2010 ANTIBIOGRAM

University of Alberta Hospital and the Stollery Children's Hospital

Medical Microbiology
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 of the University of Alberta (UAH), Stollery Childrens' Hospital, and the Cross Cancer Institute (CCI), and is intended to be used as a guideline 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 were not calculated, with several exceptions, due to the limited statistical relevance; in fact, rates derived from less than 30 isolates are of limited statistical value and should be interpreted carefully.

This antibiogram handbook contains summary data for 2010 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, Department of Laboratory Medicine and Pathology, at jeff.fuller@albertahealthservices.ca.

Antibiogram Resistance Trends

Enterobacteriaceae:

Enterobacter, Citrobacter, and *Serratia* species may develop resistance to all β-lactams except for carbapenems during prolonged β-lactam therapy. These pathogens are also intrinsically resistant to ampicillin, cefazolin, and cefuroxime.

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* isolation rates have remained relatively stable at ~5% since 2007. In 2010, the cross-resistance rates for ESBL-positive *E. coli* to the quinolones, aminoglycosides, and trimethoprim-sulfamethoxazole were 84%, 42%, and 59%, respectively.

Klebsiella ESBL isolation rates from 2006 to 2010 have ranged from 2.3% to 4.2%. Cross-resistance rates for 2010 to the quinolones, aminoglycosides, and trimethoprim-sulfamethoxazole were 59%, 67%, and 80%, respectively (n=24).

Enterococcus species:

Resistance rates in clinically relevant enterococci have not changed significantly over the last five years. However, outbreaks of vancomycin resistant enterococcus (VRE) colonization increase the risk of serious infections. 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.

Pseudomonas aeruginosa:

Resistance rates in *P. aeruginosa* have remained relatively unchanged for over five years of surveillance in patients with and without cystic fibrosis and in both adult and pediatric populations. Resistance in 2010 was 14% to ceftazidime, 28% to ciprofloxacin, 25% to gentamicin, 21% to imipenem, and 15% to piperacillin.

***Staphylococcus aureus*:**

Resistance and isolation rates of *S. aureus* (ie. MSSA) and methicillin-resistant *S.aureus* (MRSA), which is resistant to all β-lactam antibiotics, have remained relatively unchanged in the last several years. MRSA strains may be referred to as 'community-associated' (CA) or 'hospital-associated' (HA) that, in the context of this antibiogram, primarily differ based on the degree of non-β-lactam antibiotic resistance; this distinction requires molecular genotyping that is not routinely available.

The isolation rate of MRSA relative to all *S. aureus* has been 20% for the last two years, down from 28% in 2008. In 2010, 339 (264 Adult, 75 Pediatric) MRSA isolates were identified with susceptibility testing but genotype data was available only for the subset displayed in the table; no linezolid or vancomycin resistance was detected, and CA-MRSA resistance to clindamycin has remained at ~27% the past three years.

***Streptococcus pneumoniae*:**

Susceptibility interpretations of certain β-lactams for pneumococci are reported in several categories to account for the pharmacodynamics in cases of meningitis, non-meningeal infections, or oral penicillin V therapy. In 2010, resistance rates for meningeal and non-meningeal infections were 10% and 3% for penicillin, and 7% and 5% for ceftriaxone, respectively. Note, these rates do not reflect actual cases of pneumococcal meningitis.

***Candida* species:**

C. albicans and *C. glabrata* comprise more than 80% of all *Candida* isolated from sterile-sites. This has remained unchanged since 2005 when UAH yeast susceptibility results were first published. *C. albicans* are predictably susceptible to most antifungal agents. *C. glabrata* exhibit significant resistance to fluconazole (46%), which has increased from previous years (~30% in 2008 and 2009).

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	*Proteus mirabilis*	*Pseudomonas* species
Klebsiella oxytoca	*Morganella morganii*	*Stenotrophomonas maltophilia*
Enterobacter cloacae	*Aeromonas* species	*Acinetobacter baumanii* complex
Citrobacter freundii complex	*Providencia rettgeri*	*Achromobacter* species
Enterobacter aerogenes	*Providencia stuartii*	*Burkholderia cepacia*
Citrobacter koseri	*Salmonella species*	*Chryseobacterium* species

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

Abbreviation Glossary for Antimicrobials

Antimicrobial	Abbreviation	Antimicrobial	Abbreviation
Amikacin	AMK	Imipenem	IMI
Ampicillin	AMP	Levofloxacin	LEV
Amphotericin B	AMB	Linezolid	LNZ
Cefazolin	FAZ	Meropenem	MERO
Ceftriaxone	CRO	Micafungin	MICA
Ceftazidime	CAZ	Nitrofurantoin	NIT
Ciprofloxacin	CIP	Penicillin	PEN
Clindamycin	CLIN	Piperacillin	PIP
Cloxacillin	CLOX	Rifampin	RIF
Doxycycline	DOXY	Tetracycline	TET
Erythromycin	ERY	Ticarcillin-clavulanic acid	TIM
Fluconazole	FLUC	Tobramycin	TOB
Flucytosine	5-FC	Trimethoprim-sulfamethoxazole	SXT
Gentamicin	GEN	Vancomycin	VAN
Gentamicin Synergy	GM500	Voriconazole	VORI

Antibiogram Tables

***Acinetobacter baumanni* complex**							
All Specimen Sources		**CAZ**	**CIP**	**GEN**	**IMI**	**TOB**	**SXT**
ALL Ages	**% SUS**	**75**	**95**	**97**	**97**	**97**	**90**
	# SUS	31	39	40	39	40	37
	# TESTED	41	41	41	40	41	41
≥ 17 years	**% SUS**	**77**	**93**	**97**	**93**	**97**	**97**
	# SUS	22	27	28	27	28	28
	# TESTED	30	30	30	30	30	30

***Burkholderia cepacia* complex**					
All Specimen Sources		**CAZ**	**LEVO**	**MERO**	**SXT**
CF Patients	**% SUS**	**--**	**--**	**--**	**--**
ALL Ages	# SUS	19	11	17	17
	# TESTED	21	21	21	21

***Citrobacter freundii* complex**									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
ALL Ages	**% SUS**	**0**	**0**	**76**	**92**	**97**	**100**	**90**	**91**
	# SUS	0	0	65	79	83	85	77	78
	# TESTED	85	85	85	85	85	85	85	85
≥ 17 years	**% SUS**	**0**	**0**	**73**	**91**	**98**	**100**	**91**	**92**
	# SUS	0	0	52	65	70	71	65	66
	# TESTED	71	71	71	71	71	71	71	71

Citrobacter koseri									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
ALL Ages	**% SUS**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
	# SUS	0	24	25	25	25	25	13	25
	# TESTED	25	25	25	25	25	25	25	25

Enterobacter, *Citrobacter,* and *Serratia* species may develop resistance to all β-lactams except for carbapenems during prolonged β-lactam therapy. These pathogens are also intrinsically resistant to ampicillin, cefazolin, and cefuroxime.

Enterobacter aerogenes									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
	% SUS	**0**	**0**	**73**	**95**	**100**	**98**	**7**	**95**
ALL Ages	# SUS	0	0	62	80	84	82	6	80
	# TESTED	84	84	84	84	84	84	84	84
	% SUS	**0**	**0**	**77**	**94**	**100**	**97**	**7**	**97**
≥ 17 years	# SUS	0	0	60	73	77	75	6	75
	# TESTED	77	77	77	77	77	77	77	77

Enterobacter cloacae									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
All Patients	**% SUS**	**0**	**0**	**77**	**89**	**93**	**99**	**15**	**86**
ALL Ages	# SUS	0	0	221	265	277	273	46	256
	# TESTED	297	297	297	297	297	274	297	297
	% SUS	**0**	**0**	**73**	**87**	**92**	**99**	**15**	**85**
≥ 17 years	# SUS	0	0	178	211	224	222	37	206
	# TESTED	242	242	242	242	242	223	242	242
	% SUS	**0**	**0**	**78**	**98**	**96**	**100**	**16**	**90**
< 17 years	# SUS	0	0	43	54	53	51	9	50
	# TESTED	55	55	55	55	55	51	55	55

Enterobacter, Citrobacter, and *Serratia* species may develop resistance to all β-lactams except for carbapenems during prolonged β-lactam therapy. These pathogens are also intrinsically resistant to ampicillin, cefazolin, and cefuroxime.

Escherichia coli									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
All Patients	**% SUS**	**53**	**92**	**97**	**74**	**93**	**100**	**94**	**71**
ALL Ages	# SUS	1198	1937	2178	1660	2075	2076	2107	1589
	# TESTED	2231	2094	2131	2231	2231	2076	2231	2231
	% SUS	**54**	**92**	**97**	**68**	**92**	**100**	**93**	**72**
≥ 17 years	# SUS	927	1464	1650	1167	1571	1571	1587	1219
	# TESTED	1692	1587	1692	1692	1692	1571	1692	1692
	% SUS	**50**	**93**	**97**	**91**	**93**	**99**	**96**	**68**
< 17 years	# SUS	271	473	528	493	504	504	520	320
	# TESTED	539	539	539	539	539	539	539	539
	% SUS	**46**	**86**	**96**	**72**	**94**	**100**	**90**	**76**
UAH 3C3/3C4	# SUS	31	55	64	48	63	62	60	51
	# TESTED	67	64	67	67	67	62	67	67
	% SUS	**64**	**92**	**97**	**74**	**96**	**100**	**92**	**83**
CCI	# SUS	79	69	79	60	80	74	75	67
	# TESTED	81	72	81	81	81	74	81	81

Escherichia coli - **ESBL Producers**									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
	% SUS	**0**	**0**	**0**	**16**	**58**	**100**	**88**	**41**
ALL Ages	# SUS	0	0	0	18	65	106	99	46
	# TESTED	112	112	112	112	112	106	112	112
	% SUS	**0**	**0**	**0**	**12**	**55**	**100**	**90**	**42**
≥ 17 years	# SUS	0	0	0	12	55	94	90	42
	# TESTED	100	100	100	100	100	94	100	100

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* isolation rates have remained relatively stable at ~5% since 2007. In 2010, the cross-resistance rates for ESBL-positive *E. coli* to the quinolones, aminoglycosides, and trimethoprim-sulfamethoxazole were 84%, 42%, and 59%, respectively.

Haemophilus influenzae				
All Specimen Sources		**AMP**	**CXM**	**SXT**
ALL Ages	**% SUS**	**84**	**94**	**86**
	# SUS	203	47	40
	# TESTED	241	50	46
≥ 17 years	**% SUS**	**84**	**94**	**88**
	# SUS	145	37	32
	# TESTED	172	39	36

Klebsiella species									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
All Patients	**% SUS**	**0**	**86**	**97**	**97**	**98**	**100**	**34**	**92**
ALL Ages	# SUS	0	562	638	635	643	654	228	606
	# TESTED	654	625	654	654	654	654	654	654
	% SUS	**0**	**92**	**98**	**96**	**99**	**100**	**31**	**93**
≥ 17 years	# SUS	0	478	535	525	540	544	173	507
	# TESTED	544	518	544	544	544	544	544	544
	% SUS	**0**	**78**	**93**	**100**	**93**	**100**	**50**	**90**
< 17 years	# SUS	0	84	103	110	103	110	55	99
	# TESTED	110	107	110	110	110	110	110	110
	% SUS	**0**	**84**	**96**	**100**	**100**	**100**	**46**	**98**
UAH 3C3/3C4	# SUS	0	38	46	48	48	48	22	48
	# TESTED	48	45	48	48	48	48	48	48
	% SUS	--	--	--	--	--	--	--	--
CCI	# SUS	0	26	29	29	29	29	7	27
	# TESTED	29	27	29	29	29	29	29	29

Klebsiella species - ESBL Producers									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
	% SUS	--	--	--	--	--	--	--	--
ALL Ages	# SUS	0	0	0	10	8	24	8	5
	# TESTED	24	24	24	24	24	24	24	24

The extended-spectrum β-lactamase (ESBL) resistance phenotype confers resistance to all third-generation cephalosporins and, in many cases, piperacillin-tazobactam. *Klebsiella* ESBL isolation rates from 2006 to 2010 have ranged from 2.3% to 4.2%. Cross-resistance rates for 2010 to the quinolones, aminoglycosides, and trimethoprim-sulfamethoxazole were 59%, 67%, and 80%, respectively (n=24).

Morganella morganii									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
ALL Ages	**% SUS**	**0**	**0**	**97**	**92**	**90**	**100**	**0**	**80**
	# SUS	0	0	41	39	38	46	0	34
	# TESTED	42	42	42	42	42	42	42	42
≥ 17 years	**% SUS**	**0**	**0**	**97**	**91**	**91**	**100**	**0**	**82**
	# SUS	0	0	34	32	32	41	0	29
	# TESTED	35	35	35	35	35	35	35	35

Proteus mirabilis									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
ALL Ages	**% SUS**	**76**	**89**	**97**	**78**	**93**	**100**	**0**	**71**
	# SUS	135	150	172	132	165	176	0	125
	# TESTED	176	167	176	176	176	176	176	176
≥ 17 years	**% SUS**	**76**	**91**	**97**	**76**	**94**	**100**	**0**	**69**
	# SUS	117	133	149	117	144	153	0	107
	# TESTED	153	146	153	153	153	153	153	153

Pseudomonas aeruginosa									
All Specimen Sources		**AMK**	**CAZ**	**CIP**	**GEN**	**IMI**	**MERO**	**PIP**	**TOB**
All Patients	**% SUS**	**77**	**86**	**72**	**75**	**79**	**82**	**85**	**88**
ALL Ages	# SUS	867	964	810	844	891	465	962	985
	# TESTED	1112	1119	1119	1119	1119	565	1119	1119
≥ 17 years	**% SUS**	**78**	**84**	**67**	**76**	**77**	**82**	**85**	**88**
	# SUS	674	725	579	654	667	364	733	762
	# TESTED	854	857	857	857	857	439	857	857
< 17 years	**% SUS**	**74**	**91**	**88**	**72**	**85**	**80**	**87**	**85**
	# SUS	193	239	231	190	224	101	229	223
	# TESTED	258	262	262	262	262	126	262	262
Non-CF Patients	**% SUS**	**93**	**87**	**72**	**86**	**80**	**61**	**87**	**93**
ALL Ages	# SUS	646	607	505	603	561	89	612	651
	# TESTED	694	696	696	696	695	144	696	696
≥17 years	**% SUS**	**93**	**84**	**67**	**87**	**76**	**59**	**86**	**93**
	# SUS	502	457	366	470	413	72	465	503
	# TESTED	539	539	539	539	539	122	539	539
< 17 years	**% SUS**	**92**	**95**	**88**	**84**	**94**	**--**	**93**	**94**
	# SUS	144	150	139	133	148	--	147	148
	# TESTED	155	157	157	157	157	--	157	157
CF Patients	**% SUS**	**52**	**84**	**72**	**56**	**77**	**89**	**82**	**78**
ALL Ages	# SUS	221	357	305	241	330	376	350	334
	# TESTED	418	423	423	423	423	421	423	423
≥ 17 years	**% SUS**	**54**	**84**	**66**	**57**	**79**	**92**	**84**	**81**
	# SUS	172	268	213	184	254	292	268	259
	# TESTED	315	318	318	318	318	318	318	318
< 17 years	**% SUS**	**47**	**84**	**87**	**54**	**72**	**80**	**78**	**71**
	# SUS	49	89	92	57	76	84	82	75
	# TESTED	103	105	105	105	105	105	105	105
UAH 3C3/3C4	**% SUS**	**89**	**77**	**59**	**82**	**65**	**--**	**81**	**88**
	# SUS	47	41	31	43	34	--	43	46
	# TESTED	53	53	53	53	53	--	53	53

Resistance rates in *P. aeruginosa* have remained relatively unchanged for over five years of surveillance in patients with and without cystic fibrosis and in both adult and pediatric populations. Resistance in 2010 was 14% to ceftazidime, 28% to ciprofloxacin, 25% to gentamicin, 21% to imipenem, and 15% to piperacillin.

Serratia marcescens									
All Specimen Sources		**AMP**	**FAZ**	**CRO**	**CIP**	**GEN**	**IMI**	**NIT**	**SXT**
All Patients	**% SUS**	**0**	**0**	**89**	**91**	**94**	**99**	**0**	**94**
ALL Ages	# SUS	0	0	106	109	103	109	0	113
	# TESTED	119	119	119	119	119	119	119	119
	% SUS	**0**	**0**	**90**	**94**	**98**	**100**	**0**	**94**
≥ 17 years	# SUS	0	0	76	79	83	84	0	79
	# TESTED	84	84	84	84	84	84	84	84

Enterobacter, *Citrobacter*, and *Serratia* species may develop resistance to all β-lactams except for carbapenems during prolonged β-lactam therapy. These pathogens are also intrinsically resistant to ampicillin, cefazolin, and cefuroxime.

Stenotrophomonas maltophilia				
All Specimen Sources		**DOXY**	**TIM**	**SXT**
All Patients	**% SUS**	**73**	**32**	**95**
ALL Ages	# SUS	251	102	324
	# TESTED	342	312	342
	% SUS	**70**	**32**	**94**
≥ 17 years	# SUS	168	70	225
	# TESTED	240	216	240
	% SUS	**81**	**33**	**97**
< 17 years	# SUS	83	32	99
	# TESTED	102	96	102

Enterococcus species							
All Specimen Sources		**AMP**	**CIP**	**GM500**	**LNZ**	**NIT**	**VAN**
All Patients	**% SUS**	**88**	**60**	**70**	**96**	**87**	**97**
ALL Ages	# SUS	1436	954	1124	1527	1390	1603
	# TESTED	1615	1589	1592	1575	1588	1636
	% SUS	**86**	**51**	**66**	**97**	**86**	**97**
≥ 17 years	# SUS	1114	655	844	1215	1083	1271
	# TESTED	1283	1260	1263	1250	1259	1302
	% SUS	**96**	**90**	**85**	**96**	**93**	**99**
< 17 years	# SUS	322	299	280	312	307	332
	# TESTED	332	329	329	325	329	334
	% SUS	**66**	**44**	**74**	**96**	**62**	**90**
UAH 3C3/3C4	# SUS	46	28	47	61	39	67
	# TESTED	70	64	64	65	64	74
	% SUS	**88**	**43**	**53**	**97**	**92**	**98**
CCI	# SUS	63	30	37	66	64	71
	# TESTED	72	69	69	68	69	72

Enterococcus faecalis							
Blood specimens		**AMP**	**CIP**	**GM500**	**LNZ**	**NIT**	**VAN**
	% SUS	**100**	**64**	**64**	**100**	**100**	**100**
ALL Ages	# SUS	53	34	34	53	53	53
	# TESTED	53	53	53	53	53	53

Enterococcus faecium							
Blood specimens		**AMP**	**CIP**	**GM500**	**LNZ**	**NIT**	**VAN**
	% SUS	**--**	**--**	**--**	**--**	**--**	**--**
ALL Ages	# SUS	2	2	18	19	4	16
	# TESTED	19	19	19	19	19	19

Resistance rates in clinically relevant enterococci have not changed significantly over the last five years. However, outbreaks of vancomycin resistant enterococcus (VRE) colonization increase the risk of serious infections. 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.

Staphylococcus aureus - **MSSA**												
All Specimen Sources		**CIP**	**CLIN**	**CLOX**	**ERY**	**GEN**	**LNZ**	**NIT**	**RIF**	**SXT**	**TET**	**VAN**
All Patients	**% SUS**	**92**	**82**	**100**	**79**	**97**	**100**	**98**	**99**	**96**	**96**	**99**
ALL Ages	# SUS	1530	1369	1657	1318	1603	1651	1625	1649	1607	1591	1655
	# TESTED	1651	1658	1657	1658	1651	1651	1650	1650	1658	1650	1655
	% SUS	**91**	**82**	**100**	**79**	**97**	**100**	**98**	**99**	**97**	**96**	**99**
≥ 17 years	# SUS	1095	993	1201	955	1167	1197	1181	1196	1177	1157	1201
	# TESTED	1197	1203	1201	1203	1197	1197	1197	1197	1203	1196	1201
	% SUS	**95**	**82**	**100**	**79**	**96**	**100**	**98**	**100**	**94**	**95**	**100**
< 17 years	# SUS	435	376	456	363	436	454	444	453	430	434	454
	# TESTED	454	455	456	455	454	454	453	453	455	454	454
	% SUS	**99**	**89**	**100**	**87**	**100**	**100**	**100**	**100**	**95**	**99**	**100**
UAH 3C3/3C4	# SUS	116	104	118	103	118	118	118	118	112	116	118
	# TESTED	118	118	118	118	118	118	118	118	118	118	118
	% SUS	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
UAH 3C2	# SUS	24	22	24	22	24	24	24	24	24	22	24
	# TESTED	24	24	24	24	24	24	24	24	24	24	24
	% SUS	**92**	**88**	**100**	**88**	**98**	**100**	**97**	**100**	**98**	**93**	**100**
CCI	# SUS	71	68	77	68	75	77	75	77	72	75	77
	# TESTED	77	77	77	77	77	77	77	77	77	77	77

***Staphylococcus aureus* - MRSA**												
All Specimen Sources		**CIP**	**CLIN**	**CLOX**	**ERY**	**GEN**	**LNZ**	**NIT**	**RIF**	**SXT**	**TET**	**VAN**
Community-associated	**% SUS**	**24**	**73**	**0**	**26**	**97**	**100**	**100**	**100**	**97**	**94**	**100**
	# SUS	35	107	0	38	142	147	147	147	143	138	147
	# TESTED	147	147	147	147	147	147	147	147	147	147	147
Hospital-associated	**% SUS**	**10**	**14**	**0**	**3**	**73**	**100**	**97**	**98**	**73**	**76**	**100**
	# SUS	6	8	0	2	43	59	57	58	43	45	59
	# TESTED	59	59	59	59	59	59	59	59	59	59	59

Resistance and isolation rates of *S. aureus* (ie. MSSA) and methicillin-resistant *S.aureus* (MRSA), which is resistant to all β-lactam antibiotics, have remained relatively unchanged in the last several years. MRSA strains may be referred to as 'community-associated' (CA) or 'hospital-associated' (HA) that, in the context of this antibiogram, primarily differ based on the degree of non-β-lactam antibiotic resistance; this distinction requires molecular genotyping that is not routinely available.

The isolation rate of MRSA relative to all *S. aureus* has been 20% for the last two years, down from 28% in 2008. In 2010, 339 (264 Adult, 75 Pediatric) MRSA isolates were identified with susceptibility testing but genotype data was available only for the subset displayed in the table; no linezolid or vancomycin resistance was detected, and CA-MRSA resistance to clindamycin has remained at ~27% the past three years.

***Staphylococcus* species, coagulase-negative**											
All Specimen Sources		**FAZ**	**CIP**	**CLIN**	**CLOX**	**ERY**	**GEN**	**NIT**	**PEN**	**SXT**	**VAN**
All Patients	**% SUS**	**35**	**46**	**48**	**36**	**35**	**74**	**99**	**11**	**60**	**100**
ALL Ages	# SUS	124	161	176	127	129	263	352	40	217	360
	# TESTED	347	354	360	350	360	354	355	362	359	360
	% SUS	**35**	**41**	**48**	**36**	**35**	**75**	**98**	**10**	**58**	**100**
≥ 17 years old	# SUS	104	124	147	107	108	223	293	32	176	301
	# TESTED	289	2968	301	292	302	296	296	303	300	301
	% SUS	**34**	**72**	**49**	**34**	**36**	**68**	**100**	**13**	**69**	**100**
< 17 years old	# SUS	20	42	29	20	21	40	58	8	41	59
	# TESTED	58	58	59	58	58	58	58	59	59	59

Staphylococcus lugdunensis											
All Specimen Sources		**FAZ**	**CIP**	**CLIN**	**CLOX**	**ERY**	**GEN**	**NIT**	**PEN**	**SXT**	**VAN**
	% SUS	**98**	**100**	**79**	**98**	**80**	**100**	**100**	**67**	**98**	**100**
ALL Ages	# SUS	80	82	65	81	66	82	82	55	81	82
	# TESTED	82	82	82	82	82	82	82	82	82	82
	% SUS	**98**	**100**	**78**	**98**	**78**	**100**	**100**	**67**	**98**	**100**
≥ 17 years	# SUS	71	73	57	72	57	73	73	49	72	73
	# TESTED	73	73	73	73	73	73	73	73	73	73

Viridans Group Streptococci				
All Specimen Sources		**CRO**	**PEN**	**VAN**
ALL Ages	**% SUS**	**95**	**70**	**100**
	# SUS	93	68	97
	# TESTED	97	97	97
≥ 17 years	**% SUS**	**99**	**74**	**100**
	# SUS	75	58	78
	# TESTED	78	78	78
< 17 years	**% SUS**	**--**	**--**	**--**
	# SUS	18	10	19
	# TESTED	19	19	19

***Streptococcus anginosis* group**				
All Specimen Sources		**CRO**	**PEN**	**VAN**
ALL Ages	**% SUS**	**100**	**100**	**100**
	# SUS	110	110	110
	# TESTED	110	110	110

Streptococcus pneumoniae		M	NM				M	NM	PO		
All Specimen Sources		**CRO**	**CRO**	**DOXY**	**ERY**	**LEV**	**PEN**	**PEN**	**PEN**	**SXT**	**VAN**
All Patients	**% SUS**	**93**	**95**	**86**	**78**	**99**	**90**	**97**	**90**	**85**	**100**
ALL Ages	# SUS	60	61	106	100	169	144	155	144	110	174
	# TESTED	64	64	122	127	170	159	159	159	128	174
	% SUS	**95**	**95**	**88**	**80**	**99**	**94**	**97**	**94**	**88**	**100**
≥ 17 years old	# SUS	42	42	76	71	120	113	117	113	79	124
	# TESTED	44	44	86	88	121	120	120	120	89	124
	% SUS	**--**	**--**	**83**	**74**	**100**	**79**	**97**	**79**	**79**	**100**
< 17 years old	# SUS	18	19	30	29	49	31	38	31	31	50
	# TESTED	20	20	36	39	49	39	39	39	39	50

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, non-meningeal infections, or oral penicillin V therapy. In 2010, resistance rates for meningeal and non-meningeal infections were 10% and 3% for penicillin, and 7% and 5% for ceftriaxone, respectively. Note, these rates do not reflect actual cases of pneumococcal meningitis.

Streptococcus pyogenes				
All Specimen Sources		**CLIN**	**ERY**	**PEN**
	% SUS	**77**	**80**	**100**
ALL Ages	# SUS	31	32	36
	# TESTED	40	40	36

***Candida* species**							
All Specimen Sources		**AMB**	**5-FC**	**ITRA**	**FLUC**	**VORI**	**MICA**
C. albicans	**% SUS**	**100**	**100**	**92**	**100**	**100**	**100**
ALL Ages	# SUS	93	93	86	93	93	93
	# TESTED	93	93	93	93	93	93
C. glabrata	**% SUS**	**100**	**100**	**6**	**54**	**96**	**100**
ALL Ages	# SUS	98	98	6	53	94	98
	# TESTED	98	98	98	98	98	98
C. parapsilosis	**% SUS**	**100**	**100**	**91**	**96**	**100**	**100**
ALL Ages	# SUS	23	23	21	22	23	23
	# TESTED	23	23	23	23	23	23
C. tropicalis	**% SUS**	**100**	**100**	**77**	**92**	**92**	**100**
ALL Ages	# SUS	13	13	10	12	12	13
	# TESTED	13	13	13	13	13	13

C. albicans and *C. glabrata* comprise more than 80% of all *Candida* isolated from sterile-sites. This has remained unchanged since 2005 when UAH yeast susceptibility results were first published. *C. albicans* are predictably susceptible to most antifungal agents. *C. glabrata* exhibit significant resistance to fluconazole (46%), which has increased from previous years (~30% in 2008 and 2009).