Zuckerberg San Francisco General Hospital and Trauma Center

Clinical Laboratory Microbiology

Community Health Network

ANTIMICROBIAL SUSCEPTIBILITY STUDIES

(excluding Laguna Honda Hospital)

January - December 2018

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
Camille Beauduy, Pharm.D.
Cassandra Lei, 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
628-206-3595

URINE ISOLATES
JANUARY - DECEMBER 2018

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	83	R	67	61	100	94	94	89	94	94	100	100
Citrobacter koseri	26	R	100	100	100	100	100	100	100	100	100	100	100	100
Enterobacter aerogenes	42	R	95	R	81	79	100	100	100	100	100	100	57	98
Enterobacter cloacae	43	R	81	R	70	65	93	100	100	79	98	100	86	88
Escherichia coli	1547	47	98	89^	92	90	91	89	88	66	80	81	98	99
- ESBL	158		96					60	49	32	28	34	91	99
- Non ESBL	1408	52	99	98^	99	99	99	92	92	70	85	86	99	99
Klebsiella oxytoca	38	R	97	18	92	92	95	100	95	90	95	100	97	100
Klebsiella pneumoniae	208	R	96	89^	91	89	90	95	91	82	91	96	61	99
Morganella morganii	18	R	94	R	89	94	94	94	94	78	100	100	R	100
Proteus mirabilis	190	83	99	95^	99	97	98	89	91	80	91	93	R	100

Non-Enteric Urine Isolates	# Tested	PIPTZ	CTAZ	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	4		100	75	100	100	100	100	100	100
Pseudomonas aeruginosa	68	94	94	93	88	99		88	87	90
Stenotrophomonas maltophilia	4		25				100		75	

Gram Positive Urine Isolates	# Tested	AMP	AMCL	NAF	CZOL	CTRX	TMSX	TET	LEVO
Staphylococcus aureus	77	31	66	61	62	62	100	92	65
Staphylococcus, Coagulase Negative	28	50	82	57	61	61	64	93	61
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	92
Streptomycin	1	80

Thirteen isolates (six respiratory specimens, seven non respiratory) were tested by San Francisco Department of Public Health

NOTES:

1. 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.
2. *Escherichia coli*, *Klebsiella pneumoniae*, *K. oxytoca* and *Proteus mirabilis* are routinely screened for extended spectrum beta-lactamases (ESBL). 11% of isolates tested in 2018 were confirmed ESBL producers [236 patients].
3. *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.
4. 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.
5. *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

6. 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: 393)
Vancomycin	555	32 ^ (6%)	28 (6%)
Ampicillin	555	36 ^^ (6%)	32 (7%)

^ 20 urines, 3 bloods, 5 wounds/drainages, 4 tissues
^^ 21 urines, 3 bloods, 8 wounds/abscesses/drainages, 3 tissues, 1 flud

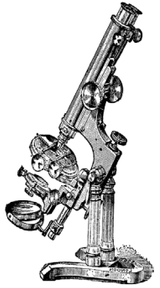
AEROBIC ISOLATES NON-URINE SOURCES
JANUARY THROUGH DECEMBER 2018

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Isolates	# Tested	AMP	PIPTZ	CZOL	CTAZ	CTRX	CFPM	GENT	TOB	TMSX	CIPR	LEVO	ETP
Citrobacter koseri	13	R	100	100	100	100	100	100	100	100	100	100	100
Enterobacter aerogenes	24	R	100	R	96	92	100	100	100	96	100	100	100
Enterobacter cloacae	59	R	98	R	90	81	97	98	97	95	97	97	98
Escherichia coli	221	44	98	59	83	79	82	86	83	66	80	81	100
- ESBL	44		96					68	55	36	36	39	100
- Non ESBL	178	55	99	73	98	98	99	91	90	74	90	91	100
Klebsiella oxytoca	35	R	100	17	100	100	100	100	100	86	97	97	100
Klebsiella pneumoniae	111	R	97	87	93	92	93	96	95	87	94	98	99
Morganella morganii	20	R	95		95	85	95	95	100	70	85	100	100
Proteus mirabilis	74	77	99	57	97	93	95	89	92	77	85	88	100
Proteus vulgaris	17	R	100	R	94	47	100	94	100	65	100	100	100
Salmonella sp.	6	100		R		100				83	100	100	
Serratia marcescens	19	R	95	R	84	90	100	95	95	100	100	100	100
Shigella flexneri	13	31		R						23	100	100	
Shigella sonnei	34	74		R						3	74	73	

Gram Positive Isolates & Miscellaneous	# Tested	PCN	AMP	AMCL	NAF	CZOL	CTRX	ERYT	CLIN	TET	VAN	GENT	TOB	TMSX	LEVO
Staphylococcus aureus	898	17	17	66	66	66	66	49	78^	93	100			98	71
- Methicillin Resistant	316	0	0	0	0	0	0	8	66^	92	100			98	41
- Methicillin Susceptible	594	27	27	100	100	100	100	70	84^	94	100			99	88
Staphylococcus lugdunensis	25	64	64	96	96	96	96	88	88^	96	100			100	100
Staphylococcus, Coagulase Negative	356	27	27	58	58	58	58	40	57^	78	100			69	80
	Staphylococci resistant to Nafcillin (Oxacillin) are resistant to PCN, AMP, AMCL, PIPTZ, Cephems (CZOL, CTAZ, CTRX, CFPM), & Carbapenems.														
Streptococcus pyogenes, Group A	43	100			S		100	74	72^		100	R	R		
Streptococcus agalactiae, Group B	28	100					100	61	57^		100	R	R		
Streptococcus pneumoniae (See Note # 5)	100/57	99					100	89	90	87	100	R	R	72	
	100 isolates tested against PCN, ERYT and TET. 57 isolates were tested against the other antimicrobials.														
Haemophilus influenzae (See Note # 4)	77		75	S		R	S	R				R	R	S	S
Moraxella catarrhalis (See Note # 4)	15	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).



Non Enteric Isolates	# Tested	PIPTZ	CTAZ	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	15		93	93	100	93	93	87	93	93
Acinetobacter lwoffii	2		100	100	100	100	50	100	100	100
Pseudomonas aeruginosa	82	89	89	92	88	96		92	92	87
Stenotrophomonas maltophilia	26		39				100		92	

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	$9.44	2 gm Q 6 hr IV
AMSL	Ampicillin / sulbactam	$11.68	3 gm Q 6 hr IV
AZTH	Azithromycin	$3.04	500 mg Q 24 hr IV
CZOL	Cefazolin	$32.28	2 gm Q 8 hr IV
CFPM	Cefepime	$16.32	2 gm Q 8 hr IV
CFTAR	Ceftaroline	$361.54	600 mg Q 12 hr IV
CTRX	Ceftriaxone	$1.37	1 gm Q 24 hr IV
CIPR	Ciprofloxacin	$0.34	500 mg Q 12 hr PO
CIPR	Ciprofloxacin	$5.54	400 mg Q 12 hr IV
CLIN	Clindamycin	$34.20	600 mg Q 8 hr IV
CLIN	Clindamycin	$4.12	300 mg Q 6 hr PO
DAPTO	Daptomycin	$79.98	500 mg Q 24 hr IV
DOXY	Doxycycline	$3.66	100 mg Q 12 hr PO
ETP	Ertapenem	$89.29	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	$3.81	750 mg Q 24 hr IV
LZLD	Linezolid	$6.72	600 mg Q 12 hr PO
LZLD	Linezolid	$33.50	600 mg Q12 hr IV
MERO	Meropenem	$17.82	1 gm Q 8 hr IV
METR	Metronidazole	$2.04	500 mg Q 8 hr PO
NAF	Nafcillin	$41.76	2 gm Q 4 hr IV
NITRO	Nitrofurantoin	$5.54	100mg Q 12 hr PO
PCN	Penicillin	$47.64	3 MU Q 4 hr IV
PIPTZ	Piperacillin / tazobactam	$19.48	4.5 gm Q 6 hr IV
TMSX	Trimethoprim/sulfa	$0.32	160 mg TMP Q 12 hr PO
TMSX	Trimethoprim/sulfa	$224.18	320 mg TMP Q 12 hr IV
TOB	Tobramycin	$2.34	80mg Q 8 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..