



Massachusetts Department of Public Health
Bureau of Infectious Disease and Laboratory Sciences

Antibiotic Resistance Surveillance at the MA SPHL

Tracy Stiles
Microbiology Division Director
Massachusetts State Public Health Laboratory

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Tracy.stiles@state.ma.us

617-983-6619

ARLN Background

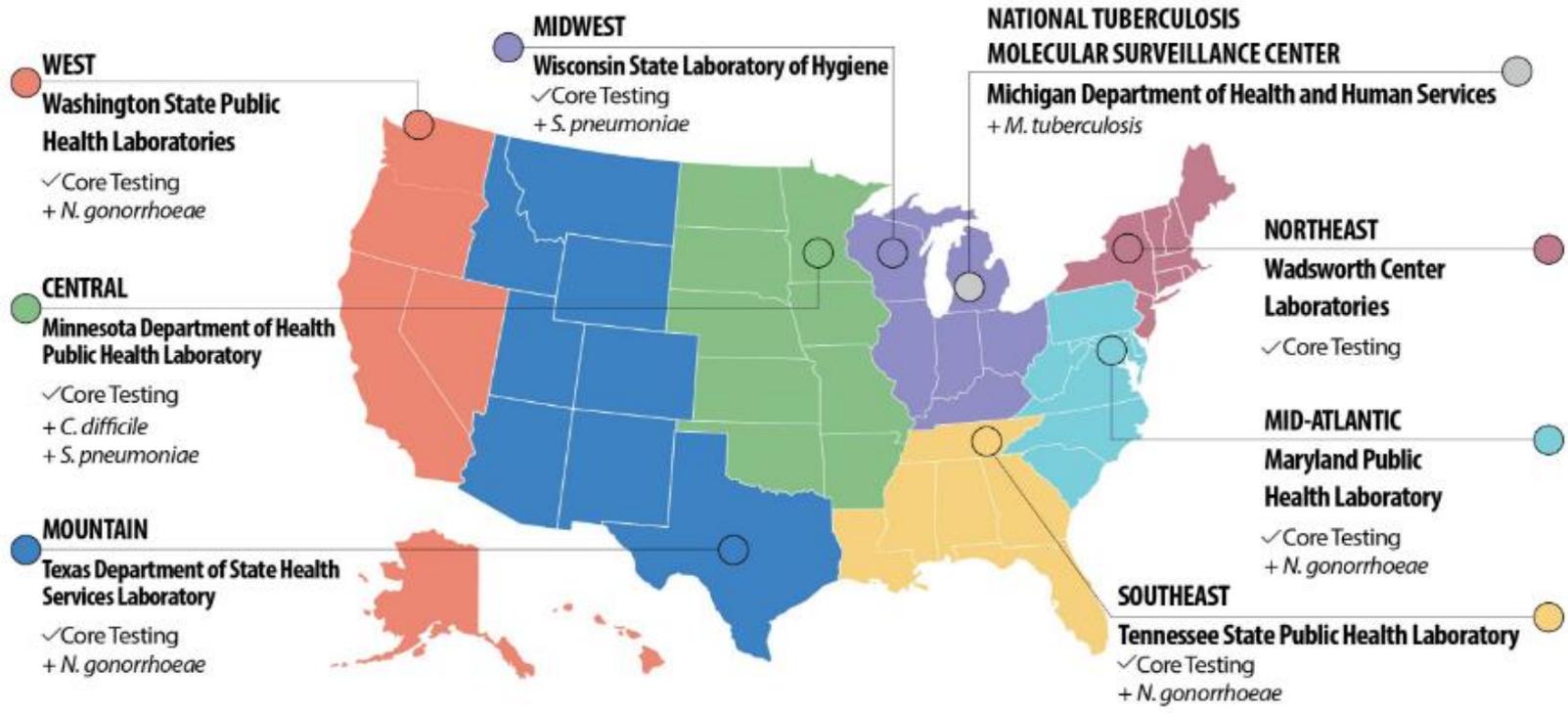
- Antibiotic Resistance Laboratory Network
- Started in 2016
- Funded through CDC to collect, confirm, and characterize
 - carbapenem-resistant Enterobacteriaceae (CRE) and *Pseudomonas aeruginosa* (CRPA),
 - CRE and CRPA which are carbapenemase-producing strains

ARLN: Organisms being collected

- *E. coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Enterobacter species*
- *Pseudomonas aeruginosa*
- *Acinetobacter baumannii* (targeted surveillance)
 - resistant to imipenem, meropenem, doripenem, ertapenem

ARLN: the Network

7 regional labs, the National Tuberculosis Molecular Surveillance Center, labs in 50 states, Six cities, and Puerto Rico



ARLN in Massachusetts

What is Reportable?

- Any CRE (isolated from any source), including CP-CRE (reportable since December 2013)
 - *Klebsiella pneumoniae*
 - *Klebsiella oxytoca*
 - *Enterobacter cloacae*
 - *Enterobacter aerogenes*
 - *E. coli*
- Any identified novel resistance (isolated from any source) or organism of concern
 - – This includes **mcr-1** and ***Candida auris***

105 CMR 300.000 Reportable Diseases, Surveillance, and Isolation and Quarantine Requirements.

(Latest version from January 2017):

<http://www.mass.gov/eohhs/docs/dph/cdc/reporting/rprtbl diseases-labs.pdf>

AR Lab in Massachusetts

What must be submitted?

- Any of the following *Enterobacteriaceae* (isolated from any source):

<i>Klebsiella pneumoniae</i>

<i>Klebsiella oxytoca</i>

<i>Enterobacter cloacae</i>

<i>Enterobacter aerogenes</i>

<i>E. coli</i>

- With resistance to one or more of the following **THREE** carbapenems:
 - Imipenem (MIC ≥ 4 $\mu\text{g/ml}$)
 - Meropenem (MIC ≥ 4 $\mu\text{g/ml}$)
 - Doripenem (MIC ≥ 4 $\mu\text{g/ml}$)
- OR, demonstrate carbapenemase production (CP-CRE)

One isolate per patient per admission, regardless of source

AR Lab in Massachusetts

What must be submitted?

- CRPA: Carbapenem Resistant
Pseudomonas aeruginosa: **Submit only the first isolate per month**
- CRAB: Carbapenem Resistant
Acinetobacter baumannii: **Do NOT submit at this time**

How to submit your CRE and CRPA

- CRE: One isolate per patient per admission, regardless of source
- CRPA: Submit only the first isolate per month
- Please use general state lab requisition found:
 - <http://www.mass.gov/eohhs/docs/dph/laboratory-sciences/general-submission-form.pdf>
- Please send to the clinical microbiology lab
- Please include all susceptibility data generated at your facility
 - Your results may help inform our testing

What testing will be done?

- Isolate identification will be confirmed via Maldi-TOF or API 20E
- mCIM to determine carbapenemase production
- AST testing via sensititre**, Kirby Bauer disk diffusion, or both
- PCR to detect resistance genes: **bla_{kpc}** **bla_{ndm}**
bla_{imp}** **bla_{vim}**, **bla_{oxa-48like}**, *bla_{mcr}** (1 AND 2)

* Will be live in May2018

** Still undergoing validation

Discordant results

- Testing done at the MA-SPHL & ARLN/CDC is for surveillance purposes
- MA SPHL may generate different results than the submitting lab—these will be submitted to NYS Wadsworth for additional testing
- Treatment decisions should be based on your facility susceptibility results

Notes:

The test results included in this report will be used to support infection prevention measures. This report should not be used as a substitute for diagnostic procedures or used to guide clinical decisions.

Reporting Results

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Massachusetts Department of Public Health
MA State Public Health Laboratory
305 South Street, Jamaica Plain, MA 02130 (617) 983-6607

Report Date
Accession



Patient Name
Provider Patient ID
DOB
Sex
Collection Date
Received Date
Contact
Source
Specimen Type



FINAL REPORT

Organism
identification
10/25/2017

Pseudomonas aeruginosa was identified.
* Identification determined by MALDI-TOF.

mCIM
10/25/2017

Positive for carbapenemase production.

Susceptibility
Testing
10/25/2017

AZTREONAM KB	23 mm	Susceptible
CEFAZOLIN KB	6 mm	No interpretation
CEFEPIME KB	15 mm	Indeterminate
CEFTAZIDIME KB	15 mm	Indeterminate
CEFTRIAXONE KB	6 mm	No interpretation
COLISTIN KB	15 mm	No interpretation
DORIPENEM KB	6 mm	Resistant
ERTAPENEM KB	6 mm	No interpretation
IMIPENEM KB	6 mm	Resistant
MEROPENEM KB	6 mm	Resistant

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Report Date
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Patient Name
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MATTHEW COTE
A/31 CARB
SUBCUTAN

FINAL REPORT

PIPERACILLIN-TAZOBACTAM KB 19 mm Indeterminate

Gene Targets
10/25/2017

bla _{YIM}	Detected
bla _{KPC}	Not detected
bla _{NDM}	Not detected
bla _{OXA-48-like}	Not detected

NOTE:

The test results included in this report will be used to support infection prevention measures. This report should not be used as a substitute for diagnostic procedures or used to guide clinical decisions.

* The performance characteristics of this test were determined by the MA SPHL. It has not been cleared or approved by the FDA.

End of Report

Isolates tested

September 2017-March 2018

Tested at MA SPHL	CRE (n=94)	CRPA (n=58)
North	6	2
Greater Boston	48	17
Southeast	8	12
Inside 495	22	10
Western MA	6	13
Cape	1	4
Reference Labs	22	0

Source of Isolates

	CRE	CRPA
Urine	56	27
Body Fluid	5	0
Bronchial	1	2
Sputum	6	14
Blood	8	2
Wound	6	6
Tissue	2	1
Rectal Swab	0	1
Other	10	6

Enterobacter aerogenes

- 8 from urine
- 1 from sputum
- All mCIM negative
- No gene targets detected
 - KPC, NDM, VIM, Oxa 48-like

Enterobacter cloacae complex

- **31 total**
 - 3 blood
 - 2 body fluid
 - 4 other
 - 1 sputum
 - 1 tissue
 - 18 urine
 - 2 wound
- **mCIM**
 - 13 positive, 16 negative, 1 indeterminate
- **PCR**
 - 12 KPC positive, 1 NDM positive
 - 1 mCIM positive but all gene targets tested were negative

E. coli

- 11 total
 - 6 urine
 - 1 sputum
 - 1 bronchial
 - 1 blood
 - 2 “other”
- mCIM
 - 4 positive, 7 negative
- PCR
 - 2 KPC pos
 - 2 NDM pos
 - 1 KPC/NDM
 - 1 Oxa 48-like/NDM pos

Klebsiella oxytoca

- **6 total**
 - 2 urine
 - 2 body fluid
 - 1 wound
 - 1 blood
- **mCIM**
 - 5 positive, 1 negative
- **PCR**
 - 5 KPC pos

Klebsiella pneumoniae

- **37 total**
 - 3 blood
 - 1 body fluid
 - 4 “other”
 - 3 sputum
 - 1 tissue
 - 23 urine
 - 3 wound
- **mCIM**
 - 23 positive, 14 negative
- **PCR**
 - 17 KPC, 1 NDM, 1NDM/KPC, 5 Oxa 48-like

Pseudomonas aeruginosa

- 58 Total
 - 27 Urine
 - 14 Sputum
 - 2 Bronchial
 - 1 Tissue
 - 6 Other
 - 1 Blood
 - 1 rectal swab
- mCIM
 - 4 positive, 54 negative
- PCR
 - 1 KPC+, 1 NDM/Vim+, 3 VIM +

ARLN Alerts

- Pan Resistance
 - Resistant to all drugs tested by both SPHL and submitting lab
- mcr-resistance by PCR or WGS
- Novel carbapenemase in CRE or CRPA
- Non-KPC carbapenemase in an Enterobacteriaceae
- Any Carbapenemase producing *Pseudomonas aeruginosa*
- Any Carbapenemase producing *Acinetobacter baumannii*
- Any Carbapenemase detected during colonization screening

What happens following an alert?

- MA Lab notifies MA Epi
- Epi sends secure email to CDC ARLN alert mailbox
- ARLN notifies MA Epi and Lab that an alert has been received on the isolate
 - list of instructions

What happens following an alert?

- To prevent spread of this resistance mechanism, we recommend the following:
- Place patient in a single room on contact precautions if currently inpatient in an acute care hospital or high-acuity post-acute care setting. If the patient is in a lower-acuity post-acute care setting, such as a non-ventilator unit of a skilled nursing facility, we recommend following infection control recommendations as outlined in the CDC CRE toolkit (available at: <https://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf>).
- Conduct a public health response as outlined in the CDC Interim guidance for a Public Health Response to Contain Novel or Targeted MDROs (available at: <https://www.cdc.gov/hai/outbreaks/docs/health-response-contain-mdro.pdf>).
- The following epi is often helpful when performing a containment response:
 - A brief medical history
 - Healthcare exposures in the past month and in the month prior to the specimen collection date
 - Any travel or healthcare exposures outside the US in the last 12 months
 - Roommates or overlap with other patients during recent overnight stays in healthcare facilities
 - If/when any infection control interventions were implemented such as isolation and contact precautions
- If you have any questions or need any further assistance, please don't hesitate to contact us.

Recommendations

- Patient on contact precautions
- Targeted screening of roommates
- Consideration of wider screening in facility depending on organism/gene identified and facility characteristics
- Testing is coordinated with the regional lab
 - Send supplies and mailing labels in a “kit”
 - Swabs sent to Wadsworth directly
 - Results within 24 hours
- CDC CRE toolkit
 - <https://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf>).
- CDC Interim guidance for a Public Health Response to Contain Novel or Targeted MDROs
 - <https://www.cdc.gov/hai/outbreaks/docs/health-response-contain-mdro.pdf>).

Alerts

September 2017-March 2018

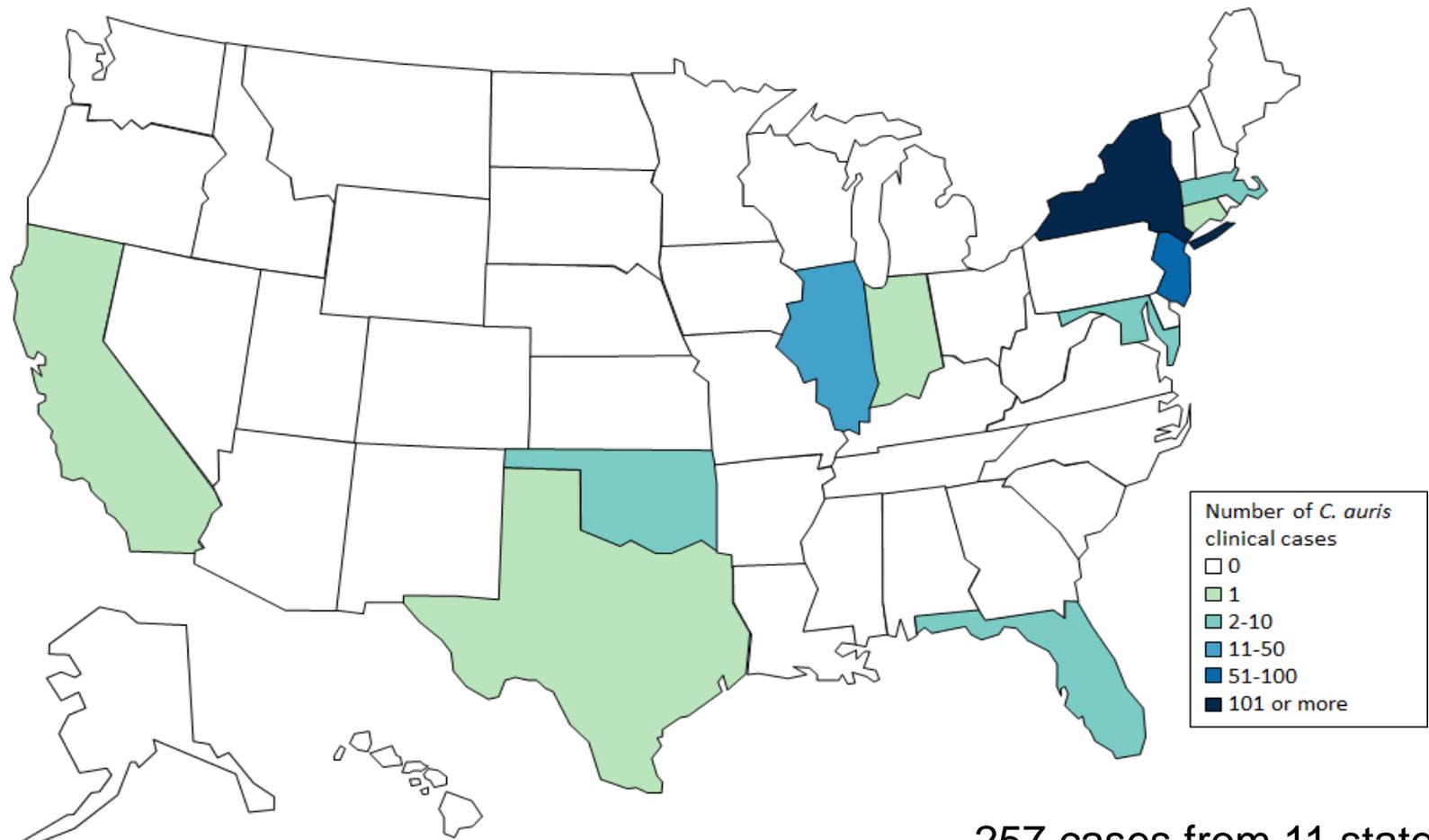
Tested at MA SPHL	CRE	CRPA
Pan-Resistance	6	0
Novel carbapenemase in CRE or CRPA	2	0
Non-KPC in CRE	10	NA
Any carbapenemase producing <i>Pseudomonas aeruginosa</i>	NA	4
Any carbapenemase producing <i>Acinetobacter baumannii</i>	NA	NA
Any Carbapenemase detected during colonization screening	NA	NA

What about *Candida auris*

- Emerging Pathogen: first identified in 2009 in Japan
 - Retrospective review suggests earliest strain dates to 1996
- Often multidrug resistant
- Causes outbreaks in healthcare settings

Candida auris

U.S. Map: Clinical cases of *Candida auris* reported by state, United States, as of March 31, 2018



Laboratory Diagnosis of *Candida auris*

- Candida isolates from normally sterile sites should be fully speciated
 - Especially if the patient is already known to be colonized, or the facility is known to have had other cases
- Commercial systems do not routinely have *C. auris* in their library
 - Bruker Maldi-ToF MS (RUO) and Vitek MS (RUO) do
 - Other systems do not (misidentify with *Candida haemulonii*, *Candida sake*, *C. duobushaemulonii*, *Rhodotorula glutinis*)
 - <https://www.cdc.gov/fungal/diseases/candidiasis/pdf/Testing-algorithm-by-Method-temp.pdf>

What should clinical labs do?

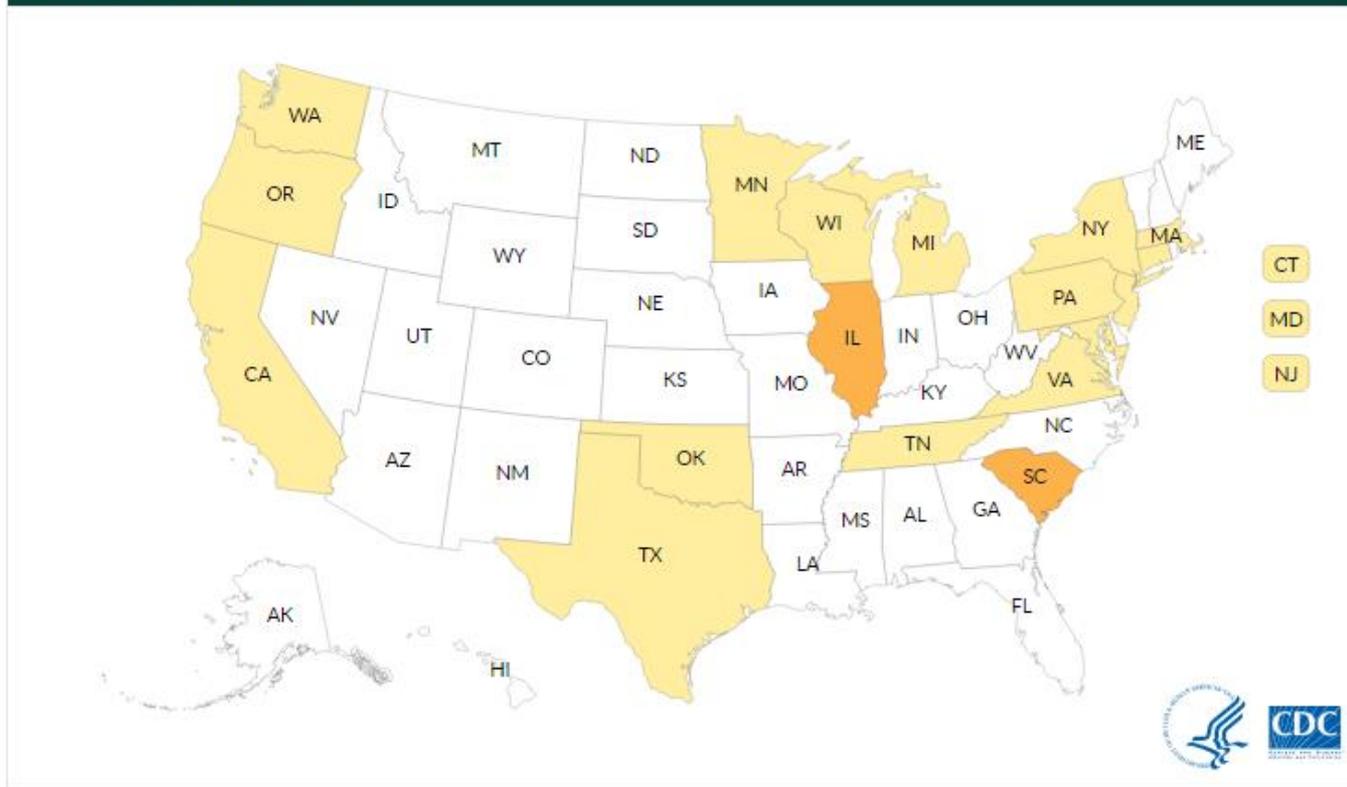
- MA SPHL does not have approved procedures for *Candida* identification
- If *C. auris* is confirmed or suspected, call 617-983-6800
 - Isolate will be sent to Wadsworth or CDC directly, SPHL will assist
- No isolates are to be sent to CDC or Wadsworth without SPHL approval

Global Emergence of mcr-1, 2 and 3

- Plasmid mediated colistin resistance
 - First identified in 2015
 - Gene found on plasmids
 - Infers colistin resistance
- 35 isolates from 18 states
- If you suspect colistin resistance, contact 617-983-6800
- These isolates are being referred to Wadsworth currently, MA SPHL assay live later this spring

Global Emergence of *mcr*-1, 2 and 3

Tracking the *mcr* genes



About This Map

- No isolates reported
- Human isolate
- Animal isolate

Questions?

