Streptococci and Enterococci

Percent Susceptible R = intrinsic resistance "-" = data not availabe	No. Tested (a)	Penicillin or Ampicillin			Cefuroxime	Ceftriaxone	Vancomycin	Erythromycin	Clindamycin (b)	Meropenem	Trimethoprim/sulfamethoxazole	Tetracycline	Gentamicin Synergy with Pen/Amp	Streptomycin Synergy with Pen/Amp	Moxifloxacin	Nitrofurantoin	Levofloxacin	Ciprofloxacin	Linezolid
		%S	%I	%R															
Streptococci																			
Grp. B (Strep. agalactiae)	35	100	0	0	-	-	-	56	66	-	-	-	-	-	-	-	100	-	-
Viridans (various species)	175	64	35	1	-	99	100	56	83	-	-	-	-	-	-	-	83	-	-
Strep. pneumoniae (c)	44	77d	-	23	88	100d	100	66	87	89	84	Doxy 70		-	100	-	-	-	-
Enterococcus																			
Enterococcus faecalis (e)	123	99	-	1	R	R	98	-	R	-	R	18f	87	93	-	100f	83f	67f	99
Enterococcus faecium (e)	256	25	-	75	R	R	55	-	R	-	R	36f	100	45	-	68f	16f	13f	94
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. Clindamycin induction test performed on all beta hemolytic streptococci and S. pneumoniae.
(c) 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.
(d) 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.
(e) If susceptible, ampicillin is the drug of choice when enterococci must be treated. 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.
(f) Urine only.

Candida

Percent Susceptible or Susceptible-Dose Dependent by Broth Microdilution Method	No. Tested	Amphotericin B (a)	Caspofungin	Fluconazole (b)	Voriconazole
Candida albicans	57	100	100	86/4	84
Candida glabrata	30	100	100	0/97	-
Candida parapsilosis	29(c)	100	100	97/0	97
C. tropicalis	12(c,d)	100	92	83/0	58
Other Candida spp.	10(c,d)	100	88	(e)	56
Costs ($)		$$$$	$$$$	$	$$$$

(a) Based on suggested resistant breakpoint MIC ≥2 μg/ml.
(b) Shows susceptible / susceptible dose dependent.
(c) Data from <30 isolates may be statistically unreliable.
(d) Includes isolates from 2023.
(e) 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.
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 24% and 58% 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 HEALTH CARE

CLINICAL MICROBIOLOGY LABORATORY

SHC ANTIBIOGRAM DATA FOR BACTERIAL AND YEAST ISOLATES

Jan 1, 2023 - Dec 31, 2023

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Gram negative rods

Percent Susceptible R = intrinsic resistance "-" = data not availabe	No. Tested (a)	PENICILLINS				CEPHEMS			LACTAMS				AMINOGLYC's			OTHERS			Urine
		Ampicillin	Amp/Sulbactam	Amox/Clavulanate	Pip/Tazobactam	Cefazolin (g)	Ceftriaxone	Cefepime (b)	Aztreonam (c)	Imipenem	Meropenem	Ertapenem	Gentamicin	Tobramycin	Amikacin	Ciprofloxacin	Levofloxacin	Trimeth/Sulfamethoxazole	Nitrofurantoin (g)
Achromobacter xylosoxidans	39	R	-	-	97	R	R	8	0	-	80	R	3	3	3	10	59	90	-
Acinetobacter baumannii complex	25(d)	R	88	R	-	R	R	84	R	-	80	R	88	100	92	80	88	84	-
Burkholderia cepacia complex (e)	20(d,f)	Ceftazidime 85				R	Minocycline 70			-	55	R	R	R	R	R	-	55	-
Citrobacter freundii complex	98	R	R	R	77	R	67	84 / 0	75	93	99	99	91	89	97	92	89	79	96
Citrobacter koseri	150	R	92	100	97	97	99	96 / 0	96	100	100	100	100	99	99	99	99	98	95
Enterobacter cloacae complex	243	R	R	R	63	R	61	77 / 15	73	86	98	82	96	96	100	95	91	89	63
Escherichia coli	4048	51	51	84	95	83	86	67 / 1	67	98	100	100	89	88	99	73	67	72	98
Klebsiella aerogenes	166	R	R	R	75	R	73	94 / 6	83	52	97	96	99	99	100	99	98	97	14
Klebsiella oxytoca	193	R	64	88	87	57	86	86 / 12	91	100	100	100	90	90	100	92	95	83	94
Klebsiella pneumoniae	1005	R	67	91	89	84	87	79 / 2	81	96	98	98	94	93	99	85	83	84	26
Morganella morganii	74	R	16	R	99	R	89	100 / 0	90	-	100	100	92	99	100	76	76	75	R
Proteus mirabilis	452	76	87	99	100	87	92	87 / 5	97	-	100	100	87	87	99	81	81	77	R
Proteus vulgaris group	30	R	70	100	100	R	83	100 / 0	100	-	100	100	100	100	100	100	97	79	R
Pseudomonas aeruginosa	717	R	R	R	93	C/T 99		92	82	89	92	R	-	99	100g	89	84	-	R
Ps. aeruginosa CF mucoid (e)	115	R	R	R	86	C/T 97		82	81	77	82	R	-	88	-	64	53	-	R
Ps. aeruginosa CF non-mucoid (e)	58	R	R	R	91	C/T 91		83	85	79	85	R	-	75	-	55	45	-	R
Salmonella enterica	40	98	-	-	-	R	100	-	-	-	-	-	R	R	R	53	-	100	-
Serratia marcescens	115	R	R	R	96	R	96	100 / 0	99	-	98	98	100	97	100	92	95	97	R
Stenotrophomonas maltophilia	113	R	R	R	R	R	R	-	R	R	R	R	R	R	R	-	94	98	-
Cost		$$	$	$	$$	$	$	$	$$$	$$$	$$	$$	$	$	$	$	$	$	$

C/T= Ceftolozane/Tazobactam

(a) First isolate from each patient was included.
(b) Shows susceptible / susceptible dose dependent. Cefepime not routinely tested on urine and blood Enterobacterales isolates.
(c) 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 (pager# available from unit secretary).
(d) Data from isolate totals <30 may be statistically unreliable.
(e) Cystic fibrosis patient isolates tested by disk diffusion.
(f) Includes isolates from 2022.
(g) Urine only.

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 Cephems (c)	Vancomycin	Erythromycin	Clindamycin (d)	Gentamicin	Trimeth/Sulfa	Moxifloxacin	Tetracycline (Doxy)	Linezolid
Staphylococcus aureus, ALL(b)	1384	(a)	76	76	100	60	74	94	99	77	92	100
MRSA (ONLY) (c)	334	0	0	0	100	22	64	85	97	32	80	100
MSSA (ONLY)	1050	(a)	100	100	100	72	77	96	99	91	95	100
Staph. lugdunensis	32	(a)	90	90	100	84	88	94	100	100	91	100
Staph. coagulase negative	228	(a)	42	42	100	35	53	76	55	58	80	100
Cost ($)		$	$$	$	$	$	$	$	$	$	$	$$$

Haemophilus Influenzae

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, 79% of H. influenzae (n=68) are ampicillin susceptible.

(a) Penicillin sensitivity confirmed per request. Penicillin-resistant staphylococci should be considered resistant to all penicillinase-labile penicillins, including ampicillin, amoxicillin, 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.
(c) Oxacillin resistant staphylococci (MRSA & MRSE) should be considered resistant to all penicillins, cephalosporins (except ceftaroline), 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

Percent Susceptible by Etest	No. Tested (a,e)	Penicillin	Amp/sulbactam	Pip/tazobactam	Meropenem	Clindamycin	Metronidazole
Bacteroides fragilis	38	R	84	-	92	50	100
Bacteroides sp. NOT fragilis	30	R	77	-	100	50	100
Gram negative rods (other) (b)	40	53	93	-	100	60	100
Clostridium perfringens	15	100	100	-	100	60	100
Clostridium sp. NOT perfringens	40	64	97	-	100	55	100
Gram positive rods (other) (c)	27	85	100	-	100	78	15
Gram positive cocci	30	100	100	-	100	87 (d)	100
Cost ($)		$	$	$$	$$	$$	$

(a) Not all isolates tested with every drug
(b) Include Fusobacterium, Prevotella, Porphyromonas, & other.
c) Non-sporeforming rods include Actinomyces, Bifidobacterium, Lactobacillus, Cutibacterium, and others.
(d) Notify Micro Lab to perform antibiotic susceptibility testing if clindamycin is being considered for a Peptostreptococcus.
(e) <30 isolates may be statistically unreliable

Campylobacter sp. (n = 58)

Drug	%Susceptible
Ciprofloxacin	52
Doxycycline	59
Erythromycin	98

M. tuberculosis (n = 27)

Drug (mcg/mL)	%Susceptible
Isoniazid (0.1)	82
Rifampin (1)	93
Ethambutol (5)	96
Pyrazinamide (100)	93