European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 11.0, valid from 2021-01-01

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Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow.** **Changed comments are underlined. Removed comments are shown in strikethrough font style.**
General	• MIC and zone diameter breakpoints are linked to the search page of the new EUCAST database for MIC and zone diameter distributions. • Explanation added for "off scale breakpoints" (S≤0.001 mg/L, S≥50 mm) in relevant tables • Links added to rationale documents for temocillin, ceftazidime-avibactam and ceftolozane-tazobactam • "Mecillinam oral" changed to "Mecillinam oral (Pivmecillinam)" • Cefiderocol breakpoints added • Doripenem breakpoints added • Lefamulin breakpoints added
Notes	• Note 4 updated with information on links from MIC and zone diameter breakpoints. • Explanation added for breakpoints in brackets.
Dosages	**General** • Indications added for daptomycin **New dosages** • Temocillin • Cefiderocol • Doripenem • Fidaxomicin • Lefamulin **Revised dosages** • Piperacillin • Piperacillin-tazobactam • Cefaclor **New comments** • Piperacillin • Piperacillin-tazobactam • Doripenem • Daptomycin **Revised comments** • Cefaclor • Cefixime • Ceftriaxone • Azithromycin • Clarithromycin • Chloramphenicol

Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow.** **Changed comments are underlined. Removed comments are shown in strikethrough font style.**
Enterobacterales	**General** • Link to cefiderocol guidance document added in MIC methodology • New indications related to meningitis for cefotaxime, ceftriaxone and meropenem • List of species streamlined for imipenem and imipenem-relebactam • Species information added for fosfomycin oral **New breakpoints** • Temocillin (MIC and zone diameter) • Cefazolin (zone diameter) • Cefiderocol (MIC and zone diameter) • Cefotaxime (meningitis) [MIC and zone diameter] • Ceftriaxone (meningitis) [MIC and zone diameter] • Doripenem (MIC and zone diameter) • Imipenem-relebactam (zone diameter) • Meropenem (meningitis) [MIC and zone diameter] **Revised breakpoints** • Piperacillin (MIC and zone diameter) • Piperacillin-tazobactam (MIC and zone diameter) • Imipenem (zone diameter) • Tobramycin (zone diameter) • Fosfomycin iv (zone diameter) • Fosfomycin oral (MIC) **New ATUs** • Cefiderocol (zone diameter) • Ceftolozane-tazobactam (zone diameter) **Revised ATUs** • Piperacillin-tazobactam (zone diameter) **New comments** • Cephaloporins comment 2/A • Cephaloporins comment 3 **Revised comments** • Macrolides comment 1 **Removed comments** • Penicillins previous comment 5/C (temocillin)

Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow.** **Changed comments are underlined. Removed comments are shown in strikethrough font style.**
***Pseudomonas* spp.**	**General** • Link to cefiderocol guidance document added in MIC methodology **New breakpoints** • Cefiderocol (MIC and zone diameter) • Doripenem (MIC and zone diameter) • Imipenem-relebactam (zone diameter) • Meropenem (meningitis) [MIC and zone diameter] **Revised breakpoints** • Cefoxitin (changed from NA to dash) • Ceftolozane-tazobactam (zone diameter) **New ATUs** • Cefiderocol (zone diameter) **New comments** • Cephalosporins comment 1
Stenotrophomonas maltophilia	**General** • Link to cefiderocol guidance document added in MIC methodology • Notes added for cefiderocol **New comments** • Cephalosporins comment 1 • Cephalosporins comment A
***Acinetobacter* spp.**	**General** • Link to cefiderocol guidance document added in MIC methodology • Notes added for cefiderocol **New breakpoints** • Doripenem (MIC and zone diameter) • Imipenem-relebactam (zone diameter) • Meropenem (meningitis) [MIC and zone diameter] **Revised breakpoints** • Meropenem-vaborbactam (changed from IE to Note 2/A) **New comments** • Cephalosporins comment 1 • Cephalosporins comment A • Carbapenems comment 2/A

Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.**
***Staphylococcus* spp.**	**General** • Taxonomy information updated • All penicillin comments and placement of comments reviewed • Species information added for oxacillin **New breakpoints** • Oxacillin (separate lines for "Oxacillin (screen only), *S. pseudintermedius* and *S. schleiferi*" and "Oxacillin, other staphylococci") • Doripenem (Note) • Lefamulin (MIC and zone diameter) **Revised breakpoints** • Benzylpenicillin, Coagulase-negative staphylococci (changed from dash to Note 2/C) **Removed breakpoints** • Ofloxacin (changed to Note 2/D) **New comments** • Penicillins comment 2/C • Penicillins comment E • Fluoroquinolones comment 2/D **Revised comments** • Penicillins comment 1/A (staphylococci changed to *S. aureus*) • Tetracyclines comment B
***Enterococcus* spp.**	**General** • Note added for lefamulin **Revised breakpoints** • Imipenem-relebactam (changed from IE to Note 1/A) • Moxifloxacin (changed from dash to Note 1/B) **New comments** • Carbapenems comment 1/A • Fluoroquinolones comment 1/B • Miscellaneous agents comment 2/A **Revised comments** • Fluoroquinolones comment C
Streptococcus groups A, B, C and G	**General** • New indication related to meningitis for benzylpenicillin **New breakpoints** • Benzylpenicillin (meningitis) [MIC and zone diameter] • Doripenem (Note) **Revised breakpoints** • Cefoxitin (changed from NA to IE)

Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.**
Streptococcus pneumoniae	**General** • New indications related to meningitis for ampicillin, amoxicillin iv, cefotaxime and ceftriaxone • Clarification in flow chart for meningitis and screen-positive isolates **New breakpoints** • Ampicillin (meningitis) [MIC] • Amoxicillin iv (meningitis) [MIC] • Cefotaxime (meningitis) [MIC] • Ceftriaxone (meningitis) [MIC] • Doripenem (MIC) • Lefamulin (MIC and zone diameter) **Revised breakpoints** • Cefoxitin (changed from NA to IE) **New comments** • Penicillins comment B • Cephaloporins comment B • Carbapenems comment B • Miscellaneous agents comment 1 **Removed comments** • Penicillins previous comment 2
Viridans group streptococci	**New breakpoints** • Benzylpenicillin (screen only) [MIC] • Doripenem (MIC) **Revised breakpoints** • Cefoxitin (changed from NA to IE) • Imipenem-relebactam (zone diameter) [changed from IP to Note 2/B] • Meropenem-vaborbactam (changed from IE to Note 2/B) • Moxifloxacin (changed from IE to Note 1/B) • Linezolid (changed from dash to IE) • Tedizolid (MIC) • Rifampicin (changed from dash to Note 1/A) **Removed breakpoints** • Cefazolin (MIC) **New comments** • Penicillins comment 2 • Cephalosporins comment 1 • Carbapenems comment 2/A • Fluoroquinolones comment 1/B • Miscellaneous agents comment 1/A **Revised comments** • Penicillins comment 1/A • Penicillins comment 3/B • Cephalosporins comment A • Carbapenems comment A

Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.**
Haemophilus influenzae	**General** • New indications related to meningitis for ampicillin and amoxicillin iv • Clarification regarding meningitis in flow chart **New breakpoints** • Ceftolozane-tazobactam (zone diameter) • Doripenem (MIC and zone diameter) **Revised breakpoints** • Cefoxitin (changed from NA to IE) • Imipenem-relebactam (changed from IE to Note 3/E) • Meropenem-vaborbactam (changed from IE to Note 3/E) **New ATUs** • Ceftolozane-tazobactam (zone diameter) **New comments** • Penicillins comment F • Cephalosporins comment 4 • Carbapenems comment 3/E • Miscellaneous agents comment 1
Moraxella catarrhalis	**New breakpoints** • Doripenem (MIC and zone diameter) **Revised breakpoints** • Cefoxitin (changed from NA to IE) • Imipenem-relebactam (changed from IE to Note 2/A)) • Meropenem-vaborbactam (changed from IE to Note 2/A) **Removed breakpoints** • Chlorampenicol (referral to tables of topical agents) **New comments** • Carbapenems comment 2/A
Neisseria gonorrhoeae	**Revised breakpoints** • Cefoxitin (changed from dash to IE)
Neisseria meningitidis	**General** • New indications related to meningitis for ampicillin, amoxicillin and meropenem • Note added for doripenem **Revised breakpoints** • Benzylpenicillin • Ertapenem (changed from dash to IE) • Imipenem (changed from dash to Note 2) • Imipenem-relebactam (changed from dash to Note 3) • Meropenem-vaborbactam (changed from IE to Note 3) **New comments** • Carbapenems comment 2 • Carbapenems comment 3
Gram-positive anaerobes	**New breakpoints** • Doripenem **Revised breakpoints** • Meropenem-vaborbactam (changed from IE to Note 2) **New comments** • Penicillins comment 1 • Carbapenems comment 2

Version 10.0, 2020-01-01	**Changes (cells containing a change, a deletion or an addition) from v. 10.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.**
Gram-negative anaerobes	**New breakpoints** • Doripenem **Revised breakpoints** • Meropenem-vaborbactam (changed from IE to Note 2) **New comments** • Carbapenems comment 2
Listeria monocytogenes	**General** • New indications related to meningitis for benzylpenicillin
Campylobacter jejuni **and** ***coli***	**Revised breakpoints** • Ciprofloxacin (MIC and zone diameter)
Corynebacterium **spp.**	**Revised breakpoints** • Ciprofloxacin (MIC and zone diameter) • Gentamicin (changed from dash to IE)
Achromobacter xylosoxidans	• New table
Bacillus **spp.**	• New table
Mycobacterium tuberculosis	**New breakpoints** • Pretomanid **New comment** • Comment 2
Topical agents	**Revised screening cut-off values** • *P. aeruginosa* and tobramycin (zone diameter) • *P. aeruginosa* and ciprofloxacin (zone diameter) • *M. catarrhalis* and chloramphenicol (zone diameter)
PK-PD breakpoints	**New breakpoints** • Cefiderocol • Doripenem • Fosfomycin oral • Lefamulin **Revised breakpoints** • Piperacillin • Piperacillin-tazobactam **New comments** • Cephalosporins comment 1

European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 11.0, valid from 2021-01-01

Notes

1. The EUCAST clinical breakpoint tables contain clinical MIC breakpoints (determined or revised during 2002-2019) and their inhibition zone diameter correlates. The EUCAST breakpoint table version 10.0 includes corrected typographical errors, clarifications, breakpoints for new agents and/or organisms, revised MIC breakpoints and revised and new zone diameter breakpoints. Changes are best seen on screen or on a colour printout since cells containing a change are yellow. New or revised comments are underlined. Removed comments are shown in strikethrough font style.

2. PK-PD (Non-species related) breakpoints are listed separately.

3. Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

4. Antimicrobial agent names in blue are linked to EUCAST rationale documents. MIC and zone diameter breakpoints in blue are linked to the search page of the EUCAST MIC and zone diameter distribution database.

5. The document is released as an Excel® file suitable for viewing on screen and as an Acrobat® pdf file suitable for printing. To utilize all functions in the Excel® file, use Microsoft™ original programs only. The Excel® file enables users to alter the list of agents to suit the local range of agents tested. The content of single cells cannot be changed. Hide lines by right-clicking on the line number and choose "hide". Hide columns by right-clicking on the column letter and choose "hide".

6. EUCAST breakpoints are used to categorise results into three susceptibility categories:
S - Susceptible, standard dosing regimen: A microorganism is categorised as *Susceptible, standard dosing regimen,* when there is a high likelihood of therapeutic success using a standard dosing regimen of the agent.
I - Susceptible, increased exposure: A microorganism is categorised as *Susceptible, increased exposure* * when there is a high likelihood of therapeutic success because exposure to the agent is increased by adjusting the dosing regimen or by its concentration at the site of infection.
R - Resistant: A microorganism is categorised as *Resistant* when there is a high likelihood of therapeutic failure even when there is increased exposure.
*Exposure is a function of how the mode of administration, dose, dosing interval, infusion time, as well as distribution and excretion of the antimicrobial agent will influence the infecting organism at the site of infection.

7. For an agent and a species, the ECOFF (epidemiological cut-off value) is the highest MIC (or the smallest inhibition zone diameter) for organisms devoid of phenotypically detectable acquired resistance mechanisms. Breakpoints in brackets are based on ECOFF values for relevant species. They are used to distinguish between organisms with and without acquired resistance mechanisms. ECOFFs do not predict clinical susceptibility but in some situations and/or when the agent is combined with another active agent, therapy may be considered.

8. An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report “Susceptible, standard dosing regimen” (S).

9. For some organism-agent combinations, results may be in an area where the interpretation is uncertain. EUCAST has designated this an Area of Technical Uncertainty (ATU). It corresponds to an MIC value and/or zone diameter interval where the categorisation is doubtful. See separate page for more information on ATU and how to deal with results in the ATU.

10. In order to simplify the EUCAST tables, the "Susceptible, increased exposure" (I category) is not listed. It is interpreted as values between the S and the R breakpoints. For example, for MIC breakpoints listed as S ≤ 1 mg/L and R > 8 mg/L, the I category is 2-8 (technically >1-8) mg/L, and for zone diameter breakpoints listed as S ≥ 22 mm and R < 18 mm, the I category is 18-21 mm.

Notes

11. For *Escherichia coli* with fosfomycin, *Stenotrophomonas maltophilia* with trimethoprim-sulfamethoxazole, *Staphylococcus aureus* with benzylpenicillin, enterococci with vancomycin, *Haemophulis influenzae* with beta-lactam agents, *Aeromonas* spp. with trimethoprim-sulfamethoxazole and *Burkholderia pseudomallei* with trimethoprim-sulfamethoxazole, it is crucial to follow specific reading instructions for correct interpretation of the disk diffusion test. For these, pictures with reading examples are included at the end of the corresponding breakpoint table. For general and other specific reading instructions, please refer to the EUCAST Reading Guide.

12. With a few exceptions, EUCAST recommends the use of the broth microdilution reference method as described by the International Standards Organisation for MIC determination of non-fastidious organisms. For fastidious organisms, EUCAST recommends the use of the same methodology but with the use of MH-F broth (MH broth with lysed horse blood and beta-NAD), see EUCAST media preparation file at www.eucast.org. There are a number of commercially available surrogate methods, for which it is the responsibility of the manufacturer to guarantee the accuracy of the system and the responsibility of the user to quality control the results.

13. By international convention MIC dilution series are based on twofold dilutions up and down from 1 mg/L. At dilutions below 0.25 mg/L, this leads to concentrations with multiple decimal places. To avoid having to use these in tables and documents, EUCAST has decided to use the following format (in bold): 0.125→ **0.125**, 0.0625→**0.06**, 0.03125→**0.03**, 0.015625→**0.016**, 0.0078125→**0.008**, 0.00390625→**0.004** and 0.001953125→**0.002** mg/L.

14. Definitions of "uncomplicated UTI" and “Infections originating from the urinary tract” used with EUCAST breakpoints:
Uncomplicated UTI: acute, sporadic or recurrent lower urinary tract infections (uncomplicated cystitis) in patients with no known relevant anatomical or functional abnormalities within the urinary tract or comorbidities.
Infections originating from the urinary tract: Infections originating from, but not confined to, the urinary tract, including acute pyelonephritis and bloodstream infections.

"-" indicates that susceptibility testing is not recommended as the species is a poor target for therapy with the agent. Isolates may be reported as R without prior testing.
"IE" indicates that there is insufficient evidence that the organism or group is a good target for therapy with the agent. An MIC with a comment but without an accompanying S, I or R categorisation may be reported.
NA = Not Applicable
IP = In Preparation
( ) = Breakpoints in brackets are based on ECOFF values for relevant species. They are used to distinguish between organisms with and without acquired resistance mechanisms. ECOFFs do not predict clinical susceptibility but in some situations and/or when the agent is combined with another active agent, therapy may be considered.

Guidance on reading EUCAST Breakpoint Tables

EUCAST Clinical Breakpoint Tables v. 11.0, valid from 2021-01-01

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium:
Inoculum:
Incubation:
Reading:
Quality control:

EUCAST methodology and quality control for MIC determination

Disk diffusion (EUCAST standardised disk diffusion method)
Medium:
Inoculum:
Incubation:
Reading:
Quality control:

EUCAST methodology and quality control for disk diffusion

An arbitrary "off scale" breakpoint which categorises wild-type organisms as "Susceptible, increased exposure (I)".

Breakpoints with a species name apply only to that particular species (in this example *S. aureus*)

The I category is not listed but is interpreted as the values between the S and the R breakpoints. If the S and R breakpoints are the same value there is no I category.

Agent A: No I category
Agent B: I category: 4 mg/L, 23-25 mm
Agent H: I category: 1-2 mg/L, 24-29 mm

Area of Technical Uncertainty
See specific information on how to handle technical uncertainty in antimicrobial susceptibility testing.

Antimicrobial agent	MIC breakpoint (mg/L)			Disk content (µg)	Zone diameter breakpoint (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Antimicrobial agent A	1[1]	1[1]		X	20[A]	20[A]		**1.** Notes that are general comments and/or relating to MIC breakpoints.
Antimicrobial agent B	2[2]	4		Y	26	23		**2.** New comment ~~Removed comment~~
Antimicrobial agent C	0.001	8		X	50	18		
Antimicrobial agent D, *S. aureus*	IE	IE			IE	IE		**A.** Comment on disk diffusion
Antimicrobial agent E	-	-			-	-		
Antimicrobial agent F	IP	IP			IP	IP		
Antimicrobial agent G (screen only)	NA	NA		Y	25	25		
Antimicrobial agent H	0.5	2		Z	30	24		
Antimicrobial agent I	(8)[1]	(8)[1]		30	(18)[A]	(18)[A]		

Changes from previous version highlighted in yellow

Screening breakpoint to differentiate between isolates without and with resistance mechanisms

Not Applicable (disk screening breakpoint only)

No breakpoints. Susceptibility testing is not recommended

MIC breakpoints in blue are linked to MIC distributions

In Preparation

Zone diameter breakpoints in blue are linked to zone diameter distributions

Antimicrobial agents in blue are linked to EUCAST rationale documents

Breakpoints in brackets are used to distinguish between organisms with and without acquired resistance mechanisms (see Notes)

Insufficient evidence that the organism or group is a good target for therapy with the agent

EUCAST breakpoints are based on the following dosages (see section 8 in Rationale Documents). Alternative dosing regimens may result in equivalent exposure. The table should not be considered a guidance for dosing in clinical practice, and does not replace specific local, national, or regional dosing guidelines. However, if national practices significantly differ from those listed below, EUCAST breakpoints may not be valid. Situations where less antibiotic is given as standard or high dose should be discussed locally or regionally.

Uncomplicated UTI: acute, sporadic or recurrent lower urinary tract infections (uncomplicated cystitis) in patients with no known relevant anatomical or functional abnormalities within the urinary tract or comorbidities.

Penicillins	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Benzylpenicillin	0.6 g (1 MU) x 4 iv	1.2 g (2 MU) x 4-6 iv		**Meningitis caused by *S. pneumoniae:*** For a dose of 2.4 g (4 MU) x 6 iv, isolates with MIC≤0.06 mg/L are susceptible. **Pneumonia caused by *S. pneumoniae:* breakpoints are related to dosage:** For a dose of 1.2 g (2 MU) x 4 iv, isolates with MIC ≤0.5 mg/L are susceptible. For a dose of 2.4 (4 MU) g x 4 iv or 1.2 g (2 MU) x 6 iv, isolates with MIC ≤1 mg/L are susceptible. For a dose of 2.4 g (4 MU) x 6 iv, isolates with MIC ≤2 mg/L are susceptible.
Ampicillin	2 g x 3 iv	2 g x 4 iv		**Meningitis:** 2 g x 6 iv
Ampicillin-sulbactam	(2 g ampicillin + 1 g sulbactam) x 3 iv	(2 g ampicillin + 1 g sulbactam) x 4 iv		
Amoxicillin iv	1 g x 3-4 iv	2 g x 6 iv		**Meningitis:** 2 g x 6 iv
Amoxicillin oral	0.5 g x 3 oral	0.75-1 g x 3 oral	0.5 g x 3 oral	
Amoxicillin-clavulanic acid iv	(1 g amoxicillin + 0.2 g clavulanic acid) x 3-4 iv	(2 g amoxicillin + 0.2 g clavulanic acid) x 3 iv		
Amoxicillin-clavulanic acid oral	(0.5 g amoxicillin + 0.125 g clavulanic acid) x 3 oral	(0.875 g amoxicillin + 0.125 g clavulanic acid) x 3 oral	(0.5 g amoxicillin + 0.125 g clavulanic acid) x 3 oral	Amoxicillin-clavulanic acid has separate breakpoints for systemic infections and uncomplicated UTI. When amoxicillin-clavulanic acid is reported for uncomplicated UTI, the report must make clear that the susceptibility category is only valid for uncomplicated UTI.
Piperacillin	4 g x 4 iv	4 g x 4 iv by extended 3-hour infusion		High dosage for more serious infections.
Piperacillin-tazobactam	(4 g piperacillin + 0.5 g tazobactam) x 4 iv or x 3 by extended 4-hour infusion	(4 g piperacillin + 0.5 g tazobactam) x 4 iv by extended 3-hour infusion		A lower dosage of (4 g piperacillin + 0.5 g tazobactam) x 3 iv is adequate for some infections such as complicated UTI, intraabdominal infections and diabetic foot infections, but not for infections caused by isolates resistant to third-generation cephalosporins.
Ticarcillin	3 g x 4 iv	3 g x 6 iv		
Ticarcillin-clavulanic acid	(3 g ticarcillin + 0.1-0.2 g clavulanic acid) x 4 iv	(3 g ticarcillin + 0.1 g clavulanic acid) x 6 iv		
Temocillin	2 g x 2 iv	2 g x 3 iv		The 2 g x 2 iv dose has been used in the treatment of uncomplicated UTI caused by bacteria with beta-lactam resistance mechanisms.
Phenoxymethylpenicillin	0.5-2 g x 3-4 oral depending on species and/or infection type	None		
Oxacillin	1 g x 4 iv	1 g x 6 iv		
Cloxacillin	0.5 g x 4 oral or 1 g x 4 iv	1 g x 4 oral or 2 g x 6 iv		
Dicloxacillin	0.5-1 g x 4 oral or 1 g x 4 iv	2 g x 4 oral or 2 g x 6 iv		
Flucloxacillin	1 g x 3 oral or 2 g x 4 iv (or 1 g x 6 iv)	1 g x 4 oral or 2 g x 6 iv		
Mecillinam oral (pivmecillinam)	None	None	0.2-0.4 g x 3 oral	

Cephalosporins	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Cefaclor	0.25-0.5 g x 3 oral depending on species and/or infection type	1 g x 3 oral		***Staphylococcus* spp.:** Minimum dose 0.5 g x 3 oral
Cefadroxil	0.5-1 g x 2 oral	None	0.5-1 g x 2 oral	
Cefalexin	0.25-1 g x 2-3 oral	None	0.25-1 g x 2-3 oral	
Cefazolin	1 g x 3 iv	2 g x 3 iv		
Cefepime	1 g x 3 iv or 2 g x 2 iv	2 g x 3 iv		
Cefiderocol	2 g x 3 iv over 3 hours	None		
Cefixime	0.2-0.4 g x 2 oral	None	0.2-0.4 g x 2 oral	**Uncomplicated gonorrhoea:** 0.4 g oral as a single dose
Cefotaxime	1 g x 3 iv	2 g x 3 iv		**Meningitis:** 2 g x 4 iv ***S. aureus:*** High dose only
Cefpodoxime	0.1-0.2 g x 2 oral	None	0.1-0.2 g x 2 oral	
Ceftaroline	0.6 g x 2 iv over 1 hour	0.6 g x 3 iv over 2 hours		***S. aureus* in complicated skin and skin structure infections:** There is some PK-PD evidence to suggest that isolates with MICs of 4 mg/L could be treated with high dose.
Ceftazidime	1 g x 3 iv	2 g x 3 iv or 1 g x 6 iv		
Ceftazidime-avibactam	(2 g ceftazidime + 0.5 g avibactam) x 3 iv over 2 hours			
Ceftibuten	0.4 g x 1 oral	None		
Ceftobiprole	0.5 g x 3 iv over 2 hours	None		
Ceftolozane-tazobactam (intra-abdominal infections and UTI)	(1 g ceftolozane + 0.5 g tazobactam) x 3 iv over 1 hour	None		
Ceftolozane-tazobactam (hospital acquired pneumonia, including ventilator associated pneumonia)	(2 g ceftolozane + 1 g tazobactam) x 3 iv over 1 hour	None		
Ceftriaxone	2 g x 1 iv	2 g x 2 iv or 4 g x 1 iv		**Meningitis:** 2 g x 2 iv or 4 g x 1 iv ***S. aureus:*** High dose only **Uncomplicated gonorrhoea:** 0.5-1 g im as a single dose
Cefuroxime iv	0.75 g x 3 iv	1.5 g x 3 iv		
Cefuroxime oral	0.25 g x 2 oral	0.5 g x 2 oral	0.25 g x 2 oral	

Carbapenems	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Doripenem	0.5 g x 3 iv over 1 hour	1 g x 3 iv over 1 hour		HAP/VAP* due to non-fermenting Gram-negative pathogens (such as *Pseudomonas* spp. and *Acinetobacter* spp.) should be treated with 1 g x 3 iv over 4 hours.
Ertapenem	1 g x 1 iv over 30 minutes	None		
Imipenem	0.5 g x 4 iv over 30 minutes	1 g x 4 iv over 30 minutes		
Imipenem-relebactam	(0.5 g imipenem + 0.25 g relebactam) x 4 iv over 30 minutes	None		
Meropenem	1 g x 3 iv over 30 minutes	2 g x 3 iv over 3 hours		**Meningitis:** 2 g x 3 iv over 30 minutes (or 3 hours)
Meropenem-vaborbactam	(2 g meropenem + 2 g vaborbactam) x 3 iv over 3 hours			

* HAP/VAP = hospital-acquired pneumonia/ventilator-associated pneumonia

Monobactams	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Aztreonam	1 g x 3 iv	2 g x 4 iv		

Fluoroquinolones	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Ciprofloxacin	0.5 g x 2 oral or 0.4 g x 2 iv	0.75 g x 2 oral or 0.4 g x 3 iv		
Delafloxacin	0.45 g x 2 oral or 0.3 g x 2 iv	None		
Levofloxacin	0.5 g x 1 oral or 0.5 g x 1 iv	0.5 g x 2 oral or 0.5 g x 2 iv		
Moxifloxacin	0.4 g x 1 oral or 0.4 g x 1 iv	None		
Norfloxacin	None	None	0.4 g x 2 oral	
Ofloxacin	0.2 g x 2 oral or 0.2 g x 2 iv	0.4 g x 2 oral or 0.4 g x 2 iv		

Aminoglycosides	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Amikacin	25-30 mg/kg x 1 iv	None		
Gentamicin	6-7 mg/kg x 1 iv	None		
Netilmicin	Under review	Under review		
Tobramycin	6-7 mg/kg x 1 iv	None		

Glycopeptides and lipoglycopeptides	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Dalbavancin	1 g x 1 iv over 30 minutes on day 1 If needed, 0.5 g x 1 iv over 30 minutes on day 8	None		
Oritavancin	1.2 g x 1 (single dose) iv over 3 hours	None		
Teicoplanin	0.4 g x 1 iv	0.8 g x 1 iv		
Telavancin	10 mg/kg x 1 iv over 1 hour	None		
Vancomycin	0.5 g x 4 iv or 1 g x 2 iv or 2 g x 1 by continuous infusion	None		Based on body weight. Therapeutic drug monitoring should guide dosing.

Macrolides, lincosamides and streptogramins	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Azithromycin	0.5 g x 1 oral or 0.5 g x 1 iv	None		**Uncomplicated gonorrhoea:** 2 g oral as a single dose
Clarithromycin	0.25 g x 2 oral	0.5 g x 2 oral		In some countries clarithromycin is available for intravenous administration at a dose of 0.5 g x 2, principally for treating pneumonia.
Erythromycin	0.5 g x 2-4 oral or 0.5 g x 2-4 iv	1 g x 4 oral or 1 g x 4 iv		
Roxithromycin	0.15 g x 2 oral	None		
Telithromycin	0.8 g x 1 oral	None		
Clindamycin	0.3 g x 2 oral or 0.6 g x 3 iv	0.3 g x 4 oral or 0.9 g x 3 iv		
Quinupristin-dalfopristin	7.5 mg/kg x 2 iv	7.5 mg/kg x 3 iv		

Tetracyclines	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Doxycycline	0.1 g x 1 oral	0.2 g x 1 oral		
Eravacycline	1 mg/kg x 2 iv	None		
Minocycline	0.1 g x 2 oral	None		
Tetracycline	0.25 g x 4 oral	0.5 g x 4 oral		
Tigecycline	0.1 g loading dose followed by 50 mg x 2 iv	None		

Oxazolidinones	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Linezolid	0.6 g x 2 oral or 0.6 g x 2 iv	None		
Tedizolid	0.2 g x 1 oral or 0.2 g x 1 iv	None		

Miscellaneous agents	Standard dosage	High dosage	Uncomplicated UTI	Special situations
Chloramphenicol	1 g x 4 oral or 1 g x 4 iv	2 g x 4 oral or 2 g x 4 iv		For chloramphenicol treatment of meningitis always use intravenous high dose.
Colistin	4.5 MU x 2 iv with a loading dose of 9 MU	None		
Daptomycin (cSSTI** without concurrent *S. aureus* bacteraemia)	4 mg/kg x 1 iv	None	.	.
Daptomycin (cSSTI** with concurrent *S. aureus* bacteraemia; right-sided infective endocarditis due to *S. aureus*)	6 mg/kg x 1 iv	None		**Enterococcal bloodstream infection and endocarditis,** see http://www.eucast.org/guidance_documents/.
Fidaxomicin	0.2 g x 2 oral	None		
Fosfomycin iv	4 g x 3 iv	8 g x 3 iv		
Fosfomycin oral	None	None	3 g x 1 oral as a single dose	
Fusidic acid	0.5 g x 2 oral or 0.5 g x 2 iv	0.5 g x 3 oral or 0.5 g x 3 iv		
Lefamulin	0.15 g x 2 iv or 0.6 g x 2 oral	None		
Metronidazole	0.4 g x 3 oral or 0.4 g x 3 iv	0.5 g x 3 oral or 0.5 g x 3 iv		
Nitrofurantoin	None	None	50-100 mg x 3-4 oral	Dosing is dependent on drug formulation.
Nitroxoline	None	None	0.25 g x 3 oral	
Rifampicin	0.6 g x 1 oral or 0.6 g x 1 iv	0.6 g x 2 oral or 0.6 g x 2 iv		
Spectinomycin	2 g x 1 im	None		
Trimethoprim	None	None	0.16 g x 2 oral	
Trimethoprim-sulfamethoxazole	(0.16 g trimethoprim + 0.8 g sulfamethoxazole) x 2 oral or (0.16 g trimethoprim + 0.8 g sulfamethoxazole) x 2 iv	(0.24 g trimethoprim + 1.2 g sulfamethoxazole) x 2 oral or (0.24 g trimethoprim + 1.2 g sulfamethoxazole) x 2 iv	(0.16 g trimethoprim + 0.8 g sulfamethoxazole) x 2 oral	

** cSSTI = complicated skin and skin structure infection

European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 11.0, valid from 2021-01-01

How to handle technical uncertainty in antimicrobial susceptibility testing

All measurements are affected by random variation and some by systematic variation. Systematic variation can normally be avoided and random variation should be reduced as much as possible. Antimicrobial susceptibility testing (AST), irrespective of method, is no exception.

EUCAST strives to minimise variation by providing standardised methods for MIC determination and disk diffusion and by avoiding setting breakpoints which seriously affect the reproducibility of AST. Variation in AST can be further reduced by setting more stringent standards for manufacturers of AST material (broth, agar, antimicrobial disks) and criteria for quality control of manufacturing processes and laboratory practices.

It is tempting to think that generating an MIC value will solve all problems. However, MIC measurements also have variation and a single value is not automatically accurate. Even when using the reference method, MICs might vary between days and technicians. Under the best of circumstances, an MIC of 1.0 mg/L should be considered as a value between 0.5 and 2.0 mg/L, although the probability of getting any one of these three values is not equal and will vary among strains and antimicrobial agents. Not infrequently, EUCAST discovers problems with commercial testing systems including quality of disks and media for disk diffusion, commercial panels for broth microdilution tests, gradient tests and semi-automated AST devices. Some of these affect accuracy (poorly calibrated concentration series) and others precision (poor general quality,

Although AST is straightforward for most agents and species, there are problematic situations even when testing is performed to a high standard. It is important to warn laboratories about these and the uncertainty of susceptibility categorisation. Analysis of EUCAST data (readily available at http://www.eucast.org/ast_of_bacteria/calibration_and_validation/) that have been generated over the years has identified such situations, named by EUCAST "**Area of Technical Uncertainty (ATU)**". The ATUs are **warnings to laboratory staff** that there is an uncertainty that needs to be addressed before reporting AST results to clinical colleagues. The ATU is not a susceptibility category and does not prevent the laboratory from interpreting the susceptibility test result.

Below are alternatives for how the ATUs can be dealt with by the laboratory. Which of these actions are chosen will depend on the situation. The type of sample (blood culture vs. urine culture), the number of alternative agents available, the severity of the disease, whether or not a consultation with clinical colleagues is feasible, will

- **Repeat the test**
  To ONLY repeat the test is relevant if there is reason to suspect a technical problem in the primary AST. To repeat the test while confirming the result with another test is good laboratory practice. If an MIC test is performed, the chances are that this result may also end up in the ATU. If so, a primary test and an alternative test may both point to a result and an interpretation in the ATU. In this case, interpret the result according to the breakpoints and report.
- **Use an alternative test (perform an MIC or a genotypic test)**
  This may be relevant if the susceptibility report otherwise leaves only few therapeutic alternatives. If the organism is multi-resistant, perform an MIC determination for several antibiotics, possibly extending the AST to include new beta-lactam inhibitor combinations and colistin for Gram-negative bacteria. Sometimes it may be necessary to perform genotypic or phenotypic characterisation of the resistance mechanism to obtain more information, some of which may be of importance for epidemiological decisions. When performing an MIC, this result may end up in the ATU. In this case, interpret the result according to the breakpoints and report.
- **Downgrade the susceptibility category**
  If there are other therapeutic alternatives in the AST report, it is permissible to downgrade the result (from S to I, or from I to R or from S to R). However, a comment should be included and the isolate saved for further testing.

How to handle technical uncertainty in antimicrobial susceptibility testing

- **Include the uncertainty as part of the report**
  It is common practice in many other laboratory settings to include information on the uncertainty of the reported result. This can be dealt with in several alternative ways:
  • Report results in the ATU as "uncertain". This can be achieved by leaving the interpretation "blank + a comment".
  • Develop the LIS system to deliver an asterix or Note (instead of an S, I or R) which refers to a comment explaining the uncertainty.
  • Categorise the result according to the breakpoints but include information about the technical difficulties and/or the uncertainty of the interpretation. In many instances, an "R" is less ambiguous than other alternatives, especially when there are alternative agents. Do not report "S" unless you have confirmed the result.
  For serious situations, take the opportunity to contact the clinical colleague to explain and discuss the results.
- **Omit an uncertain result**
  When there are several therapeutic options, or when an ambiguous interpretation cannot be readily resolved in a timely manner, an ATU result is best left either unreported or downgraded (see above).

The Area of Technical Uncertainty is typically listed as a defined MIC value or in disk diffusion as a range of 2-4 mm. ATUs are only listed when obviously needed. The absence of an ATU (MIC and/or zone diameter) means that there is no immediate need for a warning. The ATUs introduced in 2019 (v. 9.0) will be evaluated and ATUs may be added as more information develops.

Link to the guidance material available on the EUCAST website.

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1 except for mecillinam and fosfomycin where agar dilution is used)
Medium: Mueller-Hinton broth (for cefiderocol, see http://www.eucast.org/guidance documents/)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Escherichia coli* ATCC 25922. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor combinations, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Escherichia coli* ATCC 25922. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor-combination disks, see EUCAST QC Tables.

*** Recent taxonomic studies have narrowed the definition of the family Enterobacteriaceae. Some previous members of this family are now included in other families within the Order *Enterobacterales*. Breakpoints in this table apply to all members of the *Enterobacterales*.**

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Benzylpenicillin	-	-			-	-	
Ampicillin[1]	8	8		10	14[A]	14[A]	
Ampicillin-sulbactam[1]	8[2]	8[2]		10-10	14[A]	14[A]	
Amoxicillin[1]	8	8		-	Note[B]	Note[B]	
Amoxicillin-clavulanic acid[1]	8[3]	8[3]		20-10	19[A]	19[A]	19-20
Amoxicillin-clavulanic acid (uncomplicated UTI only)	32[3]	32[3]		20-10	16[A]	16[A]	
Piperacillin	8	8		30	20	20	
Piperacillin-tazobactam	8[4]	8[4]	16	30-6	20	20	19
Ticarcillin	8	16		75	23	20	
Ticarcillin-clavulanic acid	8[3]	16[3]		75-10	23	20	
Temocillin (infections originating from the urinary tract), *E. coli, Klebsiella* spp. (except *K. aerogenes*) and *P. mirabilis*	0.001	16		30	50[C]	17[C]	
Phenoxymethylpenicillin	-	-			-	-	
Oxacillin	-	-			-	-	
Cloxacillin	-	-			-	-	
Dicloxacillin	-	-			-	-	
Flucloxacillin	-	-			-	-	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only), *E. coli, Citrobacter* spp., *Klebsiella* spp., *Raoultella* spp., *Enterobacter* spp. and *P. mirabilis*	8[5]	8[5]		10	15[C]	15[C]	

Notes

Numbered notes relate to general comments and/or MIC breakpoints.
Lettered notes relate to the disk diffusion method.

1. Aminopenicillin breakpoints in *Enterobacterales* are based on intravenous administration. For oral administration the breakpoints are relevant for urinary tract infections only. Breakpoints for other infections are under review.
2. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
3. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
4. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
~~**5/C.** Breakpoints still under consideration.~~
5. Agar dilution is the reference method for mecillinam MIC determination.

A. Ignore growth that may appear as a thin inner zone on some batches of Mueller-Hinton agars.
B. Susceptibility inferred from ampicillin.
C. Ignore isolated colonies within the inhibition zone.

Cephalosporins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor	-	-			-	-		**1.** The cephalosporin breakpoints for *Enterobacterales* will detect all clinically important resistance mechanisms (including ESBL and plasmid mediated AmpC). Some isolates that produce beta-lactamases are susceptible to 3rd or 4th generation cephalosporins with these breakpoints and should be reported as tested, i.e. the presence or absence of an ESBL does not in itself influence the categorisation of susceptibility. ESBL detection and characterisation are recommended for public health and infection control purposes.
Cefadroxil (uncomplicated UTI only)	16	16		**30**	12	12		
Cefalexin (uncomplicated UTI only)	16	16		**30**	14	14		
Cefazolin (infections originating from the urinary tract), *E. coli,* and *Klebsiella spp.* (except *K. aerogenes*)	0.001[2]	4[2]		**30**	50[A]	20[A]		**2/A.** Isolates susceptible to cefadroxil and/or cefalexin can be reported "susceptible, increased exposure" (I) to cefazolin.
Cefepime	1	4		**30**	27	24		**3.** Broth microdilution MIC determination must be performed in iron-depleted Mueller-Hinton broth and specific reading instructions must be followed. For testing conditions and reading instructions, see http://www.eucast.org/guidance_documents/.
Cefiderocol	2[3]	2[3]		**30**	22	22	18-22	
Cefixime (uncomplicated UTI only)	1	1		**5**	17	17		**4.** The cefoxitin ECOFF (8 mg/L) has a high sensitivity but poor specificity for identification of AmpC-producing *Enterobacterales* as this agent is also affected by permeability alterations and some carbapenemases. Classical non-AmpC producers are wild type, whereas plasmid AmpC producers or chromosomal AmpC hyperproducers are non-wild type.
Cefotaxime (indications other than meningitis)	1	2		**5**	20	17		
Cefotaxime (meningitis)	1	1		**5**	20	20		**5.** For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L.
Cefoxitin (screen only)[4]	Note[4]	Note[4]		**30**	19	19		**6.** See table of dosages for dosing for different indications.
Cefpodoxime (uncomplicated UTI only)	1	1		**10**	21	21		**7.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Ceftaroline	0.5	0.5		**5**	23	23	22-23	
Ceftazidime	1	4		**10**	22	19		
Ceftazidime-avibactam	8[5]	8[5]		**10-4**	13	13		
Ceftibuten (infections originating from the urinary tract)	1	1		**30**	23	23		
Ceftobiprole	0.25	0.25		**5**	23	23		
Ceftolozane-tazobactam[6]	2[7]	2[7]		**30-10**	22	22	19-21	
Ceftriaxone (indications other than meningitis)	1	2		**30**	25	22		
Ceftriaxone (meningitis)	1	1		**30**	25	25		
Cefuroxime iv, *E. coli, Klebsiella* spp. (except *K. aerogenes*), *Raoultella* spp. and *P. mirabilis*	0.001	8		**30**	50	19		
Cefuroxime oral (uncomplicated UTI only), *E. coli, Klebsiella* spp. (except *K. aerogenes*), *Raoultella* spp. and *P. mirabilis*	8	8		**30**	19	19		

Carbapenems[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem	1	2		**10**	24	21		**1.** Some isolates that produce carbapenemase are categorised as susceptible with the current breakpoints and should be reported as tested, i.e. the presence or absence of a carbapenemase does not in itself influence the categorisation of susceptibility. Carbapenemase detection and characterisation are recommended for public health and infection control purposes. For carbapenemase screening a meropenem screening cut-off of >0.125 mg/L (zone diameter <28 mm) is recommended. **2.** The intrinsically low activity of imipenem against *Morganella morganii* , *Proteus* spp. and *Providencia* spp. requires the high exposure of imipenem. **3**. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L. 4**.** For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.
Ertapenem	0.5	0.5		**10**	25	25		
Imipenem, *Enterobacterales* except *Morganellaceae*	2	4		**10**	22	19		
Imipenem[2], *Morganellaceae*	0.001	4		**10**	50	19		
Imipenem-relebactam, *Enterobacterales* except *Morganellaceae*	2[3]	2[3]		**10-25**	22	22		
Meropenem (indications other than meningitis)	2	8		**10**	22	16		
Meropenem (meningitis)	2	2		**10**	22	22		
Meropenem-vaborbactam	8[4]	8[4]		**IP**	IP	IP		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam[1]	1	4		**30**	26	21		**1.** The aztreonam breakpoints for *Enterobacterales* will detect clinically important resistance mechanisms (including ESBL). Some isolates that produce beta-lactamases are susceptible to aztreonam with these breakpoints and should be reported as tested, i.e. the presence or absence of an ESBL does not in itself influence the categorisation of susceptibility. ESBL detection and characterisation are recommended for public health and infection control purposes.

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.25	0.5	0.5	**5**	25	22	22-24	**1**. There is clinical evidence for ciprofloxacin to indicate a poor response in systemic infections caused by *Salmonella* spp. with low-level ciprofloxacin resistance (MIC >0.06 mg/L). The available data relate mainly to *Salmonella* Typhi but there are also case reports of poor response with other *Salmonella* species. **2/C.** The pefloxacin 5 µg breakpoint used to screen for clinical fluoroquinolone resistance in *Salmonella* spp., can also be used to detect fluoroquinolone resistance mechanisms in other *Enterobacterales* such as *E. coli, K. pneumoniae* and *Shigella* spp. **A**. Tests with a ciprofloxacin 5 µg disk will not reliably detect low-level resistance in *Salmonella* spp. To screen for ciprofloxacin resistance in *Salmonella* spp., use the pefloxacin 5 µg disk. **See Note B.** **B.** Susceptibility of *Salmonella* spp. to ciprofloxacin can be inferred from pefloxacin disk diffusion susceptibility. **D**. A disk diffusion test is not yet developed. Perform an MIC test.
Ciprofloxacin[1], *Salmonella* spp.	0.06	0.06			Note[A]	Note[A]		
Pefloxacin (screen only)[1,2] *Salmonella* spp.	NA	NA		**5**	24[B,C]	24[B,C]		
Delafloxacin, *E. coli*	0.125	0.125			Note[D]	Note[D]		
Levofloxacin	0.5	1		**5**	23	19		
Moxifloxacin	0.25	0.25		**5**	22	22		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (uncomplicated UTI only)	0.5	0.5		**10**	22	22		
Ofloxacin	0.25	0.5		**5**	24	22		

Aminoglycosides[1,2]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amikacin (systemic infections)	(8)[1]	(8)[1]		30	(18)[A]	(18)[A]		**1/A.** For systemic infections, aminoglycosides must be used in combination with other active therapy. In this circumstance, the breakpoint/ECOFF in brackets can be used to distinguish between organisms with and without acquired resistance mechanisms. For isolates without resistance mechanisms, include a comment in the report: "Aminoglycosides are often given in combination with other agents, either to support the activity of the aminoglycoside or to broaden the spectrum of therapy. In systemic infections, the aminoglycoside must be supported by other active therapy." For more information, see http://www.eucast.org/guidance_documents/. **2.** Breakpoints do not apply to *Plesiomonas shigelloides* since aminoglycosides have low intrinsic activity against this species.
Amikacin (infections originating from the urinary tract)	8	8		30	18	18		
Gentamicin (systemic infections)	(2)[1]	(2)[1]		10	(17)[A]	(17)[A]		
Gentamicin (infections originating from the urinary tract)	2	2		10	17	17		
Netilmicin	IE	IE			IE	IE		
Tobramycin (systemic infections)	(2)[1]	(2)[1]		10	(16)[A]	(16)[A]		
Tobramycin (infections originating from the urinary tract)	2	2		10	16	16		

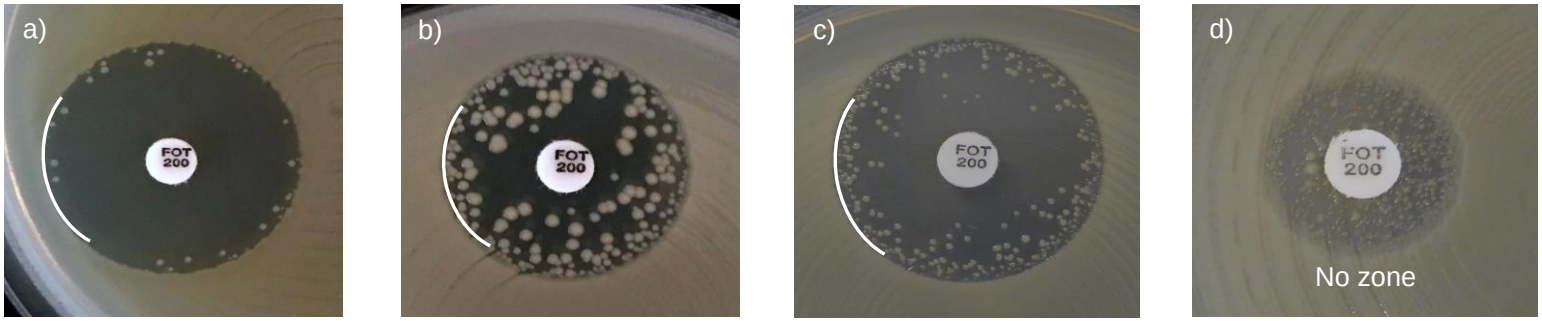
Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Dalbavancin	-	-			-	-		
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Azithromycin[1]	-	-			-	-		**1.** Azithromycin has been used in the treatment of enteric infections, primarily with *Salmonella* Typhi and *Shigella* spp. For wild-type isolates of both species, the MICs are ≤16 mg/L and the inhibition zone diameters for the azithromycin 15 µg disk ≥12 mm.
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	-	-			-	-		**1.** Tetracycline can be used to predict doxycycline susceptibility for the treatment of *Yersinia enterocolitica* infections (tetracycline MIC ≤4 mg/L for wild-type isolates). The corresponding zone diameter for the tetracycline 30 µg disk is ≥19 mm. **2.** For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use. **3/A.** For other *Enterobacterales* , the activity of tigecycline varies from insufficient in *Proteus* spp., *Morganella morganii* and *Providencia* spp. to variable in other species. For more information, see http://www.eucast.org/guidance_documents/. **B.** Zone diameter breakpoints validated for *E. coli* only. For *C. koseri,* use an MIC method.
Eravacycline, *E. coli*	0.5	0.5		20	17	17		
Minocycline	-	-			-	-		
Tetracycline[1]	-	-			-	-		
Tigecycline, *E. coli* and *C. koseri*	0.5[2,3]	0.5[2,3]		15	18[A,B]	18[A,B]		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	-	-			-	-		
Tedizolid	-	-			-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	8	8		30	17	17		**1.** Colistin MIC determination should be performed with broth microdilution. Quality control must be performed with both a susceptible QC strain (*E. coli* ATCC 25922 or *P. aeruginosa* ATCC 27853) and the colistin resistant *E. coli* NCTC 13846 (*mcr-1* positive). **2.** Agar dilution is the reference method for fosfomycin. MICs must be determined in the presence of glucose-6-phosphate (25 mg/L in the medium). Follow the manufacturers' instructions for commercial systems. **3.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. **A.** Use an MIC method (broth microdilution only). **B.** Fosfomycin 200 µg disks must contain 50 µg glucose-6-phosphate. **C.** Zone diameter breakpoints apply to *E. coli* only. For other *Enterobacterales* , use an MIC method. **D.** Ignore isolated colonies within the inhibition zone (**see pictures below**).
Colistin[1]	2	2			Note[A]	Note[A]		
Daptomycin	-	-			-	-		
Fosfomycin iv	32[2]	32[2]		200[B]	21[C,D]	21[C,D]		
Fosfomycin oral (uncomplicated UTI only), *E. coli*	8[2]	8[2]		200[B]	24[D]	24[D]		
Fusidic acid	-	-			-	-		
Lefamulin	-	-			-	-		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), *E. coli*	64	64		100	11	11		
Nitroxoline (uncomplicated UTI only), *E. coli*	16	16		30	15	15		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	4	4		5	15	15		
Trimethoprim-sulfamethoxazole[3]	2	4		1.25-23.75	14	11		



Examples of inhibition zones for *Escherichia coli* with fosfomycin.
a-c) Ignore all colonies and read the outer zone edge.
d) Record as no inhibition zone.

Pseudomonas spp.

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1 except for fosfomycin where agar dilution is used)
Medium: Mueller-Hinton broth (for cefiderocol, see http://www.eucast.org/guidance_documents/)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor combinations, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor-combination disks, see EUCAST QC Tables.

***Pseudomonas aeruginosa* is the most frequent species of this genus. Other less frequent *Pseudomonas* species recovered in clinical samples are: *P. fluorescens* group, *P. putida* group and *P. stutzeri* group.**

Penicillins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	-	-			-	-		**1.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Ampicillin	-	-			-	-		**2.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Ampicillin-sulbactam	-	-			-	-		
Amoxicillin	-	-			-	-		
Amoxicillin-clavulanic acid	-	-			-	-		
Piperacillin	0.001	16		30	50	18	18-19	
Piperacillin-tazobactam	0.001[1]	16[1]		30-6	50	18	18-19	
Ticarcillin	0.001	16		75	50	18		
Ticarcillin-clavulanic acid	0.001[2]	16[2]		75-10	50	18		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-		

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor	-	-			-	-		**1.** Broth microdilution MIC determination must be performed in iron-depleted Mueller-Hinton broth and specific reading instructions must be followed. For testing conditions and reading instructions, see http://www.eucast.org/guidance_documents/.
Cefadroxil	-	-			-	-		**2.** For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L.
Cefalexin	-	-			-	-		**3.** See table of dosages for dosing for different indications.
Cefazolin	-	-			-	-		**4.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Cefepime	0.001	8		**30**	50	21		
Cefiderocol, *P. aeruginosa*	2[1]	2[1]		**30**	22	22	14-22	
Cefixime	-	-			-	-		
Cefotaxime	-	-			-	-		
Cefoxitin	-	-			-	-		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime	0.001	8		**10**	50	17		
Ceftazidime-avibactam, *P. aeruginosa*	8[2]	8[2]		**10-4**	17	17	16-17	
Ceftibuten	-	-			-	-		
Ceftobiprole	IE	IE			IE	IE		
Ceftolozane-tazobactam[3], *P. aeruginosa*	4[4]	4[4]		**30-10**	23	23		
Ceftriaxone	-	-			-	-		
Cefuroxime iv	-	-			-	-		
Cefuroxime oral	-	-			-	-		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem	0.001	2		**10**	50	22		**1.** For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Ertapenem	-	-			-	-		**2.** For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.
Imipenem	0.001	4		**10**	50	20		
Imipenem-relebactam, *P. aeruginosa*	2[1]	2[1]		**10-25**	22	22		
Meropenem (indications other than meningitis)	2	8		**10**	24	18		
Meropenem (meningitis)	2	2		**10**	24	24		
Meropenem-vaborbactam, *P. aeruginosa*	8[2]	8[2]		**IP**	IP	IP		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam	0.001	16		**30**	50	18		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.001	0.5		5	50	26		
Delafloxacin	IE	IE			IE	IE		
Levofloxacin	0.001	1		5	50	22		
Moxifloxacin	-	-			-	-		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (uncomplicated UTI only)	-	-			-	-		
Ofloxacin	-	-			-	-		

Aminoglycosides[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amikacin (systemic infections)	(16)[1]	(16)[1]		30	(15)[A]	(15)[A]		**1/A.** For systemic infections, aminoglycosides must be used in combination with other active therapy. In this circumstance, the breakpoint/ECOFF in brackets can be used to distinguish between organisms with and without acquired resistance mechanisms. For isolates without resistance mechanisms, include a comment in the report: "Aminoglycosides are often given in combination with other agents, either to support the activity of the aminoglycoside or to broaden the spectrum of therapy. In systemic infections, the aminoglycoside must be supported by other active therapy." For more information, see http://www.eucast.org/guidance_documents/.
Amikacin (infections originating from the urinary tract)	16	16		30	15	15		
Gentamicin (systemic infections)	IE	IE			IE	IE		
Gentamicin (infections originating from the urinary tract)	IE	IE			IE	IE		
Netilmicin	IE	IE			IE	IE		
Tobramycin (systemic infections)	(2)[1]	(2)[1]		10	(18)[A]	(18)[A]		
Tobramycin (infections originating from the urinary tract)	2	2		10	18	18		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Dalbavancin	-	-			-	-		
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Azithromycin	-	-			-	-		
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	-	-			-	-		
Eravacycline	-	-			-	-		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline	-	-			-	-		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	-	-			-	-		
Tedizolid	-	-			-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	-	-			-	**-**		**1.** Colistin MIC determination should be performed with broth microdilution. Quality control must be performed with both a susceptible QC strain (*E. coli* ATCC 25922 or *P. aeruginosa* ATCC 27853) and the colistin resistant *E. coli* NCTC 13846 (*mcr-1* positive). **2.** Agar dilution is the reference method for fosfomycin. MICs must be determined in the presence of glucose-6-phosphate (25 mg/L in the medium). Follow the manufacturers' instructions for commercial systems. Infections caused by wild-type isolates (ECOFF: MIC 128 mg/L; corresponding zone diameter 12 mm using the disk potency and reading instructions for *E. coli*) have been treated with fosfomycin in combination with other agents. **A.** Use an MIC method (broth microdilution only).
Colistin[1]	2	2	4		Note[A]	Note[A]		
Daptomycin	-	-			-	**-**		
Fosfomycin iv[2]	-	-			-	-		
Fosfomycin oral[2]	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	-	-			-	-		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole	**-**	**-**			**-**	**-**		

Stenotrophomonas maltophilia

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 11.0, valid from 2021-01-01

Trimethoprim-sulfamethoxazole is the only agent for which EUCAST breakpoints are currently available. **For further information, see guidance document on www.eucast.org.**

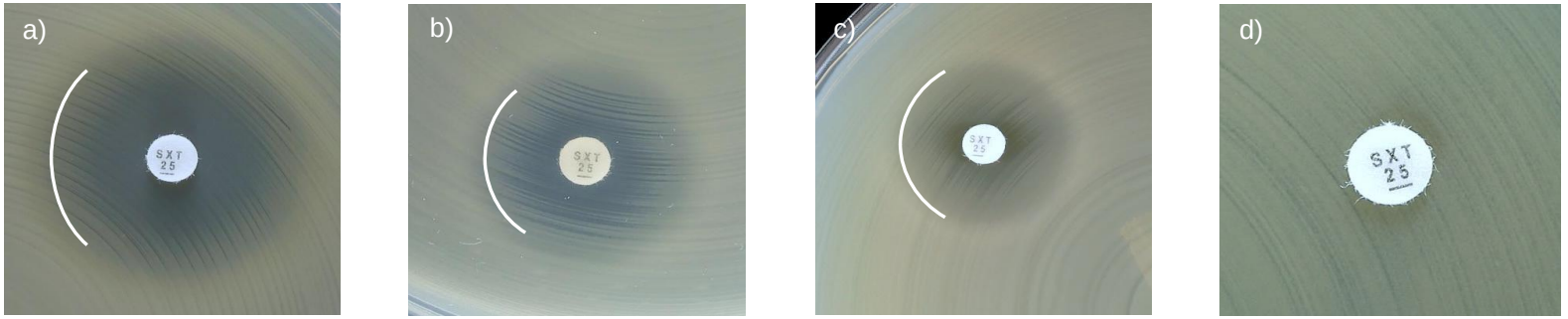
An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth (for cefiderocol, see http://www.eucast.org/guidance_documents/)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: For trimethoprim-sulfamethoxazole, the MIC should be read at the lowest concentration that inhibits approximately 80% of growth as compared with the growth control well.
Quality control: *Escherichia coli* ATCC 25922

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Read zone edges from the back of the plate against a dark background illuminated with reflected light (see below for specific instructions).
Quality control: *Escherichia coli* ATCC 25922

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefiderocol	IE[1]	IE[1]			Note[A]	Note[A]		**1.** Broth microdilution MIC determination must be performed in iron-depleted Mueller-Hinton broth and specific reading instructions must be followed. For testing conditions and reading instructions, see http://www.eucast.org/guidance_documents/. **A.** Zone diameters of ≥20 mm for the cefiderocol 30 µg disk correspond to MIC values below the PK-PD breakpoint of S ≤ 2 mg/L.

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Trimethoprim-sulfamethoxazole[1]	0.001	4		**1.25-23.75**	50[A]	16[A,B]		**1.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. **A.** There may be growth within the inhibition zone. The density of growth may vary from a fine haze to substantial growth (**see pictures below**). If any zone edge can be seen, ignore growth within the inhibition zone and read the zone diameter. **B.** Trimetoprim-sulfamethoxazole resistance in *S. maltophilia* is rare and should be confirmed with an MIC test.



Examples of inhibition zones for *Stenotrophomonas maltophilia* with trimethoprim-sulfamethoxazole.
a-c) An outer zone can be seen. Read the outer zone edge and interpret according to the breakpoints.
d) Growth up to the disk **and** no sign of inhibition zone. Report resistant.

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth (for cefiderocol, see http://www.eucast.org/guidance_documents/)
Inoculum: 5x10^5 CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain, see EUCAST QC Tables.

This genus includes several species. The most frequent *Acinetobacter* species recovered in clinical samples are those included in the *A. baumannii* group, which includes *A. baumannii, A. nosocomialis, A. pittii, A. dijkshoorniae* and *A. seifertii*. Other species are *A. haemolyticus, A. junii, A. lwoffii, A. ursingii* and *A. variabilis.*

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	-	-			-	-		**1.** Susceptibility testing of *Acinetobacter* spp. to penicillins is unreliable. In most instances, *Acinetobacter* spp. are resistant to penicillins.
Ampicillin	-	-			-	-		
Ampicillin-sulbactam	IE	IE			IE	IE		
Amoxicillin	-	-			-	-		
Amoxicillin-clavulanic acid	-	-			-	-		
Piperacillin	IE	IE			IE	IE		
Piperacillin-tazobactam	IE	IE			IE	IE		
Ticarcillin	IE	IE			IE	IE		
Ticarcillin-clavulanic acid	IE	IE			IE	IE		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-		

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor	-	-			-	-		**1.** Broth microdilution MIC determination must be performed in iron-depleted Mueller-Hinton broth and specific reading instructions must be followed. For testing conditions and reading instructions, see http://www.eucast.org/guidance_documents/.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		**A.** Zone diameters of ≥17 mm for the cefiderocol 30 µg disk correspond to MIC values below the PK-PD breakpoint of S ≤ 2 mg/L.
Cefazolin	-	-			-	-		
Cefepime	-	-			-	-		
Cefiderocol	IE[1]	IE[1]			Note[A]	Note[A]		
Cefixime	-	-			-	-		
Cefotaxime	-	-			-	-		
Cefoxitin	-	-			-	-		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole	-	-			-	-		
Ceftolozane-tazobactam	-	-			-	-		
Ceftriaxone	-	-			-	-		
Cefuroxime iv	-	-			-	-		
Cefuroxime oral	-	-			-	-		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem	0.001	2		10	50	22		**1.** For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Ertapenem	-	-			-	-		**2/A.** The beta-lactamases produced by the organisms either do not modify the parent carbapenem or are not affected by the inhibitor. Therefore the addition of the beta-lactamase inhibitor does not add clinical benefit.
Imipenem	2	4		10	24	21		
Imipenem-relebactam[2]	2[1]	2[1]		10-25	24	24		
Meropenem (indications other than meningitis)	2	8		10	21	15		
Meropenem (meningitis)	2	2		10	21	21		
Meropenem-vaborbactam[2]	Note[2]	Note[2]			Note[A]	Note[A]		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam	-	-			-	-		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.001	1		5	50	21		
Delafloxacin	IE	IE			IE	IE		
Levofloxacin	0.5	1		5	23	20		
Moxifloxacin	-	-			-	-		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (uncomplicated UTI only)	-	-			-	-		
Ofloxacin	-	-			-	-		

Aminoglycosides[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amikacin (systemic infections)	(8)[1]	(8)[1]		30	(19)[A]	(19)[A]		**1/A.** For systemic infections, aminoglycosides must be used in combination with other active therapy. In this circumstance, the breakpoint/ECOFF in brackets can be used to distinguish between organisms with and without acquired resistance mechanisms. For isolates without resistance mechanisms, include a comment in the report: "Aminoglycosides are often given in combination with other agents, either to support the activity of the aminoglycoside or to broaden the spectrum of therapy. In systemic infections, the aminoglycoside must be supported by other active therapy." For more information, see http://www.eucast.org/guidance_documents/.
Amikacin (infections originating from the urinary tract)	8	8		30	19	19		
Gentamicin (systemic infections)	(4)[1]	(4)[1]		10	(17)[A]	(17)[A]		
Gentamicin (infections originating from the urinary tract)	4	4		10	17	17		
Netilmicin	IE	IE			IE	IE		
Tobramycin (systemic infections)	(4)[1]	(4)[1]		10	(17)[A]	(17)[A]		
Tobramycin (infections originating from the urinary tract)	4	4		10	17	17		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Dalbavancin	-	-			-	-		
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Azithromycin	-	-			-	-		
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	-	-			-	-		
Eravacycline	IE	IE			IE	IE		
Minocycline	IE	IE			IE	IE		
Tetracycline	-	-			-	-		
Tigecycline	IE	IE			IE	IE		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	-	-			-	-		
Tedizolid	-	-			-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	-	-			-	-		**1.** Colistin MIC determination should be performed with broth microdilution. Quality control must be performed with both a susceptible QC strain (*E. coli* ATCC 25922 or *P. aeruginosa* ATCC 27853) and the colistin resistant *E. coli* NCTC 13846 (*mcr-1* positive). **2.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. **A.** Use an MIC method (broth microdilution only).
Colistin[1]	2	2			Note[A]	Note[A]		
Daptomycin	-	-			-	-		
Fosfomycin iv	-	-			-	-		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	-	-			-	-		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole[2]	2	4		**1.25-23.75**	14	11		

Staphylococcus spp.

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1 except for fosfomycin where agar dilution is used)
Medium: Mueller-Hinton broth
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Staphylococcus aureus* ATCC 29213. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light (except for benzylpenicillin, see below).
Quality control: *Staphylococcus aureus* ATCC 29213. For agents not covered by this strain, see EUCAST QC Tables.

Unless otherwise indicated, breakpoints apply to all members of the *Staphylococcus* genus.
• Breakpoints for *S. aureus* also apply to other coagulase positive staphylococci, unless otherwise indicated: *S. argenteus, S. schweitzeri, S. intermedius, S. pseudintermedius* and *S. coagulans* (previously *S. schleiferi* subsp. *coagulans*).
• Coagulase-negative staphylococci include *S. capitis, S. cohnii, S. epidermidis, S. haemolyticus, S. hominis, S. hyicus, S. lugdunensis, S. pettenkoferi, S. saprophyticus, S. schleiferi, S. sciuri, S. simulans, S. warneri* and *S. xylosus.* For these, unless otherwise indicated, use breakpoints for "coagulase-negative staphylococci".
• For *S. saccharolyticus,* use methodology and breakpoints for Gram-positive anaerobic bacteria.

Penicillins[1]	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU
Benzylpenicillin, *S. aureus*	0.125[1]	0.125[1]		**1 unit**	26[A,B]	26[A,B]	
Benzylpenicillin, *S. lugdunensis*	0.125	0.125		**1 unit**	26	26	
Benzylpenicillin, Coagulase-negative staphylococci	Note[2]	Note[2]			Note[C]	Note[C]	
Ampicillin, *S. saprophyticus*	Note[2,3]	Note[2,3]		**2**	18[C,D]	18[C,D]	
Ampicillin-sulbactam	Note[1,2,3]	Note[1,2,3]			Note[A,C,D]	Note[A,C,D]	
Amoxicillin	Note[1,2,3]	Note[1,2,3]			Note[A,C,D]	Note[A,C,D]	
Amoxicillin-clavulanic acid	Note[1,2,3]	Note[1,2,3]			Note[A,C,D]	Note[A,C,D]	
Piperacillin	Note[1,2,3]	Note[1,2,3]			Note[A,C,D]	Note[A,C,D]	
Piperacillin-tazobactam	Note[1,2,3]	Note[1,2,3]			Note[A,C,D]	Note[A,C,D]	
Ticarcillin	Note[1,2]	Note[1,2]			Note[A,C]	Note[A,C]	
Ticarcillin-clavulanic acid	Note[1,2]	Note[1,2]			Note[A,C]	Note[A,C]	
Temocillin	-	-			-	-	
Phenoxymethylpenicillin, *S. aureus*	Note[1]	Note[1]			Note[A]	Note[A]	
Phenoxymethylpenicillin, Coagulase-negative staphylococci	-[2]	-[2]			Note[C]	Note[C]	
Oxacillin (screen only), *S. pseudintermedius* and *S. schleiferi*	NA	NA		**1**	20[E]	20[E]	
Oxacillin[4], other staphylococci	Note[1,4]	Note[1,4]			Note[A]	Note[A]	
Cloxacillin	Note[1,2]	Note[1,2]			Note[A,C]	Note[A,C]	
Dicloxacillin	Note[1,2]	Note[1,2]			Note[A,C]	Note[A,C]	
Flucloxacillin	Note[1,2]	Note[1,2]			Note[A,C]	Note[A,C]	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-	

Notes
Numbered notes relate to general comments and/or MIC breakpoints.
Lettered notes relate to the disk diffusion method.

1/A. Most *S. aureus* are penicillinase producers and some are methicillin resistant. Either mechanism renders them resistant to benzylpenicillin, phenoxymethylpenicillin, ampicillin, amoxicillin, piperacillin and ticarcillin. Isolates that test susceptible to benzylpenicillin and cefoxitin can be reported susceptible to all penicillins. Isolates that test resistant to benzylpenicillin but susceptible to cefoxitin are susceptible to β-lactam β-lactamase inhibitor combinations, the isoxazolylpenicillins (oxacillin, cloxacillin, dicloxacillin and flucloxacillin) and nafcillin. For agents given orally, care to achieve sufficient exposure at the site of the infection should be exercised. Isolates that test resistant to cefoxitin are resistant to all penicillins.
2/C. Most coagulase-negative staphylococci are penicillinase producers and some are methicillin resistant. Either mechanism renders them resistant to benzylpenicillin, phenoxymethylpenicillin, ampicillin, amoxicillin, piperacillin and ticarcillin. No currently available method can reliably detect penicillinase production in coagulase-negative staphylococci but methicillin resistance can be detected with cefoxitin as described.
3/D. Ampicillin susceptible *S. saprophyticus* are *mecA*-negative and susceptible to ampicillin, amoxicillin and piperacillin (without or with a beta-lactamase inhibitor).
4. *S. aureus, S. lugdunensis* and *S. saprophyticus* with oxacillin MIC values >2 mg/L are mostly methicillin resistant due to the presence of the *mecA* or *mecC* gene. Occasionally oxacillin MIC values are high in *S. aureus* in absence of *mec*-gene mediated resistance. These isolates have been called BORSA (borderline oxacillin resistant *S. aureus*). EUCAST does not recommend systematic screening for BORSA. For coagulase-negative staphylococci other than *S. saprophyticus* and *S. lugdunensis,* the oxacillin MIC in methicillin resistant isolates is >0.25 mg/L.

B. For *S. aureus*, disk diffusion is more reliable than MIC determination for detection of penicillinase producers, provided the zone diameter is measured AND the zone edge closely inspected (**see pictures below**). Examine the zone edge with transmitted light (plate held up to light). If the zone diameter is <26 mm, then report resistant. If the zone diameter is ≥26 mm AND the zone edge is sharp, then report resistant. If not sharp, then report susceptible and if uncertain, then report resistant. Chromogenic cephalosporin-based beta-lactamase tests do not reliably detect staphylococcal penicillinase.
E. For screening for methicillin resistance in *S. pseudintermedius* and *S. schleiferi.*

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Cephalosporins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor[2]	Note[1]	Note[1]			Note[A]	Note[A]		**1/A.** Susceptibility of staphylococci to cephalosporins is inferred from the cefoxitin susceptibility except for cefixime, ceftazidime, ceftazidime-avibactam, ceftibuten and ceftolozane-tazobactam, which do not have breakpoints and should not be used for staphylococcal infections. For agents given orally, care to achieve sufficient exposure at the site of the infection should be exercised. If cefotaxime and ceftriaxone are reported for methicillin-susceptible staphylococci, these should be reported "Susceptible, increased exposure" (I). Some methicillin-resistant *S. aureus* are susceptible to ceftaroline and ceftobiprole**, see Notes 5/D and 7/F.**
Cefadroxil	Note[1]	Note[1]			Note[A]	Note[A]		
Cefalexin	Note[1]	Note[1]			Note[A]	Note[A]		
Cefazolin	Note[1]	Note[1]			Note[A]	Note[A]		
Cefepime	Note[1]	Note[1]			Note[A]	Note[A]		
Cefiderocol	-	-			-	-		
Cefixime	-	-			-	-		
Cefotaxime[2]	Note[1]	Note[1]			Note[A]	Note[A]		
Cefoxitin (screen only), *S. aureus* and coagulase-negative staphylococci other than *S. epidermidis*	Note[3,4]	Note[3,4]		**30**	22[A,B]	22[A,B]		**2.** See table of dosages.
Cefoxitin (screen only), *S. epidermidis*	Note[4]	Note[4]		**30**	25[A,B]	25[A,B]	25-27	**3.** *S. aureus* and *S. lugdunensis* with cefoxitin MIC values >4 mg/L and *S. saprophyticus* with cefoxitin MIC values >8 mg/L are methicillin resistant, mostly due to the presence of the *mecA* or *mecC* gene. Disk diffusion reliably predicts methicillin resistance.
Cefoxitin (screen only), *S. pseudintermedius* and *S. schleiferi*	Note[5]	Note[5]			Note[C]	Note[C]		**4.** For staphylococci other than *S. aureus, S. lugdunensis* and *S. saprophyticus* , the cefoxitin MIC is a poorer predictor of methicillin resistance than the disk diffusion test.
Cefpodoxime	Note[1]	Note[1]			Note[A]	Note[A]		**5/C.** In *S. pseudintermedius* and *S. schleiferi* the cefoxitin disk is less predictive for the detection of methicillin resistance than in other staphylococci. Use the oxacillin 1 µg disk with zone diameter breakpoints S≥20, R<20 mm.
Ceftaroline (indications other than pneumonia), *S. aureus*	1[6]	2[6,7]	1	**5**	20[D]	17[D,E]	19-20	**6/D.** Methicillin-susceptible isolates can be reported susceptible to ceftaroline without further testing.
Ceftaroline (pneumonia), *S. aureus*	1[6]	1[6]	1	**5**	20[D]	20[D]	19-20	**7/E.** Resistant isolates are rare.
Ceftazidime	-	-			-	-		**8/F.** Methicillin-susceptible isolates can be reported susceptible to ceftobiprole without further testing.
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		**B.** If coagulase-negative staphylococci are not identified to species level, use zone diameter breakpoints S≥25, R<25 mm.
Ceftobiprole, *S. aureus*	2[8]	2[8]	2	**5**	17[F]	17[F]	16-17	
Ceftolozane-tazobactam	-	-			-	-		
Ceftriaxone[2]	Note[1]	Note[1]			Note[A]	Note[A]		
Cefuroxime iv	Note[1]	Note[1]			Note[A]	Note[A]		
Cefuroxime oral	Note[1]	Note[1]			Note[A]	Note[A]		

Carbapenems[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem	Note[1]	Note[1]			Note[A]	Note[A]		**1/A.** Susceptibility of staphylococci to carbapenems is inferred from the cefoxitin susceptibility.
Ertapenem	Note[1]	Note[1]			Note[A]	Note[A]		
Imipenem	Note[1]	Note[1]			Note[A]	Note[A]		
Imipenem-relebactam	Note[1]	Note[1]			Note[A]	Note[A]		
Meropenem	Note[1]	Note[1]			Note[A]	Note[A]		
Meropenem-vaborbactam	Note[1]	Note[1]			Note[A]	Note[A]		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Aztreonam	-	-			-	-		

Fluoroquinolones[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin, *S. aureus*	0.001	1		**5**	50[A]	21[A]		**1.** For breakpoints for other fluoroquinolones (*e.g.* pefloxacin and enoxacin), refer to breakpoints set by national breakpoint committees. **2/D.** Ofloxacin breakpoints for *Staphylococcus* spp. have been removed since in systemic infections with staphylococci the agent is inferior to other fluoroquinolones. For topical use of ofloxacin, see tables of topical agents. **A.** The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note C.** **B.** A disk diffusion test is not yet developed. Perform an MIC test. **C.** Isolates categorised as susceptible to norfloxacin can be reported susceptible to moxifloxacin and "susceptible increased exposure" (I) to ciprofloxacin, levofloxacin and ofloxacin. Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Ciprofloxacin, Coagulase-negative staphylococci	0.001	1		**5**	50[A]	24[A]		
Delafloxacin, *S. aureus*	0.25	0.25			Note[B]	Note[B]		
Levofloxacin, *S. aureus*	0.001	1		**5**	50[A]	22[A]		
Levofloxacin, Coagulase-negative staphylococci	0.001	1		**5**	50[A]	24[A]		
Moxifloxacin, *S. aureus*	0.25	0.25		**5**	25[A]	25[A]		
Moxifloxacin, Coagulase-negative staphylococci	0.25	0.25		**5**	28[A]	28[A]		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (screen only)	NA	NA		**10**	17[C]	Note[C]		
Ofloxacin	Note[2]	Note[2]			Note[D]	Note[D]		

Aminoglycosides[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin[2], *S. aureus*	(8)[1]	(8)[1]		**30**	(18)[A]	(18)[A]	16-19	**1/A.** For systemic infections, aminoglycosides must be used in combination with other active therapy. In this circumstance, the breakpoint/ECOFF in brackets can be used to distinguish between organisms with and without acquired resistance mechanisms. For isolates without resistance mechanisms, include a comment in the report: "Aminoglycosides are often given in combination with other agents, either to support the activity of the aminoglycoside or to broaden the spectrum of therapy. In systemic infections, the aminoglycoside must be supported by other active therapy." For more information, see http://www.eucast.org/guidance_documents/. **2.** Resistance to amikacin is most reliably determined by testing with kanamycin (MIC >8 mg/L). The corresponding zone diameter for the kanamycin 30 µg disk is R<18 mm for *S. aureus* and R<22 mm for coagulase-negative staphylococci.
Amikacin[2], Coagulase-negative staphylococci	(8)[1]	(8)[1]		**30**	(22)[A]	(22)[A]		
Gentamicin, *S. aureus*	(1)[1]	(1)[1]		**10**	(18)[A]	(18)[A]		
Gentamicin, Coagulase-negative staphylococci	(1)[1]	(1)[1]		**10**	(22)[A]	(22)[A]		
Netilmicin	IE	IE			IE	IE		
Tobramycin, *S. aureus*	(1)[1]	(1)[1]		**10**	(18)[A]	(18)[A]		
Tobramycin, Coagulase-negative staphylococci	(1)[1]	(1)[1]		**10**	(22)[A]	(22)[A]		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Glycopeptides and lipoglycopeptides[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin[2]	0.125[3,4]	0.125[3]			Note[A]	Note[A]		**1.** Glycopeptide MICs are method dependent and should be determined by broth microdilution (ISO standard 20776-1). *S. aureus* with vancomycin MIC values of 2 mg/L are on the border of the wild-type distribution and there may be an impaired clinical response. **2.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **3.** MICs must be determined in the presence of polysorbate-80 (0.002% in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturer's instructions for commercial systems. **4.** *S. aureus* isolates susceptible to vancomycin can be reported susceptible to dalbavancin and oritavancin. **5.** MRSA isolates susceptible to vancomycin can be reported susceptible to telavancin. **A.** Disk diffusion is unreliable and cannot distinguish between wild type isolates and those with non-vanA-mediated glycopeptide resistance.
Oritavancin[2], *S. aureus*	0.125[3,4]	0.125[3]			Note[A]	Note[A]		
Teicoplanin[2], *S. aureus*	2	2			Note[A]	Note[A]		
Teicoplanin, Coagulase-negative staphylococci	4	4			Note[A]	Note[A]		
Telavancin[2], MRSA	0.125[3,5]	0.125[3]			Note[A]	Note[A]		
Vancomycin[2], *S. aureus*	2	2			Note[A]	Note[A]		
Vancomycin[2], Coagulase-negative staphylococci	4	4			Note[A]	Note[A]		

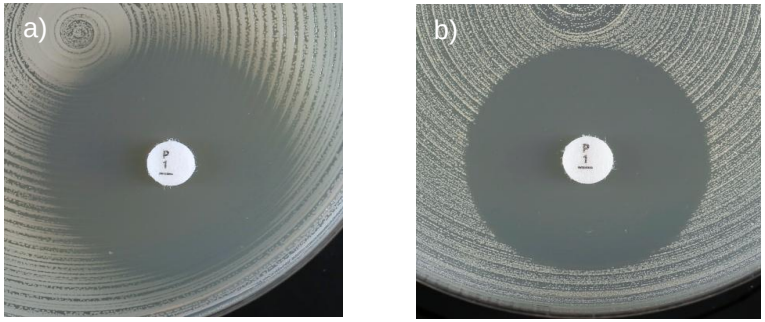
Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	1[1]	2[1]			Note[A]	Note[A]		**1/A.** Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin. **2.** Inducible clindamycin resistance can be detected by antagonism of clindamycin activity by a macrolide agent. If not detected, then report as tested according to the clinical breakpoints. If detected, then report as resistant and consider adding this comment to the report: "Clindamycin may still be used for short-term therapy of less serious skin and soft tissue infections as constitutive resistance is unlikely to develop during such therapy". **B.** Place the erythromycin and clindamycin disks 12-20 mm apart (edge to edge) and look for antagonism (the D phenomenon) to detect inducible clindamycin resistance. **C.** Isolates non-susceptible by disk diffusion should be confirmed by MIC testing.
Clarithromycin	1[1]	2[1]			Note[A]	Note[A]		
Erythromycin	1[1]	2[1]		15	21[A]	18[A]		
Roxithromycin	1[1]	2[1]			Note[A]	Note[A]		
Telithromycin	IE	IE			IE	IE		
Clindamycin[2]	0.25	0.5		2	22[B]	19[B]		
Quinupristin-dalfopristin	1	2		15	21	18[C]		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1[1]	2[1]			Note[A]	Note[A]		**1/A**. Isolates susceptible to tetracycline are also susceptible to doxycycline and minocycline, but some resistant to tetracycline may be susceptible to minocycline and/or doxycycline. An MIC method should be used to test doxycycline susceptibility of tetracycline resistant isolates if required. **2.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **3.** For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use. **B.** For MRSA that test susceptible with disk diffusion, the results should be confirmed with an MIC test.
Eravacycline, *S. aureus*	0.25	0.25		20	20[B]	20[B]		
Minocycline	0.5[1]	0.5[1]		30	23[A]	23[A]		
Tetracycline	1[1]	2[1]		30	22[A]	19[A]		
Tigecycline[2]	0.5[3]	0.5[3]		15	19	19		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	4	4		10	21	21		**1/A.** Isolates susceptible to linezolid can be reported susceptible to tedizolid.
Tedizolid	0.5[1]	0.5		2	21[A]	21		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	8	8		30	18	18		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory.
Colistin	-	-			-	-		**2.** Daptomycin MICs must be determined in the presence of Ca^{2+} (50 mg/L in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturers' instructions for commercial systems.
Daptomycin[1]	1[2]	1[2]			Note[A]	Note[A]		**3.** Agar dilution is the reference method for fosfomycin. MICs must be determined in the presence of glucose-6-phosphate (25 mg/L in the medium). Follow the manufacturers' instructions for commercial systems.
Fosfomycin iv	32[3]	32[3]			Note[A]	Note[A]		**4.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Fosfomycin oral	-	-			-	-		
Fusidic acid	1	1		10	24	24		**A.** Use an MIC method.
Lefamulin, *S. aureus*	0.25	0.25		5	23	23		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), *S. saprophyticus*	64	64		100	13	13		
Nitroxoline (uncomplicated UTI only), *S. saprophyticus*	IE	IE			IE	IE		
Rifampicin	0.06	0.5		5	26	23		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	4	4		5	14	14		
Trimethoprim-sulfamethoxazole[4]	2	4		1.25-23.75	17	14		



Examples of inhibition zones for *Staphylococcus aureus* with benzylpenicillin.
a) Fuzzy zone edge and zone diameter ≥ 26 mm. Report susceptible.
b) Sharp zone edge and zone diameter ≥ 26 mm. Report resistant.

Enterococcus spp.

Expert Rules and Intrinsic Resistance Tables

In endocarditis, refer to national or international endocarditis guidelines for breakpoints for *Enterococcus* spp.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Enterococcus faecalis* ATCC 29212. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor combinations, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h (for glycopeptides 24h)
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light (except for vancomycin, see below).
Quality control: *Enterococcus faecalis* ATCC 29212. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor-combination disks, see EUCAST QC Tables.

This genus includes several species. The most frequent enterococci recovered in clinical samples are *E. faecalis, E. faecium, E. avium, E. casseliflavus, E. durans, E. gallinarum, E. hirae, E. mundtii* and *E. raffinosus*. Unless otherwise indicated, breakpoints apply to all members of the *Enterococcus* genus.

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	-	-			-	-		**1.** Aminopenicillin breakpoints in enterococci are based on intravenous administration. For oral administration the breakpoints are relevant for urinary tract infections only. **2/A.** Susceptibility to ampicillin, amoxicillin and piperacillin (with and without beta-lactamase inhibitor) can be inferred from ampicillin. Ampicillin resistance is uncommon in *E. faecalis* (confirm with MIC) but common in *E. faecium*. **3.** For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L. **4.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Ampicillin[1]	4[2]	8[2]		2	10[A]	8[A]		
Ampicillin-sulbactam[1]	4[2,3]	8[2,3]			Note[A]	Note[A]		
Amoxicillin[1]	4[2]	8[2]			Note[A]	Note[A]		
Amoxicillin-clavulanic acid[1]	4[2,4]	8[2,4]			Note[A]	Note[A]		
Piperacillin	Note[2]	Note[2]			Note[A]	Note[A]		
Piperacillin-tazobactam	Note[2]	Note[2]			Note[A]	Note[A]		
Ticarcillin	-	-			-	-		
Ticarcillin-clavulanic acid	-	-			-	-		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-		

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor	-	-			-	-		
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	-	-			-	-		
Cefiderocol	-	-			-	-		
Cefixime	-	-			-	-		
Cefotaxime	-	-			-	-		
Cefoxitin	-	-			-	-		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole	-	-			-	-		
Ceftolozane-tazobactam	-	-			-	-		
Ceftriaxone	-	-			-	-		
Cefuroxime iv	-	-			-	-		
Cefuroxime oral	-	-			-	-		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem	-	-			-	-		**1/A.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Ertapenem	-	-			-	-		
Imipenem	0.001	4		**10**	50	21		
Imipenem-relebactam[1]	Note[1]	Note[1]			Note[A]	Note[A]		
Meropenem	-	-			-	-		
Meropenem-vaborbactam	-	-			-	-		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam	-	-			-	-		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin (uncomplicated UTI only)	4	4		5	15[A]	15[A]		**1/B.** There are no clinical breakpoints for *Enterococcus* spp. and moxifloxacin, but moxifloxacin has been used for oral step-down treatment of endocarditis caused by *Enterococcus* spp. The norfloxacin disk diffusion test or the moxifloxacin MIC ECOFF (1 mg/L) can be used to screen for resistance mechanisms. When screen negative, the isolate should be reported "wild type" or "devoid of fluoroquinolone resistance mechanisms", but not as susceptible to moxifloxacin.
Delafloxacin	IE	IE			IE	IE		
Levofloxacin (uncomplicated UTI only)	4	4		5	15[A]	15[A]		
Moxifloxacin	Note[1]	Note[1]			Note[B]	Note[B]		
Nalidixic acid (screen only)	NA	NA			NA	NA		**A.** The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note C.**
Norfloxacin (screen only)	NA	NA		10	12[C]	12[C]		**C.** Susceptibility of ciprofloxacin and levofloxacin can be inferred from the norfloxacin susceptibility. For moxifloxacin, **see comment 1/B**.
Ofloxacin	-	-			-	-		

Aminoglycosides[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amikacin	Note[2]	Note[2]			Note[A]	Note[A]		**1**. Enterococci are intrinsically resistant to aminoglycosides and aminoglycoside monotherapy is ineffective. There is likely to be synergy between aminoglycosides and penicillins or glycopeptides against enterococci without acquired high-level aminoglycoside resistance. All testing is therefore to distinguish between intrinsic and high-level acquired resistance.
Gentamicin (test for high-level aminoglycoside resistance)	Note[2]	Note[2]		30	Note[A]	Note[A]		**2/A.** Gentamicin can be used to screen for high-level aminoglycoside resistance (HLAR). **Negative test:** Isolates with gentamicin MIC ≤128 mg/L or a zone diameter ≥8 mm. The isolate is wild type for gentamicin and low-level intrinsic resistant. For other aminoglycosides, this may not be the case. Synergy with penicillins or glycopeptides can be expected if the isolate is susceptible to the penicillin or glycopeptide. **Positive test:** Isolates with gentamicin MIC >128 mg/L or a zone diameter <8 mm. The isolate is high-level resistant to gentamicin and other aminoglycosides, except streptomycin which must be tested separately if required (**see note 3/B**). There will be no synergy with penicillins or glycopeptides.
Netilmicin	Note[2]	Note[2]			Note[A]	Note[A]		
Streptomycin (test for high-level streptomycin resistance)	Note[3]	Note[3]		300	Note[B]	Note[B]		**3/B.** Isolates with high-level gentamicin resistance may not be high-level resistant to streptomycin. **Negative test:** Isolates with streptomycin MIC ≤512 mg/L or a zone diameter ≥14 mm. The isolate is wild type for streptomycin and low-level intrinsic resistant. Synergy with penicillins or glycopeptides can be expected if the isolate is susceptible to the penicillin or glycopeptide. **Positive test:** Isolates with streptomycin MIC >512 mg/L or a zone diameter <14 mm. The isolate is high-level resistant to streptomycin. There will be no synergy with penicillins or glycopeptides.
Tobramycin	Note[2]	Note[2]			Note[A]	Note[A]		

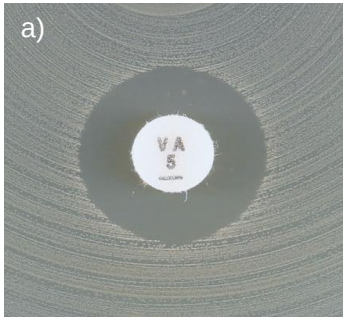
Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Dalbavancin	IE	IE			IE	IE		**A.** Vancomycin susceptible enterococci exhibit sharp zone edges and do not exhibit colonies in the inhibition zone. Examine zone edges with transmitted light (plate held up to light). If the zone edge is fuzzy, colonies grow within the zone or if you are uncertain, then perform confirmatory testing with PCR or report resistant (**see pictures below**) even if the zone diameter is ≥ 12 mm. Isolates must not be reported susceptible before 24 h incubation.
Oritavancin	IE	IE			IE	IE		
Teicoplanin	2	2		30	16	16		
Telavancin	IE	IE			IE	IE		
Vancomycin	4	4		5	12[A]	12[A]		

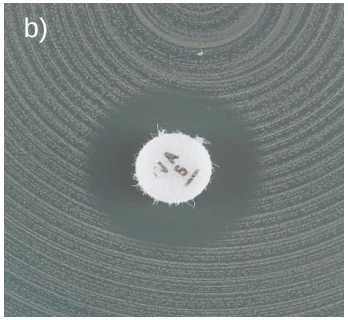
Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Azithromycin	-	-			-	-		
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin, *E. faecium*	1	4		15	22	20		

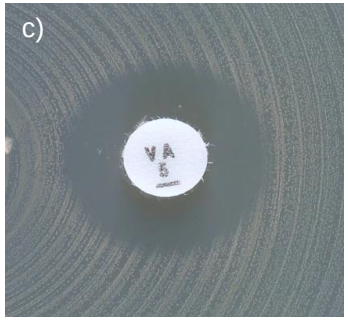
Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	-	-			-	-		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **2.** For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use.
Eravacycline, *E. faecalis*	0.125	0.125		20	22	22		
Eravacycline, *E. faecium*	0.125	0.125		20	24	24		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline[1], *E. faecalis*	0.25[2]	0.25[2]		15	20	20		
Tigecycline[1], *E. faecium*	0.25[2]	0.25[2]		15	22	22		

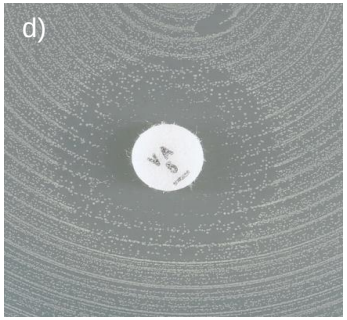
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	4	4		10	20	20		
Tedizolid	IE	IE			IE	IE		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	-	-			-	-		**1.** For more information, see http://www.eucast.org/guidance_documents/.
Colistin	-	-			-	-		**2/A.** Lefamulin has insufficient activity against *E. faecalis*. For *E. faecium*, the ECOFF of 0.5 mg/L can be used to distinguish wild type from non-wild type isolates.
Daptomycin[1]	IE	IE			IE	IE		**3/B.** The activity of trimethoprim and trimethoprim-sulfamethoxazole is uncertain against enterococci, and it is not possible to predict clinical outcome. The ECOFF to categorise isolates as wild type or non-wild type for both *E. faecalis* and *E. faecium* is 1 mg/L, with a corresponding zone diameter ECOFF of 21 mm for trimethoprim and 23 mm for trimethoprim-sulfamethoxazole.
Fosfomycin iv	-	-			-	-		**4.** Trimethoprim-sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	Note[2]	Note[2]			Note[A]	Note[A]		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), *E. faecalis*	64	64		**100**	15	15		
Nitroxoline (uncomplicated UTI only)	IE	IE			IE	IE		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	Note[3]	Note[3]		**5**	Note[B]	Note[B]		
Trimethoprim-sulfamethoxazole[4]	Note[3]	Note[3]		**1.25-23.75**	Note[B]	Note[B]		









Examples of inhibition zones for *Enterococcus* spp. with vancomycin.
a) Sharp zone edge **and** zone diameter ≥ 12 mm. Report susceptible.
b-d) Fuzzy zone edge or colonies within zone. Perform confirmatory testing with PCR or report resistant even if the zone diameter ≥ 12 mm.

Streptococcus groups A, B, C and G

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

This group of bacteria includes many species, which can be grouped as follows:
Group A: *S. pyogenes*
Group B: *S. agalactiae*
Group C: *S. dysgalactiae* (plus the more rarely isolated *S. equi*)
Group G: *S. dysgalactiae* and *S. canis*
S. dysgalactiae includes the subspecies *equisimilis* and *dysgalactiae, S. equi* includes the subspecies *equi* and *zooepidemicus.*

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Benzylpenicillin (indications other than meningitis)[2]	0.25	0.25		**1 unit**	18	18	
Benzylpenicillin (meningitis)[2], *S. agalactiae* (group B streptococci)	0.125	0.125		**1 unit**	19	19	
Ampicillin	Note[1]	Note[1]			Note[A]	Note[A]	
Ampicillin-sulbactam[3]	Note[1]	Note[1]			Note[A]	Note[A]	
Amoxicillin	Note[1]	Note[1]			Note[A]	Note[A]	
Amoxicillin-clavulanic acid[3]	Note[1]	Note[1]			Note[A]	Note[A]	
Piperacillin	Note[1]	Note[1]			Note[A]	Note[A]	
Piperacillin-tazobactam[3]	Note[1]	Note[1]			Note[A]	Note[A]	
Ticarcillin	-	-			-	-	
Ticarcillin-clavulanic acid	-	-			-	-	
Temocillin	-	-			-	-	
Phenoxymethylpenicillin Streptococcus groups A, C and G	Note[1]	Note[1]			Note[A]	Note[A]	
Oxacillin Streptococcus groups A, C and G	Note[1]	Note[1]			Note[A]	Note[A]	
Cloxacillin Streptococcus groups A, C and G	Note[1]	Note[1]			Note[A]	Note[A]	
Dicloxacillin Streptococcus groups A, C and G	Note[1]	Note[1]			Note[A]	Note[A]	
Flucloxacillin Streptococcus groups A, C and G	Note[1]	Note[1]			Note[A]	Note[A]	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-	

Notes
Numbered notes relate to general comments and/or MIC breakpoints.
Lettered notes relate to the disk diffusion method.

1/A. The susceptibility of streptococcus groups A, B, C and G to penicillins is inferred from the benzylpenicillin susceptibility (indications other than meningitis) with the exception of phenoxymethylpenicillin and isoxazolylpenicillins for streptococcus group B.
2. Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory.
3. The addition of a beta-lactamase inhibitor does not add clinical benefit.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Cephalosporins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	Note[1]	Note[1]			Note[A]	Note[A]		**1/A**. The susceptibility of streptococcus groups A, B, C and G to cephalosporins is inferred from the benzylpenicillin susceptibility. **2.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Cefadroxil	Note[1]	Note[1]			Note[A]	Note[A]		
Cefalexin	Note[1]	Note[1]			Note[A]	Note[A]		
Cefazolin	Note[1]	Note[1]			Note[A]	Note[A]		
Cefepime	Note[1]	Note[1]			Note[A]	Note[A]		
Cefiderocol	IE	IE			IE	IE		
Cefixime	-	-			-	-		
Cefotaxime	Note[1]	Note[1]			Note[A]	Note[A]		
Cefoxitin	IE	IE			IE	IE		
Cefpodoxime	Note[1]	Note[1]			Note[A]	Note[A]		
Ceftaroline	Note[1]	Note[1]			Note[A]	Note[A]		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	Note[1]	Note[1]			Note[A]	Note[A]		
Ceftobiprole	IE	IE			IE	IE		
Ceftolozane-tazobactam[2]	IE	IE			IE	IE		
Ceftriaxone	Note[1]	Note[1]			Note[A]	Note[A]		
Cefuroxime iv	Note[1]	Note[1]			Note[A]	Note[A]		
Cefuroxime oral	Note[1]	Note[1]			Note[A]	Note[A]		

Carbapenems[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doripenem	Note[1]	Note[1]			Note[A]	Note[A]		**1/A**. The susceptibility of streptococcus groups A, B, C and G to carbapenems is inferred from the benzylpenicillin susceptibility. **2/B.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Ertapenem	Note[1]	Note[1]			Note[A]	Note[A]		
Imipenem	Note[1]	Note[1]			Note[A]	Note[A]		
Imipenem-relebactam[2]	Note[2]	Note[2]			Note[B]	Note[B]		
Meropenem	Note[1]	Note[1]			Note[A]	Note[A]		
Meropenem-vaborbactam[2]	Note[2]	Note[2]			Note[B]	Note[B]		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Aztreonam	-	-			-	-		

Streptococcus groups A, B, C and G

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	-	-			-	-		**A.** A disk diffusion test is not yet developed. Perform an MIC test. **B.** The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note C.** **C.** Isolates categorised as susceptible to norfloxacin can be reported susceptible to moxifloxacin and as "susceptible increased exposure" (I) to levofloxacin. Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Delafloxacin	0.03	0.03			Note[A]	Note[A]		
Levofloxacin	0.001	2		5	50[B]	17[B]		
Moxifloxacin	0.5	0.5		5	19[B]	19[B]		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (screen only)	NA	NA		10	12[C]	Note[C]		
Ofloxacin	-	-			-	-		

Aminoglycosides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	-	-			-	-		
Gentamicin	-	-			-	-		
Netilmicin	-	-			-	-		
Tobramycin	-	-			-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin[1]	0.125[2,3]	0.125[2]			Note[A]	Note[A]		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **2.** MICs must be determined in the presence of polysorbate-80 (0.002% in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturer's instructions for commercial systems. **3.** Isolates susceptible to vancomycin can be reported susceptible to dalbavancin and oritavancin. **A.** Disk diffusion criteria have not been defined and an MIC method should be used. **B.** Non-wild type isolates were not available when developing the disk diffusion method.
Oritavancin[1]	0.25[2,3]	0.25[2]			Note[A]	Note[A]		
Teicoplanin[1]	2	2		30	15[B]	15[B]		
Telavancin	IE	IE			IE	IE		
Vancomycin[1]	2	2		5	13[B]	13[B]		

Streptococcus groups A, B, C and G

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25[1]	0.5[1]			Note[A]	Note[A]		**1/A.** Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin. **2.** Inducible clindamycin resistance can be detected by antagonism of clindamycin activity by a macrolide agent. If not detected, then report as tested according to the clinical breakpoints. If detected, then report as resistant and consider adding this comment to the report: "Clindamycin may still be used for short-term therapy of less serious skin and soft tissue infections as constitutive resistance is unlikely to develop during such therapy". The clinical importance of inducible clindamycin resistance in combination treatment of severe *S. pyogenes* infections is not known. **B.** Place the erythromycin and clindamycin disks 12-16 mm apart (edge to edge) and look for antagonism (the D phenomenon) to detect inducible clindamycin resistance.
Clarithromycin	0.25[1]	0.5[1]			Note[A]	Note[A]		
Erythromycin	0.25[1]	0.5[1]		15	21[A]	18[A]		
Roxithromycin	0.5[1]	1[1]			Note[A]	Note[A]		
Telithromycin	0.25	0.5		15	20	17		
Clindamycin[2]	0.5	0.5		2	17[B]	17[B]		
Quinupristin-dalfopristin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1[1]	2[1]			Note[A]	Note[A]		**1/A.** Isolates susceptible to tetracycline are also susceptible to doxycycline and minocycline, but some resistant to tetracycline may be susceptible to minocycline and/or doxycycline. An MIC method should be used to test doxycycline susceptibility of tetracycline resistant isolates if required. **2.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **3.** For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use.
Eravacycline	IE	IE			IE	IE		
Minocycline	0.5[1]	0.5[1]		30	23[A]	23[A]		
Tetracycline	1[1]	2[1]		30	23[A]	20[A]		
Tigecycline[2]	0.125[3]	0.125[3]		15	19	19		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid[1]	2	2		10	19	19		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **2/A.** Isolates susceptible to linezolid can be reported susceptible to tedizolid.
Tedizolid[1]	0.5[2]	0.5		2	18[A]	18[A]		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	8	8		**30**	19	19		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory.
Colistin	-	-			-	-		
Daptomycin[1]	1[2]	1[2]			Note[A]	Note[A]		**2.** Daptomycin MICs must be determined in the presence of Ca^{2+} (50 mg/L in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturer's instructions for commercial systems.
Fosfomycin iv	-	-			-	-		**3**. Trimethoprim-sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Fosfomycin oral	-	-			-	-		
Fusidic acid	IE	IE			IE	IE		**A.** Use an MIC method.
Lefamulin	IE	IE			IE	IE		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), *S. agalactiae* (group B streptococci)	64	64		**100**	15	15		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	0.06	0.5		**5**	21	15		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only), *S. agalactiae* (group B streptococci)	2	2		**5**	IP	IP		
Trimethoprim-sulfamethoxazole[3]	1	2		**1.25-23.75**	18	15		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: 5x10^5 CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5 from blood agar or McFarland 1.0 from chocolate agar
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Benzylpenicillin (indications other than meningitis)[2]	0.06[1]	2[1]			Note[A]	Note[A]	
Benzylpenicillin (meningitis)	0.06[1]	0.06[1]			Note[A]	Note[A]	
Ampicillin (indications other than meningitis)	0.5[1]	2[1]		2	22[A]	16[A]	
Ampicillin (meningitis)	0.5[1]	0.5[1]			Note[A,B]	Note[A,B]	
Ampicillin-sulbactam[3]	Note[1,4]	Note[1,4]			Note[A,C]	Note[A,C]	
Amoxicillin iv (indications other than meningitis)	Note[1,4]	Note[1,4]			Note[A,C]	Note[A,C]	
Amoxicillin iv (meningitis)	0.5[1]	0.5[1]			Note[A,B]	Note[A,B]	
Amoxicillin oral	0.5[1]	1[1]			Note[A,D]	Note[A,D]	
Amoxicillin-clavulanic acid iv[3]	Note[1,4]	Note[1,4]			Note[A,C]	Note[A,C]	
Amoxicillin-clavulanic acid oral[3]	0.5[1,5]	1[1,5]			Note[A,D]	Note[A,D]	
Piperacillin	Note[1,4]	Note[1,4]			Note[A,C]	Note[A,C]	
Piperacillin-tazobactam[3]	Note[1,4]	Note[1,4]			Note[A,C]	Note[A,C]	
Ticarcillin	-	-			-	-	
Ticarcillin-clavulanic acid	-	-			-	-	
Temocillin	-	-			-	-	
Phenoxymethylpenicillin	Note[1]	Note[1]			Note[A]	Note[A]	
Oxacillin (screen only)	NA	NA		1	20[E]	Note[E]	
Cloxacillin	-	-			-	-	
Dicloxacillin	-	-			-	-	
Flucloxacillin	-	-			-	-	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-	

Notes
Numbered notes relate to general comments and/or MIC breakpoints.
Lettered notes relate to the disk diffusion method.

1/A. The oxacillin 1 µg disk screen test or a benzylpenicillin MIC test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (oxacillin inhibition zone ≥20 mm, or benzylpenicillin MIC ≤0.06 mg/L) all beta-lactam agents for which clinical breakpoints are available, including those with "Note" can be reported susceptible without further testing, except for cefaclor, which if reported, should be reported as "susceptible, increased exposure" (I). When the screen is positive (inhibition zone <20 mm, or benzylpenicillin MIC >0.06 mg/L), **see flow chart below**.
~~**2.** Breakpoints for penicillins other than "benzylpenicillin (meningitis)" relate only to non-meningitis isolates.~~
2. For breakpoints and dosing in pneumonia, see table of dosages.
3. The addition of a beta-lactamase inhibitor does not add clinical benefit.
4/C. Susceptibility inferred from ampicillin (indications other than meningitis).
5. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.

B. For isolates with oxacillin inhibition zone <20 mm, or benzylpenicillin MIC >0.06 mg/L, determine the MIC.
D. Perform an MIC or infer susceptibility from the ampicillin 2 µg disk diffusion test with ampicillin breakpoints S≥22, R<19 mm.
E. For interpretation of the oxacillin disk screen, see flow chart below.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Cephalosporins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	0.001	0.5		30	50	28		**1/A.** The oxacillin 1 µg disk screen test or a benzylpenicillin MIC test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (oxacillin inhibition zone ≥20 mm, or benzylpenicillin MIC ≤0.06 mg/L) all beta-lactam agents for which clinical breakpoints are available, including those with "Note" can be reported susceptible without further testing, except for cefaclor, which if reported, should be reported as "susceptible, increased exposure" (I). When the screen is positive (inhibition zone <20 mm, or benzylpenicillin MIC >0.06 mg/L), **see flow chart below**.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	1	2			Note[A]	Note[A]		
Cefiderocol	IE	IE			IE	IE		**B.** For isolates with oxacillin inhibition zone <20 mm, or benzylpenicillin MIC >0.06 mg/L, determine the MIC.
Cefixime	-	-			-	-		
Cefotaxime (indications other than meningitis)	0.5	2			Note[A]	Note[A]		
Cefotaxime (meningitis)	0.5	0.5			Note[A,B]	Note[A,B]		
Cefoxitin	IE	IE			IE	IE		
Cefpodoxime	0.25	0.5			Note[A]	Note[A]		
Ceftaroline	0.25	0.25			Note[A]	Note[A]		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole	0.5	0.5			Note[A]	Note[A]		
Ceftolozane-tazobactam	-	-			-	-		
Ceftriaxone (indications other than meningitis)	0.5	2			Note[A]	Note[A]		
Ceftriaxone (meningitis)	0.5	0.5			Note[A,B]	Note[A,B]		
Cefuroxime iv	0.5	1			Note[A]	Note[A]		
Cefuroxime oral	0.25	0.5			Note[A]	Note[A]		

Carbapenems[1,2]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doripenem	1	1			Note[A]	Note[A]		**1/A.** The oxacillin 1 µg disk screen test or a benzylpenicillin MIC test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (oxacillin inhibition zone ≥20 mm, or benzylpenicillin MIC ≤0.06 mg/L) all beta-lactam agents for which clinical breakpoints are available, including those with "Note" can be reported susceptible without further testing, except for cefaclor, which if reported, should be reported as "susceptible, increased exposure" (I). When the screen is positive (inhibition zone <20 mm, or benzylpenicillin MIC >0.06 mg/L), **see flow chart below**. **2.** Meropenem is the only carbapenem used for meningitis. **3/B.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Ertapenem	0.5	0.5			Note[A]	Note[A]		
Imipenem	2	2			Note[A]	Note[A]		
Imipenem-relebactam[3]	Note[3]	Note[3]			Note[B]	Note[B]		
Meropenem (indications other than meningitis)	2	2			Note[A]	Note[A]		
Meropenem (meningitis)	0.25	0.25			Note[A,C]	Note[A,C]		
Meropenem-vaborbactam[3]	Note[3]	Note[3]			Note[B]	Note[B]		**C.** For isolates with oxacillin inhibition zone <20 mm, or benzylpenicillin MIC >0.06 mg/L, determine the MIC for meropenem.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Aztreonam	-	-			-	-		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	-	-			-	-		**A.** The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note B.**
Delafloxacin	IE	IE			IE	IE		**B.** Isolates categorised as susceptible to norfloxacin can be reported susceptible to moxifloxacin and as "susceptible increased exposure" (I) to levofloxacin. Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Levofloxacin	0.001	2		5	50[A]	16[A]		
Moxifloxacin	0.5	0.5		5	22[A]	22[A]		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (screen only)	NA	NA		10	10[B]	Note[B]		
Ofloxacin	-	-			-	-		

Aminoglycosides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	-	-			-	-		
Gentamicin	-	-			-	-		
Netilmicin	-	-			-	-		
Tobramycin	-	-			-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin	IE	IE			IE	IE		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory.
Oritavancin	IE	IE			IE	IE		
Teicoplanin[1]	2	2		30	17[A]	17[A]		**A.** Non-wild type isolates were not available when developing the disk diffusion method.
Telavancin	IE	IE			IE	IE		
Vancomycin[1]	2	2		5	16[A]	16[A]		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25[1]	0.5[1]			Note[A]	Note[A]		**1/A.** Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin. **2.** Inducible clindamycin resistance can be detected by antagonism of clindamycin activity by a macrolide agent. If not detected, then report as tested according to the clinical breakpoints. If detected, then report as resistant. **B.** Place the erythromycin and clindamycin disks 12-16 mm apart (edge to edge) and look for antagonism (the D phenomenon) to detect inducible clindamycin resistance.
Clarithromycin	0.25[1]	0.5[1]			Note[A]	Note[A]		
Erythromycin	0.25[1]	0.5[1]		15	22[A]	19[A]		
Roxithromycin	0.5[1]	1[1]			Note[A]	Note[A]		
Telithromycin	0.25	0.5		15	23	20		
Clindamycin[2]	0.5	0.5		2	19[B]	19[B]		
Quinupristin-dalfopristin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1[1]	2[1]			Note[A]	Note[A]		**1/A**. Isolates susceptible to tetracycline are also susceptible to doxycycline and minocycline, but some resistant to tetracycline may be susceptible to minocycline and/or doxycycline. An MIC method should be used to test doxycycline susceptibility of tetracycline resistant isolates if required.
Eravacycline	IE	IE			IE	IE		
Minocycline	0.5[1]	0.5[1]		30	24[A]	24[A]		
Tetracycline	1[1]	2[1]		30	25[A]	22[A]		
Tigecycline	IE	IE			IE	IE		

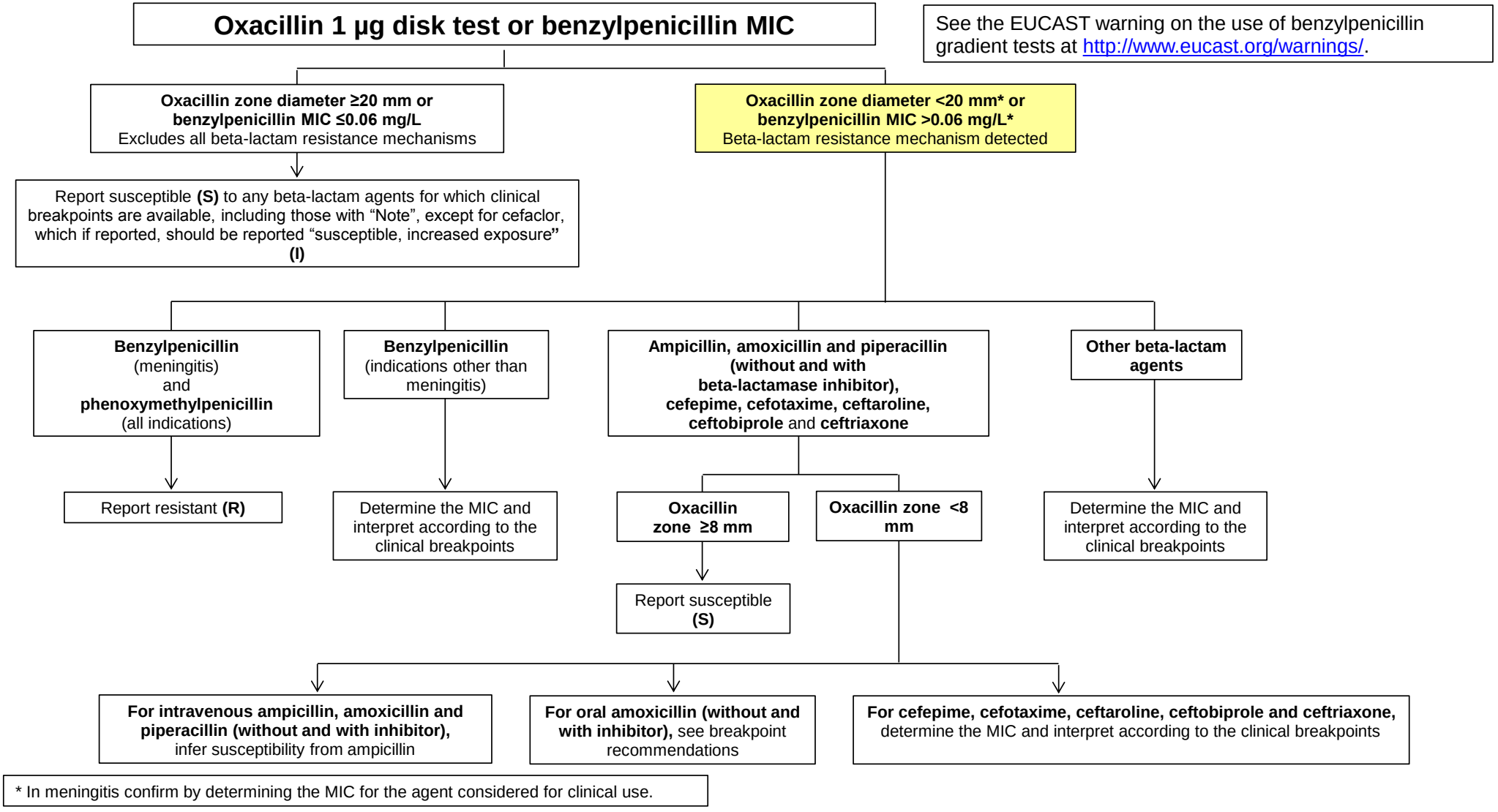
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	2	2		10	22	22		
Tedizolid	IE	IE			IE	IE		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol[1]	8	8		30	21	21		**1.** For chloramphenicol treatment in meningitis, see table of dosages.
Colistin	-	-			-	-		**2.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Daptomycin	IE	IE			IE	IE		
Fosfomycin iv	IE	IE			IE	IE		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	0.5	0.5		5	12	12		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	0.125	0.5		5	22	17		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole[2]	1	2		1.25-23.75	13	10		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Screening for beta-lactam resistance in *S. pneumoniae*



* In meningitis confirm by determining the MIC for the agent considered for clinical use.

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

In endocarditis, refer to national or international endocarditis guidelines for breakpoints for viridans group streptococci.

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

This group of bacteria includes many species, which can be grouped as follows:
***S. anginosus* group:** *S. anginosus, S. constellatus, S. intermedius*
***S. mitis* group:** *S. australis, S. cristatus, S. infantis, S. mitis, S. oligofermentans, S. oralis,S. peroris, S. pseudopneumoniae, S. sinensis*
***S. sanguinis* group:** *S. sanguinis, S. parasanguinis, S. gordonii*
***S. bovis* group:** *S. equinus, S. gallolyticus (S. bovis), S. infantarius*
***S. salivarius* group:** *S. salivarius, S. vestibularis, S. thermophilus*
***S. mutans* group:** *S. mutans, S. sobrinus*

Penicillins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	0.25	2		1 unit	18	12		**1/A.** Benzylpenicillin (MIC or disk diffusion) can be used to screen for beta-lactam resistance in viridans group streptococci. Isolates categorised as screen negative can be reported susceptible to beta-lactam agents for which clinical breakpoints are listed (including those with "Note"). Isolates categorised as screen positive should be tested for susceptibility to individual agents.
Benzylpenicillin (screen only)	0.25[1]	Note[1]		1 unit	18[A]	Note[A]		
Ampicillin	0.5	2		2	21	15		
Ampicillin-sulbactam[2]	Note[1,3]	Note[1,3]			Note[A,B]	Note[A,B]		
Amoxicillin	0.5	2			Note[A,B]	Note[A,B]		**2.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Amoxicillin-clavulanic acid[2]	Note[1,3]	Note[1,3]			Note[A,B]	Note[A,B]		
Piperacillin	Note[1,3]	Note[1,3]			Note[A,B]	Note[A,B]		**3/B.** For benzylpenicillin screen negative isolates (inhibition zone ≥18 mm or MIC ≤0.25 mg/L), susceptibility can be inferred from benzylpenicillin or ampicillin. For benzylpenicillin screen positive isolates (inhibition zone <18 mm or MIC >0.25 mg/L), susceptibility is inferred from ampicillin.
Piperacillin-tazobactam[2]	Note[1,3]	Note[1,3]			Note[A,B]	Note[A,B]		
Ticarcillin	IE	IE			IE	IE		
Ticarcillin-clavulanic acid[2]	IE	IE			IE	IE		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	IE	IE			IE	IE		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-		

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor	-	-			-	-		**1.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		**A**. Benzylpenicillin (MIC or disk diffusion) can be used to screen for beta-lactam resistance in viridans group streptococci. **See Note 1/A on penicillins.**
Cefazolin	-	-			-	-		
Cefepime	0.5	0.5		30	25[A]	25[A]		
Cefiderocol	IE	IE			IE	IE		
Cefixime	-	-			-	-		
Cefotaxime	0.5	0.5		5	23[A]	23[A]		
Cefoxitin	IE	IE			IE	IE		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole	-	-			-	-		
Ceftolozane-tazobactam[1], *S. anginosus* group	IE	IE			IE	IE		
Ceftriaxone	0.5	0.5		30	27[A]	27[A]		
Cefuroxime iv	0.5	0.5		30	26[A]	26[A]		
Cefuroxime oral	-	-			-	-		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem	1	1			Note[A]	Note[A]		**1.** For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Ertapenem	0.5	0.5			Note[A]	Note[A]		**2/B.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Imipenem	2	2			Note[A]	Note[A]		
Imipenem-relebactam[2]	2[1]	2[1]			Note[A,B]	Note[A,B]		**A.** Benzylpenicillin (MIC or disk diffusion) can be used to screen for beta-lactam resistance in viridans group streptococci. **See Note 1/A on penicillins.**
Meropenem	2	2			Note[A]	Note[A]		
Meropenem-vaborbactam[2]	Note[2]	Note[2]			Note[B]	Note[B]		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam	-	-			-	-		

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	-	-			-	-		**1/B.** There are no clinical breakpoints for viridans group streptococci and moxifloxacin, but moxifloxacin has been used for oral step-down treatment of endocarditis caused by viridans group streptococci .The moxifloxacin MIC ECOFF (0.5 mg/L) can be used to screen for resistance mechanisms. When screen negative, the isolate should be reported "wild type" or "devoid of fluoroquinolone resistance mechanisms", but not as susceptible to moxifloxacin.
Delafloxacin, *S. anginosus* group	0.03	0.03			Note[A]	Note[A]		
Levofloxacin	IE	IE			IE	IE		
Moxifloxacin	Note[1]	Note[1]			Note[B]	Note[B]		
Nalidixic acid (screen only)	NA	NA			NA	NA		**A.** A disk diffusion test is not yet developed. Perform an MIC test.
Norfloxacin (uncomplicated UTI only)	-	-			-	-		
Ofloxacin	-	-			-	-		

Aminoglycosides[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amikacin	Note[2]	Note[2]			-	-		**1**. Viridans group streptococci are intrinsically resistant to aminoglycosides and aminoglycoside monotherapy is ineffective. There is likely to be synergy between aminoglycosides and penicillins or glycopeptides against streptococci without acquired high-level aminoglycoside resistance. All testing is therefore to distinguish between intrinsic and high-level acquired resistance.
Gentamicin (test for high-level aminoglycoside resistance)	Note[2]	Note[2]			-	-		**2.** Gentamicin can be used to screen for high-level aminoglycoside resistance (HLAR).
Netilmicin	Note[2]	Note[2]			-	-		**Negative test:** Isolates with gentamicin MIC ≤128 mg/L. The isolate is wild type for gentamicin and low-level intrinsic resistant. For other aminoglycosides, this may not be the case. Synergy with penicillins or glycopeptides can be expected if the isolate is susceptible to the penicillin or glycopeptide.
Tobramycin	Note[2]	Note[2]			-	-		**Positive test:** Isolates with gentamicin MIC >128 mg/L. The isolate is high-level resistant to gentamicin and other aminoglycosides except streptomycin. There will be no synergy with penicillins or glycopeptides.

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Dalbavancin[1], *S. anginosus* group	0.125[2,3]	0.125[2]			Note[A]	Note[A]		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory.
Oritavancin[1], *S. anginosus* group	0.25[2,3]	0.25[2]			Note[A]	Note[A]		**2.** MICs must be determined in the presence of polysorbate-80 (0.002% in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturer's instructions for commercial systems.
Teicoplanin[1]	2	2		30	16[B]	16[B]		**3.** Isolates susceptible to vancomycin can be reported susceptible to dalbavancin and oritavancin.
Telavancin	IE	IE			IE	IE		**A.** Disk diffusion criteria have not been defined and an MIC method should be used.
Vancomycin[1]	2	2		5	15[B]	15[B]		**B.** Non-wild type isolates were not available when developing the disk diffusion method.

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Azithromycin	IE	IE			IE	IE		**1.** Inducible clindamycin resistance can be detected by antagonism of clindamycin activity by a macrolide agent. If not detected, then report as tested according to the clinical breakpoints. If detected, then report as resistant. **A.** Place the erythromycin and clindamycin disks 12-16 mm apart (edge to edge) and look for antagonism (the D phenomenon) to detect inducible clindamycin resistance.
Clarithromycin	IE	IE			IE	IE		
Erythromycin	IE	IE		15	IE	IE		
Roxithromycin	IE	IE			IE	IE		
Telithromycin	IE	IE			IE	IE		
Clindamycin[1]	0.5	0.5		2	19[A]	19[A]		
Quinupristin-dalfopristin	IE	IE			IE	IE		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	-	-			-	-		
Eravacycline	0.125	0.125		20	17	17		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline	IE	IE			IE	IE		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	IE	IE			IE	IE		
Tedizolid, *S. anginosus* group	0.5	0.5		2	18	18		

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	-	-			-	-		**1/A.** There are no clinical breakpoints for viridans group streptococci and rifampicin, but rifampicin has been used for oral step-down treatment of endocarditis caused by viridans group streptococci. The rifampicin MIC ECOFF (0.125 mg/L) can be used to screen for resistance mechanisms. When screen negative, the isolate should be reported "wild type" or "devoid rifampicin resistance mechanisms", but not as susceptible to rifampicin.
Colistin	-	-			-	-		
Daptomycin	-	-			-	-		
Fosfomycin iv	-	-			-	-		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	IE	IE			IE	IE		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	Note[1]	Note[1]			Note[A]	Note[A]		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole	-	-			-	-		

Haemophilus influenzae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 11.0, valid from 2021-01-01

EUCAST breakpoints have been defined for *H. influenzae* only. Clinical data for other *Haemophilus* species are scarce. MIC distributions for *H. parainfluenzae* are similar to those for *H. influenzae*. In the absence of specific breakpoints, the *H. influenzae* MIC breakpoints can be applied to *H. parainfluenzae*.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor combinations, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor-combination disks, see EUCAST QC Tables.

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Benzylpenicillin	IE	IE			IE	IE	
Benzylpenicillin (screen only)[1]	NA	NA		1 unit	12[A,B]	Note[A,B]	
Ampicillin (indications other than meningitis)[2]	1	1		2	18[A,B]	18[A,B]	
Ampicillin (meningitis)[2]	IE	IE			IE	IE	
Ampicillin-sulbactam	1[3,4]	1[3,4]		10-10	Note[A,D]	Note[A,D]	
Amoxicillin iv (indications other than meningitis)[2]	2	2			Note[A,E]	Note[A,E]	
Amoxicillin iv (meningitis)[2]	IE	IE			IE	IE	
Amoxicillin oral[2]	0.001	2			Note[A,F]	Note[A,F]	
Amoxicillin-clavulanic acid iv	2[5]	2[5]		2-1	15[A,B]	15[A,B]	
Amoxicillin-clavulanic acid oral	0.001[5]	2[5]		2-1	50[A,B]	15[A,B]	
Piperacillin[2]	IE	IE			IE	IE	
Piperacillin-tazobactam	0.25[6]	0.25[6]		30-6	27[A,B]	27[A,B]	24-27[B,C]
Ticarcillin	IE	IE			IE	IE	
Ticarcillin-clavulanic acid	IE	IE			IE	IE	
Temocillin	IE	IE			IE	IE	
Phenoxymethylpenicillin	IE	IE			IE	IE	
Oxacillin	-	-			-	-	
Cloxacillin	-	-			-	-	
Dicloxacillin	-	-			-	-	
Flucloxacillin	-	-			-	-	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-	

Notes

Numbered notes relate to general comments and/or MIC breakpoints.
Lettered notes relate to the disk diffusion method.

1/A. The benzylpenicillin 1 unit disk screen test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (inhibition zone ≥12 mm) all penicillins for which clinical breakpoints are available, including those with "Note", can be reported susceptible without further testing, except for amoxicillin oral and amoxicillin-clavulanic acid oral, which if reported, should be reported "susceptible, increased exposure" (I). When the screen is positive (inhibition zone <12 mm), **see flow chart below.**
2. Beta-lactamase positive isolates can be reported resistant to ampicillin, amoxicillin and piperacillin without inhibitors. Tests based on a chromogenic cephalosporin can be used to detect the beta-lactamase.
3. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
4/D. Susceptibility can be inferred from amoxicillin-clavulanic acid iv.
5. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
6. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.

B. Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk, **see pictures below.**
C. ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).
E. Susceptibility can be inferred from ampicillin.
F. Isolates susceptible to ampicillin can be reported "susceptible, increased exposure" (I) to amoxicillin oral.

Cephalosporins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefaclor	-	-			-	-		**1/A.** The benzylpenicillin 1 unit disk screen test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (inhibition zone ≥12 mm) all cephalosporins for which clinical breakpoints are available, including those with "Note", can be reported susceptible without further testing, except for cefuroxime oral, which if reported, should be reported "susceptible, increased exposure" (I). When the screen is positive (inhibition zone <12 mm), **see flow chart below**.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	0.25	0.25		30	28[A,B]	28[A,B]	28-33[B,C]	**2.** See table of dosages for dosing for different indications.
Cefiderocol	IE	IE			IE	IE		**3/C.** ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).
Cefixime	0.125	0.125		5	26[A,B]	26[A,B]		**4.** The breakpoints also apply to meningitis.
Cefotaxime[4]	0.125	0.125		5	27[A,B]	27[A,B]	25-27[B,C]	
Cefoxitin	IE	IE			IE	IE		**B.** Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk, **see pictures below.**
Cefpodoxime	0.25	0.25		10	26[A,B]	26[A,B]	26-29[B,C]	
Ceftaroline	0.03	0.03			Note[A]	Note[A]		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	1	1		30	25[A,B]	25[A,B]		
Ceftobiprole	IE	IE			IE	IE		
Ceftolozane-tazobactam (pneumonia)[2]	0.5	0.5		30-10	23[A,B]	23[A,B]	22-23[B,C]	
Ceftriaxone[4]	0.125	0.125		30	32[A,B]	32[A,B]	31-33[B,C]	
Cefuroxime iv	1	2	2[3]	30	27[A,B]	25[A,B]	25-27[B,C]	
Cefuroxime oral	0.001	1		30	50[A,B]	27[A,B]	25-27[B,C]	

Carbapenems[1,2]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doripenem[1]	1	1		10	23[A,B]	23[A,B]		**1/A.** The benzylpenicillin 1 unit disk screen test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (inhibition zone ≥12 mm) all carbapenems for which clinical breakpoints are available, including those with "Note", can be reported susceptible without further testing. When the screen is positive (inhibition zone <12 mm), **see flow chart below**.
Ertapenem	0.5	0.5		10	23[A,B]	23[A,B]		**2.** Meropenem is the only carbapenem used for meningitis.
Imipenem	2	2		10	20[A,B]	20[A,B]	6-19[B,C]	**3/E.** The beta-lactamases produced by the organism either do not modify the parent carbapenem or are not affected by the inhibitor. Therefore the addition of the beta-lactamase inhibitor does not add clinical benefit.
Imipenem-relebactam[3]	Note[3]	Note[3]			Note[E]	Note[E]		
Meropenem (indications other than meningitis)	2	2		10	20[A,B]	20[A,B]		**B.** Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk, **see pictures below.**
Meropenem (meningitis)	0.25	0.25			Note[A,D]	Note[A,D]		**C.** ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).
Meropenem-vaborbactam[3]	Note[3]	Note[3]			Note[E]	Note[E]		**D.** For benzylpenicillin 1 unit disk screen positive isolates (inhibition zone <12 mm), determine the MIC for meropenem.

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam	IE	IE			IE	IE		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.06	0.06		5	30[A]	30[A]		**A.** The nalidixic acid disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note B.**
Delafloxacin	IE	IE			IE	IE		**B.** Isolates categorised as susceptible to nalidixic acid can be reported susceptible to ciprofloxacin, levofloxacin, moxifloxacin and ofloxacin. Isolates categorised as non-susceptible may have fluoroquinolone resistance and should be tested against the appropriate agent.
Levofloxacin	0.06	0.06		5	30[A]	30[A]		
Moxifloxacin	0.125	0.125		5	28[A]	28[A]		
Nalidixic acid (screen only)	NA	NA		30	23[B]	Note[B]		
Norfloxacin (uncomplicated UTI only)	-	-			-	-		
Ofloxacin	0.06	0.06		5	30[A]	30[A]		

Aminoglycosides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amikacin	IE	IE			IE	IE		
Gentamicin	IE	IE			IE	IE		
Netilmicin	IE	IE			IE	IE		
Tobramycin	IE	IE			IE	IE		

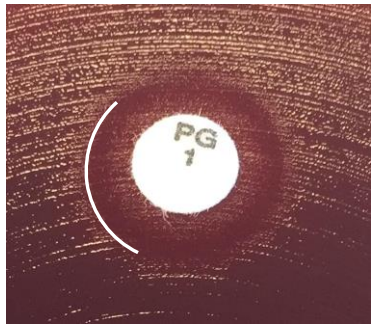
Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Dalbavancin	-	-			-	-		
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Macrolides[1], lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	Note[1]	Note[1]			Note[A]	Note[A]		**1/A.** Clinical evidence for the efficacy of macrolides in *H. influenzae* respiratory infections is conflicting due to high spontaneous cure rates. Should there be a need to test any macrolide against this species, the epidemiological cut-offs (ECOFFs) should be used to detect strains with acquired resistance. The ECOFFs for each agent are: azithromycin 4 mg/L, clarithromycin 32 mg/L, erythromycin 16 mg/L and telithromycin 8 mg/L. There are insufficient data available to establish an ECOFF for roxithromycin.
Clarithromycin	Note[1]	Note[1]			Note[A]	Note[A]		
Erythromycin	Note[1]	Note[1]			Note[A]	Note[A]		
Roxithromycin	Note[1]	Note[1]			Note[A]	Note[A]		
Telithromycin	Note[1]	Note[1]			Note[A]	Note[A]		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1[1]	2[1]			Note[A]	Note[A]		**1/A**. Isolates susceptible to tetracycline are also susceptible to doxycycline and minocycline, but some resistant to tetracycline may be susceptible to minocycline and/or doxycycline. An MIC method should be used to test doxycycline susceptibility of tetracycline resistant isolates if required.
Eravacycline	IE	IE			IE	IE		
Minocycline	1[1]	1[1]		30	24[A]	24[A]		
Tetracycline	1[1]	2[1]		30	25[A]	22[A]		
Tigecycline	IE	IE			IE	IE		

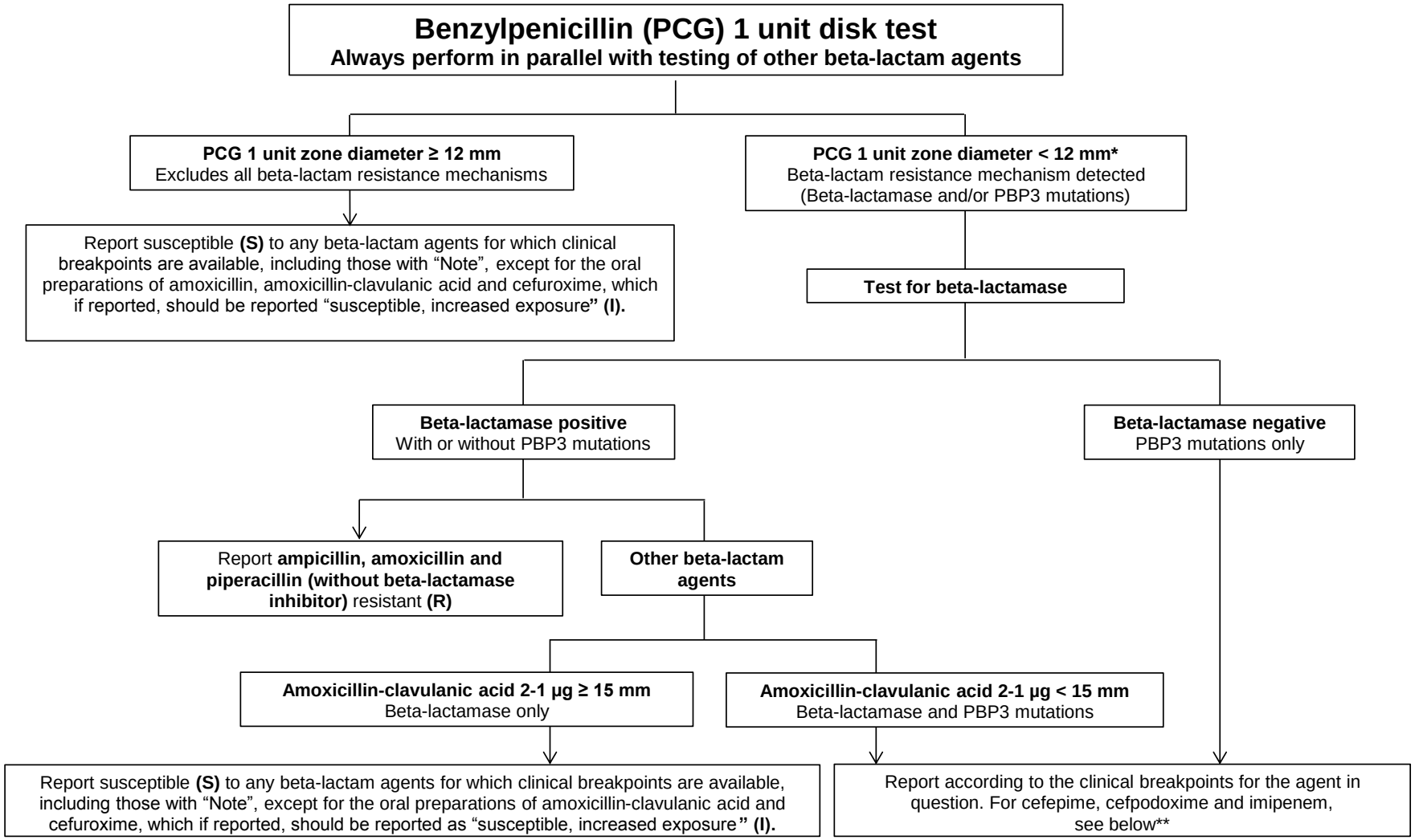
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	-	-			-	-		
Tedizolid	-	-			-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol[1]	2	2		30	28	28		**1.** For chloramphenicol treatment in meningitis, see table of dosages.
Colistin	-	-			-	-		**2.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Daptomycin	-	-			-	-		
Fosfomycin iv	IE	IE			IE	IE		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	IE	IE			IE	IE		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin (for prophylaxis only)	1	1		5	18	18		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole[2]	0.5	1		1.25-23.75	23	20		



Examples of inhibition zones for *H. influenzae* and a beta-lactam agent where an otherwise clear inhibition zone contains an area of growth around the disk.
Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk.

Screening for beta-lactam resistance in *H. influenzae*



Moraxella catarrhalis

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor combinations, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor-combination disks, see EUCAST QC Tables.

Penicillins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Benzylpenicillin	-	-			-	-	
Ampicillin	-[1]	-[1]			-	-	
Ampicillin-sulbactam	1[2,3]	1[2,3]			Note[A]	Note[A]	
Amoxicillin	-[1]	-[1]			-	-	
Amoxicillin-clavulanic acid	1[4]	1[4]		2-1	19	19	
Piperacillin	-[1]	-[1]			-	-	
Piperacillin-tazobactam	Note[3]	Note[3]			Note[A]	Note[A]	
Ticarcillin	IE	IE			IE	IE	
Ticarcillin-clavulanic acid	IE	IE			IE	IE	
Temocillin	IE	IE			IE	IE	
Phenoxymethylpenicillin	-	-			-	-	
Oxacillin	-	-			-	-	
Cloxacillin	-	-			-	-	
Dicloxacillin	-	-			-	-	
Flucloxacillin	-	-			-	-	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-	

Notes
Numbered notes relate to general comments and/or MIC breakpoints.
Lettered notes relate to the disk diffusion method.

1. Most *M. catarrhalis* produce beta-lactamase, although beta-lactamase production is slow and may give weak results with *in vitro* tests. Beta-lactamase producers should be reported resistant to penicillins and aminopenicillins without inhibitors.
2. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
3/A. Susceptibility can be inferred from amoxicillin-clavulanic acid.
4. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	-	-			-	-		
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	4	4		30	20	20		
Cefiderocol	IE	IE			IE	IE		
Cefixime	0.5	1		5	21	18		
Cefotaxime	1	2		5	20	17		
Cefoxitin	IE	IE			IE	IE		
Cefpodoxime	IP	IP		10	IP	IP		
Ceftaroline	IE	IE			IE	IE		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	IE	IE			IE	IE		
Ceftobiprole	IE	IE			IE	IE		
Ceftolozane-tazobactam	IE	IE			IE	IE		
Ceftriaxone	1	2		30	24	21		
Cefuroxime iv	4	8		30	21	18		
Cefuroxime oral	0.001	4		30	50	21		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doripenem[1]	1	1		10	30	30		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **2/A.** The beta-lactamases produced by the organism either do not modify the parent carbapenem or are not affected by the inhibitor. Therefore the addition of the beta-lactamase inhibitor does not add clinical benefit.
Ertapenem[1]	0.5	0.5		10	29	29		
Imipenem[1]	2	2		10	29	29		
Imipenem-relebactam[2]	Note[2]	Note[2]			Note[A]	Note[A]		
Meropenem[1]	2	2		10	33	33		
Meropenem-vaborbactam[2]	Note[2]	Note[2]			Note[A]	Note[A]		

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Aztreonam	IE	IE			IE	IE		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.125	0.125		5	31[A]	31[A]		**A.** The nalidixic acid disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note B.** **B.** Isolates categorised as susceptible to nalidixic acid can be reported susceptible to ciprofloxacin, levofloxacin, moxifloxacin and ofloxacin. Isolates categorised as non-susceptible may have fluoroquinolone resistance and should be tested against the appropriate agent.
Delafloxacin	IE	IE			IE	IE		
Levofloxacin	0.125	0.125		5	29[A]	29[A]		
Moxifloxacin	0.25	0.25		5	26[A]	26[A]		
Nalidixic acid (screen only)	NA	NA		30	23[B]	Note[B]		
Norfloxacin (uncomplicated UTI only)	-	-			-	-		
Ofloxacin	0.25	0.25		5	28[A]	28[A]		

Aminoglycosides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	IE	IE			IE	IE		
Gentamicin	IE	IE			IE	IE		
Netilmicin	IE	IE			IE	IE		
Tobramycin	IE	IE			IE	IE		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin	-	-			-	-		
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25[1]	0.5[1]			Note[A]	Note[A]		**1/A.** Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin.
Clarithromycin	0.25[1]	0.5[1]			Note[A]	Note[A]		
Erythromycin	0.25	0.5		15	23[A]	20[A]		
Roxithromycin	0.5[1]	1[1]			Note[A]	Note[A]		
Telithromycin	0.25	0.5		15	23	20		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin	-	-			-	-		

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1[1]	2[1]			Note[A]	Note[A]		**1/A**. Isolates susceptible to tetracycline are also susceptible to doxycycline and minocycline, but some resistant to tetracycline may be susceptible to minocycline and/or doxycycline. An MIC method should be used to test doxycycline susceptibility of tetracycline resistant isolates if required.
Eravacycline	IE	IE			IE	IE		
Minocycline	1[1]	1[1]		30	25[A]	25[A]		
Tetracycline	1[1]	2[1]		30	28[A]	25[A]		
Tigecycline	IE	IE			IE	IE		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	-	-			-	-		
Tedizolid	-	-			-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	Note[1]	Note[1]			Note[A]	Note[A]		**1/A**. For topical use of chloramphenicol, see tables of topical agents.
Colistin	-	-			-	-		**2.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Daptomycin	-	-			-	-		
Fosfomycin iv	IE	IE			IE	IE		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Lefamulin	IE	IE			IE	IE		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole[2]	0.5	1		1.25-23.75	18	15		

Neisseria gonorrhoeae

Expert Rules and Intrinsic Resistance Tables

For comments on dosages related to breakpoints, see the table of dosages.

Disk diffusion criteria for antimicrobial susceptibility testing of *Neisseria gonorrhoeae* have not yet been defined and an MIC method should be used. If a commercial MIC method is used, follow the manufacturer´s instructions. Laboratories with few isolates are encouraged to refer these to a reference laboratory for testing.

Penicillins[1]	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Benzylpenicillin (surrogate agent)[1]	0.06[1]	1		**1.** Always test for beta-lactamase (tests based on a chromogenic cephalosporin can be used). If beta-lactamase positive, report resistant to ampicillin and amoxicillin. If beta-lactamase negative, determine the MIC of benzylpenicillin. Infer the susceptibility to ampicillin and amoxicillin from the benzylpenicillin MIC (do not report benzylpenicillin susceptibility).
Ampicillin[1]	Note[1]	Note[1]		
Ampicillin-sulbactam	IE	IE		
Amoxicillin[1]	Note[1]	Note[1]		
Amoxicillin-clavulanic acid	IE	IE		
Piperacillin	-	-		
Piperacillin-tazobactam	-	-		
Ticarcillin	-	-		
Ticarcillin-clavulanic acid	-	-		
Temocillin	IE	IE		
Phenoxymethylpenicillin	-	-		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-		

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
Cefiderocol	IE	IE		
Cefixime	0.125	0.125		
Cefotaxime	0.125	0.125		
Cefoxitin	IE	IE		
Cefpodoxime	-	-		
Ceftaroline	-	-		
Ceftazidime	-	-		
Ceftazidime-avibactam	-	-		
Ceftibuten	-	-		
Ceftobiprole	-	-		
Ceftolozane-tazobactam	-	-		
Ceftriaxone	0.125	0.125		
Cefuroxime iv	-	-		
Cefuroxime oral	-	-		

Carbapenems	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doripenem	IE	IE		
Ertapenem	IE	IE		
Imipenem	IE	IE		
Imipenem-relebactam	IE	IE		
Meropenem	IE	IE		
Meropenem-vaborbactam	IE	IE		

Monobactams	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Aztreonam	IE	IE		

Fluoroquinolones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Ciprofloxacin	0.03	0.06		
Delafloxacin	IE	IE		
Levofloxacin	IE	IE		
Moxifloxacin	IE	IE		
Nalidixic acid (screen only)	NA	NA		
Norfloxacin (uncomplicated UTI only)	-	-		
Ofloxacin	0.125	0.25		

Aminoglycosides	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Amikacin	-	-		
Gentamicin	-	-		
Netilmicin	-	-		
Tobramycin	-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Dalbavancin	-	-		
Oritavancin	-	-		
Teicoplanin	-	-		
Telavancin	-	-		
Vancomycin	-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Azithromycin	Note[1]	Note[1]		**1.** Azithromycin is always used in conjunction with another effective agent. For testing purposes with the aim of detecting acquired resistance mechanisms, the ECOFF is 1 mg/L.
Clarithromycin	-	-		
Erythromycin	-	-		
Roxithromycin	-	-		
Telithromycin	-	-		
Clindamycin	-	-		
Quinupristin-dalfopristin	-	-		

Tetracyclines	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Doxycycline	IE	IE		
Eravacycline	IE	IE		
Minocycline	IE	IE		
Tetracycline	0.5	1		
Tigecycline	IE	IE		

Oxazolidinones	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Linezolid	-	-		
Tedizolid	-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Chloramphenicol	-	-		
Colistin	-	-		
Daptomycin	-	-		
Fosfomycin iv	-	-		
Fosfomycin oral	-	-		
Fusidic acid	-	-		
Lefamulin	IE	IE		
Metronidazole	-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin	-	-		
Spectinomycin	64	64		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Disk diffusion criteria for antimicrobial susceptibility testing of *Neisseria meningitidis* have not yet been defined and an MIC method should be used. If a commercial MIC method is used, follow the manufacturer´s instructions.

Penicillins[1]	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Benzylpenicillin	0.25	0.25		**1.** All breakpoints pertain to iv administration.
Ampicillin (indications other than meningitis)	0.125	1		
Ampicillin (meningitis)	IE	IE		
Ampicillin-sulbactam	IE	IE		
Amoxicillin (indications other than meningitis)	0.125	1		
Amoxicillin (meningitis)	IE	IE		
Amoxicillin-clavulanic acid	-	-		
Piperacillin	-	-		
Piperacillin-tazobactam	-	-		
Ticarcillin	-	-		
Ticarcillin-clavulanic acid	-	-		
Temocillin	-	-		
Phenoxymethylpenicillin	-	-		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-		

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory.
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
Cefiderocol	IE	IE		
Cefixime	-	-		
Cefotaxime[1]	0.125	0.125		
Cefoxitin	-	-		
Cefpodoxime	-	-		
Ceftaroline	-	-		
Ceftazidime	-	-		
Ceftazidime-avibactam	-	-		
Ceftibuten	-	-		
Ceftobiprole	-	-		
Ceftolozane-tazobactam	-	-		
Ceftriaxone[1]	0.125	0.125		
Cefuroxime iv	-	-		
Cefuroxime oral	-	-		

Carbapenems[1,2]	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doripenem	Note[2]	Note[2]		**1.** Non-susceptible isolates are rare or not yet reported. The identification and antimicrobial susceptibility test result on any such isolate must be confirmed and the isolate sent to a reference laboratory. **2.** Breakpoints for serious *N. meningitidis* systemic infections (meningitis with or without septicemia) have been determined for meropenem only. The meningitis breakpoint can be used to categorise meropenem for other serious infections. **3.** The beta-lactamases produced by the organism either do not modify the parent carbapenem or are not affected by the inhibitor. Therefore the addition of the beta-lactamase inhibitor does not add clinical benefit.
Ertapenem	IE	IE		
Imipenem	Note[2]	Note[2]		
Imipenem-relebactam[3]	Note[2,3]	Note[2,3]		
Meropenem (indications other than meningitis)	Note[2]	Note[2]		
Meropenem (meningitis)[1,2]	0.25	0.25		
Meropenem-vaborbactam[3]	Note[2,3]	Note[2,3]		

Monobactams	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Aztreonam	-	-		

Fluoroquinolones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Ciprofloxacin	0.03[1]	0.03[1]		**1.** Breakpoints apply only to use in the prophylaxis of meningococcal disease.
Delafloxacin	IE	IE		
Levofloxacin	IE	IE		
Moxifloxacin	IE	IE		
Nalidixic acid (screen only)	NA	NA		
Norfloxacin (uncomplicated UTI only)	-	-		
Ofloxacin	IE	IE		

Aminoglycosides	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Amikacin	-	-		
Gentamicin	-	-		
Netilmicin	-	-		
Tobramycin	-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Dalbavancin	-	-		
Oritavancin	-	-		
Teicoplanin	-	-		
Telavancin	-	-		
Vancomycin	-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Azithromycin	-	-		
Clarithromycin	-	-		
Erythromycin	-	-		
Roxithromycin	-	-		
Telithromycin	-	-		
Clindamycin	-	-		
Quinupristin-dalfopristin	-	-		

Tetracyclines	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doxycycline	-	-		**1.** Tetracycline can be used to predict susceptibility to minocycline for prophylaxis against *N. meningitidis* infections.
Eravacycline	IE	IE		
Minocycline	1[1]	1[1]		
Tetracycline	2[1]	2[1]		
Tigecycline	IE	IE		

Oxazolidinones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Linezolid	-	-		
Tedizolid	-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Chloramphenicol (meningitis)[1]	2	2		**1.** For chloramphenicol treatment in meningitis, see table of dosages. **2.** For prophylaxis of meningitis only (refer to national guidelines).
Colistin	-	-		
Daptomycin	-	-		
Fosfomycin iv	-	-		
Fosfomycin oral	-	-		
Fusidic acid	-	-		
Lefamulin	-	-		
Metronidazole	-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin[2]	0.25	0.25		
Spectinomycin	-	-		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Gram-positive anaerobes

except *Clostridioides difficile*

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 11.0, valid from 2021-01-01

Disk diffusion criteria for antimicrobial susceptibility testing of anaerobes have not yet been defined and an MIC method should be used. If a commercial MIC method is used, follow the manufacturer´s instructions.

This group of bacteria includes many genera. The most frequently isolated Gram-positive anaerobes are: *Actinomyces, Bifidobacterium, Clostridioides, Clostridium, Cutibacterium, Eggerthella, Eubacterium, Lactobacillus,* and *Propionibacterium.* The group also includes a number of anaerobic Gram-positive cocci, including *Staphylococcus saccharolyticus* . Anaerobes are most frequently defined by no growth on culture plates incubated in a CO_2 enriched atmosphere, but many Gram-positive, non-spore forming rods such as *Actinomyces* spp., many *C. acnes* and some *Bifidobacterium* spp. can grow on incubation in CO_2 and may be tolerant enough to grow poorly in air, but are still considered as anaerobic bacteria. Several species of *Clostridium,* including *C. carnis, C. histolyticum* and *C. tertium,* can grow but not sporulate in air. For all these species, susceptibility testing should be performed in anaerobic environment.

Penicillins[1]	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Benzylpenicillin[2]	0.25	0.5		**1.** Aminopenicillin breakpoints in Gram-positive anaerobic bacteria are based on intravenous administration.
Ampicillin[2]	4	8		**2.** Susceptibility to ampicillin, amoxicillin, piperacillin and ticarcillin can be inferred from susceptibility to benzylpenicillin.
Ampicillin-sulbactam	4[3]	8[3]		**3.** For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
Amoxicillin[2]	4	8		**4.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Amoxicillin-clavulanic acid	4[4]	8[4]		**5.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Piperacillin[2]	8	16		
Piperacillin-tazobactam	8[5]	16[5]		
Ticarcillin[2]	8	16		
Ticarcillin-clavulanic acid	8[4]	16[4]		
Temocillin	-	-		
Phenoxymethylpenicillin	IE	IE		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-		

Gram-positive anaerobes

except *Clostridioides difficile*

Expert Rules and Intrinsic Resistance Tables

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
Cefiderocol	IE	IE		
Cefixime	-	-		
Cefotaxime	-	-		
Cefoxitin	IE	IE		
Cefpodoxime	-	-		
Ceftaroline	-	-		
Ceftazidime	-	-		
Ceftazidime-avibactam	-	-		
Ceftibuten	-	-		
Ceftobiprole	-	-		
Ceftolozane-tazobactam	IE	IE		
Ceftriaxone	-	-		
Cefuroxime iv	-	-		
Cefuroxime oral	-	-		

Carbapenems	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doripenem	1	1		**1.** For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Ertapenem	0.5	0.5		**2.** The addition of a beta-lactamase inhibitor does not add clinical benefit.
Imipenem	2	4		
Imipenem-relebactam[2]	2[1]	2[1]		
Meropenem	2	8		
Meropenem-vaborbactam[2]	Note[2]	Note[2]		

Monobactams	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Aztreonam	-	-		

Gram-positive anaerobes

except *Clostridioides difficile*

Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Ciprofloxacin	-	-		
Delafloxacin	-	-		
Levofloxacin	-	-		
Moxifloxacin	IE	IE		
Nalidixic acid (screen only)	NA	NA		
Norfloxacin (uncomplicated UTI only)	-	-		
Ofloxacin	-	-		

Aminoglycosides	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Amikacin	-	-		
Gentamicin	-	-		
Netilmicin	-	-		
Tobramycin	-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Dalbavancin	IE	IE		
Oritavancin	IE	IE		
Teicoplanin	IE	IE		
Telavancin	IE	IE		
Vancomycin	2	2		

Gram-positive anaerobes

except *Clostridioides difficile*

Expert Rules and Intrinsic Resistance Tables

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Azithromycin	-	-		
Clarithromycin	-	-		
Erythromycin	IE	IE		
Roxithromycin	-	-		
Telithromycin	-	-		
Clindamycin	4	4		
Quinupristin-dalfopristin	-	-		

Tetracyclines[1]	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doxycycline	Note[1]	Note[1]		**1.** For anaerobic bacteria there is clinical evidence of activity in mixed intra-abdominal infections, but no correlation between MIC values, PK-PD data and clinical outcome. Therefore no breakpoints for susceptibility testing are given.
Eravacycline	IE	IE		
Minocycline	Note[1]	Note[1]		
Tetracycline	Note[1]	Note[1]		
Tigecycline	Note[1]	Note[1]		

Oxazolidinones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Linezolid	-	-		
Tedizolid	-	-		

Gram-positive anaerobes

except *Clostridioides difficile*

Expert Rules and Intrinsic Resistance Tables

Miscellaneous agents	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Chloramphenicol	8	8		
Colistin	-	-		
Daptomycin	-	-		
Fosfomycin iv	-	-		
Fosfomycin oral	-	-		
Fusidic acid	-	-		
Lefamulin	IE	IE		
Metronidazole	4	4		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin	-	-		
Spectinomycin	-	-		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Disk diffusion criteria for antimicrobial susceptibility testing of *Clostridiodes difficile* have not yet been defined and an MIC method should be used. If a commercial MIC method is used, follow the manufacturer´s instructions.

Fluoroquinolones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Moxifloxacin	-[1]	-[1]		**1.** Not used clinically. May be tested for epidemiological purposes only (ECOFF 4 mg/L).

Glycopeptides	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Vancomycin	2[1]	2[1]		**1.** The breakpoints are based on epidemiological cut-off values (ECOFFs) and apply to oral treatment of *C. difficile* infections with vancomycin. There are no conclusive clinical data regarding the relation between MICs and outcomes.

Tetracyclines	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Tigecycline	-[1,2]	-[1,2]		**1.** For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use. **2.** Not used clinically. May be tested for epidemiological purposes only (ECOFF 0.25 mg/L).

Miscellaneous agents	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Daptomycin	-[1,2]	-[1,2]		**1.** Daptomycin MICs must be determined in the presence of Ca^{2+} (50 mg/L in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturers' instructions for commercial systems. **2.** Not used clinically. May be tested for epidemiological purposes only (ECOFF 4 mg/L). **3.** Not used clinically. May be tested for epidemiological purposes only (ECOFF 2 mg/L). **4.** Fidaxomicin breakpoints and ECOFF have not been set because the available data show major variation in MIC distribution between studies. **5.** The breakpoints are based on epidemiological cut-off values (ECOFFs) and apply to oral treatment of *C. difficile* infections with metronidazole. There are no conclusive clinical data regarding the relation between MICs and outcomes. **6.** Not used clinically. May be tested for epidemiological purposes only (ECOFF 0.004 mg/L).
Fusidic acid	-[3]	-[3]		
Fidaxomicin	IE[4]	IE[4]		
Metronidazole	2[5]	2[5]		
Rifampicin	-[6]	-[6]		

Gram-negative anaerobes

Expert Rules and Intrinsic Resistance Tables

Disk diffusion criteria for antimicrobial susceptibility testing of anaerobes have not yet been defined and an MIC method should be used. If a commercial MIC method is used, follow the manufacturer´s instructions.

This group of bacteria includes many genera. The most frequently isolated Gram-negative anaerobes are *Bacteroides, Bilophila, Fusobacterium, Mobiluncus, Parabacteroides, Porphyromonas* and *Prevotella.* Anaerobes are most frequently defined by no growth on culture plates incubated in a CO_2 enriched atmosphere. For all these species, susceptibility testing should be performed in anaerobic environment.

Penicillins	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Benzylpenicillin[1]	0.25	0.5		**1.** Susceptibility to ampicillin, amoxicillin, piperacillin and ticarcillin can be inferred from susceptibility to benzylpenicillin.
Ampicillin[1]	0.5	2		**2.** For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
Ampicillin-sulbactam	4[2]	8[2]		**3.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Amoxicillin[1]	0.5	2		**4.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Amoxicillin-clavulanic acid	4[3]	8[3]		
Piperacillin[1]	16	16		
Piperacillin-tazobactam	8[4]	16[4]		
Ticarcillin[1]	16	16		
Ticarcillin-clavulanic acid	8[3]	16[3]		
Temocillin	-	-		
Phenoxymethylpenicillin	IE	IE		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-		

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
Cefiderocol	-	-		
Cefixime	-	-		
Cefotaxime	-	-		
Cefoxitin	IE	IE		
Cefpodoxime	-	-		
Ceftaroline	-	-		
Ceftazidime	-	-		
Ceftazidime-avibactam	-	-		
Ceftibuten	-	-		
Ceftobiprole	-	-		
Ceftolozane-tazobactam	IE	IE		
Ceftriaxone	-	-		
Cefuroxime iv	-	-		
Cefuroxime oral	-	-		

Carbapenems	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doripenem	1	1		**1.** For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L. **2.** The beta-lactamases produced by the organisms either do not modify the parent carbapenem or are not affected by the inhibitor. Therefore the addition of the beta-lactamase inhibitor does not add clinical benefit.
Ertapenem	0.5	0.5		
Imipenem	2	4		
Imipenem-relebactam[2]	2[1]	2[1]		
Meropenem	2	8		
Meropenem-vaborbactam[2]	Note[2]	Note[2]		

Monobactams	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Aztreonam	-	-		

Fluoroquinolones	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Ciprofloxacin	-	-		
Delafloxacin	-	-		
Levofloxacin	-	-		
Moxifloxacin	IE	IE		
Nalidixic acid (screen only)	NA	NA		
Norfloxacin (uncomplicated UTI only)	-	-		
Ofloxacin	-	-		

Aminoglycosides	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Amikacin	-	-		
Gentamicin	-	-		
Netilmicin	-	-		
Tobramycin	-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Dalbavancin	-	-		
Oritavancin	-	-		
Teicoplanin	-	-		
Telavancin	-	-		
Vancomycin	-	-		

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Azithromycin	-	-		
Clarithromycin	-	-		
Erythromycin	IE	IE		
Roxithromycin	-	-		
Telithromycin	-	-		
Clindamycin	4	4		
Quinupristin-dalfopristin	-	-		

Tetracyclines[1]	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doxycycline	Note[1]	Note[1]		**1.** For anaerobic bacteria there is clinical evidence of activity in mixed intra-abdominal infections, but no correlation between MIC values, PK-PD data and clinical outcome. Therefore no breakpoints for susceptibility testing are given.
Eravacycline	IE	IE		
Minocycline	Note[1]	Note[1]		
Tetracycline	Note[1]	Note[1]		
Tigecycline	Note[1]	Note[1]		

Oxazolidinones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Linezolid	-	-		
Tedizolid	-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Chloramphenicol	8	8		
Colistin	-	-		
Daptomycin	-	-		
Fosfomycin iv	-	-		
Fosfomycin oral	-	-		
Fusidic acid	-	-		
Lefamulin	-	-		
Metronidazole	4	4		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin	-	-		
Spectinomycin	-	-		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Disk diffusion criteria for antimicrobial susceptibility testing of *Helicobacter pylori* have not yet been defined and an MIC method should be used. If a commercial MIC method is used, follow the manufacturer´s instructions.

Penicillins	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Amoxicillin oral	0.125	0.125		

Fluoroquinolones	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Levofloxacin	1	1		

Macrolides	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Clarithromycin	0.25	0.5		

Tetracyclines	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Tetracycline	1	1		

Miscellaneous agents	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Metronidazole	8	8		
Rifampicin	1	1		

Listeria monocytogenes

Expert Rules and Intrinsic Resistance Tables

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Penicillins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin (indications other than meningitis)	1	1		1 unit	13	13		
Benzylpenicillin (meningitis)	IE	IE			IE	IE		
Ampicillin iv	1	1		2	16	16		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Meropenem	0.25	0.25		10	26	26		

Macrolides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Erythromycin	1	1		15	25	25		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Trimethoprim-sulfamethoxazole[1]	0.06	0.06		1.25-23.75	29	29		**1.** Trimethoprim-sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.

Pasteurella multocida

Expert Rules and Intrinsic Resistance Tables

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor combinations, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain and for control of the inhibitor component of beta-lactam inhibitor-combination disks, see EUCAST QC Tables.

Penicillins	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	0.5	0.5		1 unit	17	17		**1.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Ampicillin	1	1			Note[A]	Note[A]		**A.** Infer susceptibility from benzylpenicillin susceptibility.
Amoxicillin	1	1			Note[A]	Note[A]		
Amoxicillin-clavulanic acid	1[1]	1[1]		2-1	15	15		

Cephalosporins	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefotaxime	0.03	0.03		5	26	26		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.06	0.06		5	27[A]	27[A]		**A.** The nalidixic acid disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note B.**
Levofloxacin	0.06	0.06		5	27[A]	27[A]		**B.** Isolates categorised as susceptible to nalidixic acid can be reported susceptible to ciprofloxacin and levofloxacin. Isolates categorised as non-susceptible may have fluoroquinolone resistance and should be tested against the appropriate agent.
Nalidixic acid (screen only)	NA	NA		30	23[B]	Note[B]		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1	1			Note[A]	Note[A]		**A.** Susceptibility inferred from tetracycline screen test.
Tetracycline (screen only)	NA	NA		**30**	24[A]	24[A]		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Trimethoprim-sulfamethoxazole[1]	0.25	0.25		**1.25-23.75**	23	23		**1.** Trimethoprim-sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.

Campylobacter jejuni and *coli*

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: 5x10^5 CFU/mL
Incubation: Microaerobic environment, 41±1ºC, 24h. Isolates with insufficient growth after 24h incubation are reincubated immediately and MICs read after a total of 40-48h incubation.
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Staphylococcus aureus* ATCC 29213 (standard conditions for staphylococci)

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F). The MH-F plates should be dried prior to inoculation to reduce swarming (at 20-25°C overnight or at 35°C, with the lid removed, for 15 min).
Inoculum: McFarland 0.5
Incubation: Microaerobic environment, 41±1ºC, 24h. Isolates with insufficient growth after 24h incubation are reincubated immediately and inhibition zones read after a total of 40-48h incubation.
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Campylobacter jejuni* ATCC 33560

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.001	0.5		5	50	26		

Macrolides	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Azithromycin	Note[1]	Note[1]			Note[A]	Note[A]		**1/A.** Erythromycin can be used to determine susceptibility to azithromycin and clarithromycin.
Clarithromycin	Note[1]	Note[1]			Note[A]	Note[A]		
Erythromycin, *C. jejuni*	4[1]	4[1]		15	20[A]	20[A]		
Erythromycin, *C. coli*	8[1]	8[1]		15	24[A]	24[A]		

Tetracyclines	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	Note[1]	Note[1]			Note[A]	Note[A]		**1/A.** Tetracycline can be used to determine susceptibility to doxycycline.
Tetracycline	2[1]	2[1]		30	30[A]	30[A]		

Corynebacterium spp.

Expert Rules and Intrinsic Resistance Tables

Breakpoints for corynebacteria were developed for species other than *C. diphtheriae*. In an ongoing study, the preliminary results indicate that the current breakpoints for benzylpenicillin and rifampicin are not useful for *C. diphtheriae*.

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h. Isolates with insufficient growth after 16-20h incubation are reincubated immediately and MICs read after a total of 40-44h incubation.
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h. Isolates with insufficient growth after 16-20h incubation are reincubated immediately and inhibition zones read after a total of 40-44h incubation.
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Penicillins	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	0.125	0.125		1 unit	29	29		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.001	1		5	50	25		
Moxifloxacin	0.5	0.5		5	25	25		

Aminoglycosides	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Gentamicin	IE	IE			IE	IE		

Glycopeptides	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Vancomycin	2	2		5	17[A]	17[A]		**A.** Non-wild type isolates were not available when developing the disk diffusion method.

Macrolides and lincosamides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Erythromycin	IP	IP		15	IP	IP		**1.** Inducible clindamycin resistance may occur in *Corynebacteria* . This can be detected by antagonism of clindamycin activity by a macrolide agent. The clinical significance is unknown. There is currently no recommendation for testing.
Clindamycin[1]	0.5	0.5		2	20	20		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Tetracycline	2	2		30	24	24		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	2	2		10	25	25		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Rifampicin	0.06	0.5		5	30	25		

Aerococcus sanguinicola and *urinae*

Expert Rules and Intrinsic Resistance Tables

MIC determination (broth microdilution according to ISO standard 20776-1)[1]
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: 5x10^5 CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h. Isolates with insufficient growth after 16-20h incubation are reincubated immediately and MICs read after a total of 40-44h incubation.
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.
[1] For fluoroquinolones, agar dilution may produce clearer endpoints.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h. Isolates with insufficient growth after 16-20h incubation are reincubated immediately and inhibition zones read after a total of 40-44h incubation.
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Streptococcus pneumoniae* ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.

Penicillins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	0.125	0.125		1 unit	21	21		**1/A.** Infer susceptibility from ampicillin susceptibility.
Ampicillin	0.25	0.25		2	26	26		
Amoxicillin	Note[1]	Note[1]			Note[A]	Note[A]		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Meropenem	0.25	0.25		10	31	31		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin (uncomplicated UTI only)	2	2		5	21[A]	21[A]		**1.** Susceptibility can be inferred from ciprofloxacin susceptibility.
Levofloxacin (uncomplicated UTI only)	2[1]	2[1]		5	Note[B]	Note[B]		**A.** Susceptibility can be inferred from norfloxacin susceptibility. **See Note C.**
Norfloxacin (screen only)	NA	NA		10	17[C]	17[C]		**B.** Susceptibility can be inferred from ciprofloxacin or norfloxacin susceptibility. **See Note C.** **C.** The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance.

Glycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Vancomycin	1	1		5	16[A]	16[A]		**A.** Non-wild type isolates were not available when developing the disk diffusion method.

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Nitrofurantoin (uncomplicated UTI only)	16	16		100	16	16		
Rifampicin	0.125	0.125		5	25	25		

Kingella kingae

Expert Rules and Intrinsic Resistance Tables

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: 5x10^5 CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h. Isolates with insufficient growth after 16-20h incubation are reincubated immediately and inhibition zones read after a total of 40-44h incubation.
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar + 5% defibrinated horse blood and 20 mg/L β-NAD (MH-F)
Inoculum: McFarland 0.5
Incubation: 5% CO_2, 35±1ºC, 18±2h. Isolates with insufficient growth after 16-20h incubation are reincubated immediately and inhibition zones read after a total of 40-44h incubation.
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the front of the plate with the lid removed and with reflected light.
Quality control: *Haemophilus influenzae* ATCC 49766. For agents not covered by this strain, see EUCAST QC Tables.

Penicillins[1]	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Benzylpenicillin	0.03	0.03		1 unit	25	25		**1.** Beta-lactamase positive isolates can be reported resistant to benzylpenicillin and to ampicillin and amoxicillin without inhibitors. Tests based on a chromogenic cephalosporin can be used to detect the beta-lactamase. Beta-lactam resistance mechanisms other than beta-lactamase production have not yet been described for *K. kingae* . **2.** Susceptibility can be inferred from benzylpenicillin susceptibility. **3/B.** The intrinsic activity of clavulanic acid in *K. kingae* is such that the organism is inhibited by 2 mg/L clavulanic acid. Therefore no breakpoints for amoxicillin-clavulanic acid can be given. **A.** Infer susceptibility from benzylpenicillin susceptibility.
Ampicillin	0.06[2]	0.06[2]			Note[A]	Note[A]		
Amoxicillin	0.125[2]	0.125[2]			Note[A]	Note[A]		
Amoxicillin-clavulanic acid	Note[3]	Note[3]			Note[B]	Note[B]		

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefotaxime	0.125	0.125		5	27	27		
Ceftriaxone	0.06	0.06		30	30	30		
Cefuroxime iv	0.5	0.5		30	29	29		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Meropenem	0.03	0.03		10	30	30		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.06	0.06		5	28	28		
Levofloxacin	0.125	0.125		5	28	28		

Macrolides and lincosamides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25[1]	0.25[1]			Note[A]	Note[A]		**1.** Susceptibility can be inferred from erythromycin susceptibility. **A.** Infer susceptibility from erythromycin susceptibility.
Clarithromycin	0.5[1]	0.5[1]			Note[A]	Note[A]		
Erythromycin	0.5	0.5		15	20	20		
Clindamycin	-	-			-	-		

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	0.5[1]	0.5[1]			Note[A]	Note[A]		**1/A.** Isolates susceptible to tetracycline are also susceptible to doxycycline, but some resistant to tetracycline may be susceptible to doxycycline. An MIC method should be used to test doxycycline susceptibility of tetracycline resistant isolates if required.
Tetracycline	0.5	0.5		30	28	28		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Rifampicin	0.5	0.5		5	20	20		**1.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Trimethoprim-sulfamethoxazole[1]	0.25	0.25		1.25-23.75	28	28		

Aeromonas spp.

Expert Rules and Intrinsic Resistance Tables

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: 5x10^5 CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain, see EUCAST QC Tables.

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Cefepime	1	4		**30**	27	24		
Ceftazidime	1	4		**10**	24	21		

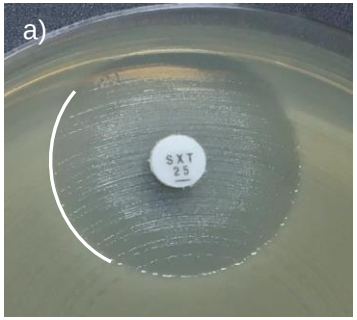
Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Aztreonam	1	4		**30**	29	26		

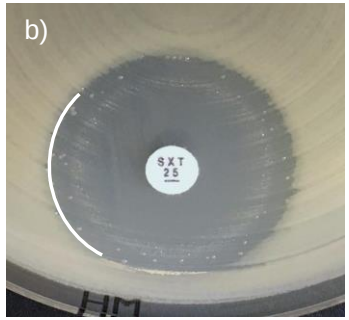
Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.25	0.5		**5**	27	24		
Levofloxacin	0.5	1		**5**	27	24		

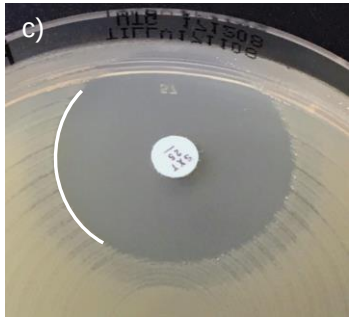
Aeromonas spp.

Expert Rules and Intrinsic Resistance Tables

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Trimethoprim-sulfamethoxazole[1]	2	4		**1.25-23.75**	19[A]	16[A]		**1.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. **A.** Read the obvious zone edge and disregard haze or growth within the inhibition zone (**see pictures below**).







Examples of inhibition zones for *Aeromonas* spp. with trimethoprim-sulfamethoxazole.
a-c) Read the obvious zone edge and disregard haze or growth within the inhibition zone.

Achromobacter xylosoxidans

Expert Rules and Intrinsic Resistance Tables

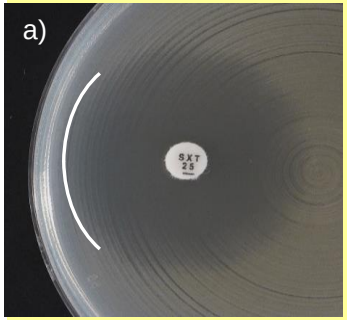
MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: 5x10^5 CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain, see EUCAST QC Tables.

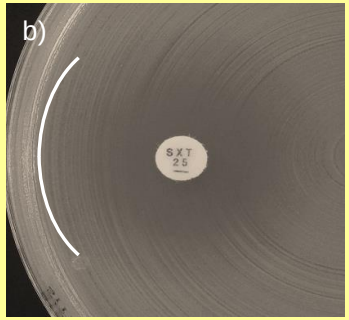
Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Pseudomonas aeruginosa* ATCC 27853. For agents not covered by this strain, see EUCAST QC Tables.

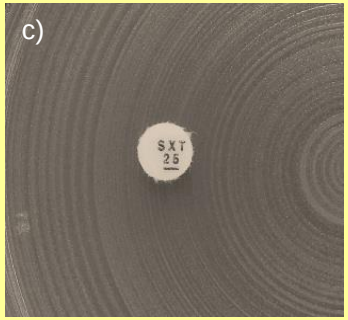
Penicillins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Piperacillin-tazobactam	4[1]	4[1]		30-6	26	26		**1.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Meropenem	1	4		10	26	20		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Trimethoprim-sulfamethoxazole[1]	0.125	0.125		1.25-23.75	26[A]	26[A]		**1.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. **A.** There may be growth within the inhibition zone. The density of growth may vary from a fine haze to substantial growth (**see pictures below**). If any zone edge can be seen, ignore growth within the inhibition zone and read the zone diameter.







Examples of inhibition zones for *Achromobacter xylosoxidans* with trimethoprim-sulfamethoxazole.
a-b) An outer zone can be seen. Read the outer zone edge and interpret according to the breakpoints.
c) Growth up to the disk **and** no sign of inhibition zone. Report resistant.

Bacillus spp.

except *B. anthracis*

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 11.0, valid from 2021-01-01

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Staphylococcus aureus* ATCC 29213. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Staphylococcus aureus* ATCC 29213. For agents not covered by this strain, see EUCAST QC Tables.

This genus includes several species. The most frequent species belong to the *Bacillus cereu* s complex (*B. cereus, B. thuringiensis, B. mycoides* and *B. weihenstephanensis*). The breakpoints are not validated for *Bacillus anthracis*.

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Imipenem	0.5	0.5		10	30	30		
Meropenem	0.25	0.25		10	25	25		

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ciprofloxacin	0.001	0.5		5	50[A]	23[A]		**A.** The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. **See Note B.**
Levofloxacin	0.001	1		5	50[A]	23[A]		**B.** Isolates categorised as susceptible to norfloxacin can be reported "susceptible increased exposure" (I) to ciprofloxacin and levofloxacin. Isolates categorised as resistant to norfloxacin can be reported resistant to ciprofloxacin and levofloxacin.
Norfloxacin (screen only)	NA	NA		10	21[B]	21[B]		

Glycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Vancomycin	2	2		5	10[A]	10[A]		**A.** Non-wild type isolates were not available when developing the disk diffusion method.

Bacillus spp.

except *B. anthracis*

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An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Macrolides and lincosamides	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Erythromycin	0.5	0.5		15	24	24		
Clindamycin	1	1		2	17	17		

Oxazolidinones	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Linezolid	2	2		10	22	22		

Burkholderia pseudomallei

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: $5x10^5$ CFU/mL
Incubation: Sealed panels, air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.
Quality control: *Escherichia coli* ATCC 25922. For agents not covered by this strain, see EUCAST QC Tables.

Disk diffusion (EUCAST standardised disk diffusion method)
Medium: Mueller-Hinton agar
Inoculum: McFarland 0.5
Incubation: Air, 35±1ºC, 18±2h
Reading: Unless otherwise stated, read zone edges as the point showing no growth viewed from the back of the plate against a dark background illuminated with reflected light.
Quality control: *Escherichia coli ATCC 25922.* For agents not covered by this strain, see EUCAST QC Tables.

Penicillins	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Amoxicillin-clavulanic acid	0.001[1]	8[1]		**20-10**	50	22		**1.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.

Cephalosporins	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Ceftazidime	0.001	8		**10**	50	18		

Carbapenems	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Imipenem	2	2		**10**	29	29		
Meropenem	2	2		**10**	24	24		

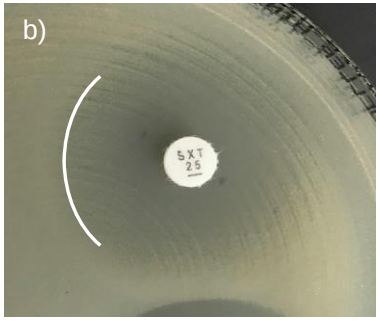
Tetracyclines	MIC breakpoints (mg/L)			Disk content	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU	(µg)	S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Doxycycline	0.001	2			Note[A]	Note[A]		**A.** Susceptibility inferred from tetracycline disk diffusion screen test.
Tetracycline (screen only)	NA	NA		**30**	50[A]	23[A]		

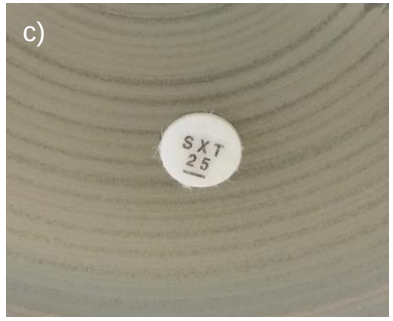
Burkholderia pseudomallei

Expert Rules and Intrinsic Resistance Tables

An MIC breakpoint of S ≤ 0.001 mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of "S ≥ 50 mm") which categorises wild-type organisms (organisms without phenotypically detectable resistance mechanisms to the agent) as "Susceptible, increased exposure" (I). For these organism-agent combinations, never report "Susceptible, standard dosing regimen" (S).

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Chloramphenicol	0.001	8		**30**	50	22		**1.** Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Trimethoprim-sulfamethoxazole[1]	0.001	4		**1.25-23.75**	50[A]	17[A]		**A.** There may be growth within the inhibition zone. The density of growth may vary from a fine haze to substantial growth (**see pictures below**). If any zone edge can be seen, ignore growth within the inhibition zone and read the zone diameter.





Examples of inhibition zones for *Burkholderia pseudomallei* with trimethoprim-sulfamethoxazole.
a-b) An outer zone can be seen. Read the outer zone edge and interpret according to the breakpoints.
c) Growth up to the disk **and** no sign of inhibition zone. Report resistant.

Burkholderia cepacia complex

Expert Rules and Intrinsic Resistance Tables

EUCAST has not determined breakpoints for *Burkholderia cepacia* complex organisms since accurate and reproducible methods for antimicrobial susceptibility testing are lacking due to technical difficulties encountered with these species and the lack of convincing clinical outcome correlates.
Users are referred to the EUCAST guidance document on *Burkholderia cepacia* complex.

***Burkholderia cepacia* complex currently includes at least 21 closely related species: *B. ambifaria* (genomovar VII), *B. anthina* (genomovar VIII), *B. arboris* (BCC3), *B. cepacia* (genomovar I), *B. cenocepacia* (genomovar III), *B. contaminans* (group K, BBC AT), *B. diffusa* (BCC2), *B. dolosa* (genomovar VI), *B. lata* (group K), *B. latens* (BCC1), *B. metallica* (BCC8), *B. multivorans* (genomovar II), *B. paludis* , *B. pseudomultivorans* , *B. pyrrocinia* (genomovar IX), *B. seminalis* (BCC7), *B. stabilis* (genomovar IV), *B. stagnalis* (BCC B), *B. territorii* (BCC L), *B. ubonensis* (genomovar X), *B. vietnamiensis* (genomovar V).**

Legionella pneumophila

Expert Rules and Intrinsic Resistance Tables

EUCAST has not determined breakpoints for *Legionella pneumophila* as there is no established reference method or any documentation of clinical outcome related to antimicrobial susceptibility testing.
Users are referred to the EUCAST guidance document on *Legionella pneumophila* susceptibility testing.

Mycobacterium tuberculosis

Expert Rules and Intrinsic Resistance Tables

Listed breakpoints have been set in parallel with marketing authorisation by EMA. Breakpoints for other agents have not yet been established. Infections with *M. tuberculosis* are always treated with two or more agents.

MIC determination using broth microdilution according to the EUCAST reference method for the *Mycobacterium tuberculosis* complex
Medium: Middlebrook 7H9 with 10% OADC in polystyrene plates
Inoculum: $1x10^5$ CFU/mL
Incubation: Plates sealed with a plastic lid, air, 36±1°C, 7-21 days
Reading: At the earliest time point (7, 14 or 21 days) when the 1% growth control shows visible growth, read MICs at the lowest concentration of the agent that completely inhibits visible growth
Quality control: *Mycobacterium tuberculosis* H37Rv ATCC 27294

The *Mycobacterium tuberculosis* complex includes different species and variants such as *M. tuberculosis* var. *tuberculosis*, *M. tuberculosis* var. *africanum* and *M. tuberculosis* var. *bovis*. Breakpoints have only been established for *M. tuberculosis* var. *tuberculosis*.

Antimicrobial agent	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	Numbered notes relate to general comments and/or MIC breakpoints.
Bedaquiline	0.25[1]	0.25[1]		**1.** Breakpoints were determined on MICs performed on Middlebrook 7H11/7H10 medium. The comparability of tests performed by other media has not been established. There is ongoing work to review breakpoints using the EUCAST reference method (described above). **2.** MIC data have been generated with MGIT system and not with the EUCAST reference method. Therefore, it has not been possible to set an ECOFF, nor calibrate MGIT MIC values against the reference method. Consequently, EUCAST cannot endorse the tentative breakpoint set by EMA based on the MGIT method. Breakpoints are pending MIC data with the reference method.
Delamanid	0.06	0.06		
Pretomanid	IE[2]	IE[2]		

Topical agents
Screening cut-off values for detection of phenotypic resistance

In the absence of clinical data on outcome related to MIC of infecting organisms EUCAST has not been able to determine relevant clinical breakpoints for topical use of antimicrobial agents. Laboratories are advised to either use the regular breakpoints or the cut-off values listed below to distinguish between organisms without and with resistance mechanisms (**for further details see guidance document on www.eucast.org**).

Organisms	Screening cut-off values for the detection of phenotypic resistance (based on MIC and inhibition zone diameter ECOFFs for one or several relevant species)		Gentamicin	Tobramycin	Pefloxacin (screen only)[1]	Norfloxacin (screen only)[1]	Nalidixic acid (screen only)[1]	Ciprofloxacin	Levofloxacin	Ofloxacin	Chloramphenicol	Colistin (for polymyxin B)	Fusidic acid	Neomycin (framycetin)	Bacitracin	Mupirocin	Retapamulin
	Disk content	(µg)	**10**	**10**	**5**	**10**	**30**	**5**	**5**	**5**	**30**	**-**	**10**	**10**	**-**	**200**	**-**
Enterobacterales	**MIC**	(mg/L)	2	2	-	-	-	0.125	0.25	0.25	16	2	-	8	-	-	-
	Zone diameter	(mm)	17	16	24	-	-	Note[1]	Note[1]	Note[1]	17	-	-	12	-	-	-
P. aeruginosa	**MIC**	(mg/L)	8	2	-	-	-	0.5	2	2	ND	4	-	ND	-	-	-
	Zone diameter	(mm)	15	18	-	-	-	26	20	ND	ND	-	-	ND	-	-	-
***Acinetobacter* spp.**	**MIC**	(mg/L)	4	4	-	-	-	1	0.5	1	ND	2	-	ND	-	-	-
	Zone diameter	(mm)	17	17	-	-	-	21	23	ND	ND	-	-	ND	-	-	-
S. aureus	**MIC**	(mg/L)	2	2	-	-	-	1	0.5	1	16	-	0.5	1	ND	1[2]	0.5
	Zone diameter	(mm)	18	18	-	17	-	Note[1]	Note[1]	Note[1]	18	-	24	14	ND	30[2]	ND
S. pneumoniae	**MIC**	(mg/L)	-	-	-	-	-	4	2	4	8	-	ND	-	ND	-	-
	Zone diameter	(mm)	-	-	-	10	-	Note[1]	Note[1]	Note[1]	21	-	ND	-	ND	-	-
Streptococcus groups A, B, C and G	**MIC**	(mg/L)	-	-	-	-	-	2	2	4	8	-	32	-	ND	0.5	0.125
	Zone diameter	(mm)	-	-	-	12	-	Note[1]	Note[1]	Note[1]	21	-	ND	-	ND	ND	ND
H. influenzae	**MIC**	(mg/L)	4	8	-	-	-	0.06	0.06	0.06	2	-	ND	ND	-	-	-
	Zone diameter	(mm)	ND	ND	-	-	23	Note[1]	Note[1]	Note[1]	28	-	ND	ND	-	-	-
M. catarrhalis	**MIC**	(mg/L)	ND	ND	-	-	-	0.125	0.125	0.25	2	-	ND	ND	-	-	-
	Zone diameter	(mm)	ND	ND	-	-	23	Note[1]	Note[1]	Note[1]	31	-	ND	ND	-	-	-

Notes

1. Screening agent for detection of fluoroquinolone resistance (pefloxacin for *Enterobacterales* , norfloxacin for gram positive organisms and nalidixic acid for *H.influenzae* and *M. catarrhalis)* .
2. Breakpoints for nasal decontamination S ≤1, R >256 mg/L (S ≥30, R <18 mm for the mupirocin 200 µg disk). Isolates in the I category are associated with short term suppression (useful preoperatively) but, unlike fully susceptible isolates, long term eradication rates are low.

ND = No ECOFF available.

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 11.0, valid from 2021-01-01

These breakpoints are used only when there are no species-specific breakpoints or other recommendations (a dash or a note) in the species-specific tables.
If the MIC is greater than the PK-PD resistant breakpoint, advise against use of the agent.
If the MIC is less than or equal to the PK-PD susceptible breakpoint, suggest that the agent can be used with caution. The MIC may also be reported although this is not essential. Include a note that the guidance is based on PK-PD breakpoints only, and include the dosage on which PK-PD breakpoint is based.
More information is available in the guidance document "Antimicrobial susceptibility tests on groups of organisms or agents for which there are no EUCAST breakpoints".

Penicillins	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Benzylpenicillin	0.25	2	**1.** For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
Ampicillin	2	8	**2.** For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Ampicillin-sulbactam	2[1]	8[1]	**3.** For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Amoxicillin	2	8	
Amoxicillin-clavulanic acid	2[2]	8[2]	
Piperacillin	8	16	
Piperacillin-tazobactam	8[3]	16[3]	
Ticarcillin	8	16	
Ticarcillin-clavulanic acid	8[2]	16[2]	
Temocillin	IE	IE	
Phenoxymethylpenicillin	IE	IE	
Oxacillin	IE	IE	
Cloxacillin	IE	IE	
Dicloxacillin	IE	IE	
Flucloxacillin	IE	IE	
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	IE	IE	

Cephalosporins	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Cefaclor	IE	IE	**1.** Broth microdilution MIC determination must be performed in iron-depleted Mueller-Hinton broth and specific reading instructions must be followed. For testing conditions and reading instructions, see http://www.eucast.org/guidance_documents/.
Cefadroxil	IE	IE	**2**. Based on PK-PD target for Gram-negative organisms.
Cefalexin	IE	IE	**3.** For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L.
Cefazolin	1	2	**4**. Breakpoints are based on ceftolozane data.
Cefepime	4	8	**5**. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Cefiderocol	2[1]	2[1]	
Cefixime	IE	IE	
Cefotaxime	1	2	
Cefoxitin	IE	IE	
Cefpodoxime	IE	IE	
Ceftaroline	0.5[2]	0.5[2]	
Ceftazidime	4	8	
Ceftazidime-avibactam	8[3]	8[3]	
Ceftibuten	IE	IE	
Ceftobiprole	4	4	
Ceftolozane-tazobactam	4[4.5]	4[4.5]	
Ceftriaxone	1	2	
Cefuroxime iv	4	8	
Cefuroxime oral	IE	IE	

Carbapenems	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Doripenem	1	2	**1.** For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Ertapenem	0.5	0.5	**2.** For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.
Imipenem	2	4	
Imipenem-relebactam	2[1]	2[1]	
Meropenem	2	8	
Meropenem-vaborbactam	8[2]	8[2]	

Monobactams	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Aztreonam	4	8	

Fluoroquinolones	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Ciprofloxacin	0.25	0.5	
Delafloxacin	IE	IE	
Levofloxacin	0.5	1	
Moxifloxacin	0.25	0.25	
Nalidixic acid (screen only)	IE	IE	
Norfloxacin	IE	IE	
Ofloxacin	0.25	0.5	

Aminoglycosides	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Amikacin	1	1	
Gentamicin	0.5	0.5	
Netilmicin	IE	IE	
Tobramycin	0.5	0.5	

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Dalbavancin	0.25[1]	0.25[1]	**1.** For broth microdilution MIC determination, the medium must be supplemented with polysorbate-80 to a final concentration of 0.002%.
Oritavancin	0.125[1,2]	0.125[1,2]	**2.** PK-PD breakpoints are based on *S. aureus* . For *S. pyogenes* there is uncertainty regarding the PK-PD target.
Teicoplanin	IE	IE	
Telavancin	IE	IE	
Vancomycin	IE	IE	

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Azithromycin	IE	IE	
Clarithromycin	IE	IE	
Erythromycin	IE	IE	
Roxithromycin	IE	IE	
Telithromycin	IE	IE	
Clindamycin	IE	IE	
Quinupristin-dalfopristin	IE	IE	

Tetracyclines	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Doxycycline	IE	IE	**1.** For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use.
Eravacycline	IE	IE	
Minocycline	IE	IE	
Tetracycline	IE	IE	
Tigecycline	0.5[1]	0.5[1]	

Oxazolidinones	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Linezolid	2	2	
Tedizolid	IE	IE	

Miscellaneous agents	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Chloramphenicol	IE	IE	
Colistin	IE	IE	
Daptomycin	IE	IE	
Fosfomycin iv	IE	IE	
Fosfomycin oral	8	8	
Fusidic acid	IE	IE	
Lefamulin	0.25	0.25	
Metronidazole	IE	IE	
Nitrofurantoin	IE	IE	
Nitroxoline	IE	IE	
Rifampicin	IE	IE	
Spectinomycin	IE	IE	
Trimethoprim	IE	IE	
Trimethoprim-sulfamethoxazole	IE	IE	