiline, Cycloserine (d/c), Linezolid, Delomanid, moxifloxacin

Diagnosis date	Age at diagnosis	Type of test	Treatment regimen
3/28/2022	20 years	QFT	Moxifloxacin x6 months
3/21/2022	46 years	QFT	Moxifloxacin x6 months
7/12/2022	47 years	QFT	TBD

Household 4, latent

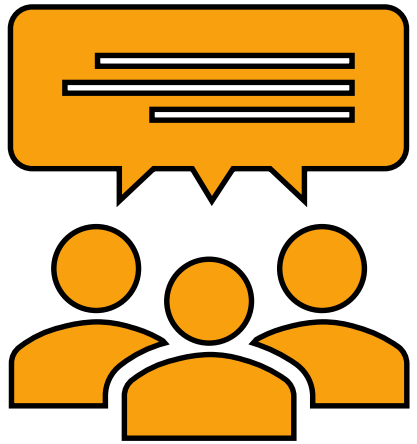
Diagnosis date	Age at diagnosis	Type of test	Treatment regimen
4/8/2022	32 years	QFT	Moxifloxacin x6 months
4/8/2022	17 years	QFT	Moxifloxacin x6 months

Negative patients

Negative test date	Age at test
8/2/2022	42 years
8/1/2022	10 years
8/5/2022	6 years
8/5/2022	8 years
8/5/2022	12 years
8/5/2022	2 years
8/2/2022	22 years

Systematic approach

- Coordination of care
- Partnering with university hospital
- Weekly patient review
- Splitting DOT case load into teams
- Monthly clinic visits and labs for active patients
- Master spreadsheet to track patients



Support from other agencies

- Kansas Department of Health and Environment
  - Medication support
  - Lab support
  - Contact investigation support
- CDC
  - Field epidemiologist
  - Contact investigation support
- Neighboring Health Departments
  - School and worksite testing for contact investigation

Break for Questions

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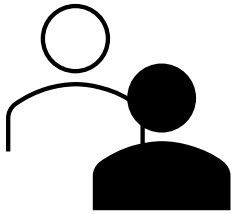
Additional Contact Investigations

- School
  - Private Catholic school
  - 74 students and 21 staff tested, all negative
- Workplace
  - Factory environment
  - 22 tested, all negative except 1 who has history of positive
- Additional contacts in other states—Colorado, Nebraska, Missouri

Staffing

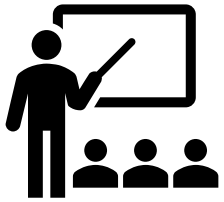
- Brought on 2 additional contract RNs, 2 additional contract LPNs, 1 contract community health worker
- CHW assisted with language barrier, cultural challenges, social needs
- RNs provided case management and medication oversights
- LPNs in field providing DOTs

Staffing Challenges



1 LPN
Vacant RN position
Contract nurses needed

20 DOTs per Day



High turnover, no TB training

Cultural Competence

Takeaway: Nursing Staff can make or break disease containment

Medication challenges

- Lengthy process to acquire
- Navigating paperwork, processes, PAP, FDA
- Different side effects—neuropathy, tendinitis, vision changes, prolonged QT interval, mood changes
- Missed doses prolonged treatment
- Limited supply/cost for medications

Cultural challenges

- Language barriers
  - Multiple patients did not speak English
  - Chuukese language uncommon, hard to find interpreter
- Families not well integrated into U.S.
- Initial distrust of public health
- Differing beliefs about medical care and modern medicine

Social challenges

- Variable employment statuses
- Struggle to pay rent, bills
  - Time off work during isolation and contact investigation
- School absence before and during isolation
- Lack of transportation for medical appointments
- Food insecurity
- Uninsured
- No primary care, medical home or routine care
  - Other undiagnosed/untreated conditions (diabetes, OB/GYN concerns, etc.)

Other challenges

- Multiple providers missed diagnoses early on
  - Multiple providers did not "Think TB"
  - Different medical providers involved from multiple health systems
- Incorrect medications given initially for many patients
  - Communication challenges and public health's role as facilitator of information
  - Utilizing Heartland as resource
  - CDC site visit
  - Challenges in obtaining medications

Thank you!

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