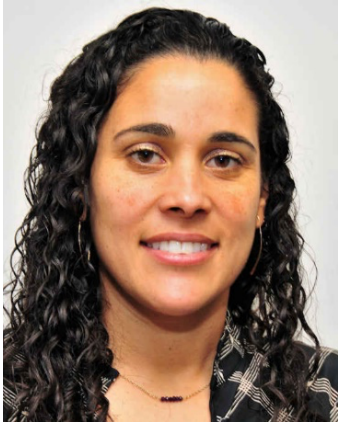
NEW YORK STATE Department of Health | Wadsworth Center

ARLABnetwork

Northeast Region Antibiotic Resistance Laboratory Network Newsletter

Volume 1 Issue 2 December 2021

NEW STAFF



MARIE-CLAIRE ROWLINSON, PHD, D(ABMM) – Chief, Bacterial Disease Laboratory

Marie-Claire Rowlinson, Ph.D., D(ABMM) received her undergraduate and doctoral degrees in Medical Microbiology in the United Kingdom and then completed a postdoctoral fellowship in the Medical and Public Health Laboratory Microbiology at University of California, Los Angeles. Following the fellowship, Dr. Rowlinson worked with the Association of Public Health Laboratories (APHL) in their Global Health program, building laboratory capacity in countries around the globe. Prior to joining Wadsworth Center's Bacterial Disease Laboratory, she was at the Florida Department of Health, Bureau of Public Health Laboratories in Jacksonville as the Assistant Laboratory Director and CLIA Laboratory Director.

Dr. Rowlinson participates in organizational work. She is the Chair of the APHL Infectious Diseases Committee and a member of the APHL TB Subcommittee. She also continues to work with APHL on an international level, consulting with the Global Health program, most recently working with the Ukraine Ministry of Health. Dr. Rowlinson is the American Society for Microbiology Division Y (Public Health) Chair and is a member of the College of American Pathologists Microbiology Committee.

SHANNON MURPHY, PHD – APHL AR FELLOW

Shannon earned a B.S. in biochemistry from the State University of New York (SUNY) at Geneseo and a Ph.D. in microbiology from Cornell University. As a graduate researcher, she studied the bacterial cell wall – a structure that ranks among our most powerful targets for antibiotic intervention. She focused on β-lactam tolerance in the diarrheal pathogen *Vibrio cholerae* and investigated the ways that this bacterium modifies its cell wall mechanics in response to environmental stress. In pursuit of a career in translational research and clinical diagnostics, she recently joined the Wadsworth Center as an APHL/CDC fellow to study antimicrobial resistance through the lens of public health. We are excited to have Shannon in the AR Lab Network as our new antimicrobial resistance fellow.

PAST APHL FELLOW UPDATES

JUNE CHAN, PHD – APHL AR FELLOW

In the public health sphere, I have gained such invaluable experience as an APHL Antimicrobial Resistance (AR) Fellow at the Wadsworth Center (WC)—from leading a multi-center pilot surveillance for carbapenemase-producing organisms (CPOs) in hospital transplant units, to performing hands-on molecular testing of patient specimens for SARS-CoV-2 during the pandemic. As my time at Wadsworth comes to a close, I am happy to report that our manuscript, "Prevalence of Carbapenemase-producing Organisms Among Hospitalized Solid Organ Transplant Recipients, Five U.S. Hospitals, 2019-2020", will soon go through CDC clearance and journal submission. Through my participation in other research projects, we are also on our way to validating lower respiratory specimens for CPO screening and to bettering our understanding of the genetic diversity of CPOs in individual carriers. Overall, I hope that these laboratory contributions will improve CPO detection, surveillance, and infection prevention and control measures to multidrug-resistant organisms. While I am sad to be leaving the WC, I am very excited to continue my training as a CPEP Fellow with the UCLA Medical and Public Health Laboratory Microbiology Program where I plan to stay active in AR testing and applied research. Thank you for allowing me to support the Northeast Region for the past two years!

KELLI HAGER, MPH – APHL AR FELLOW

The CDC AR Laboratory Network employs molecular assays that detect the more common beta-lactamase (*bla*) genes conferring resistance to carbapenem antibiotics: *bla*$_{KPC}$, *bla*$_{NDM}$, *bla*$_{VIM}$, *bla*$_{IMP}$, and *bla*$_{OXA-48}$. Yet, few rapid detection methods exist for rare or emerging *bla* resistance genes. My project was to design a multiplex novel panel that detects *bla*$_{SIM}$, *bla*$_{IMI}$, and *bla*$_{SPM}$, all novel or emerging resistance genes that confer carbapenem resistance. While wrapping up the validation on that project, my next task was to design an assay that will not only detect *bla*$_{GES}$ variants but will also differentiate between the extended spectrum beta-lactamases and the carbapenemase-producing variants. Beta-lactamase genes like *bla*$_{SIM}$, *bla*$_{IMI}$, *bla*$_{SPM}$ and *bla*$_{GES}$, which can be located on mobile genetic elements, are a threat to antimicrobial resistance efforts. My projects focused on developing a more rapid and accessible method to detect these genes. During my mycology rotation, I worked to develop a probe-based melt curve analysis to detect echinocandin resistance in *Candida auris*. I learned a lot about different types of PCR assays and discovered a new single nucleotide polymorphism in the hot spot 1 region of *Candida auris*'s FKS1 gene that may confer echinocandin resistance. In August 2021, I moved to the University of Texas, Austin to obtain a Ph.D. in Microbiology as my next adventure.

APHL-CDC Fellowships Now Accepting Applications for January 2022 Fellows and Host Labs

As a recipient of American Rescue Plan funding, APHL is expanding its current fellowship program offerings and recruiting for two classes of fellows in 2022. Applications for host laboratories and prospective fellows for a January 2022 start date are now being accepted for the following programs: bioinformatics, environmental health, infectious diseases and newborn screening. Another application cycle for these and more programs to start in July 2022 will begin in November 2021. Learn more.

WADSWORTH FELLOW UPDATE

BRYANNA LEXUS FREITAS, MPH – WADSWORTH FELLOW served as a Wadsworth Fellow at the New York State Department of Health. She received a BS in Chemistry and Psychology from the University of Massachusetts Amherst and is going to further her education as an MD student at the Jacobs School of Medicine at the University at Buffalo. As a fellow, she rotated through various departments with research focused in mycology, sequencing, arbovirology, antibodies and bacterial pathogenesis.

Current tests for the emerging multi-drug resistant yeast *Candida auris* involve using DNA with Real-Time PCR and this does not allow for the distinction between dead and live cells, leading to high rates of false positives that can hinder containment and surveillance efforts in healthcare centers. While in the Mycology Department, she aided in developing a Reverse Transcriptase Real-Time PCR assay targeting the internal transcribed spacer (ITS2) region of the ribosomal RNA gene of *Candida auris* so that only viable cells are detected. This assay was highly sensitive, reproducible, robust and specific.

The main goal of another project Bryanna worked on was to understand the mechanisms for the evolution of antibiotic resistance in *Staphylococcus aureus*. She studied the extent to which antibiotics induce resistance by measuring the frequency of antibiotic resistance and cross-resistance in response to treatment with sub-lethal doses of clinically relevant antibiotics.. She also looked into the pathways by which mutations arose for each of the drugs tested.

HIGHLIGHT - REGIONAL LABORATORY COLLABORATION

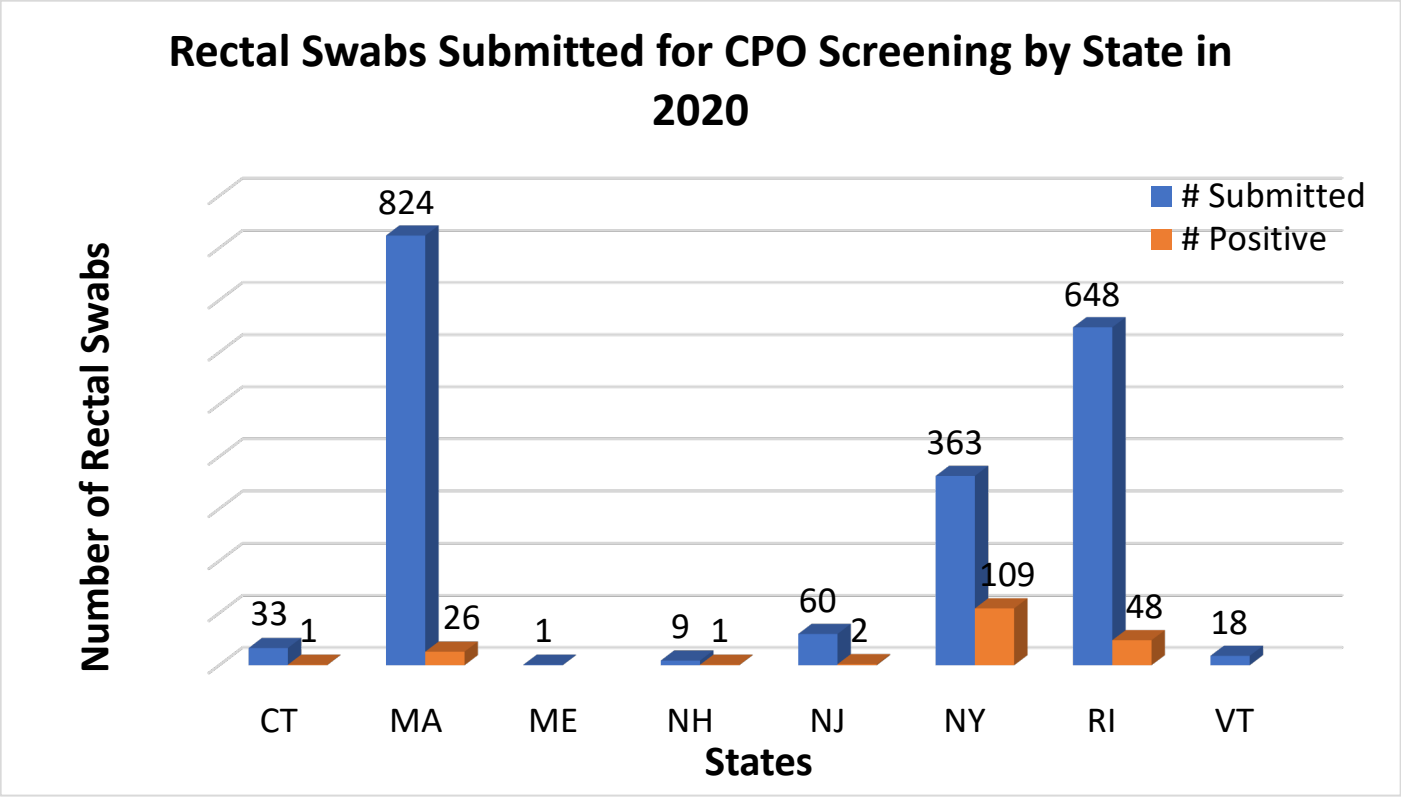
American Society for Microbiology featured a Letter to the Editor in their October 2021 Volume 65 Issue 10 regarding, **"Characterization of the First Carbapenem-Resistant *Pseudomonas aeruginosa* Clinical Isolate Harboring *bla*$_{SIM-1}$ from the United States".** This project was a collaboration between New York State, Rhode Island and the Center for Disease Control.

HIGHLIGHT - REGIONAL LABORATORY NEW TESTING

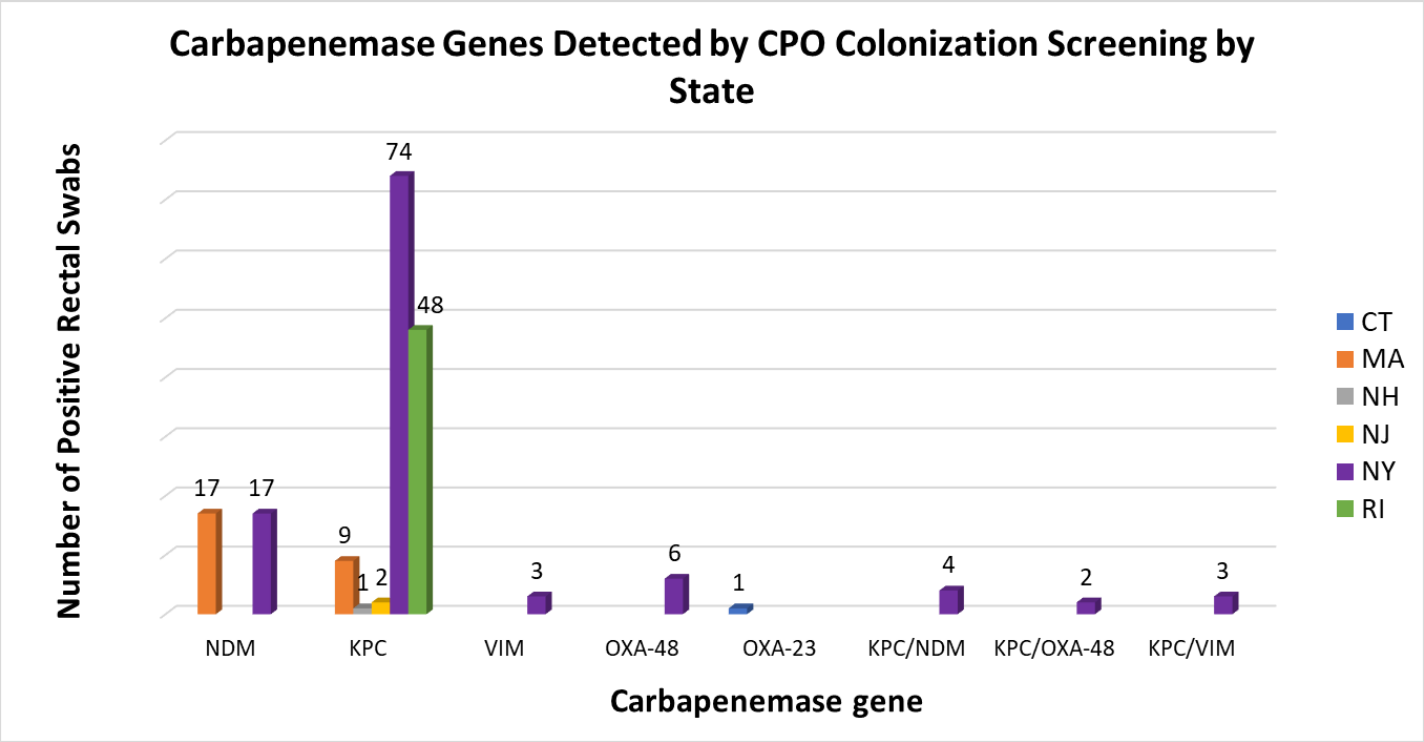
- **Multiplex Novel Real-time PCR Panel for the detection of *bla*$_{SIM}$, *bla*$_{IMI}$, *bla*$_{SPM}$ from culture isolates and rectal swabs**
  - New York State Clinical Laboratory Evaluation Program approval August 24, 2021

- **Cepheid GeneXpert® Infinity 80/80**
  - Increase in testing capacity for Cepheid Carba-R colonization screenings

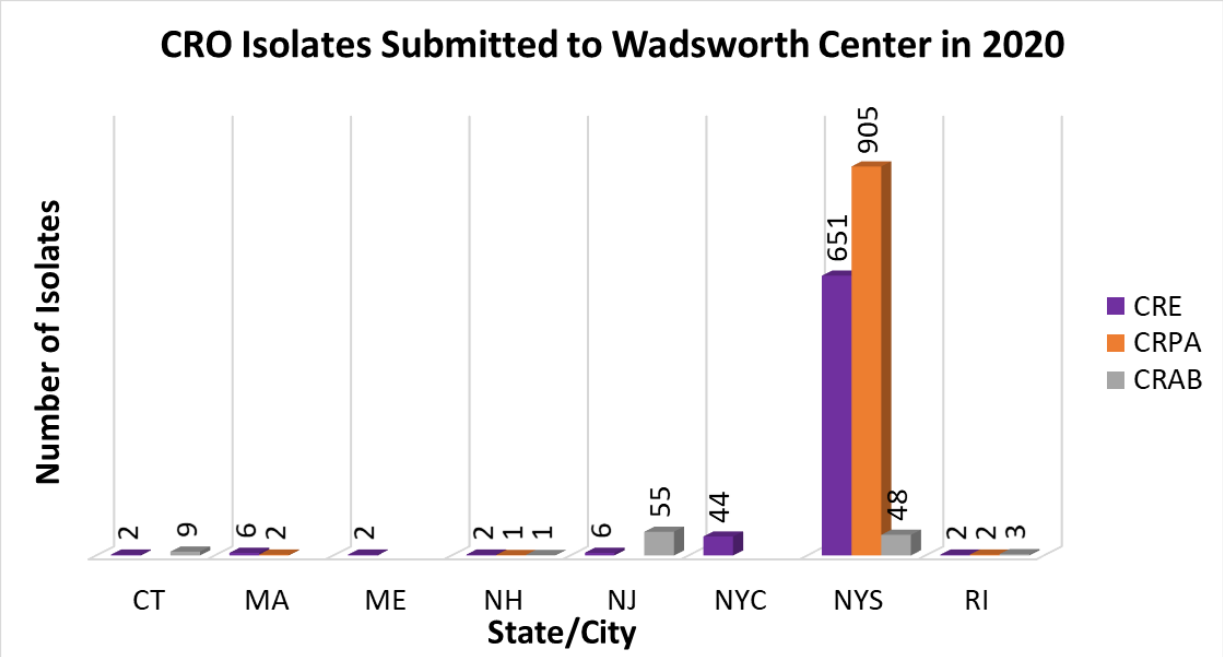
CARBAPENEM RESISTANT ORGANISM TESTING DATA and ALERTS



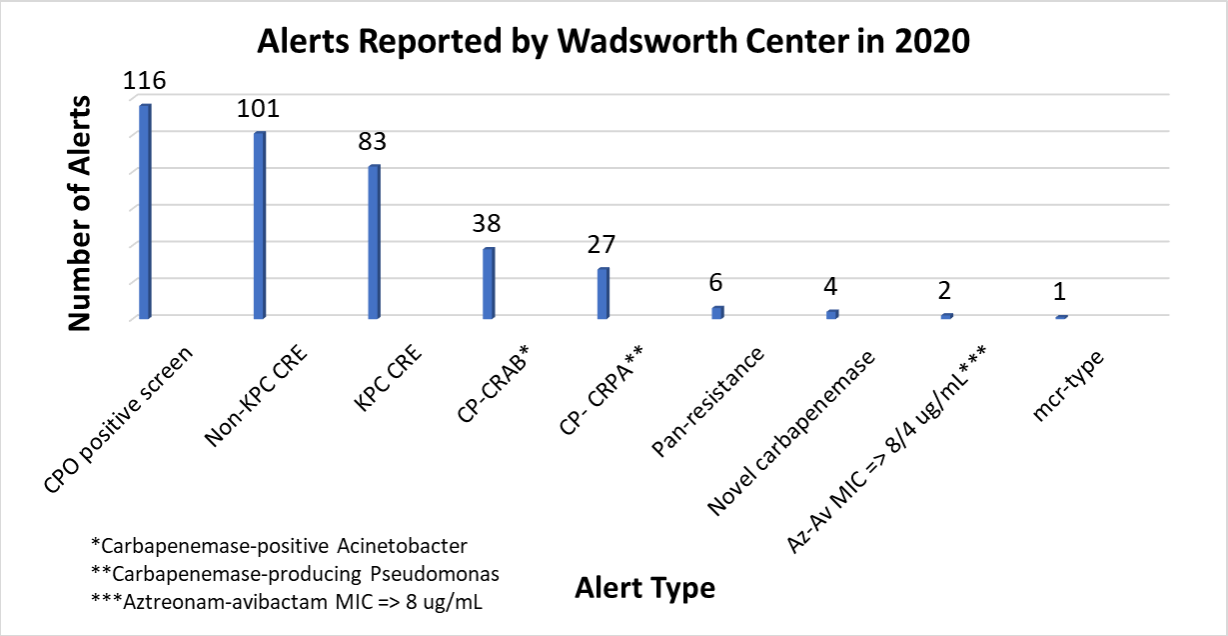
A total of 1,956 rectal swabs were submitted to Wadsworth Center for CPO screening in 2020 with approximately 10% positive for a carbapenemase gene. The highest number of rectal swabs were received from MA, followed by RI; however, the highest number of positive tests (30%) were recorded from NY submitted swabs.



The percentage of carbapenemase genes identified in the 187 positive rectal swabs were KPC (76%), NDM (20%), OXA-48 (4%), VIM (3%), and OXA-23 (0.5%).



In total, Northeast region states submitted 715 CRE, 910 CRPA and 116 CRAB isolates to Wadsworth Center for testing in 2020.



A total of 378 alerts were reported by Wadsworth Center in 2020 with the majority being carbapenemase detected during colonization screening and non-KPC CRE.

Expanded Susceptibility Testing – Aztreonam-avibactam:

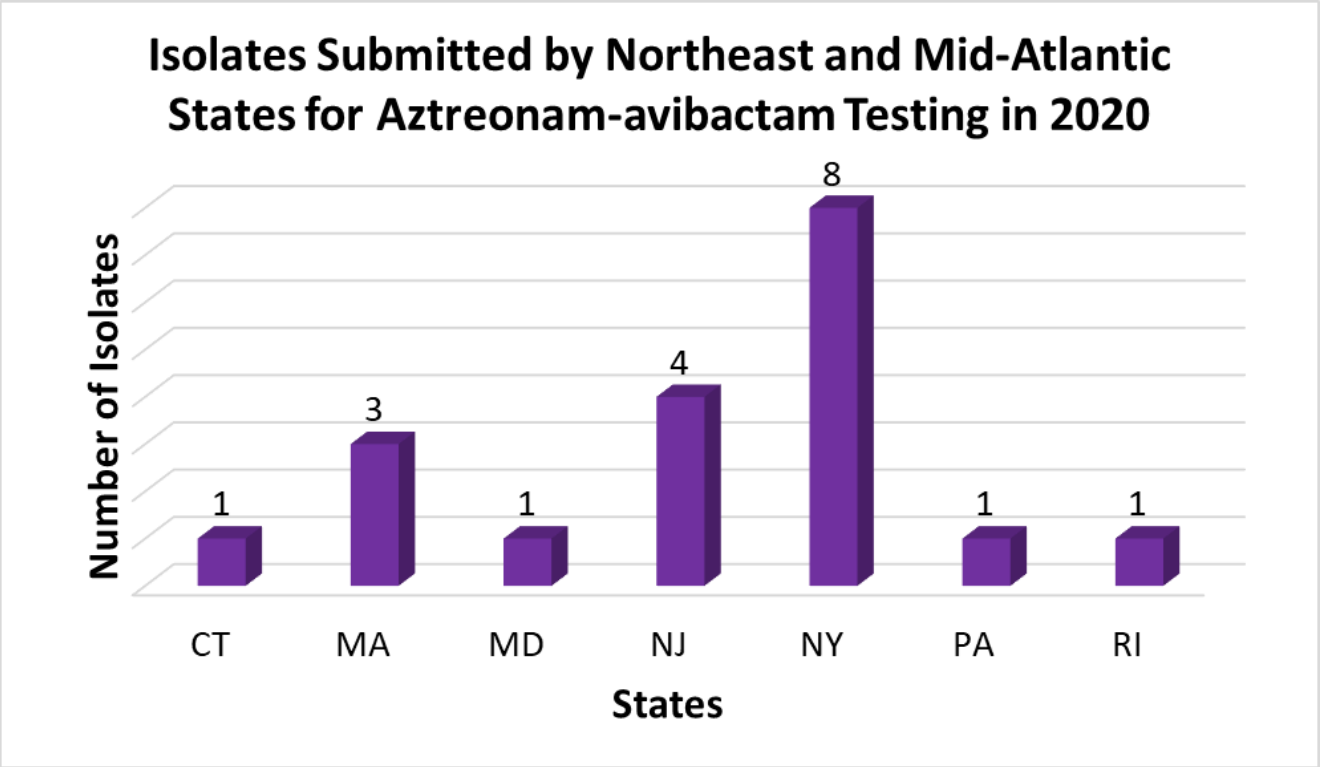
Expanded Antimicrobial Susceptibility testing for Aztreonam-avibactam requires Wadsworth Center AR Lab Network authorization prior to submission of isolates. Please email ARLNCORENY@health.ny.gov or go to https://www.wadsworth.org/antimicrobial-resistance-laboratory-network-submission-guidelines for information.

Antimicrobial susceptibility testing for Enterobacteriaceae producing a metallo-beta-lactamase (MBL)

Clinicians, hospital laboratories, and public health labs can request expanded antimicrobial susceptibility testing (ExAST) from CDC's Antibiotic Resistance Lab Network (AR Lab Network) to find new, effective treatment options for their patients' most resistant infections.

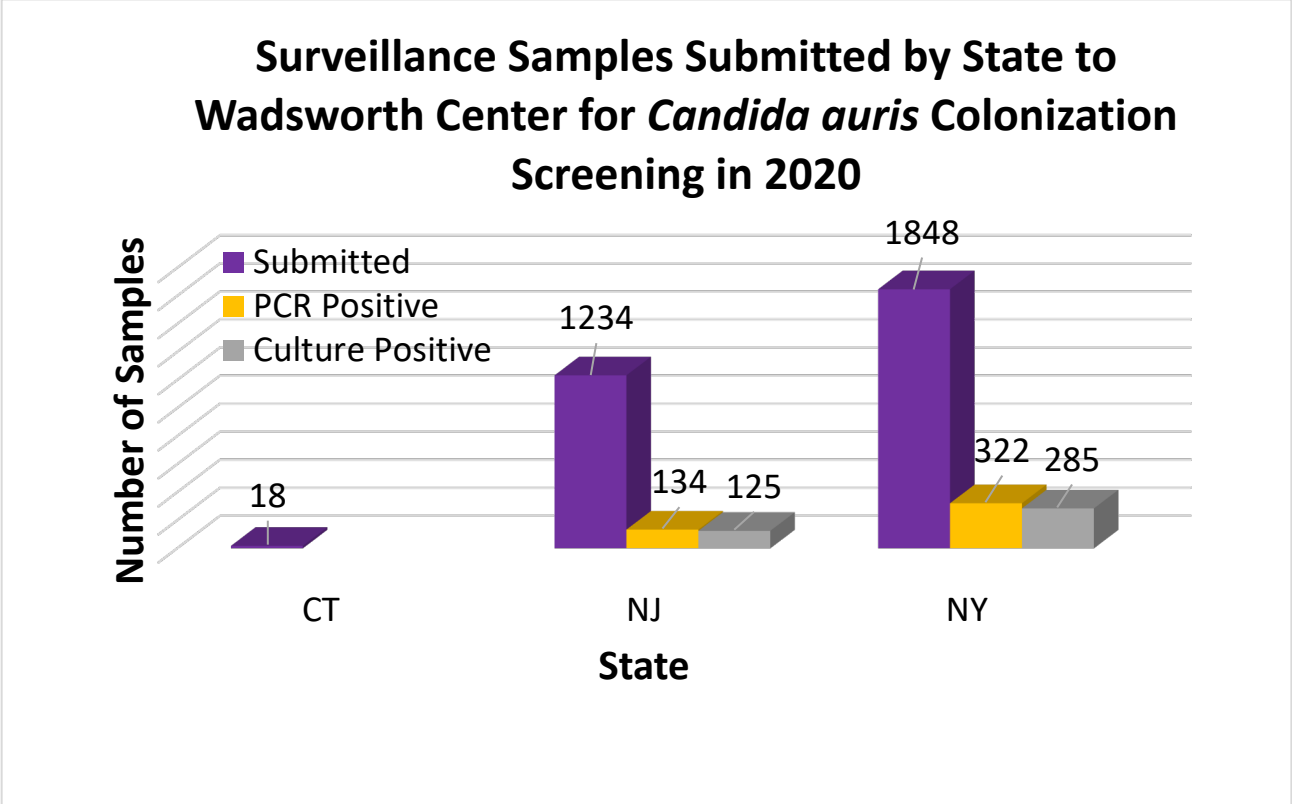
- Enterobacteriaceae are resistant to new drugs for carbapenem-resistant Enterobacteriaceae (CRE) treatment, specifically ceftazidime-avibactam and meropenem-vaborbactam. However, these bacteria may be susceptible to the combination therapy ceftazidime + avibactam + aztreonam*.
- Susceptibility testing is CLIA-compliant and results will be reported for ceftazidime + avibactam, aztreonam; and aztreonam + avibactam to help assess utility of combination therapy.
- CDC plans to expand testing as new antimicrobial treatment options become available for other hard-to-treat bacterial infections.
- There is no cost for this service.

***Ceftazidime + avibactam + aztreonam is a combination of drugs recommended by the 2018 Sanford** Guide for treatment of serious infections caused by MBL-producing Enterobacteriaceae.

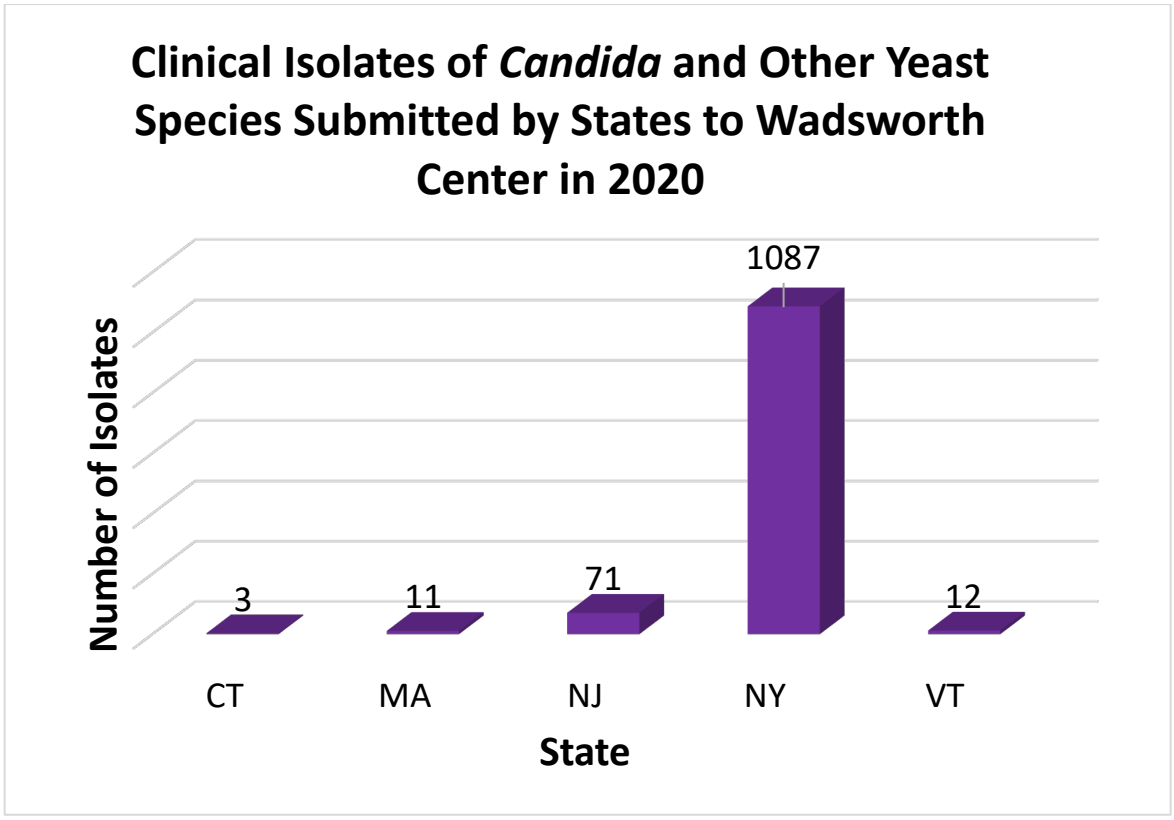


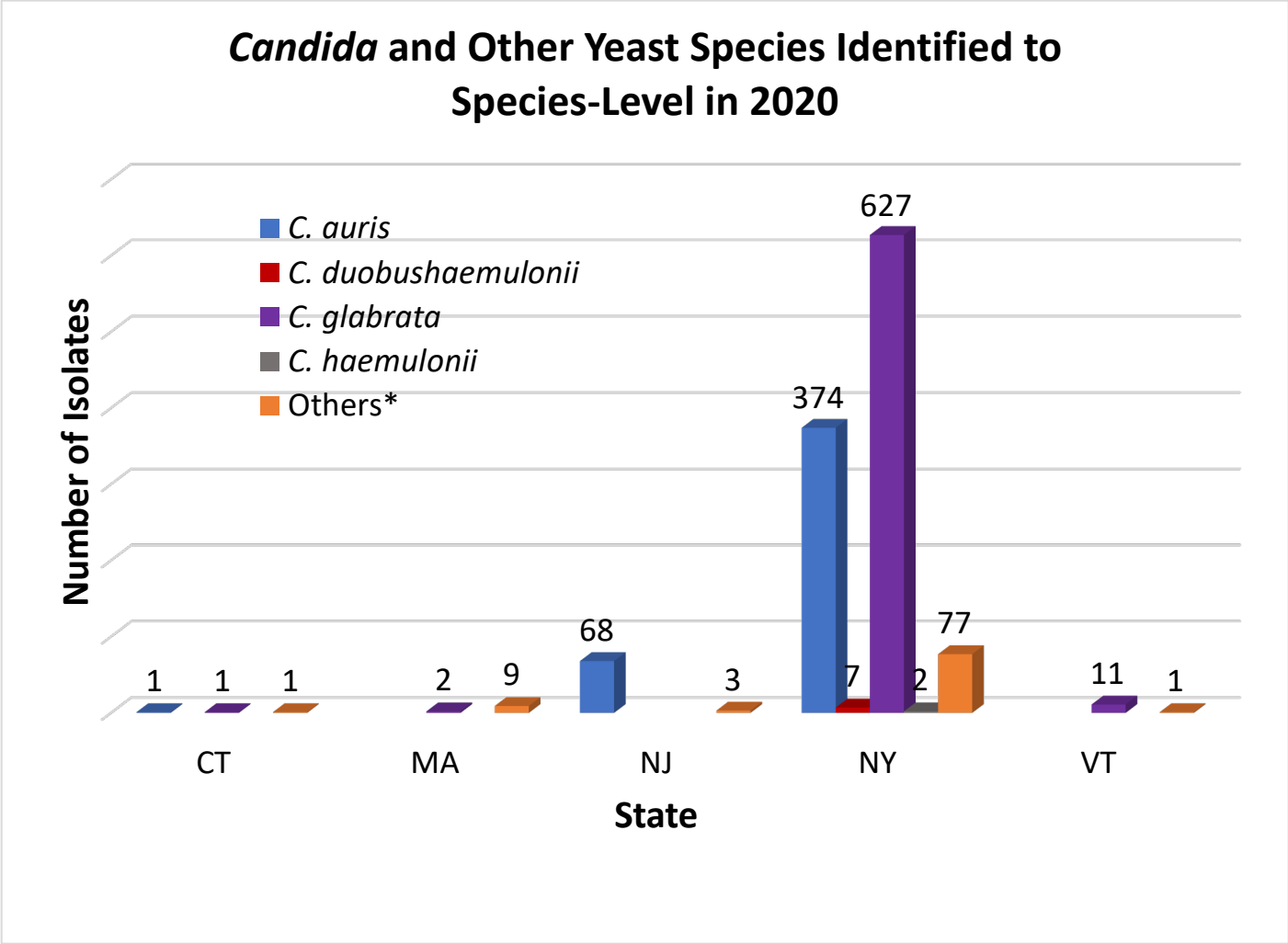
A total of 19 isolates were submitted for Aztreonam-avibactam testing in 2020. There were 2 isolates that generated alert reporting for Aztreonam-avibactam MIC's >8.

CANDIDA TESTING



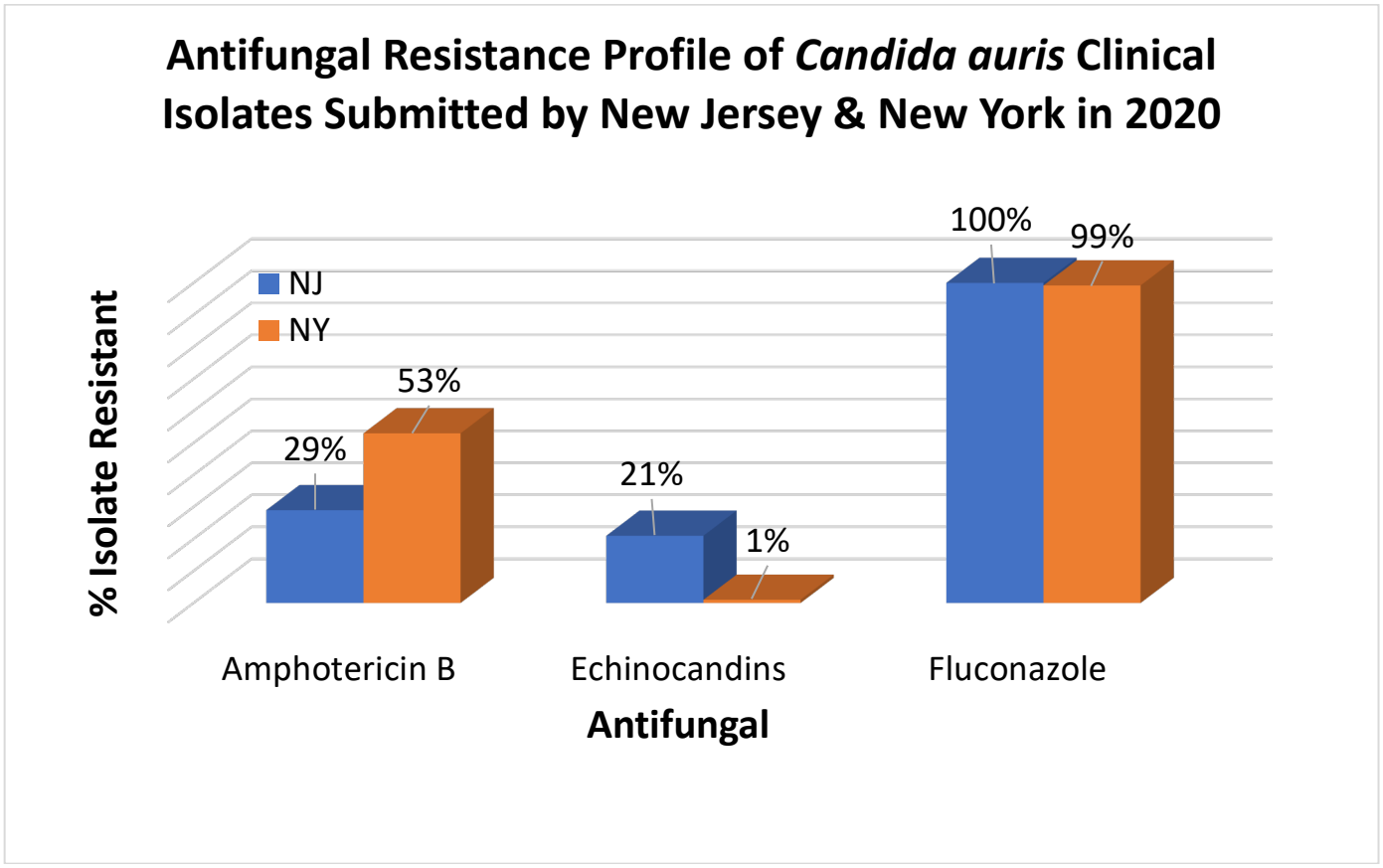
Note: PCR results for *C. auris* were reported to the facilities within 1 to 2 days of receiving samples, while culture results were reported within 4 to 14 days. For NJ, approximately 11% & 10% of surveillance samples were positive for *C. auris*, while for NY, about 17% & 15% were positive for *C. auris* by PCR and culture respectively. These results revealed that *C. auris* is still quite prevalent in healthcare facilities in NJ and NY.


Clinical Isolates of *Candida* and Other Yeast Species Submitted by States to Wadsworth Center in 2020
Number of Isolates
3
11
71
1087
12
CT
MA
NJ
NY
VT
State

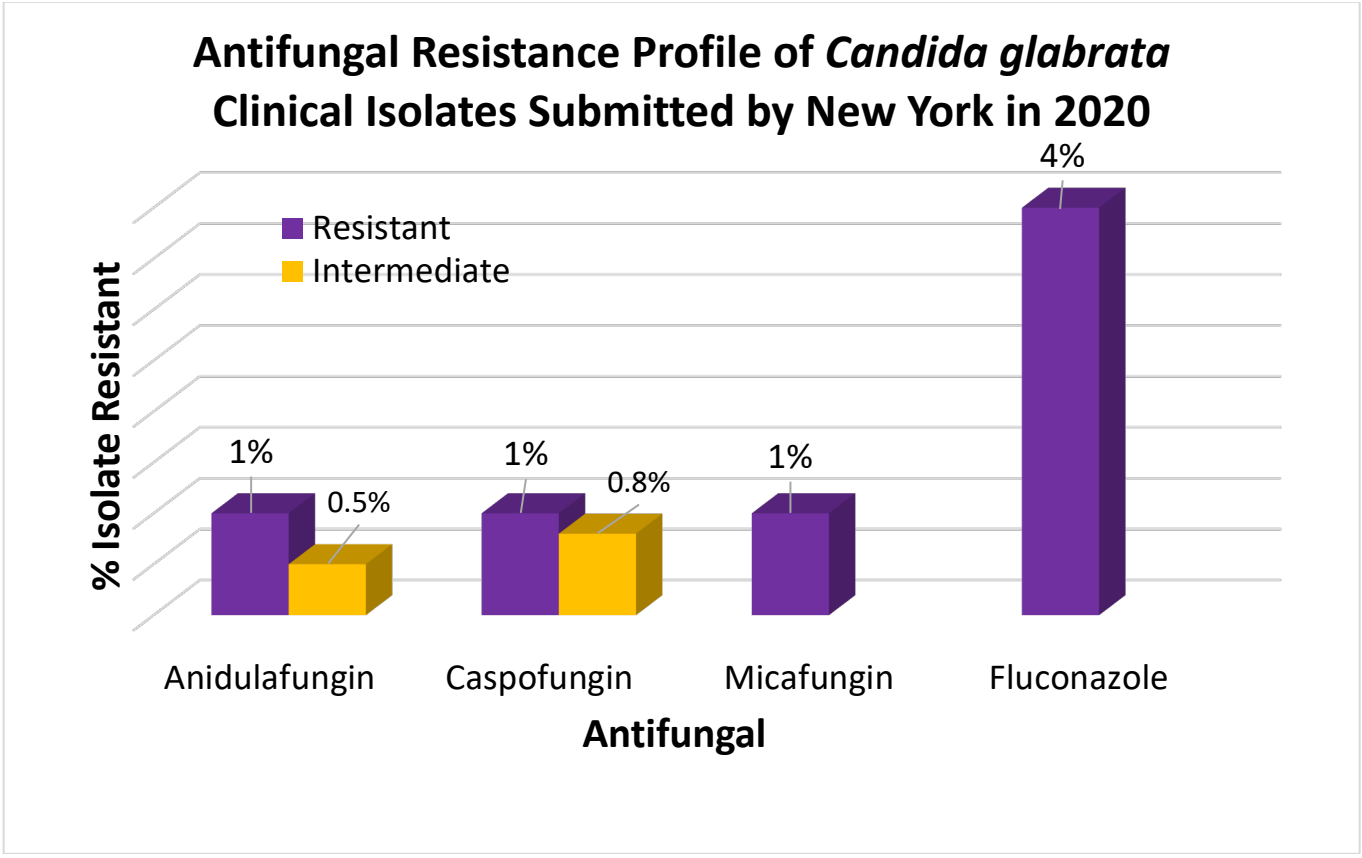


Note: Of clinical isolates received, *C. glabrata* and *C. auris* constituted the majority of isolates received for identification from NY while *C. auris* was the predominant isolates from NJ, and *C. glabrata* from VT. These results indicate that more work is needed to engage other states in the northeast region for submission of *Candida* isolates that are of public health importance.

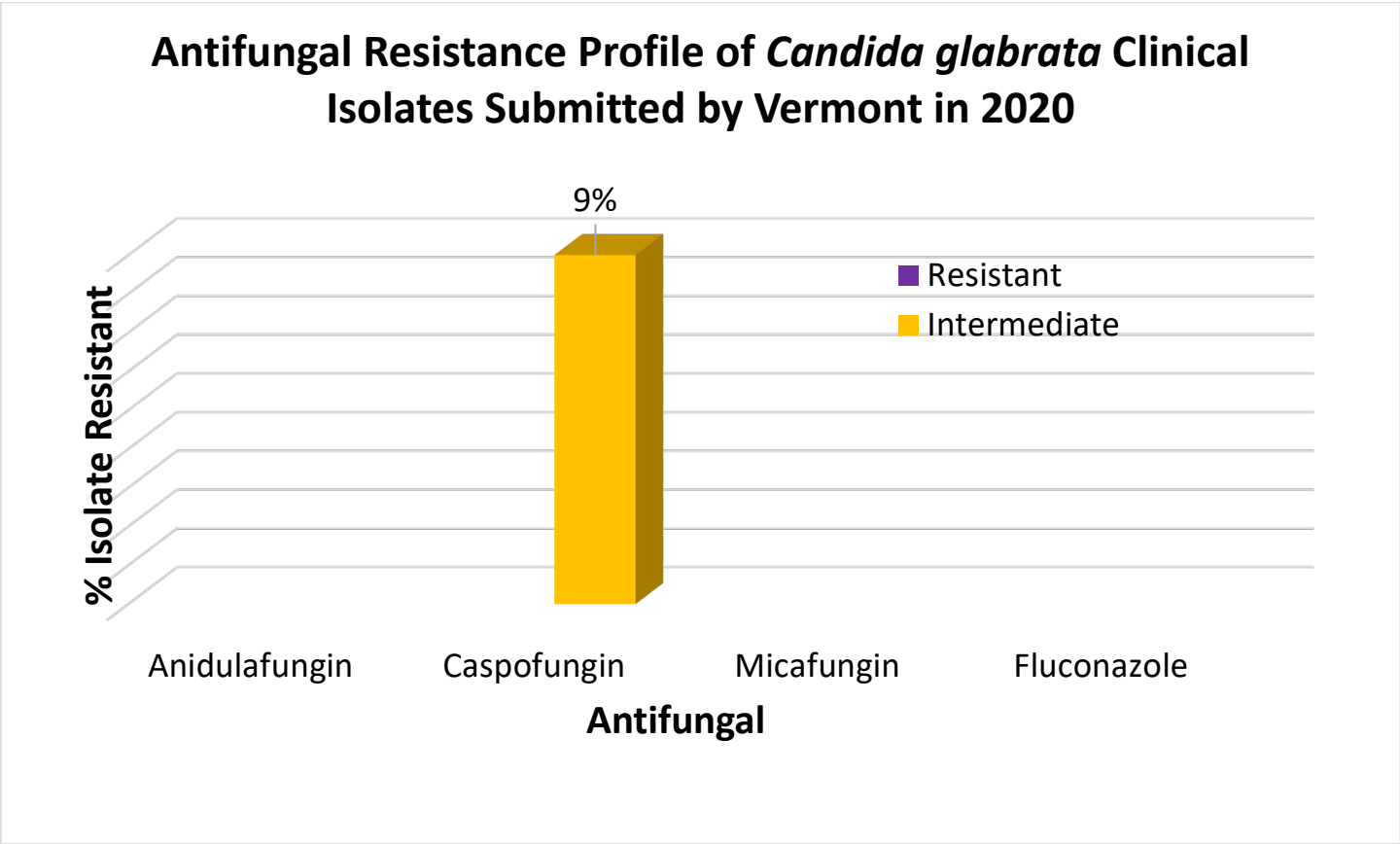
*Others include: *Candida albicans, Candida blankii, Candida bracarensis, Candida catenulata, Candida cylindracea, Candida dubliniensis, Candida fermentati, Candida fermenticarens, Candida inconspicua, Candida intermedia, Candida kefyr, Candida lactativora, Candida lusitaniae, Candida metapsilosis, Candida nivariensis, Candida orthopsilosis, Candida parapsilosis, Candida quercitrusa, Candida rugosa, Candida sake, Candida sojae, Candida steatolytica, Candida tropicalis, Exophiala dermatitidis, Issatchenkia terricola, Magnusiomyces clavatus, Saccharomyces cerevisiae, Torulaspora delbrueckii, Trichosporon asahii, Trichosporon japonicum, Yarrowia lipolytica*



Note: A total of 14 out of the 68 *C. auris* isolates from NJ were echinocandin resistant. All 14 isolates came from a single patient, collected over different time points. Interestingly, Amphotericin B resistance was more common in *C. auris* isolates from NY than that from NJ.



Note: A total of 627 *C. glabrata* isolates were submitted by New York in 2020.



Note: Of the11 *C. glabrata* isolates that were submitted by Vermont in 2020, one showed intermediate resistance for Caspofungin.

PUBLICATIONS ON *CANDIDA AURIS*

1. Rossow J, Ostrowsky B, Adams E, Greenko J, McDonald R, Vallabhaneni S, Forsberg K, Perez S, Lucas T, Alroy KA, Jacobs Slifka K, Walters M, Jackson BR, Quinn M, Chaturvedi S, Blog D. Factors Associated With Candida auris Colonization and Transmission in Skilled Nursing Facilities With Ventilator Units, New York, 2016-2018. Clin Infect Dis. 2021 Jun 1;72(11):e753-e760. doi: 10.1093/cid/ciaa1462. PubMed PMID: 32984882; PubMed Central PMCID: PMC8155826.
2. Bergeron G, Bloch D, Murray K, Kratz M, Parton H, Ackelsberg J, Antwi M, Del Rosso P, Dorsinville M, Kubinson H, Lash M, Rand S, Adams E, Zhu Y, Erazo R, Chaturvedi S, Weiss D. *Candida auris* Colonization After Discharge to a Community Setting: New York City, 2017-2019. Open Forum Infect Dis. 2021 Jan;8(1):ofaa620. doi: 10.1093/ofid/ofaa620. eCollection 2021 Jan. PubMed PMID: 33511238; PubMed Central PMCID: PMC7814391.
3. Zhu Y, Kilburn S, Kapoor M, Chaturvedi S, Shaw KJ, Chaturvedi V. *In Vitro* Activity of Manogepix against Multidrug-Resistant and Panresistant Candida auris from the New York Outbreak. Antimicrob Agents Chemother. 2020 Oct 20;64(11). doi: 10.1128/AAC.01124-20. Print 2020 Oct 20. PubMed PMID: 32839219; PubMed Central PMCID: PMC7577132.
4. Ghannoum M, Arendrup MC, Chaturvedi VP, Lockhart SR, McCormick TS, Chaturvedi S, Berkow EL, Juneja D, Tarai B, Azie N, Angulo D, Walsh TJ. Ibrexafungerp: A Novel Oral Triterpenoid Antifungal in Development for the Treatment of *Candida auris* Infections. Antibiotics (Basel). 2020 Aug 25;9(9). doi: 10.3390/antibiotics9090539. Review. PubMed PMID: 32854252; PubMed Central PMCID: PMC7559578.

TALKS & POSTER PRESENTATIONS

1. Eleanor Adams, MD, MPH and Sudha Chaturvedi, Ph.D. were invited to speak in this meeting on Screening and Detection of *Candida auris* in NYS

2. APHL Virtual Meeting was held in September/October 2020 and Sudha Chaturvedi was invited to speak on 'Testing of Emerging and Re-emerging Fungal Pathogens – A Public Health Perspective'

3. Bryanna Freitas, A Wadsworth Fellow, presented a poster on 'Reverse Transcriptase Real-Time PCR Assay for the Enumeration of Live *Candida auris* from the Healthcare Environment'

4. Kelli Hager, an ARLN fellow presented a talk on 'Fluorescent Melting Curve Analysis for the Detection of Echinocandin Resistance' in the Regional AR Lab Network Meeting held on November 16, 2020

read all about it…

1. Antimicrobial Resistance: Another Long-Term Consequence of COVID-19? (worldbank.org)
2. Model can predict how drug interactions influence antibiotic resistance -- ScienceDaily
   Scientific paper on which above article is based Price equation captures the role of drug interactions and collateral effects in the evolution of multidrug resistance | eLife (elifesciences.org)
3. Angela Brown Leverages Understanding of Bacteria to Combat Antibiotic Resistance | Lehigh University
4. Study: How a unique family of bacteria hides from the immune system (phys.org)
   Scientific paper on which above article is based Yersinia pseudotuberculosis YopJ Limits Macrophage Response by Downregulating COX-2-Mediated Biosynthesis of PGE2 in a MAPK/ERK-Dependent Manner | Microbiology Spectrum (asm.org)
5. C.D.C. Warns of Superbug Fungus Outbreaks in 2 Cities - The New York Times (nytimes.com)
6. How does the structure of cytolysins influence their activity? -- ScienceDaily
   Scientific paper on which above article is based Structure–Activity Relationships of the Enterococcal Cytolysin | ACS Infectious Diseases
7. Addressing Antimicrobial Resistance—The Invisible Pandemic | Health Affairs
8. C auris Taking Advantage of Focus on COVID 19 - Anesthesiology News
9. WHO/Europe | Antimicrobial resistance - New study by WHO/Europe and ECDC examines variations in antibiotic consumption in European countries between 2014 and 2018
10. MRSA hospital return tied to extensive antibiotic exposure, *C. diff* infection (CIDRAP Scan)
    News Scan for Apr 16, 2021 | CIDRAP (umn.edu)
    Scientific abstract on which above article is based *(Infection Control & Hospital Epidemiology)*
    Impact of empiric antibiotics for methicillin-resistant Staphylococcus aureus (MRSA) Infection and associated Clostridioides difficile infection (CDI) risk: Secondary analysis of the CLEAR trial | Infection Control & Hospital Epidemiology | Cambridge Core
11. We Don't Just Need a Few New Antibiotics We Need an Arsenal – The Pew Charitable Trust (pewtrusts.org)
12. Early Release - Prevalence of mcr-1 in Colonized Inpatients, China, 2011–2019 - Volume 27, Number 9—September 2021 - Emerging Infectious Diseases journal - CDC
13. Early Release - Gram-Negative Bacteria Harboring Multiple Carbapenemase Genes, United States, 2012–2019 - Volume 27, Number 9—September 2021 - Emerging Infectious Diseases journal - CDC
14. A rapid antimicrobial susceptibility test for K. pneumoniae | IDR
15. WHO reveals new global antibiotic resistance data, more concerns | CIDRAP (umn.edu)
    WHO report https://www.who.int/publications/i/item/9789240027336
16. Dawn of a New Age: Novel Agents for the Treatment of Carbapenem-Resistant A baumannii (contagionlive.com)
17. Researchers Discover Potential New Treatment for Antibiotic Resistance | CSUF News (fullerton.edu)
    Scientific paper on which above article is based Antibiotics | Free Full-Text | A New Twist: The Combination of Sulbactam/Avibactam Enhances Sulbactam Activity against Carbapenem-Resistant Acinetobacter baumannii (CRAB) Isolates (mdpi.com)
18. Pan-Resistant C. auris Identified in U.S. - Pharmacy Practice News
19. Vaccination guards against certain bacterial infections and slows the spread of superbugs in populations (medicalxpress.com)
    Scientific paper on which above article is based Modeling the effect of vaccination on selection for antibiotic resistance in Streptococcus pneumoniae (science.org)
20. Antimicrobial Resistance in the United States, the European Union, and Canada: A Comparative Analysis of Policy Approaches and Promising Solutions - JPHMP Direct