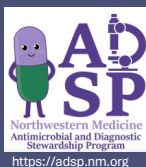




## Lake Forest Hospital Antibigrams - 2023

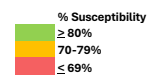
1. [Facility-wide Antibigram](#)
2. [Blood specimen-specific Antibigram](#)
3. [Emergency Department \(ED\)-specific Antibigram](#)
4. [Urine specimen-specific Antibigram](#)

# LFH 2023 Facility-Wide Antibiogram



Isolates	Amikacin	Ampicillin	Ampicillin/Sulbactam	Aztreonam	Cefazolin <sup>a</sup>	Cefepime <sup>l</sup>	Ceftazidime	Ceftazidime/Avibactam	Ceftolozane/Tazobactam	Ceftriaxone	Ciprofloxacin	Clindamycin	Daptomycin	Gentamicin	Levofloxacin	Linezolid	Meropenem <sup>s</sup>	Minocycline	Oxacillin	Pencilin G	Piperacillin/Tazobactam <sup>k</sup>	Sulfamethoxazole/Trimethoprim	Tetracycline	Tobramycin	Vancomycin	
<b>GRAM POSITIVES</b>																										
Enterococcus faecalis	377	100 <sup>b</sup>											80 <sup>i</sup>		99											99
Enterococcus faecium	61	28 <sup>b</sup>													99											58
Vancomycin-Resistant Enterococci	33	19 <sup>h</sup>											84 <sup>n</sup>		100											
Staphylococcus coagulase negative	124														100											
Staphylococcus aureus	573														100				40 <sup>h</sup>			90	87 <sup>l</sup>		100	
Methicillin-resistant Staphylococcus aureus	232														100							62	80 <sup>l</sup>		100	
Viridans Group Streptococci	117									97		82			98						99					100
<b>GRAM NEGATIVES</b>																										
Citrobacter freundii <sup>d</sup>	57	98		79		100					88			91	82	100						79	86		91	
Citrobacter koseri	32	100		100		100	100			97	97			97	97	100						100	97		97	
Enterobacter cloacae complex <sup>d</sup>	107	99		79		89					94			99	92	98						78	90		98	
Escherichia coli	1224	94	48 <sup>e</sup>	60	88	75	91	92			87	71			90		100					95	76		89	
Klebsiella aerogenes <sup>d</sup>	45	100			82		100					100			100	100	100					76	100		100	
Klebsiella oxytoca	91	97		69	92	47	96	98			88	91			93	85	99					93	91		92	
Klebsiella pneumoniae	304	98		81	88	85	91	90			86	84			93	83	99					93	84		91	
Morganella morganii	58	98			96		100	93							91	80	100					100	80		91	
Proteus mirabilis	232	98	84 <sup>e</sup>	89	99	65	98	99			97	82			89	82	99					100	83		90	
Pseudomonas aeruginosa	302	97 <sup>a</sup>			81		97	89	100	100		87			82		88					92			96	
Serratia species	54	87			98		100	100			92	94			96	91	100					100	100		78	
Stenotrophomonas maltophilia	34														82 <sup>m</sup>		82 <sup>m</sup>					100 <sup>m</sup>				
<b>MULTI-DRUG RESISTANT GRAM NEGATIVES</b>																										
Extended-Spectrum β-Lactamase Enterobacterales (ESBL)	239	72						100	92		15			62	8	99						41				48

Antibiogram data helps guide clinicians to choose appropriate empiric antibiotics for many infectious syndromes.  
See protocol for multi-drug resistant gram-negative agents for guidance

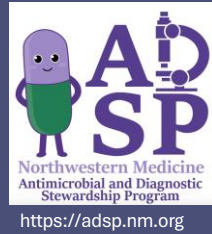


<sup>a</sup> %S using MIC breakpoint for urine sources only (≤ 16 mcg/ml). Not recommended for use outside of cystitis caused by *P. aeruginosa*.  
<sup>b</sup> Results of ampicillin susceptibility tests should be used to predict the activity of amoxicillin. Ampicillin may be used to predict susceptibility to amoxicillin-clavulanate, ampicillin-sulbactam, and piperacillin-tazobactam among non-β-lactamase-producing Enterococci in clinically stable/non-immunocompromised patients.  
<sup>c</sup> Results of ampicillin can predict results for amoxicillin and amoxicillin-clavulanate.  
<sup>d</sup> Klebsiella (formerly Enterobacter) aerogenes, Citrobacter freundii, and Enterobacter cloacae complex are intrinsically resistant to ampicillin/sulbactam and cefazolin and are at high-risk for ampC resistance expression.  
<sup>e</sup> For Enterobacterales, %S based on systemic MIC breakpoint of ≤ 2 (inferred via lowest Vitek automated dilution ≤ 4)  
<sup>f</sup> %S based on MIC ≤ 2 with daptomycin dosage regimen of 6-8 mg/kg every 24 hours  
<sup>g</sup> Should be reserved for patients who are intolerant to penicillins and cephalosporins or in patients who are suspected of having a drug-resistant bacteria.  
<sup>h</sup> For agents with established clinical efficacy, considering site of infection and appropriate dosing, oxacillin-susceptible Staphylococci can be considered susceptible to the following beta-lactam agents:  
 1) β-lactam combination agents (amoxicillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam);  
 2) Oral cephalosporins (cefactor, cefdinir, cephalixin, cefpodoxime, cefprozil, cefuroxime);  
 3) IV cephalosporins (cefazolin, cefepime, ceftriaxone); and 4) carbapenems (ertapenem, imipenem, meropenem)  
<sup>i</sup> Organisms that are susceptible to tetracycline are also considered susceptible to doxycycline and minocycline. However, some organisms that are intermediate or resistant to tetracycline may be susceptible to doxycycline, minocycline, or both.  
<sup>j</sup> %S based on susceptible MIC (≤ 2) & susceptible dose dependent MIC (up to 8) for Enterobacterales  
<sup>k</sup> %S based on susceptible MIC (≤ 8) & susceptible dose dependent MIC (up to 16) for Enterobacterales  
<sup>m</sup> For moderate to severe *S. maltophilia* infections consider using combination therapy until clinical improvement is observed.  
<sup>n</sup> %S based on MIC ≤ 4 with daptomycin dosage regimen of 8-12 mg/kg every 24 hours

Abbreviations: %S, percent susceptible; SDD, susceptible-dose-dependent  
 30 isolate threshold  
 Blank boxes indicate organism has intrinsic resistance to corresponding antimicrobial or resistance testing is not applicable  
 When risk for mortality or significant morbidity is high (eg. meningitis, septic shock/critical illness) agents with %S at least 90% should be selected.  
 Less significant concerns for mortality within the next 24 to 48 hours (eg. uncomplicated UTIs or community-acquired infections), %S of 80% may be appropriate.  
 Antibiogram Guidance (CLSI M100-Ed34)

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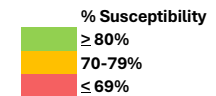
# LFH 2023 Blood Antibiogram



	Isolates	Amikacin	Ampicillin	Ampicillin/Sulbactam	Aztreonam	Cefazolin <sup>e</sup>	Cefepime <sup>j</sup>	Ceftazidime	Ceftriaxone	Ciprofloxacin	Clindamycin	Daptomycin	Doxycycline	Gentamicin	Levofloxacin	Linezolid	Meropenem <sup>g</sup>	Oxacillin	Piperacillin/Tazobactam <sup>k</sup>	Sulfamethoxazole/Trimethoprim	Tetracycline	Tobramycin	Vancomycin
<b>GRAM POSITIVES</b>																							
Staphylococcus aureus	52									78	100				100		71 <sup>h</sup>		98	85 <sup>i</sup>		100	
<b>GRAM NEGATIVES</b>																							
Escherichia coli	109	91	44 <sup>c</sup>	60	82	65	84	95	77	76				83	61		100		95	72		83	
Klebsiella species <sup>d</sup>	35	97		75 <sup>d</sup>	89	71 <sup>d</sup>	91	91	83	74				94	71		100		94	83		91	
<b>MULTI-DRUG RESISTANT GRAM NEGATIVES</b>																							
Extended-Spectrum $\beta$ -Lactamase Enterobacterales (ESBL)	30	70								10				53		100			47			50	

Antibiogram data helps guide clinicians to choose appropriate empiric antibiotics for many infectious syndromes.

[See protocol for multi-drug resistant gram-negative agents for guidance](#)



<sup>b</sup> Results of ampicillin susceptibility tests should be used to predict the activity of amoxicillin.

Ampicillin may be used to predict susceptibility to amoxicillin-clavulanate, ampicillin-sulbactam, and piperacillin-tazobactam among non- $\beta$ -lactamase-producing Enterococci in clinically stable/non-immunocompromised patients.

<sup>c</sup> Results of ampicillin can predict results for amoxicillin and amoxicillin-clavulanate.

<sup>d</sup> Klebsiella (formerly Enterobacter) aerogenes, Citrobacter freundii, and Enterobacter cloacae complex are intrinsically resistant to ampicillin/sulbactam and cefazolin and are at high-risk for ampC resistance expression.

<sup>e</sup> For Enterobacterales, %S based on systemic MIC breakpoint of  $\leq 2$  (inferred via lowest Vitek automated dilution  $\leq 4$ )

<sup>f</sup> %S based on MIC  $\leq 2$  with daptomycin dosage regimen of 6-8 mg/kg every 24 hours

<sup>g</sup> Should be reserved for patients who are intolerant to penicillins and cephalosporins or in patients who are suspected of having a drug-resistant bacteria.

<sup>h</sup> For agents with established clinical efficacy, considering site of infection and appropriate dosing, oxacillin-susceptible Staphylococci can be considered susceptible to the following beta-lactam agents:

- 1)  $\beta$ -lactam combination agents (amoxicillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam);
- 2) Oral cephalosporins (cefaclor, cefdinir, cephalexin, cefpodoxime, cefprozil, cefuroxime);
- 3) IV cephalosporins (cefazolin, cefepime, ceftriaxone); and 4) carbapenems (ertapenem, imipenem, meropenem)

<sup>i</sup> Organisms that are susceptible to tetracycline are also considered susceptible to doxycycline and minocycline. However, some organisms that are intermediate or resistant to tetracycline may be susceptible to doxycycline, minocycline, or both.

<sup>j</sup> %S based on susceptible MIC ( $\leq 2$ ) & susceptible dose dependent MIC (up to 8) for Enterobacterales

<sup>k</sup> %S based on susceptible MIC ( $\leq 8$ ) & susceptible dose dependent MIC (up to 16) for Enterobacterales

Abbreviations: %S, percent susceptible; SDD, susceptible-dose-dependent

30 isolate threshold

Blank boxes indicate organism has intrinsic resistance to corresponding antimicrobial or resistance testing is not applicable

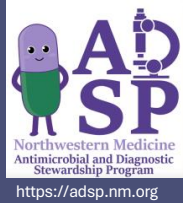
When risk for mortality or significant morbidity is high (eg. meningitis, septic shock/critical illness) agents with %S at least 90% should be selected.

Less significant concerns for mortality within the next 24 to 48 hours (eg. uncomplicated UTIs or community-acquired infections), %S of 80% may be appropriate.

Antibiogram Guidance (CLSI M100-Ed34)

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# LFH 2023 ED Antibiogram



## GRAM POSITIVES

Isolates	Amikacin	Ampicillin	Ampicillin/Sulbactam	Aztreonam	Cefazolin	Cefepime <sup>f</sup>	Ceftazidime	Ceftriaxone	Ciprofloxacin	Clindamycin	Daptomycin	Gentamicin	Levofloxacin	Linezolid	Meropenem <sup>g</sup>	Oxacillin	Penicillin G	Piperacillin/Tazobactam <sup>k</sup>	Sulfamethoxazole/Trimethoprim	Tetracycline	Tobramycin	Vancomycin
Enterococcus faecalis	194	100 <sup>b</sup>								81 <sup>f</sup>			99									97
Staphylococcus coagulase negative	44								61	98			100		45 <sup>h</sup>			86	82 <sup>i</sup>			100
Staphylococcus aureus	194								74	99			100		64 <sup>h</sup>			92	88 <sup>i</sup>			100
Methicillin-resistant Staphylococcus aureus	68								60	98			100					82	84 <sup>i</sup>			100
Viridans Group Streptococci	41							95	80			97				100						100

## GRAM NEGATIVES

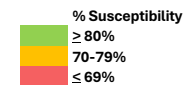
Citrobacter species <sup>d</sup>	37	100		78		100	77	77	89			89	81	100				86	86			89
Enterobacter cloacae complex <sup>d</sup>	35	100		69		100			91			100	89	97				71	89			100
Escherichia coli	821	93	47	57	87	74	91	92	84	69		88	60	99				95	72			86
Klebsiella aerogenes <sup>d</sup>	30	100			80		100			100		100	100	100				70	100			100
Klebsiella oxytoca	39	95		62	97	41	95	97	90	90		92	92	100				97	87			90
Klebsiella pneumoniae	173	97			80	85	83	90	89	84	83	92	83	99				92	83			89
Proteus mirabilis	106	97	82 <sup>c</sup>	88	98	64	98	96	96	81		86	80	100				100	82			88
Pseudomonas aeruginosa	110	99 <sup>a</sup>			80		99	83		86			78	81				92				100

## MULTI-DRUG RESISTANT GRAM NEGATIVES

Extended-Spectrum $\beta$ -Lactamase Enterobacterales (ESBL)	161	69							13			58	7	99					43			44
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Antibiogram data helps guide clinicians to choose appropriate empiric antibiotics for many infectious syndromes.

[See protocol for multi-drug resistant gram-negative agents for guidance](#)



<sup>a</sup> %S using MIC breakpoint for urine sources only ( $\leq 16$  mcg/ml). Not recommended for use outside of cystitis caused by *P. aeruginosa*.

<sup>b</sup> Results of ampicillin susceptibility tests should be used to predict the activity of amoxicillin.

Ampicillin may be used to predict susceptibility to amoxicillin-clavulanate, ampicillin-sulbactam, and piperacillin-tazobactam among non- $\beta$ -lactamase-producing enterococci in clinically stable/non-immunocompromised patients.

<sup>c</sup> Results of ampicillin can predict results for amoxicillin and amoxicillin-clavulanate.

<sup>d</sup> Klebsiella (formerly Enterobacter) aerogenes, Citrobacter freundii, and Enterobacter cloacae complex are intrinsically resistant to ampicillin/sulbactam and cefazolin and are at high-risk for ampC resistance expression.

<sup>e</sup> %S based on MIC  $\leq 2$  with daptomycin dosage regimen of 6-8 mg/kg every 24 hours

<sup>f</sup> Should be reserved for patients who are intolerant to penicillins and cephalosporins or in patients who are suspected of having a drug-resistant bacteria.

<sup>h</sup> For agents with established clinical efficacy, considering site of infection and appropriate dosing, oxacillin-susceptible Staphylococci can be considered susceptible to the following beta-lactam agents:

- 1)  $\beta$ -lactam combination agents (amoxicillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam);
- 2) Oral cephalosporins (cefaclor, cefdinir, cephalexin, cefpodoxime, cefprozil, cefuroxime);
- 3) IV cephalosporins (cefazolin, cefepime, ceftriaxone); and 4) carbapenems (ertapenem, imipenem, meropenem)

<sup>i</sup> Organisms that are susceptible to tetracycline are also considered susceptible to doxycycline and minocycline. However, some organisms that are intermediate or resistant to tetracycline may be susceptible to doxycycline, minocycline, or both.

<sup>j</sup> %S based on susceptible MIC ( $\leq 2$ ) & susceptible dose dependent MIC (up to 8) for Enterobacterales

<sup>k</sup> %S based on susceptible MIC ( $\leq 8$ ) & susceptible dose dependent MIC (up to 16) for Enterobacterales

Abbreviations: %S, percent susceptible; SDD, susceptible-dose-dependent

30 isolate threshold

Blank boxes indicate organism has intrinsic resistance to corresponding antimicrobial or resistance testing is not applicable

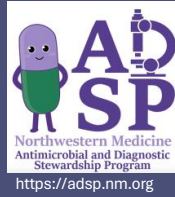
When risk for mortality or significant morbidity is high (eg. meningitis, septic shock/critical illness) agents with %S at least 90% should be selected.

Less significant concerns for mortality within the next 24 to 48 hours (eg. uncomplicated UTIs or community-acquired infections), %S of 80% may be appropriate.

Antibiogram Guidance (CLSI M100-Ed34)

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# LFH 2023 Urine Antibiogram

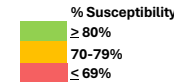


	Isolates	Amikacin	Ampicillin	Ampicillin/Sulbactam	Aztreonam	Cefazolin	Cefepime <sup>j</sup>	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Levofloxacin	Linezolid	Meropenem <sup>f</sup>	Nitrofurantoin	Oxacillin	Piperacillin/Tazobactam <sup>k</sup>	Sulfamethoxazole/Trimethoprim	Tetracycline	Tobramycin	Vancocycin
<b>GRAM POSITIVES</b>																					
Enterococcus faecalis	234		100 <sup>b</sup>									99		98							98
Enterococcus faecium	41		33 <sup>b,j</sup>									99		35							63
Staphylococcus aureus <sup>o</sup>	40											100			63 <sup>g</sup>		90				100
<b>GRAM NEGATIVES</b>																					
Citrobacter species <sup>d</sup>	44	100		86		100	86	86	86	91	82		100	87		93	82				93
Enterobacter species <sup>d</sup>	37	100		59		92			92	97	86		95	27		57	84				97
Escherichia coli	1039	95	49 <sup>c</sup>	60	88	83 <sup>p</sup>	91	93	85	70	90	62		99	96		96	74			88
Klebsiella species <sup>d</sup>	274	98		77 <sup>d</sup>	87	76 <sup>d</sup>	91	89	85	86	94	85		99	38		90	85			92
Proteus species	146	99	77 <sup>c</sup>	87	99	89	98	97	97	85	90	84		99			100	82			91
Pseudomonas aeruginosa	105	99 <sup>a</sup>		81		99	86			86		84		83			91				100
<b>MULTI-DRUG RESISTANT GRAM NEGATIVES</b>																					
Extended-Spectrum β-Lactamase Enterobacterales (ESBL-E)	193	72								16	62	8	99		75			41			47

Several agents have the potential to concentrate in the urine with an intermediate MIC. Contact ADSP for appropriate indication and recommended dosing.

Antibiogram data helps guide clinicians to choose appropriate empiric antibiotics for many infectious syndromes.

[See protocol for multi-drug resistant gram-negative agents for guidance](#)



<sup>a</sup> %S using MIC breakpoint for urine sources only (≤ 16 mcg/ml). Not recommended for use outside of cystitis caused by *P. aeruginosa*.

<sup>b</sup> Results of ampicillin susceptibility tests should be used to predict the activity of amoxicillin.

Ampicillin may be used to predict susceptibility to amoxicillin-clavulanate, ampicillin-sulbactam, and piperacillin-tazobactam among non-β-lactamase-producing enterococci in clinically stable/non-immunocompromised patients.

<sup>c</sup> Results of ampicillin can predict results for amoxicillin and amoxicillin-clavulanate.

<sup>d</sup> Klebsiella (formerly Enterobacter) aerogenes, Citrobacter freundii, and Enterobacter cloacae complex are intrinsically resistant to ampicillin/sulbactam and cefazolin and are at high-risk for ampC resistance expression.

<sup>e</sup> Should be reserved for patients who are intolerant to penicillins and cephalosporins or in patients who are suspected of having a drug-resistant bacteria.

<sup>f</sup> For agents with established clinical efficacy, considering site of infection and appropriate dosing, oxacillin-susceptible Staphylococci can be considered susceptible to the following beta-lactam agents:

- 1) β-lactam combination agents (amoxicillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam);
- 2) Oral cephalosporins (cefaclor, cefdinir, cephalexin, cefpodoxime, cefprozil, cefuroxime);
- 3) IV cephalosporins (cefazolin, cefepime, ceftriaxone); and 4) carbapenems (ertapenem, imipenem, meropenem)

<sup>h</sup> Organisms that are susceptible to tetracycline are also considered susceptible to doxycycline and minocycline. However, some organisms that are intermediate or resistant to tetracycline may be susceptible to doxycycline, minocycline, or both.

<sup>i</sup> For cases of cystitis, ampicillin is expected to achieve adequate urinary concentrations to overcome resistance up to MIC 256 mcg/dl and should be considered as first-line treatment.

<sup>j</sup> %S based on susceptible MIC (≤ 2) & susceptible dose dependent MIC (up to 8) for Enterobacterales

<sup>k</sup> %S based on susceptible MIC (≤ 8) & susceptible dose dependent MIC (up to 16) for Enterobacterales

<sup>o</sup> Staph aureus is not an expected urinary organism, outside of rare occasions of contamination from skin flora, which may be increased in patients with urinary catheters. Recommend ordering blood cultures when isolated from urine as clinically indicated.

<sup>p</sup> %S based on urinary MIC breakpoint of ≤ 16 for cystitis. For pyelonephritis & complicated infections outside of the bladder, refer to facility-wide antibiogram, Enterobacterales are 65-80% susceptible at MIC ≤ 4.

Enterobacterales included for the urinary (cystitis only) MIC breakpoint include *E. coli*, *K. pneumoniae*, and *P. mirabilis* only.

Abbreviations: %S, percent susceptible; SDD, susceptible-dose-dependent

30 isolate threshold

Blank boxes indicate organism has intrinsic resistance to corresponding antimicrobial or resistance testing is not applicable

When risk for mortality or significant morbidity is high (eg. meningitis, septic shock/critical illness) agents with %S at least 90% should be selected.

Less significant concerns for mortality within the next 24 to 48 hours (eg. cystitis, pyelonephritis or community-acquired infections with prompt clinical response), %S of 80% may be appropriate.

Antibiogram Guidance (CLSI M100-Ed34)

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