

European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 10.0, valid from 2020-01-01

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European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 10.0, valid from 2020-01-01

Version 10.0, 2020-01-01	<p>Changes (cells containing a change, a deletion or an addition) from v. 9.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.</p>
General	<ul style="list-style-type: none"> • "Mecillinam" changed to "Mecillinam oral" • Imipenem-relebactam added • Delafloxacin added • HE superscript (high exposure for agent) removed and replaced with breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". • For agents used to screen for resistance only, "screen" has been changed to "screen only" for clarification.
Breakpoints related to the new definition of the I category	<p>For several agents, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". Some of these were introduced in v. 9.0 and some in v. 10.0 (green highlights). From v. 10.0, susceptible breakpoints for these organism-agent combinations are listed as arbitrary, "off scale" breakpoints of $S \leq 0.001$ mg/L and $S \geq 50$ mm:</p> <ul style="list-style-type: none"> • <i>Enterobacterales</i>: Cefazolin, cefuroxime iv and imipenem for <i>Morganella morganii</i>, <i>Proteus</i> spp. and <i>Providencia</i> spp. • <i>Pseudomonas</i> spp.: Piperacillin, piperacillin-tazobactam, ticarcillin, ticarcillin-clavulanic acid, cefepime, ceftazidime, imipenem, aztreonam, ciprofloxacin and levofloxacin • <i>Stenotrophomonas maltophilia</i>: Trimethoprim-sulfamethoxazole • <i>Acinetobacter</i> spp.: Ciprofloxacin • <i>Staphylococcus</i> spp.: Ciprofloxacin, levofloxacin and ofloxacin • <i>Enterococcus</i> spp.: Imipenem • Streptococcus groups A, B, C and G: Levofloxacin • <i>Streptococcus pneumoniae</i>: Levofloxacin • <i>Haemophilus influenzae</i>: Amoxicillin oral, amoxicillin-clavulanic acid oral and cefuroxime oral • <i>Moraxella catarrhalis</i>: Cefuroxime oral • <i>Burkholderia pseudomallei</i>: Amoxicillin-clavulanic acid, ceftazidime, doxycycline, chloramphenicol and trimethoprim-sulfamethoxazole
Notes	<ul style="list-style-type: none"> • Note 7 new • Note 8 revised • Note 14 new
Guidance	<ul style="list-style-type: none"> • Updated information on breakpoints which categorise wild-type organisms as "Susceptible, increased exposure (I)" • New information on breakpoints in brackets
Taxonomy	<ul style="list-style-type: none"> • Information added for Streptococcus groups A, B, C and G • <i>M. tuberculosis</i> var. <i>canetti</i> removed in species list for <i>M. tuberculosis</i> complex
Dosages	<p>General</p> <ul style="list-style-type: none"> • New position in the breakpoint table • General text updated • Definition on uncomplicated UTI added • Dosages for uncomplicated UTI listed in a separate column. For some agents, there is only a dose for uncomplicated UTI • Comments on high dose removed when breakpoints categorise wild-type organisms as "Susceptible, increased exposure (I)" • Dosages of ceftazidime-avibactam and meropenem-vaborbactam are presented as a single dosing regimen because the approved dosage is designed to achieve maximum exposure <p>New dosages</p> <ul style="list-style-type: none"> • Imipenem-relebactam • Delafloxacin

Version 10.0, 2020-01-01	Changes (cells containing a change, a deletion or an addition) from v. 9.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.
Dosages continued	Revised dosages <ul style="list-style-type: none"> • Amoxicillin oral • Amoxicillin-clavulanic acid oral • Mecillinam oral • Cefadroxil • Cefalexin • Cefazolin • Cefixime • Cefpodoxime • Ceftolozane-tazobactam (different doses depending on indication) • Ceftriaxone • Cefuroxime oral • Norfloxacin • Amikacin • Gentamicin • Netilmicin • Tobramycin • Tedizolid (iv dosage added) • Fosfomycin oral • Nitrofurantoin • Nitroxoline • Trimethoprim • Trimethoprim-sulfamethoxazole New comments <ul style="list-style-type: none"> • Amoxicillin-clavulanic acid oral • Clarithromycin Revised comments <ul style="list-style-type: none"> • Benzylpenicillin • Ceftriaxone • Ciprofloxacin ("+ combination" removed) • Ofloxacin ("+ combination" removed)
Technical uncertainty	<ul style="list-style-type: none"> • General updates in the text
Enterobacterales	General <ul style="list-style-type: none"> • "Mecillinam" changed to "Mecillinam oral" • Mecillinam oral breakpoints valid also for <i>Citrobacter</i> spp. and <i>Enterobacter</i> spp. • Indication for ceftibuten changed from "UTI only" to "infections originating from the urinary tract" • New indications for aminoglycosides New breakpoints <ul style="list-style-type: none"> • Cefazolin (MIC) • Imipenem-relebactam (MIC) • Delafloxacin (MIC) • Eravacycline (zone diameter)

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<i>Enterobacterales</i> continued	Revised breakpoints <ul style="list-style-type: none"> • Ceftolozane-tazobactam (MIC and zone diameter) • Cefuroxime iv (MIC and zone diameter) • Imipenem (S breakpoint changed to ≤ 0.001 mg/L for consistency) • Norfloxacin (MIC and zone diameter) • Amikacin (MIC and zone diameter) • Gentamicin (MIC and zone diameter) • Netilmicin (MIC and zone diameter) • Tobramycin (MIC and zone diameter) • Trimethoprim (MIC and zone diameter) New comments <ul style="list-style-type: none"> • Cephaloporins comment 4 • Carbapenems comment 3 • Fluoroquinolones comment 2/C • Fluoroquinolones comment D Revised comments <ul style="list-style-type: none"> • Penicillins comment 1 • Penicillins comment D • Aminoglycosides comment 1/A
<i>Pseudomonas</i> spp.	General <ul style="list-style-type: none"> • New indications for aminoglycosides New breakpoints <ul style="list-style-type: none"> • Imipenem-relebactam (MIC) Revised breakpoints <ul style="list-style-type: none"> • Piperacillin (MIC and zone diameter) • Piperacillin-tazobactam (MIC and zone diameter) • Ticarcillin (MIC and zone diameter) • Ticarcillin-clavulanic acid (MIC and zone diameter) • Cefepime (MIC and zone diameter) • Ceftazidime (MIC and zone diameter) • Imipenem (MIC and zone diameter) • Aztreonam (MIC and zone diameter) • Ciprofloxacin (MIC and zone diameter) • Levofloxacin (MIC and zone diameter) • Amikacin (MIC and zone diameter) • Gentamicin (MIC and zone diameter) • Netilmicin (MIC and zone diameter) • Tobramycin (MIC and zone diameter) ATUs added <ul style="list-style-type: none"> • Piperacillin (zone diameter) New comments <ul style="list-style-type: none"> • Cephalosporins comment 2 • Carbapenems comment 1 Revised comments <ul style="list-style-type: none"> • Aminoglycosides comment 1/A

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<i>Stenotrophomonas maltophilia</i>	Revised breakpoints <ul style="list-style-type: none"> • Trimethoprim-sulfamethoxazole (MIC and zone diameter) New comments <ul style="list-style-type: none"> • Miscellaneous agents comment B
<i>Acinetobacter</i> spp.	General <ul style="list-style-type: none"> • New indications for aminoglycosides New breakpoints <ul style="list-style-type: none"> • Imipenem-relebactam (MIC) Revised breakpoints <ul style="list-style-type: none"> • Ciprofloxacin (S breakpoint changed to ≤ 0.001 mg/L for consistency) • Amikacin (MIC and zone diameter) • Gentamicin (MIC and zone diameter) • Netilmicin (MIC and zone diameter) • Tobramycin (MIC and zone diameter) New comments <ul style="list-style-type: none"> • Carbapenems comment 1 Revised comments <ul style="list-style-type: none"> • Aminoglycosides comment 1/A
<i>Staphylococcus</i> spp.	General <ul style="list-style-type: none"> • Screening criteria for methicillin resistance in <i>S. schleiferi</i> added • Penicillin comment 2/C added to amoxicillin, piperacillin, ticarcillin and phenoxymethylpenicillin (coagulase-negative staphylococci) New breakpoints <ul style="list-style-type: none"> • Imipenem-relebactam (Note) • Delafloxacin (MIC) • Eravacycline (zone diameter) • Tedizolid (zone diameter) Revised breakpoints <ul style="list-style-type: none"> • Ciprofloxacin (MIC and zone diameter) • Levofloxacin (MIC and zone diameter) • Ofloxacin (MIC and zone diameter) • Amikacin (MIC and zone diameter) • Gentamicin (MIC and zone diameter) • Netilmicin (MIC and zone diameter) • Tobramycin (MIC and zone diameter) • Minocycline (MIC and zone diameter) • Tigecycline (zone diameter) • Trimethoprim (MIC and zone diameter) New comments <ul style="list-style-type: none"> • Cephalosporins comment 2 • Fluoroquinolones comment B • Tetracyclines comment B

Version 10.0, 2020-01-01	Changes (cells containing a change, a deletion or an addition) from v. 9.0 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.
Staphylococcus spp. continued	Revised comments <ul style="list-style-type: none"> • Penicillins comment 1/A • Penicillins comment E • Cephalosporins comment 1/A • Fluoroquinolones comment C • Aminoglycosides comment 1/A • Glycopeptides comment 1 Removed comments <ul style="list-style-type: none"> • Oxazolidinones comment A • Oxazolidinones comment B
Enterococcus spp.	New breakpoints <ul style="list-style-type: none"> • Eravacycline (zone diameter, separate breakpoints for <i>E. faecalis</i> and <i>E. faecium</i>) Revised breakpoints <ul style="list-style-type: none"> • Imipenem (MIC and zone diameter) • Tigecycline (zone diameter, separate breakpoints for <i>E. faecalis</i> and <i>E. faecium</i>) • Linezolid (zone diameter) New comments <ul style="list-style-type: none"> • Penicillins comment 1 Revised comments <ul style="list-style-type: none"> • Penicillins comment 2/A
Streptococcus groups A, B, C and G	General <ul style="list-style-type: none"> • Information on taxonomy added New breakpoints <ul style="list-style-type: none"> • Imipenem-relebactam (Note) • Delafloxacin (MIC) • Tedizolid (zone diameter) Revised breakpoints <ul style="list-style-type: none"> • Oxacillin (Note added) • Meropenem-vaborbactam (Note added) • Levofloxacin (MIC and zone diameter) • Minocycline (MIC and zone diameter) • Linezolid (MIC and zone diameter) New comments <ul style="list-style-type: none"> • Cephalosporins comment 2 (lacking in previous versions) • Fluoroquinolones comment A Revised comments <ul style="list-style-type: none"> • Fluoroquinolones comment C • Oxazolidinones comment A

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<i>Streptococcus pneumoniae</i>	<p>General</p> <ul style="list-style-type: none"> • Flow chart updated <p>New breakpoints</p> <ul style="list-style-type: none"> • Imipenem-relebactam (Note) <p>Revised breakpoints</p> <ul style="list-style-type: none"> • Cefaclor (S breakpoint changed to ≤ 0.001 mg/L for consistency) • Meropenem-vaborbactam (Note added) • Levofloxacin (MIC and zone diameter) • Minocycline (MIC and zone diameter) • Linezolid (MIC and zone diameter) • Rifampicin (MIC) <p>New comments</p> <ul style="list-style-type: none"> • Penicillins comment 4 (lacking in previous versions) <p>Revised comments</p> <ul style="list-style-type: none"> • Penicillins comment 1/A • Cephalosporins comment 1/A • Carbapenems comment 1/A • Fluoroquinolones comment B
Viridans group streptococci	<p>New breakpoints</p> <ul style="list-style-type: none"> • Imipenem-relebactam (MIC) • Delafloxacin (MIC) • Eravacycline (zone diameter) • Tedizolid (zone diameter) <p>New comments</p> <ul style="list-style-type: none"> • Carbapenems comment 1 • Fluoroquinolones comment A <p>Removed comments</p> <ul style="list-style-type: none"> • Oxazolidinones comment A

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<i>Haemophilus influenzae</i>	<p>General</p> <ul style="list-style-type: none"> • Indication added for ceftolozane-tazobactam • Flow chart updated (amoxicillin-clavulanic acid added) • Pictures with reading example for beta-lactam agents added <p>New breakpoints</p> <ul style="list-style-type: none"> • Ceftolozane-tazobactam (MIC) <p>Revised breakpoints</p> <ul style="list-style-type: none"> • Ampicillin (zone diameter) • Amoxicillin oral (MIC and zone diameter) • Amoxicillin-clavulanic acid oral (MIC and zone diameter) • Cefuroxime oral (S breakpoint changed to ≤0.001 mg/L for consistency) • Minocycline (MIC and zone diameter) <p>ATUs removed</p> <ul style="list-style-type: none"> • Ampicillin (zone diameter) • Amoxicillin-clavulanic acid iv and oral (zone diameter) <p>New comments</p> <ul style="list-style-type: none"> • Penicillins comment B • Cephalosporins comment B • Carbapenems comment B • Carbapenems comment D <p>Revised comments</p> <ul style="list-style-type: none"> • Penicillins comment 1/A • Cephalosporins comment 1/A
<i>Moraxella catarrhalis</i>	<p>Revised breakpoints</p> <ul style="list-style-type: none"> • Cefuroxime oral (S breakpoint changed to ≤0.001 mg/L for consistency) • Minocycline (MIC and zone diameter)
<i>Neisseria gonorrhoeae</i>	<p>General</p> <ul style="list-style-type: none"> • "Surrogate agent" added to benzylpenicillin <p>Revised breakpoints</p> <ul style="list-style-type: none"> • Amoxicillin-clavulanic acid <p>Revised comments</p> <ul style="list-style-type: none"> • Penicillins comment 1
<i>Neisseria meningitidis</i>	<p>General</p> <ul style="list-style-type: none"> • "Meningitis" added to chloramphenicol <p>Revised breakpoints</p> <ul style="list-style-type: none"> • Minocycline • Tetracycline <p>New comments</p> <ul style="list-style-type: none"> • Penicillins comment 1 • <u>Miscellaneous agents comment 1</u>
Gram-positive anaerobes	<p>New breakpoints</p> <ul style="list-style-type: none"> • Imipenem-relebactam <p>New comments</p> <ul style="list-style-type: none"> • Carbapenems comment 1
Gram-negative anaerobes	<p>New breakpoints</p> <ul style="list-style-type: none"> • Imipenem-relebactam <p>New comments</p> <ul style="list-style-type: none"> • Carbapenems comment 1

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<i>Helicobacter pylori</i>	General • "Oral" added to amoxicillin Removed comments • Comment 1 for penicillins, fluoroquinolones, macrolides, tetracyclines and miscellaneous agents
<i>Listeria monocytogenes</i>	General • "iv" added to ampicillin
<i>Corynebacterium</i> spp.	Removed breakpoints • Gentamicin (MIC and zone diameter) New comments • Macrolides comment 1
<i>Burkholderia pseudomallei</i>	• New table
<i>Burkholderia cepacia</i>	• New table (general information only)
<i>Legionella pneumophila</i>	• New table (general information only)
<i>Mycobacterium tuberculosis</i>	General • General information on breakpoints updated • Reference method for MIC determination added • Taxonomy updated Revised comments • Comment 1
Topical agents	General • New format. Clinical breakpoints removed and zone diameter screening cut-off values added • Tobramycin added
PK-PD breakpoints	New breakpoints • Imipenem-relebactam • Delafloxacin Revised breakpoints • Amikacin • Gentamicin • Tobramycin • Linezolid New comments • Carbapenems comment 1

European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 10.0, valid from 2020-01-01

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 EUCAST MIC and zone diameter distributions, respectively.

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 $S \leq 0.001$ mg/L is an arbitrary, "off scale" breakpoint (corresponding to a zone diameter breakpoint of " $S \geq 50$ 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 $S \leq 1$ 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 $S \geq 22$ 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, *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

HE = High exposure for agent (see table of dosages, last tab in breakpoint table)

Guidance on reading EUCAST Breakpoint Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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)".

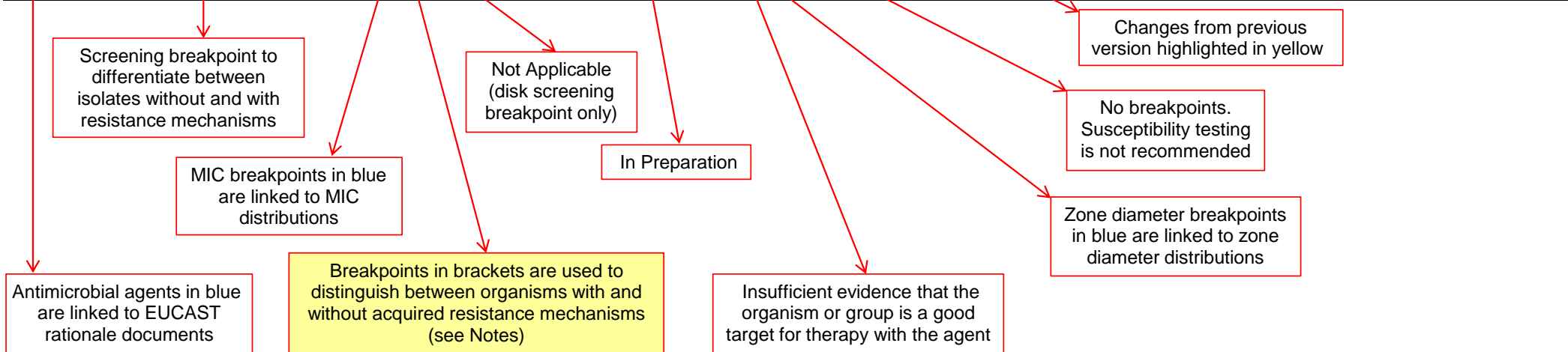
Breakpoints with a species name apply only to that particular species (in this example *S. aureus*)

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	
Antimicrobial agent A	1 ¹	1 ¹		X	20 ^A	20 ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Notes that are general comments and/or relating to MIC breakpoints. 2. New comment Removed comment A. Comment on disk diffusion
Antimicrobial agent B	2 ²	4		Y	26	23		
Antimicrobial agent C	0.001	8		X	50	18		
Antimicrobial agent D, <i>S. aureus</i>	IE	IE			IE	IE		
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		



Dosages

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

EUCAST breakpoints are based on the following dosages (see section 8 in Rationale Documents). Alternative dosing regimens which result in equivalent exposure are acceptable. The table should not be considered an exhaustive 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 dose	High dose	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 <i>S. pneumoniae</i> : For a dose of 2.4 g (4 MU) x 6 iv, isolates with MIC \leq 0.06 mg/L are susceptible. Pneumonia caused by <i>S. pneumoniae</i>: breakpoints are related to dosage: For a dose of 1.2 g (2 MU) x 4 iv, isolates with MIC \leq 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 \leq 1 mg/L are susceptible. For a dose of 2.4 g (4 MU) x 6 iv, isolates with MIC \leq 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	H. influenzae: High-dose only
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. H. influenzae: High-dose only
Piperacillin	4 g x 3 iv	4 g x 4 iv		Pseudomonas spp.: High-dose only
Piperacillin-tazobactam	(4 g piperacillin + 0.5 g tazobactam) x 3 iv	(4 g piperacillin + 0.5 g tazobactam) x 4 iv		Pseudomonas spp.: High-dose only
Ticarcillin	3 g x 4 iv	3 g x 6 iv		Pseudomonas spp.: High-dose only
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		Pseudomonas spp.: High-dose only
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	None	None	0.2-0.4 g x 3 oral	

Dosages

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins	Standard dose	High dose	Uncomplicated UTI	Special situations
Cefaclor	0.25-1 g x 3 oral depending on species and/or infection type	None		<i>Staphylococcus</i> spp.: Minimum dose 0.5 g x 3
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		<i>Pseudomonas</i> spp.: High-dose only
Cefixime	0.2-0.4 g x 2 oral	None	0.2-0.4 g x 2 oral	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 <i>S. aureus</i> : 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		<i>S. aureus</i> 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		<i>Pseudomonas</i> spp.: High-dose only
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 <i>S. aureus</i> : High dose only
Cefuroxime iv	0.75 g x 3 iv	1.5 g x 3 iv		<i>E. coli</i> , <i>Klebsiella</i> spp. (except <i>K. aerogenes</i>), <i>Raoultella</i> spp. and <i>P. mirabilis</i> : High dose only
Cefuroxime oral	0.25 g x 2 oral	0.5 g x 2 oral	0.25 g x 2 oral	

Carbapenems	Standard dose	High dose	Uncomplicated UTI	Special situations
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		<i>Pseudomonas</i> spp.: High-dose only
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			

Monobactams	Standard dose	High dose	Uncomplicated UTI	Special situations
Aztreonam	1 g x 3 iv	2 g x 4 iv		<i>Pseudomonas</i> spp.: High-dose only

Dosages

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Fluoroquinolones	Standard dose	High dose	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		<i>Pseudomonas</i> spp.: High-dose only <i>Staphylococcus</i> spp.: High-dose only + combination
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		<i>Pseudomonas</i> spp.: High-dose only <i>Streptococcus</i> groups A, B, C and G : High-dose only <i>S. pneumoniae</i> : High-dose only
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		<i>Staphylococcus</i> spp.: High-dose only + combination

Aminoglycosides	Standard dose	High dose	Uncomplicated UTI	Special situations
Amikacin	25-30 mg/kg x 1 iv	None		<i>Enterobacterales</i> : High-dose only <i>Pseudomonas</i> spp.: High-dose only <i>Acinetobacter</i> spp.: High-dose only
Gentamicin	6-7 mg/kg x 1 iv	None		<i>Enterobacterales</i> : High-dose only <i>Pseudomonas</i> spp.: High-dose only <i>Acinetobacter</i> spp.: High-dose only
Netilmicin	Under review	Under review		<i>Enterobacterales</i> : High-dose only <i>Pseudomonas</i> spp.: High-dose only <i>Acinetobacter</i> spp.: High-dose only
Tobramycin	6-7 mg/kg x 1 iv	None		<i>Enterobacterales</i> : High-dose only <i>Pseudomonas</i> spp.: High-dose only <i>Acinetobacter</i> spp.: High-dose only

Glycopeptides and lipoglycopeptides	Standard dose	High dose	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.

Dosages

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Macrolides, lincosamides and streptogramins	Standard dose	High dose	Uncomplicated UTI	Special situations
Azithromycin	0.5 g x 1 oral or 0.5 g x 1 iv	None		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 (0.5 g x 2).
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 dose	High dose	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 dose	High dose	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 dose	High dose	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		<i>Neisseria meningitidis</i> : High dose only
Colistin	4.5 MU x 2 iv with a loading dose of 9 MU	None		
Daptomycin	4 mg/kg x 1 iv	6 mg/kg x 1 iv		
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		
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	<i>Stenotrophomonas maltophilia</i> : High-dose-only

European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 10.0, valid from 2020-01-01

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 asterisk 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.](#)

Enterobacterales *

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

MIC determination (broth microdilution according to ISO standard 20776-1 except for mecillinam and fosfomycin where agar dilution is used)
Medium: Mueller-Hinton broth
Inoculum: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin	-	-			-	-		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Wild type Enterobacterales are categorised as susceptible to aminopenicillins. Some countries prefer to categorise wild-type isolates of <i>E. coli</i> and <i>P. mirabilis</i> as "Susceptible, increased exposure". When this is the case, use the MIC breakpoint S ≤ 0.5 mg/L and the corresponding zone diameter breakpoint S ≥ 50 mm.</p> <p>1. Aminopenicillin breakpoints in <i>Enterobacterales</i> are based on intravenous administration. Breakpoints for oral administration are relevant for uncomplicated urinary tract infections only. Breakpoints for other infections are under review.</p> <p>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.</p> <p>5/C. Breakpoints still under consideration. 6. Agar dilution is the reference method for mecillinam MIC determination.</p> <p>A. Ignore growth that may appear as a thin inner zone on some batches of Mueller-Hinton agars. B. Susceptibility inferred from ampicillin. D. Ignore isolated colonies within the inhibition zone. for <i>E. coli</i></p>
Ampicillin¹	8	8		10	14 ^A	14 ^A		
Ampicillin-sulbactam¹	8 ²	8 ²		10-10	14 ^A	14 ^A		
Amoxicillin¹	8	8		-	Note ^B	Note ^B		
Amoxicillin-clavulanic acid¹	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	16		30	20	17		
Piperacillin-tazobactam	8 ⁴	16 ⁴	16	30-6	20	17	17-19	
Ticarcillin	8	16		75	23	20		
Ticarcillin-clavulanic acid	8 ³	16 ³		75-10	23	20		
Temocillin	Note ⁵	Note ⁵			Note ^C	Note ^C		
Phenoxymethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (uncomplicated UTI only), <i>E. coli</i>, <i>Citrobacter</i> spp., <i>Klebsiella</i> spp., <i>Raoultella</i> spp., <i>Enterobacter</i> spp. and <i>P. mirabilis</i>	8 ⁶	8 ⁶		10	15 ^D	15 ^D		

Enterobacteriales *

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	-	-			-	-		1. The cephalosporin breakpoints for <i>Enterobacteriales</i> 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. 2. The cefoxitin ECOFF (8 mg/L) has a high sensitivity but poor specificity for identification of AmpC-producing <i>Enterobacteriales</i> 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. 3. For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L. 4. See table of dosages for dosing for different indications. 5. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
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), <i>E. coli</i> , and <i>Klebsiella</i> spp. (except <i>K. aerogenes</i>)	0.001	4		IP	IP	IP		
Cefepime	1	4		30	27	24		
Cefixime (uncomplicated UTI only)	1	1		5	17	17		
Cefotaxime	1	2		5	20	17		
Cefoxitin (screen only) ²	NA	NA		30	19	19		
Cefpodoxime (uncomplicated UTI only)	1	1		10	21	21		
Ceftaroline	0.5	0.5		5	23	23	22-23	
Ceftazidime	1	4		10	22	19		
Ceftazidime-avibactam	8 ³	8 ³		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 ⁴	2 ⁵	2 ⁵		30-10	22	22		
Ceftriaxone	1	2		30	25	22		
Cefuroxime iv, <i>E. coli</i> , <i>Klebsiella</i> spp. (except <i>K. aerogenes</i>), <i>Raoultella</i> spp. and <i>P. mirabilis</i>	0.001	8		30	50	19		
Cefuroxime oral (uncomplicated UTI only), <i>E. coli</i> , <i>Klebsiella</i> spp. (except <i>K. aerogenes</i>), <i>Raoultella</i> spp. and <i>P. mirabilis</i>	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	
Ertapenem	0.5	0.5		10	25	25		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 <i>Morganella morganii</i> , <i>Proteus</i> spp. and <i>Providencia</i> 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.
Imipenem	2	4		10	22	17		
Imipenem ² , <i>Morganella morganii</i> , <i>Proteus</i> spp. and <i>Providencia</i> spp.	0.001	4		10	50	17		
Imipenem-relebactam, <i>Enterobacteriales</i> except <i>Morganella</i> spp.	2 ³	2 ³		IP	IP	IP		
Meropenem	2	8		10	22	16		
Meropenem-vaborbactam	8 ⁴	8 ⁴		IP	IP	IP		

Enterobacterales *

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Monobactams	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Aztreonam ¹	1	4		30	26	21		<p>Numbered notes relate to general comments and/or MIC breakpoints.</p> <p>Lettered notes relate to the disk diffusion method.</p> <p>1. The aztreonam breakpoints for <i>Enterobacterales</i> 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.</p>

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.25	0.5	0.5	5	25	22	22-24	<p>Numbered notes relate to general comments and/or MIC breakpoints.</p> <p>Lettered notes relate to the disk diffusion method.</p> <p>1. There is clinical evidence for ciprofloxacin to indicate a poor response in systemic infections caused by <i>Salmonella</i> spp. with low-level ciprofloxacin resistance (MIC >0.06 mg/L). The available data relate mainly to <i>Salmonella</i> Typhi but there are also case reports of poor response with other <i>Salmonella</i> species.</p> <p>2/C. The pefloxacin 5 µg breakpoint used to screen for clinical fluoroquinolone resistance in <i>Salmonella</i> spp., can also be used to detect fluoroquinolone resistance mechanisms in other <i>Enterobacterales</i> such as <i>E. coli</i>, <i>K. pneumoniae</i>, and <i>Shigella</i> spp.</p> <p>A. Tests with a ciprofloxacin 5 µg disk will not reliably detect low-level resistance in <i>Salmonella</i> spp. To screen for ciprofloxacin resistance in <i>Salmonella</i> spp., use the pefloxacin 5 µg disk. See Note B.</p> <p>B. Susceptibility of <i>Salmonella</i> spp. to ciprofloxacin can be inferred from pefloxacin disk diffusion susceptibility.</p> <p>D. A disk diffusion test is not yet developed. Perform an MIC test.</p>
Ciprofloxacin ¹ , <i>Salmonella</i> spp.	0.06	0.06			Note ^A	Note ^A		
Pefloxacin (screen only) ^{1,2} <i>Salmonella</i> spp.	NA	NA		5	24 ^{B,C}	24 ^{B,C}		
Delafloxacin, <i>E. coli</i>	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	
Amikacin (systemic infections)	(8) ¹	(8) ¹		30	(18) ^A	(18) ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints.</p> <p>Lettered notes relate to the disk diffusion method.</p> <p>1. Most often aminoglycosides are given in combination with beta-lactam agents.</p> <p>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/.</p> <p>2. Breakpoints do not apply to <i>Plesiomonas shigelloides</i> since aminoglycosides have low intrinsic activity against this species.</p>
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	(17) ^A	(17) ^A		
Tobramycin (infections originating from the urinary tract)	2	2		10	17	17		

Enterobacteriales *

Expert Rules and Intrinsic Resistance Tables

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Azithromycin ¹	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Azithromycin has been used in the treatment of infections with <i>Salmonella</i> Typhi (MIC ≤16 mg/L for wild-type isolates) and <i>Shigella</i> spp.
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	
Doxycycline	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Tetracycline can be used to predict doxycycline susceptibility for the treatment of <i>Yersinia enterocolitica</i> 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 <i>Enterobacteriales</i> , the activity of tigecycline varies from insufficient in <i>Proteus</i> spp., <i>Morganella morganii</i> and <i>Providencia</i> spp. to variable in other species. For more information, see http://www.eucast.org/guidance_documents/ . B. Zone diameter breakpoints validated for <i>E. coli</i> only. For <i>C. koseri</i> , use an MIC method.
Eravacycline, <i>E. coli</i>	0.5	0.5		20	17	17		
Minocycline	-	-			-	-		
Tetracycline ¹	-	-			-	-		
Tigecycline, <i>E. coli</i> and <i>C. koseri</i>	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	
Linezolid	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Tedizolid	-	-			-	-		

Enterobacterales *

Expert Rules and Intrinsic Resistance Tables

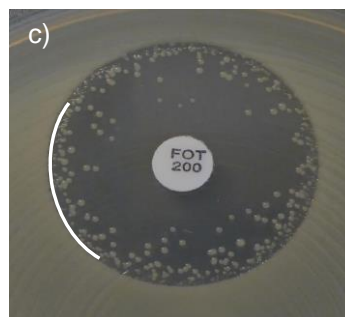
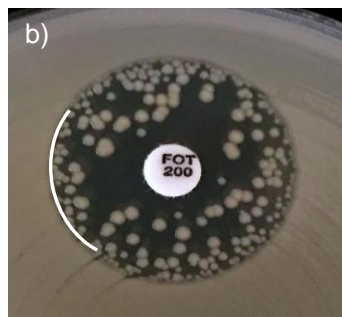
EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	8	8		30	17	17		
Colistin ¹	2	2			Note ^A	Note ^A		
Daptomycin	-	-			-	-		
Fosfomycin iv	32 ²	32 ²		200 ^B	24 ^{C,D}	24 ^{C,D}		
Fosfomycin oral (uncomplicated UTI only)	32 ²	32 ²		200 ^B	24 ^{C,D}	24 ^{C,D}		
Fusidic acid	-	-			-	-		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), <i>E. coli</i>	64	64		100	11	11		
Nitroxoline (uncomplicated UTI only), <i>E. coli</i>	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		

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

- 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).
- 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.
- 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).



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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

MIC determination (broth microdilution according to ISO standard 20776-1 except for fosfomycin where agar dilution is used)

Medium: Mueller-Hinton broth

Inoculum: 5x10⁵ CFU/mL

Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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	
Benzylpenicillin	-	-			-	-		1. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L. 2. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Ampicillin	-	-			-	-		
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 (uncomplicated UTI only)	-	-			-	-		

Pseudomonas spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L. 2. See table of dosages for dosing for different indications. 3. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	0.001	8		30	50	21		
Cefixime	-	-			-	-		
Cefotaxime	-	-			-	-		
Cefoxitin	NA	NA			NA	NA		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime	0.001	8		10	50	17		
Ceftazidime-avibactam, <i>P. aeruginosa</i>	8 ¹	8 ¹		10-4	17	17	16-17	
Ceftibuten	-	-			-	-		
Ceftobiprole	IE	IE			IE	IE		
Ceftolozane-tazobactam ² , <i>P. aeruginosa</i>	4 ³	4 ³		30-10	24	24		
Ceftriaxone	-	-			-	-		
Cefuroxime iv	-	-			-	-		
Cefuroxime oral	-	-			-	-		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ertapenem	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L. 2. For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.
Imipenem	0.001	4		10	50	20		
Imipenem-relebactam, <i>P. aeruginosa</i>	2 ¹	2 ¹		IP	IP	IP		
Meropenem	2	8		10	24	18		
Meropenem-vaborbactam, <i>P. aeruginosa</i>	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	
Aztreonam	0.001	16		30	50	18		

***Pseudomonas* spp.**

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.001	0.5		5	50	26		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Amikacin (systemic infections)	(16) ¹	(16) ¹		30	(15) ^A	(15) ^A		1. Most often aminoglycosides are given in combination with beta-lactam agents. <u>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/.</u>
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	
Dalbavancin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

***Pseudomonas* spp.**

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-			-	-		
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
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	-	-			-	-		
Eravacycline	-	-			-	-		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline	-	-			-	-		

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	-	-			-	-		

***Pseudomonas* 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	
Chloramphenicol	-	-			-	-		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1. Colistin MIC determination should be performed with broth microdilution. Quality control must be performed with both a susceptible QC strain (<i>E. coli</i> ATCC 25922 or <i>P. aeruginosa</i> ATCC 27853) and the colistin resistant <i>E. coli</i> NCTC 13846 (<i>mcr-1</i> positive).</p> <p>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 <i>E. coli</i>) have been treated with fosfomycin in combination with other agents.</p> <p>A. Use an MIC method (broth microdilution only).</p>
Colistin ¹	2	2	4		Note ^A	Note ^A		
Daptomycin	-	-			-	-		
Fosfomycin iv ²	-	-			-	-		
Fosfomycin oral ²	-	-			-	-		
Fusidic acid	-	-			-	-		
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. 10.0, valid from 2020-01-01

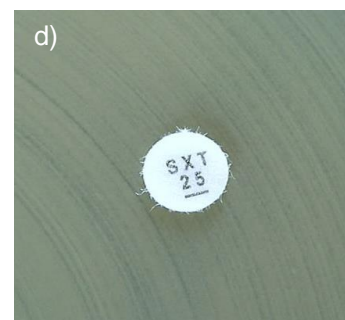
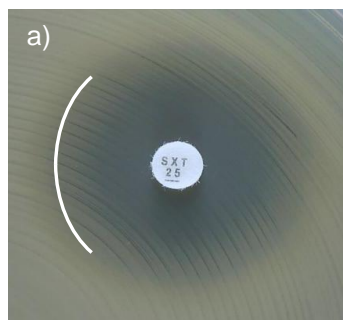
For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

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

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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. Trimethoprim-sulfamethoxazole resistance in <i>S. maltophilia</i> is rare and should be confirmed with an MIC test.



Examples of inhibition zones for *Stenotrophomonas maltophilia* with trimethoprim-sulfamethoxazole.

a-b) 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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

MIC determination (broth microdilution according to ISO standard 20776-1)

Medium: Mueller-Hinton broth

Inoculum: 5x10⁵ CFU/mL

Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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. Iwoffii*, *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	
Benzylpenicillin	-	-			-	-		1. Susceptibility testing of <i>Acinetobacter</i> spp. to penicillins is unreliable. In most instances, <i>Acinetobacter</i> 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 (uncomplicated UTI only)	-	-			-	-		

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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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	-	-			-	-		
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 Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Ertapenem	-	-			-	-		
Imipenem	2	4		10	24	21		
Imipenem-relebactam	2 ¹	2 ¹		IP	IP	IP		1. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Meropenem	2	8		10	21	15		
Meropenem-vaborbactam	IE	IE			IE	IE		

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	-	-			-	-		

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.001	1		5	50	21		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Amikacin (systemic infections)	(8) ¹	(8) ¹		30	(19) ^A	(19) ^A		1. Most often aminoglycosides are given in combination with beta-lactam agents. 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	
Dalbavancin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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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	-	-			-	-		
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
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	-	-			-	-		
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 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	-	-			-	-		

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Colistin MIC determination should be performed with broth microdilution. Quality control must be performed with both a susceptible QC strain (<i>E. coli</i> ATCC 25922 or <i>P. aeruginosa</i> ATCC 27853) and the colistin resistant <i>E. coli</i> NCTC 13846 (<i>mcr-1</i> 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	-	-			-	-		
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

For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

MIC determination (broth microdilution according to ISO standard 20776-1 except for fosfomycin where agar dilution is used)
Medium: Mueller-Hinton broth
Inoculum: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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 and linezolid, see below).
Quality control: *Staphylococcus aureus* ATCC 29213. For agents not covered by this strain, see EUCAST QC Tables.

This genus has been traditionally divided in *S. aureus*, now considered as a complex [*S. aureus*, *S. argenteus* (found in human infections) and *S. schweitzeri* (found so far in animals)], other coagulase-positive species not belonging to the *S. aureus*-complex: *S. intermedius*, *S. pseudintermedius*, *S. schleiferi* subspecies *coagulans*, and lastly coagulase-negative staphylococci. Coagulase-negative species most frequently recovered in clinical samples are *S. capitis*, *S. cohnii*, *S. epidermidis*, *S. haemolyticus*, *S. hominis*, *S. hyicus*, *S. lugdunensis*, *S. saprophyticus*, *S. schleiferi* subspecies *schleiferi*, *S. sciuri*, *S. simulans*, *S. warneri* and *S. xylosus*. Unless otherwise indicated, breakpoints apply to all members of the *Staphylococcus* genus, except that breakpoints for other species than *S. aureus* in the *S. aureus*-complex have not been validated, and that *S. saccharolyticus* should be tested as a Gram-positive anaerobe.

Penicillins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin, <i>S. aureus</i>	0.125 ¹	0.125 ¹		1 unit	26 ^{A,B}	26 ^{A,B}		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Most staphylococci are penicillinase producers and some are methicillin resistant. Either mechanism renders them resistant to benzylpenicillin, phenoxymethylpenicillin, ampicillin, amoxicillin, piperacillin and ticarcillin. Staphylococci that test susceptible to benzylpenicillin and ceftiofur can be reported susceptible to all penicillins. Staphylococci that test resistant to benzylpenicillin but susceptible to ceftiofur are susceptible to β-lactamase inhibitor combinations, the isoxazolylic penicillins (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. Staphylococci that test resistant to ceftiofur are resistant to all penicillins.</p> <p>2/C. No currently available method can reliably detect penicillinase production in coagulase-negative staphylococci.</p> <p>3/D. Ampicillin susceptible <i>S. saprophyticus</i> are <i>mecA</i>-negative and susceptible to ampicillin, amoxicillin and piperacillin (without or with a beta-lactamase inhibitor).</p> <p>4. <i>S. aureus</i>, <i>S. lugdunensis</i> and <i>S. saprophyticus</i> with oxacillin MIC values >2 mg/L are mostly methicillin resistant due to the presence of the <i>mecA</i> or <i>mecC</i> gene. Occasionally oxacillin MIC values are high in <i>S. aureus</i> in absence of <i>mec</i>-gene mediated resistance. These strains have been called BORSA (borderline oxacillin resistant <i>S. aureus</i>). EUCAST does not recommend systematic screening for BORSA. For coagulase-negative staphylococci other than <i>S. saprophyticus</i> and <i>S. lugdunensis</i>, the oxacillin MIC in methicillin resistant strains is >0.25 mg/L.</p> <p>B. For <i>S. aureus</i>, 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.</p> <p>E. For screening for methicillin resistance in <i>S. pseudintermedius</i> and <i>S. schleiferi</i>, see Note C on cephalosporins.</p>
Benzylpenicillin, <i>S. lugdunensis</i>	0.125 ¹	0.125 ¹		1 unit	26 ^A	26 ^A		
Benzylpenicillin, Coagulase-negative staphylococci	- ^{1,2}	- ^{1,2}			Note ^{A,C}	Note ^{A,C}		
Ampicillin, <i>S. saprophyticus</i>	Note ^{1,3}	Note ^{1,3}		2	18 ^{A,D}	18 ^{A,D}		
Ampicillin-sulbactam	Note ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Amoxicillin	Note ^{1,2,3}	Note ^{1,2,3}			Note ^{A,C,D}	Note ^{A,C,D}		
Amoxicillin-clavulanic acid	Note ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Piperacillin	Note ^{1,2,3}	Note ^{1,2,3}			Note ^{A,C,D}	Note ^{A,C,D}		
Piperacillin-tazobactam	Note ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Ticarcillin	Note ^{1,2}	Note ^{1,2}			Note ^{A,C}	Note ^{A,C}		
Ticarcillin-clavulanic acid	Note ¹	Note ¹			Note ^A	Note ^A		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin, <i>S. aureus</i>	Note ¹	Note ¹			Note ^A	Note ^A		
Phenoxymethylpenicillin, Coagulase-negative staphylococci	- ^{1,2}	- ^{1,2}			Note ^{A,C,D}	Note ^{A,C,D}		
Oxacillin ⁴	Note ^{1,4}	Note ^{1,4}			Note ^{A,E}	Note ^{A,E}		
Cloxacillin	Note ¹	Note ¹			Note ^A	Note ^A		
Dicloxacillin	Note ¹	Note ¹			Note ^A	Note ^A		
Flucloxacillin	Note ¹	Note ¹			Note ^A	Note ^A		
Mecillinam oral (uncomplicated UTI only)	-	-			-	-		

Staphylococcus spp.
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Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor ²	Note ¹	Note ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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. <u>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).</u> Some methicillin-resistant <i>S. aureus</i> are susceptible to ceftaroline and ceftobiprole, see Notes 5/D and 7/F.</p> <p>2. See table of dosages.</p> <p>3. <i>S. aureus</i> and <i>S. lugdunensis</i> with cefoxitin MIC values >4 mg/L and <i>S. saprophyticus</i> with cefoxitin MIC values >8 mg/L are methicillin resistant, mostly due to the presence of the <i>mecA</i> or <i>mecC</i> gene. Disk diffusion reliably predicts methicillin resistance.</p> <p>4. For staphylococci other than <i>S. aureus</i>, <i>S. lugdunensis</i> and <i>S. saprophyticus</i>, the cefoxitin MIC is a poorer predictor of methicillin resistance than the disk diffusion test.</p> <p>5/D. Methicillin-susceptible isolates can be reported susceptible to ceftaroline without further testing.</p> <p>6/E. Resistant isolates are rare.</p> <p>7/F. Methicillin-susceptible isolates can be reported susceptible to ceftobiprole without further testing.</p> <p>B. If coagulase-negative staphylococci are not identified to species level, use zone diameter breakpoints S≥25, R<25 mm.</p> <p>C. Cefoxitin screen for methicillin resistance in <i>S. pseudintermedius</i> and <i>S. schleiferi</i> is less predictive of the presence of <i>mecA</i> than in other staphylococci. Use the oxacillin 1 µg disk with zone diameter breakpoints S≥20, R<20 mm to screen for methicillin resistance.</p>
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		
Cefixime	-	-			-	-		
Cefotaxime ²	Note ¹	Note ¹			Note ^A	Note ^A		
Cefoxitin (screen only), <i>S. aureus</i> and coagulase-negative staphylococci other than <i>S. epidermidis</i>	Note ^{3,4}	Note ^{3,4}		30	22 ^{A,B}	22 ^{A,B}		
Cefoxitin (screen only), <i>S. epidermidis</i>	Note ⁴	Note ⁴		30	25 ^{A,B}	25 ^{A,B}	25-27	
Cefoxitin (screen only), <i>S. pseudintermedius</i> and <i>S. schleiferi</i>	NA	NA			Note ^C	Note ^C		
Cefpodoxime	Note ¹	Note ¹			Note ^A	Note ^A		
Ceftaroline, <i>S. aureus</i> (indications other than pneumonia)	1 ⁵	2 ^{5,6}	1	5	20 ^D	17 ^{D,E}	19-20	
Ceftaroline, <i>S. aureus</i> (pneumonia)	1 ⁵	1 ⁵	1	5	20 ^D	20 ^D	19-20	
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole, <i>S. aureus</i>	2 ⁷	2 ⁷	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	
Ertapenem	Note ¹	Note ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Susceptibility of staphylococci to carbapenems is inferred from the cefoxitin susceptibility.</p>
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		

Staphylococcus spp.

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

Fluoroquinolones ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin, <i>S. aureus</i>	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. 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, <i>S. aureus</i>	0.25	0.25			Note ^B	Note ^B		
Levofloxacin, <i>S. aureus</i>	0.001	1		5	50 ^A	22 ^A		
Levofloxacin, Coagulase-negative staphylococci	0.001	1		5	50 ^A	24 ^A		
Moxifloxacin, <i>S. aureus</i>	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, <i>S. aureus</i>	0.001	1		5	50 ^A	20 ^A		
Ofloxacin, Coagulase-negative staphylococci	0.001	1		5	50 ^A	24 ^A		

Aminoglycosides ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin ² , <i>S. aureus</i>	(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 <i>S. aureus</i> and R<22 mm for coagulase-negative staphylococci.
Amikacin ² , Coagulase-negative staphylococci	(8) ¹	(8) ¹		30	(22) ^A	(22) ^A		
Gentamicin, <i>S. aureus</i>	(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, <i>S. aureus</i>	(1) ¹	(1) ¹		10	(18) ^A	(18) ^A		
Tobramycin, Coagulase-negative staphylococci	(1) ¹	(1) ¹		10	(22) ^A	(22) ^A		

Staphylococcus spp.

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Glycopeptides and lipoglycopeptides ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin ²	0.125 ^{3,4}	0.125 ³			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1. Glycopeptide MICs are method dependent and should be determined by broth microdilution (ISO standard 20776-1). <i>S. aureus</i> 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. The resistant breakpoint has been reduced to 2 mg/L to avoid reporting "GISA" isolates in the I category as serious infections with "GISA" isolates are not treatable with increased doses of vancomycin or teicoplanin.</p> <p>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.</p> <p>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.</p> <p>4. <i>S. aureus</i> isolates susceptible to vancomycin can be reported susceptible to dalbavancin and oritavancin.</p> <p>5. MRSA isolates susceptible to vancomycin can be reported susceptible to telavancin.</p> <p>A. Disk diffusion is unreliable and cannot distinguish between wild type isolates and those with non-vanA-mediated glycopeptide resistance.</p>
Oritavancin ² , <i>S. aureus</i>	0.125 ^{3,4}	0.125 ³			Note ^A	Note ^A		
Teicoplanin ² , <i>S. aureus</i>	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 , <i>S. aureus</i>	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
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	1 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin.</p> <p>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".</p> <p>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.</p> <p>C. Isolates non-susceptible by disk diffusion should be confirmed by MIC testing.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>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.</p> <p>3. For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use.</p> <p>B. The zone diameter breakpoint is valid for MSSA only. For MRSA, perform an MIC test.</p>
Eravacycline, <i>S. aureus</i>	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		

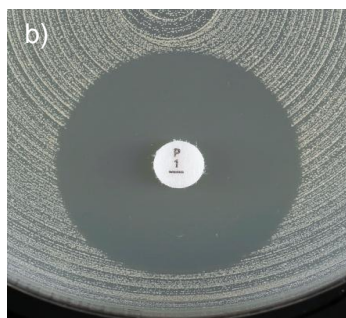
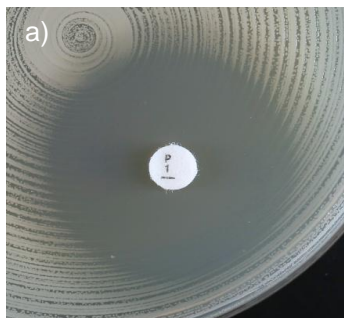
Staphylococcus spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	4	4		10	21	21		1/A. Isolates susceptible to linezolid can be reported susceptible to tedizolid. A- Examine zone edges with transmitted light (plate held up to light). B- Isolates susceptible to linezolid can be reported susceptible to tedizolid. For isolates resistant to linezolid, perform an MIC test.
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	
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. 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. 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. 4. Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. A. Use an MIC method.
Colistin	-	-			-	-		
Daptomycin ¹	1 ²	1 ²			Note ^A	Note ^A		
Fosfomycin iv	32 ³	32 ³			Note ^A	Note ^A		
Fosfomycin oral	-	-			-	-		
Fusidic acid	1	1		10	24	24		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), <i>S. saprophyticus</i>	64	64		100	13	13		
Nitroxoline (uncomplicated UTI only), <i>S. saprophyticus</i>	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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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	
Benzylpenicillin	-	-			-	-		1. Aminopenicillin breakpoints in enterococci are based on intravenous administration. Oral administration is 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 <i>E. faecalis</i> (confirm with MIC) but common in <i>E. faecium</i> . 1. <i>E. faecium</i> resistant to penicillins can be considered resistant to all other beta-lactam agents including carbapenems. 2. Ampicillin resistance in <i>E. faecalis</i> is rare and should be confirmed with an MIC test. 3/A. Susceptibility to ampicillin, amoxicillin and piperacillin with and without beta-lactamase inhibitor can be inferred from ampicillin. 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.
Ampicillin¹	4 ²	8 ²		2	10 ^A	8 ^A		
Ampicillin-sulbactam¹	4 ^{2,3}	8 ^{2,3}			Note ^A	Note ^A		
Amoxicillin¹	4 ²	8 ²			Note ^A	Note ^A		
Amoxicillin-clavulanic acid¹	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 (uncomplicated UTI only)	-	-			-	-		

Enterococcus spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-			-	-		
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 Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Ertapenem	-	-			-	-		
Imipenem	0.001	4		10	50	21		
Imipenem-relebactam	IE	IE			IE	IE		
Meropenem	-	-			-	-		
Meropenem-vaborbactam	-	-			-	-		

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	-	-			-	-		

Enterococcus spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin (uncomplicated UTI only)	4	4		5	15 ^A	15 ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. A. The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. See Note B. B. Susceptibility of ciprofloxacin and levofloxacin can be inferred from the norfloxacin susceptibility.
Delafloxacin	IE	IE			IE	IE		
Levofloxacin (uncomplicated UTI only)	4	4		5	15 ^A	15 ^A		
Moxifloxacin	-	-			-	-		
Nalidixic acid (screen only)	NA	NA			NA	NA		
Norfloxacin (screen only)	NA	NA		10	12 ^B	12 ^B		
Oxfloxacin	-	-			-	-		

Aminoglycosides ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	Note ²	Note ²			Note ^A	Note ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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. 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. 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.
Gentamicin (test for high-level aminoglycoside resistance)	Note ²	Note ²		30	Note ^A	Note ^A		
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		
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	
Dalbavancin	IE	IE			IE	IE		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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		

Enterococcus spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-			-	-		
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
					-	-		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin, <i>E. faecium</i>	1	4		15	22	20		

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. 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, <i>E. faecalis</i>	0.125	0.125		20	22	22		
Eravacycline, <i>E. faecium</i>	0.125	0.125		20	24	24		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline ¹ , <i>E. faecalis</i>	0.25 ²	0.25 ²		15	20	20		
Tigecycline ¹ , <i>E. faecium</i>	0.25 ²	0.25 ²		15	22	22		

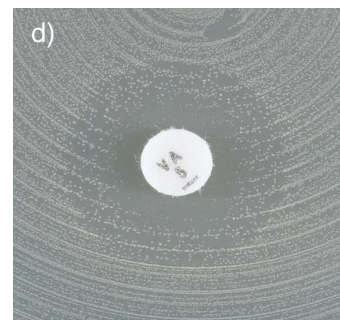
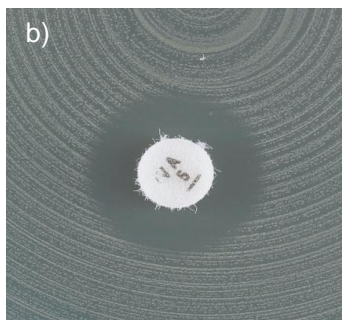
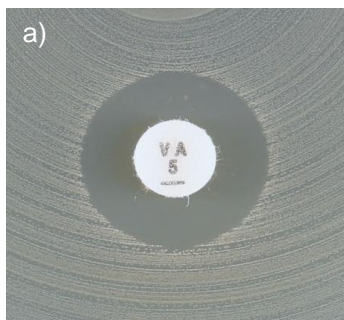
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	4	4		10	20	20		
Tedizolid	IE	IE			IE	IE		

Enterococcus spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	-	-			-	-		1. For more information, see http://www.eucast.org/guidance_documents/ . 2/A. 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 <i>E. faecalis</i> and <i>E. faecium</i> is 1 mg/L, with a corresponding zone diameter ECOFF of 21 mm for trimethoprim and 23 mm for trimethoprim-sulfamethoxazole. 3. Trimethoprim-sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Colistin	-	-			-	-		
Daptomycin ¹	IE	IE			IE	IE		
Fosfomycin iv	-	-			-	-		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), <i>E. faecalis</i>	64	64		100	15	15		
Nitroxoline (uncomplicated UTI only)	IE	IE			IE	IE		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	Note ²	Note ²		5	Note ^A	Note ^A		
Trimethoprim-sulfamethoxazole ³	Note ²	Note ²		1.25-23.75	Note ^A	Note ^A		



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

For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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 *zoepidemicus*.

Penicillins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzympenicillin²	0.25	0.25		1 unit	18	18		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 benzympenicillin susceptibility 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. Streptococcus groups A, B, C and G do not produce beta-lactamase. The addition of a beta-lactamase inhibitor does not add clinical benefit.
Ampicillin	Note ¹	Note ¹			Note ^A	Note ^A		
Ampicillin-sulbactam³	Note ¹	Note ¹			Note ^A	Note ^A		
Amoxicillin	Note ¹	Note ¹			Note ^A	Note ^A		
Amoxicillin-clavulanic acid³	Note ¹	Note ¹			Note ^A	Note ^A		
Piperacillin	Note ¹	Note ¹			Note ^A	Note ^A		
Piperacillin-tazobactam³	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 (uncomplicated UTI only)	-	-			-	-		

Streptococcus groups A, B, C and G
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Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	Note ¹	Note ¹			Note ^A	Note ^A		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 cephalosporins is inferred from the benzylpenicillin susceptibility. 2. Streptococcus groups A, B, C and G do not produce beta-lactamase. 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		
Cefixime	-	-			-	-		
Cefotaxime	Note ¹	Note ¹			Note ^A	Note ^A		
Cefoxitin	NA	NA			NA	NA		
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Ertapenem	Note ¹	Note ¹			Note ^A	Note ^A		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 carbapenems is inferred from the benzylpenicillin susceptibility. 2/B. Streptococcus groups A, B, C and G do not produce beta-lactamase. The addition of a beta-lactamase inhibitor does not add clinical benefit.
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Aztreonam	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

Streptococcus groups A, B, C and G
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Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	-	-			-	-		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>A. A disk diffusion test is not yet developed. Perform an MIC test.</p> <p>B. The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. See Note C.</p> <p>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.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	-	-			-	-		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p>
Gentamicin	-	-			-	-		
Netilmicin	-	-			-	-		
Tobramycin	-	-			-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin ¹	0.125 ^{2,3}	0.125 ²			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>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.</p> <p>3. Isolates susceptible to vancomycin can be reported susceptible to dalbavancin and oritavancin.</p> <p>A. Disk diffusion criteria have not been defined and an MIC method should be used.</p> <p>B. Non-wild type isolates were not available when developing the disk diffusion method.</p>
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

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Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25 ¹	0.5 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin.</p> <p>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 <i>S. pyogenes</i> infections is not known.</p> <p>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.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>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.</p> <p>3. For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid ¹	2	2		10	19	19		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>2. Isolates susceptible to linezolid can be reported susceptible to tedizolid.</p> <p>A. Isolates susceptible to linezolid can be reported susceptible to tedizolid. For isolates resistant to linezolid, perform an MIC test.</p>
Tedizolid ¹	0.5 ²	0.5		2	18 ^A	18 ^A		

Streptococcus groups A, B, C and G

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Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	8	8		30	19	19		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>2. Daptomycin MICs must be determined in the presence of Ca²⁺ (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.</p> <p>3. Trimethoprim-sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.</p> <p>A. Use an MIC method.</p>
Colistin	-	-			-	-		
Daptomycin ¹	1 ²	1 ²			Note ^A	Note ^A		
Fosfomycin iv	-	-			-	-		
Fosfomycin oral	-	-			-	-		
Fusidic acid	IE	IE			IE	IE		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only), <i>S. agalactiae</i> (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), <i>S. agalactiae</i> (group B streptococci)	2	2		5	IP	IP		
Trimethoprim-sulfamethoxazole ³	1	2		1.25-23.75	18	15		

Streptococcus pneumoniae
Expert Rules and Intrinsic Resistance Tables

For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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 ^{1,2}	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin (indications other than meningitis) ³	0.06 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>2. Breakpoints for penicillins other than "benzylpenicillin (meningitis)" relate only to non-meningitis isolates.</p> <p>3. For breakpoints and dosing in pneumonia, see table of dosages.</p> <p>4. <i>Streptococcus pneumoniae</i> do not produce beta-lactamase. The addition of a beta-lactamase inhibitor does not add clinical benefit.</p> <p>5/B. Susceptibility inferred from ampicillin (MIC or zone diameter).</p> <p>6. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.</p> <p>C. Perform an MIC or infer susceptibility from the ampicillin 2 µg disk diffusion test with ampicillin breakpoints S≥22, R<19 mm.</p> <p>D. For interpretation of the oxacillin disk screen, see flow chart below.</p>
Benzylpenicillin (meningitis)	0.06 ¹	0.06 ¹			Note ^A	Note ^A		
Ampicillin	0.5 ¹	2 ¹		2	22 ^A	16 ^A		
Ampicillin-sulbactam ⁴	Note ^{1,5}	Note ^{1,5}			Note ^{A,B}	Note ^{A,B}		
Amoxicillin iv	Note ^{1,5}	Note ^{1,5}			Note ^{A,B}	Note ^{A,B}		
Amoxicillin oral	0.5 ¹	1 ¹			Note ^{A,C}	Note ^{A,C}		
Amoxicillin-clavulanic acid iv ⁴	Note ^{1,5}	Note ^{1,5}			Note ^{A,B}	Note ^{A,B}		
Amoxicillin-clavulanic acid oral ⁴	0.5 ^{1,6}	1 ^{1,6}			Note ^{A,C}	Note ^{A,C}		
Piperacillin	Note ^{1,5}	Note ^{1,5}			Note ^{A,B}	Note ^{A,B}		
Piperacillin-tazobactam ⁴	Note ^{1,5}	Note ^{1,5}			Note ^{A,B}	Note ^{A,B}		
Ticarcillin	-	-			-	-		
Ticarcillin-clavulanic acid	-	-			-	-		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	Note ¹	Note ¹			Note ^A	Note ^A		
Oxacillin (screen only)	NA	NA		1	20 ^D	Note ^D		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (uncomplicated UTI only)	-	-			-	-		

Streptococcus pneumoniae
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Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	0.001	0.5		30	50	28		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p>
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	1	2			Note ^A	Note ^A		
Cefixime	-	-			-	-		
Cefotaxime	0.5	2			Note ^A	Note ^A		
Cefoxitin	NA	NA			NA	NA		
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	0.5	2			Note ^A	Note ^A		
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Ertapenem	0.5	0.5			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>2. Meropenem is the only carbapenem used for meningitis.</p> <p>3/B. <i>Streptococcus pneumoniae</i> do not produce beta-lactamase. The addition of a beta-lactamase inhibitor does not add clinical benefit.</p> <p>C. For use in meningitis determine the meropenem MIC.</p>
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		

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

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Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. A. The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. See Note B. 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.
Delafloxacin	IE	IE			IE	IE		
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Gentamicin	-	-			-	-		
Netilmicin	-	-			-	-		
Tobramycin	-	-			-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin	IE	IE			IE	IE		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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. A. Non-wild type isolates were not available when developing the disk diffusion method.
Oritavancin	IE	IE			IE	IE		
Teicoplanin ¹	2	2		30	17 ^A	17 ^A		
Telavancin	IE	IE			IE	IE		
Vancomycin ¹	2	2		5	16 ^A	16 ^A		

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Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25 ¹	0.5 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin.</p> <p>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.</p> <p>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.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p>
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		

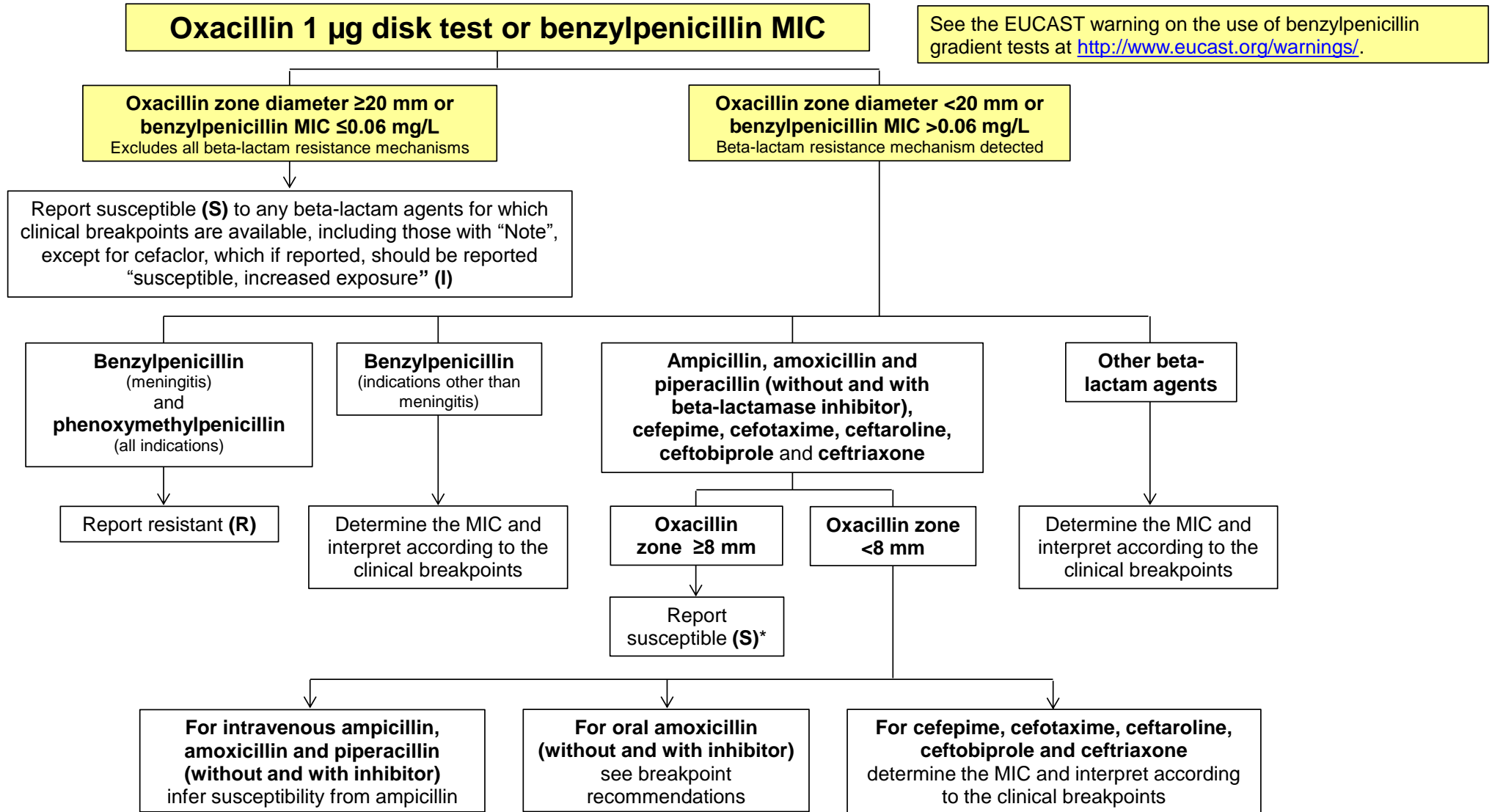
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	2	2		10	22	22		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p>
Tedizolid	IE	IE			IE	IE		

Streptococcus pneumoniae
 Expert Rules and Intrinsic Resistance Tables

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

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

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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: 5x10⁵ CFU/mL

Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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	
Benzylpenicillin	0.25	2		1 unit	18	12		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1/B. For isolates susceptible to benzylpenicillin, susceptibility can be inferred from benzylpenicillin or ampicillin. For isolates resistant to benzylpenicillin, susceptibility is inferred from ampicillin. A. Benzylpenicillin 1 unit can be used to screen for beta-lactam resistance in viridans group streptococci. Isolates categorised as susceptible can be reported susceptible to beta-lactam agents for which clinical breakpoints are listed (including those with "Note"). Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Benzylpenicillin (screen only)	NA	NA		1 unit	18 ^A	Note ^A		
Ampicillin	0.5	2		2	21	15		
Ampicillin-sulbactam	Note ¹	Note ¹			Note ^{A,B}	Note ^{A,B}		
Amoxicillin	0.5	2			Note ^{A,B}	Note ^{A,B}		
Amoxicillin-clavulanic acid	Note ¹	Note ¹			Note ^{A,B}	Note ^{A,B}		
Piperacillin	Note ¹	Note ¹			Note ^{A,B}	Note ^{A,B}		
Piperacillin-tazobactam	Note ¹	Note ¹			Note ^{A,B}	Note ^{A,B}		
Ticarcillin	IE	IE			IE	IE		
Ticarcillin-clavulanic acid	IE	IE			IE	IE		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	IE	IE			IE	IE		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (uncomplicated UTI only)	-	-			-	-		

Viridans group streptococci
Expert Rules and Intrinsic Resistance Tables

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Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. A. Benzylpenicillin 1 unit can be used to screen for beta-lactam resistance in viridans group streptococci. See Note A on penicillins.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	0.5	0.5		30	IP	IP		
Cefepime	0.5	0.5		30	25 ^A	25 ^A		
Cefixime	-	-			-	-		
Cefotaxime	0.5	0.5		5	23 ^A	23 ^A		
Cefoxitin	NA	NA			NA	NA		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole	-	-			-	-		
Ceftolozane-tazobactam, <i>S. anginosus</i> 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	
Ertapenem	0.5	0.5			Note ^A	Note ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L. A. Benzylpenicillin 1 unit can be used to screen for beta-lactam resistance in viridans group streptococci. See Note A on penicillins.
Imipenem	2	2			Note ^A	Note ^A		
Imipenem-relebactam	2 ¹	2 ¹		IP	IP	IP		
Meropenem	2	2			Note ^A	Note ^A		
Meropenem-vaborbactam	IE	IE			IE	IE		

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

Viridans group streptococci
Expert Rules and Intrinsic Resistance Tables

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Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. A. A disk diffusion test is not yet developed. Perform an MIC test.
Delafloxacin, <i>S. anginosus</i> group	0.03	0.03			Note ^A	Note ^A		
Levofloxacin	IE	IE			IE	IE		
Moxifloxacin	IE	IE			IE	IE		
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	
Amikacin	Note ²	Note ²			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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. 2. Gentamicin can be used to screen for high-level aminoglycoside resistance (HLAR). 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. 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.
Gentamicin (test for high-level aminoglycoside resistance)	Note ²	Note ²			-	-		
Netilmicin	Note ²	Note ²			-	-		
Tobramycin	Note ²	Note ²			-	-		

Glycopeptides and lipoglycopeptides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Dalbavancin ¹ , <i>S. anginosus</i> group	0.125 ^{2,3}	0.125 ²			Note ^A	Note ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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 , <i>S. anginosus</i> group	0.25 ^{2,3}	0.25 ²			Note ^A	Note ^A		
Teicoplanin ¹	2	2		30	16 ^B	16 ^B		
Telavancin	IE	IE			IE	IE		
Vancomycin ¹	2	2		5	15 ^B	15 ^B		

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

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Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	IE	IE			IE	IE		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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	
Doxycycline	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Linezolid	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. A. Perform an MIC test.
Tedizolid, <i>S. anginosus</i> group	0.25	0.25		2	18	18		

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

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Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Colistin	-	-			-	-		
Daptomycin	-	-			-	-		
Fosfomycin iv	-	-			-	-		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
Metronidazole	-	-			-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-			-	-		
Nitroxoline (uncomplicated UTI only)	-	-			-	-		
Rifampicin	-	-			-	-		
Spectinomycin	-	-			-	-		
Trimethoprim (uncomplicated UTI only)	-	-			-	-		
Trimethoprim-sulfamethoxazole	-	-			-	-		

Haemophilus influenzae
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For several agents, in v. 10.0 of the breakpoint tables, EUCAST has introduced breakpoints which categorise wild-type organisms (organisms without phenotypically detectable acquired resistance mechanisms to the agent) as "Susceptible, increased exposure (I)" instead of "Susceptible, standard dosing regimen (S)". In v. 9.0, these are listed as agent^{HE} to emphasize the need for high exposure (HE). Following efforts to explain and inform colleagues in clinical microbiology, colleagues involved in treatment and in forming antimicrobial policies and stewardship, laboratories are encouraged to implement the new standard as soon as possible but no later than at the end of 2020. During the transition, it is possible to continue to use breakpoints in table v. 9.0 for breakpoints highlighted in light green in v. 10.0.

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*.

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin	IE	IE			IE	IE		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, <u>except for amoxicillin oral and amoxicillin-clavulanic acid oral</u> , 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. 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.
Benzylpenicillin (screen only)¹	NA	NA		1 unit	12 ^{A,B}	Note ^{A,B}		
Ampicillin²	1	1		2	18 ^{A,B}	18 ^{A,B}		
Ampicillin-sulbactam	1 ^{3,4}	1 ^{3,4}		10-10	Note ^{A,D}	Note ^{A,D}		
Amoxicillin iv²	2	2			Note ^{A,E}	Note ^{A,E}		
Amoxicillin oral²	0.001	2			Note ^A	Note ^A		
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}		
Piperacillin²	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 (uncomplicated UTI only)	-	-			-	-		

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Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	-	-			-	-		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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, <u>except for cefuroxime oral, which if reported, should be reported "susceptible, increased exposure" (I).</u> When the screen is positive (inhibition zone <12 mm), see flow chart below.</p> <p>2. See table of dosages for dosing for different indications.</p> <p>3/C. ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).</p> <p>B. Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk. see pictures below.</p>
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	0.25	0.25		30	28 ^{A,B}	28 ^{A,B}	28-33 ^{B,C}	
Cefixime	0.125	0.125		5	26 ^{A,B}	26 ^{A,B}		
Cefotaxime	0.125	0.125		5	27 ^{A,B}	27 ^{A,B}	25-27 ^{B,C}	
Cefoxitin	NA	NA			NA	NA		
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		IP	IP	IP		
Ceftriaxone	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	
Ertapenem	0.5	0.5		10	23 ^{A,B}	23 ^{A,B}		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>2. Meropenem is the only carbapenem used for meningitis.</p> <p>B. Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk. see pictures below.</p> <p>C. ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).</p> <p>D. For benzylpenicillin 1 unit disk screen positive isolates (inhibition zone <12 mm), <u>determine the MIC for meropenem.</u></p>
Imipenem	2	2		10	20 ^{A,B}	20 ^{A,B}	6-19 ^{B,C}	
Imipenem-relebactam	IE	IE			IE	IE		
Meropenem (indications other than meningitis)	2	2		10	20 ^{A,B}	20 ^{A,B}		
Meropenem (meningitis)	0.25	0.25			Note ^{A,D}	Note ^{A,D}		
Meropenem-vaborbactam	IE	IE			IE	IE		

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

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Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.06	0.06		5	30 ^A	30 ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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	0.06	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	
Amikacin	IE	IE			IE	IE		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Dalbavancin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Oritavancin	-	-			-	-		
Teicoplanin	-	-			-	-		
Telavancin	-	-			-	-		
Vancomycin	-	-			-	-		

Haemophilus influenzae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Macrolides ¹ , lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	Note ¹	Note ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Clinical evidence for the efficacy of macrolides in <i>H. influenzae</i> 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.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p>
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
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	-	-			-	-		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p>
Tedizolid	-	-			-	-		

Haemophilus influenzae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

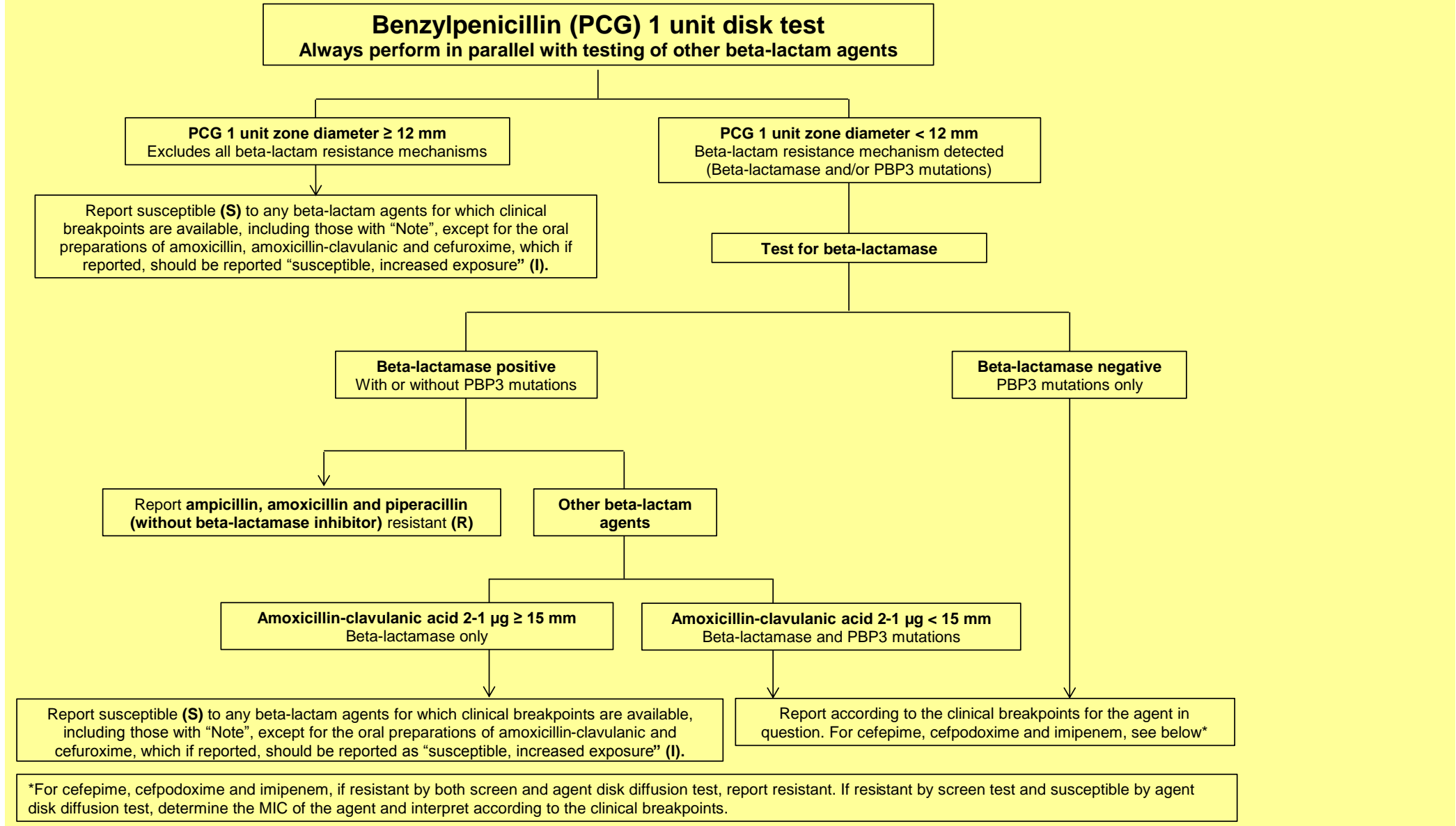
Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	2	2		30	28	28		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Colistin	-	-			-	-		
Daptomycin	-	-			-	-		
Fosfomycin iv	IE	IE			IE	IE		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
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 ¹	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

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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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylopenicillin	-	-			-	-		1. Most <i>M. catarrhalis</i> produce beta-lactamase, although beta-lactamase production is slow and may give weak results with <i>in vitro</i> 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.
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 (uncomplicated UTI only)	-	-			-	-		

Moraxella catarrhalis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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		
Cefixime	0.5	1		5	21	18		
Cefotaxime	1	2		5	20	17		
Cefoxitin	NA	NA			NA	NA		
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	
Ertapenem ¹	0.5	0.5		10	29	29		
Imipenem ¹	2	2		10	29	29		
Imipenem-relebactam	IE	IE			IE	IE		
Meropenem ¹	2	2		10	33	33		
Meropenem-vaborbactam	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.

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		

Moraxella catarrhalis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.125	0.125		5	31 ^A	31 ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin	IE	IE			IE	IE		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Dalbavancin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Azithromycin	0.25 ¹	0.5 ¹			Note ^A	Note ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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	-	-			-	-		

Moraxella catarrhalis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	2 ¹	2 ¹		30	30 ^A	30 ^A		1/A. Breakpoints relate to topical use only. 2. Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration.
Colistin	-	-			-	-		
Daptomycin	-	-			-	-		
Fosfomycin iv	IE	IE			IE	IE		
Fosfomycin oral	-	-			-	-		
Fusidic acid	-	-			-	-		
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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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
	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		
Phenoxyethylpenicillin	-	-		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (uncomplicated UTI only)	-	-		

Neisseria gonorrhoeae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
Cefixime	0.125	0.125		
Cefotaxime	0.125	0.125		
Cefoxitin	-	-		
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	
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		

Neisseria gonorrhoeae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-		

Neisseria gonorrhoeae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Tetracyclines	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doxycycline	IE	IE		
Eravacycline	IE	IE		
Minocycline	IE	IE		
Tetracycline	0.5	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	-	-		
Colistin	-	-		
Daptomycin	-	-		
Fosfomycin iv	-	-		
Fosfomycin oral	-	-		
Fusidic acid	-	-		
Metronidazole	-	-		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin	-	-		
Spectinomycin	64	64		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Neisseria meningitidis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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 Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Benzylpenicillin	0.06	0.25		1. All breakpoints pertain to iv administration.
Ampicillin	0.125	1		
Ampicillin-sulbactam	IE	IE		
Amoxicillin	0.125	1		
Amoxicillin-clavulanic acid	-	-		
Piperacillin	-	-		
Piperacillin-tazobactam	-	-		
Ticarcillin	-	-		
Ticarcillin-clavulanic acid	-	-		
Temocillin	-	-		
Phenoxymethylpenicillin	-	-		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (uncomplicated UTI only)	-	-		

Neisseria meningitidis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-		
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	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Ertapenem	-	-		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.
Imipenem	-	-		
Imipenem-relebactam	-	-		
Meropenem (meningitis) ¹	0.25	0.25		
Meropenem-vaborbactam	IE	IE		

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

Neisseria meningitidis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-		

Neisseria meningitidis

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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 <i>N. meningitidis</i> 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. See table of dosages. 2. For prophylaxis of meningitis only (refer to national guidelines).
Colistin	-	-		
Daptomycin	-	-		
Fosfomycin iv	-	-		
Fosfomycin oral	-	-		
Fusidic acid	-	-		
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. 10.0, valid from 2020-01-01

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 CO₂ 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 CO₂ 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	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	
Benzylpenicillin¹	0.25	0.5		1. Susceptibility to ampicillin, amoxicillin, piperacillin and ticarcillin can be inferred from susceptibility to benzylpenicillin. 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.
Ampicillin¹	4	8		
Ampicillin-sulbactam	4 ²	8 ²		
Amoxicillin¹	4	8		
Amoxicillin-clavulanic acid	4 ³	8 ³		
Piperacillin¹	8	16		
Piperacillin-tazobactam	8 ⁴	16 ⁴		
Ticarcillin¹	8	16		
Ticarcillin-clavulanic acid	8 ³	16 ³		
Temocillin	-	-		
Phenoxymethylpenicillin	IE	IE		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam oral (uncomplicated UTI only)	-	-		

Gram-positive anaerobes

except *Clostridioides difficile*

[Expert Rules and Intrinsic Resistance Tables](#)

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
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	
Ertapenem	0.5	0.5		
Imipenem	2	4		
Imipenem-relebactam	2 ¹	2 ¹		1. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Meropenem	2	8		
Meropenem-vaborbactam	IE	IE		

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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

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	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](#)

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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](#)

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-		
Metronidazole	4	4		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin	-	-		
Spectinomycin	-	-		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Clostridioides difficile

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Disk diffusion criteria for antimicrobial susceptibility testing of *Clostridioides 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 <i>C. difficile</i> 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 <i>C. difficile</i> 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	1E ⁴	1E ⁴		
Metronidazole	2 ⁵	2 ⁵		
Rifampicin	_6	_6		

Gram-negative anaerobes
Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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-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 CO₂ enriched atmosphere. For all these species, susceptibility testing should be performed in anaerobic environment.

Penicillins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Benzylpenicillin ¹	0.25	0.5		1. Susceptibility to ampicillin, amoxicillin, piperacillin and ticarcillin can be inferred from susceptibility to benzylpenicillin. 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.
Ampicillin ¹	0.5	2		
Ampicillin-sulbactam	4 ²	8 ²		
Amoxicillin ¹	0.5	2		
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 (uncomplicated UTI only)	-	-		

Gram-negative anaerobes
Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
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	
Ertapenem	0.5	0.5		1. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L.
Imipenem	2	4		
Imipenem-relebactam	2 ¹	2 ¹		
Meropenem	2	8		
Meropenem-vaborbactam	IE	IE		

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

Gram-negative anaerobes
Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

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	IE	IE		
Roxithromycin	-	-		
Telithromycin	-	-		
Clindamycin	4	4		
Quinupristin-dalfopristin	-	-		

Gram-negative anaerobes

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-	-		
Metronidazole	4	4		
Nitrofurantoin (uncomplicated UTI only)	-	-		
Nitroxoline (uncomplicated UTI only)	-	-		
Rifampicin	-	-		
Spectinomycin	-	-		
Trimethoprim (uncomplicated UTI only)	-	-		
Trimethoprim-sulfamethoxazole	-	-		

Helicobacter pylori

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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 Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Amoxicillin oral	0.125	0.125		1. The breakpoints are based on epidemiological cut-off values (ECOFFs), which distinguish wild-type isolates from those with reduced susceptibility.

Fluoroquinolones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Levofloxacin	1	1		1. The breakpoints are based on epidemiological cut-off values (ECOFFs), which distinguish wild-type isolates from those with reduced susceptibility.

Macrolides	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Clarithromycin	0.25	0.5		1. The breakpoints are based on epidemiological cut-off values (ECOFFs), which distinguish wild-type isolates from those with reduced susceptibility.

Tetracyclines	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Tetracycline	1	1		1. The breakpoints are based on epidemiological cut-off values (ECOFFs), which distinguish wild-type isolates from those with reduced susceptibility.

Miscellaneous agents	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Metronidazole	8	8		1. The breakpoints are based on epidemiological cut-off values (ECOFFs), which distinguish wild-type isolates from those with reduced susceptibility.
Rifampicin	1	1		

Listeria monocytogenes

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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	
Benzylpenicillin	1	1		1 unit	13	13		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Meropenem	0.25	0.25		10	26	26		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin	0.5	0.5		1 unit	17	17		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L. A. Infer susceptibility from benzylpenicillin susceptibility.
Ampicillin	1	1			Note ^A	Note ^A		
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 (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefotaxime	0.03	0.03		5	26	26		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

Pasteurella multocida

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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: 5x10⁵ CFU/mL
Incubation: Microaerobic environment, 41±1°C, 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±1°C, 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 (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.5	0.5		5	26	26		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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*.

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: 5x10⁵ CFU/mL

Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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	
Benzylpenicillin	0.125	0.125		1 unit	29	29		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

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

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

Corynebacterium spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Macrolides and lincosamides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Erythromycin	IP	IP		15	IP	IP		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Inducible clindamycin resistance may occur in <i>Corynebacteria</i> . 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	
Tetracycline	2	2		30	24	24		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

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

Aerococcus sanguinicola and urinae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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	
Benzylpenicillin	0.125	0.125		1 unit	21	21		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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	
Meropenem	0.25	0.25		10	31	31		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

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

Aerococcus sanguinicola* and *urinae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

Kingella kingae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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% CO₂, 35±1°C, 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	
	0.03	0.03		1 unit	25	25		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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 <i>K. kingae</i> . 2. Susceptibility can be inferred from benzylpenicillin susceptibility. 3/B. The intrinsic activity of clavulanic acid in <i>K. kingae</i> 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.
Benzylpenicillin	0.03	0.03			Note ^A	Note ^A		
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		

Kingella kingae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Macrolides and lincosamides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	0.25 ¹	0.25 ¹			Note ^A	Note ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	0.5 ¹	0.5 ¹			Note ^A	Note ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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
	S ≤	R >	ATU		S ≥	R <	ATU	
Rifampicin	0.5	0.5		5	20	20		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

MIC determination (broth microdilution according to ISO standard 20776-1)

Medium: Mueller-Hinton broth

Inoculum: 5x10⁵ CFU/mL

Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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	
Cefepime	1	4		30	27	24		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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	
Aztreonam	1	4		30	29	26		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

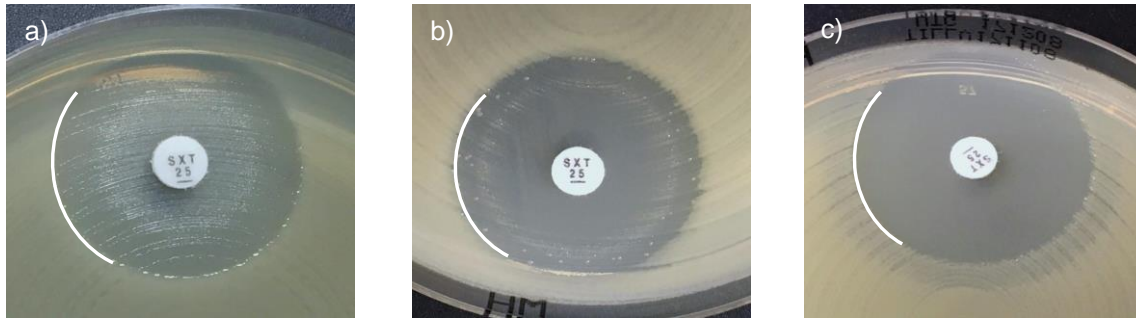
Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.25	0.5		5	27	24		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Levofloxacin	0.5	1		5	27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

Aeromonas spp.

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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.

Burkholderia pseudomallei

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: 5x10⁵ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 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±1°C, 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 (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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 (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ceftazidime	0.001	8		10	50	18		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.

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

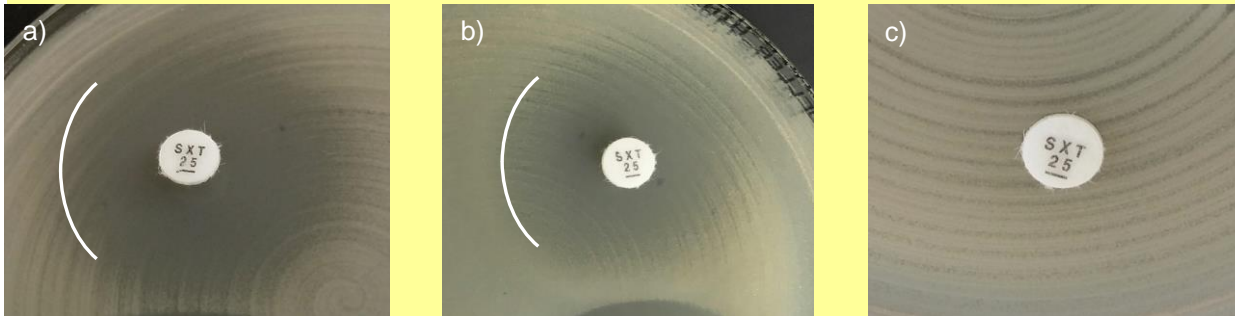
Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	0.001	2			Note ^A	Note ^A		A. Susceptibility inferred from tetracycline disk diffusion screen test.
Tetracycline (screen only)	NA	NA		30	50 ^A	23 ^A		

Burkholderia pseudomallei

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	
Chloramphenicol	0.001	8		30	50	22		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.
Trimethoprim-sulfamethoxazole ¹	0.001	4		1.25-23.75	50 ^A	17 ^A		

**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**

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

[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 22 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. pseudomultivorans*, *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 Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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: 1x10⁵ 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. *canetti*~~, *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	
Delamanid	0.06	0.06		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).
Bedaquiline	0.25 ¹	0.25 ¹		

Topical agents

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	-
<i>Enterobacterales</i>	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	-	-	-
<i>P. aeruginosa</i>	MIC (mg/L)	8	2	-	-	-	0.5	2	2	ND	4	-	ND	-	-	-
	Zone diameter (mm)	15	16	-	-	-	25	20	ND	ND	-	-	ND	-	-	-
<i>Acinetobacter</i> spp.	MIC (mg/L)	4	4	-	-	-	1	0.5	1	ND	2	-	ND	-	-	-
	Zone diameter (mm)	17	17	-	-	-	21	23	ND	ND	-	-	ND	-	-	-
<i>S. aureus</i>	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
<i>S. pneumoniae</i>	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
<i>H. influenzae</i>	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	-	-	-
<i>M. catarrhalis</i>	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	30	-	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. 10.0, valid from 2020-01-01

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. 2. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L. 3. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Ampicillin	2	8	
Ampicillin-sulbactam	2 ¹	8 ¹	
Amoxicillin	2	8	
Amoxicillin-clavulanic acid	2 ²	8 ²	
Piperacillin	4	16	
Piperacillin-tazobactam	4 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 (uncomplicated UTI only)	IE	IE	

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

Cephalosporins	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Cefaclor	IE	IE	1. Based on PK-PD target for Gram-negative organisms. 2. For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L. 3. Breakpoints are based on ceftolozane data. 4. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Cefadroxil	IE	IE	
Cefalexin	IE	IE	
Cefazolin	1	2	
Cefepime	4	8	
Cefixime	IE	IE	
Cefotaxime	1	2	
Cefoxitin	IE	IE	
Cefpodoxime	IE	IE	
Ceftaroline	0.5 ¹	0.5 ¹	
Ceftazidime	4	8	
Ceftazidime-avibactam	8 ²	8 ²	
Ceftibuten	IE	IE	
Ceftobiprole	4	4	
Ceftolozane-tazobactam	4 ^{3,4}	4 ^{3,4}	
Ceftriaxone	1	2	
Cefuroxime iv	4	8	
Cefuroxime oral	IE	IE	

Carbapenems	MIC breakpoints (mg/L)		Notes
	S ≤	R >	
Ertapenem	0.5	0.5	1. For susceptibility testing purposes, the concentration of relebactam is fixed at 4 mg/L. 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	

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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%. 2. PK-PD breakpoints are based on <i>S. aureus</i> . For <i>S. pyogenes</i> there is uncertainty regarding the PK-PD target.
Oritavancin	0.125 ^{1,2}	0.125 ^{1,2}	
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	

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 10.0, valid from 2020-01-01

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	IE	IE	
Fusidic acid	IE	IE	
Metronidazole	IE	IE	
Nitrofurantoin	IE	IE	
Nitroxoline	IE	IE	
Rifampicin	IE	IE	
Spectinomycin	IE	IE	
Trimethoprim	IE	IE	
Trimethoprim-sulfamethoxazole	IE	IE	