
Oregon Multi-Drug-Resistant Organism (MDRO) Surveillance Update 10/9/2018

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Health
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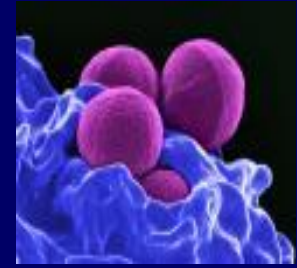
MDRO Definitions



- CDC – National Healthcare Safety Network
 - Definition varies by organism
 - MDR-Acinetobacter: nonsusceptibility \geq one agent in 3 of 6 antimicrobial classes
 - MDR-Pseudomonas: nonsusceptibility \geq one agent in 3 of 5 antimicrobial classes

https://www.cdc.gov/nhsn/PDFs/pscManual/12pscMDRO_CDADcurrent.pdf

MDRO Definitions



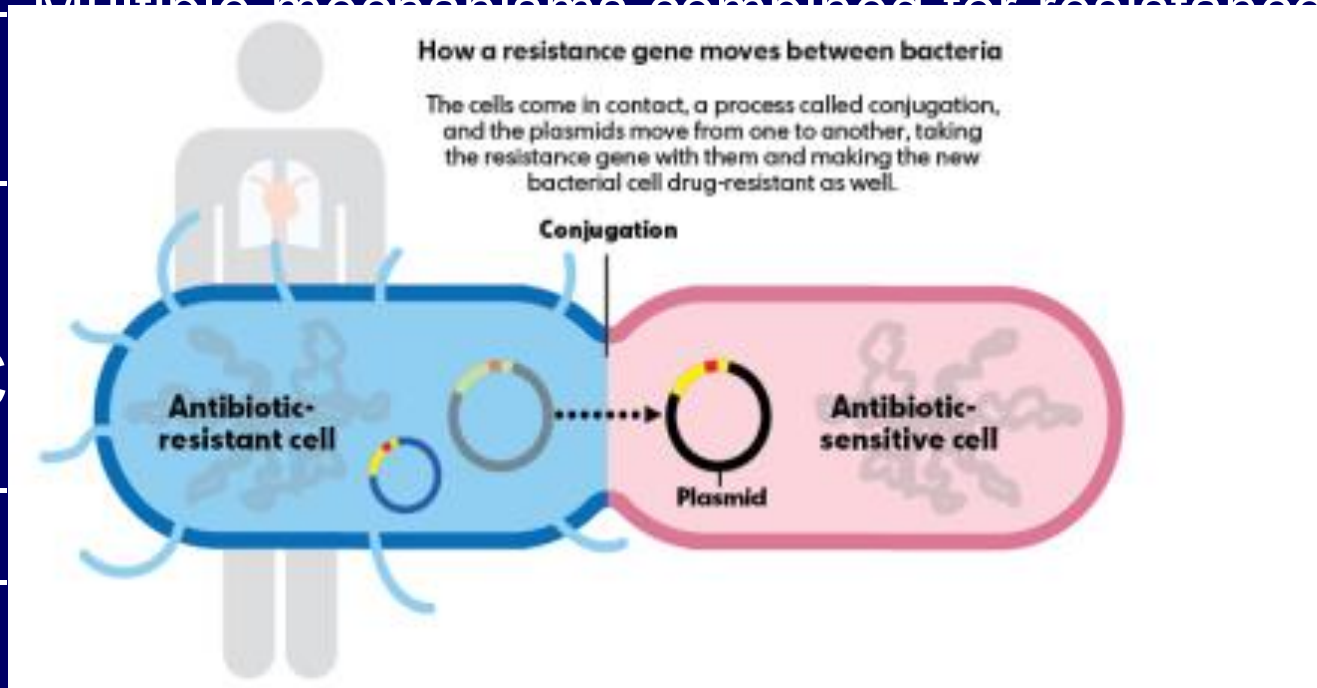
- OHA Interfacility Transfer Notification Rule broadly categorizes MDROs:
 - MRSA, VRE, Carbapenem-Resistant *Enterobacteriaceae* (CRE), Multidrug-Resistant *Acinetobacter*, toxin-producing *Clostridioides difficile*
- What's lab reportable in Oregon?
 - CRE
 - Unusual organisms of public health significance
 - pan non-susceptible gram-negatives

Carbapenem-Resistant *Enterobacteriaceae* (CRE)

CRE Terminology Review

- Non-carbapenemase-producing (CRE)

– Multiple mechanisms combined for resistance –



– Data suggest higher morbidity/mortality

Oregon CRE by Subtype and Specimen Source, Nov 2010 – June 2018

Organism	Anatomical Site of culture					Total
	Urine	Blood	Respiratory	Wound	Other	
<i>Enterobacter aerogenes</i>	38	2	4	4	5	53
<i>Enterobacter cloacae</i>	236	14	22	39	11	322
<i>Escherichia coli</i>	60	3	2	9	3	77
<i>Klebsiella pneumoniae</i>	40	4	3	5	3	55
<i>Serratia marcescens</i>	26	2	9	1	1	39
Other	30	1	1	12	4	48
Total	430	26	41	70	27	594

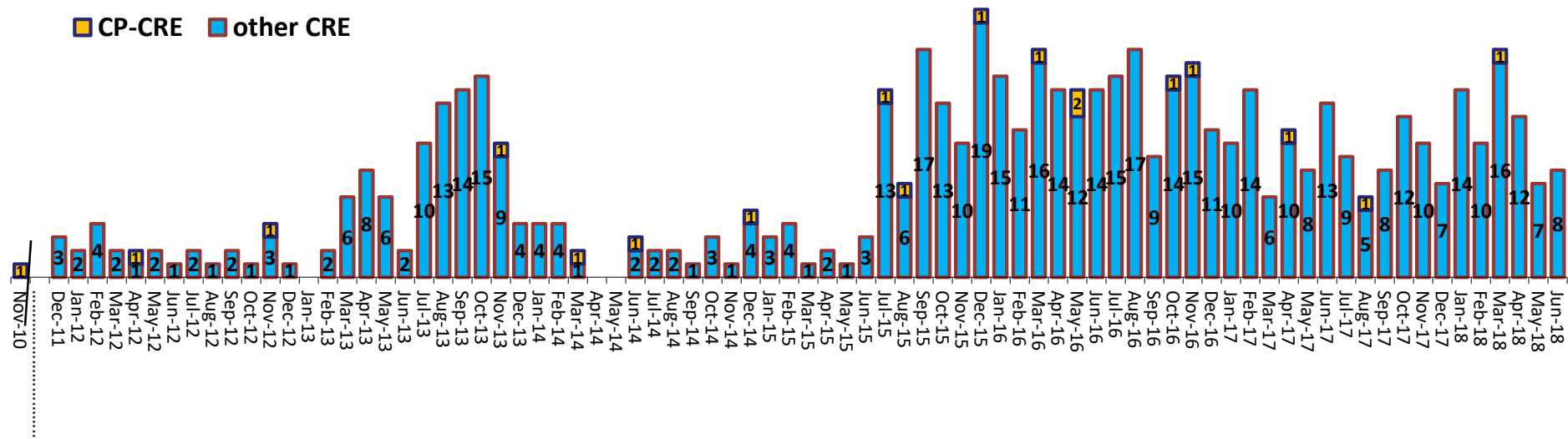
CRE Cases

2010 – June 2018

- 283 (47%) of cases were hospitalized at time of, or within 30 days after, specimen collection
- 371 (63%) of cases are women
- 406 (68%) of cases are ≥ 65 yrs
- 56 (9%) listed as deceased

CRE Oregon Residents Nov 2010 – June 2018

■ CP-CRE ■ other CRE



Carbapenemases

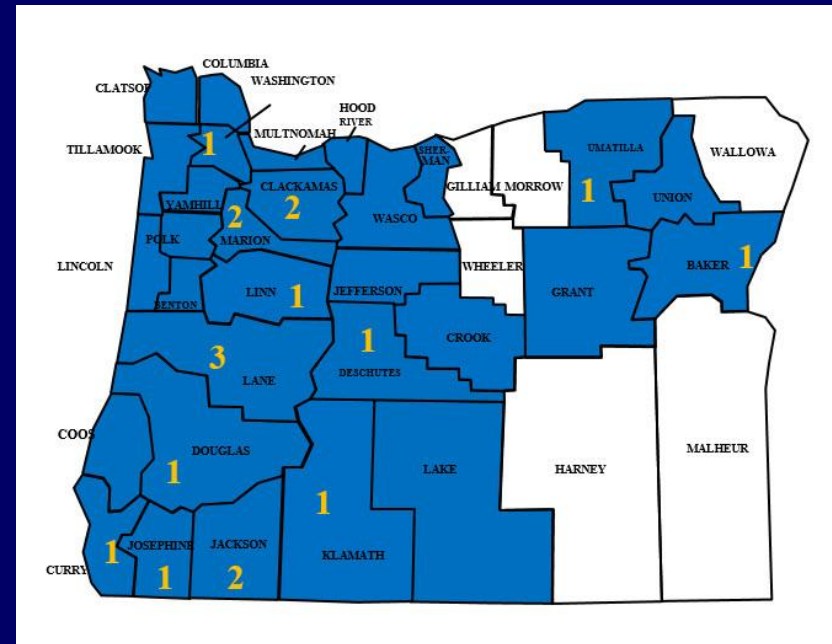
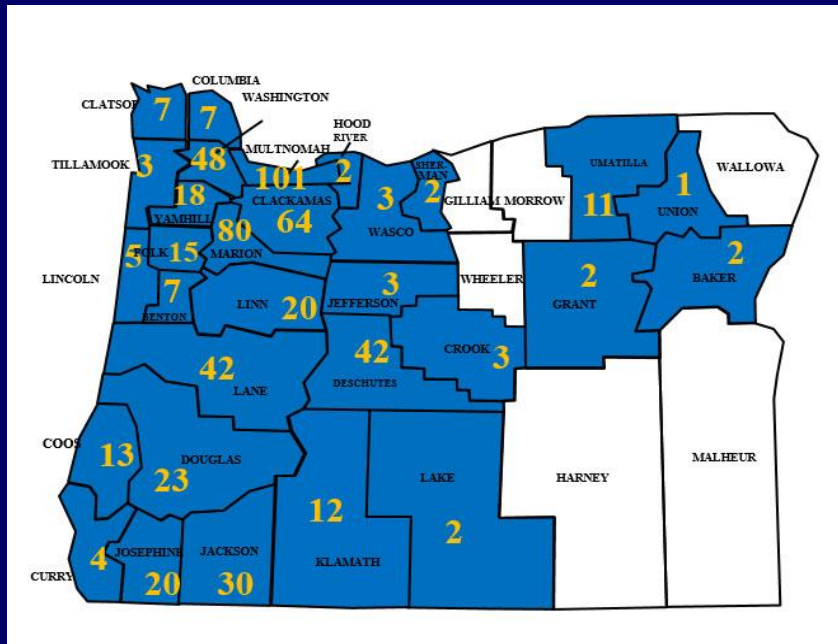
Type of Carbapenemase	When/where discovered	Numbers reported USA (12/2017)	Numbers found by Oregon labs
<i>Klebsiella pneumoniae</i> carbapenemase (KPC)	2001 North Carolina	Too many to count	11
New Delhi metallo- β -lactamase (NDM)	2009 Sweden (India)	379	6
Verona integron encoded metallo- β -lactamase (VIM)	2004 Turkey	57	1
Imipenemase metallo- β -lactamase (IMP)	1997 Japan	36	0
Oxacillinase-48 (OXA-48)	2002/2003 Greece, Korea, Taiwan	146	4

CP-CRE Identified by Oregon Labs, by Year, n=22



CRE in Oregon by County, 2010 – June 2018

CP-CRE in Oregon by County, 2010 – June 2018



CP-CRE identified in Oregon 2010-2018, n=22

- Sex: 13 (59%) males
- Age: 47- 88 years (median: 71)
- Sources: 10 urines, 5 wounds, 1 blood, 3 respiratory, 1 tissue, 1 pleural fluid, 1 ostomy
- 13 (59%) hospitalized at collection

CP-CRE and Healthcare out of Oregon

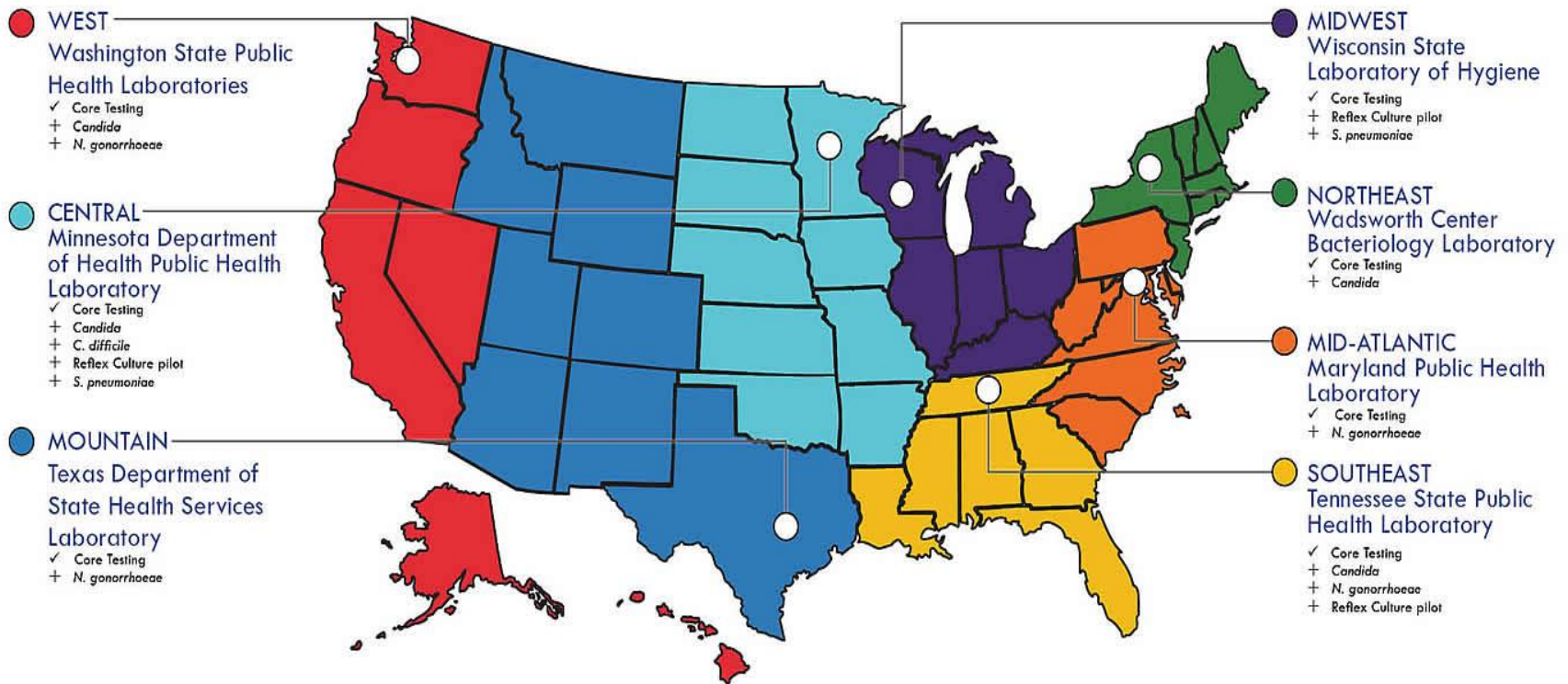
- Oregon is still a low prevalence state
- 18/594 (3%) of Oregon cases are CP-CRE
- 14/18 (77%) CP-CRE – documentation of healthcare out of state

- Compare to Illinois – 331 CP-CRE cases reported in 2015

Carbapenem-Resistant *Acinetobacter baumannii* (CRAB)

Other Surveillance for Multi-Drug-Resistant Organisms (ARLN)

CDC Antibiotic Resistance Laboratory Network: 7 Regional Labs

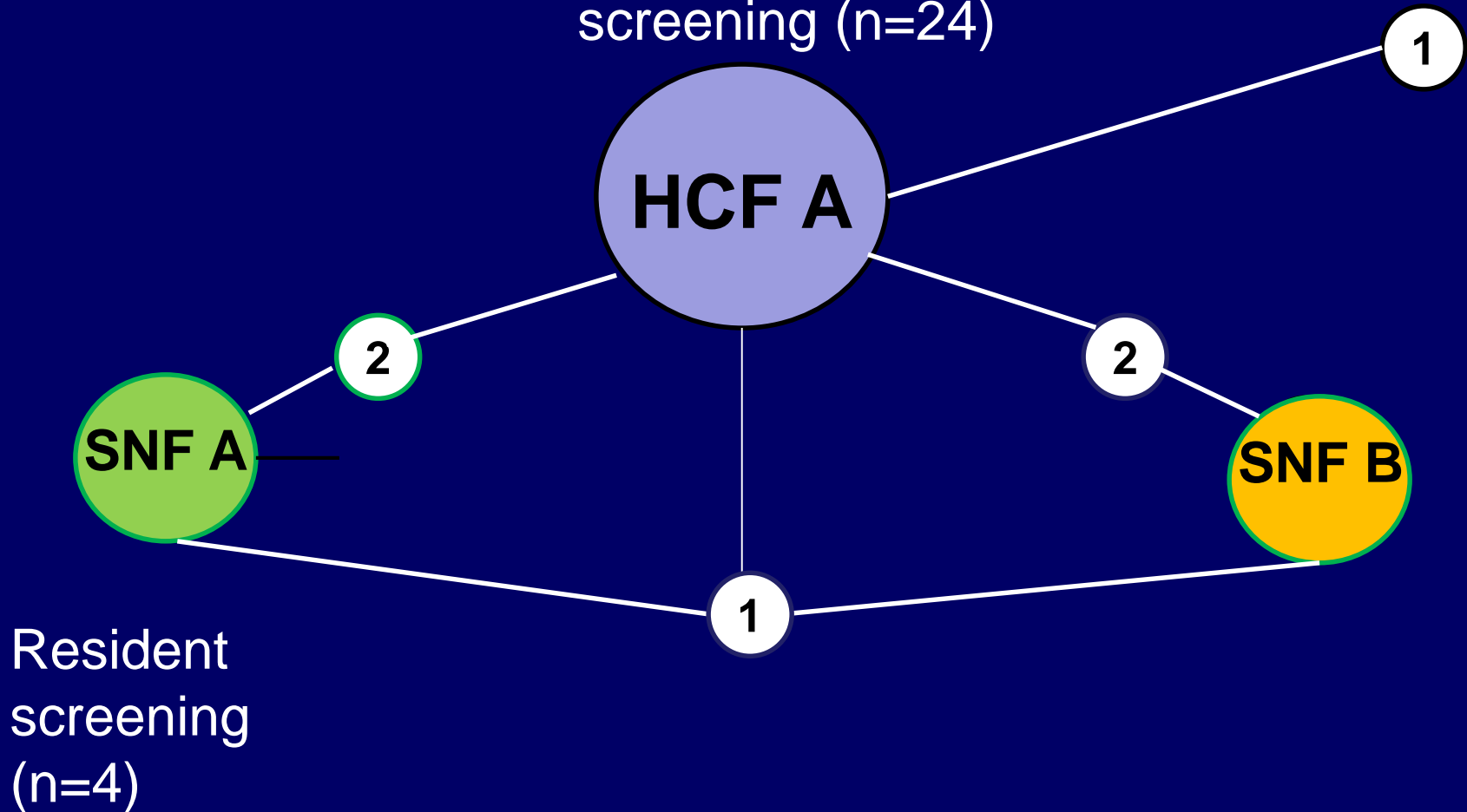


ARLN and CRAB Surveillance

- Sentinel lab reported 2 highly resistant CRAB isolates among residents of the same SNF
- 3 weeks later 3 more isolates reported; 2 from another SNF, 1 no SNF exposure
- 1 more 2 months later
 - Residence in both SNFs
- All 6 cases had been to same hospital within 4 months of each other

CRAB transmission

Environmental
screening (n=24)



CRAB screening

- Hospital environmental cultures
 - Outbreak strain found in 1 sink
- Resident screening
 - all negative
- Extensive environmental cleaning recommended for all facilities

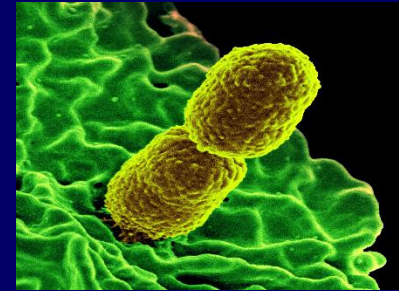
MICs for Outbreak CRAB cases

Susceptibility Information	Card:	AST-GN93	Lot Number:	6830580103	Expires:	Jun 29, 2019 13:00 PDT
	Completed:	Feb 18, 2018 20:50 PST	Status:	Final	Analysis Time:	6.75 hours
Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation	
ESBL			Ertapenem			
Ampicillin	>= 32	R	Meropenem	>= 16	R	
Ampicillin/Sulbactam	>= 32	R	Amikacin			
Piperacillin/Tazobactam	>= 128	R	Gentamicin	2	S	
Cefazolin	>= 64	R	Ciprofloxacin	>= 4	R	
Ceftazidime	>= 64	R	Tigecycline	4	I	
Ceftriaxone	>= 64	R	Nitrofurantoin	>= 512	R	
Cefepime			Trimethoprim/Sulfamethoxazole	>= 320	R	
Aztreonam	>= 64	R				

+ = Deduced drug * = AES modified ** = User modified

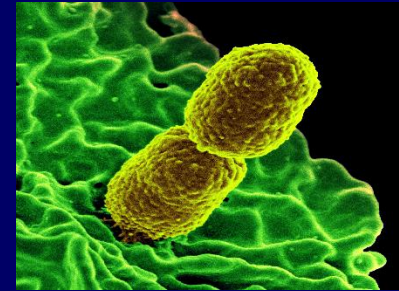
Case Study

Case Study



- Middle-aged male presented to acute care hospital
- Draining, post-surgical wound after procedure in middle east

Case Study

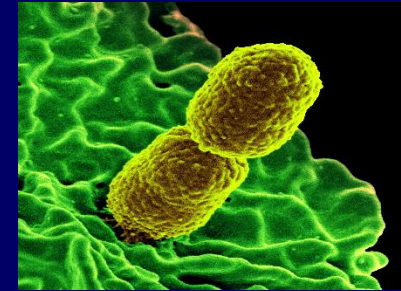


- Wound grew multiple organisms
- *Klebsiella pneumoniae*

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Iso/Org: 05  Klebsiella pneumoniae
```

<u>Antimicrobial</u>	<u>MIC</u>	<u>Systemic</u>
Amp/Sulbactam	>16/8	R
Ampicillin	>16	R
Ceftriaxone	>32	R
Cefazolin	>16	R
Cefepime	>16	R
Cefuroxime	>16	R
Gentamicin	>8	R
Levofloxacin	>4	R
Meropenem	>8	R
Pip/Tazo	>64	R
Trimeth/Sulfa	>2/38	R
Tetracycline	>8	R

Case Study



Also had

- Carbapenem-resistant *Acinetobacter baumannii* (CRAB)

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Iso/Org: 01 Acinetobacter baumannii/haemolyticus
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<u>Antimicrobial</u>	<u>MIC</u>	<u>Sytemic</u>
Amp/Sulbactam	>16/8	R
Amikacin	>32	R
Ceftriaxone	>32	R
Ceftazidime	>16	R
Cefepime	>16	R
Gentamicin	>8	R
Levofloxacin	>4	R
Meropenem	>8	R
Trimeth/Sulfa	≤2/38	S
Tetracycline	>8	R

Case Study

Carbapenemase Testing

- *Klebsiella pneumoniae* tested at public health lab
 - Carba NP: Positive
 - PCR: NDM
- *Acinetobacter* tested at ARLN
 - modified carbapenem inactivation method (mCIM): Positive
 - PCR: NDM

Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA)

CRPA Surveillance

Time & Place

- Multnomah, Clackamas, & Washington counties
- August 2016 – July 2018

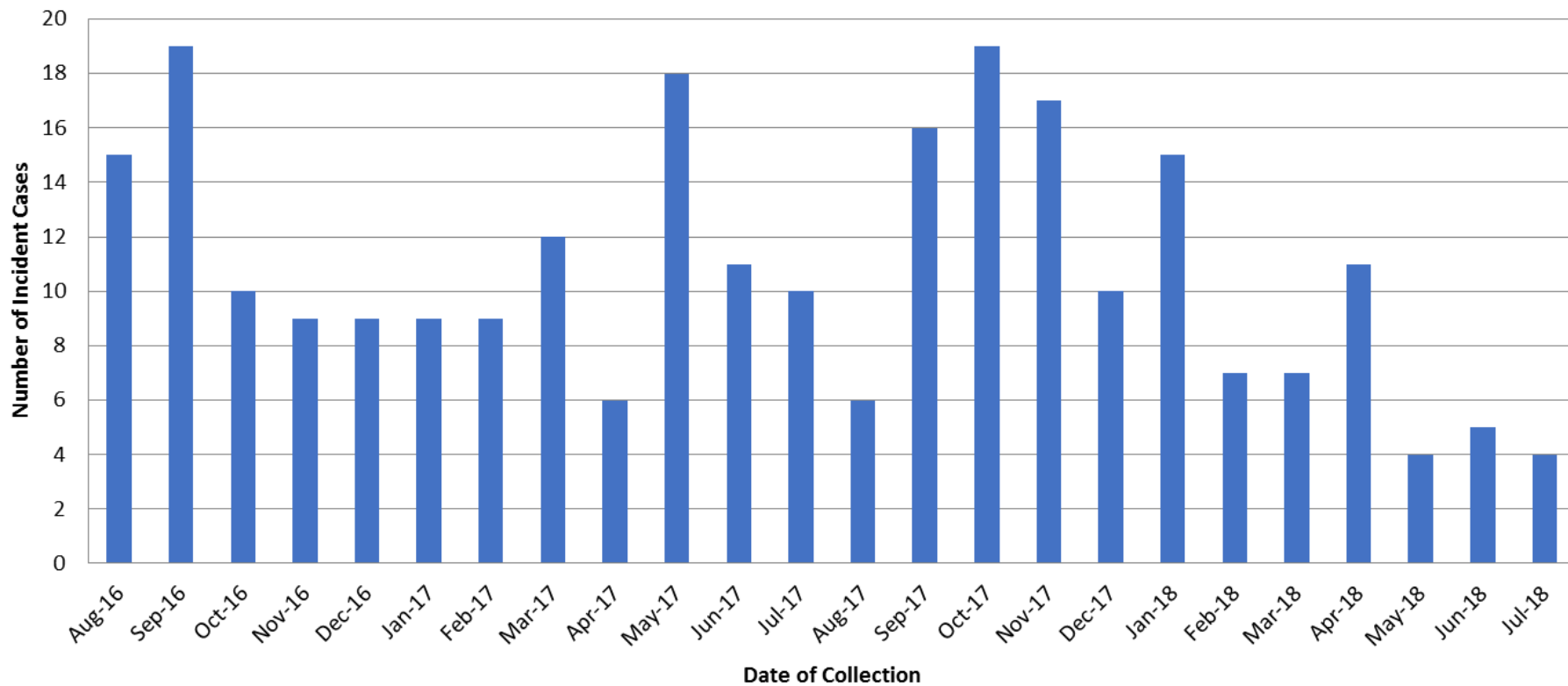
Cultures

- Incident case: 1st CRPA culture from a single patient in a 30 day period
- Resistant to >1 carbapenem (imipenem, meropenem, or doripenem; MIC \geq 8 or zone diameter \leq 15)

Study Elements

- Chart reviews for incident cases
- Isolates submitted for carbapenemase testing

Incident CRPA Isolation Portland Tri-County Area, Aug. 2016- Jul. 2018



CRPA Surveillance

Case Counts	Number (N=258)
CRPA Incident Cases	258
Year 1	137 (53%)
Year 2	121 (47%)
Eligible for Chart Reviews	228 (88%)
Year 1	137 (100%)
Year 2	91 (75%)
CRPA from Sterile Sites	21 (8%)
Year 1	6 (29%)
Year 2	15 (71%)

Specimen Sources & Infections

Specimen Source & Type of Infection	Number (Percent) N=220
Respiratory Specimens	103 (59%)
Pneumonia	28 (27%)
CF Exacerbation	27 (26%)
Colonization	34 (33%)
Urine	94 (43%)
UTI	69 (26%)
Colonization	20 (33%)
Wound	14 (6%)
Sterile	11 (5%)

Numbers based on completed chart reviews

Risk Factors

3.7

Average number of comorbid conditions

- Range: 0-10
- Top: diabetes (34%), pulmonary disease (31%), neurological conditions (30%)

0.5

Average number of indwelling devices

- Range: 0-4
- Top: urinary catheter (31%), CVC (23%), trach (12%)

56%

Antibiotic use in previous 2 weeks

- For case cultures collected in hospital/ED, LTCF, or LTACH
- Range: 1-8 medications among users (avg=1)

Carbapenemases - CRPA Statewide

- 7 pan-nonsusceptible at clinical lab
 - 4 carbapenamase positive
 - 1 VIM
 - 2 with beta-lactamase combination GES-19, GES-26, and OXA-2
 - 1 positive (mCIM) but carbapenemase unknown
 - 3 carbapenemase negative



Carbapenemases - CRPA Statewide

- 3 XDR CRPA at clinical lab
 - 3 carbapenemase positive
 - 1 VIM
 - 2 positive (mCIM) but carbapenemase unknown



Questions?

