Franciscan HEALTH
Indianapolis

Antimicrobial Susceptibility Profile of Isolates for 2022 (Jan. – Nov.)

INDIANAPOLIS

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2022 Indianapolis Campus - First Isolate, All Sites

GRAM-NEGATIVE AEROBES	# Isolates	Amikacin	Gentamicin	Tobramycin	Cefazolin	Cefuroxime	Ceftriaxone	Cefepime	Aztreonam	Ciprofloxacin	Imipenem/Meropenem***	Amoxicillin/clavulanate**	Ampicillin	Ampicillin/sulbactam	Piperacillin/tazobactam	Nitrofurantoin**	Trimethoprim/sulfamethox.
MIC Breakpoints (mcg/ml)		≤16	≤4	≤4	≤4†	≤8	≤1	≤8‡	≤8	≤0.5	≤2§	≤8/4	≤8	≤8/4	≤16	≤32	≤2/38
Acinetobacter spp.	30	93	93	97	-	-	-	60	-	-	80	-	-	87	-	-	93
*Citrobacter freundii**	25	100	84	84	-	-	-	92	48	-	88	-	-	-	64	84	68
*Enterobacter cloacae**	101	99	99	98	-	-	-	90	73	-	93	-	-	-	77	33	94
Escherichia coli	987	99	92	90	80	84	89	90	90	-	99	75	51	56	88	97	77
*Klebsiella aerogenes**	44	100	100	100	-	-	-	100	89	-	89	-	-	-	80	12	100
Klebsiella oxytoca	86	100	99	95	31	83	93	97	94	-	99	89	-	64	92	93	90
Klebsiella pneumoniae	348	99	94	93	86	-	91	92	92	-	99	90	-	78	89	50	86
Morganella morganii	39	100	90	97	-	-	72	92	87	-	-	-	-	-	97	-	72
Proteus mirabilis	244	98	94	95	88	93	95	95	95	-	99	-	85	89	96	-	84
Pseudomonas aeruginosa	221	96	81	98	-	-	-	89	84	82Δ	91	-	-	-	90	-	-
Serratia marcescens	49	100	98	92	-	-	-	100	84	-	94	-	-	-	78	-	96
Steonotrophomonas (X.) maltophila	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100

Only organisms with 25 or more isolates included for statistical significance and to minimize skewed results

* cephalosporins (except cefepime) not advocated as first-line agents

(-) Drug not tested or drug not indicated

**Amoxicillin/clavulanate and nitrofurantoin urine isolates only tested. Tetracycline not consistently tested; may not represent population therefore not reported.

*** Isolates from urine tested against imipenem only. All other isolates tested against meropenem. Isolates not tested against both antibiotics.

† Cefazolin systemic MIC breakpoint of ≤4 utilized based on optimal dosing inpatient for non-urine isolates. Due to increased urinary concentrations cefazolin MIC breakpoint for UTIs is ≤16 and susceptibility may be higher

‡ Cefepime MIC breakpoint for *Gram negative pathogens is ≤8 due to optimal dosing for inpatients.*

§ Imipenem/Meropenem MIC breakpoint for *Pseudomonas aeruginosa* is ≤2 and for Enterobacterales is ≤1

ΔNon-urine *Pseudomonas aeruginosa* isolates tested utilizing approved MIC breakpoint of ≤0.5 for ciprofloxacin indicates 81% susceptible (130 isolates).

All the data is derived by including only patient's first isolate of each organism per hospital stay.

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GRAM POSITIVE ISOLATES	# Isolates	Ampicillin	Clindamycin	Daptomycin (≤2)	Daptomycin (≤4) SDD	Erythromycin	Gentamicin	Gentamicin Synergy	Linezolid	Nafcillin/oxacillin	Nitrofurantoin	Rifampin	Tetracycline	Trim/sulfa	Vancomycin
Enterococcus faecalis	312	100	-	99	100	-	-	74	100	-	100	44	24	-	96
Enterococcus faecium	92	14	-	36	100	-	-	78	98	-	40	17	11	-	36
Total Enterococcal isolates	438	81	-	87	100	-	-	77	99	-	86	40	22	-	84
Methicillin susceptible S. aureus	232	-	96	100	-	74	100	-	100	100	100	99	93	99	100
Methicillin resistant S. aureus	167	-	76	100	-	14	98	-	100	0	100	99	82	92	100*
Total Staphylococcus aureus	399	-	88	100	-	49	99	-	100	59	100	99	88	96	100
Staphylococcus coagulase-neg.	108	-	74	100	-	47	89	-	100	61	100	99	73	82	100
Staphylococcus epidermidis	200	-	61	100	-	26	75	-	100	24	100	100	78	56	100

* Vancomycin: susceptibility 97% with MIC≤1

A. Serious enterococcal infections usually require combination therapy with ampicillin + gentamicin or vancomycin + gentamicin if susceptible. infections.
Gentamicin or Streptomycin should only be used with a cell wall active antibiotic when treating serious enterococcal infections

B. Some antibiotics only tested for certain isolates: Nitrofurantoin (urine), daptomycin (non-respiratory), linezolid and rifampin (non-urine)

C. Only a portion of enterococcal isolates were tested for linezolid, nitrofurantoin, and gentamicin.

D. Daptomycin breakpoint for *Enterococcus spp.* is ≤2; increased daptomycin (8-12 mg/kg) doses in serious infections may cover MIC of >2 Susceptible Dose Dependent (SDD: susceptibility 100%).

SUPPLEMENTAL DATA	# Isolates	Ceftriaxone	Moxifloxacin	Penicillin G	Vancomycin	Azithromycin	Doxycycline
*Streptococcus pneumoniae**	27						
Meningitis - Susceptible		93	-	81	-	*	*
Meningitis - Intermediate		4	-	0	-	*	*
Meningitis - Resistant		4	-	9	-	*	*
Nonmeningitis - Susceptible		96	100	96	100	65	85
Nonmeningitis - Intermediate		4	0	4	0	0	0
Nonmeningitis - Resistant		0	0	0	0	35	15

SUPPLEMENTAL DATA	# Isolates	Ceftriaxone	Penicillin G	Vancomycin	Azithromycin
Streptococcus viridans	75				
Susceptible		96	64	99	59
Intermediate		4	35	0	9
Resistant		0	1	1	32

A. *S. pneumonia* penicillin MIC breakpoints (indicative for treating meningitis) are S MIC≤0.06mcg/ml, R MIC≥ 0.12mcg/ml
All other systemic infections (nonmeningitis) penicillin breakpoints are S MIC ≤2mcg/ml, I MIC=4mcg/ml, R MIC ≥8 mcg/ml

B. *S. pneumonia* MIC breakpoints for ceftriaxone/cefotaxime reported for meningitis (S MIC≤0.5mcg/ml, I MIC = 1mcg/ml, R MIC≥2mcg/ml) and nonmeningitis (S MIC≤1mcg/ml, I MIC= 2mcg/ml, R MIC≥4mcg/ml) types of infections are reported according to CLSI guidelines.

C. Meningitis requires treatment with maximum doses of ceftriaxone or cefotaxime (+/- high dose vancomycin)

D. *S. pneumoniae* sterile site isolates (23 isolates) had high level resistance to neither PCN, ceftriaxone, moxifloxacin, or vancomcyin

E. Ampicillin/Sulbactam (or ceftiraxone) **plus** doxycycline (or a macrolide) are considered **first-line** empiric therapy for community acquired pneumonia
Fluoroquinolones should be considered **second-line** therapy for pneumonia and are **NOT** suitable for meningitis

(-) Drug not tested or drug not indicated

Pseudomonas aeruginosa Combination Therapy

(% isolates susceptible to second agent if primary antibiotic is intermediate/resistant)

Secondary Agent	Ciprofloxacin	Tobramycin§	Gentamicin§
Pip/Tazo Resistant	81%	95%	59%
Cefepime Resistant	72%	96%	58%
Meropenem Resistant	58%	94%	78%

§ Tobramycin/Gentamicin MIC breakpoint for Pseudomonas aeruginosa is ≤2

CANDIDEMIA (single patient isolates from blood only)

Candida species	Number of patients [11]
C. glabrata	6
C. tropicalis	3
C. parapsilosis	1
C. lusitaniae	1

*Urine Isolates

Total # of isolates: 1752

E. Coli (728) K. pneumoniae (230) E. faecalis (154) P. mirabilis (149) P. aeruginosa (103) K. oxytoca (46) E.cloacae (45) E. faecium (44) K. aerogenes (28) C. freundii (19) M. morganii (15)

Ampicillin	45%
Ampicillin + Gentamicin	94%
Ampicillin + Tobramycin	94%
Cefazolin**	57%
Cefazolin** + Gentamicin	83%
Cefazolin** + Tobramycin	83%
Ceftriaxone	68%
Ciprofloxacin***	2%
Gentamicin	81%
Piperacillin/tazobactam	90%
Pip/tazo + Gentamicin	97%
Pip/tazo + Tobramycin	96%
Tobramycin	81%

*Top 89% (1561) of all urine isolates represented in above table
**Above cefazolin susceptibilities based on systemic breakpoint, but urinary susceptibilities may be higher
***The 2022 MicroScan susceptibility panels were only able to detect ciprofloxacin MICs of 0.5 mcg/mL for non-urine samples and 1 mcg/mL for urine samples. They were not able detect ciprofloxacin's breakpoint for Enterobacterales (≤0.25 mcg/mL) without use of an E-test. Ciprofloxacin use is not recommended given susceptibility cannot be readily determined and given better oral options are available

Empiric Antimicrobial Recommendation

Type of Infection		Antibiotics	Duration of Therapy (Dependent on Clinical Response)
CAP (inpatient)	1st Line	ampicillin/sulbactam + doxycycline	5 days
CAP (outpatient)	1st Line	doxycycline **OR** amoxicillin + doxycycline	5 days
CAP with PSA risk (inpatient)	1st Line	piperacillin/tazobactam + tobramycin + doxycycline +/- vancomycin	5-7 days
UTI (inpatient)*	1st Line	ampicillin + gentamicin	3-5 days
	2nd Line	PCN allergy: gentamicin	3-5 days
UTI (VRE)	1st Line	amoxicillin OR nitrofurantoin	5 days
	2nd Line	fosfomycin	1 day
UTI (outpatient)	1st Line	nitrofurantoin OR amoxicillin/clavulanate	5 days
	2nd Line	cephalexin	5 days
Intra-abdominal (community)	1st Line	cefazolin + metronidazole	4-7 days with adequate source control
	2nd Line	ampicillin/sulbactam + gentamicin	4-7 days with adequate source control
Intra-abdominal (outpatient)	1st Line	amoxicillin/clavulanate	4-7 days with adequate source control
	2nd Line	cephalexin + metronidazole	4-7 days with adequate source control
SSTI (inpatient)	1st Line	cefazolin + vancomycin	5-7 days
	2nd Line	ampicillin/sulbactam + vancomycin	5-7 days
SSTI (outpatient)	1st Line	cephalexin ± SMP/TMX	5-7 days
	2nd Line	doxycycline or minocycline	5-7 days

CAP: community-acquired pneumonia, PCN: penicillin, PSA: *Pseudomonas aeruginosa*,
SSTI: skin/soft tissue infection, UTI: urinary tract infection, VRE: vancomycin-resistant *Enterococcus*

*Oxychlorosene (Clorpactin) has activity against all microbes and may be used as empiric or targeted therapy in patients with urinary catheters

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ORAL

Penicillins	acq. cost/dose
Penicillin VK 500mg	$0.09
Penicillin VK 250mg/5ml	$0.32
Amoxicillin 500mg, 875mg	$0.08/ $0.16
Amoxicillin 250mg/5ml	$0.09
Amox/clav 500mg	$0.25
Amox/clav 875mg	$0.42
Amox/clav 250mg/5ml	$2.97
Amox/clav 600mg/5ml	$0.47
Amox/clav XR 1000 / 62.5mg	$4.21
Cephalosporins	
Cephalexin 500mg	$0.25
Cephalexin 250mg/5ml	$0.54
Cefuroxime 250mg	$0.40
Cefuroxime 500mg	$0.59
Cefpodoxime 200mg	$3.40
Cefdinir 300mg	$0.44
Cefdinir 125mg/5ml	$0.74
Antifungals	
Clotrimazole 10mg	$0.38
Fluconazole 100mg	$1.12
Fluconazole 200mg	$1.64
Fluconazole 400mg	$3.28
Flucytosine 500mg	$22.93
Isavuconazole 372mg	$178.93
Itraconazole 100mg cap	$1.44
Itraconazole soln. 10mg/ml	100mg=$10.34
Nystatin 100MU/ml	5ml=$0.29
Posaconazole 200mg susp	$64.35
Posaconazole 300mg tab	$106.26
Voriconazole 200mg	$18.77

Quinolones	acq. cost/dose
Ciprofloxacin 500mg	$0.10
Ciprofloxacin 750mg	$0.17
Moxifloxacin 400mg	$1.32
Miscellaneous	
Azithromycin 500mg	$2.42
Azithromycin 200mg/5ml	$1.98
Clarithromycin ER 500mg	$5.91
Clarithromycin 500mg	$2.19
Clarithromycin 250mg/5ml	$7.11
Erythromycin 250mg	$7.10
Erythromycin 200mg/5ml	$6.24
Minocycline 100mg	$0.83
Doxycycline 100mg	$0.28
Clindamycin 150mg	$0.19
Metronidazole 500mg	$0.24
Acyclovir 400mg	$0.22
Acyclovir 800mg	$0.60
Valacyclovir 500mg	$0.21
Valacyclovir 1g	$0.56
Valganciclovir 450mg	$25.31
Trimethoprim/Sulfa DS (160/800mg)	$0.14
Trimethoprim/Sulfa 40-200mg/5ml	$0.50
Rifampin 300mg	$0.57
Linezolid 600mg	$1.94
Nitrofurantoin 100mg	$2.42
Fosfomycin 3g	$75.39
Oxychlorosene (Clorpactin) 2g	$5.46
Vancomycin cap 125 mg	$2.08
Vanc (Firvanq) 125 mg oral susp	$2.00

INTRAVENOUS

Penicillins	acq. cost/dose
Penicillin G 10 MU	$15.42
Ampicillin 1g	$1.07
Ampicillin 2g	$1.78
Nafcillin 2 g	$6.81
Oxacillin 2g	$8.54
Ampicillin/Sulbactam 1.5g	$1.11
Ampicillin/Sulbactam 3.0g	$2.07
Piperacillin/Tazobactam 2.25g	$1.69
Piperacillin/Tazobactam 3.375g	$2.10
Piperacillin/Tazobactam 4.5g	$2.88
Piperacillin/Tazobactam 6.75g	$4.20
Cephalosporins	
Cefazolin 1g	$0.82
Cefazolin 2g	$9.68
Cefuroxime 750 mg	$2.47
Cefuroxime 1.5g	$4.94
Ceftriaxone 1g	$0.74
Ceftaroline 600mg	$194.85
Cefepime 1g	$2.41
Ceftazidime/avibactam 2.5g	$358.63
Ceftolozane/tazobactam 1.5g	$112.84
Cefiderocol 1g	$172.10
Antifungals	
Amphotericin B 200mg	$35.63
Amphotericin B Liposomal 200mg	$238.20
Micafungin 100mg	$47.40
Fluconazole 200mg	$3.75
Fluconazole 400mg	$4.13
Voriconazole 200mg	$22.18
Posaconazole 300mg	$398.35
Isavuconazole 372mg	$304.47

Aminoglycosides	acq. cost/dose
Amikacin 1g	$7.94
Gentamicin 80mg	$0.78
Gentamicin 480mg	$4.68
Tobramycin 80mg	$0.71
Tobramycin 480mg	$4.28
Quinolones	
Ciprofloxacin 400mg	$2.14
Moxifloxacin 400mg	$31.45
Miscellaneous	
Azithromycin 500mg	$3.29
Erythromycin 500mg	$73.16
Doxycycline 100mg	$15.65
Eravacycline 100mg	$98.00
Minocycline 100mg	$181.65
Tigecycline 100mg	$71.79
Clindamycin 900mg	$1.90
Metronidazole 500mg	$1.09
Acyclovir 500mg	$2.12
Ganciclovir 500mg	$56.32
Foscarnet 6g	$38.52
Pentamidine 300mg	$106.08
Aztreonam 1g	$26.95
Meropenem 500mg	$2.03
Meropenem/vaborbactam 4g	$147.21
Imipenem 500mg	$10.03
Imipenem/relebactam 1.25g	$250.73
Trimethoprim/Sulfa 160/800mg	$7.55
Daptomycin 500mg	$45.53
Linezolid 600mg	$15.77
Rifampin 600mg	$69.92
Quinupristin/dalfopristin 500mg	$328.07
Telavancin 750mg	$479.49
Dalbavancin 1000mg	$3,055.20
Oritavancin 1200mg (outpt ONLY)	$2,768.63
Vancomycin 1g	$1.94