

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

**Clinical Laboratory
Microbiology**

Community Health Network

**ANTIMICROBIAL
SUSCEPTIBILITY STUDIES**
(excluding Laguna Honda Hospital)

January - December 2015

also available online

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

Report Prepared by:

Mary Ann Lin, PHM, CLS, M(ASCP)^{cm}

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

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

Camille Beauduy, Pharm.D.

Lisa Winston, M.D.

For Questions Contact:

Microbiology Resident

415-443-1438 (Pager)

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

Chief, Microbiology Division

415-206-3595

**URINE ISOLATES
JANUARY - DECEMBER 2015**

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	16	R	94	R	81	75	94	88	88	88	88	88	100	100
Citrobacter koseri	13	R	100	92	100	100	100	100	100	92	100	100	100	100
Enterobacter aerogenes	28	R	100	R	100	100	100	100	100	100	96	96	54	100
Enterobacter cloacae	26	R	96	R	92	77	100	100	96	89	96	96	89	100
Escherichia coli	1349	51	98	91	95	93	95	91	90	68	82	82	99	100
- ESBL	89		97					66	52	23	23	25	98	100
- Non ESBL	1275	55	98	97	99	99	100	92	93	71	85	86	99	100
Klebsiella oxytoca	14	7	86	7	100	86	93	100	100	79	93	100	100	100
Klebsiella pneumoniae	162	R	97	98	99	99	99	99	99	90	98	99	63	100
Morgonella morganii	10	R	90	R	80	80	90	100	100	100	100	100	R	90
Proteus mirabilis	128	88	100	98	100	100	100	89	90	85	94	95	R	99

Non-Enteric Urine Isolates	# Tested	PIPTZ^	CTAZ^	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	1		100	100	100	100	100	100	100	100
Pseudomonas aeruginosa	45	91	89	89	84	100		80	78	84
Stenotrophomonas maltophilia	4		25				100		50	

Gram Positive Urine Isolates	# Tested	AMP^	AMCL^	NAF	CZOL^	CTRX	TMSX	TET	LEVO
Staphylococcus aureus	76	28	68	68	68	68	97	95	61
Staphylococcus, Coagulase Negative	27	15	52	52	52	52	59	89	67
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.**
 ^ **Many antimicrobials used to treat urinary tract infections are highly concentrated in the urine. While serum levels may not be effective to treat pyelonephritis, levels achievable in urine (assuming normal renal function) may be effective for cystitis.**

Mycobacterium Tuberculosis Complex		
Antimicrobial (mcg/ml)	% Susceptible	
Ethambutol	5	100
Isoniazid	0.1	92
Pyrazinamide	100	100
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). 7% of isolates tested are confirmed ESBL producers [110 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: 386)
Vancomycin	522	79 ^ (15%)	53 (14%)
Ampicillin	522	81 ^^ (16%)	52 (13%)

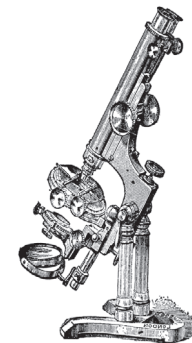
^ 43 urines, 1 blood, 10 wounds, 23 (tissue, fluids), 2 others

^^ 46 urines, 11 wounds, 23 (tissue, fluids), 1 other

**AEROBIC ISOLATES NON-URINE SOURCES
JANUARY THROUGH DECEMBER 2015**

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Isolates	# Tested	AMP	PIPTZ	CZOL	CTAZ	CTRX	CFPM	GENT	TOB	TMSX	CIPR	LEVO	ETP
Citrobacter freundii	15	R	87	R	80	73	93	100	100	93	93	93	100
Enterobacter aerogenes	26	R	100	R	96	92	100	100	100	96	100	100	100
Enterobacter cloacae	61	R	90	R	87	77	100	100	100	95	98	98	92
Escherichia coli	213	37	97	61	90	88	89	89	89	64	78	79	99
- ESBL	26		92					73	65	35	27	31	92
- Non ESBL	189	42	97	69	99	99	100	91	92	68	85	86	99
Klebsiella oxytoca	34	6	97	18	100	97	100	100	100	97	97	97	100
Klebsiella pneumoniae	114	R	98	93	97	97	97	98	95	88	93	97	99
Proteus mirabilis	63	83	100	71	97	97	98	91	91	87	94	95	97
Salmonella sp.	15	80		R	R	87				100	87	100	
Serratia marcescens	35	R	86	R	74	69	97	100	100	97	97	97	100
Shigella flexneri	17	35		R	R					24	100	100	
Shigella sonnei	45	71		R	R					4	16	16	



Gram Positive Isolates & Miscellaneous	# Tested	PCN	AMP	AMCL	NAF	CZOL	CTRX	ERYT	CLIN	TET	VAN	GENT	TOB	TMSX	LEVO	
Staphylococcus aureus	808	16	16	62	62	62	62	48	77 [^]	92	100			97	75	
- Methicillin Resistant	314	0	0	0	0	0	0	9	65 [^]	92	100			96	44	
- Methicillin Susceptible	510	26	26	100	100	100	100	72	84 [^]	92	100			98	93	
Staphylococcus, Coagulase Negative	368	24	24	60	60	60	60	41	60 [^]	77	100			71	77	
Staphylococci resistant to Nafcillin are resistant to PCN, AMP, AMCL, PIPTZ, Cephems (CZOL, CTAZ, CTRX, CFPM), & Carbapenems.																
Streptococcus pyogenes, Group A	29	100			S		100	79	83 [^]		100	R	R			
Streptococcus agalactiae, Group B	25	100					96	64	68 [^]		100	R	R			
Streptococcus pneumoniae (See Note # 5)	83/57	100					100	78	86	78	100	R	R	68		
83 isolates tested against PCN, ERYT and TET. 57 isolates were tested against the other antimicrobials.																
Haemophilus influenzae (See Note # 4)	57		79	S		R	S	R				R	R	S	S	
Moraxella catarrhalis (See Note # 4)	13	R	8	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	9		100	100	100	100	89	100	100	100
Acinetobacter lwoffii	2		100	100	100	100	100	100	100	100
Pseudomonas aeruginosa	88	89	87	88	89	99		89	88	89
Stenotrophomonas maltophilia	22		27				100		100	

Abbrev	Antimicrobial	Cost / Day	Std. Adult Regimen
AMCL	Amoxicillin / clavulanate	\$1.56	875 mg Q 12 hr PO
AMOX	Amoxicillin	\$0.30	500 mg Q 8 hr PO
AMP	Ampicillin	\$10.60	2 gm Q 6 hr IV
AMSL	Ampicillin / sulbactam	\$9.08	3 gm Q 6 hr IV
AZTH	Azithromycin	\$2.54	500 mg Q 24 hr IV
AZTR	Aztreonam	\$152.70	2 gm Q 8 hr IV
CZOL	Cefazolin	\$5.16	2 gm Q 8 hr IV
CFPM	Cefepime	\$14.82	2 gm Q 8 hr IV
CFTAR	Ceftaroline	\$282.94	600 mg Q 12 hr IV
CTRX	Ceftriaxone	\$1.27	1 gm Q 24 hr IV
CIPR	Ciprofloxacin	\$0.26	500 mg Q 12 hr PO
CIPR	Ciprofloxacin	\$5.90	400 mg Q 12 hr IV
CLIN	Clindamycin	\$18.63	600 mg Q 8 hr IV
CLIN	Clindamycin	\$2.96	300 mg Q 6 hr PO
DAPTO	Daptomycin	\$419.30	500 mg Q 24 hr IV
DOXY	Doxycycline	\$4.78	100 mg Q 12 hr PO
ETP	Ertapenem	\$94.65	1 gm Q 24 hr IV
GENT	Gentamicin	\$2.40	80 mg Q 8 hr IV
LEVO	Levofloxacin	\$0.40	750 mg Q 24 hr PO
LEVO	Levofloxacin	\$3.35	750 mg Q 24 hr IV
LZLD	Linezolid	\$6.66	600 mg Q 12 hr PO
LZLD	Linezolid	\$92.62	600 mg Q 12 hr IV
MERO	Meropenem	\$30.30	1 gm Q 8 hr IV
METR	Metronidazole	\$1.86	500 mg Q 8 hr PO
NAF	Nafcillin	\$45.48	2 gm Q 4 hr IV
NITRO	Nitrofurantoin	\$4.36	100 mg Q 12 hr PO
PCN	Penicillin	\$34.56	3 MU Q 4 hr IV
PIPTZ	Piperacillin / tazobactam	\$19.92	4.5 gm Q 6 hr IV
TMSX	Trimethoprim / sulfa	\$0.26	160 mg TMP Q 12 hr PO
TMSX	Trimethoprim / sulfa	\$34.10	320 mg TMP Q 12 hr IV
TOB	Tobramycin	\$6.87	80 mg Q 8 hr IV
VAN	Vancomycin	\$5.20	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: 415 433-1438).

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