2012 ANTIBIOGRAM

University of Alberta Hospital and the Stollery Children's Hospital

Department of Laboratory Medicine and Pathology

Table of Contents

Introduction

The antibiogram is an annual cumulative report of the antimicrobial susceptibility rates of common microbial pathogens to antimicrobials available on the hospital formulary. This report represents the local microbial epidemiology at the University of Alberta (UAH), Stollery Children's Hospital, and the Cross Cancer Institute (CCI), and is intended to be used as a resource to direct empiric antimicrobial therapy.

Antibiograms are generated by the compilation of susceptibility results from all 'first' clinical isolates of a specific pathogen recovered from an individual patient per calendar year. That is, only the first isolate within a 14-day period, regardless of specimen type or body site, is selected for analysis. The rationale for this referral period is based on the need to represent 'wild-type' susceptibility profiles and avoid over-representing antimicrobial resistance that may develop *de novo* during a patient's prolonged hospital stay. Susceptibility rates for patient groups (ie. age or ward location) represented by less than 30 isolates of a pathogen are not calculated due to the limited statistical significance and interpretive value.

This antibiogram handbook contains summary data for 2012 and notable resistance trends over several years.

A tremendous amount of effort goes into the creation of this document each year and the effort of the entire medical microbiology technologist staff is truly appreciated. We would also like to acknowledge Dr. Darren Hudson, UAH, for his assistance with the antibiogram data synthesis.

The antibiogram is available in PDF format at http://www.albertahealthservices.ca/3294.asp or Google 'UAH Antibiogram'. Alternatively, users can access a web-based application for quick reference at http://www.antibiogram.ca/.

Inquiries and feedback may be directed to Dr. Jeff Fuller, Provlab, at jeff.fuller@albertahealthservices.ca.

Antibiogram Resistance Trends

Enterobacteriaceae:

Enterobacter, Citrobacter, and *Serratia* species are intrinsically resistant to ampicillin, cefazolin, and cefuroxime and may develop resistance to broader-spectrum β-lactams during prolonged β-lactam therapy. Carbapenems are effective empiric options but a small proportion of these species (11% in 2012) exhibit in vitro resistance to ertapenem albeit susceptible to imipenem and meropenem.

The extended-spectrum β-lactamase (ESBL) resistance phenotype confers resistance to all third-generation cephalosporins and, in many cases, piperacillin-tazobactam. ESBL-positive *Escherichia coli* recovery rates remained relatively stable at ~5% between 2007 and 2010 but have trended upwards in 2011 (5.9%) and 2012 (6.7%). In 2012, the cross-resistance rates for ESBL-positive *E. coli* to the quinolones, aminoglycosides, and trimethoprim-sulfamethoxazole were 82%, 34%, and 61, respectively.

Klebsiella ESBL recovery rates are low and have remained between 2.5% and 4.2% since 2007 (3.7% in 2012). Similar to *E. coli* ESBL, resistance rates to other antibiotic classes are characteristically high but the overall annual recovery is low (n=30).

Enterococcus species:

Resistance rates in clinically relevant enterococci have not changed significantly over the last seven years. Identification of enterococci to the species level is only performed for sterile site isolates but vancomycin susceptibility is confirmed for ALL enterococcus isolates, regardless of specimen site. Although enterococcal bacteraemia is not common, the rate of vancomycin resistance in infections caused by *E. faecium* is significant.

***Pseudomonas aeruginosa*:**

Resistance rates in *P. aeruginosa* have remained unchanged for over seven years of surveillance of patients with and without cystic fibrosis (adult and paediatric). Notably, aminoglycosides have reduced activity in the CF population. Overall resistance in 2012 was 15% to ceftazidime, 25% to ciprofloxacin, 25% to gentamicin, 21% to imipenem, and 16% to meropenem.

***Staphylococcus aureus*:**

Resistance and isolation rates of *S. aureus* (ie. MSSA) and methicillin-resistant *S.aureus* (MRSA) have remained relatively unchanged over the last several years. The rate of MRSA detection relative to all *S. aureus* has remained ~20% since 2009.

***Streptococcus pneumoniae*:**

Susceptibility interpretations of certain β-lactams for pneumococci are reported in several categories to account for the pharmacodynamics in cases of meningitis (M), non-meningeal (NM) infections, or oral penicillin V therapy (PO). In 2012, resistance rates for meningeal and non-meningeal infections were 19% and 6% for penicillin, and 14% and 7% for ceftriaxone, respectively, similar to 2011 rates. Note, these rates do not reflect actual cases of pneumococcal meningitis.

Medically Relevant Pathogens Based on Gram Morphology

Gram-negative Bacilli		
Lactose Fermenters	**Non-lactose Fermenters**	**Glucose Non-fermenters**
Escherichia coli	*Serratia marcescens*	*Pseudomonas aeruginosa*
Klebsiella pneumoniae	*Salmonella* spp.	*Pseudomonas* spp.
Klebsiella oxytoca	*Proteus* spp.	*Stenotrophomonas maltophilia*
Enterobacter cloacae	*Morganella morganii*	*Acinetobacter baumanii* complex
Citrobacter freundii complex	*Aeromonas* spp.	*Achromobacter* species
Enterobacter aerogenes	*Providencia* spp.	*Burkholderia cepacia*
Citrobacter koseri	*Yersinia* spp.	*Chryseobacterium* species

Gram-positive Cocci	
Gram-positive Cocci in Chains	**Gram-positive Cocci in Clumps**
Enterococcus faaecium, Enterococcus faecalis	*Staphylococcus aureus*
Streptococcus pyogenes (Group A)	*Staphylococcus* spp., coagulase-negative
Streptococcus agalactiae (Group B)	*Staphylococcus lugdunensis*
Streptococcus pneumoniae	*Micrococcus* spp.
Viridans group streptococci	*Aerococcus* spp.
Streptococcus anginosus group	*Rothia mucilaginosus*

Abbreviation Glossary for Antimicrobials

Antimicrobial	Abbreviation	Antimicrobial	Abbreviation
Amikacin	AMK	Gentamicin Synergy	GM500
Amoxicillin/clavulanate	A/C	Imipenem	IMI
Ampicillin	AMP	Levofloxacin	LEV
Amphotericin B	AMB	Linezolid	LNZ
Cefazolin	FAZ	Meropenem	MERO
Ceftriaxone	CRO	Metronidazole	MET
Ceftazidime	CAZ	Micafungin	MICA
Cefuroxime	CXM	Nitrofurantoin	NIT
Ciprofloxacin	CIP	Penicillin	PEN
Clindamycin	CLIN	Piperacillin	PIP
Cloxacillin	CLOX	Tetracycline	TET
Doxycycline	DOXY	Tobramycin	TOB
Erythromycin	ERY	Trimethoprim-sulfamethoxazole	SXT
Fluconazole	FLUC	Vancomycin	VAN
Gentamicin	GEN	Voriconazole	VORI

Antibiogram Tables

***Acinetobacter baumanni* complex**							
All Specimen Sources		**CAZ**	**CIP**	**GEN**	**IMI**	**TOB**	**SXT**
ALL Ages	**% SUSC**	**70**	**83**	**84**	**97**	**98**	**85**
	# SUSC	34	40	38	41	43	41
	# TESTED	48	48	48	42	48	48

***Bacteroides fragilis* group**					
All Specimen Sources		**A/C**	**CLIN**	**IMI**	**MET**
ALL Ages	**% SUSC**	**86**	**63**	**94**	**100**
	# SUSC	33	24	36	38
	# TESTED	38	38	38	38

***Citrobacter freundii* complex**									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
ALL Ages	**% SUSC**	**0**	**0**	**81**	**90**	**95**	**100**	**86**	**79**
	# SUSC	0	0	74	81	87	91	77	72
	# TESTED	91	91	91	91	91	91	91	91
$\geq$ 17 years	**% SUSC**	**0**	**0**	**81**	**91**	**96**	**100**	**87**	**80**
	# SUSC	0	0	66	73	78	81	79	65
	# TESTED	81	81	81	81	81	81	81	81

Enterobacter, *Citrobacter*, and *Serratia* species are intrinsically resistant to ampicillin, cefazolin, and cefuroxime and may develop resistance to broader-spectrum β-lactams during prolonged β-lactam therapy. Carbapenems are effective empiric options but a small proportion of these species (11% in 2012) exhibit in vitro resistance to ertapenem albeit susceptible to imipenem and meropenem.

Enterobacter aerogenes									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
ALL Ages	**% SUSC**	**0**	**0**	**69**	**95**	**98**	**98**	**0**	**98**
	# SUSC	0	0	59	81	84	84	0	84
	# TESTED	85	85	85	85	85	85	85	85
≥ 17 years	**% SUSC**	**0**	**0**	**77**	**95**	**100**	**98**	**0**	**98**
	# SUSC	0	0	53	65	68	67	0	67
	# TESTED	68	68	68	68	68	68	68	68

Enterobacter cloacae									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
All Patients	**% SUSC**	**0**	**0**	**78**	**93**	**97**	**98**	**23**	**90**
ALL Ages	# SUSC	0	0	283	338	351	357	83	328
	# TESTED	361	361	361	361	361	361	361	361
≥ 17 years	**% SUSC**	**0**	**0**	**76**	**92**	**98**	**98**	**21**	**92**
	# SUSC	0	0	220	265	283	283	62	265
	# TESTED	286	286	286	286	286	286	286	286
< 17 years	**% SUSC**	**0**	**0**	**84**	**97**	**90**	**98**	**28**	**84**
	# SUSC	0	0	63	73	68	74	21	63
	# TESTED	75	75	75	75	75	75	75	75

Enterobacter, Citrobacter, and *Serratia* species are intrinsically resistant to ampicillin, cefazolin, and cefuroxime and may develop resistance to broader-spectrum β-lactams during prolonged β-lactam therapy. Carbapenems are effective empiric options but a small proportion of these species (11% in 2012) exhibit in vitro resistance to ertapenem albeit susceptible to imipenem and meropenem.

Escherichia coli (including ESBLs)								
All Specimen Sources		**AMP**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
All Patients	**% SUSC**	**50**	**90**	**72**	**89**	**99**	**94**	**71**
ALL Ages	# SUSC	1283	2315	1854	2273	2543	2397	1827
	# TESTED	2552	2550	2552	2553	2546	2549	2552
	% SUSC	**50**	**89**	**68**	**88**	**99**	**93**	**70**
≥ 17 years	# SUSC	1021	1817	1379	1799	1017	1893	1436
	# TESTED	2025	2025	2025	2025	2020	2025	2025
	% SUSC	**49**	**94**	**90**	**89**	**100**	**96**	**74**
< 17 years	# SUSC	262	498	475	474	527	504	391
	# TESTED	527	527	527	527	527	527	527
	% SUSC	**45**	**91**	**74**	**87**	**99**	**100**	**69**
UAH 3C3/3C4	# SUSC	42	85	69	81	92	93	64
	# TESTED	93	93	93	93	93	93	93
	% SUSC	**55**	**93**	**73**	**89**	**100**	**91**	**71**
CCI	# SUSC	49	83	65	79	89	92	63
	# TESTED	89	89	89	89	89	89	89

Escherichia coli - ESBL Producers Only								
All Specimen Sources		**AMP**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
	% SUSC	**0**	**0**	**18**	**66**	**98**	**85**	**39**
ALL Ages	# SUSC	0	0	31	114	170	147	68
	# TESTED	172	172	172	172	172	172	172
	% SUSC	**0**	**0**	**14**	**67**	**98**	**84**	**36**
≥ 17 years	# SUSC	0	0	22	101	148	126	55
	# TESTED	150	150	150	150	150	150	150

The extended-spectrum β-lactamase (ESBL) resistance phenotype confers resistance to all third-generation cephalosporins and, in many cases, piperacillin-tazobactam. ESBL-positive *Escherichia coli* recovery rates remained relatively stable at ~5% between 2007 and 2010 but have trended upwards in 2011 (5.9%) and 2012 (6.7%). In 2012, the cross-resistance rates for ESBL-positive *E. coli* to the quinolones, aminoglycosides, and trimethoprim-sulfamethoxazole were 82%, 34%, and 61, respectively.

Klebsiella species (Including ESBLs)								
All Specimen Sources		**AMP**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
All Patients	**% SUSC**	**0**	**95**	**94**	**98**	**99**	**45**	**93**
ALL Ages	# SUSC	0	782	778	804	817	369	762
	# TESTED	819	819	819	819	819	819	819
	% SUSC	**0**	**95**	**94**	**97**	**99**	**42**	**92**
≥ 17 years	# SUSC	0	651	645	668	680	291	633
	# TESTED	682	682	682	682	682	682	682
	% SUSC	**0**	**95**	**97**	**99**	**100**	**56**	**94**
< 17 years	# SUSC	0	11	133	136	137	78	129
	# TESTED	137	137	137	137	137	137	137
	% SUSC	**0**	**94**	**91**	**100**	**100**	**24**	**91**
CCI	# SUSC	0	35	34	37	37	9	34
	# TESTED	37	37	37	37	37	37	37

Klebsiella species - ESBL Producers Only								
All Specimen Sources		**AMP**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
	% SUSC	**0**	**0**	**40**	**70**	**100**	**26**	**53**
ALL Ages	# SUSC	0	0	12	21	30	8	16
	# TESTED	30	30	30	30	30	30	30

The extended-spectrum β-lactamase (ESBL) resistance phenotype confers resistance to all third-generation cephalosporins and, in many cases, piperacillin-tazobactam. *Klebsiella* ESBL recovery rates are low and have remained between 2.5% and 4.2% since 2007 (3.7% in 2012). Similar to *E. coli* ESBL, resistance rates to other antibiotic classes are characteristically high but the overall annual recovery is low (n=30).

Haemophilus influenzae				
All Specimen Sources		**AMP**	**CXM**	**SXT**
ALL Ages	**% SUSC**	**80**	**90**	**65**
	# SUSC	157	48	31
	# TESTED	194	53	47
≥ 17 years	**% SUSC**	**81**	**85**	**56**
	# SUSC	113	29	18
	# TESTED	139	34	32

Morganella morganii								
All Specimen Sources		**AMP**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
ALL Ages	**% SUSC**	**0**	**98**	**71**	**77**	**100**	**0**	**64**
	# SUSC	0	56	41	44	57	0	37
	# TESTED	57	57	57	57	57	57	57
≥ 17 years	**% SUSC**	**0**	**98**	**69**	**77**	**100**	**0**	**64**
	# SUSC	0	52	37	41	53	0	34
	# TESTED	53	53	53	53	53	53	53

Proteus mirabilis								
All Specimen Sources		**AMP**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
ALL Ages	**% SUSC**	**68**	**95**	**64**	**92**	**100**	**0**	**64**
	# SUSC	132	186	126	179	194	0	126
	# TESTED	194	194	194	194	194	194	194
≥ 17 years	**% SUSC**	**69**	**96**	**61**	**94**	**100**	**0**	**63**
	# SUSC	119	166	105	162	172	0	110
	# TESTED	172	172	172	172	172	172	172

Pseudomonas aeruginosa									
All Specimen Sources		**AMK**	**CAZ**	**CIP**	**GEN**	**IMI**	**MERO**	**PIP**	**TOB**
All Patients	**% SUSC**	**79**	**85**	**75**	**75**	**79**	**84**	**79**	**88**
ALL Ages	# SUSC	905	971	861	865	898	951	899	1011
	# TESTED	1137	1139	1139	1140	1128	1132	1136	1137
≥ 17 years	**% SUSC**	**78**	**84**	**70**	**74**	**78**	**83**	**79**	**88**
	# SUSC	714	774	646	677	710	754	772	809
	# TESTED	912	913	913	914	905	907	910	911
< 17 years	**% SUSC**	**84**	**87**	**95**	**83**	**84**	**87**	**78**	**89**
	# SUSC	191	197	215	118	188	197	177	202
	# TESTED	225	226	226	226	223	225	226	226
Non-CF Patients	**% SUSC**	**92**	**84**	**74**	**83**	**80**	**82**	**77**	**92**
ALL Ages	# SUSC	710	645	566	635	611	631	595	705
	# TESTED	764	764	764	764	764	764	764	764
≥ 17 years	**% SUSC**	**92**	**83**	**68**	**81**	**77**	**80**	**77**	**91**
	# SUSC	570	12	422	500	477	495	479	562
	# TESTED	615	615	615	615	615	615	615	615
< 17 years	**% SUSC**	**93**	**89**	**96**	**91**	**90**	**91**	**77**	**95**
	# SUSC	140	133	144	135	134	136	116	143
	# TESTED	149	149	149	149	149	149	149	149
CF Patients	**% SUSC**	**51**	**87**	**78**	**61**	**76**	**86**	**81**	**81**
ALL Ages	# SUSC	195	328	296	230	289	325	309	308
	# TESTED	377	377	377	377	377	377	377	377
≥ 17 years	**% SUSC**	**47**	**88**	**75**	**59**	**77**	**87**	**82**	**83**
	# SUSC	143	264	225	177	233	263	248	249
	# TESTED	300	300	300	300	300	300	300	300
< 17 years	**% SUSC**	**67**	**83**	**92**	**68**	**72**	**80**	**79**	**76**
	# SUSC	52	64	71	53	56	62	61	59
	# TESTED	77	77	77	77	77	77	77	77
UAH 3C3/3C4	**% SUSC**	**93**	**68**	**75**	**81**	**68**	**72**	**65**	**91**
	# SUSC	70	51	56	61	51	54	49	68
	# TESTED	75	75	75	75	75	75	75	75

Resistance rates in *P. aeruginosa* have remained unchanged for over seven years of surveillance of patients with and without cystic fibrosis (adult and paediatric). Notably, aminoglycosides have reduced activity in the CF population. Overall resistance in 2012 was 15% to ceftazidime, 25% to ciprofloxacin, 25% to gentamicin, 21% to imipenem, and 16% to meropenem.

Serratia marcescens									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**MERO**	**NIT**	**SXT**
All Patients	**% SUSC**	**0**	**0**	**95**	**97**	**98**	**95**	**0**	**97**
ALL Ages	# SUSC	0	0	95	97	98	95	0	97
	# TESTED	99	99	99	99	99	99	99	99
	% SUSC	**0**	**0**	**95**	**97**	**98**	**95**	**0**	**97**
≥ 17 years	# SUSC	0	0	87	89	90	87	0	89
	# TESTED	91	91	91	91	91	91	91	91

Enterobacter, *Citrobacter*, and *Serratia* species are intrinsically resistant to ampicillin, cefazolin, and cefuroxime and may develop resistance to broader-spectrum β-lactams during prolonged β-lactam therapy. Carbapenems are effective empiric options but a small proportion of these species (11% in 2012) exhibit in vitro resistance to ertapenem albeit susceptible to imipenem and meropenem.

Stenotrophomonas maltophilia				
All Specimen Sources		**CAZ**	**DOXY**	**SXT**
All Patients	**% SUSC**	**40**	**77**	**94**
ALL Ages	# SUSC	148	287	346
	# TESTED	368	368	368
	% SUSC	**44**	**76**	**92**
≥ 17 years	# SUSC	124	211	255
	# TESTED	277	277	277
	% SUSC	**26**	**83**	**100**
< 17 years	# SUSC	24	76	91
	# TESTED	91	91	91

Enterococcus species (Including VRE)						
All Specimen Sources		**AMP**	**GM500**	**LNZ**	**NIT**	**VAN**
All Patients	**% SUSC**	**82**	**74**	**99**	**82**	**94**
ALL Ages	# SUSC	1425	1285	1688	1405	1651
	# TESTED	1726	1724	1691	1711	1739
	% SUSC	**80**	**71**	**99**	**79**	**94**
≥ 17 years	# SUSC	1156	1037	1419	1138	1370
	# TESTED	1445	1443	1422	1431	1457
	% SUSC	**95**	**88**	**100**	**95**	**99**
< 17 years	# SUSC	269	288	269	267	281
	# TESTED	281	281	269	280	282
	% SUSC	**43**	**73**	**94**	**57**	**76**
UAH 3C3/3C4	# SUSC	33	56	72	39	55
	# TESTED	77	77	77	68	72
	% SUSC	**89**	**71**	**100**	**86**	**96**
CCI	# SUSC	73	58	82	70	82
	# TESTED	82	82	82	81	85

Enterococcus faecalis						
Blood specimens		**AMP**	**GM500**	**LNZ**	**NIT**	**VAN**
	% SUSC	**100**	**70**	**100**	**97**	**97**
ALL Ages	# SUSC	44	31	44	43	43
	# TESTED	44	44	44	44	44

Enterococcus faecium						
Blood specimens		**AMP**	**GM500**	**LNZ**	**NIT**	**VAN**
	% SUSC	**2**	**92**	**100**	**8**	**70**
ALL Ages	# SUSC	1	39	40	3	29
	# TESTED	43	43	40	35	41

Resistance rates in clinically relevant enterococci have not changed significantly over the last seven years. Identification of enterococci to the species level is only performed for sterile site isolates but vancomycin susceptibility is confirmed for ALL enterococcus isolates, regardless of specimen site. Although enterococcal bacteraemia is not common, the rate of vancomycin resistance in infections caused by *E. faecium* is significant.

***Staphylococcus aureus* (Including MRSA)**									
All Specimen Sources		**CLIN**	**CLOX**	**ERY**	**LNZ**	**NIT**	**TET**	**SXT**	**VAN**
All Patients	**% SUSC**	**76**	**81**	**66**	**99**	**97**	**95**	**95**	**99**
ALL Ages	# SUSC	1701	1181	1498	2234	2187	2131	2142	2235
	# TESTED	2237	2233	2236	2235	2233	2236	2237	2236
	% SUSC	**75**	**79**	**65**	**100**	**97**	**95**	**95**	**99**
≥ 17 years	# SUSC	1293	1374	1132	1721	1682	1639	1647	1720
	# TESTED	1722	1719	1722	1721	1720	1721	1722	1721
	% SUSC	**79**	**85**	**71**	**99**	**98**	**95**	**96**	**100**
< 17 years	# SUSC	408	437	366	513	505	492	495	515
	# TESTED	515	514	514	514	513	515	515	515
	% SUSC	**71**	**81**	**65**	**100**	**98**	**95**	**96**	**100**
UAH 3C3/3C4	# SUSC	117	133	106	164	161	155	157	164
	# TESTED	164	164	164	164	164	164	164	164
	% SUSC	**82**	**82**	**78**	**100**	**98**	**97**	**95**	**100**
CCI	# SUSC	57	57	54	69	68	67	66	69
	# TESTED	69	69	69	69	69	69	69	69

Resistance and isolation rates of *S. aureus* (ie. MSSA) and methicillin-resistant *S.aureus* (MRSA) have remained relatively unchanged over the last several years. The rate of MRSA detection relative to all *S. aureus* has remained at ~20% since 2009.

Staphylococcus lugdunensis							
All Specimen Sources		**CLIN**	**CLOX**	**ERY**	**NIT**	**SXT**	**VAN**
	% SUSC	**84**	**99**	**84**	**100**	**100**	**100**
ALL Ages	# SUSC	88	103	88	104	104	104
	# TESTED	104	104	104	104	104	104

***Staphylococcus* species, coagulase-negative**							
All Specimen Sources		**CLIN**	**CLOX**	**ERY**	**NIT**	**SXT**	**VAN**
All Patients	**% SUSC**	**46**	**31**	**32**	**98**	**58**	**99**
ALL Ages	# SUSC	161	107	114	339	204	347
	# TESTED	346	336	347	345	347	348
	% SUSC	**48**	**31**	**33**	**98**	**57**	**100**
≥ 17 years old	# SUSC	142	90	99	288	171	296
	# TESTED	294	284	295	293	295	296
	% SUSC	**36**	**32**	**28**	**98**	**63**	**98**
< 17 years old	# SUSC	19	17	15	51	33	51
	# TESTED	52	52	52	52	52	52

Viridans Group Streptococci				
All Specimen Sources		**CRO**	**PEN**	**VAN**
	% SUSC	**98**	**80**	**100**
ALL Ages	# SUSC	113	92	115
	# TESTED	115	115	115

***Streptococcus anginosus* group**				
All Specimen Sources		**CRO**	**PEN**	**VAN**
	% SUSC	**100**	**100**	**100**
ALL Ages	# SUSC	40	40	40
	# TESTED	40	40	40

Streptococcus pyogenes				
All Specimen Sources		**CLIN**	**ERY**	**PEN**
	% SUSC	**84**	**84**	**100**
ALL Ages	# SUSC	42	42	50
	# TESTED	50	50	50

Streptococcus pneumoniae		M	NM				M, PO	NM		
All Specimen Sources		**CRO**	**CRO**	**DOXY**	**ERY**	**LEV**	**PEN**	**PEN**	**SXT**	**VAN**
All Patients	**% SUSC**	**86**	**93**	**84**	**72**	**98**	**81**	**94**	**80**	**100**
ALL Ages	# SUSC	78	84	79	78	137	124	145	87	151
	# TESTED	90	90	94	108	139	153	153	108	151
	% SUSC	**86**	**96**	**88**	**79**	**98**	**86**	**95**	**83**	**100**
≥ 17 years old	# SUSC	44	49	61	58	101	93	102	61	106
	# TESTED	51	51	69	73	103	107	107	73	106
	% SUSC	**87**	**89**	**72**	**57**	**100**	**67**	**93**	**74**	**100**
< 17 years old	# SUSC	34	35	18	20	36	31	43	29	45
	# TESTED	39	39	25	35	36	46	46	35	45

M, meningitis; NM, non-meningitis; PO, oral administration.

Susceptibility interpretations of certain β-lactams for pneumococci are reported in several categories to account for the pharmacodynamics in cases of meningitis (M), non-meningeal (NM) infections, or oral penicillin V therapy (PO). In 2012, resistance rates for meningeal and non-meningeal infections were 19% and 6% for penicillin, and 14% and 7% for ceftriaxone, respectively, similar to 2011 rates. Note, these rates do not reflect actual cases of pneumococcal meningitis.

***Candida* species**					
All Specimen Sources		**AMB**	**FLUC**	**VORI**	**MICA**
C. albicans	**% SUSC**	**100**	**97**	**98**	**100**
ALL Ages	# SUSC	106	103	104	106
	# TESTED	106	106	106	106
C. glabrata	**% SUSC**	**100**	*****	**(87)**	**100**
ALL Ages	# SUSC	86		(75)	86
	# TESTED	86		86	86

* Not recommended for empiric therapy.

The susceptibility data for *C. glabrata* against voriconazole, shown in parentheses, is based on the established microbiological breakpoint of ≤0.5 mg/L. Currently, there is insufficient data to demonstrate a correlation of susceptibility testing and clinical outcome for *C. glabrata* infections treated with voriconazole.