

2022 VAPAHCS GRAM-NEGATIVE ORGANISM (% Susceptibility)	# isolates tested	Beta lactams											Aminoglycosides			Fluoroquinolones / Miscellaneous					
		Penicillins				Cephalosporins						Carbapenems		Gentamicin	Tobramycin	Amikacin (CR)	Ciprofloxacin (CR)	Levofloxacin (CR)	Aztreonam (R)	Nitrofurantoin <i>applies to urine only</i>	Trimethoprim/ sulfamethoxazole
		Ampicillin	Amoxicillin/clav <i>sterile sites only</i>	Ampicillin/ sulbactam (CR)	Piperacillin/ tazobactam (R)	Cefazolin^ <i>applies to urine only</i>	Cefoxitin	Cefpodoxime	Ceftriaxone	Ceftazidime (R)	Cefepime (R)	Ertapenem	Meropenem (R)								
Acinetobacter baumannii	4*	-	-	100*	100*	-	-	-	-	75*	100*	-	100*	100*	100*	-	100*	100*	-	-	100*
Citrobacter freundii#	48	-	-	-	92	-	-	79#	85#	85#	100	100	98	98	98	100	96	87	85	94	92
Citrobacter koseri	38	-	-	-	100	100	95	100	100	100	100	100	100	100	100	100	100	100	100	94	97
Enterobacter cloacae#	74	-	-	-	92	-	-	81#	86#	92#	96	97	100	97	97	99	96	95	92	39	95
Escherichia coli~	507	57	74	66	97	81	93	87	89	89	91	100	100	90	90	100	79	75	89	97	77
Klebsiella aerogenes#	29*	-	-	-	90*	-	-	79**	83**	86**	100*	100*	100*	100*	100*	100*	100*	100*	90*	29*	97*
Klebsiella oxytoca~	57	-	75*	69	95	57	100	93	91	93	95	100	100	93	93	100	95	91	91	94	91
Klebsiella pneumoniae~	229	-	100*	87	99	92	99	94	95	95	96	100	100	98	95	100	88	88	95	37	89
Morganella morganii#	38	-	-	21	100	-	58	100	89	76	100	95	100	92	95	97	75	73	95	-	82
Proteus mirabilis	147	80	100*	85	100	61	95	95	97	96	97	100	99	89	92	100	73	72	97	-	69
Providencia rettgeri#	18*	-	-	67	100	-	100	100	94	94	100	100	100	94	94	100	94	94	94	-	89
Providencia stuartii#	10*	-	-	-	100*	-	100*	100*	90*	100*	100*	90*	100*	-	-	100*	20*	20*	100*	-	60*
Pseudomonas aeruginosa	154	-	-	-	92	-	-	-	-	93	93	-	92	95	99	99	86	77	87*	-	-
Serratia marcescens#	44	-	-	-	95	-	-	-	89	100	100	100	100	95	89	98	98	95	100	-	100
Stenotrophomonas maltophilia	15*	-	-	-	-	-	-	-	-	50*	-	-	-	-	-	-	-	93*	-	-	87*
Cost per day (\$)		\$	\$	\$	\$	\$	\$	\$	\$	\$\$	\$\$	\$\$	\$	\$	\$	\$	\$	\$	\$\$\$	\$	\$

FOOTNOTES * Fewer than 30 isolates were tested. Due to the small number of isolates tested, results may be statistically unreliable (i.e. interpret with caution).

(CR) Criteria restricted. ampicillin/sulbactam for animal bite wounds; amikacin for gram-negative organisms resistant to gentamicin/tobramycin; streptomycin for gentamicin-resistant Enterococcal endocarditis; ciprofloxacin for Pseudomonas infection, gram negative bacteremia, intra-abdominal infection if severe anaphylactic beta lactam allergy, severe sepsis (as part of empiric combination therapy), urology surgical prophylaxis, epididymitis if non-STD enteric orgs, prostatitis/ pyelonephritis if TMP/SMX resistant organism/susceptibility unknown, traveler's diarrhea (not SE Asia) if azithromycin contraindicated; levofloxacin for community-acquired pneumonia if severe beta lactam allergy, epididymitis. Use for other indications requires Infectious Diseases approval.

(R) Restricted. Use of these agents requires Infectious Diseases (ID) approval. Cefepime and piperacillin/tazobactam > 72 hours require ID approval.

^ Actual cefazolin urine susceptibilities are likely better than what is listed in this column (due to MIC interpretation differences).

Enterobacter, Klebsiella aerogenes (formerly Enterobacter), and Citrobacter (non-koseri) may develop resistance during prolonged therapy (approx 4 days) w/ 3rd gen cephalosporins as a result of derepression of AmpC beta-lactamase. Therefore, isolates that are initially susceptible may become resistant after initiation of therapy. Repeat testing may be warranted. For blood culture/sterile sites, ID consult is recommended.

Note: Morganella morganii, Providencia species, and Serratia marcescens are at low risk for clinically significant AmpC production and may be treated with 3rd gen cephalosporins if susceptible. [IDSA guidance 2022](#)

~ % ESBL: E.coli 11% (98% of 47 E.coli isolates tested susceptible to fosfomycin), Klebsiella oxytoca 9%, Klebsiella pneumoniae 5%

Cost per day (\$): \$ < 25; \$\$ 25-100; \$\$\$ 100-200

2022 VAPAHCS GRAM-POSITIVE ORGANISM (% Susceptibility)	# isolates tested	Beta lactams				Fluoroquinolones / AGs (for synergy only)			Miscellaneous								
		Penicillins / Cephalosporins				Levofloxacin (CR)	Gentamicin (a)	Streptomycin (a)(R)	Clindamycin	Daptomycin (d)(R)	Erythromycin	Linezolid (R)	Nitrofurantoin <i>applies to urine only</i>	Rifampin (b)(R) <i>not for monotherapy</i>	Tetracycline	Trimethoprim/ sulfamethoxazole	Vancomycin
		Penicillin	Oxacillin	Ampicillin	Ceftriaxone												
Enterococcus faecalis	274	-	-	100	-	83	90	-	100*	-	100	99	-	23	-	99	
Enterococcus faecium	20*	-	-	15*	-	88*	38*	-	100*	-	100*	45*	-	45*	-	50*	
Staphylococcus aureus (MRSA)	116	-	-	-	-	-	-	57~	100*	25	100	100	96	78	93	100	
Staphylococcus aureus (MSSA)	241	-	100	-	-	-	-	83~	-	70	100	100	100	95	98	100	
Staphylococcus, coag-negative	94	-	46	-	-	-	-	69	-	43	100	100	99	80	59	100	
Staphylococcus lugdunensis	25*	-	88*	-	-	-	-	86*	-	82*	100*	100*	100*	92*	92*	100*	
Streptococcus agalactiae (gp B)	14*	93*	-	-	93*	86*	-	36*~	-	29*	-	-	-	-	-	100*	
Streptococcus pneumoniae (c)	8*	87*(c)	-	-	100*(c)	100*	-	100*	-	87*	100*	-	-	100*	88*	100*	
Cost per day (\$)		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$-\$\$	\$	\$	

CANDIDA SP. Jan 2010-Dec 2022 - isolated from blood cultures (% Susceptibility)	# blood isolates tested	Fluconazole	Voriconazole (CR)	Echinocandins ^a -Micafungin preferred echinocandin (CR)	Amphotericin B ^b -Ambisome preferred liposomal (R)
C. albicans	24*	96 (SDD 4)*	96*	100*	100*
C. glabrata	37	9 (SDD 91)	88	97	100*
C. krusei	2*	-	100*	50*	100*
C. parapsilosis	8*	75 (SDD12)*	88 (SDD12)*	100*	100*
C. tropicalis	5*	80*	75*	100*	100*
Cost per day (\$)		\$	\$-\$\$	\$\$	\$\$\$\$

FOOTNOTES

* Fewer than 30 isolates were tested. Due to the small number of isolates tested, results may be statistically unreliable (i.e. interpret with caution).

% MRSA: 32%; % Vancomycin-resistant Enterococcus (VRE): 4.8%

(a) Test for Enterococcal high-level resistance to aminoglycosides (AGs), gentamicin (MIC 500 mcg/mL) and streptomycin (MIC 2000 mcg/mL): S: synergy with beta-lactams likely, R: synergy with beta-lactams unlikely.

(b) Rifampin should NOT be used as monotherapy for treatment of Staphylococcal infections.

(c) % susceptibility for S.pneumoniae- non-meningitis: penicillin 87% (7/8), ceftriaxone 100% (8/8); meningitis: penicillin 50% (4/8), ceftriaxone 100% (8/8).

(d) Daptomycin was only tested against 5 E.faecium isolates; 3 were VRE isolates.

(CR) Criteria restricted. levofloxacin for community-acquired pneumonia if severe beta lactam allergy, epididymitis; micafungin for blood culture positive for yeast pending speciation; voriconazole for Aspergillus prophylaxis for high risk patients (AML, post all-HCT on chronic GVHD immunosuppression); post-lung/solid organ transplant Candida/Aspergillus prophylaxis per transplant center. Use for other indications requires ID approval.

(R) Restricted. Use of these agents requires Infectious Diseases (ID) approval.

~ % inducible clindamycin resistance: MRSA 24%; MSSA 11%, Streptococcus agalactiae 14%

SDD Susceptible dose-dependent (higher dose necessary)

a Micafungin is the preferred echinocandin at VAPAHCS. While caspofungin / anidulafungin primarily tested, susceptibilities to all echinocandins may be extrapolated.

b Specific cut-offs not provided; in general, MIC ≥ 1 mcg/mL is usually considered resistant.

Cost per day (\$): \$ < 25; \$\$ 25-100; \$\$\$ 100-200; \$\$\$\$ > 200

ANAEROBES Jan 2019-Dec 2022 (% Susceptibility)	# isolates tested (a)	Penicillin	Piperacillin/ tazobactam (R)	Meropenem (R)	Clindamycin	Metronidazole
Bacteroides fragilis	36	-	88	94	65	100
Bacteroides sp. NOT fragilis (b)	39	-	57*	95	19	100
Gram negative rods (other) (c)	35	48*	100*	100	43	100
Clostridium perfringens	7*	100*	100*	100*	86*	100*
Clostridium sp. NOT perfringens (d)	6*	100*	100*	100*	33*	100*
Gram positive rods (other) (e)	10*	90*	100*	100*	75*	-
Cost per day (\$)		\$	\$	\$	\$	\$

FOOTNOTES

* Fewer than 30 isolates were tested. Due to the small number of isolates tested, results may be statistically unreliable (i.e. interpret with caution).

- (a) Not all isolates tested for susceptibility (0 gram positive cocci were tested for susceptibilities. e.g., Anaerococcus, Peptoniphilus, Peptostreptococcus)
- (b) Includes 2 B. caccae, 4 B. ovatus, 1 B. stercoris, 24 B.thetaiotaomicron, 5 B. uniformis, 3 B. vulgatus
- (c) Includes 10 Fusobacterium (9 nucleatum, 1 spp), 25 Prevotella (5 P. bivia, 1 P. buccae, 2 P. denticola, 5 P. disiens, 3 P. intermedia, 3 P. melaninogenica, 2 P. oralis, 4 P. spp)
- (d) Includes 1 C. ramosum, 1 C. septicum, 3 C. sporogenes, 1 C. tertium
- (e) Includes 9 Cutibacterium acnes, 1 Peptostreptococcus anaerobius (0 Actinomyces, Bifidobacterium, Lactobacillus, etc.)

(R) Restricted. Use of these agents requires Infectious Diseases (ID) approval.

Cost per day (\$): \$ < 25; \$\$ 25-100; \$\$\$ 100-200; \$\$\$\$ > 200

VAPAHCS Fluoroquinolone Alternatives

Note: Use of fluoroquinolones is associated with increased risk of C.difficile infection/gram negative resistance/MRSA, with multiple potential adverse effects (e.g. QTc prolongation, peripheral neuropathy, tendon inflammation/ rupture, mental health side effects, hypoglycemia, aortic aneurysm/ dissection), which may be disabling and potentially permanent.

FDA alerts 5/2016, 7/2016, 7/2018, and 12/2018 advise against use of fluoroquinolones if there are alternative treatment options

Fluoroquinolone	Common Indications	Potential Oral Alternatives*	Comments
Ciprofloxacin <i>ID Criteria Restricted</i>	<ul style="list-style-type: none"> UTI Intra-abdominal infection (with metronidazole) Nosocomial pneumonia (double <i>Pseudomonas</i> coverage) Spontaneous bacterial peritonitis (SBP) prophylaxis 	<p><u>UTI</u>: nitrofurantoin; TMP/SMX; cephalexin; cefpodoxime</p> <p><u>SBP prophylaxis</u>: cefpodoxime; TMP/SMX</p>	Not reliable against gram positive organisms (<i>Streptococcus pneumoniae</i> , <i>Staphylococcus spp</i>); No anaerobic activity
Levofloxacin <i>ID Criteria Restricted</i>	<ul style="list-style-type: none"> CAP / Nosocomial pneumonia (double <i>Pseudomonas</i> coverage) Rhinosinusitis COPD exacerbation UTI 	<p><u>CAP, sinusitis</u>: oral beta-lactam[†] + azithromycin or doxycycline</p> <p><u>COPD</u>: amoxicillin/clavulanate; azithromycin; doxycycline</p> <p><u>UTI</u>: nitrofurantoin; TMP/SMX; cephalexin; cefpodoxime</p>	No anaerobic activity
Moxifloxacin <i>ID Restricted</i>	<ul style="list-style-type: none"> CAP Rhinosinusitis COPD exacerbation Intra-abdominal infection (caution: incr anaerobe resistance) 	<p><u>CAP, sinusitis</u>: oral beta-lactam[†] + azithromycin or doxycycline</p> <p><u>COPD</u>: amoxicillin/clavulanate; azithromycin; doxycycline</p> <p><u>Intra-abdom</u>: cefpodoxime + metronidazole; amoxicillin/clav</p>	Not recommended in UTI treatment No <i>Pseudomonas</i> activity Limited anaerobic activity

KEY: *Consider susceptibility data and need for renal dose adjustments; UTI - Urinary tract infection; TMP/SMX - trimethoprim/sulfamethoxazole; CAP - Community-acquired pneumonia; COPD – Chronic obstructive pulmonary disease; [†]According to IDSA guidelines for CAP and rhinosinusitis, **preferred** oral beta-lactam agents are high dose **amoxicillin** (1g PO TID) or Augmentin XR (nonformulary 2g/125mg PO BID). **Cefpodoxime** (200mg PO BID) is also an **alternative** option.

4/2014, Updated 2022