San Francisco General Hospital Medical Center

Clinical Laboratory Microbiology

Community Health Network

ANTIMICROBIAL SUSCEPTIBILITY STUDIES

(excluding Laguna Honda Hospital)

January - December 2014

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URINE ISOLATES
JANUARY - DECEMBER 2014

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Urine Isolates	# Tested	AMP^	PIPTZ^	CTAZ^	CTRX^	CFPM	GENT	TOB	TMSX	CIPR	LEVO	NITRO	ETP
Citrobacter freundii	17	R	94	88	88	100	100	100	88	100	100	100	100
Citrobacter koseri	18	R	94	100	100	100	100	100	94	100	100	83	100
Enterobacter aerogenes	25	R	96	96	96	100	100	100	96	96	100	20	96
Enterobacter cloacae	32	R	84	72	69	91	97	91	66	78	81	22	97
Escherichia coli	1364	48	98	95	93	95	91	90	67	80	81	99	100
- ESBL	88		92				63	48	39	22	22	98	98
- Non ESBL	1288	51	98	99	99	100	93	93	69	84	85	99	100
Klebsiella oxytoca	26	R	92	96	92	100	100	100	100	100	100	92	100
Klebsiella pneumoniae	136	R	98	98	96	96	98	96	88	94	97	42	100
Morgonella morganii	15	R	100	87	93	100	93	93	93	80	87	R	100
Proteus mirabilis	127	87	100	100	99	99	93	92	89	89	92	R	100

Non-Enteric Urine Isolates	# Tested	PIPTZ^	CTAZ^	CFPM	GENT	TOB	TMSX	CIPR	LEVO	MERO
Acinetobacter baumannii	4		75	50	50	75	75	25	50	75
Pseudomonas aeruginosa	33	82	88	85	85	97		85	88	91
Stenotrophomonas maltophilia	5		40				100		100	

Gram Positive Urine Isolates	# Tested	AMP^	AMCL^	NAF	CZOL^	CTRX	TMSX	TET	LEVO
Staphylococcus aureus	67	37	73	73	73	73	93	91	63
Staphylococcus, Coagulase Negative	20	35	35	35	35	35	60	65	50
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	88
Pyrazinamide	100	96
Rifampin	1	96
Streptomycin	1	96

Twenty five isolates were tested by San Francisco Department of Public Health

NOTES:

1. Many strains of *Enterobacter*, *Citrobacter* and *Serratia* produce inducible cephalosporinases. Cephalosporins other than cefepime should be used with caution when treating infections caused by these bacteria.
2. *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 [109 patients].
3. *Campylobacter jejuni/coli* group enteric infections are usually treated with fluoroquinolones or macrolides. Strains resistant to these antimicrobials have been isolated at SFGH.
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. Enterococci that demonstrate high level aminoglycoside resistance are not killed by the usually synergistic combination of a penicillin or vancomycin plus an aminoglycoside

Incidence of Vancomycin and Ampicillin Resistance

Antimicrobial	No. isolates tested	No. resistant isolates	No. of patients with resistant Enterococci (Total No. Patients: 406)
Vancomycin	563	101 ^ (18%)	62 (15%)
Ampicillin	563	106 ^^ (19%)	64 (16%)

^ 50 urines, 7 bloods, 12 wounds, 32 (tissue, fluids)
^^ 60 urines, 11 bloods, 11 wounds, 24 (tissue, fluids)

AEROBIC ISOLATES NON-URINE SOURCES
JANUARY THROUGH DECEMBER 2014

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

Enteric Isolates	# Tested	AMP	PIPTZ	CTAZ	CTRX	CFPM	GENT	TOB	TMSX	CIPR	LEVO	ETP
Citrobacter freundii	24	R	100	96	92	100	96	96	88	96	96	100
Enterobacter aerogenes	32	R	91	84	81	100	100	100	100	97	100	97
Enterobacter cloacae	68	R	91	84	84	94	99	94	77	94	99	97
Escherichia coli	185	41	97	95	91	92	95	94	65	79	80	100
- ESBL	15		87				73	60	27	7	7	100
- Non ESBL	171	44	98	99	99	100	96	96	68	85	85	100
Klebsiella oxytoca	34	3	97	100	97	100	97	97	97	100	100	100
Klebsiella pneumoniae	111	R	98	96	94	96	98	97	89	96	96	100
Proteus mirabilis	63	94	100	100	100	100	98	98	83	87	92	100
Salmonella sp.	10	100		R	100				100	90	100	
Serratia marcescens	25	R	84	84	96	100	100	80	96	100	100	100
Shigella flexneri	14	7		R					7	100	100	
Shigella sonnei	45	89		R					0	18	18	

Gram Positive Isolates & Miscellaneous	# Tested	PCN	AMP	AMCL	NAF	CZOL	CTRX	ERYT	CLIN	TET	VAN	GENT	TOB	TMSX	LEVO
Staphylococcus aureus	879	15	19	57	57	57	57	44	**79^**	94	100			97	69
- Methicillin Resistant	387	0	0	0	0	0	0	10	**69^**	94	100			96	42
- Methicillin Susceptible	510	26	33	100	100	100	100	70	**86^**	94	100			98	89
Staphylococcus, Coagulase Negative	363	25	49	55	55	55	55	38	**56^**	75	100			71	73
	Staphylococci resistant to Nafcillin are resistant to PCN, AMP, AMCL, PIPTZ, Cephems (CZOL, CTAZ, CTRX, CFPM), & Carbapenems.														
Streptococcus pyogenes, Group A	39	100			S		100	49	**47^**		100	R	R		
Streptococcus agalactiae, Group B	22	100					100	46	**64^**		100	R	R		
Streptococcus pneumoniae (See Note # 5)	87/65	99					99	70	82	82	100	R	R	62	
	87 isolates tested against PCN, ERYT and TET. 65 isolates were tested against the other antimicrobials.														
Haemophilus influenzae (See Note # 4)	66		83	S		R	S	R				R	R	S	S
Moraxella catarrhalis (See Note # 4)	17	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	20		100	90	100	95	90	100	100	100
Acinetobacter lwoffii	3		67	100	100	100	100	67	100	100
Pseudomonas aeruginosa	79	91	94	94	82	95		87	87	87
Stenotrophomonas maltophilia	24		21				100		79	

Abbrev	Antimicrobial	Cost / Day	Std. Adult Regimen
AMCL	Amoxicillin / clavulanate	$0.80	875 mg Q 12 hr PO
AMP	Ampicillin	$9.70	2 gm Q 6 hr IV
AMSL	Ampicillin / sulbactam	$10.90	3 gm Q 6 hr IV
AZTH	Azithromycin	$2.80	500 mg Q 24 hr IV
AZTR	Aztreonam	$130.50	2 gm Q 8 hr IV
CZOL	Cefazolin	$2.70	1 gm Q 8 hr IV
CFPM	Cefepime	$14.70	2 gm Q 8 hr IV
CFTAR	Ceftaroline	$235.70	600 mg Q 12 hr IV
CTRX	Ceftriaxone	$1.30	1 gm Q 24 hr IV
CIPR	Ciprofloxacin	$0.30	500 mg Q 12 hr PO
CIPR	Ciprofloxacin	$3.40	400 mg Q 12 hr IV
CLIN	Clindamycin	$16.00	600 mg Q 8 hr IV
CLIN	Clindamycin	$0.50	300 mg Q 6 hr PO
DAPTO	Daptomycin	$379.20	500 mg Q 24 hr IV
DOXY	Doxycycline	$3.40	100 mg Q 12 hr PO
ETP	Ertapenem	$65.90	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	$3.30	750 mg Q 24 hr IV
LZLD	Linezolid	$208.20	600 mg Q 12 hr PO
LZLD	Linezolid	$96.40	600 mg Q 12 hr IV
MERO	Meropenem	$26.70	1 gm Q 8 hr IV
METR	Metronidazole	$2.00	500 mg Q 8 hr PO
NAF	Nafcillin	$50.60	2 gm Q 4 hr IV
NITRO	Nitrofurantoin	$2.40	100 mg Q 12 hr PO
PCN	Penicillin	$19.00	3 MU Q 4 hr IV
PIPTZ	Piperacillin / tazobactam	$20.20	4.5 gm Q 6 hr IV
TMSX	Trimethoprim / sulfa	$0.30	160 mg TMP Q 12 hr PO
TMSX	Trimethoprim / sulfa	$34.10	320 mg TMP Q 12 hr IV
TOB	Tobramycin	$2.50	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.