

Wisconsin Antibiotic Resistance Surveillance Update

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BREAKING NEWS

COVID-19 PANDEMIC HAS ENDED

10:59

CARLSON FIRST TO REPORT NEWS. CDC DIRECTOR WALENSKY SEEN CHUGGING BEERS



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K.I.S.S.



Three Main Takeaways

- 1) The COVID-19 pandemic sadly did not eradicate carbapenem resistance



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- 2) Carbapenem Resistant *Acinetobacter baumannii* (CRAB) is spreading in Wisconsin



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- 1) The COVID-19 pandemic sadly did not eradicate carbapenem resistance
- 2) Carbapenem Resistant *Acinetobacter baumannii* (CRAB) is spreading in Wisconsin
- 3) *Candida auris* has finally made its way to Wisconsin



HUNGER WARNING

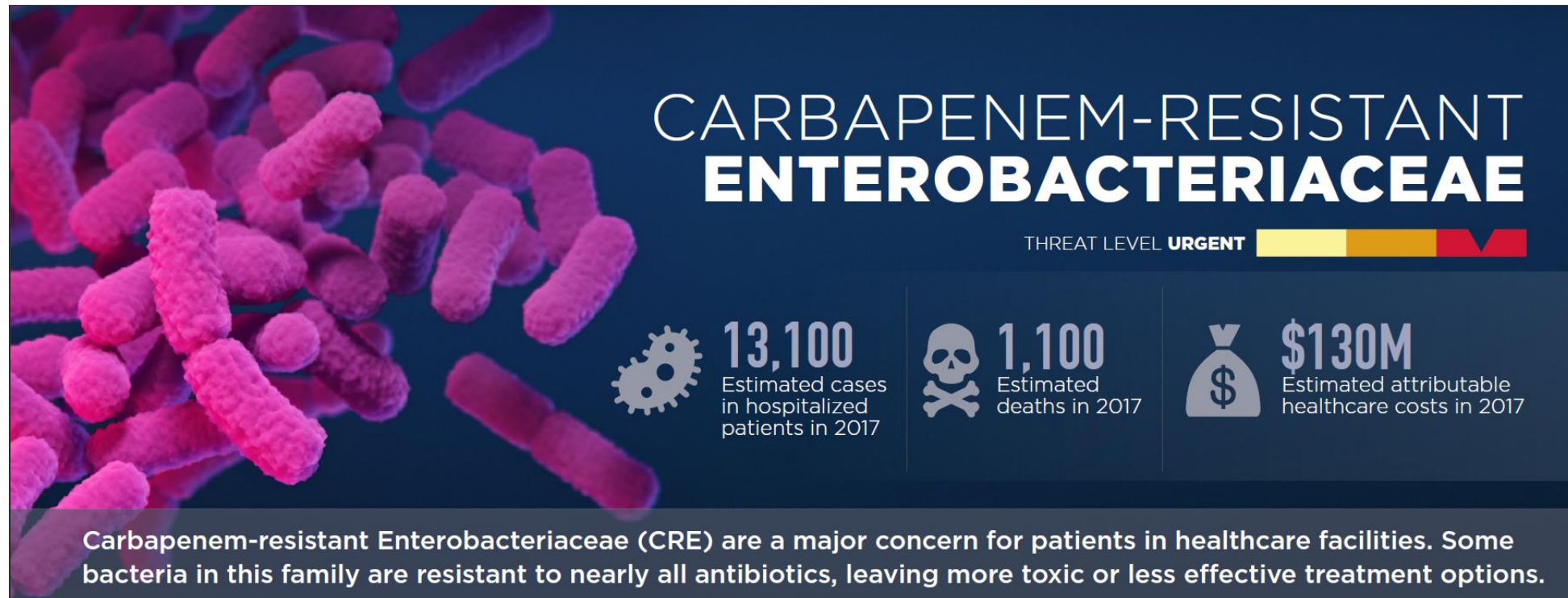


Three Main Takeaways

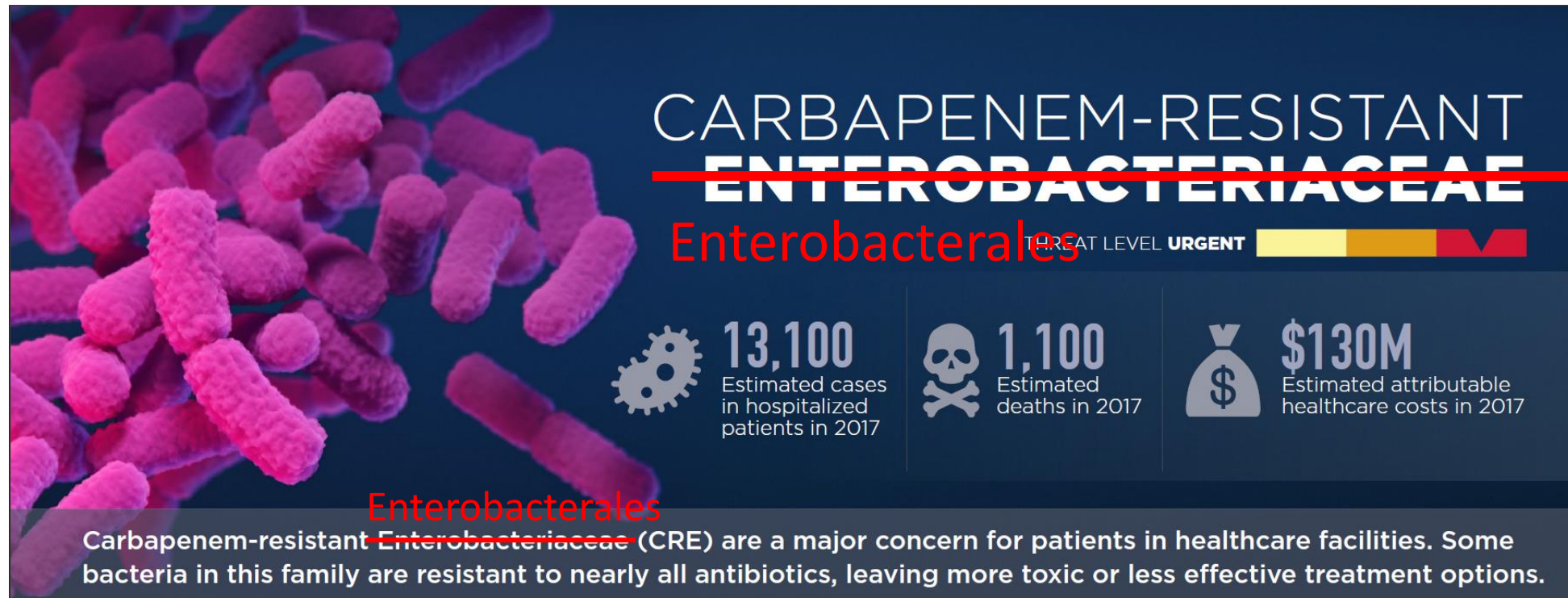
- 1) The COVID-19 pandemic sadly did not eradicate carbapenem resistance



Carbapenem-resistant *Enterobacteriaceae* (CRE)



Carbapenem-resistant **Enterobacterales** (CRE)



Carbapenem-resistant Enterobacterales (CRE)

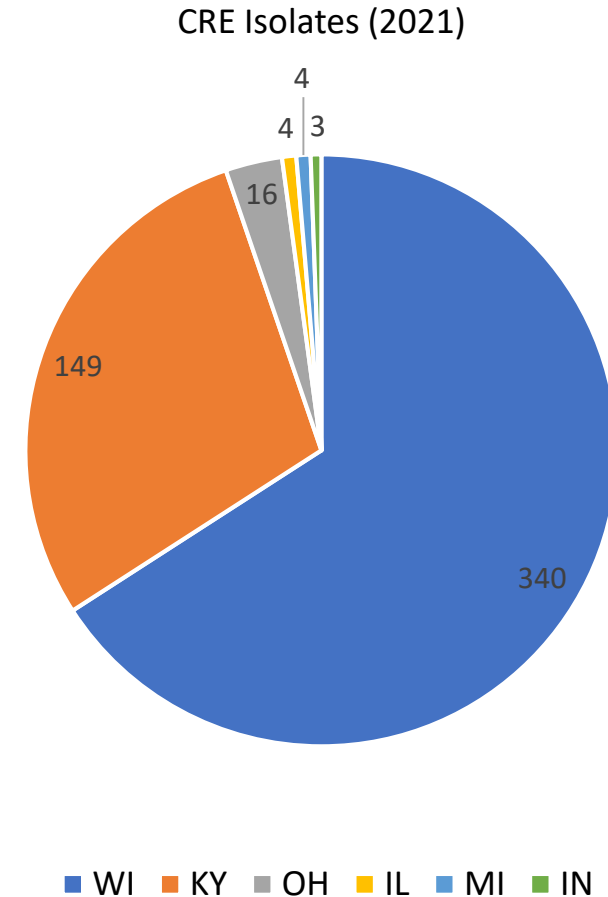
- Carbapenem-resistant Enterobacterales (CRE)
 - CRE can carry mobile genetic elements that are easily shared between bacteria
 - Approximately 30% of CRE carry a mobile genetic element that make carbapenem antibiotics ineffective
 - Patients who require devices (e.g., catheters) and patients taking long courses of antibiotics are the most at risk

Organism	Number of Isolates
<i>Enterobacter cloacae</i> /Complex	195
<i>Klebsiella</i> spp.	176
<i>Escherichia coli</i>	42
<i>Citrobacter freundii</i>	34
<i>Serratia marcescens</i>	26
<i>Proteus mirabilis</i>	25
<i>Providencia</i> spp.	12
<i>Morganella morganii</i>	3
<i>Citrobacter</i> spp.	2
<i>Kluyvera</i> spp.	1
Total	516

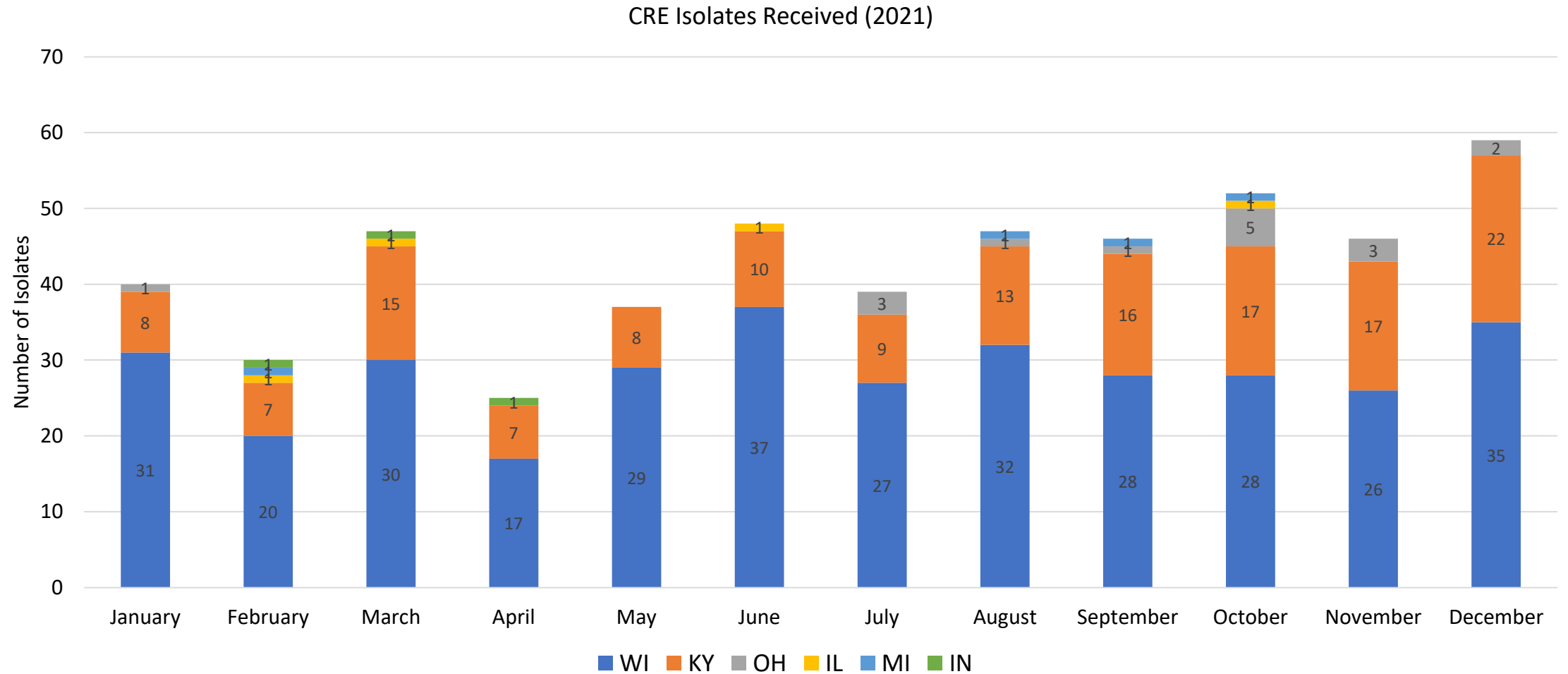


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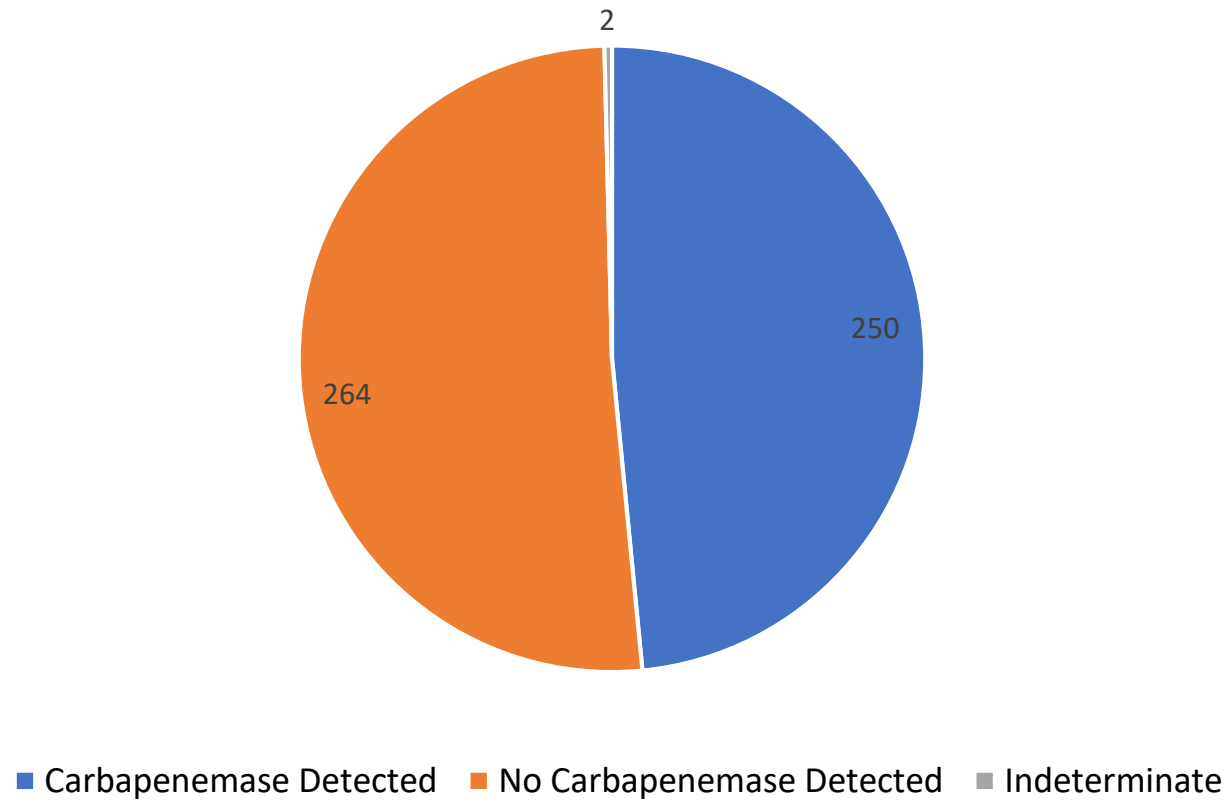


2021 CRE Data



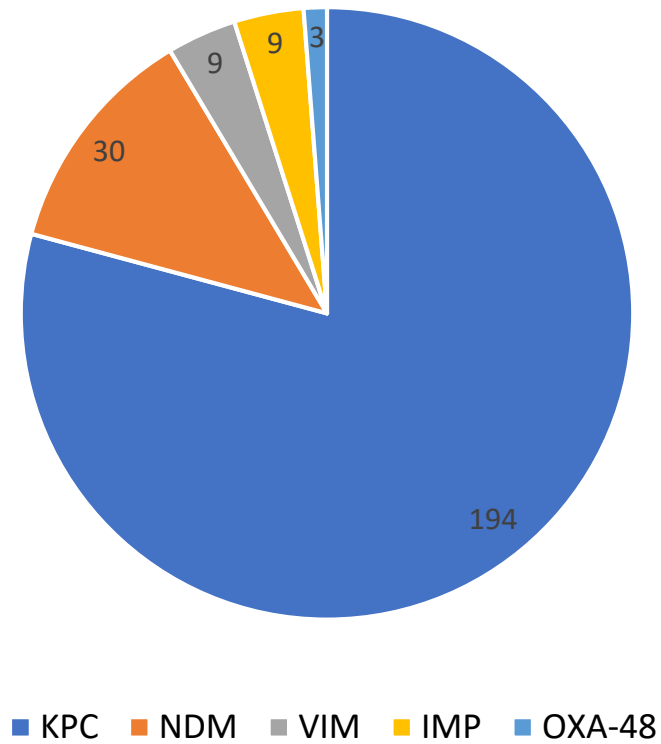
2021 CRE Data

Carbapenemase Presence in CRE Isolates (2021)



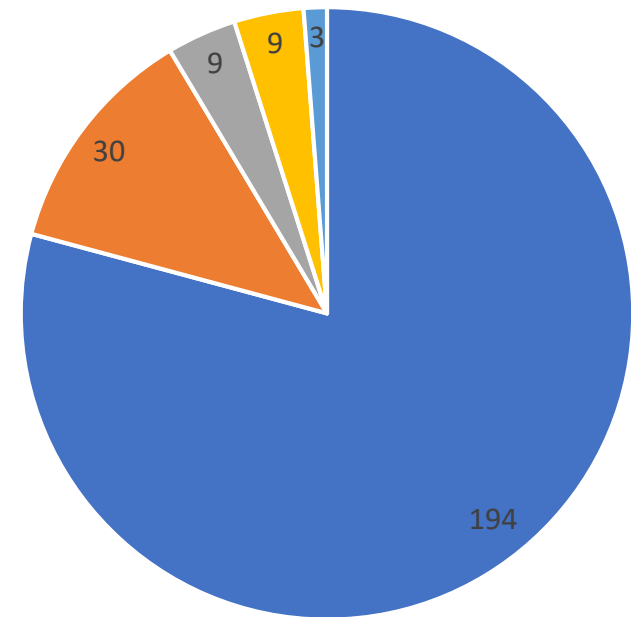
2021 CRE Data

Carbapenemase Genes Detected in CRE Isolates (2021)



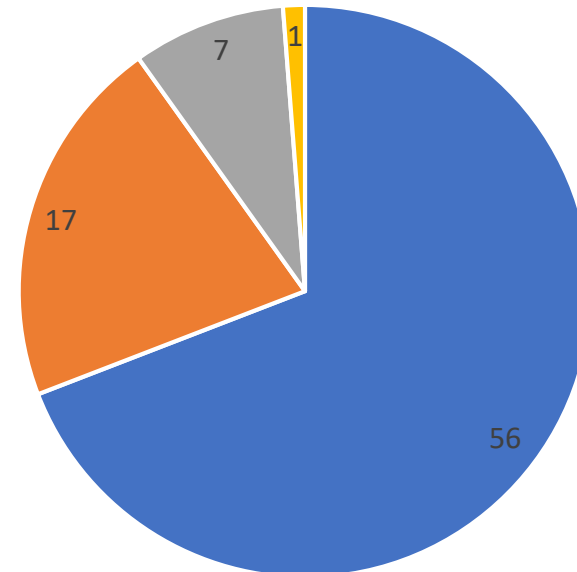
2021 CRE Data

Carbapenemase Genes Detected in CRE Isolates (2021)



■ KPC ■ NDM ■ VIM ■ IMP ■ OXA-48

Carbapenemase Genes Detected in CRE Isolates-
Wisconsin (2021)

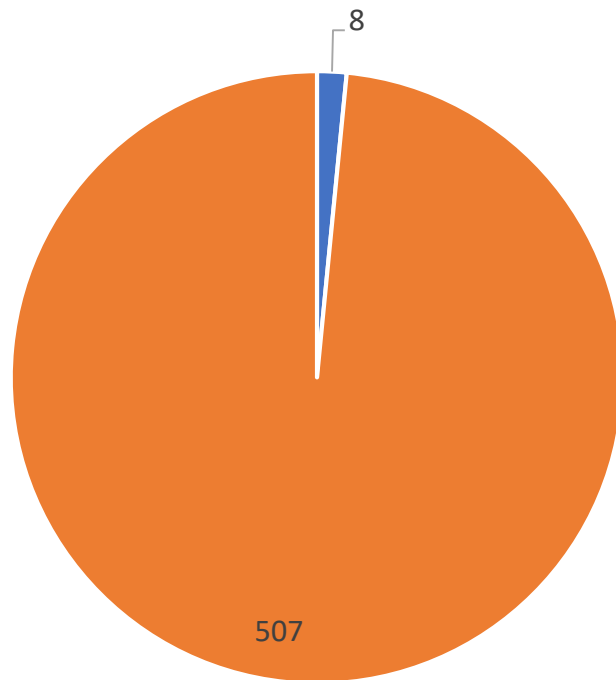


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2021 CRE Data

CRE Isolate Susceptibility (2021)

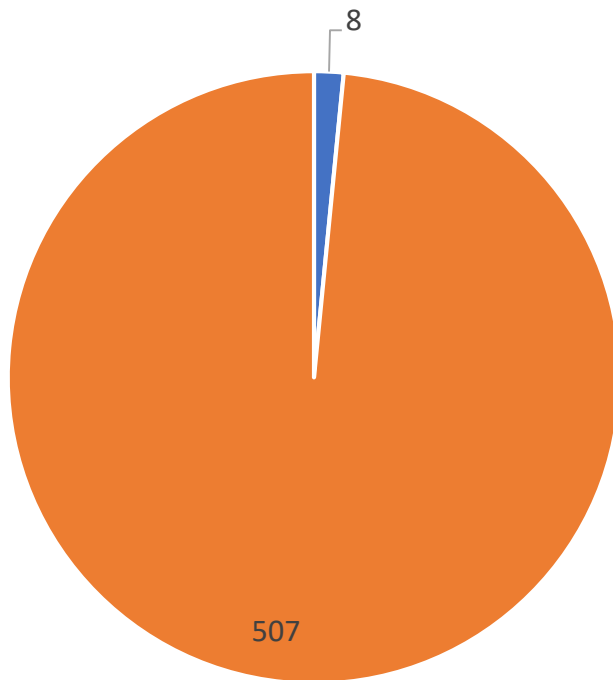


■ Pan-nonsusceptible ■ Susceptible to at least one antibiotic



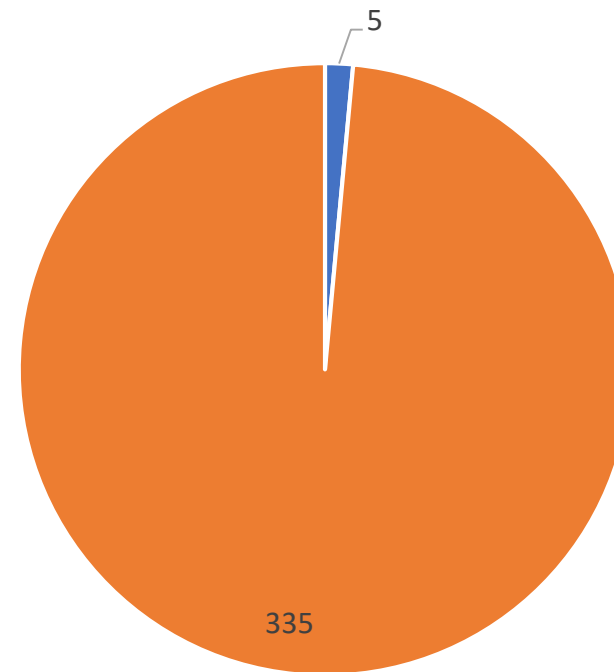
2021 CRE Data

CRE Isolate Susceptibility (2021)



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CRE Isolate Susceptibility-Wisconsin (2021)



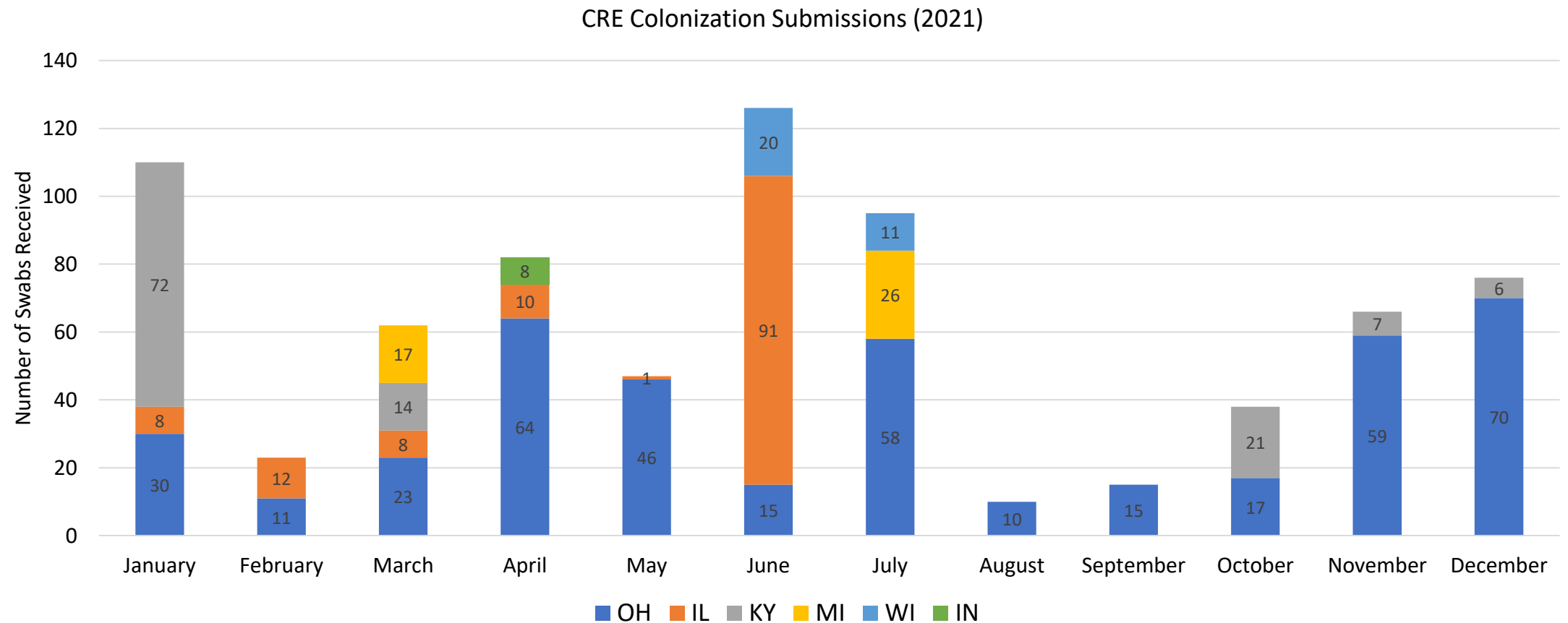
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2021 CRE Colonization Screens

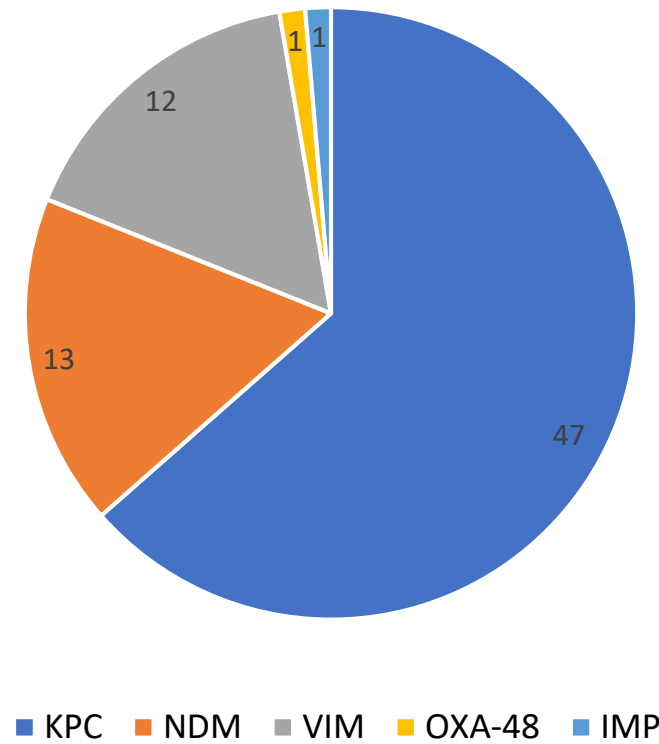


2021 CRE Colonization Data

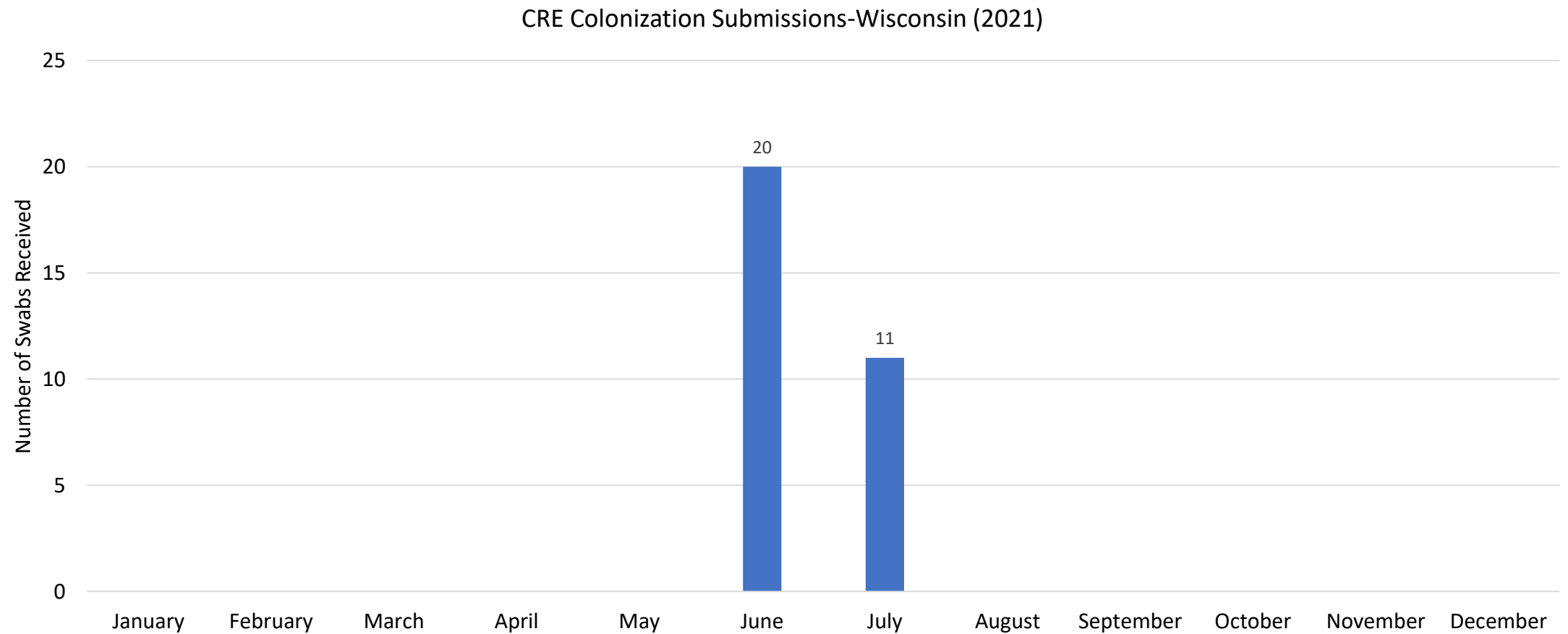


2021 CRE Colonization Data

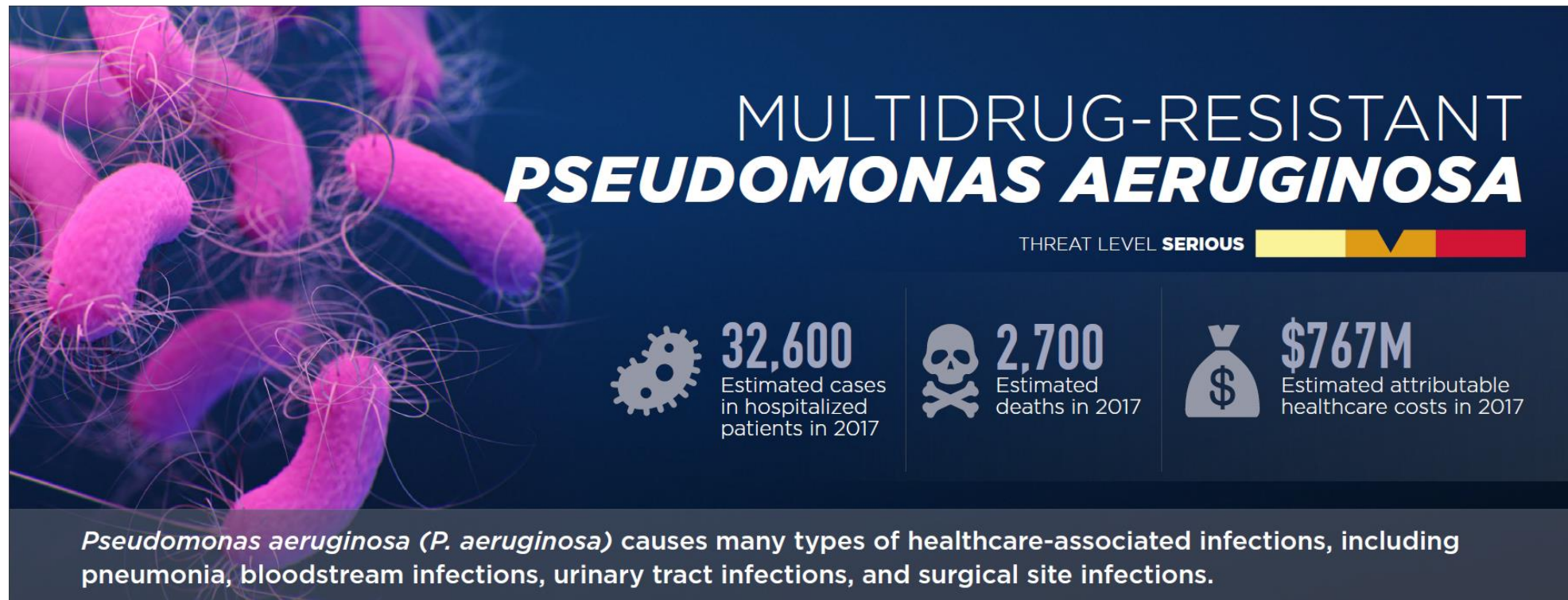
Carbapenemase Genes Detected in CRE Colonization Screens (2021)



2021 CRE Colonization Data

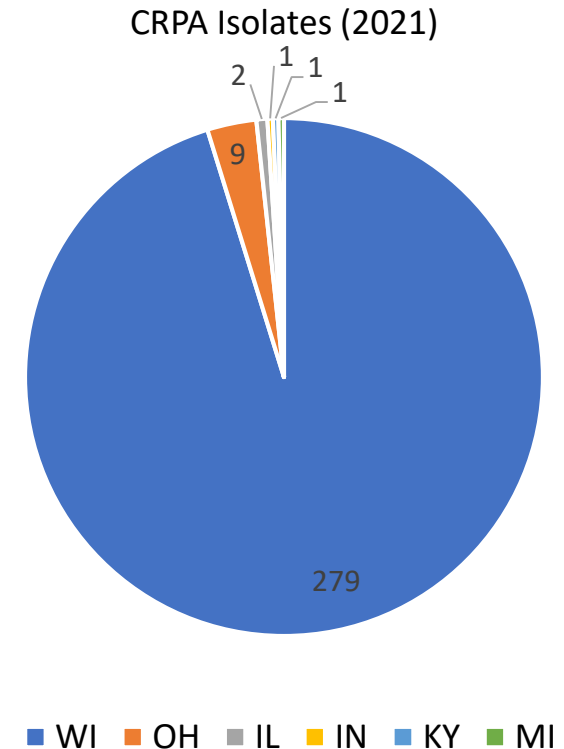


Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA)

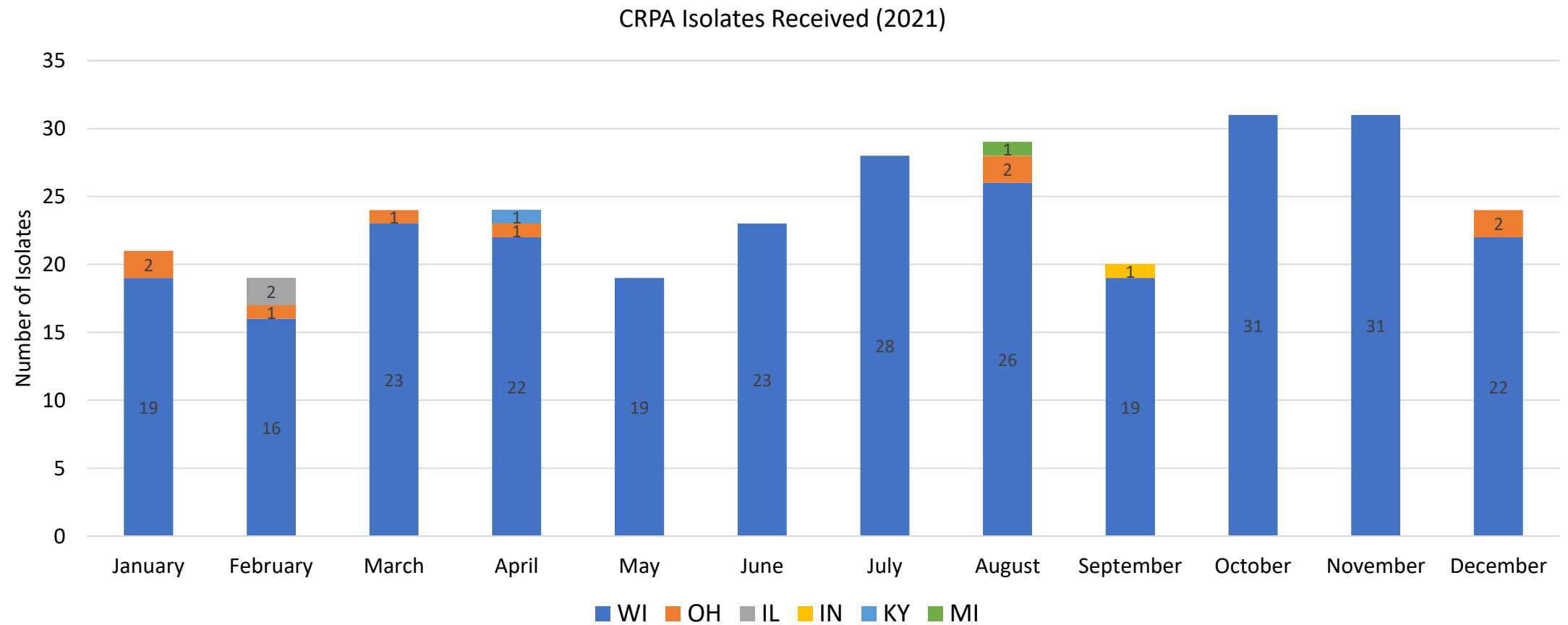


Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA)

- Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA)
 - *P. aeruginosa* infections usually occur in people in the hospital or with weakened immune systems
 - 2-3% of CRPA carry a mobile genetic element that makes a carbapenemase enzyme

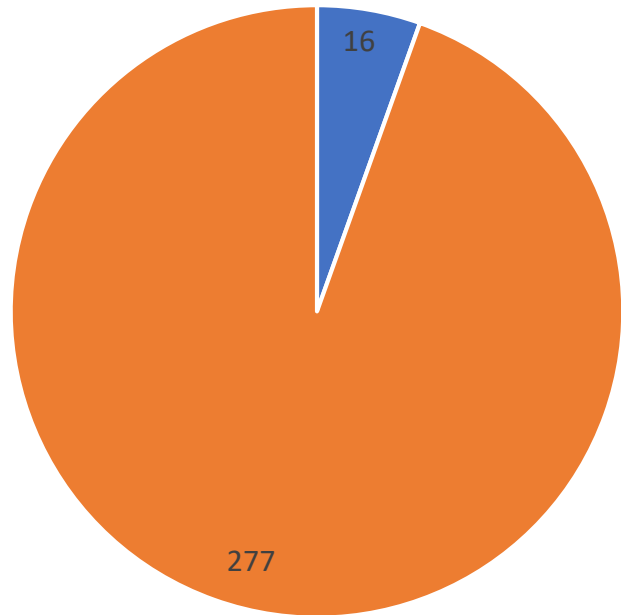


2021 CRPA Data



2021 CRPA Data

Carbapenemase Presence in CRPA Isolates (2021)

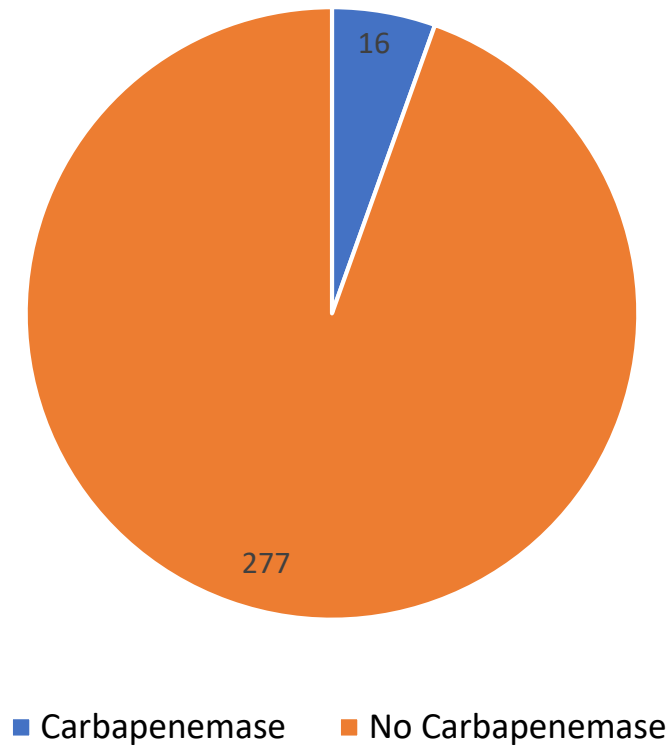


■ Carbapenemase ■ No Carbapenemase

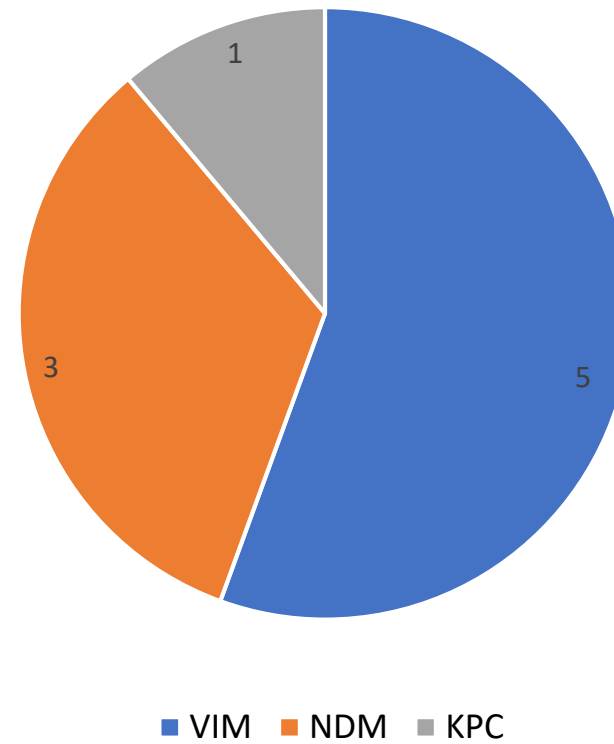


2021 CRPA Data

Carbapenemase Presence in CRPA Isolates (2021)

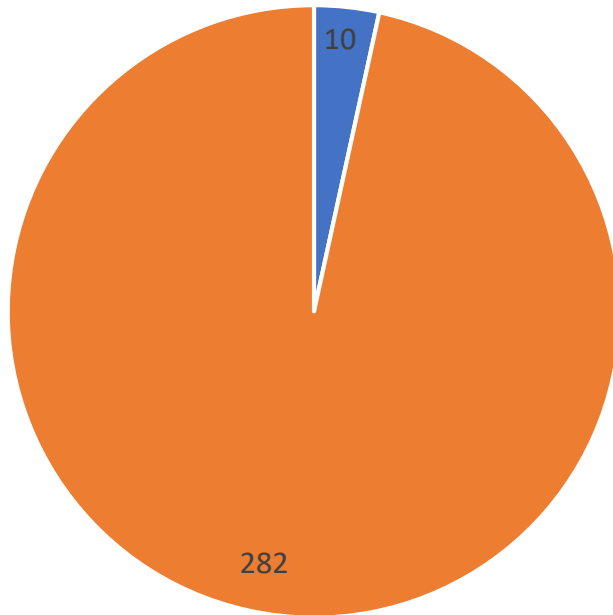


Carbapenemase Genes Detected in CRPA Isolates (2021)



2021 CRPA Data

CRPA Isolate Susceptibility (2021)



■ Pan-nonsusceptible ■ Susceptible to at least one antibiotic

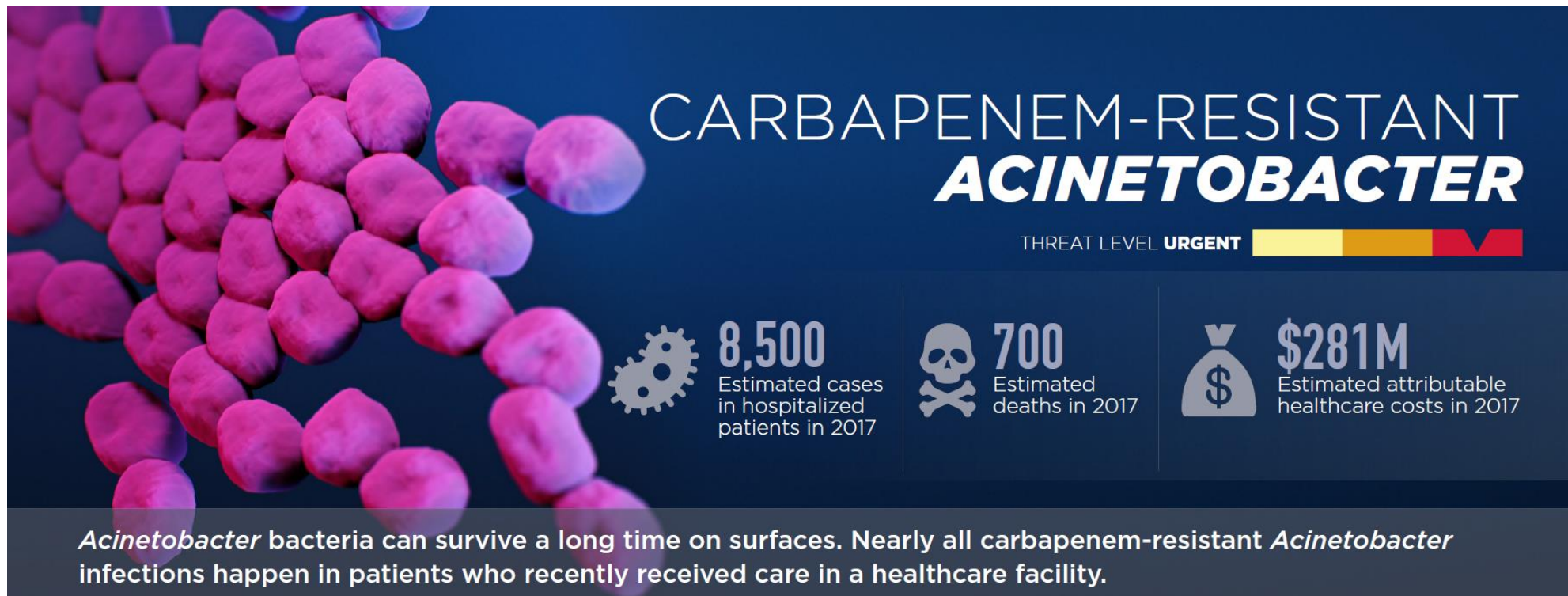


Three Main Takeaways

- 1) The COVID-19 pandemic sadly did not eradicate carbapenem resistance
- 2) Carbapenem Resistant *Acinetobacter baumannii* (CRAB) is spreading in Wisconsin

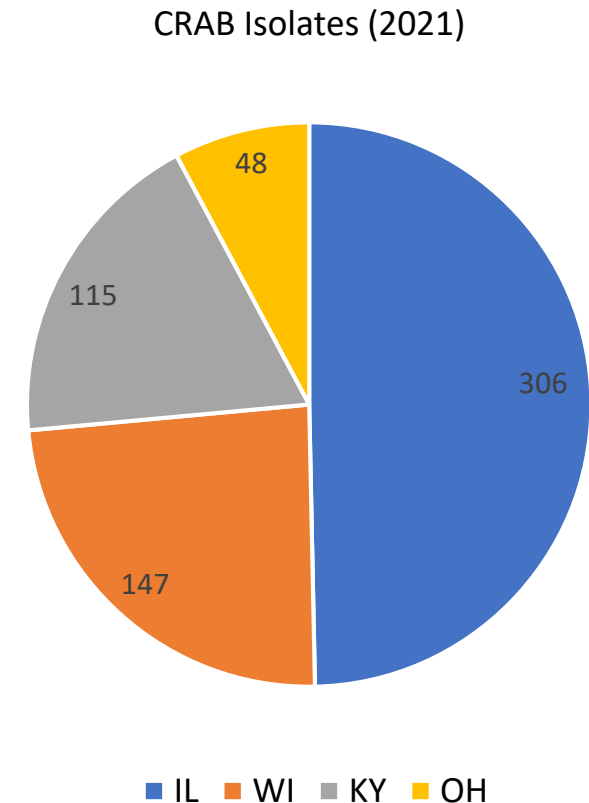


Carbapenem-resistant *Acinetobacter baumannii* (CRAB)



Carbapenem-resistant *Acinetobacter baumannii* (CRAB)

- Carbapenem-resistant *Acinetobacter baumannii* (CRAB)
 - Cause pneumonia, wound, bloodstream, and urinary tract infections
 - Infections tend to occur in intensive care units (ICUs)
 - Carry mobile genetic elements that are easily shared between bacteria, further enhancing the spread of carbapenemase producing organisms
 - Some *Acinetobacter* are resistant to nearly all antibiotics
 - Very few new drugs are in development



Carbapenem-resistant *Acinetobacter baumannii* (CRAB)

- Carbapenem-resistant *Acinetobacter baumannii* (CRAB)
 - Often carry plasmid-encoded β -lactamases with carbapenemase activity (OXA-23, OXA-24/40, and OXA-58)
 - Denoted as OXA because of their ability to confer resistance to oxacillin
 - Presence of just one carbapenemase-hydrolyzing OXA enzyme may be enough for *A. baumannii* to become resistant to all carbapenems

Review > Clin Microbiol Rev. 2014 Apr;27(2):241-63. doi: 10.1128/CMR.00117-13.

OXA β -lactamases

Benjamin A Evans¹, Sebastian G B Amyes

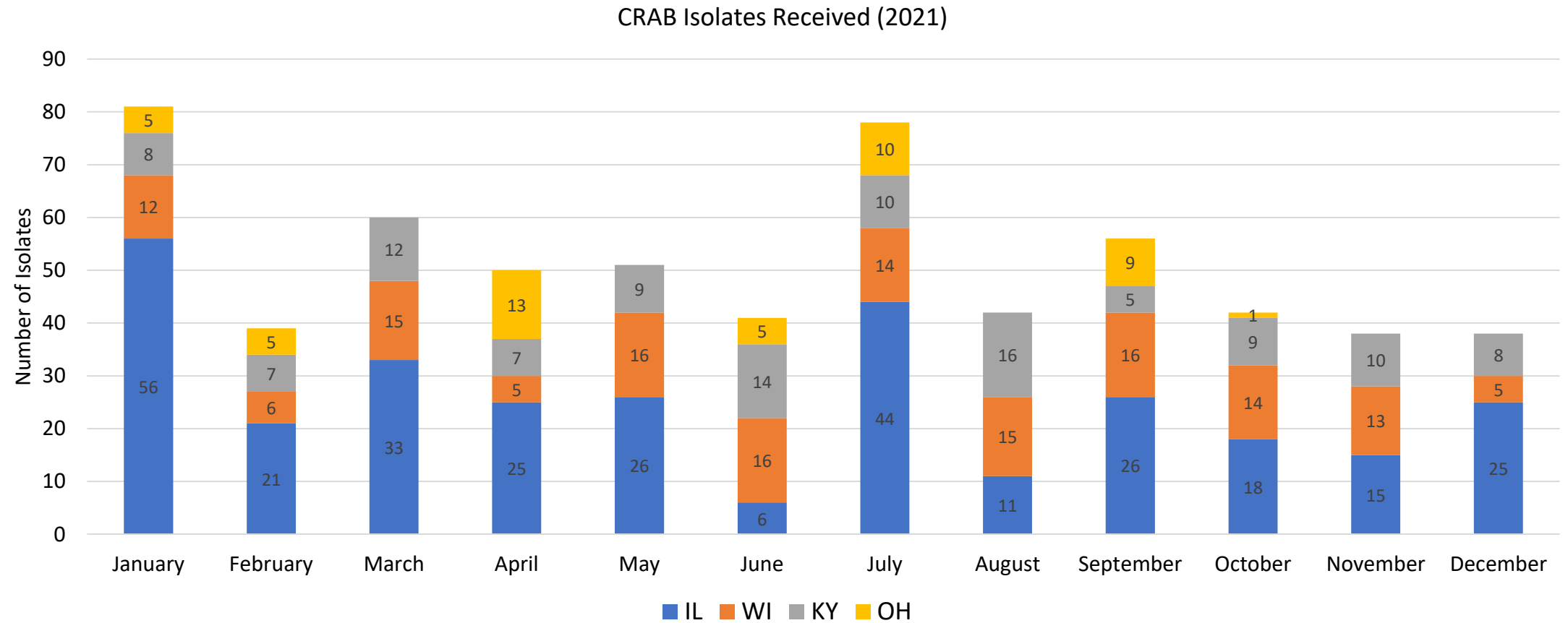
Affiliations + expand

PMID: 24696435 PMCID: PMC3993105 DOI: 10.1128/CMR.00117-13

Free PMC article

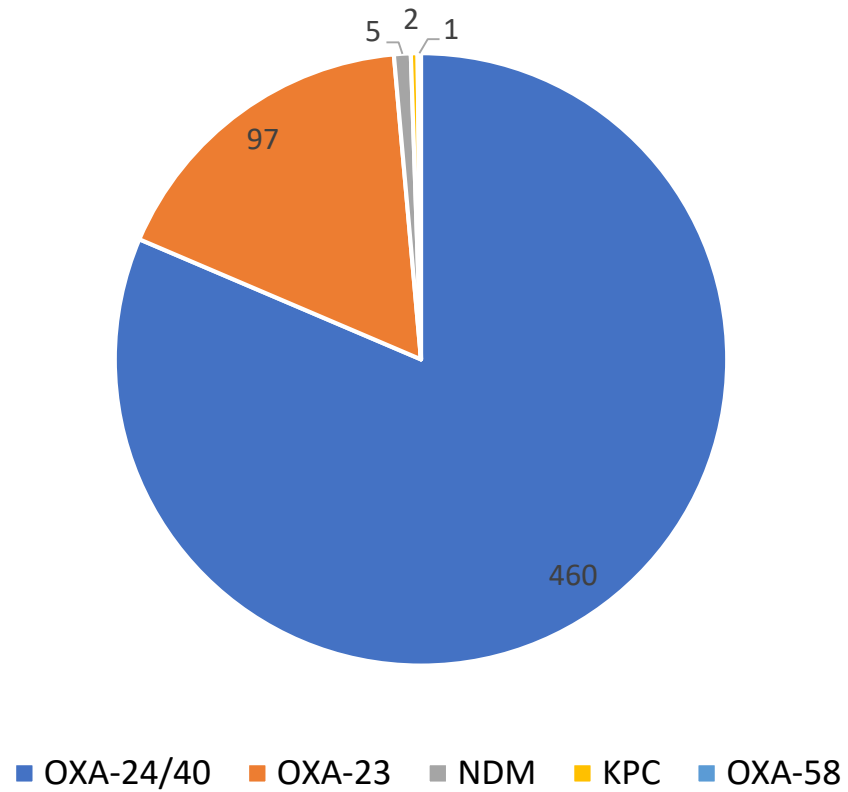


2021 CRAB Data



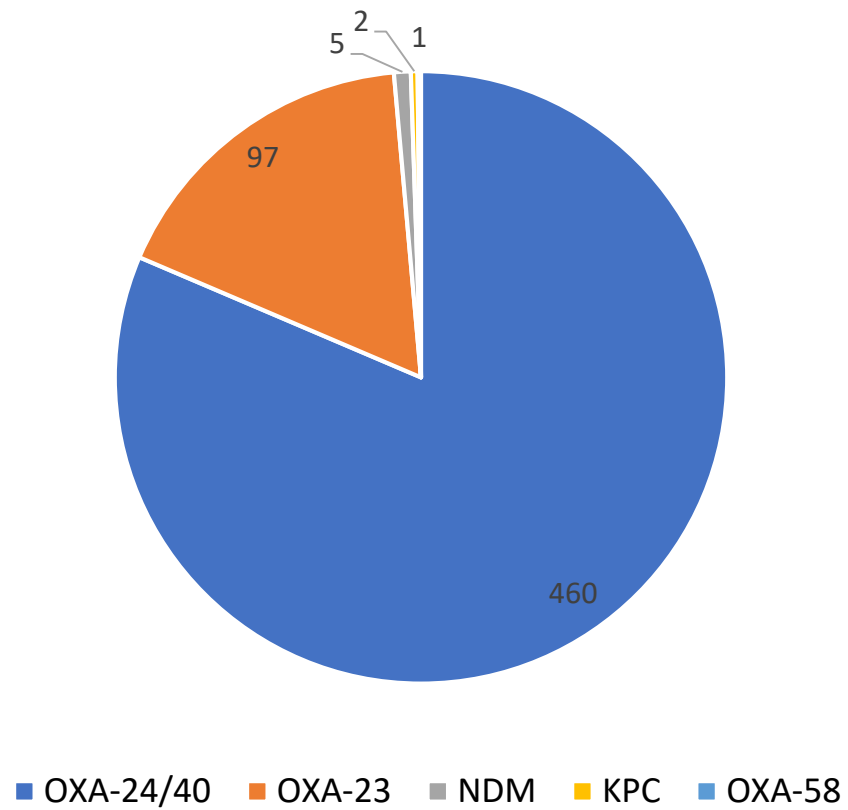
2021 CRAB Data

Carbapenemase Genes Detected in CRAB Isolates (2021)

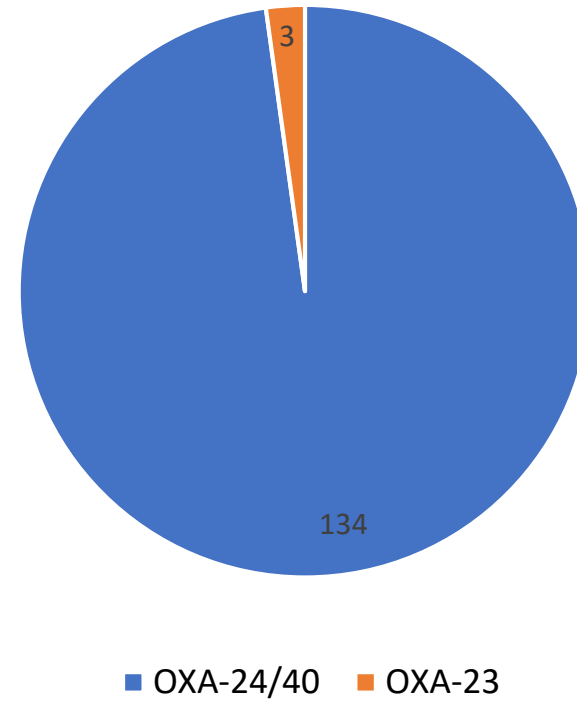


2021 CRAB Data

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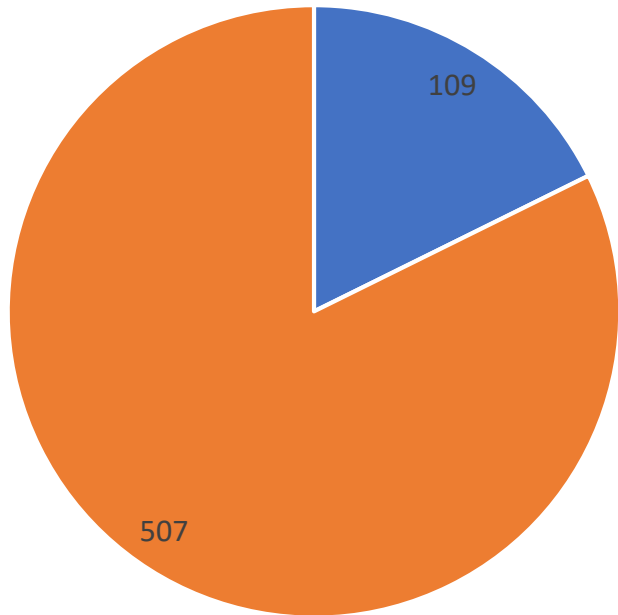


Carbapenemase Genes Detected in CRAB Isolates-
Wisconsin (2021)



2021 CRAB Data

CRAB Isolate Susceptibility (2021)

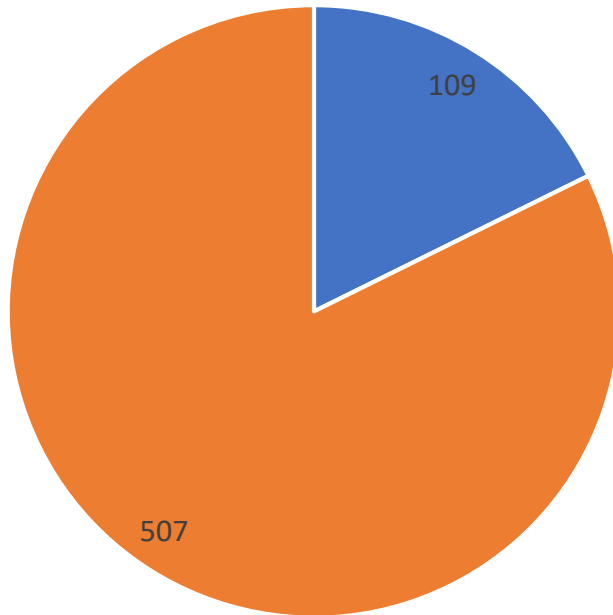


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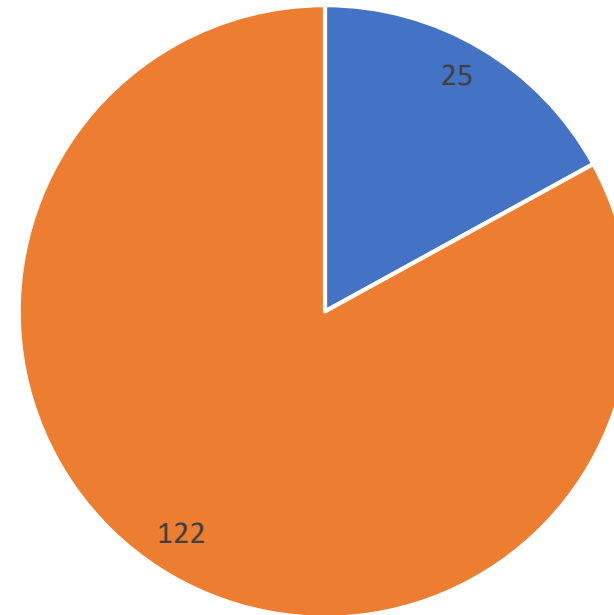
2021 CRAB Data

CRAB Isolate Susceptibility (2021)



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CRAB Isolate Susceptibility-Wisconsin (2021)



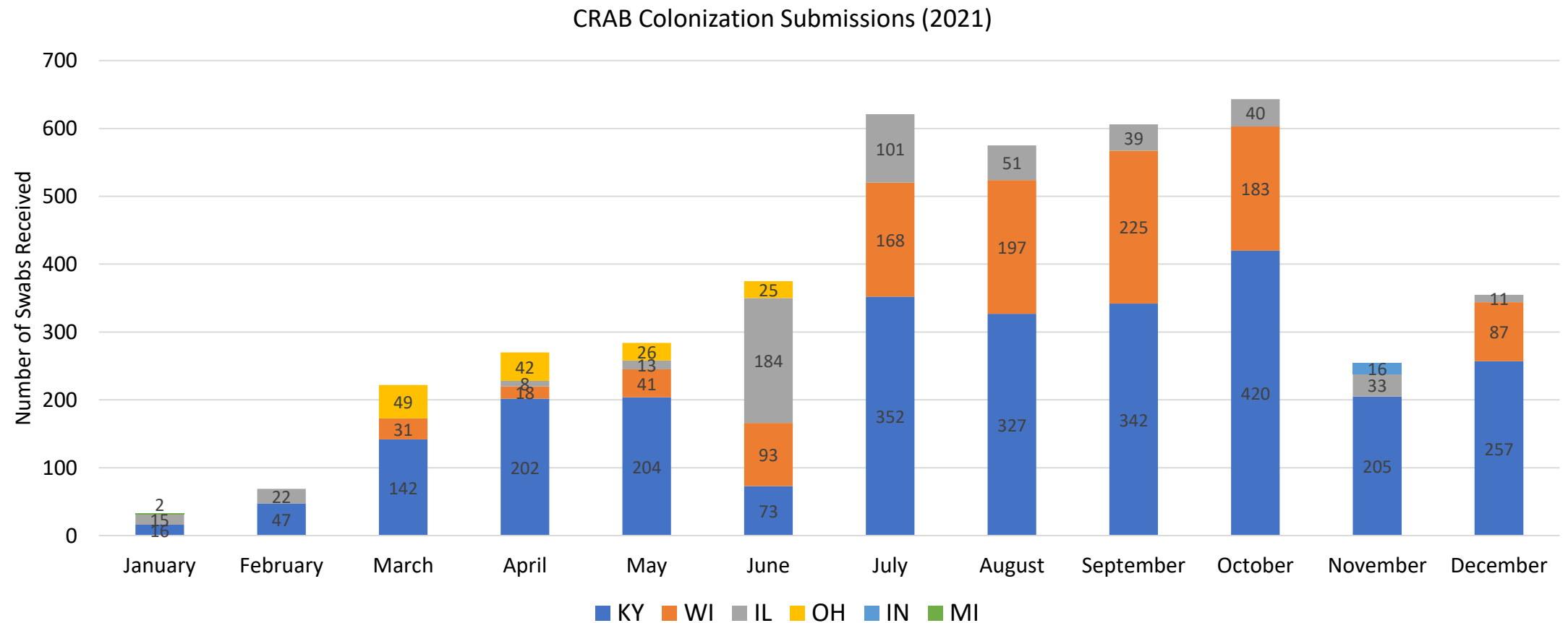
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2021 CRAB Colonization Screens



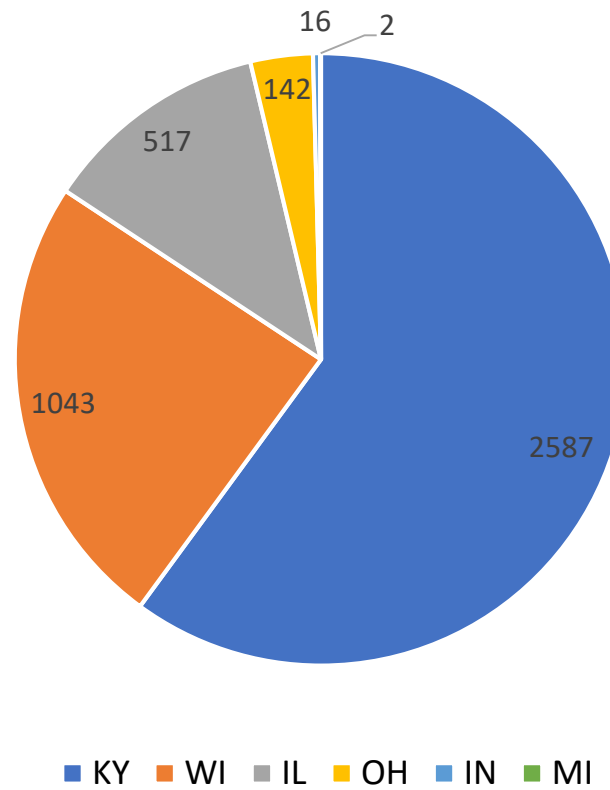
2021 CRAB Colonization Data



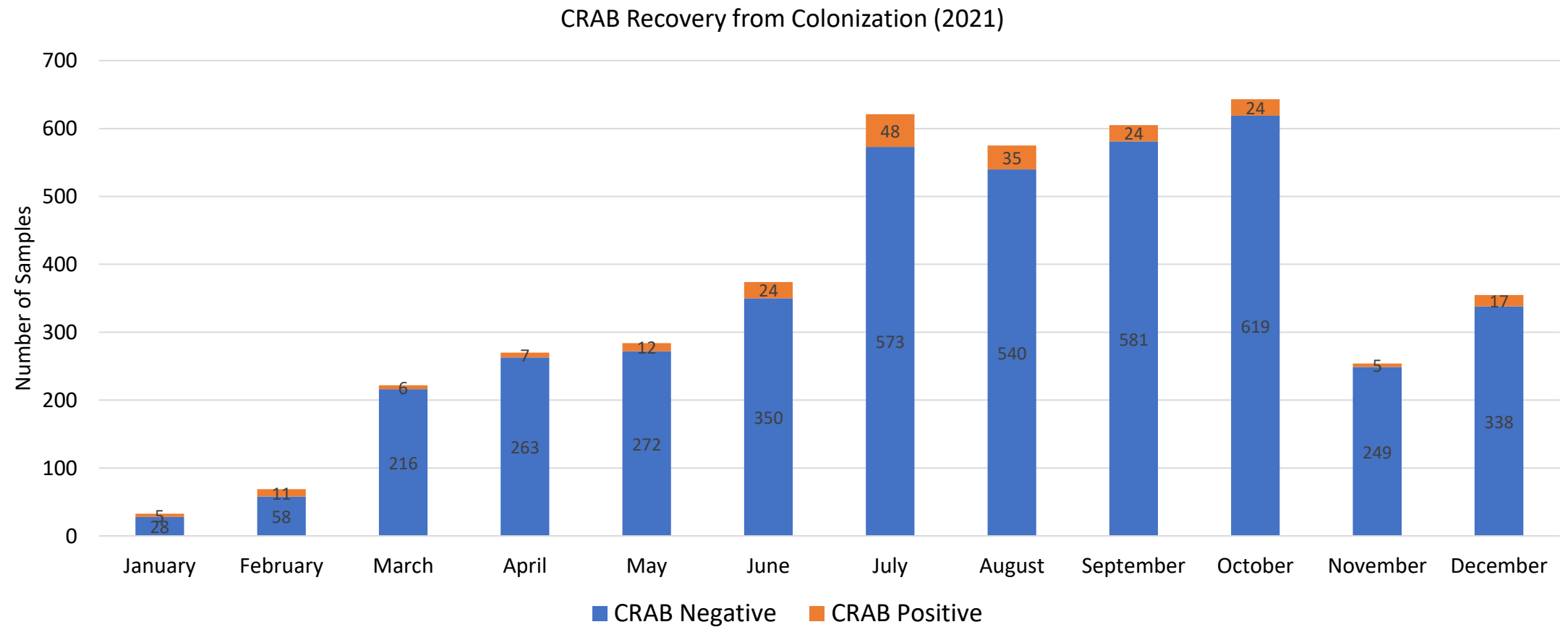


2021 CRAB Colonization Data

CRAB Colonization Submissions (2021)

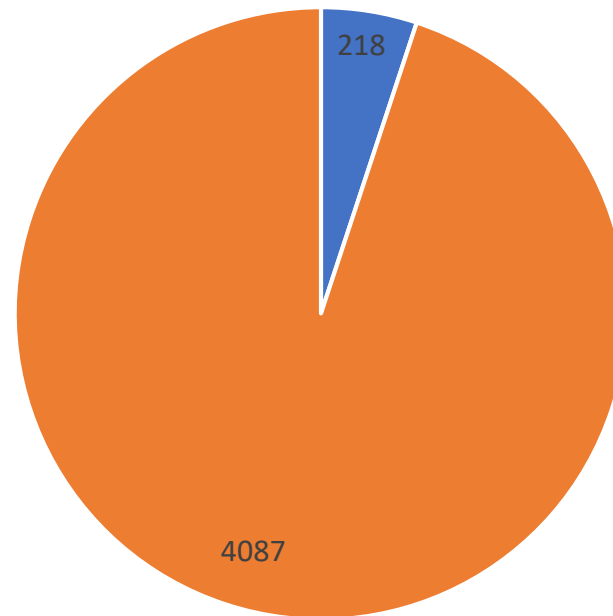


2021 CRAB Colonization Data



2021 CRAB Colonization Data

CRAB Recovery from Colonization (2021)

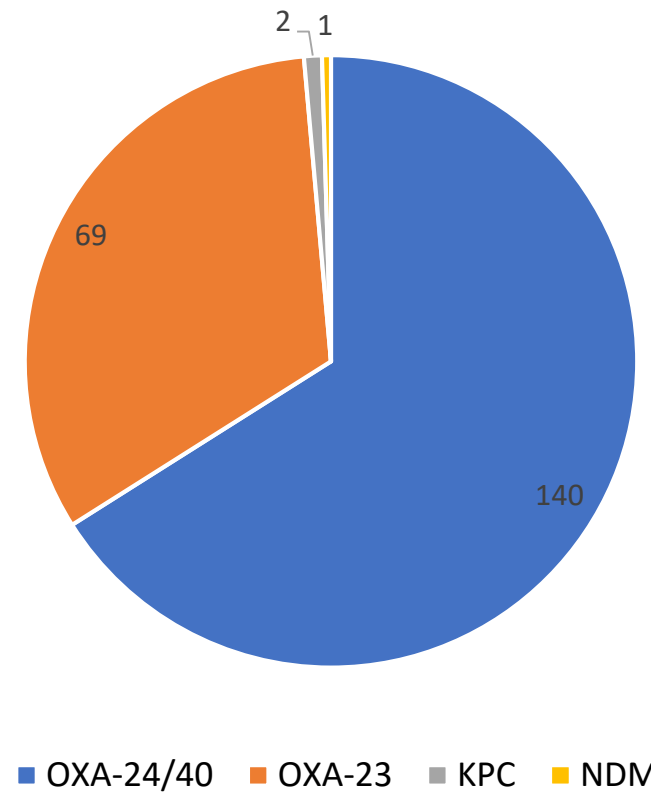


■ CRAB Positive ■ CRAB Negative

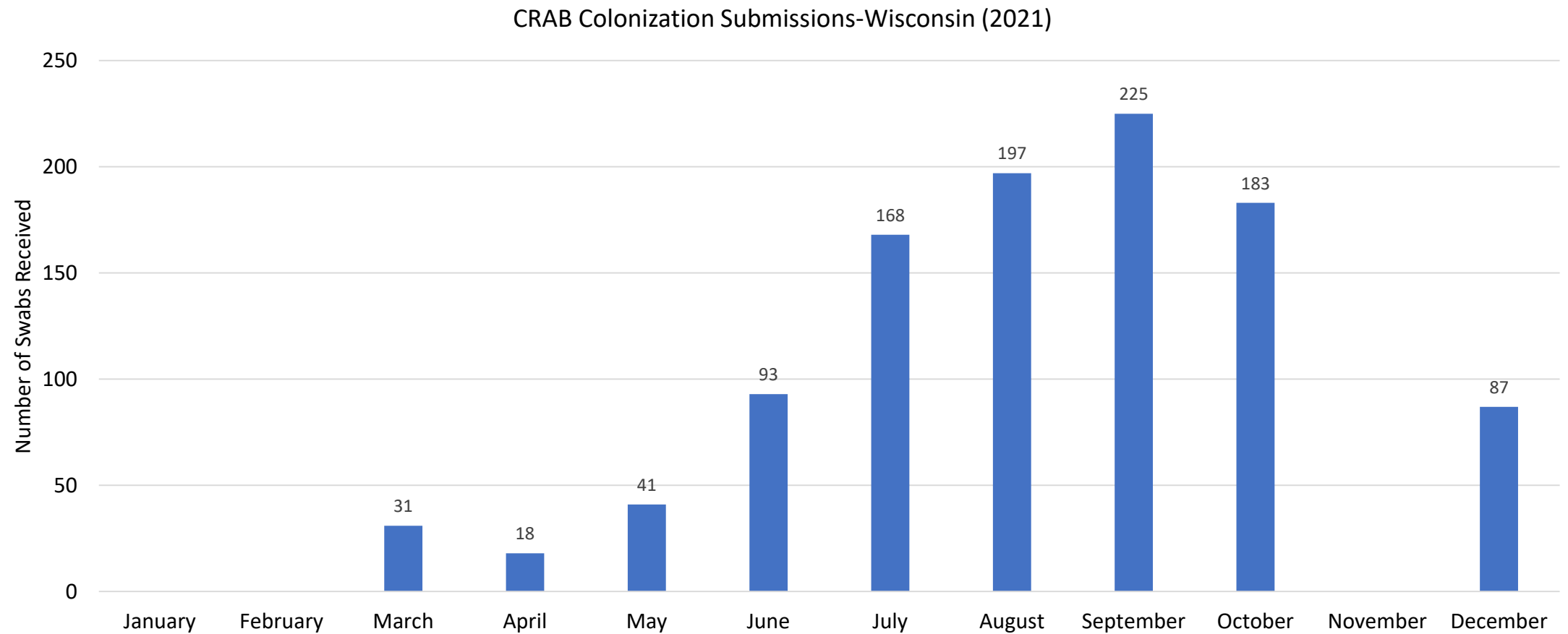


2021 CRAB Colonization Data

Carbapenemase Genes Detected in CRAB Colonization Screens (2021)



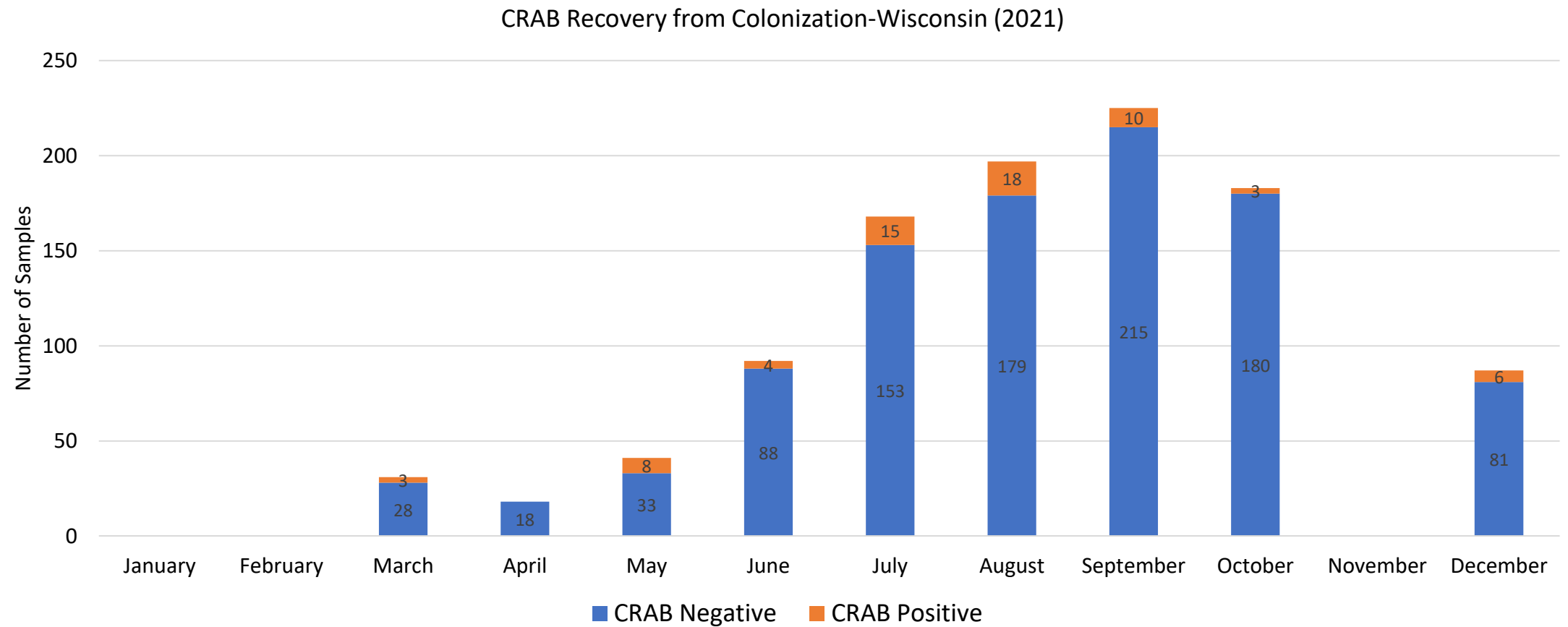
2021 CRAB Colonization Data



I'm sorry Wisconsin,
but you have CRAB

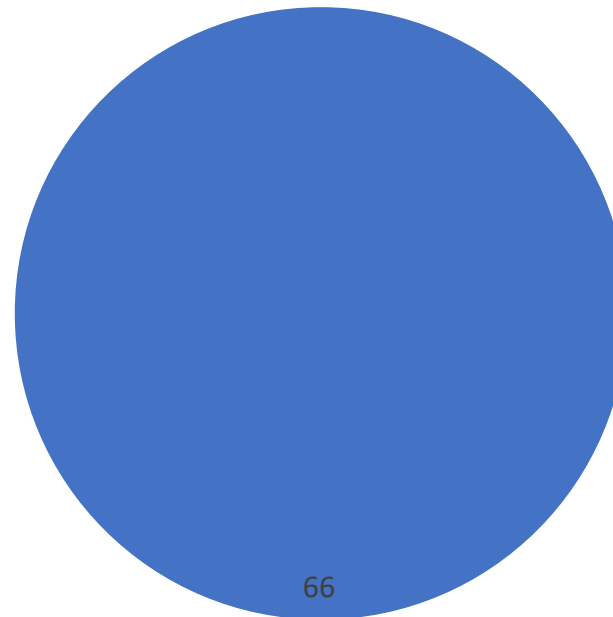


2021 CRAB Colonization Data



2021 CRAB Colonization Data

Carbapenemase Genes Detected in CRAB Colonization Screens-Wisconsin (2021)

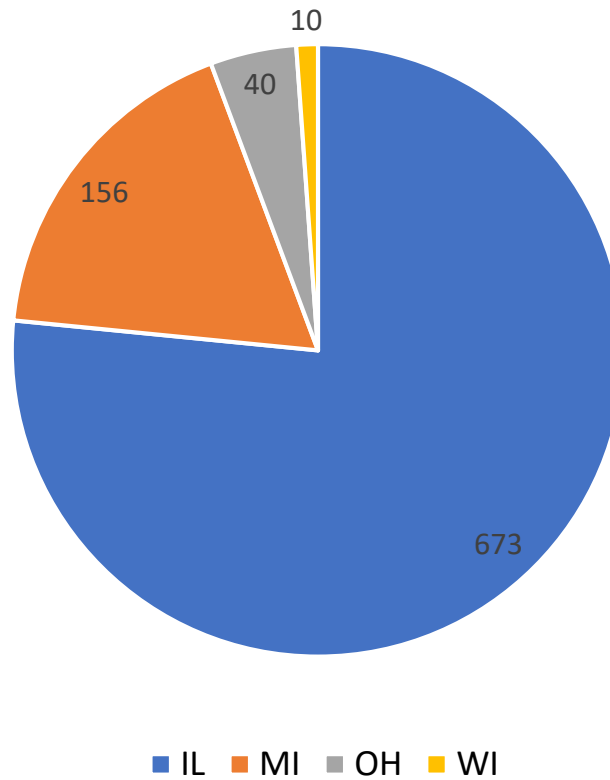


■ OXA-24/40



2021 CRE/CRAB Colonization Data

CRAB/CRE Colonization Submissions (2021)



Three Main Takeaways

- 1) The COVID-19 pandemic sadly did not eradicate carbapenem resistance
- 2) Carbapenem Resistant *Acinetobacter baumannii* (CRAB) is spreading in Wisconsin
- 3) *Candida auris* has finally made its way to Wisconsin



Candida auris



Candida auris

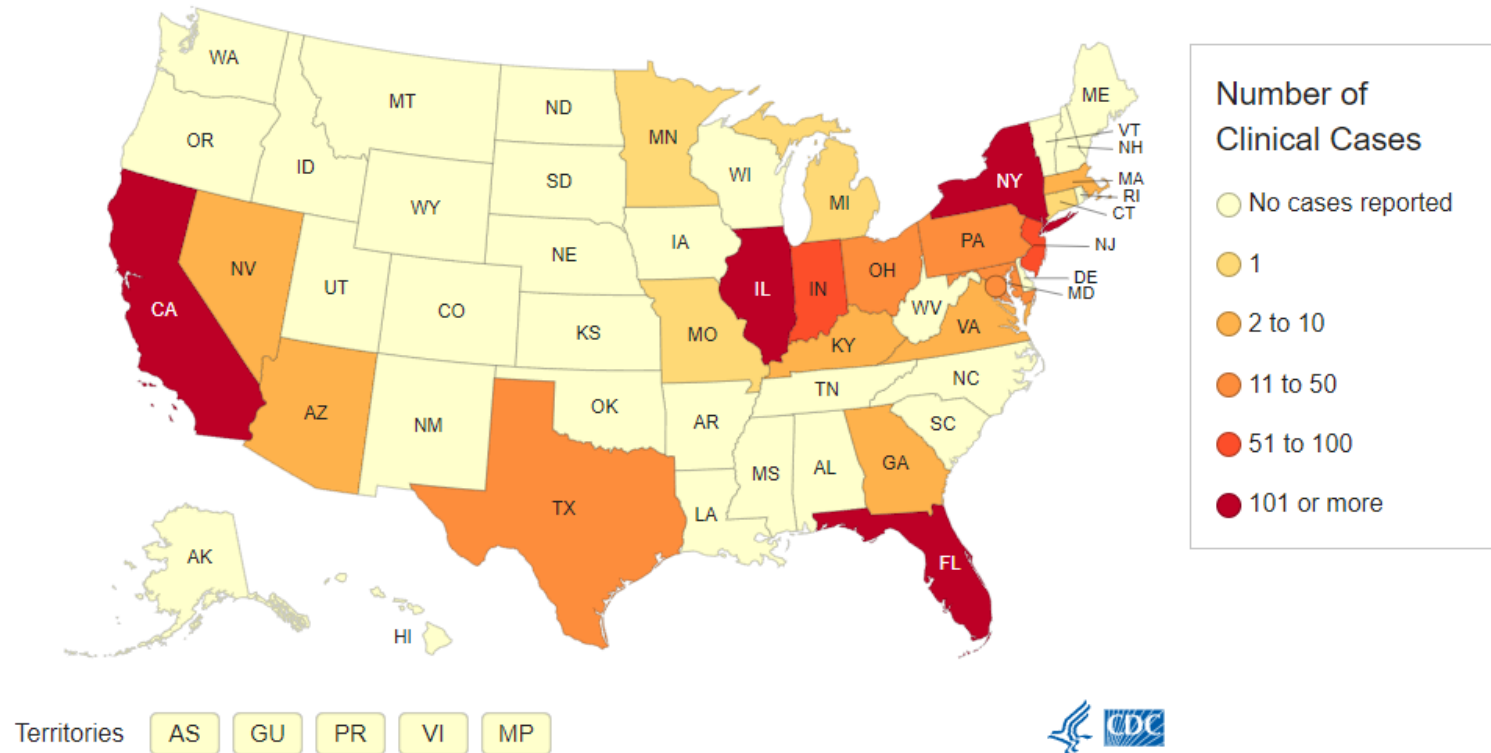
- *Candida auris*
 - Can cause outbreaks in healthcare facilities
 - Often multidrug-resistant, with some strains resistant to all three available classes of antifungals
 - Can be carried on patient's skin without causing infection, allowing further spread
 - Some common healthcare disinfectants are less effective at eliminating it

Organism	Isolates
<i>Candida auris</i>	476
<i>Candida glabrata</i>	13
<i>Candida lusitanae</i>	9
<i>Candida fermentati</i>	7
<i>Candida parapsilosis</i>	5
<i>Candida albicans</i>	3
<i>Saccharomyces cerevisiae</i>	3
<i>Cyberlindnera culbertsonii</i>	2
<i>Candida bracarensis</i>	1
<i>Candida guilliermondii</i>	1
<i>Candida metapsilosis</i>	1
<i>Candida orthopsilosis</i>	1
<i>Candida tropicalis</i>	1
Total	523

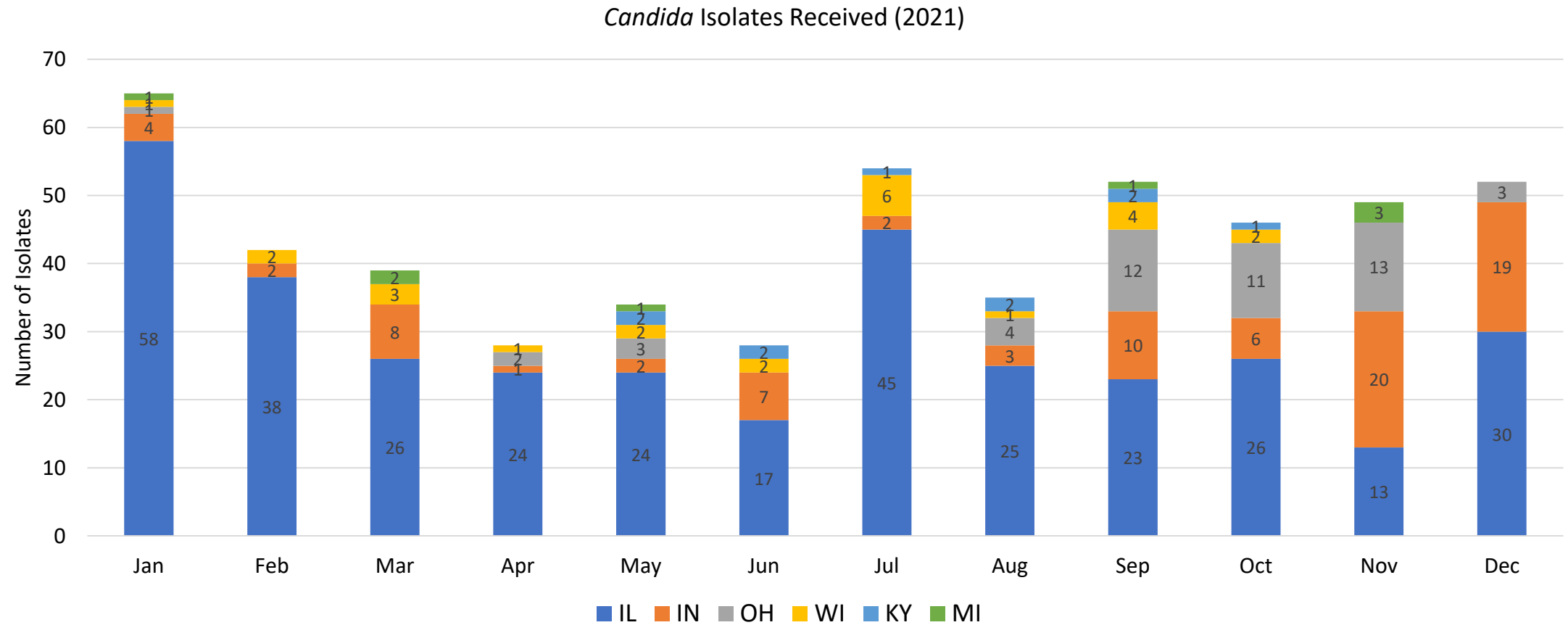


C. auris confirmed cases in the US

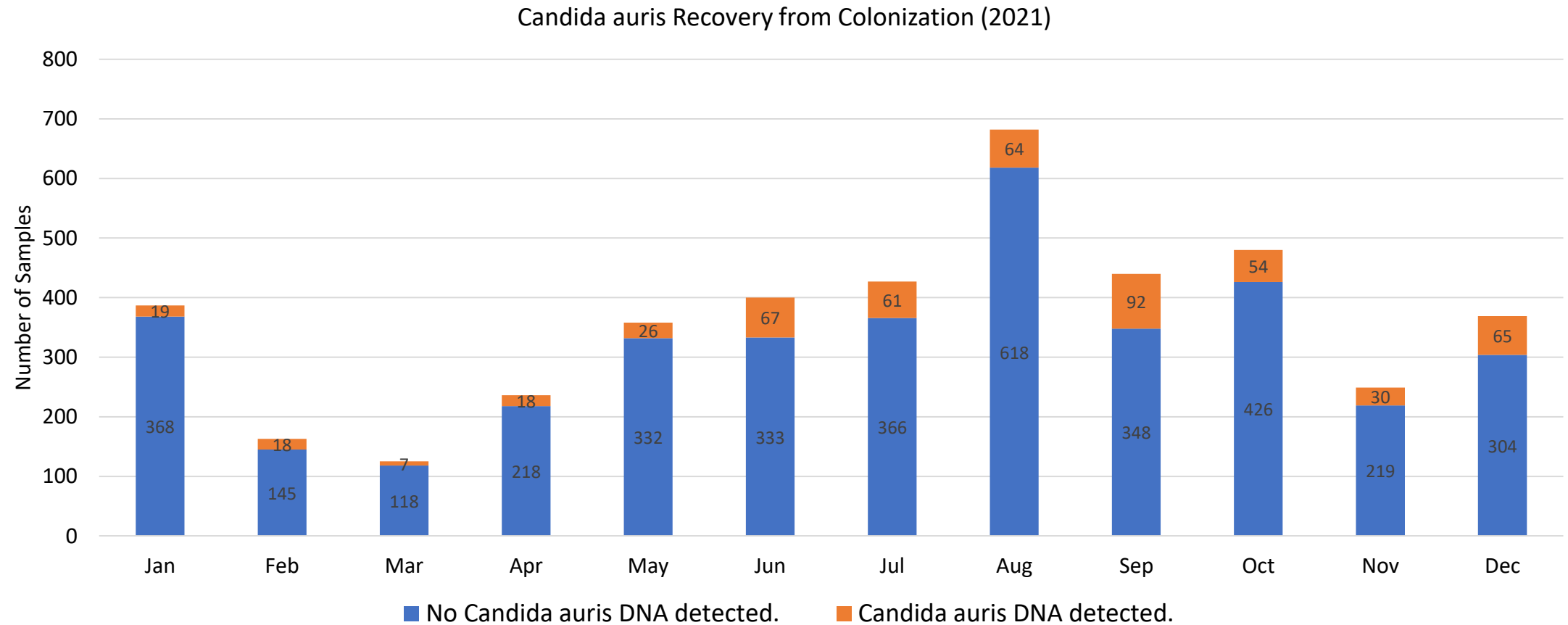
Reported clinical cases of *Candida auris*, January 01, 2021-December 31, 2021



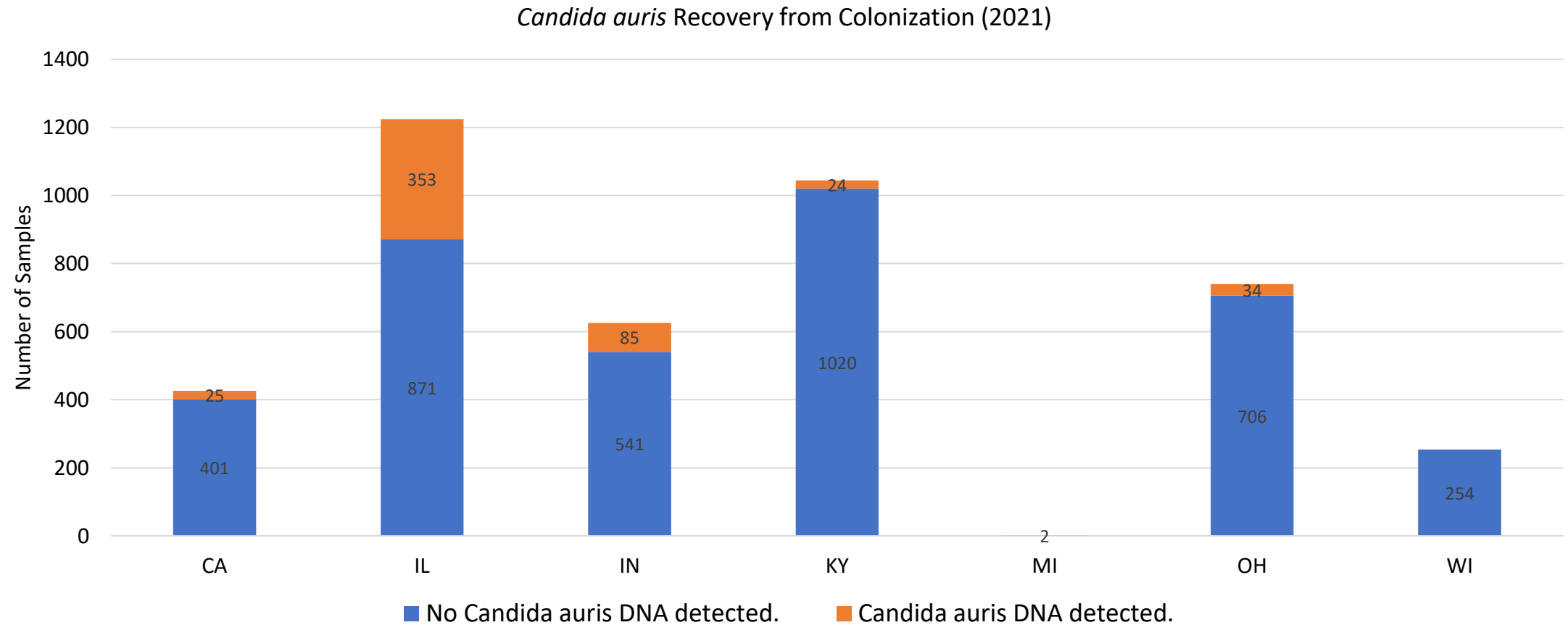
2021 *Candida* Data



2021 *Candida* Colonization Data



2021 *Candida* Colonization Data



2022 Data Ahead



2022 *Candida* Colonization Data

- 3 patients in Wisconsin facilities have tested positive for *C. auris* in 2022
 - Two positives in January; One positive in March
 - One patient also tested positive for OXA-24/40+ CRAB



2022 *Candida* Colonization Data

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Whole Genome Sequencing

- Isolates being sequenced
 - Pan-nonsusceptible
 - Novel carbapenemase (mCIM+/PCR-)
 - Non-KPC carbapenemase in Enterobacterales
 - Carbapenemase in *Pseudomonas*
 - Non-OXA carbapenemase in *Acinetobacter*
 - Carbapenemase detected during colonization (excludes KPC)
 - COMING SOON: *Candida auris*



Whole Genome Sequencing Data

- Isolates eligible for sequencing
 - 91 in 2019
 - 113 in 2020
 - 383 2021
 - 188 so far in 2022



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Illumina executives



Acknowledgments

- Wisconsin State Laboratory of Hygiene (WSLH)
 - Anna Anderegg
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