

Streptococci and Enterococci																			
Percent Susceptible	No. Tested (a)	Penicillin or Ampicillin			Cefuroxime	Ceftriaxone	Vancomycin	Erythromycin	Clindamycin	Meropenem	Trimethoprim/sulfa	Tetracycline (Doxycycline)	Gentamicin Synergy with Pen/Amp	Streptomycin Synergy with Pen/Amp	Moxifloxacin	Nitrofurantoin (UTI only)	Quinopristin/daifopristin	Ciprofloxacin (UTI only)	Linezolid
		%S	%I	%R															
Streptococci																			
Grp. B (Strep. agalactiae) (b)	222	100	0	0	-	-	-	52	56	-	-	-	-	-	-	-	-	-	-
Viridans (various species) (c)	226	88	11	1	-	99	100	57	77	-	-	-	-	-	-	-	-	-	-
Strep. pneumoniae (d)	59	75e	-	25	92	98e	100	78	84	93	85	-	-	98	-	-	-	-	-
Enterococcus (no species I.D.) (f)																			
Enterococcus faecalis (f)	81	91	0	1	-	-	99	-	-	-	-	21	-	-	-	87	-	63	98
Enterococcus faecium (f)	97	8	0	92	-	-	25	-	-	-	71	96	55	-	-	-	83	-	96
Cost (\$)		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$

- (a) First isolate from each patient was included.
- (b) Penicillin is the drug of choice for all beta hemolytic streptococci; penicillin resistance has not been documented.
- (c) Clinically important species tested; MICs for penicillin and ceftriaxone performed on 229 strains.
- (d) Penicillin-susceptible isolates are also susceptible to all other β -lactam agents. β -lactamase inhibitor combination drugs do not add additional efficacy to penicillin alone.
- (e) Based on meningitis interpretive criteria (more conservative). Nonmeningitis interpretation is 100% for penicillin. Infectious diseases consultation is recommended for meningitis in penicillin-allergic patients or those with resistant ceftriaxone or cefotaxime results.

Candida						
Percent Susceptible By Broth Microdilution (YeastOne, Trek Diagnostics)	No. Tested	Voriconazole (b)				
		Amphotericin B (a)	Caspofungin	Fluconazole (b)	Itraconazole (b)	
Candida albicans	105	100	99	95	97	96
Candida glabrata	71	100	92	76	41	87
Candida parapsilosis	17(c)	100	100	94	100	100
C. tropicalis	18(c)	100	100	94	100	100
Other Candida spp.	21(c)	100	100	(d)	100	100
Costs (\$)		\$\$\$\$	\$\$\$\$	\$	\$	\$\$\$\$

- (f) If susceptible, ampicillin is the drug of choice when enterococci must be treated. Ampicillin susceptibility predicts piperacillin susceptibility. Nitrofurantoin or ampicillin is recommended for uncomplicated UTI. Serious infections (septicemia, endocarditis) require both a β -lactam agent and an aminoglycoside. Use vancomycin+aminoglycoside only if strain is ampicillin-resistant or patient is penicillin allergic. High level resistance to gentamicin also indicates lack of synergy for tobramycin, amikacin and kanamycin.
- (a) Suggested Ampho Resistant breakpoint MIC > or = 2 mcg/ml.
- (b) Susceptible dose-dependent breakpoint MIC was used.
- (c) Data from <30 isolates may be statistically unreliable.
- (d) Species other than C. krusei are 100% susceptible; C. krusei is intrinsically resistant to fluconazole.

SITUATIONS FOR WHICH THE USE OF VANCOMYCIN IS APPROPRIATE AND ACCEPTABLE:

1. For treatment of serious infections due to β -lactam-resistant gram-positive bacteria. Clinicians should be aware that vancomycin is usually less active and less rapidly bactericidal than β -lactam agents for organisms that are susceptible to the β -lactams. Clinicians should also be aware that vancomycin sensitive MIC 2mcg/ml is associated with increased treatment failures.
2. For treatment of infections due to gram-positive organisms in patients with serious allergy to β -lactam-antibiotics.
3. Prophylaxis, (infused 60-120 min before the first incision), in penicillin-allergic patients, as recommended by the Amer. Heart Assoc., for endocarditis following certain procedures in patients at high risk for endocarditis. Cephalosporins are still recommended for non-allergic patients.
4. Prophylaxis for major surgical procedures involving implantation of prosthetic materials or devices, e.g., cardiac and vascular procedures and total hip replacements, at institutions with a high rate of infections due to MRSA or MRCoNS. Currently MRSA and MRCoNS rates are XX% and XX% at SHC, respectively. A single dose administered 60-120 min before surgery is sufficient unless the procedure lasts more than 6 hours, in which case the dose should be repeated. Prophylaxis should be dc'd after 2 doses maximum.



Stanford University Medical Center

CLINICAL MICROBIOLOGY LABORATORY

SUH ANTIBIOGRAM DATA FOR BACTERIAL AND YEAST ISOLATES

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Gram negative rods																			
Percent Susceptible	PENICILLINS				CEPHEMS			LACTAMS			AMINOGLYC's			OTHERS		Urine Only			
	No. Tested (a)	Ampicillin	Piperacillin	Amp/Subbactam	Pip/Tazobactam	Cefazolin [Urine Only]	Ceftriaxone	Cefepime	Aztreonam (b)	Imipenem	Meropenem	Gentamicin	Tobramycin	Amikacin	Ciprofloxacin	Levofloxacin	Trimeth/Sulfamethox	1ST GENERATION Cep'h's [oral]	Nitrofurantoin
Achromobacter xylosoxidans	44	-	-	-	86	-	-	7	0	95	86	5	2	7	9	52	82	-	-
Acinetobacter baumannii	39(c)	-	-	74	-	-	-	72	-	-	79	77	85	87	69	77	74	-	-
Burkholderia cepacia (e)	26(d)	Ceftazidime 68%				Minocycline 65				-	60	-	-	-	-	-	46	-	-
Citrobacter freundii complex	78	0	-	0	90	0	83	99	84	100	100	95	96	99	90	92	74	-	94
Citrobacter koseri	68	0	-	0	100	96	97	100	94	100	100	100	100	100	99	99	96	-	52
Enterobacter aerogenes	94	0	-	0	87	0	83	100	79	93	99	99	99	100	98	98	98	-	9
Enterobacter cloacae complex	173	0	-	0	85	0	81	97	84	99	98	97	96	99	95	95	88	-	29
Escherichia coli	2714	52	-	57	94	81	91	96	87	100	100	90	90	100	77	77	68	59	94
Klebsiella oxytoca	137	0	-	68	93	34	93	98	93	100	100	97	97	100	93	99	93	-	80
Klebsiella pneumoniae	564	0	-	80	94	91	92	97	92	99	99	96	95	100	92	93	84	-	20
Morganella morganii	47	0	-	4	100	0	87	98	95	-	100	73	82	100	67	69	53	-	0
Proteus mirabilis	213	80	-	94	100	64	97	100	100	-	99	90	92	99	87	90	74	-	0
Proteus vulgaris	16(c,d)	0	-	78	100	0	-	100	75	-	100	100	100	100	100	100	88	-	0
Pseudomonas aeruginosa	759(f)	-	-	-	91	-	-	79	64	80	84	80	96	90	76	72	-	-	-
Ps. aeruginosa CF mucoid (e)	384(f)	-	79	Ticarcillin 75%			-	79	75	71	77	-	87	-	59	-	-	-	-
Ps. aeruginosa CF non-mucoid (e)	210(f)	-	84	Ticarcillin 78%			-	80	75	72	76	-	91	-	61	-	-	-	-
Salmonella spp.	26(d)	75	-	-	-	-	-	Ceftriaxone 89%	-	-	-	-	-	-	67	-	84	-	-
Serratia marcescens	110	0	-	0	97	0	94	99	94	97	98	99	98	100	92	97	97	-	0
Stenotrophomonas maltophilia	151	-	-	-	-	-	-	-	-	-	-	-	-	-	88	98	-	-	-
Cost		\$\$	\$\$	\$	\$\$	\$	\$	\$	\$\$\$	\$\$\$	\$\$\$	\$	\$	\$	\$	\$	\$	\$	\$

- (a) First isolate from each patient was included.
- (b) Unlike aztreonam, aminoglycosides have synergistic activity with β -lactams (ex: piperacillin, ampicillin) against aerobic gram negative rods and enterococci. Aztreonam should only be used for treating documented infections due to susceptible organisms in patients with anaphylactic reactions to β -lactams. In patients with renal insufficiency, aminoglycosides can be administered safely when doses are adjusted for patient's renal function. For information on dosing, including single daily dosing, please contact a Clinical Pharmacist (beeper # available from unit secretary).
- (c) Includes isolates from 2012.
- (d) Data from isolate totals <30 may be statistically unreliable.
- (e) Cystic fibrosis patient isolates tested by disk diffusion.
- (f) Isolates not corrected for duplicates.

Interpretation of susceptibility results

Results are reported as minimum inhibitory concentrations (MICs), the minimum amount of drug needed to inhibit growth *in vitro*. Interpretive criteria are based on achievable serum levels. For certain antibiotics, the amount excreted into the urine via the kidneys is above the MIC, and the agent is effective clinically in this site even though reported as "resistant". Intermediate results (I), especially for beta-lactam agents, indicate that doses higher than standard recommendations may be effective. In other cases, "I" results indicate that the organism may be susceptible or resistant but the *in vitro* tests are not sensitive enough to determine specifically. For this antibiogram, Intermediate results are NOT included within the "%S" category.

Staphylococci

Percent Susceptible	No. Tested	Penicillin	Nafcillin, Oxacillin (b,c)	1st Generation Cepheems (c)	Vancomycin	Erythromycin	Clindamycin (d)	Gentamicin	Trimeth/Sulfa	Moxifloxacin	Tetracycline (bony)	Linezolid	Haemophilus Influenzae
Staphylococcus aureus, ALL(b)	1649	(a)	75	75	100	54	71	98	100	73	95	100	For infections with β -lactamase-producing H. influenzae: cefuroxime, cefotaxime, trimethoprim/sulfamethoxazole, amoxicillin/clavulanate or azithromycin is recommended. Cefotaxime or ceftriaxone is drug of choice for CNS infections. At Stanford, 74% of H. influenzae are ampicillin susceptible.
MRSA (ONLY) (c)	412	0	0	0	100	12	53	96	99	24	94	100	
MSSA (ONLY)	1237	(a)	100	100	100	70	81	98	100	89	95	100	
Staph. lugdunensis	80	(a)	94	94	100	79	81	99	100	96	-	100	
Staph. coagulase negative (other)	294	(a)	45	45	100	43	65	78	64	54	-	100	
Cost (\$)		\$	\$\$	\$	\$	\$	\$	\$	\$	\$	\$	\$\$\$	

- (a) Penicillin sensitivity confirmed by PCR per request. Penicillin-resistant staphylococci should be considered resistant to all penicillinase-sensitive penicillins, including ampicillin, amoxicillin, mezlocillin, piperacillin and ticarcillin.
- (b) For empiric therapy where S. aureus is a potential pathogen, nafcillin and first generation cephalosporins are recommended drugs of choice for infections other than serious or systemic, for which vancomycin should be used until the susceptibility results are available. Vancomycin MIC 2 mg/ml, currently interpreted sensitive, is associated with increased treatment failure.
- (c) Oxacillin resistant staphylococci (MRSA & MRSE) should be considered resistant to all penicillins, cephalosporins (except anti-MRSA cephalosporins), imipenem and beta-lactams including combinations with clavulanic acid, sulbactam and tazobactam. Oxacillin susceptibility predicts susceptibility to all other beta-lactams and cephalosporins.
- (d) Clindamycin induction test performed on all staphylococcal isolates.

Anaerobes (selected species)

Percent Susceptible by Etest (a)	No. Tested	Amp/subbactam	Penicillin	Pip/tazobactam	Meropenem	Clindamycin	Metronidazole
Bacteroides fragilis	31	94	0	97	94	87	100
Bacteroides NOT fragilis	23	91	0	91	100	30	96
Gram negative rods (other) (b)	37	100	92	100	100	72	100
ALL Gram positive rods	58	100	90	100	98	71	66(c)
Clostridium perfringens only	13	-	100	-	-	69	100
Gram pos rods NOT perfringens	45	100	87	100	98	71	56(c)
Peptostreptococci	32	-	100	-	-	66(d)	100
Cost (\$)		\$	\$	\$\$	\$\$	\$\$	\$

- (a) Not all isolates tested with every drug
- (b) 15 Fusobacterium spp., 17 Prevotella spp., 1 Porphyromonas spp., and 4 other
- (c) Non-sporeforming anaerobic gram positive rods do not respond to metronidazole
- (d) Notify Micro Lab to perform antibiotic susceptibility testing if clindamycin is being considered for a Peptostreptococcus; minimum 48 H for results

Campylobacter sp. (n = 44)

Drug (mcg/mL)	% Resistant
Ciprofloxacin	27% R
Doxycycline	39% R
Erythromycin	7% R

M. tuberculosis (n = 14)

Drug (mcg/mL)	% Resistant
Isoniazid (0.1)	0%
Rifampin (2)	0%
Ethambutol (25)	0%
Pyrazinamide	7%