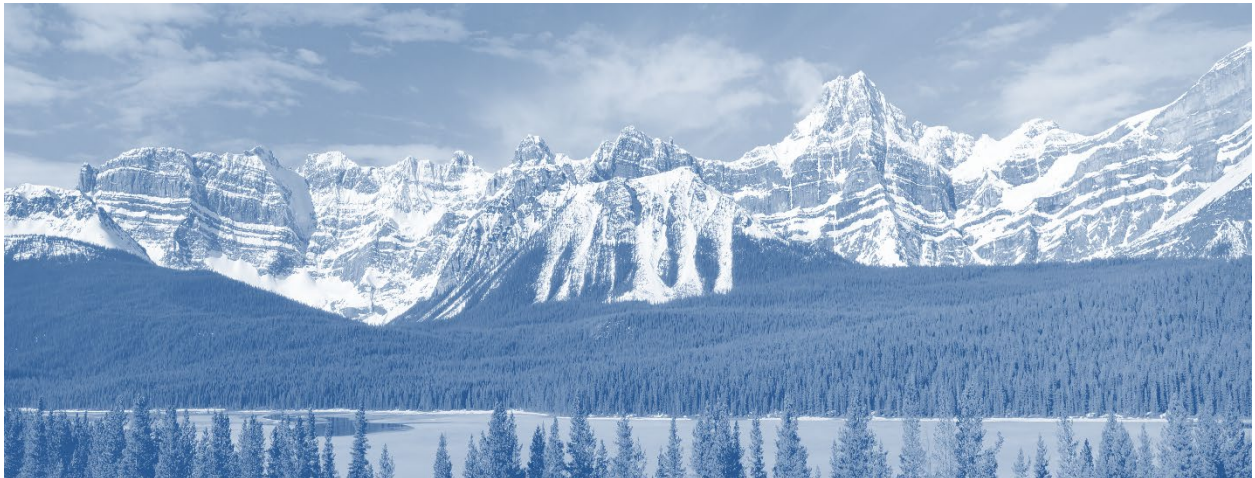


ARLABnetwork

AR Lab Network, Mountain Region Report 2020-2021

Volume 1



Utah Department of Health
Utah Public Health Laboratory
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Acknowledgements

Prepared by:

Maureen Vowles, Tasmia Mostafiz, Janelle Kammerman, Scarlett Thomas, Rebekah Ess, Joshua Mongillo, Devin Beard

Utah Public Health Laboratory
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Utah Public Health Laboratory

Alessandro Rossi, Ph.D., D (ABMM)
Maureen Vowles, MPH, CIC
Tasmia Mostafiz, MPH, MBBS

Utah Department of Health

Healthcare-Associated Infections and Antimicrobial Resistance Program

April Clements, RN, CIC
Devin Beard, MPH
Janelle Kammerman, BS
Joshua Mongillo, MPH
Rebekah Ess, MSPH
Scarlett Thomas, MSPH
Maureen Vowles, MPH, CIC



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Glossary

A

AR—Antibiotic Resistance

AR Lab Network—Antibiotic Resistance Laboratory Network

AST—Antimicrobial susceptibility testing

B

Big 5—The ‘Big 5’ are the five main carbapenemases currently causing clinical problems in the United States that are targeted by the AR Lab Network. These carbapenemase enzymes include VIM, IMP, KPC, NDM, and OXA-48.

C

Cepheid[®] Carba-R—A PCR-based test that screens for the ‘Big 5’ carbapenemases: VIM, IMP, KPC, NDM, and OXA-48

CP-CRA—Carbapenemase-positive carbapenem resistant *Acinetobacter*

CP-CRE—Carbapenemase-positive carbapenem-resistant Enterobacterales

CP-CRPA—Carbapenemase-positive carbapenem-resistant *Pseudomonas aeruginosa*

CP-Gene—Carbapenemase gene

CP-mechanism—Carbapenemase mechanism (mediated by identified carbapenemase encoding gene)

CPO—Carbapenemase-producing organisms

CRAB—Carbapenem-resistant *Acinetobacter baumannii*

I

IMP—Imipenemase - one of the ‘Big 5’ carbapenemases

K

KPC—*Klebsiella pneumoniae* carbapenemase - one of the ‘Big 5’ carbapenemases

M

MICs—Minimum inhibitory concentrations. Defined as lowest concentration of a chemical, usually a drug, which prevents visible growth of a microorganism.

N

NDM—New Delhi Metallo- β -lactamase - one of the ‘Big 5’ carbapenemases

O

OXA—Oxacillinase – OXA-48 is one of the ‘Big 5’ carbapenemases. Other oxacillinase carbapenemase mechanisms such as OXA-23-like and OXA-24-like are frequently found in CP-CRAB

P

PCR—Polymerase Chain Reaction

Q

Q1—First quarter

Q2—Second quarter

Q3—Third quarter

Q4—Fourth quarter

V

VIM—Verona Integron-encoded Metallo- β -lactamase - one of the ‘Big 5’ carbapenemases

W

WGS—Whole genome sequencing

Foreword

The Mountain Region Antibiotic Resistance (AR) Lab Network report is a compilation of testing performed in 2020 and the first few quarters of 2021 at the Mountain Region AR Lab based in Utah. The Mountain Region AR Lab receives specimens from public health labs in eight states--Arizona, Colorado, Idaho, New Mexico, Utah, Wyoming, Montana, and Texas.

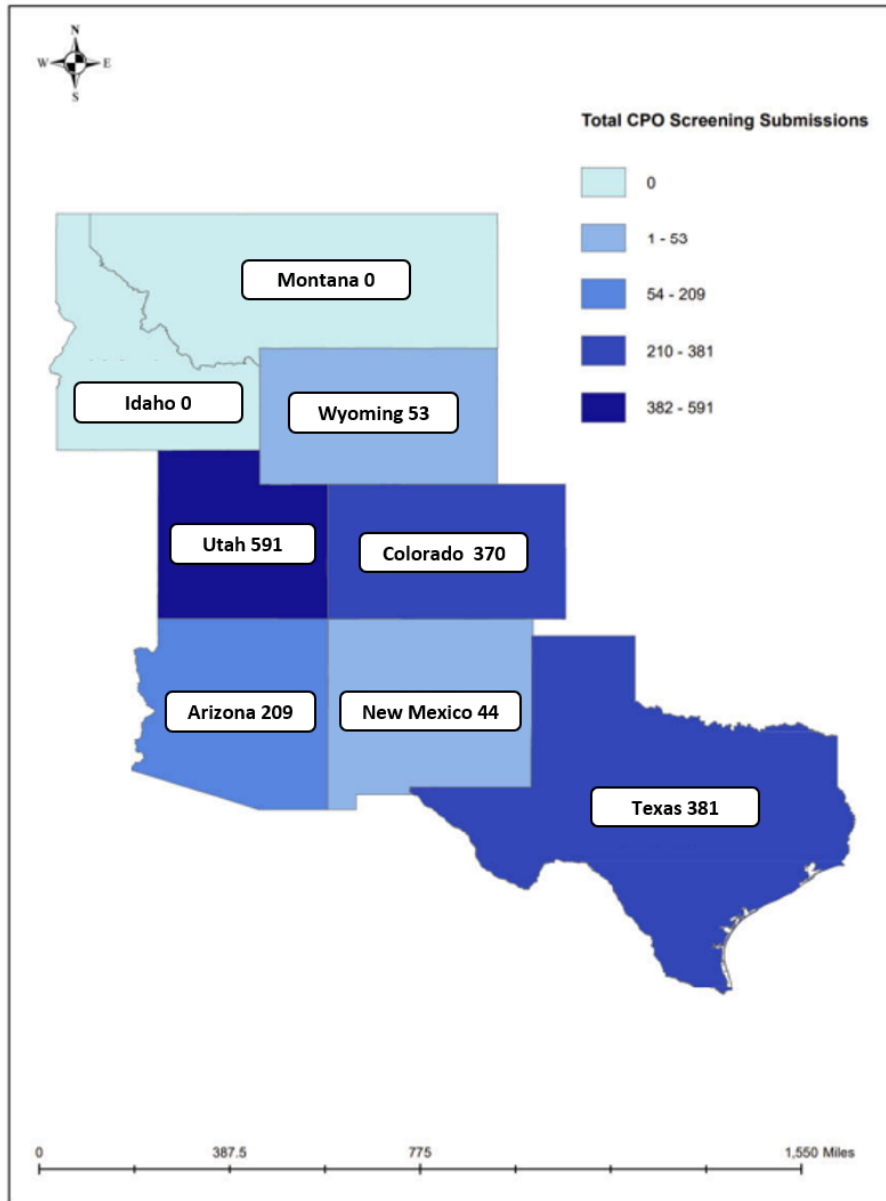
Summary tables and maps are presented that characterize colonization screening, *Acinetobacter baumannii* isolate testing, and yeast isolate testing. This report displays numbers and keeps track of regional trends in these activities.

Please email arlnutah@utah.gov with suggestions for inclusion of datasets in future reports.



CPO Colonization Screening Summary

Mountain Region total *CPO colonization screening submissions—2020 (Q1 – Q4) and 2021 (Q1 – Q3)



Total submissions: **1648**

**Includes colonization screening samples submitted to the Utah AR Lab for Cepheid[®] Carba-R PCR testing to identify CP-CRE and CP-CRPA and culture-based screening targeting CP-CRAB*

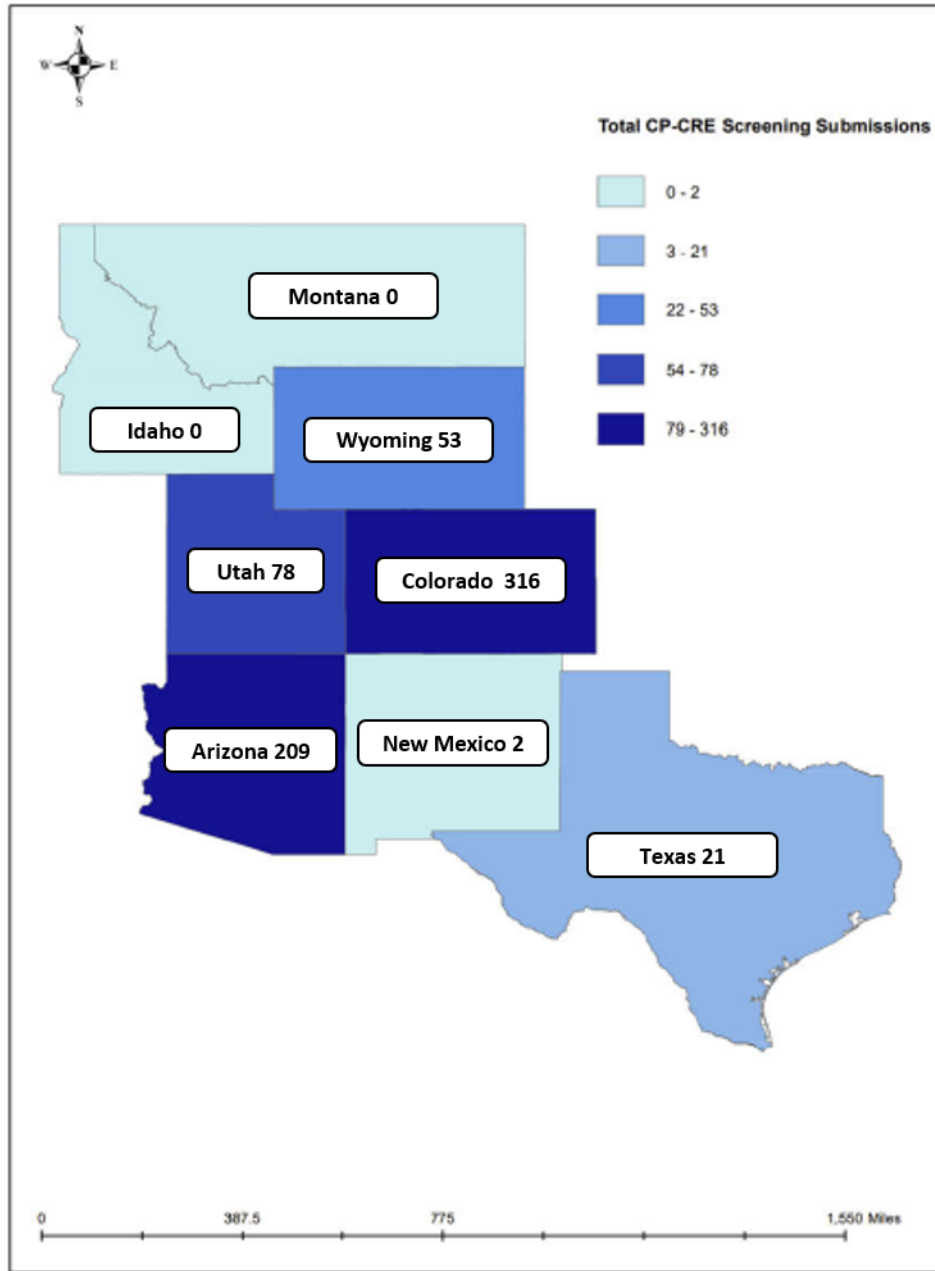
CPO Colonization Screening

**Total *CPO Colonization Screening Sample Submissions by State and Quarter—
2020 (Q1 – Q4) and 2021 (Q1 – Q3)**

State	2020				2021		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3
CO	46	81	100	63	32	36	12
UT	50	0	2	4	106	291	138
TX	30	0	0	132	6	13	200
AZ	0	0	0	0	0	1	208
NM	2	0	9	0	33	0	0
WY	53	0	0	0	0	0	0

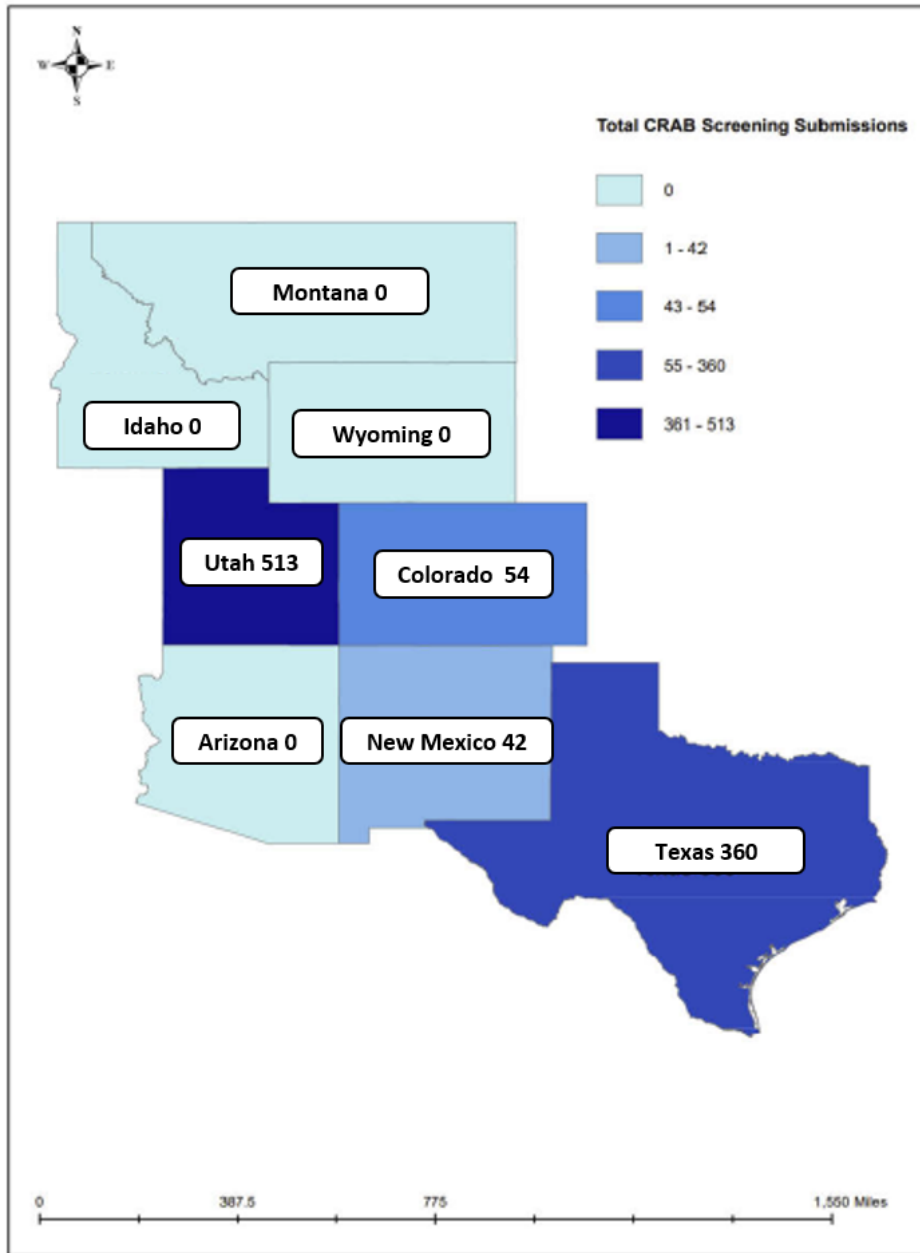
**Includes colonization screening samples submitted to the Utah AR Lab for Cepheid[®] Carba-R PCR testing to identify CP-CRE and CP-CRPA and culture-based screening targeting CP-CRAB*

Mountain Region CPO colonization sample submissions for Cepheid[®] Carba-R PCR testing for identification of CP-CRE and CP-CRPA by state—2020 (Q1 – Q4) and 2021 (Q1 – Q3)



Total submissions: **679**

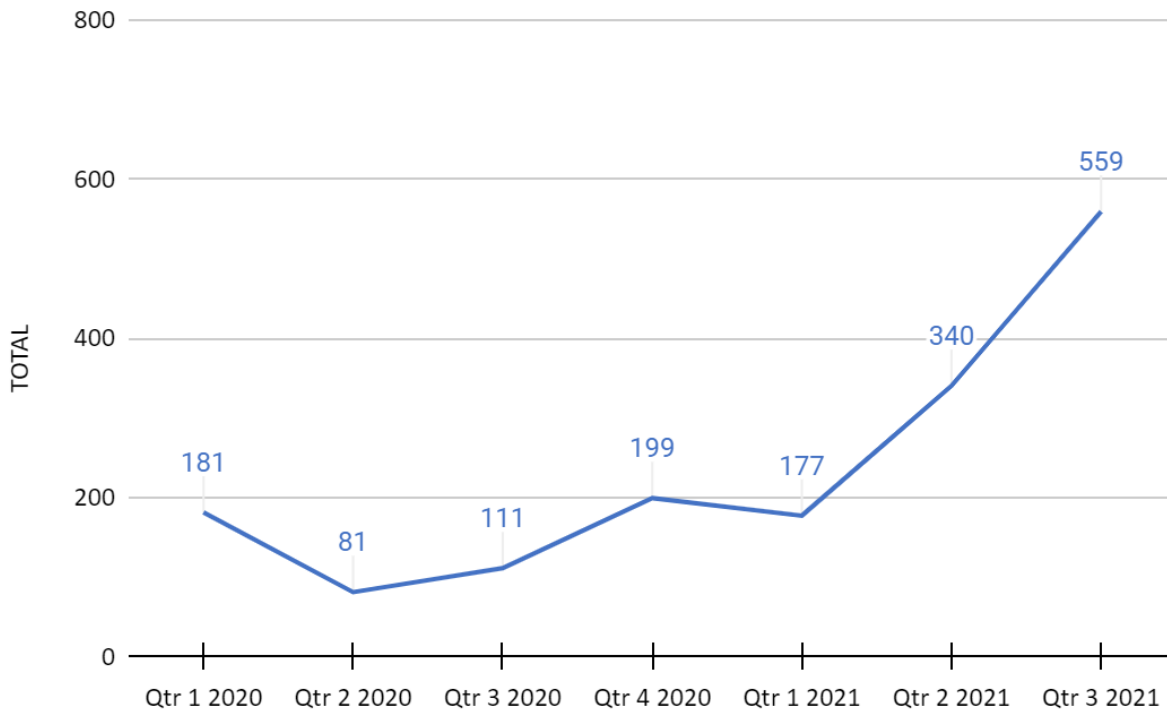
Mountain Region total culture-based colonization screening submissions targeting CP-CRAB—2020 (Q1 – Q4) and 2021 (Q1 – Q3)



Total submissions: **969**

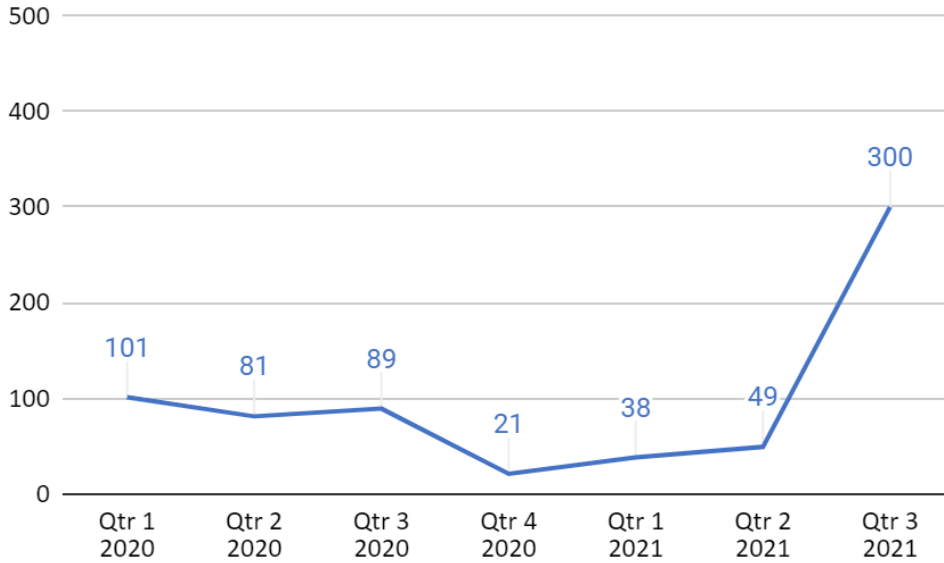
Trends in CPO Colonization Screening Sample Submission Over Time

Total Mountain Region total CPO colonization screening colonization screening samples submitted to the Utah AR Lab for Cepheid[®] Carba-R PCR testing to identify CP-CRE and CP-CRPA and culture-based screening targeting CP-CRAB, submissions by quarter—2020 (Q1 – Q4) and 2021 (Q1 – Q3)

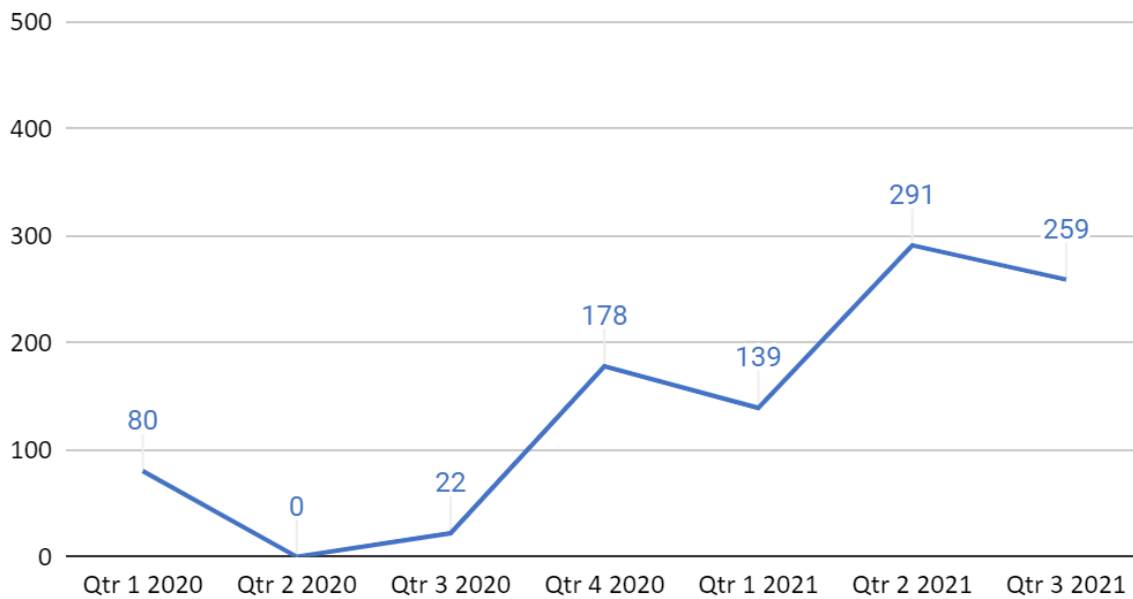


- A total of 904 CPO colonization screening samples, including 647 screening samples for Cepheid[®] Carba-R PCR testing that identified CP-CRE and CP-CRPA, and 257 culture-based screening samples targeting CP-CRAB were submitted to the Utah AR Lab during the first two months of the fourth quarter (October and November 2021). This surpassed totals for earlier quarters.

Mountain Region CPO colonization sample submissions for Cepheid[®] Carba-R PCR testing and identification of CP-CRE and CP-CRPA by quarter—2020 (Q1 – Q4) and 2021 (Q1 – Q3)

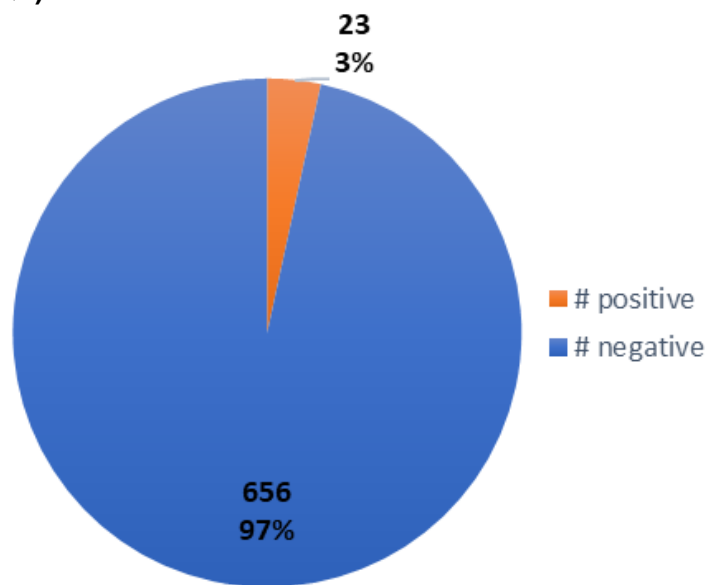


Mountain Region total culture-based colonization screening submissions targeting CP-CRAB by quarter—2020 (Q1 – Q4) and 2021 (Q1 – Q3)



Percent Positivity of CPO Colonization Screening Submissions

Percentage of Mountain Region CPO colonization screening sample submissions for Cepheid[®] Carba-R PCR testing positive for ‘Big 5’ carbapenemases—2020 (Q1 – Q4) and 2021 (Q1 – Q3)

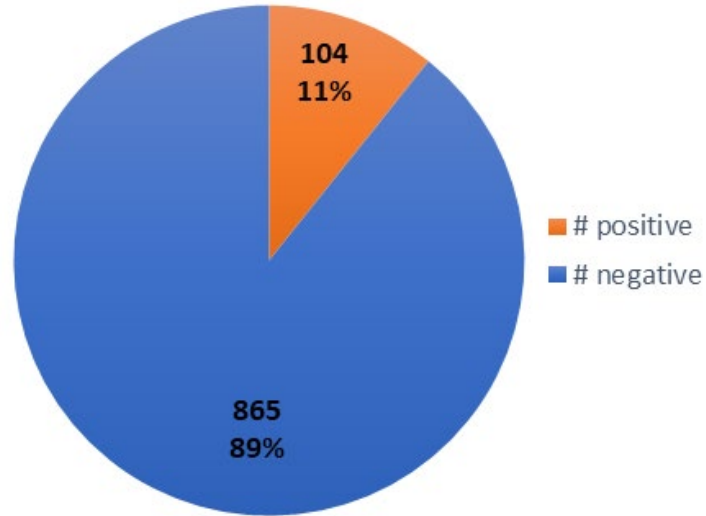


Total screening submissions: **679**

Mountain Region positive carbapenemase mechanisms for CP-CRE and CP-CRPA isolates from colonization screening by state—2020 (Q1 – Q4) and 2021 (Q1 – Q3)

STATE	ORGANISM	MECHANISM	NUMBER
UT	Klebsiella pneumoniae	NDM	3
	Klebsiella pneumoniae	KPC	1
NM	N/A	N/A	N/A
CO	Enterobacter cloacae	KPC	3
	Pseudomonas aeruginosa	IMP	1
	Escherichia coli	Oxa-48	1
WY	Escherichia coli	Oxa-181	1
TX	Citrobacter freundii	KPC	1
AZ	Pseudomonas aeruginosa	VIM	1
	Klebsiella pneumoniae	NDM	8
	Klebsiella pneumoniae	KPC	1
	Klebsiella pneumoniae	NDM and KPC	1
	E.coli	VIM	1

Percentage of Mountain Region culture-based colonization screening sample submissions positive for CRAB—2020 (Q1 – Q4) and 2021 (Q1 – Q3)



Total CRAB screening submissions: **969**

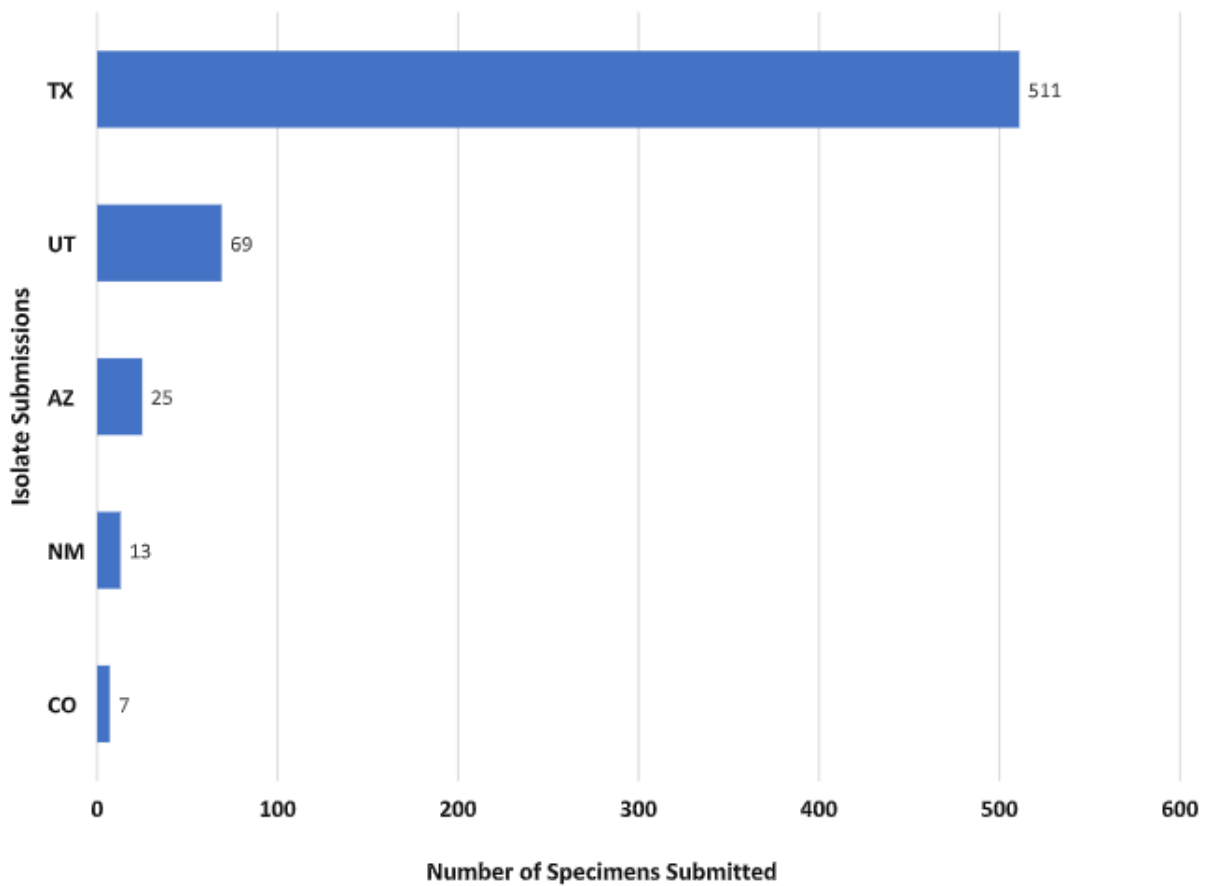
Mountain Region positive carbapenemase mechanisms from culture-based colonization screening samples targeting CRAB, isolates by state —2020 (Q1 – Q4) and 2021 (Q1 – Q3)

STATE	ORGANISM	MECHANISM	NUMBER
UT	Acinetobacter baumannii	OXA-23	2
		OXA-235	12
		no mechanism	28
TX	Acinetobacter baumannii	OXA-23	22
		OXA-72	2

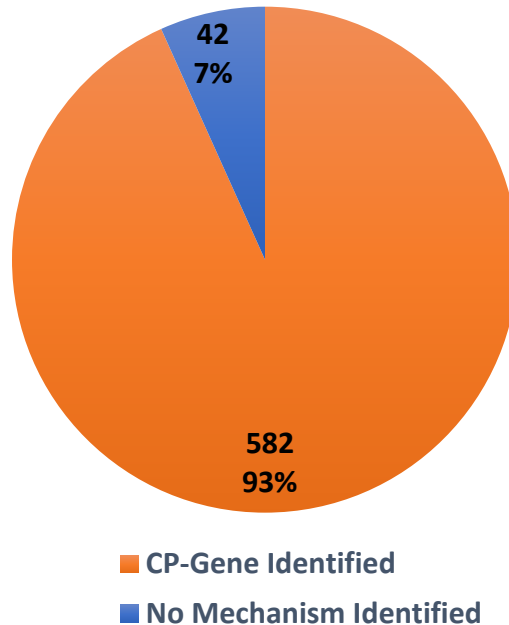
Please note: incomplete information on mechanism for 38 isolates

Carbapenem-resistant *Acinetobacter baumannii* (CRAB)

Mountain Region CRAB isolate submissions for characterization including AST and mechanism testing by whole genome sequencing—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



Mountain Region CRAB isolate submissions with CP mechanism versus no mechanism—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



Notable trends:

- Of a total of 624 CRAB isolates, 42 (7%) had no identified carbapenemase (CP) mechanism
 - Testing in the AR Lab Network during 2019 found that carbapenemase genes were not detected in 17% of CRAB isolates tested (CDC. Antibiotic Resistance & Patient Safety Portal (AR&PSP) AR Lab Network Data. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC. <https://arpsp.cdc.gov/>)
 - 48% of CRAB isolates submitted to the Utah AR Lab by Utah clinical laboratories from this same period had no identified CP-mechanism

Mountain Region CRAB isolate submissions by mechanism by WGS—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

	OXA-23 LIKE	OXA-24 LIKE	OXA-235	OXA-237	NDM	OXA-58
ALL JURISDICTIONS	405	154	18	5	2	1
%	69	25	3	1	1	1

* duplicate submissions excluded from analysis

Total CRAB isolates submitted: *624

Notable trends:

- OXA-23 most common mechanism in region (69%)
 - OXA-23 tied with OXA-235 as most common mechanism in CRAB isolates submitted by Utah clinical laboratories to the Utah AR Lab
- OXA-24 second most common mechanism in region (25%)
- “A small portion of CP-CRA possessed mobile genes that encode carbapenemases (KPC, IMP, NDM, VIM, OXA-48-like) found often in other gram-negative bacteria, such as Enterobacterales. These genes amplify the problem of resistance and are targeted for further molecular testing.” (CDC. Antibiotic Resistance & Patient Safety Portal (AR&PSP) AR Lab Network Data. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC. <https://arpsp.cdc.gov/>)
 - Of the ‘Big 5’ carbapenemase genes, NDM has only been seen in the Mountain Region, making up fewer than 2% of CRAB with identified mechanisms
 - The AR Lab Network continues to prioritize testing for the mobile but less common genes in CRAB isolates submitted for carbapenemase testing

Breakdown of OXA-23-like genes all Mountain Region jurisdictions—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

OXA-23	OXA-225	OXA-565	OXA-239
401	2	1	1

Breakdown of OXA-24-like genes all Mountain Region jurisdictions 2020 (Q1-Q4) and 2021 (Q1 and Q2)

OXA-72	OXA-24	OXA-207	OXA-139	OXA-160
115	31	3	3	2

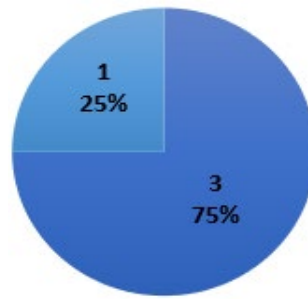
**Mountain Region CRAB isolates by mechanism and submitting jurisdictions—
2020 (Q1 – Q4) and 2021 (Q1 – Q2)**

Arizona



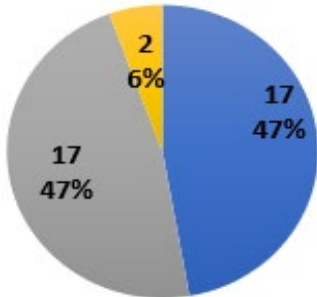
Arizona total CP-CRAB detected: *25

Colorado



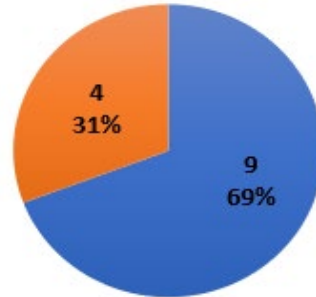
Colorado CP-CRAB detected: *4

Utah



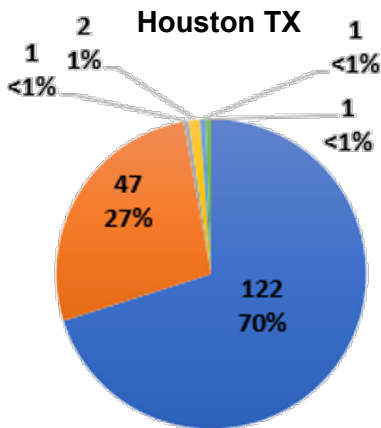
Utah total CP-CRAB detected: *36

New Mexico



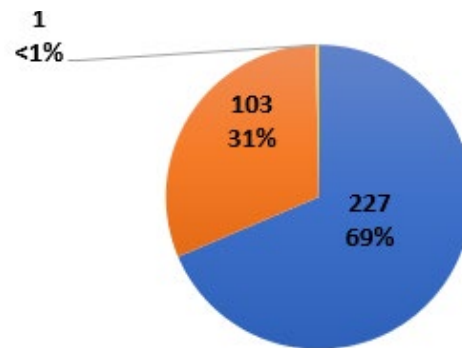
New Mexico total CP-CRAB detected: *13

Houston TX



Houston TX total CP-CRAB detected: *174

Austin TX



Austin TX total CP-CRAB detected: *331

* Duplicate submissions and isolates with no identified mechanism excluded from analysis

■ OXA-23 LIKE ■ OXA-24 LIKE ■ OXA-235 ■ OXA-237 ■ NDM ■ OXA-58

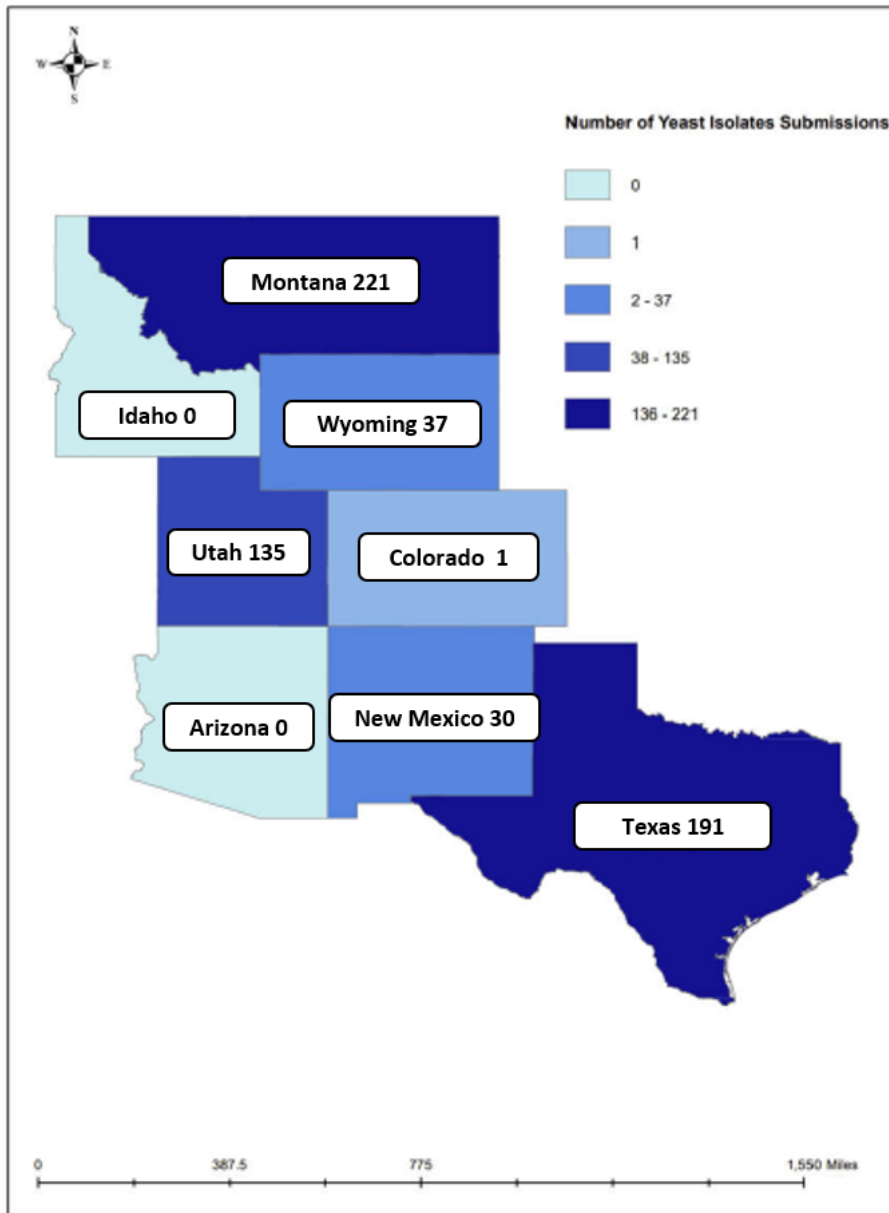
Mountain Region CRAB isolates showing dual and triple CP-mechanisms by submitting state—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

Submitting state	Mechanisms identified by WGS	Number
Utah	OXA-23 and OXA-237	1
Colorado	OXA-23 and NDM	1
TX (Austin)	OXA-72 and OXA-23	3
	OXA-23 and OXA-207 (OXA-24-like)	1
TX (Houston)	OXA-58, OXA-565 (OXA-23-like) and NDM	1

Candida non-albicans yeast

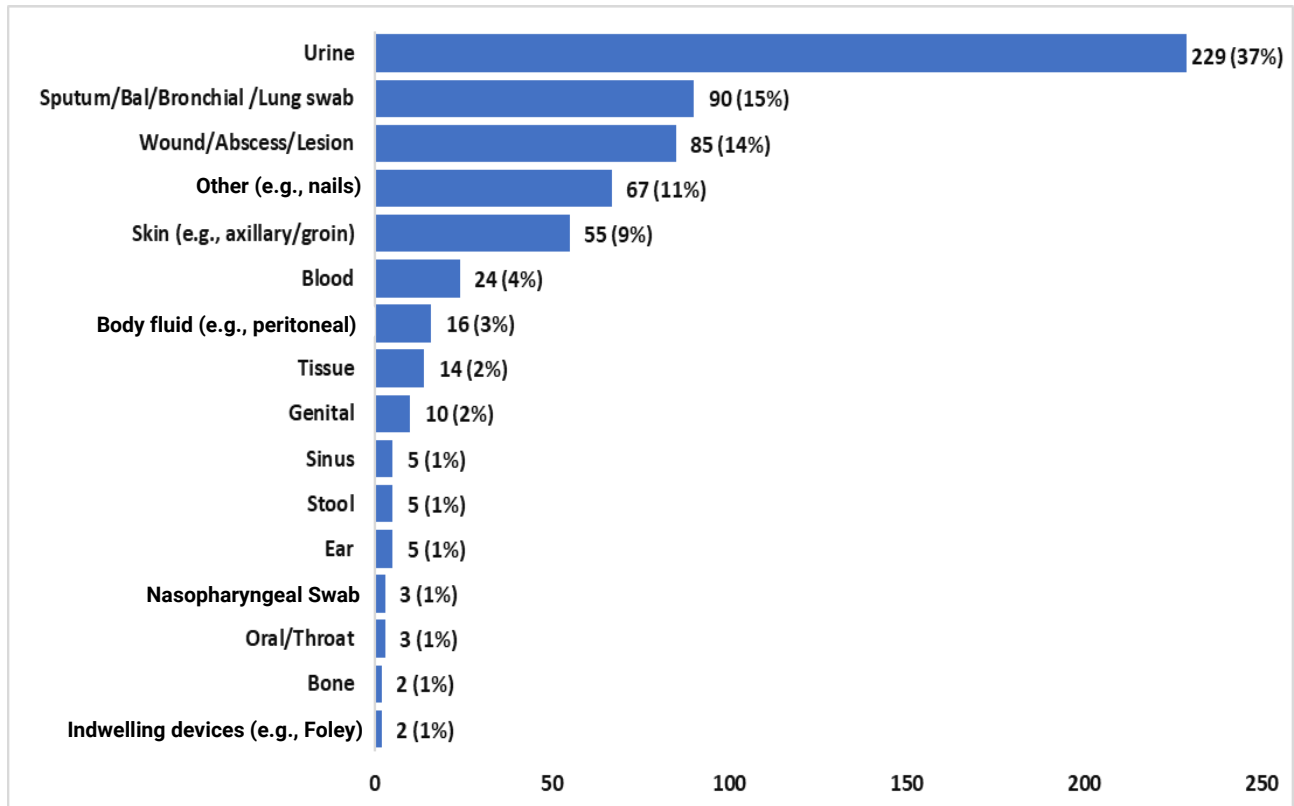
Mountain Region *Candida* total yeast isolate submissions by state—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

(Includes *Candida non-albicans* isolates submitted for identification, *Candida auris* rule-out, and antifungal susceptibility testing)



Total submissions: **615**

**Mountain Region *Candida non-albicans* yeast isolate* submissions by source—
2020 (Q1 – Q4) and 2021 (Q1 – Q2)**



Total: **615**

**Includes Candida non-albicans isolates submitted for identification, Candida auris rule-out, and antifungal susceptibility testing*

**Mountain Region *Candida non-albicans* yeast isolate submissions by species—
2020 (Q1 – Q4) and 2021 (Q1 – Q2)**

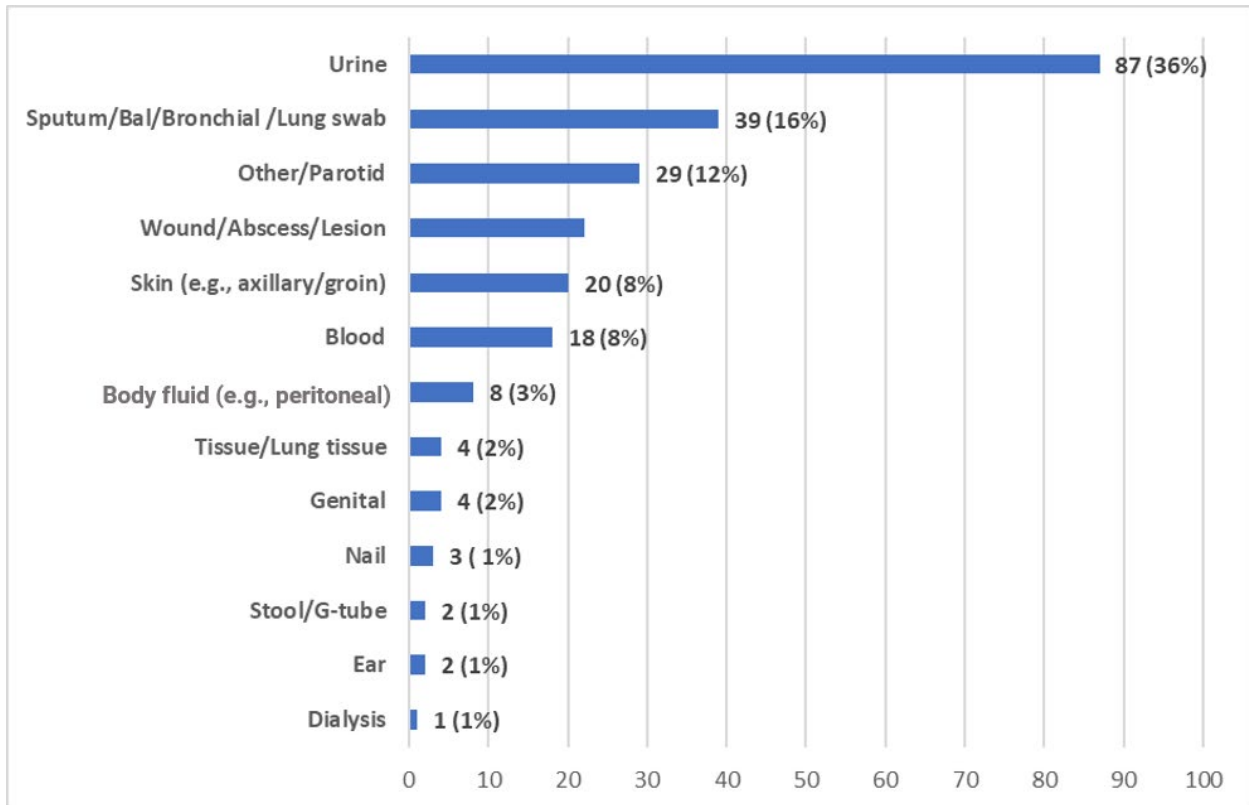
Species	Total number of Isolates	%
<i>C. glabrata</i>	263	42.76
<i>C. parapsilosis</i>	163	26.50
<i>C. tropicalis</i>	71	11.54
<i>C. lusitaniae</i>	28	4.55
<i>C. dubliniensis</i>	27	4.39
<i>C. krusei</i>	20	3.25
<i>C. guilliermondii</i>	9	1.46
<i>C. orthopsilosis</i>	9	1.46
<i>C. kefyr</i>	7	1.14
<i>C. metapsilosis</i>	6	0.98
<i>C. fermentati</i>	5	0.81
<i>C. duobushaemulonii</i>	3	0.49
<i>C. pelliculosa</i>	2	0.33
<i>Saccharomyces cerevisiae</i>	2	0.33

Mountain Region *Candida non-albicans* yeast isolate submissions by species and jurisdiction—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

Species	UT	TX	MT	WY	NM	CO
<i>C. glabrata</i>	57	58	114	15	18	1
<i>C. parapsilosis</i>	36	70	44	6	7	
<i>C. tropicalis</i>	20	28	18	3	2	
<i>C. lusitaniae</i>	6	10	4	6	2	
<i>C. dubliniensis</i>	4	2	19	2		
<i>C. krusei</i>	4	8	9	3		
<i>C. guilliermondii</i>		6	2		1	
<i>C. orthopsilosis</i>		8		1		
<i>C. kefyr</i>	1		5	1		
<i>C. metapsilosis</i>	2	3	1			
<i>C. fermentati</i>	1	1	3			
<i>C. duobushaemulonii</i>		3				
<i>C. pelliculosa</i>	2					
<i>Saccharomyces cerevisiae</i>	2					

Candida non-albicans yeast Candida glabrata

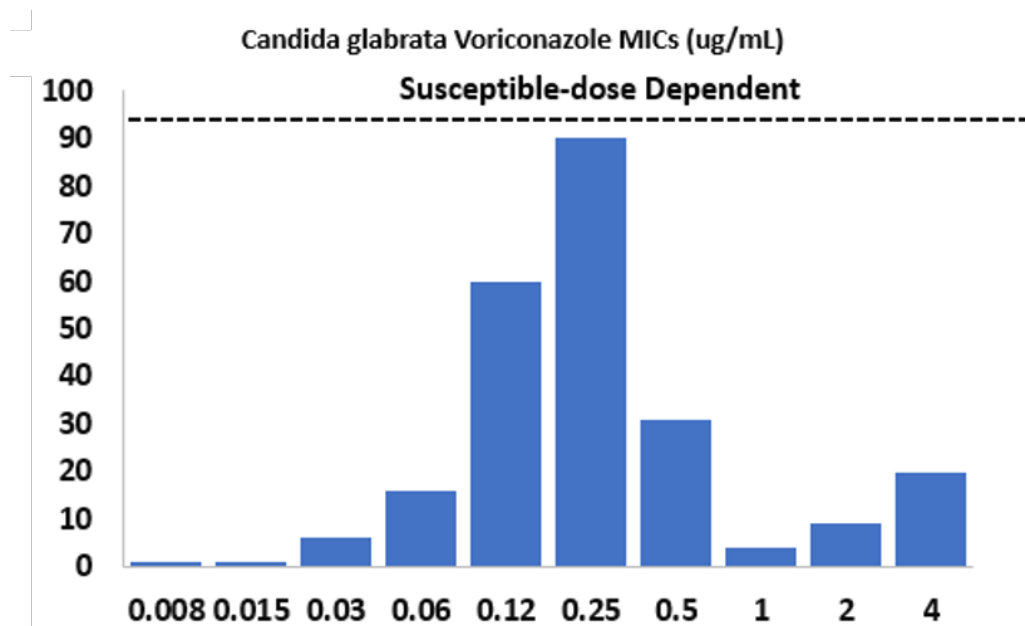
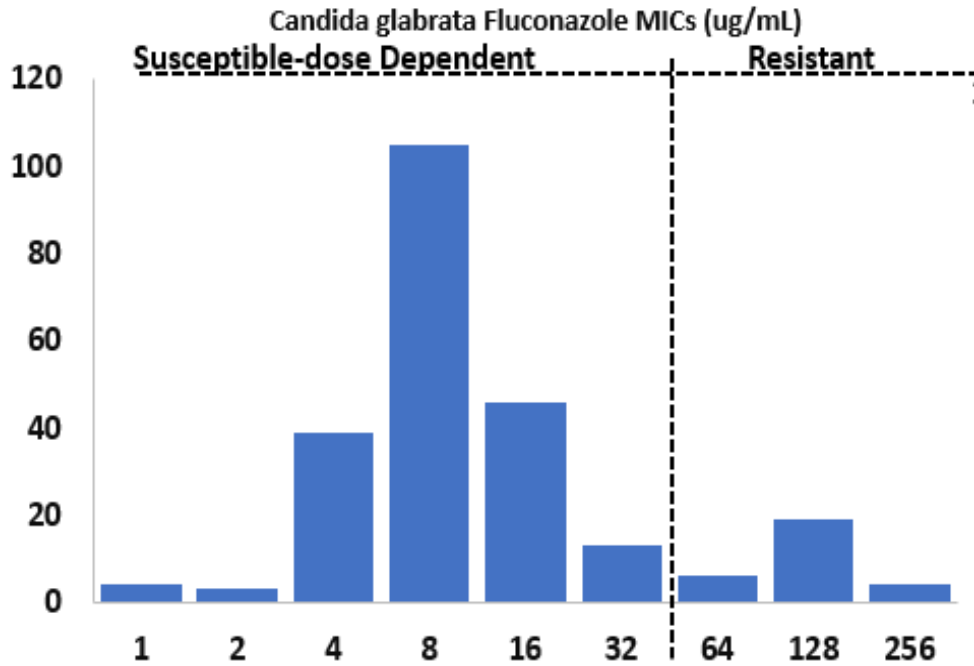
Mountain Region *Candida glabrata* yeast isolate submissions by source—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



Total: 239

Azole Resistance

Mountain Region *Candida glabrata* yeast isolate submissions and Azole susceptibility profiles—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



No interpretive criteria for voriconazole

Azole Resistance

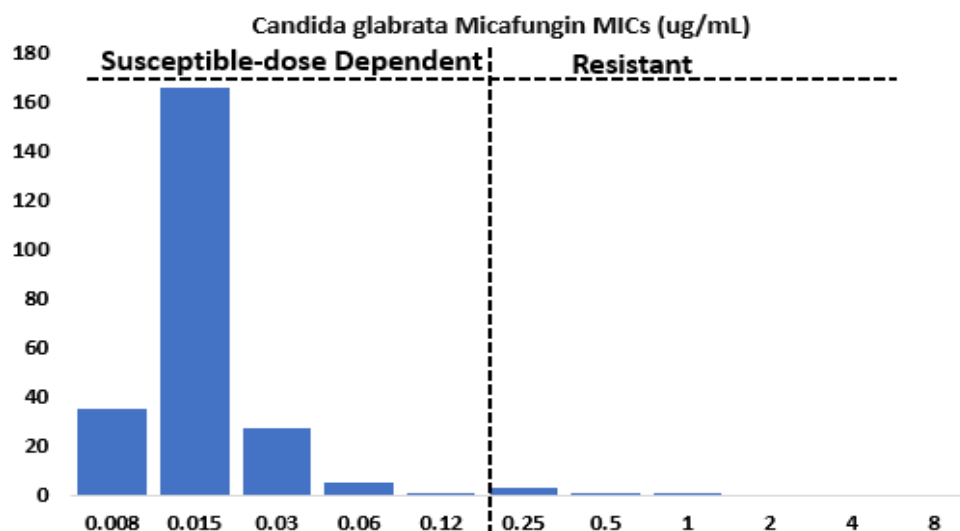
Mountain Region *Candida glabrata* yeast isolate submissions and Azole resistance—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

	# isolates resistant to Fluconazole	Total # <i>C. glabrata</i> isolates	% <i>C. glabrata</i> isolates resistant to Fluconazole
Candida glabrata (all sources)	29	239	12%
Candida glabrata (blood sources)	2	14	14%

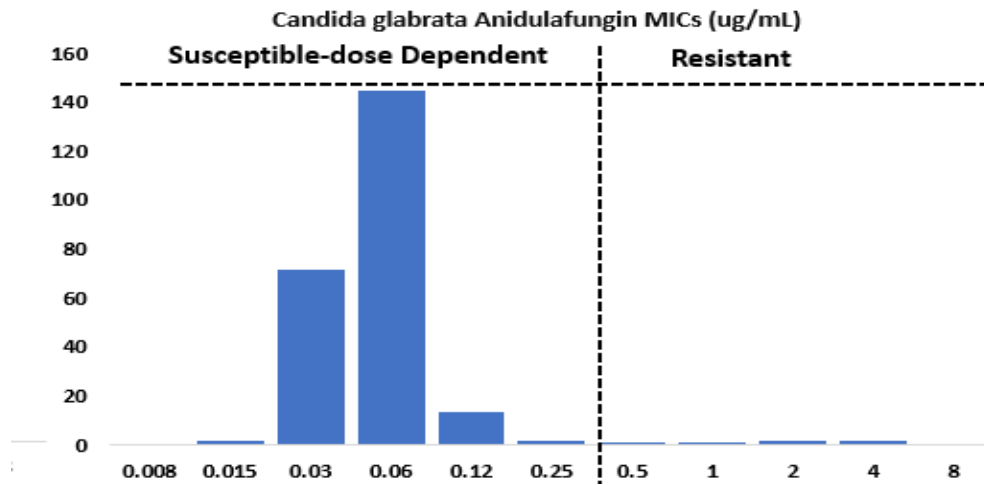
Candida glabrata breakdown of Fluconazole resistance by state

State	Resistant
Texas	12
New Mexico	1
Utah	4
Montana	8
Wyoming	2

Mountain Region *Candida glabrata* yeast isolate submissions and Echinocandin susceptibility profile—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



Candida non-albicans yeast
 Candida glabrata



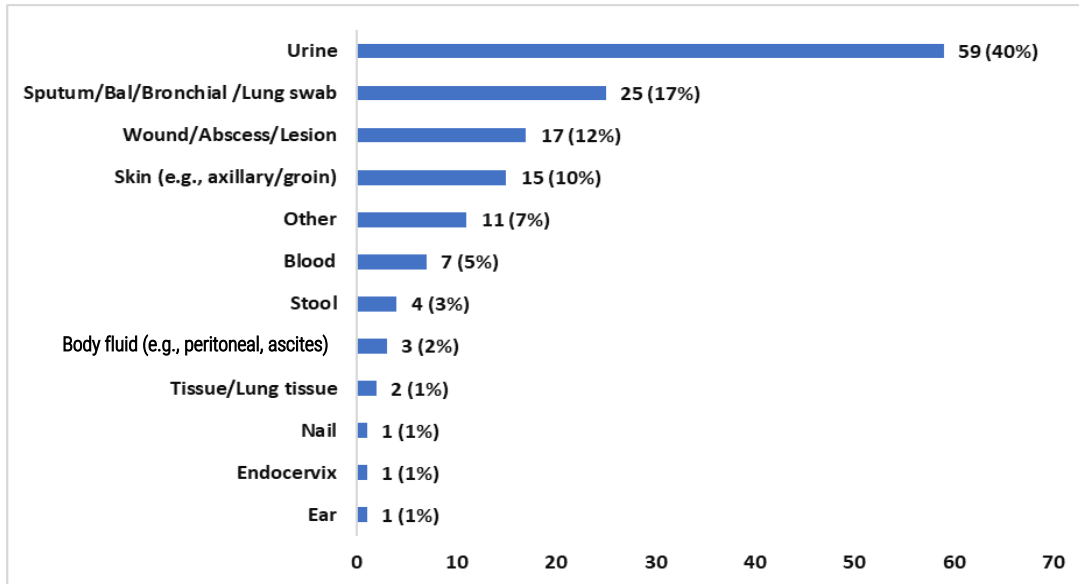
Candida glabrata and Echinocandin resistance*

	# isolates resistant to Echinocandins	Total # C. glabrata isolates	% C. glabrata isolates resistant to Echinocandins
Candida glabrata (all sources)	6	239	3%

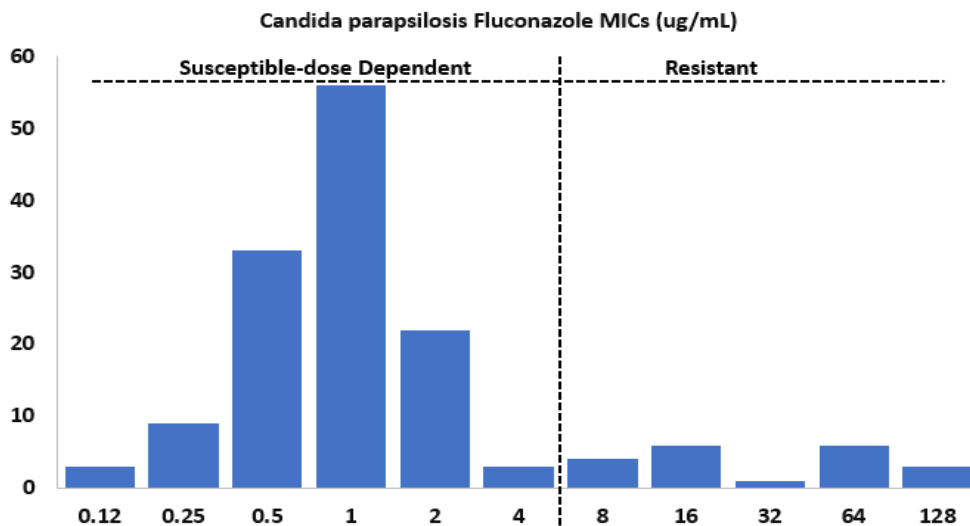
*Includes Micafungin and Anidulafungin

Candida non-albicans yeast Candida parapsilosis

Mountain Region *Candida parapsilosis* yeast isolate submissions by source—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



Mountain Region *Candida parapsilosis* yeast isolate submissions and Azole susceptibility profile—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

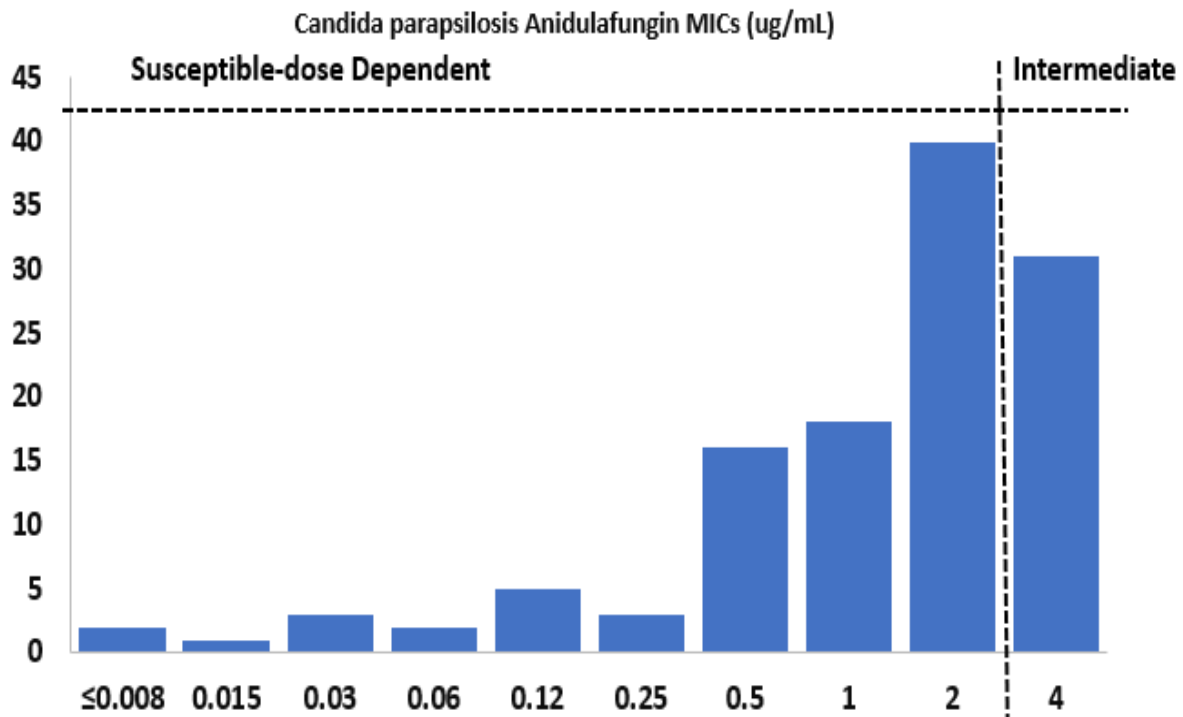


Azole Resistance

Candida parapsilosis and Azole resistance

	# isolates resistant to Fluconazole	Total # C. parapsilosis isolates	% C. parapsilosis isolates resistant to Fluconazole
Candida parapsilosis (all sources)	20	146	14%

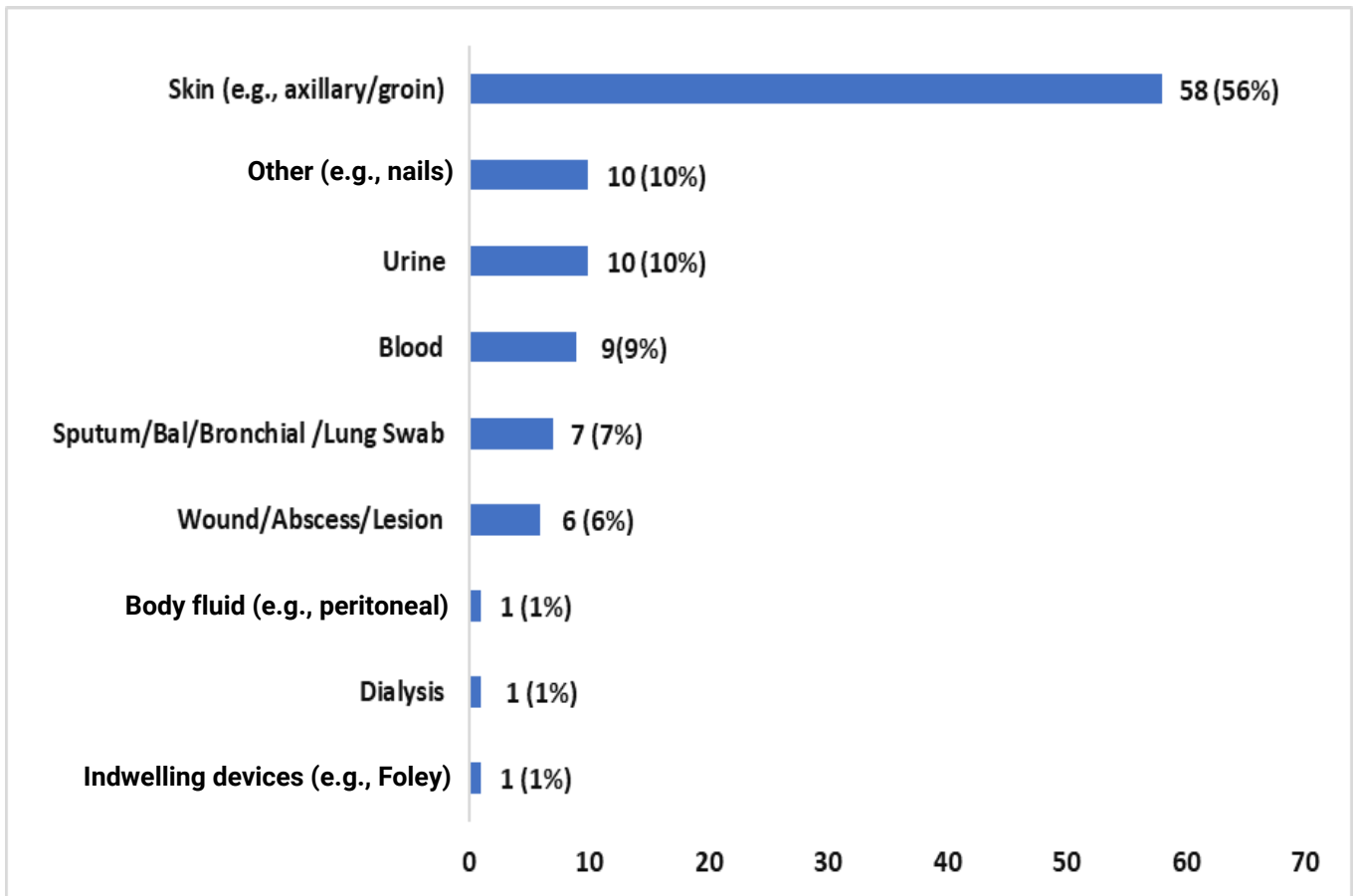
Mountain Region *Candida parapsilosis* yeast isolate submissions and Echinocandin susceptibility profile—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



*Resistance defined as > or = to 8 ug/mL—no Echinocandin resistant isolates found

Candida auris

Mountain Region **Candida auris* yeast isolate submissions by source—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



**Data available on 103 Candida auris isolates; 90 came exclusively from Texas and 13 were submitted from outside of the Mountain Region—Washington Western Regional Lab from California facilities.*

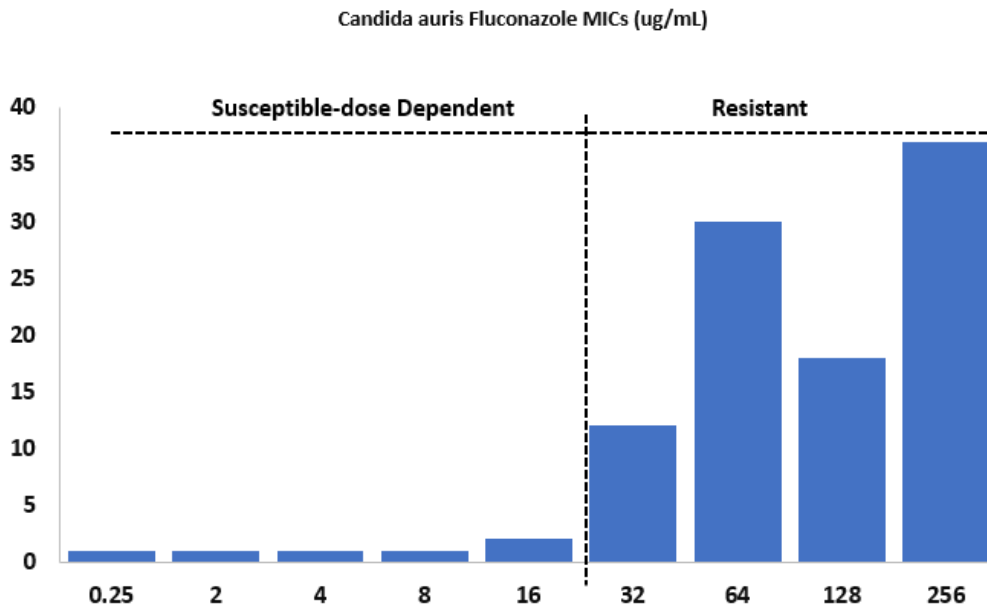
For the most recent data on *Candida auris* clinical cases in the United States, please refer to the following website:

<https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>

Mountain Region *Candida auris* yeast isolate submissions—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

Azole Resistance

Mountain Region *Candida auris* yeast isolate submissions and Azole susceptibility profile—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



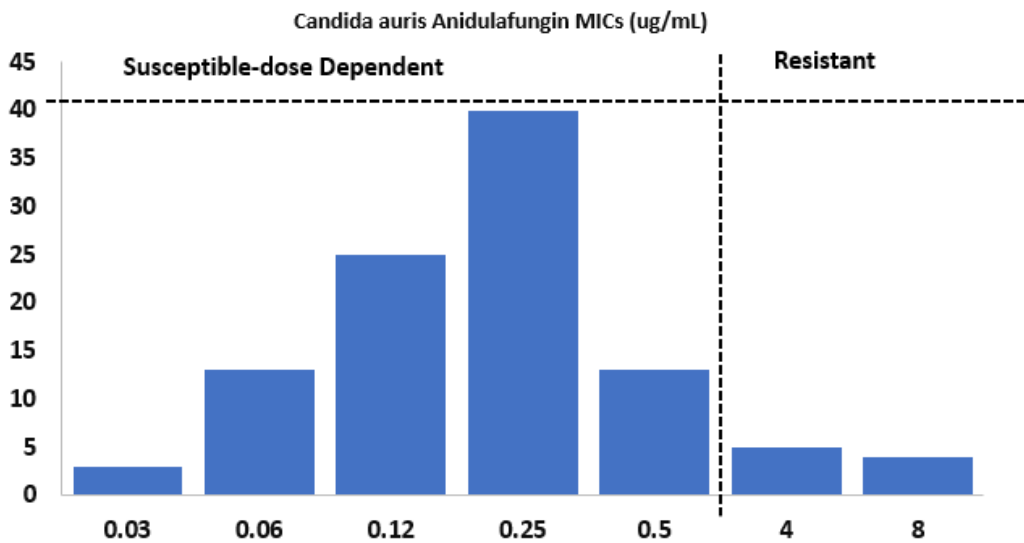
Candida auris and Azole resistance

	# isolates resistant to Fluconazole	Total # C. auris isolates	% C. auris isolates resistant to Fluconazole
Candida auris (all sources)	85	103	83%

Mountain Region *Candida auris* yeast isolate submissions—2020 (Q1 – Q4) and 2021 (Q1 – Q2)

Echinocandin resistance

Mountain Region *Candida auris* yeast isolate submissions and Echinocandin susceptibility profile—2020 (Q1 – Q4) and 2021 (Q1 – Q2)



Candida auris and Echinocandin resistance

	# isolates resistant to Echinocandins	Total # <i>C. auris</i> isolates	% <i>C. auris</i> isolates resistant to Echinocandins
Candida auris (all sources)	9	103	9%