

**Zuckerberg San Francisco General
Hospital and Trauma Center**

**Clinical Laboratory
Microbiology**

Community Health Network

**ANTIMICROBIAL
SUSCEPTIBILITY STUDIES**

(excluding Laguna Honda Hospital)

January - December 2016

also available online

<http://labmed.ucsf.edu/sfghlab/test/MicrobiologyProcedures.html>

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**URINE ISOLATES
JANUARY - DECEMBER 2016**

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	18	R	89	R	83	67	100	94	94	78	94	94	100	94
Citrobacter koseri	19	R	100	95	100	100	100	100	100	100	95	100	100	100
Enterobacter aerogenes	22	R	96	R	91	86	100	100	100	100	100	100	41	100
Enterobacter cloacae	24	R	88	R	88	79	96	96	96	88	100	100	83	92
Escherichia coli	1372	49	97	89 [^]	94	91	92	91	90	67	79	80	99	99
- ESBL	124		96					66	50	38	18	20	96	99
- Non ESBL	1266	54	97	96	99	99	99	93	94	70	84	85	99	100
Klebsiella oxytoca	21	5	100	10	95	91	95	95	95	91	100	100	100	100
Klebsiella pneumoniae	159	R	99	94 [^]	98	94	96	98	98	91	93	94	59	99
Morganella morganii	10	R	100	R	90	90	100	90	100	80	80	90	R	100
Proteus mirabilis	143	90	100	99 [^]	99	99	100	95	96	89	92	93	R	100

Non-Enteric Urine Isolates	# Tested	PIPTZ	CTAZ	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	3		100	100	100	100	67	100	100	100
Pseudomonas aeruginosa	48	90	92	85	79	94		75	75	83
Stenotrophomonas maltophilia	6		50				100		83	

Gram Positive Urine Isolates	# Tested	AMP	AMCL	NAF	CZOL	CTRX	TMSX	TET	LEVO
Staphylococcus aureus	82	12	69	69	69	69	98	87	63
Staphylococcus, Coagulase Negative	21	19	52	52	52	52	62	76	76
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.**

Mycobacterium Tuberculosis Complex	
Antimicrobial (mcg/mL)	% Susceptible
Ethambutol	5 100
Isoniazid	0.1 92
Pyrazinamide	100 92
Rifampin	1 100
Streptomycin	1 92

**Thirteen isolates were tested by
San Francisco Department
of Public Health**

NOTES:

- Many strains of *Enterobacter*, *Citrobacter* and *Serratia* produce inducible cephalosporinases. Cephalosporins on the ZSFG formulary other than cefepime should be used with caution when treating infections caused 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 are confirmed ESBL producers [159 patients].
- Campylobacter jejuni/coli* group enteric infections are usually treated with fluoroquinolones or macrolides. Strains resistant to these antimicrobials have been isolated at ZSFG. *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: 365)
Vancomycin	497	71 [^] (14%)	44 (12%)
Ampicillin	497	84 ^{^^} (17%)	55 (15%)

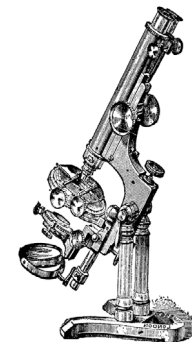
[^] 30 urines, 11 bloods, 6 wounds, 23 (tissue, fluids), 1 other (respiratory)

^{^^} 31 urines, 12 bloods, 11 (wounds, abscess), 29 (tissue, bones, fluids), 1 other (respiratory)

**AEROBIC ISOLATES NON-URINE SOURCES
JANUARY THROUGH DECEMBER 2016**

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Isolates	# Tested	AMP	PIPTZ	CZOL	CTAZ	CTRX	CFPM	GENT	TOB	TMSX	CIPR	LEVO	ETP
Citrobacter freundii	14	R	100	R	100	93	100	100	100	93	93	100	100
Enterobacter aerogenes	18	R	94	R	94	78	94	94	100	100	100	100	100
Enterobacter cloacae	58	R	91	R	88	76	95	95	95	85	91	98	93
Escherichia coli	169	41	96	63	89	85	87	88	86	60	76	77	99
- ESBL	26		85					58	46	35	8	12	96
- Non ESBL	144	48	98	74	100	100	100	93	92	64	88	88	100
Klebsiella oxytoca	33	3	100	21	97	97	97	97	97	88	94	97	100
Klebsiella pneumoniae	89	R	98	89	98	98	98	96	96	89	96	97	99
Proteus mirabilis	67	81	100	72	94	93	97	91	94	78	88	91	100
Salmonella sp.	10	100		R	R	100				100	100	100	
Serratia marcescens	24	R	83	R	75	79	100	100	96	100	100	100	100
Shigella flexneri	24	46		R	R					4	96	96	
Shigella sonnei	4	50		R	R					0	75	75	



Gram Positive Isolates & Miscellaneous	# Tested	PCN	AMP	AMCL	NAF	CZOL	CTRX	ERYT	CLIN	TET	VAN	GENT	TOB	TMSX	LEVO	
Staphylococcus aureus	783	15	15	61	61	61	61	47	79^	92	100			98	70	
- Methicillin Resistant	309	0	0	0	0	0	0	11	64^	93	100			97	37	
- Methicillin Susceptible	484	24	24	100	100	100	100	71	88^	91	100			99	90	
Staphylococcus lugdunensis	38	61	61	95	95	95	95	92	92^	90	100			100	100	
Staphylococcus, Coagulase Negative	306	22	22	59	59	59	59	36	58^	82	100			75	76	
Staphylococci resistant to Nafcillin are resistant to PCN, AMP, AMCL, PIPTZ, Cephems (CZOL, CTAZ, CTRX, CFPM), & Carbapenems.																
Streptococcus pyogenes, Group A	45	100			S		100	91	93^		100	R	R			
Streptococcus agalactiae, Group B	29	100					100	48	59^		100	R	R			
Streptococcus pneumoniae (See Note # 5)	70/50	99					100	77	80^	79	100	R	R	60		
70 isolates tested against PCN, ERYT and TET. 50 isolates were tested against the other antimicrobials.																
Haemophilus influenzae (See Note # 4)	73		86	S		R	S	R				R	R	S	S	
Moraxella catarrhalis (See Note # 4)	7	R	14	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).

Non Enteric Isolates	# Tested	PIPTZ	CTAZ	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	14		93	93	93	93	86	93	93	86
Acinetobacter lwoffii	5		80	100	100	100	100	100	100	100
Pseudomonas aeruginosa	80	89	91	89	88	100		86	81	89
Stenotrophomonas maltophilia	21		33				100		91	

Abbrev	Antimicrobial	Cost / Day	Std. Adult Regimen
AMCL	Amoxicillin / clavulanate	\$2.00	875 mg Q 12 hr PO
AMOX	Amoxicillin	\$0.24	500 mg Q 8 hr PO
AMP	Ampicillin	\$11.04	2 gm Q 6 hr IV
AMSL	Ampicillin / sulbactam	\$10.84	3 gm Q 6 hr IV
AZTH	Azithromycin	\$2.11	500 mg Q 24 hr IV
AZTR	Aztreonam	\$163.77	2 gm Q 8 hr IV
CZOL	Cefazolin	\$20.61	2 gm Q 8 hr IV
CFPM	Cefepime	\$25.02	2 gm Q 8 hr IV
CFTAR	Ceftaroline	\$301.62	600 mg Q 12 hr IV
CTRX	Ceftriaxone	\$1.38	1 gm Q 24 hr IV
CIPR	Ciprofloxacin	\$0.34	500 mg Q 12 hr PO
CIPR	Ciprofloxacin	\$5.38	400 mg Q 12 hr IV
CLIN	Clindamycin	\$34.20	600 mg Q 8 hr IV
CLIN	Clindamycin	\$3.48	300 mg Q 6 hr PO
DAPTO	Daptomycin	\$211.77	500 mg Q 24 hr IV
DOXY	Doxycycline	\$4.84	100 mg Q 12 hr PO
ETP	Ertapenem	\$110.19	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	\$2.30	750 mg Q 24 hr IV
LZLD	Linezolid	\$5.52	600 mg Q 12 hr PO
LZLD	Linezolid	\$56.76	600 mg Q 12 hr IV
MERO	Meropenem	\$33.48	1 gm Q 8 hr IV
METR	Metronidazole	\$1.92	500 mg Q 8 hr PO
NAF	Nafcillin	\$46.56	2 gm Q 4 hr IV
NITRO	Nitrofurantoin	\$5.28	100 mg Q 12 hr PO
PCN	Penicillin	\$47.61	3 MU Q 4 hr IV
PIPTZ	Piperacillin / tazobactam	\$30.12	4.5 gm Q 6 hr IV
TMSX	Trimethoprim / sulfa	\$0.34	160 mg TMP Q 12 hr PO
TMSX	Trimethoprim / sulfa	\$224.26	320 mg TMP Q 12 hr IV
TOB	Tobramycin	\$9.51	80 mg Q 8 hr IV
VAN	Vancomycin	\$9.52	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.