Overview of Antimicrobial Resistance Laboratory Network (ARLN) Activities in Division of Healthcare Quality Promotion (DHQP), 2017

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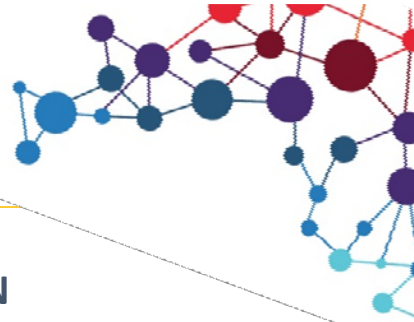
AR Capacities and Special Studies Team
ELC Grantee's Meeting
March 20, 2018

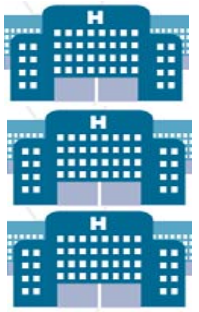
AR Laboratory Network (ARLN)



- **Division of Healthcare Quality Promotion (DHQP) combating AR through the ARLN in 3 ways**
  1. **State/Local PHL Carbapenem-Resistant Enterobacteriaceae (CRE)/ Carbapenem-Resistant Pseudomonas aeruginosa (CRPA) testing**
  2. **CRE Colonization screening**
  3. **Targeted surveillance for emerging AR threats**
     - Carbapenem-Resistant Acinetobacter (CRAB)
     - MCR gene in Extended-Spectrum β-lactamases (ESBLS)

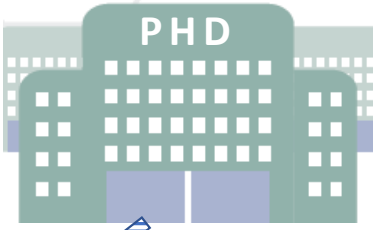
Tiered Testing

Network of participating clinical laboratories



CRE/CRPA isolates

State/Local testing



Species identification
Confirmatory AST
Phenotypic screening for carbapenemase production
Molecular detection of mechanism

Isolates for further testing

Regional lab testing

Confirmatory testing for full directory
Colonization screening
Targeted surveillance for CR-*Acinetobacter* and MCR-genes in ESBLs

CDC testing

Confirmatory testing
WGS
Applied research

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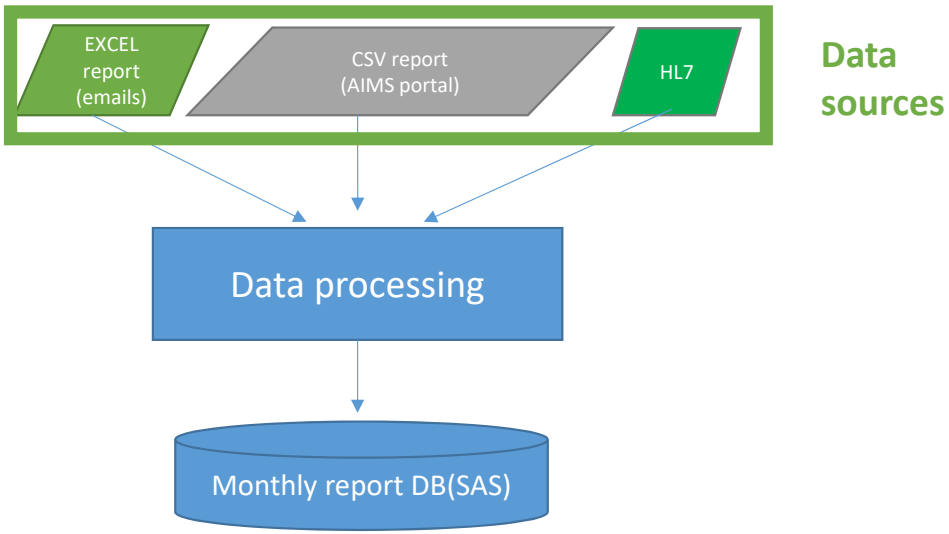
ARLN Data Reporting

- Crucial for ARLN
- Monthly isolate testing data sent to HAI and CDC



- If your PHL just started testing and is not yet reporting, please contact Jennifer Huang (uzo0@cdc.gov) to discuss your data reporting plans

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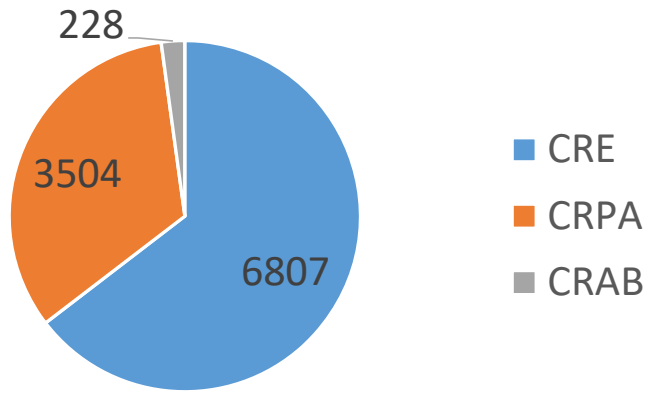
AR Laboratory Network (ARLN)

- In 2017*
  - 39 sites reported testing 10,541 isolates
  - Regional laboratories tested 1,523 swabs



*Data shown today is preliminary for 2017 and of states that have been reporting line list of isolates tested

ARLN Carbapenem-Resistant Enterobacteriaceae (CRE)

- Target species: *Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae*, and *Enterobacter* spp
  - Other Enterobacteriaceae species also reported if tested
- Defined as resistant to imipenem, meropenem, doripenem, or ertapenem by standard AST methods
- Carbapenemase-producing CRE (CP-CRE) defined as:
  - Positive to mCIM/CarbaNP test or positive on PCR or WGS for at least one carbapenemase genes (KPC, NDM, VIM, IMP, OXA-48)
  - For *Enterobacter*, it is defined as positive on PCR or WGS for at least one carbapenemase genes (KPC, NDM, VIM, IMP, OXA-48)

CRE	CP-CRE*	% CP-CRE
6807	2279	33%

- KPC (n=1986), and NDM (n=174) were the most common carbapenemases detected

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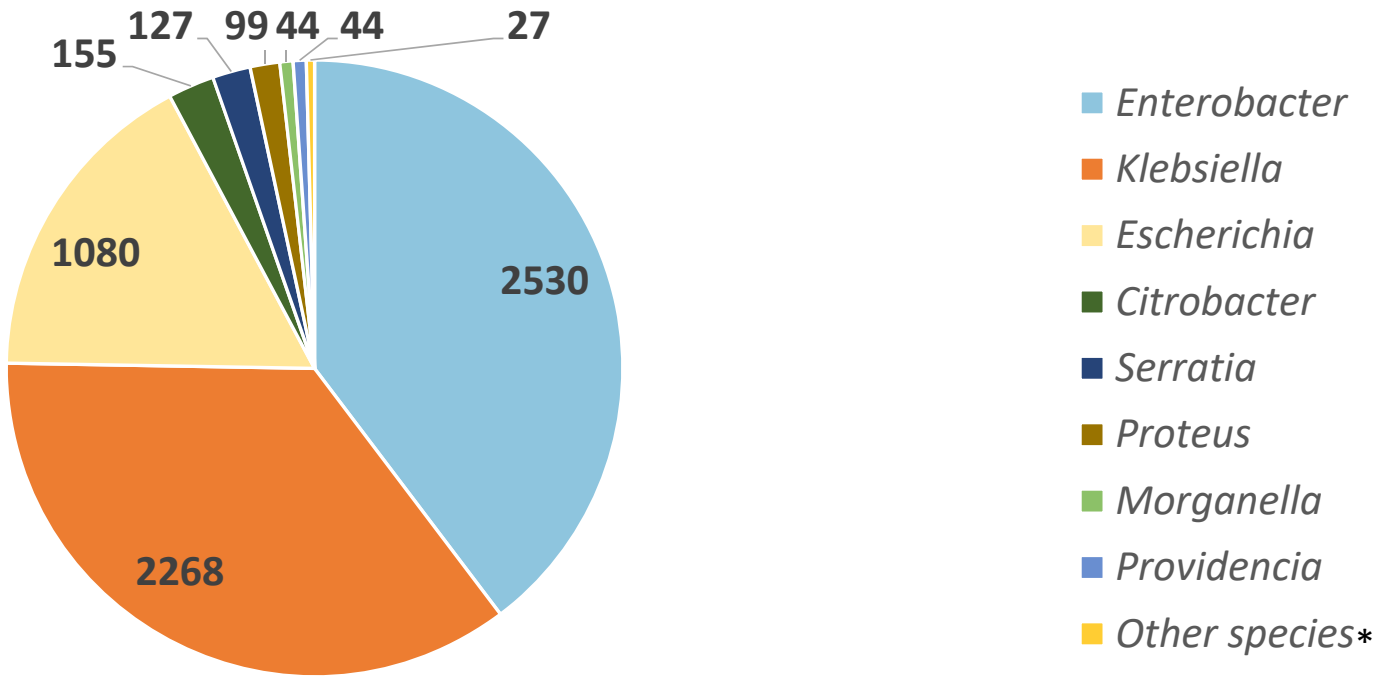
* CP-CRE is positive for mCIM or Carba-NP or PCR positive for one carbapenemase genes. For *Enterobacter*, CP-CRE is defined as positive for at least one carbapenemase genes.

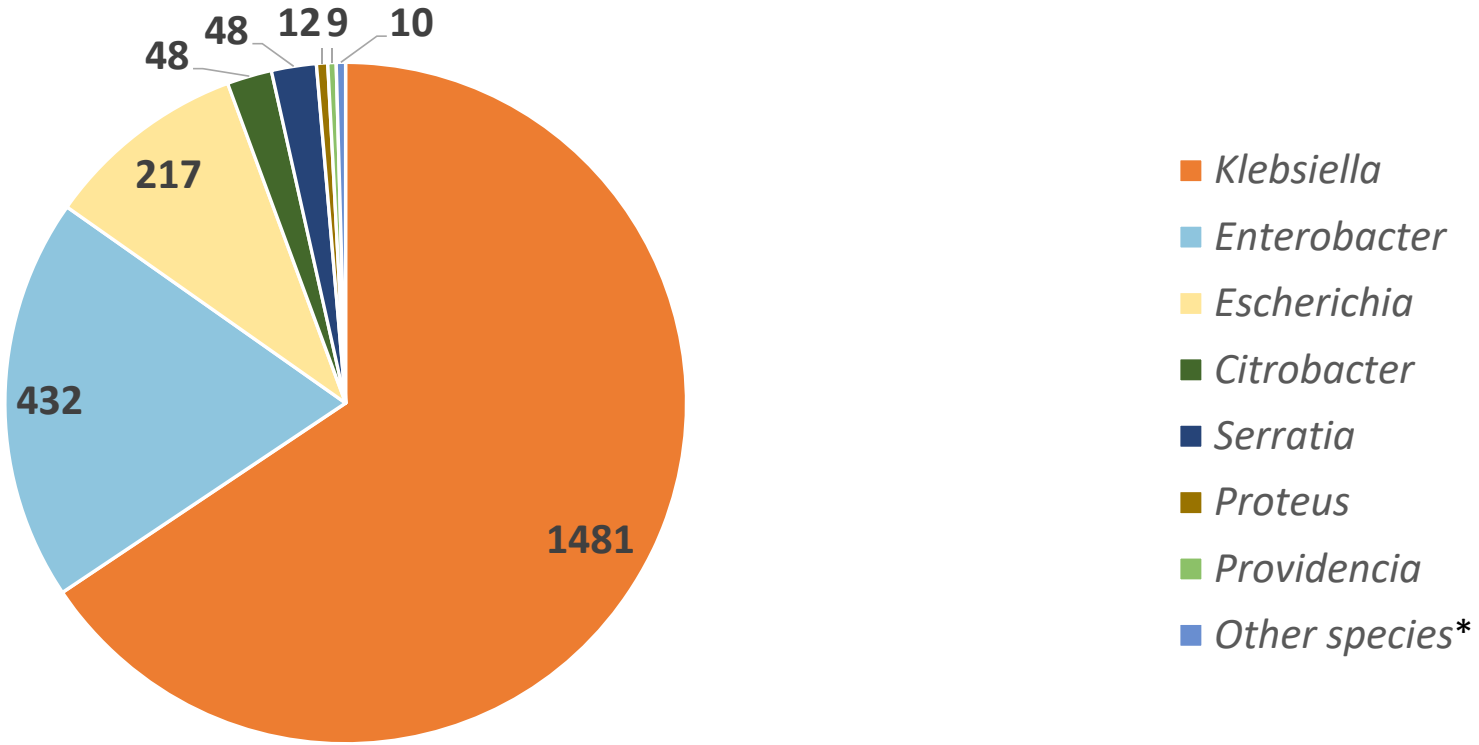
CRE by Genera—ARLN, 2017§



§ Unknown (407) and Multiple species (26) were excluded from this chart

*Other species include: *Hafnia*(12), *Raoultella* (6), *Pantoea* (1), *Kluyvera* (1), *Kosakonia* (1), *Leclercia* (1), *Yokenella* (1)

CP-CRE by Genera, 2017§

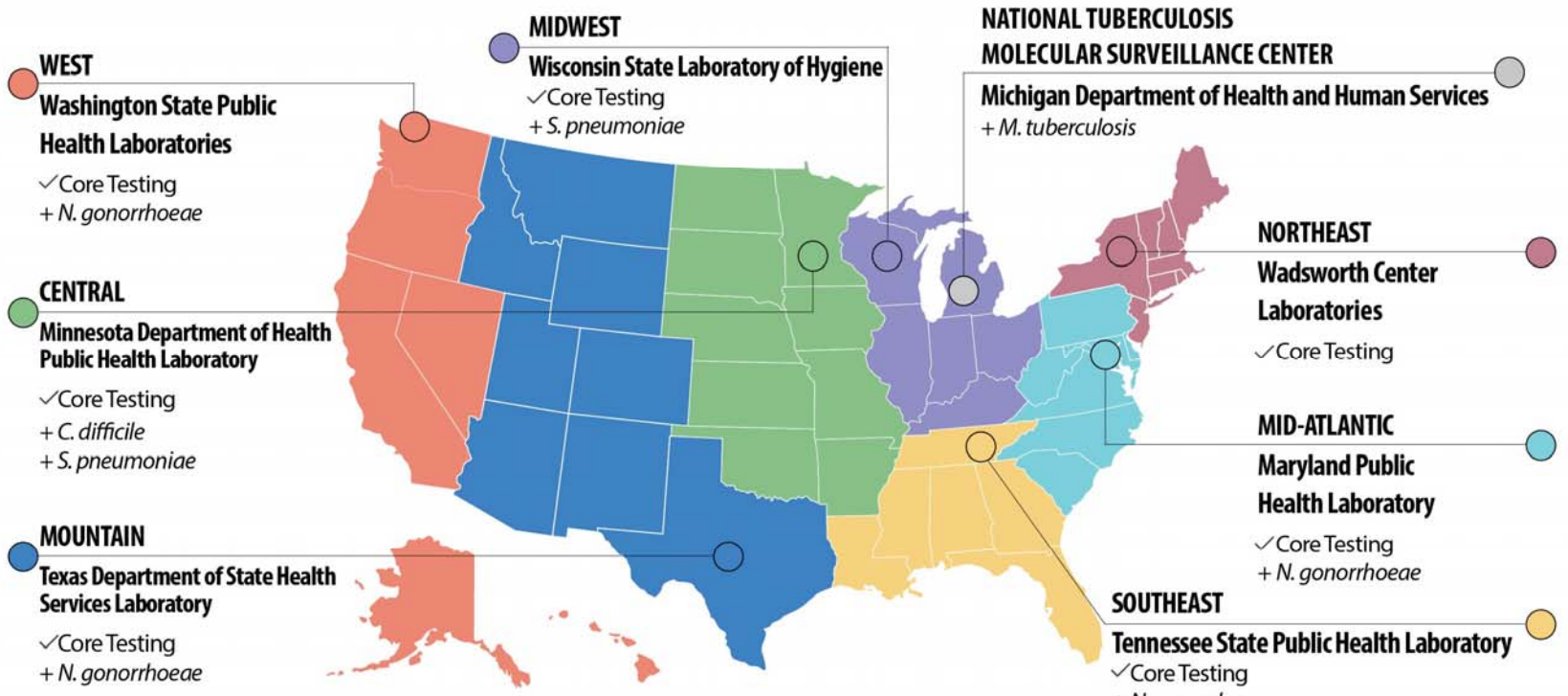


§ Unknown (104) species were excluded from this chart

*Other species include: *Raoultella* (4), Morganella (3), *Pantoea* (1), *Kluyvera* (1), *Leclercia* (1)

CP-CRE is defined positive for mCIM or Carba-NP or PCR positive for at least one of carbapenemase genes, for *Enterobacter* CP-CRE is defined as PCR positive for at least one of carbapenemase genes.

AR Lab Network Regional Labs and TB Center



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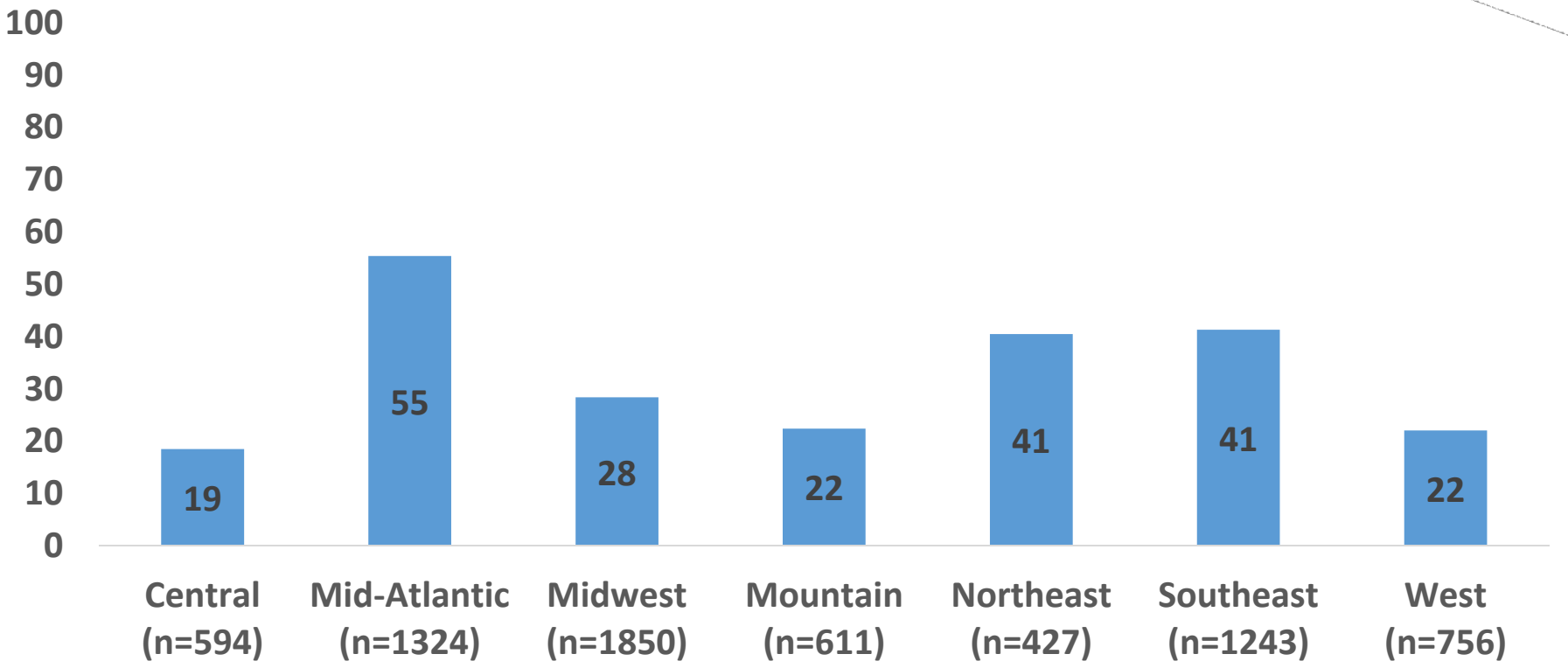
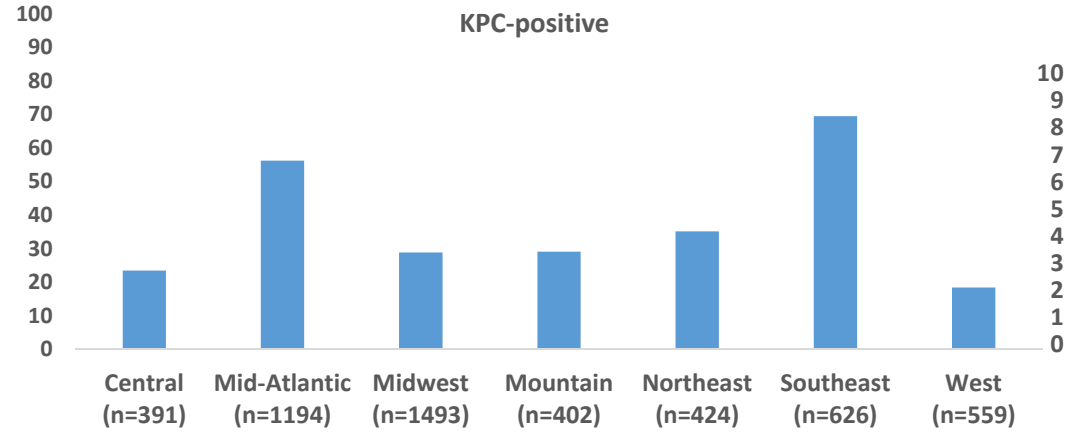
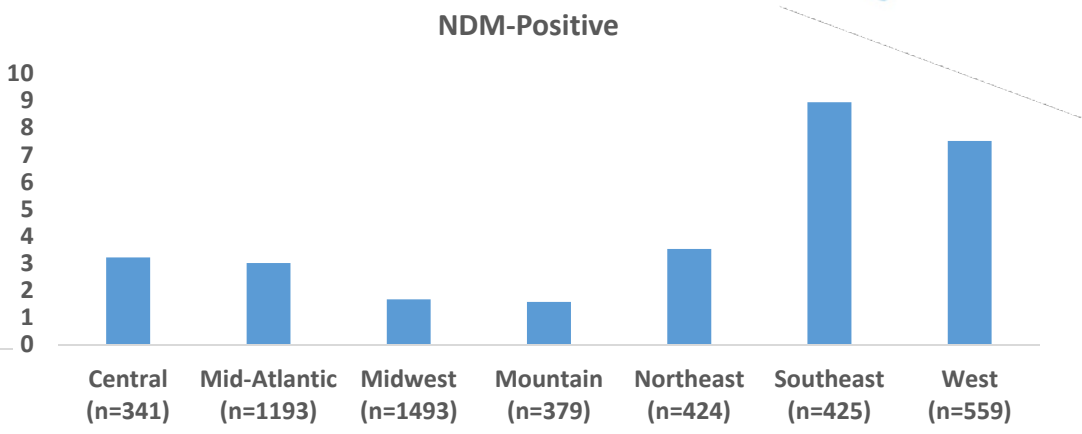
Percentage CP-CRE, by ARLN Region—2017

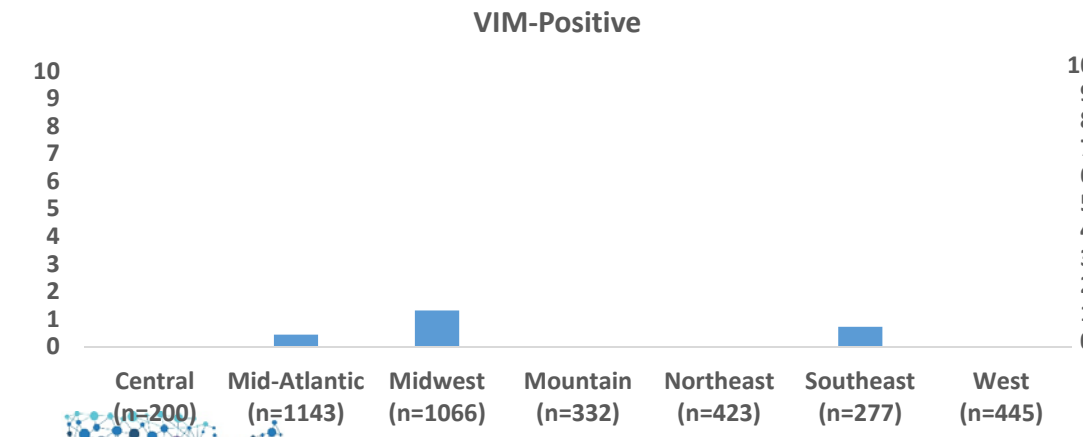


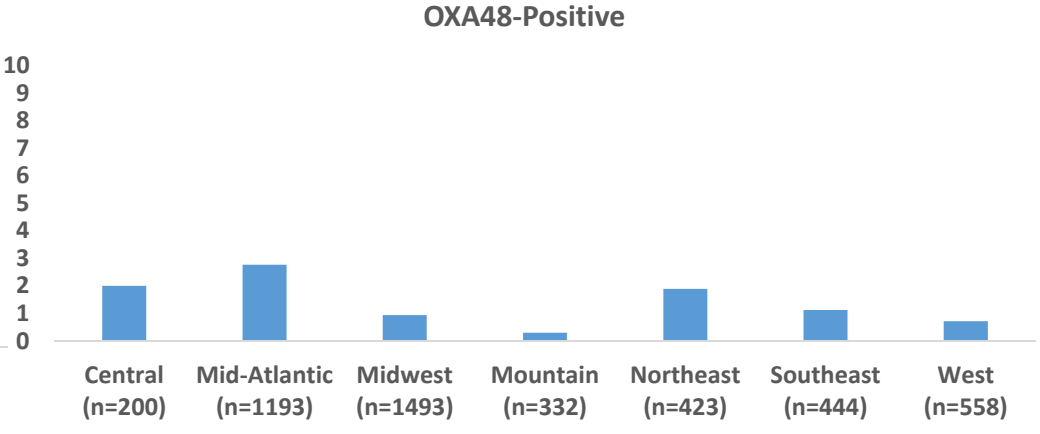
CP-CRE is defined positive for mCIM or Carba-NP or PCR positive for at least one of carbapenemase genes. For *Enterobacter,* CP-CRE is defined as PCR positive for at least one of carbapenemase genes.

Percentage of CP-CRE*, by Positive Mechanism, by ARLN Region, 2017









CP-CRE is defined positive for mCIM or Carba-NP or PCR positive for at least one of carbapenemase genes. For *Enterobacter* CP-CRE is defined as PCR positive for at least one of carbapenemase genes.

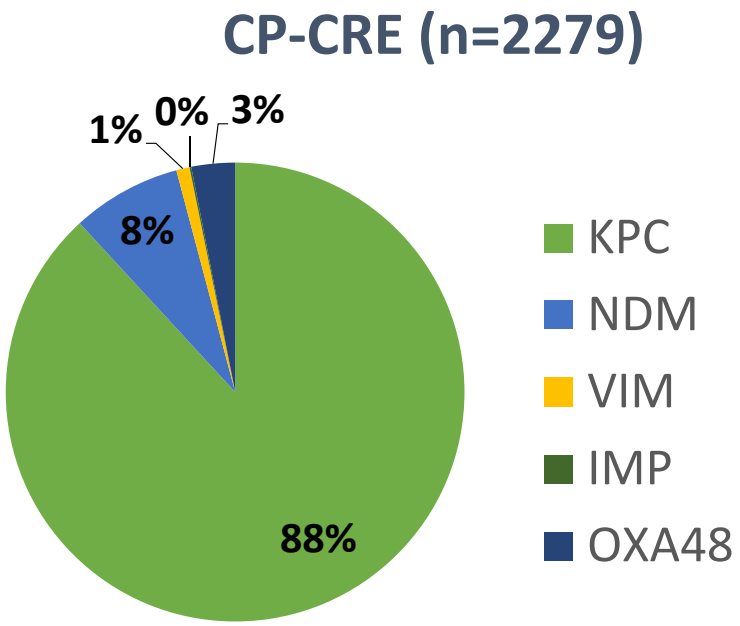
ARLN Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA)

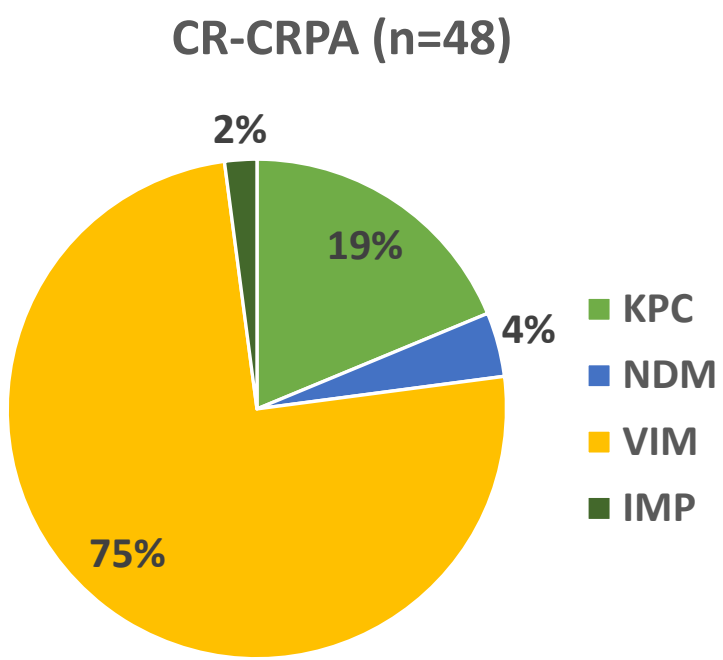
- Target species: All *Pseudomonas aeruginosa*
- Defined as resistant to imipenem, meropenem, or doripenem by standard AST methods
- Mucoid isolates should be excluded (due to testing difficulties rather than desire to exclude all CF patients)
- Carbapenemases-Producing CRPA (CP-CRPA) is defined as:
  - Positive to mCIM/CarbaNP test or positive on PCR or WGS for one of 5 carbapenemase genes (KPC, NDM, VIM, IMP, OXA-48)

CRPA	CP-CRPA	% CP-CRPA
3504	103	2.9%

  - VIM (n=36) and KPC (n=9) are the most common Carbapenemases detected

CP-CRE and CP-CRPA, by mechanism—ARLN, 2017





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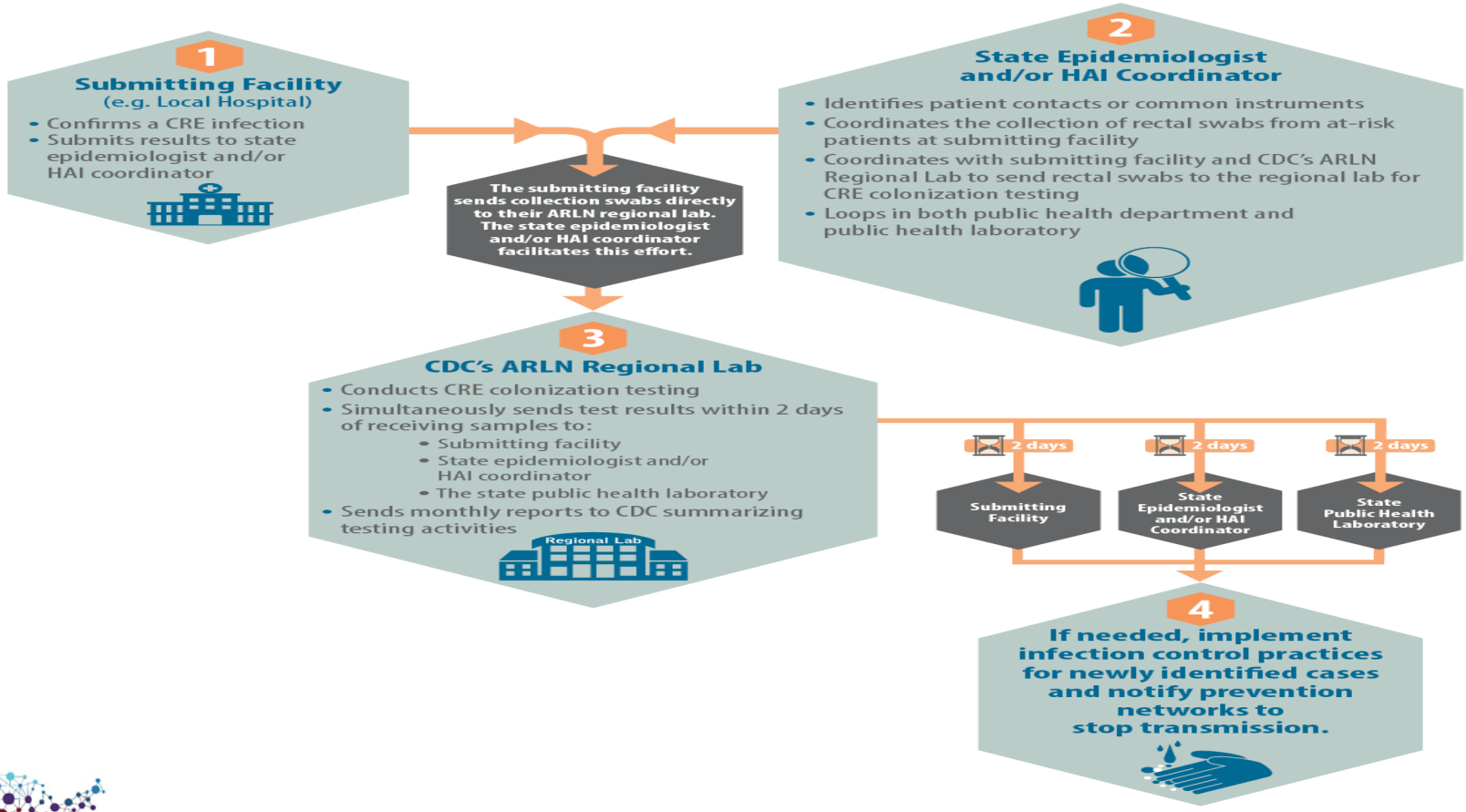
ARLN Carbapenem-Resistant *Acinetobacter* (CRAB)

- Target species: *Acinetobacter baumanii*
- Defined as resistant to imipenem, meropenem, or doripenem by standard AST methods
- Carbapenemases-Producing CRAB (CP-CRAB) is defined as:
  - Positive on PCR or WGS for at least one of the six carbapenemase genes (KPC, NDM, VIM, IMP, OXA-23, OXA-48)

CRAB	CP-CRAB	% CP-CRAB
228	11	4.8%

- OXA-23 (n=7) is most common carbapenemase detected
  - OXA-23 is not being tested uniformly, multiplex PCR assay are in development and will be distributed to assist with detection

CRE Colonization Screening & Testing at Regional Laboratories



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ARLN Colonization Activities

- Regional Laboratories are conducting colonization screenings using Cepheid
- For 2017
  - 1523 swabs were tested
  - 226 (14%) positive from screening
  - Carbapenemase genes detected: KPC, NDM, OXA-48, VIM

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Acknowledgements

- States and Local Public Health Laboratories
- ARLN Regional Laboratories
- Clinical Laboratories
- CDC
  - ARX
  - ARCSS
  - PRB
  - CEMB

Questions?

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For more information, contact CDC
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