

Zuckerberg San Francisco General Hospital and Trauma Center

Clinical Laboratory Microbiology

Community Health Network

ANTIMICROBIAL SUSCEPTIBILITY STUDIES

(excluding Laguna Honda Hospital)

January - December 2019

also available online

<https://idmp.ucsf.edu/antimicrobial-susceptibility-san-francisco-general-hospital>

Report Prepared by:

Wendy Cheung, MLS (ASCP)^{cm}

Phong D. Pham, MLS (ASCP)^{cm}

Barbara L. Haller, M.D., Ph.D

Jeffrey Whitman, M.D.

Camille Beauduy, Pharm.D.

Lisa Winston, M.D.

For Questions Contact:

Microbiology Resident

415-443-1438 (Pager)

Jeffrey Whitman, M.D.

Chief, Microbiology Division

628-206-3595

URINE ISOLATES

JANUARY - DECEMBER 2019

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Urine Isolates	# Tested	AMP	PIPTZ	CZOL	CTAZ	CTRX	CFPM	GENT	TOB	TMSX	CIPR	LEVO	NITRO	ETP
Citrobacter freundii	15	R	100	R	60	60	93	93	93	73	87	100	100	100
Citrobacter koseri	28	R	100	96	100	100	100	100	100	100	100	100	100	100
Enterobacter cloacae	32	R	91	R	84	78	97	100	94	78	88	94	71	94
Escherichia coli	1491	47	98	88^	91	90	91	90	90	66	81	82	98	99
ESBL	154		96					69	57	34	29	31	90	99
Non ESBL	1353	52	98	97^	99	99	99	93	93	69	87	87	99	100
Klebsiella aerogenes	23	R	91	R	87	87	100	100	100	100	100	100	48	100
Klebsiella oxytoca	26	R	100	8	100	100	100	100	100	92	100	100	96	100
Klebsiella pneumoniae	205	R	96	92^	93	93	93	96	93	87	93	97	52	99
Morganella morganii	17	R	100	R	77	77	100	88	100	82	82	88	R	100
Proteus mirabilis	146	82	100	95^	99	97	97	91	92	83	88	88	R	99

Non-Enteric Urine Isolates	# Tested	PIPTZ	CTAZ	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	4		100	100	100	75	100	100	100	100
Pseudomonas aeruginosa	43	86	91	84	86	100		88	84	93
Stenotrophomonas maltophilia	3		67				100		100	

Gram Positive Urine Isolates	# Tested	AMP	AMCL	NAF	CZOL	CTRX	TMSX	TET	LEVO
Staphylococcus aureus	75	20 #	67	67	67	67	100	93	69
Staphylococcus, coagulase negative	30	20	60	60	60	60	67	83	60
Staphylococcus saprophyticus	Uncomplicated UTIs respond to achievable urine levels of 1st generation Cephalosporins, Nitrofurantoin, Trimeth/ Sulfa, or Fluoroquinolones								

* First isolate per patient for the organism. Statistical validity of % susceptible is decreased if fewer than 30 isolates are tested.

^ Percent susceptible if UTI is uncomplicated.

Percent susceptible determined by MIC and rapid beta-lactamase test only.

Mycobacterium Tuberculosis Complex	
Antimicrobial (mcg/ml)	% Susceptible
Ethambutol 5	100
Isoniazid 0.1	88
Pyrazinamide 100	94
Rifampin 1	100
Streptomycin 1	100

Seventeen isolates (14 respiratory specimens, 3 non respiratory) were tested by San Francisco Department of Public Health Health

NOTES:

- Many strains of *Enterobacter* and *Citrobacter* produce inducible penicillinases and cephalosporinases. Cephalosporins on the ZSFG formulary other than cefepime should be used with caution when treating infections by these bacteria.
- Escherichia coli*, *Klebsiella pneumoniae*, *K. oxytoca* and *Proteus mirabilis* are routinely screened for extended spectrum beta-lactamases (ESBL). 10% of isolates tested in 2019 were confirmed ESBL producers [189 patients].
- Campylobacter jejuni/coli* group enteric infections are usually treated with fluoroquinolones or macrolides. Strains resistant to these antimicrobials have been isolated at ZFGH. *Shigella sonnei* strains resistant to ciprofloxacin have been recovered at ZSFG.
- Rapid beta-lactamase (penicillinase) tests, which indicate PCN and AMP resistance when positive, are performed on *Haemophilus influenzae*, *Moraxella catarrhalis* and *Neisseria gonorrhoeae*. PCN and/or AMP results in table are based upon this beta-lactamase test. Other resistance mechanisms may exist.
- Streptococcus pneumoniae* isolates recovered from Blood and CSF are tested by MIC method for Penicillin (PCN), 3rd generation cephalosporin and vancomycin susceptibility. All other isolates are screened for PCN, erythromycin and tetracycline susceptibility by a disk test. This PCN screening test cannot distinguish between intermediate resistance and full resistance. A statement is added to the report noting that the isolate may be resistant. PCN susceptible strains are also susceptible to cephalosporins active against *S. pneumoniae*. Confirmatory PCN and other antimicrobial MIC's are done automatically on isolates that screen positive for resistance by disk test. For non-meningeal infections, a PCN MIC of 4 mcg/mL is intermediate and ≥ 8 mcg/mL is interpreted as resistant.

Penicillin (parenteral)	MIC Interpretation (mcg/mL)		
	Susceptible	Intermediate	Resistant
Nonmeningitis	≤ 2	4	≥ 8
Meningitis	≤ 0.06	--	≥ 0.12

- Enterococci isolated from all sites are screened for vancomycin and ampicillin resistance.

Incidence of Vancomycin and Ampicillin Resistance

Antimicrobial	No. isolates tested	No. resistant isolates	No. of patients with resistant Enterococci (Total No. Patients: 367)
Vancomycin	481	37 ^ (8%)	29 (8%)
Ampicillin	481	35 ^^ (7%)	27 (7%)

^ 23 urines, 4 bloods, 1 abscess, 8 tissues/bones, 1 tracheal aspirate

^^ 20 urines, 5 bloods, 5 wounds/abscesses/aspirates, 4 tissues/bones, 1 tracheal aspirate

**AEROBIC ISOLATES NON-URINE SOURCES
JANUARY THROUGH DECEMBER 2019**

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Isolates	# Tested	AMP	PIPTZ	CZOL	CTAZ	CTRX	CFPM	GENT	TOB	TMSX	CIPR	LEVO	ETP
Citrobacter freundii	10	R	90	R	80	80	100	100	100	80	90	100	100
Citrobacter koseri	12	R	100	100	100	100	100	100	100	100	100	100	100
Enterobacter cloacae	63	R	94	R	92	81	97	98	97	84	92	95	98
Escherichia coli	195	50	98	63	88	86	87	87	88	61	77	79	99
ESBL	26		96					58	58	23	27	31	96
non ESBL	169	58	98	73	99	99	100	92	92	66	85	86	100
Klebsiella aerogenes	25	R	100	R	100	96	100	100	100	100	100	100	100
Klebsiella oxytoca	27	R	100	19	100	100	100	100	100	96	100	100	100
Klebsiella pneumoniae	122	R	99	95	99	99	100	100	100	90	98	99	100
Morganella morganii	26	R	100	R	69	85	96	92	89	81	81	81	100
Proteus mirabilis	89	87	98	71	99	99	99	97	97	90	93	93	99
Proteus vulgaris	20	R	100	R	100	65	100	100	100	90	95	95	100
Salmonella sp.	8	75		R		75				88	75	88	
Serratia marcescens	39	R	85	R	85	72	97	100	87	100	100	100	97
Shigella flexneri	15	33		R						13	87	87	
Shigella sonnei	37	43		R						3	60	62	



Gram Positive Isolates & Miscellaneous	# Tested	PCN	AMP	AMCL	NAF	CZOL	CTRX	ERYT	CLIN	TET	VAN	GENT	TOB	TMSX	LEVO
Staphylococcus aureus	795	19 #	19 #	66	66	66	66	48	75^	91	100			99	71
- Methicillin Resistant	279	0	0	0	0	0	0	12	65^	89	100			98	37
- Methicillin Susceptible	525	28 #	28 #	100	100	100	100	67	80^	91	100			99	89
Staphylococcus lugdunensis	22	59	64	100	100	100	100	96	96^	96	100			100	100
Staphylococcus, Coagulase Negative	340	21	49	92	59	59	57	43	60	78	100			74	76
Staphylococci resistant to Nafcillin (Oxacillin) are resistant to PCN, AMP, AMCL, PIPTZ, Cephems (CZOL, CTAX, CTRX, CFPM), & Carbapenems.															
Streptococcus pyogenes, Group A	41	100			S		100	51	51^		100	R	R		
Streptococcus agalactiae, Group B	31	100					100	61	68^		100	R	R		
Streptococcus pneumoniae	59	100					100	83	88	85	100	R	R	83	
Haemophilus influenzae	73		73	S		R	S	R				R	R	S	S
Moraxella catarrhalis	5	R	0	S		R	S					S	S	S	S

* First isolate per patient for the organism. Statistical validity of % susceptible is decreased if fewer than 30 isolates are tested.

^ Clindamycin results determined by two tests (MIC and inducible Clindamycin resistance test).

Percent susceptible determined by MIC and rapid beta-lactamase test. Additional penicillin zone edge test performed on sterile sites only.

Non Enteric Isolates	# Tested	PIPTZ	CTAZ	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	10		100	90	100	100	90	100	100	100
Acinetobacter lwoffii	4		75	75	100	100	100	100	100	100
Pseudomonas aeruginosa	78	90	92	90	90	97		90	89	89
Stenotrophomonas maltophilia	21		24				95		100	

Abbrev	Antimicrobial	Cost / Day	Std. Adult Regimen
AMCL	Amoxicillin / clavulanate	\$0.90	875 mg Q 12 hr PO
AMOX	Amoxicillin	\$0.24	500 mg Q 8 hr PO
AMP	Ampicillin	\$14.16	2 gm Q 4 hr IV
AMSL	Ampicillin / sulbactam	\$11.68	3 gm Q 6 hr IV
AZTH	Azithromycin	\$2.11	500 mg Q 24 hr IV
AZTR	Aztreonam	\$163.68	2 gm Q 8 hr IV
CZOL	Cefazolin	\$36.03	2 gm Q 8 hr IV
CFPM	Cefepime	\$16.32	2 gm Q 8 hr IV
CFTAR	Ceftaroline	\$569.22	600 mg Q 8 hr IV
CTRX	Ceftriaxone	\$1.06	1 gm Q 24 hr IV
CIPR	Ciprofloxacin	\$0.34	500 mg Q 12 hr PO
CIPR	Ciprofloxacin	\$5.24	400 mg Q 12 hr IV
CLIN	Clindamycin	\$33.51	600 mg Q 8 hr IV
CLIN	Clindamycin	\$4.12	300 mg Q 6 hr PO
DAPTO	Daptomycin	\$39.51	500 mg Q 24 hr IV
DOXY	Doxycycline	\$3.08	100 mg Q 12 hr PO
ETP	Ertapenem	\$76.51	1 gm Q 24 hr IV
GENT	Gentamicin	\$3.06	80 mg Q 8 hr IV
LEVO	Levofloxacin	\$0.39	750 mg Q 24 hr PO
LEVO	Levofloxacin	\$3.14	750 mg Q 24 hr IV
LZLD	Linezolid	\$6.72	600 mg Q 12 hr PO
LZLD	Linezolid	\$33.48	600 mg Q12 hr IV
MERO	Meropenem	\$16.86	1 gm Q 8 hr IV
METR	Metronidazole	\$1.77	500 mg Q 8 hr PO
NAF	Nafcillin	\$41.76	2 gm Q 4 hr IV
NITRO	Nitrofurantoin	\$4.66	100mg Q 12 hr PO
PCN	Penicillin G Potassium	\$30.52	3 MU Q 4 hr IV
PCN	Penicillin G Sodium	\$148.88	3 MU Q 4 hr IV
PIPTZ	Piperacillin / tazobactam	\$16.80	4.5 gm Q 6 hr IV
TMSX	Trimethoprim/sulfa	\$0.32	160 mg TMP Q 12 hr PO
TMSX	Trimethoprim/sulfa	\$85.60	320 mg TMP Q 12 hr IV
VAN	Vancomycin	\$3.96	1 gm Q 12 hr IV

Note: This table is intended to compare inpatient cost of commonly used antimicrobials. Many dosing regimens vary by indication.

Abbrev	Interpretation
S	Susceptible
I	Intermediate
R	Resistant

ANAEROBIC BACTERIA

Routine antimicrobial susceptibility testing is not performed because empirical therapy and appropriate surgical treatment are usually sufficient, and because infections are frequently due to multiple bacteria, not all of which may be cultured. In special circumstances, e.g., brain abscess, endocarditis, joint infection, recurrent bacteremia, testing is available upon approval by the Microbiology Resident (pager: 415 443-1438).

Beta-lactamase tests are performed on Gram-negative anaerobic bacteria, e.g., Bacteroides and Fusobacteria..

