Antibiotic Panel 2023

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The suggestions for each organism group

- Clinical efficacy — اثر بخشی بالینی
- Prevalence of resistance — شیوع مقاومت
- Minimizing emergence of resistance — به حداقل رساندن ظهور مقاومت
- FDA clinical indications for use — اندیکاسیون های بالینی برای استفاده
- Current consensus recommendations for first-choice and alternative drugs — توصیه های مورد توافق اخیر برای انتخاب اول و داروهای جایگزین
- Cost — هزینه

Equivalent Agents

- **عوامل معادل**

آنتی بیوتیک هایی که در یک باکس برای دسته های تفسیری قرار می گیرند و اثربخشی بالینی آنها یکسان هستند.

آزمایشگاه معمولاً یکی از آنتی بیوتیک ها را بطور روتین استفاده می کند. در برخی مواقع هم بر اساس سیاست های یک مرکز درمانی هیچکدام استفاده نمی شود.

در برخی از باکسها کلمه **or** بین عوامل ضد میکروبی قرار می گیرند. نتایج مقاوم یا حساس در این گروه خیلی نزدیک بهم می باشد.;

در این آنتی بیوتیک ها بر اساس آزمایش در یک جمعیت میکروبی خطاهای با اهمیت زیاد و یا با اهمیت خیلی زیاد کمتر از ۳٪ و خطاهای کم اهمیت کمتر از ۱۰٪ می باشد.

کاربرد or وقتی است که حداقل ۱۰۰ سویه با مقاومت در برابر عوامل مورد نظر باید آزمایش شوند و نتیجه مقاوم باید برای حداقل ۹۵ درصد سویه ها به دست آید

Tier	Definition	Test	Report	Additional Test and Reporting Consideration
1	Antimicrobial agents that are appropriate for routine, primary testing and reporting	Routine	Routine	
2	Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution			
3	Antimicrobial agents that are appropriate for routine, primary testing			
4				

Antimicrobial Agent Test and Report Tiers and Additional Considerations for Agents Listed in Tab

Tier	Definition	Test	Report[a]	Additional Testing and Reporting Considerations
1	Antimicrobial agents that are appropriate for routine, primary testing and reporting	Routine	Routine	
2	Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Routine	Cascade[b]	• Report following cascade reporting rules due to resistance to agent(s) in Tier 1. • May be reported routinely based on institution-specific guidelines.
3	Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high-risk for MDROs but should only be reported following cascade reporting rules established at each institution[c]	Routine or by request	Cascade[b]	Test routinely based on institution-specific guidelines or by clinician request and report following cascade reporting rules due to resistance to agent(s) in Tiers 1 and 2.

Tier	Definition	Test	Report[a]	Additional Testing and Reporting Considerations
4	Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors	By request	By request	• Test and report by clinician request due to: – Unavailability of preferred drug for clinical use – Patient underlying condition, including allergies – Unusual susceptibility profile of the organism, including resistance to agents in Tiers 1, 2, and 3 – Polymicrobial infection • May also warrant testing as an epidemiological aid (eg, testing ceftazidime for Enterobacterales to indicate potential extended-spectrum β-lactamase production; see Table 3A).
Urine only	Antimicrobial agents designated by a "(U)" in Tables 2 should be reported only on organisms isolated from the urinary tract.	Routine	Report as appropriate	Agents in Tiers 1, 2, and 3 may also be reported on urine isolates, as appropriate, following the testing and reporting guidance for the respective tiers.

Abbreviations: MDRO, multidrug-resistant organism; UTI, urinary tract infection.

Designation	Definition	Test	Report[a]	Additional Testing and Reporting Considerations
Other	Antimicrobial agents with established clinical breakpoints designated by an * in Tables 2 that are generally not candidates for testing and reporting in the United States	By request	By request	Test and report only by clinician request and only following consultation with the antimicrobial stewardship team and other relevant institutional stakeholders to ensure appropriateness of the request. Agents with an "Other" designation may not reflect current consensus recommendations for first-choice and alternative drugs for the specific organism or organism group.
Inv.	Antimicrobial agents that are investigational for the organism group designated by "Inv." in Tables 2 have not yet been approved by the FDA for use in the United States.	By request	By request	Test and report only by clinician request and only following consultation with the antimicrobial stewardship team and other relevant institutional stakeholders to ensure appropriateness of the request. These agents would likely be clinically available for compassionate use only.

a. Antimicrobial agents should be reported selectively, as appropriate (eg, because it is effective in treating uncomplicated UTIs only, nitrofurantoin would be reported only on isolates from urine). Refer to section D for definition of cascade reporting.

b. b. Identification of patients at high risk for MDROs will likely be communicated by infection preventionists. For examples of criteria used to identify patients at high risk for MDROs, see https://www.cdc.gov/hai/organisms/ESBL.html and https://www.cdc.gov/mrsa/community/index.html

- **Breakpoint Definition**

- نقطه انفصالی سنجه ای است که بر اساس آن MIC یا قطر هاله عدم رشد برای دسته بندی ارگانیسم ها به حساس، حساس وابسته به دوز، حساس بینابینی، مقاوم یا غیر حساس مورد استفاده قرار می گیرد.

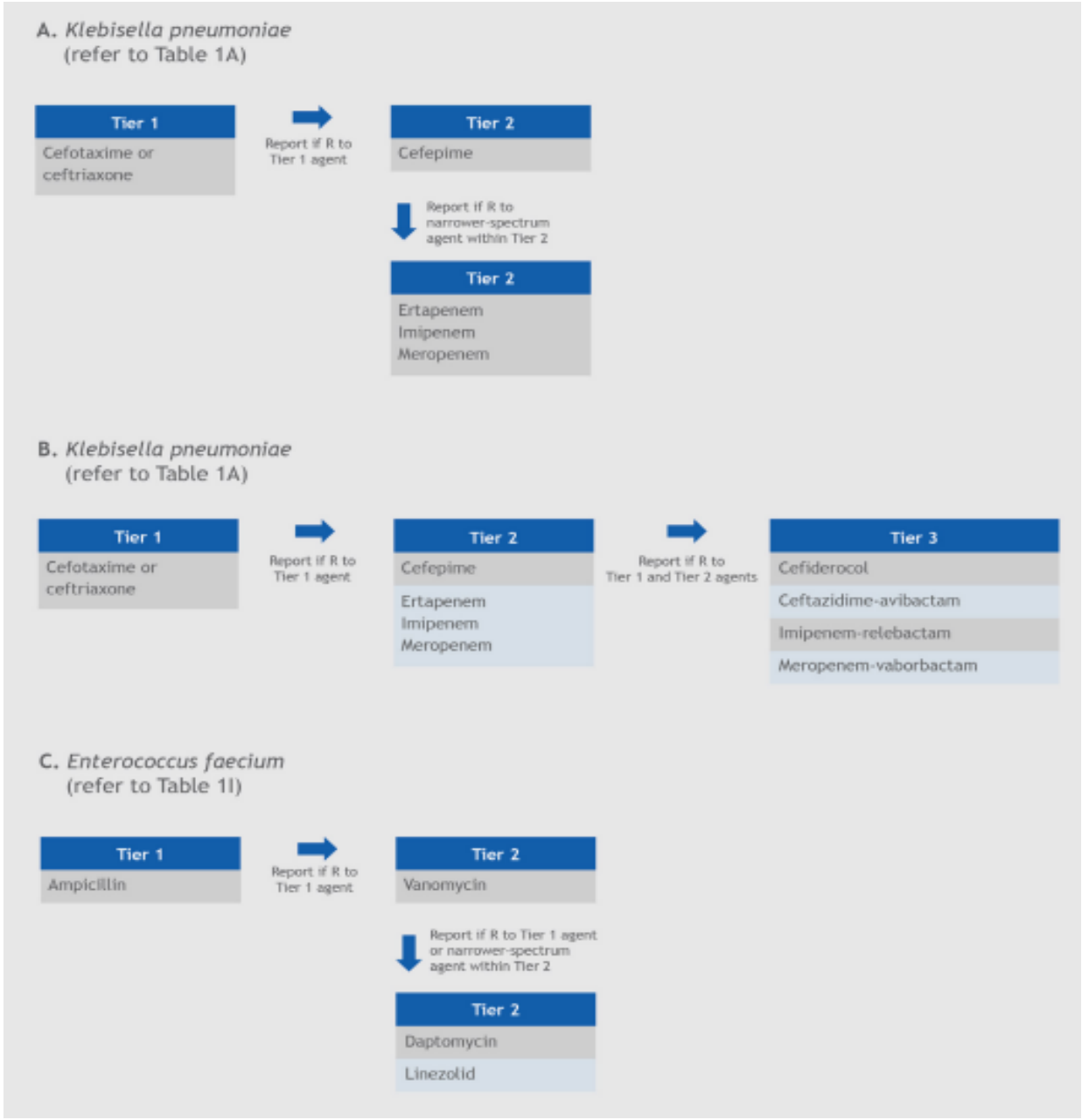
- **Susceptible**

- اصطلاح حساس به گروهی از باکتری های جدا شده اطلاق می گردد که رشد آنها در برابر غلظت داروی ضد میکروبی، بر اساس دوز توصیه شده که معمولاً در محل عفونت به دست می آید، مهار شود.

- **Intermediate**

- اصطلاح حساسیت بینابینی به گروهی از باکتری های جدا شده اطلاق می گردد که با سطح MIC به دست آمده در خون و بافت، پاسخی پایین تر از باکتری های حساس می دهند.
- کاربرد آن: در مناطقی از بدن که دارو از لحاظ فیزیولوژیک در بافت تغلیظ می شود (کینولون ها و بتا لاکتام ها در ادرار)
- زمانی که مقدار دارو را می توان بیش از حد معمول تجویز کرد مثل بتالاکتام ها
- ایجاد یک محدوده برای جلوگیری از خطا های کوچک و غیر قابل کنترل تکنیکی بویژه برای دارو هایی که حاشیه مسمومیت دارویی آنها محدود است.

- **Susceptible-dose dependent**
  - حساسیت وابسته به دوز تعریف دسته ای است که بر اساس نقطه انفصالی حساسیت یک ایزوله وابسته به دوز رژیم درمانی مورد استفاده برای یک بیمار است.
- **Resistant**
  - اصطلاح مقاوم به گروهی از باکتری های جدا شده اطلاق می گردد که:
  - الف) رشد آنها با غلظت های معمولی دارو با دوز متداول تجویز شده مهار نشود یا
  - ب) هاله عدم رشد بدست آمده از آنها به علت مکانیسم های ویژه مقاومت میکروبی نظیر بتالاکاتامازهایی مانند MRSA یا ESBL باید بصورت مقاوم گزارش گردد.
- **Non susceptible**
  - این دسته بندی برای ارگانیسم هایی است که فقط محدوده تفسیری حساس دارند اما محدوده تفسیری بینابینی یا مقاوم ندارند.



interpretive category

Interpretive Category	Breakpoints	
	MIC, µg/mL	Zone Diameter, mm
Susceptible	≤ 4	≥ 20
Susceptible-dose dependent	8-16	15-19
Intermediate	8-16	15-19
Resistant	≥ 32	≤ 14
Non susceptible	> 1	≤ 17

Example of Breakpoints and Interpretive Categories

Antimicrobial Agent	Disk Content	Interpretive Categories and Zone Diameter Breakpoints, nearest whole mm			Interpretive Categories and MIC Breakpoints, µg/mL		
		S	I	R	S	I	R
X	30 µg	≥ 20	15-19	≤ 14	≤ 4	8-16	≥ 32
Y	-	-	-	-	≤ 1	2	≥ 4
Z	10 µg	≥ 16	-	-	≤ 1	-	-

Warning

Locations	Organisms	Antimicrobial Agents
"Warning": The following antimicrobial agent-organism combinations may appear active *in vitro* but are not effective clinically and must not be reported as susceptible.		
Table 2A	*Salmonella* spp., *Shigella* spp.	First- and second-generation cephalosporins, cephamycins, and aminoglycosides
Table 2D	*Enterococcus* spp.	Aminoglycosides (except for high-level resistance testing), cephalosporins, clindamycin, and trimethoprim-sulfamethoxazole
"Warning": Do not report the following antimicrobial agents for bacteria isolated from CSF. These are not the drugs of choice and may not be effective for treating CSF infections caused by the bacteria included in Tables 2A through 2J:		
Tables 2A through 2J	Bacteria isolated from CSF	Agents administered by oral route only, first- and second-generation cephalosporins and cephamycins, doripenem, ertapenem, imipenem, clindamycin, lefamulin, macrolides, tetracyclines, and fluoroquinolones

Table 1A. Enterobacterales (not including inducible AmpC producers and *Salmonella*/*Shigella*)

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ampicillin			
Cefazolin	Cefuroxime		
Cefotaxime or ceftriaxone[b]	Cefepime[c]		
	Ertapenem Imipenem Meropenem	Cefiderocol	
		Ceftazidime-avibactam	
		Imipenem-relebactam	
		Meropenem-vaborbactam	
Amoxicillin-clavulanate Ampicillin-sulbactam			
Piperacillin-tazobactam			
Gentamicin	Tobramycin	Plazomicin	
	Amikacin		
Ciprofloxacin Levofloxacin			
Trimethoprim-sulfamethoxazole			
	Cefotetan Cefoxitin		
	Tetracycline[d]		
			Aztreonam
			Ceftaroline[b]
			Ceftazidime[b]
			Ceftolozane-tazobactam
Urine Only			
Cefazolin (surrogate for uncomplicated UTI)[e]			
Nitrofurantoin			
		Fosfomycin[f] (*Escherichia coli*)	

Abbreviations: MDRO, multidrug-resistant organism; UTI, urinary tract infection.

Table 1A. Enterobacterales (Continued)

Footnotes

a. See Appendix B for species-specific intrinsic resistance profiles. If an antimicrobial agent-organism combination that is defined as intrinsically resistant is tested, the result hould be reported as resistant. Consideration may be given to adding comments regarding intrinsic resistance of agents not tested.

b. *Citrobacter freundii* complex, *Enterobacter cloacae* complex, *Hafnia alvei*, *Klebsiella* (formerly *Enterobacter) aerogenes*, *Morganella morganii*, *Providencia* spp., *Serratia marcescens*, and *Yersinia enterocolitica* may test susceptible to ceftriaxone, cefotaxime, ceftazidime, and ceftaroline, but these agents may be ineffective against these genera within a few days after initiation of therapy due to derepression of inducible AmpC β-lactamase. The risk of AmpC derepression during therapy is moderate to high with *C. freundii* complex, *E. cloacae complex*, and *K. aerogenes* and appears to be less frequent with *M. morganii*, *Providencia* spp., and *S. marcescens*.[1] Therefore, isolates that are initially susceptible may become resistant. Testing subsequent isolates may be warranted if clinically indicated.

c. Cefepime should be considered a Tier 1 agent for testing and/or reporting of *C. freundii* complex, *E. cloacae* complex, *H. alvei*, *K. aerogenes*, *M. morganii*, *Providencia* spp., *S. marcescens*, and *Y. enterocolitica* (see footnote b).[1]

d. 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 or minocycline, or both.

e. See cefazolin comments in Table 2A for using cefazolin as a surrogate test for oral cephalosporins and for reporting cefazolin when used for therapy in uncomplicated UTIs.

f. Report only on *E. coli* isolated from the urinary tract.

Table 1B. *Salmonella* and *Shigella* spp.[a,b]

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ampicillin			
Ciprofloxacin Levofloxacin			
Trimethoprim-sulfamethoxazole			
Cefotaxime or ceftriaxone			Ertapenem[c] Imipenem[c] Meropenem[c]
	Azithromycin[d]		
			Tetracycline[e]

Abbreviation: MDRO, multidrug-resistant organism.

Footnotes

a. Table 2A should be used for interpreting antimicrobial susceptibility testing results for *Salmonella* and *Shigella* spp.

b. WARNING: For *Salmonella* spp. and *Shigella* spp., aminoglycosides, first- and second-generation cephalosporins, and cephamycins may appear active *in vitro* but are not effective clinically and should not be reported as susceptible. Routine susceptibility testing is not indicated for nontyphoidal *Salmonella* spp. isolated from intestinal sources. However, susceptibility testing is indicated for all *Shigella* isolates. When fecal isolates of *Salmonella* and *Shigella* spp. are tested, only ampicillin, a fluoroquinolone, and trimethoprim-sulfamethoxazole should be reported routinely. In addition, for extraintestinal isolates of *Salmonella* spp., a third-generation cephalosporin should be tested and reported. Azithromycin may be tested and reported per institutional guidelines.

c. Ertapenem, imipenem, and/or meropenem might be considered for testing and/or reporting for isolates resistant to all agents in Tiers 1 and 2, although there are limited clinical data suggesting their effectiveness for treating salmonellosis or shigellosis.[1]

d. Report only on *Salmonella enterica* ser. Typhi and *Shigella* spp.

e. 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.

NOTE: Information in black boldface type is new or modified since the previous edition.

Table 1C. *Pseudomonas aeruginosa*

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution.	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ceftazidime	Imipenem	Cefiderocol	
Cefepime	Meropenem	Ceftazidime-avibactam	
Piperacillin-tazobactam		Ceftolozane-tazobactam	
		Imipenem-relebactam	
Tobramycin			
Ciprofloxacin Levofloxacin			
			Aztreonam
Urine Only			
	Amikacin		

Abbreviation: MDRO, multidrug-resistant organism.

Table 1D. *Acinetobacter* spp.

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ampicillin-sulbactam			
Ceftazidime	Imipenem Meropenem	Cefiderocol	
Cefepime			
Ciprofloxacin Levofloxacin			
Gentamicin Tobramycin	Amikacin		
	Piperacillin-tazobactam		
	Trimethoprim-sulfamethoxazole		
	Minocycline		Doxycycline
			Cefotaxime Ceftriaxone
			Colistin or polymyxin B
Urine only			
Tetracycline[a]			

Abbreviation: MDRO, multidrug-resistant organism.

Footnote

a. 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.

Table 1E. *Burkholderia cepacia* complex

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ceftazidime			
Meropenem			
Levofloxacin[a]			
Minocycline			
Trimethoprim-sulfamethoxazole			

Abbreviations: MDRO, multidrug-resistant organism; MIC, minimal inhibitory concentration.

Footnote

a. **MIC testing only; disk diffusion test is unreliable.**

Table 1F. *Stenotrophomonas maltophilia*

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Levofloxacin			
Minocycline			
Trimethoprim-sulfamethoxazole			
		Cefiderocol	
			Ceftazidime[a]

Abbreviations: MDRO, multidrug-resistant organism; MIC, minimal inhibitory concentration.

Footnote

a. MIC testing only; disk diffusion test is unreliable.

Table 1G. Other Non-Enterobacterales[a,b]

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ceftazidime	Cefepime		
	Imipenem Meropenem		
Gentamicin Tobramycin	Amikacin		
Piperacillin-tazobactam			
Trimethoprim-sulfamethoxazole			
	Aztreonam		
	Ciprofloxacin Levofloxacin		
	Minocycline		
			Cefotaxime Ceftriaxone
Urine Only			
Tetracycline[c]			

Abbreviations: MDRO, multidrug-resistant organism; MIC, minimal inhibitory concentration.

Footnotes

a. Other non-Enterobacterales include *Pseudomonas* spp. and other nonfastidious, glucose-nonfermenting, gram-negative bacilli but exclude *Pseudomonas aeruginosa*, *Acinetobacter* spp., *Burkholderia cepacia* complex, and *Stenotrophomonas maltophilia*. Refer to each respective Table 1 for suggested antimicrobial agents to test and report.

b. MIC testing only; disk diffusion test is unreliable.

c. 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.

Table 1H. *Staphylococcus* spp.

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Azithromycin or clarithromycin or erythromycin[a]			
Clindamycin[a]			
Oxacillin[b,c,d,e] Cefoxitin[b,c,d] (surrogate for oxacillin)		Ceftaroline[f]	
Doxycycline Minocycline[a] Tetracycline[g]			
Trimethoprim-sulfamethoxazole			
Vancomycin[h]			
	Penicillin [b,i]		
	Daptomycin[h,j]		
	Linezolid	Tedizolid[f]	
		Rifampin[h,k]	
		Lefamulin[a,f]	
			Ciprofloxacin or levofloxacin Moxifloxacin
			Dalbavancin[f,h]
			Oritavancin[f,h]
			Telavancin[f,h]
			Gentamicin[l]
Urine Only			
Nitrofurantoin			

Abbreviations: MDRO, multidrug-resistant organism; MIC, minimal inhibitory concentration.

Table 1H. *Staphylococcus* spp. (Continued)

Footnotes

a. Not routinely reported on organisms isolated from the urinary tract.

b. Penicillin-susceptible staphylococci are also susceptible to other β-lactam agents with established clinical efficacy for staphylococcal infections. Penicillin-resistant staphylococci are resistant to penicillinase-labile penicillins. Methicillin (oxacillin)-resistant staphylococci are resistant to all currently available β-lactam antimicrobial agents, with the exception of ceftaroline. Thus, susceptibility or resistance to a wide array of β-lactam antimicrobial agents may be determined from testing only penicillin and either cefoxitin or oxacillin. Routine testing of other β-lactam agents, except ceftaroline, is not advised.

c. If a penicillinase-stable penicillin is tested, oxacillin is the preferred agent, and results can be applied to the other penicillinase-stable penicillins (refer to Glossary I). Detection of methicillin (oxacillin) resistance in staphylococci is achieved by using specific methods, as described in Tables 2C, 3G-1, and 3G-2.

d. See oxacillin and cefoxitin comments in Table 2C for using cefoxitin as a surrogate test for oxacillin.

e. For *S. aureus*, *S. lugdunensis*, and other *Staphylococcus* spp. (except *S. epidermidis*, *S. pseudintermedius*, and *S. schleiferi*), only MIC testing, not disk diffusion testing, is acceptable; see exceptions in Table 2C.

f. For *S. aureus* only, including methicillin (oxacillin)-resistant *S. aureus*.

g. 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.

h. MIC testing only; disk diffusion test is unreliable.

i. If penicillin is tested, report results when confirmed susceptible (see Table 2C comment [11], and Table 3F).

j. Not routinely reported on organisms isolated from the respiratory tract.

k. *Rx*: Rifampin should not be used alone for antimicrobial therapy.

l. For staphylococci that test susceptible, gentamicin is used only in combination with other active agents that test susceptible.

Organism	Phenotypic Methods for Detection of Methicillin (Oxacillin)-Resistant *Staphylococcus* spp.				
	Cefoxitin MIC	Cefoxitin disk diffusion	Oxacillin MIC	Oxacillin disk diffusion	Oxacillin salt agar
S. aureus	Yes (16-20 h)	Yes (16-18 h)	Yes (24 h)	No	Yes (24 h)
S. lugdunensis	Yes (16-20 h)	Yes (16-18 h)	Yes (24 h)	No	No
S. epidermidis	No	Yes (24 h)	Yes (24 h)	Yes (16-18 h)	No
S. pseudintermedius	No	No	Yes (24 h)	Yes (16-18 h)	No
S. schleiferi	No	No	Yes (24 h)	Yes (16-18 h)	No
Staphylococcus spp. (not listed above or not identified to the species level)	No	Yes[a] (24 h)	Yes[a] (24 h)	No	No

Table 1I. *Enterococcus* spp.

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ampicillin[a] Penicillin[b]			
	Vancomycin		
	Gentamicin[c] (high-level resistance testing only)	Streptomycin[c] (high-level resistance testing only)	
	Daptomycin[d,e]		
	Linezolid	Tedizolid	
			Dalbavancin[d,f]
			Oritavancin[d,f]
			Telavancin[d,f]
Urine only			
Nitrofurantoin			
	Ciprofloxacin Levofloxacin		
		Fosfomycin[g]	
		Tetracycline[h]	

Abbreviations: MDRO, multidrug-resistant organism; MIC, minimal inhibitory concentration.

Footnotes

a. The results of ampicillin susceptibility tests should be used to predict the activity of amoxicillin. Ampicillin results may be used to predict susceptibility to amoxicillin-clavulanate, ampicillin-sulbactam, and piperacillin-tazobactam among non-ß-lactamase-producing enterococci. Ampicillin susceptibility can be used to predict imipenem susceptibility, provided the species is confirmed to be *Enterococcus faecalis*.

b. Enterococci susceptible to penicillin are predictably susceptible to ampicillin, amoxicillin, ampicillin-sulbactam, amoxicillin-clavulanate, and piperacillin-tazobactam for non-ß-lactamase-producing enterococci. However, enterococci susceptible to ampicillin cannot be assumed to be susceptible to penicillin. If penicillin results are needed, testing of penicillin is required. *Rx*: Combination therapy with high-dosage parenteral ampicillin, amoxicillin, penicillin, or vancomycin (for susceptible strains only) plus an aminoglycoside is usually indicated for serious enterococcal infections such as endocarditis, unless high-level resistance to both gentamicin and streptomycin is documented; such combinations are predicted to result in synergistic killing of enterococci.

c. See additional testing and reporting information in Table 3K.

Table 1I. *Enterococcus* spp. (Continued)

d. MIC testing only; disk diffusion test is unreliable.

e. Not routinely reported on organisms isolated from the respiratory tract.

f. Report only on vancomycin-susceptible *E. faecalis*.

g. Report only on *E. faecalis* urinary tract isolates.

h. 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.

WARNING: For *Enterococcus* spp., aminoglycosides (except for high-level resistance testing), cephalosporins, clindamycin, and trimethoprim-sulfamethoxazole may appear active *in vitro*, but they are not effective clinically, and isolates should not be reported as susceptible.

NOTE: Information in black boldface type is new or modified since the previous edition.