

European Committee on Antimicrobial Susceptibility Testing

Breakpoint tables for interpretation of MICs and zone diameters

Version 9.0, valid from 2019-01-01

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Breakpoint tables for interpretation of MICs and zone diameters

Version 9.0, valid from 2019-01-01

Notes

1. The EUCAST clinical breakpoint tables contain clinical MIC breakpoints (determined or revised during 2002-2018) and their inhibition zone diameter correlates. The EUCAST breakpoint table version 9.0 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. ~~A zone diameter breakpoint of "S ≥ 50 mm" is an arbitrary "off scale" zone diameter breakpoint corresponding to MIC breakpoint situations where wild type isolates are categorised as intermediate (i.e. no fully susceptible isolates exist).~~
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 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.
8. 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.
9. For *E. coli* with fosfomycin, *Stenotrophomonas maltophilia* with trimethoprim-sulfamethoxazole, *Staphylococcus aureus* with benzylpenicillin, enterococci with vancomycin and *Aeromonas* spp. 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.

Notes

~~9. For cefuroxime and fosfomicin there are breakpoints for intravenous and oral administration.~~

10. 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.

11. 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.

"-" 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. 9.0, valid from 2019-01-01

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

High exposure for agent
See table of dosages, last tab in breakpoint table.

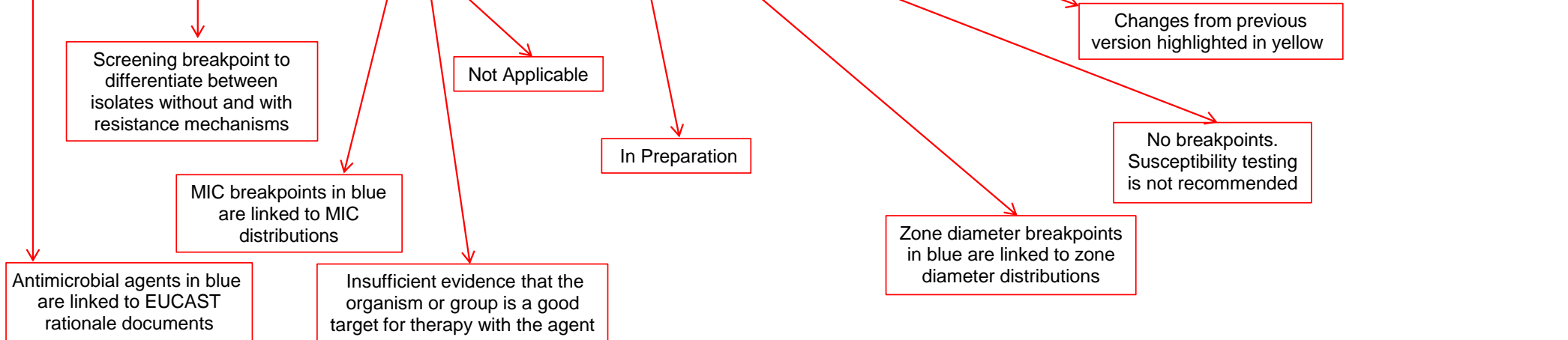
Breakpoints with a species name apply only to that particular species (in this example *S. aureus*)

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 G: 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 ^{HE}	2 ²	4		Y	26	23		
Antimicrobial agent C	IE	IE			IE	IE		
Antimicrobial agent D, <i>S. aureus</i>	-	-			-	-		
Antimicrobial agent E	IP	IP			IP	IP		
Antimicrobial agent F (screen)	NA	NA		Y	25	25		
Antimicrobial agent G	0.5	2		Z	30	24		



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How to handle technical uncertainty in antimicrobial susceptibility testing

All measurements are affected by random variation and some by systematic variation. Systematic variation should be avoided and random variation 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 the test. 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 correct. Even when using the reference method, MICs vary between days and technicians. Under the best of circumstances, an MIC of 1.0 should be considered as a value between 0.5 and 2.0 mg/L. Not infrequently, there are problems with commercial testing systems including broth microdilution tests, gradient tests and semi-automated AST devices.

Although AST is straightforward for most agents and species, there are problematic areas. It is important to warn laboratories about these and the uncertainty of susceptibility categorisation. Analysis of EUCAST data that have been generated over the years has identified such situations, called **Areas 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 to be conveyed to clinical colleagues except under special circumstances and only as part of a discussion about therapeutic alternatives in difficult cases.

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 influence the action taken.

- **Repeat the test**

This is only relevant if there is reason to suspect a technical error in the primary AST.

- **Use an alternative test (perform an MIC or a genotypic test)**

This may be relevant if the susceptibility report leaves only few therapeutic alternatives or if the result is deemed of importance. If the organism is multi-resistant, it is advisable to perform an MIC determination (see above concerning accuracy and precision of MIC determination) for several antibiotics, possibly extending the AST to antibiotics such as new beta-lactam inhibitor combinations and colistin for Gram-negative bacteria. Sometimes it may be necessary to perform genotypic or phenotypic characterization of the resistance mechanism to obtain more information.

- **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.

- **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:

- * For serious situations, take the opportunity to contact the clinical colleagues to explain and discuss the results.

- * Categorise the result according to the breakpoints but include information about the technical difficulties and/or the uncertainty of the interpretation. In many instances, a straight "R" is less ambiguous than other alternatives, especially when there are alternative agents.

The Area of Technical Uncertainty will typically be listed as a defined MIC value or in disk diffusion as a range of 2-4 mm. ATUs will only be 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.](#)

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Version 9.0, 2019-01-01	<p>Changes (cells containing a change, a deletion or an addition) from v. 8.1 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.</p>
General	<ul style="list-style-type: none"> • Link to EUCAST Expert Rules and Intrinsic Resistance Tables added to each table. • Columns for Area of Technical Uncertainty (ATU) added (MIC and zone diameters). • Comments relating to high-dose therapy have been exchanged with HE (High Exposure) superscript on the antimicrobial name. • Meropenem-vaborbactam breakpoints added. • Eravacycline breakpoints added. • Doripenem breakpoints removed. In countries that still have access to doripenem, use the breakpoints and dosages in EUCAST Breakpoint Tables v 8.1 (2018). • Links to rationale documents for nitroxoline and trimethoprim-sulfamethoxazole added.
Notes	<ul style="list-style-type: none"> • Definitions of susceptibility categories added (Note 6). • Information on Area of Technical Uncertainty (ATU) added (Note 7). • Note 9 updated to include all specific reading examples. • Information on MIC reference testing added (Note 10). • Explanation of HE (High Exposure of agent) added to Abbreviation list.
Taxonomy	<ul style="list-style-type: none"> • Enterobacteriaceae changed to Enterobacterales. • <i>Enterobacter aerogenes</i> changed to <i>Klebsiella aerogenes</i>. • <i>Clostridium difficile</i> changed to <i>Clostridioides difficile</i>. • <i>Propionibacterium acnes</i> changed to <i>Cutibacterium acnes</i>.
Technical uncertainty	<ul style="list-style-type: none"> • New sheet describing EUCAST recommendations for how to handle technical uncertainty in antimicrobial susceptibility testing.
Enterobacterales	<p>General</p> <ul style="list-style-type: none"> • Species previously listed as "<i>E. coli</i>, <i>Klebsiella</i> spp. and <i>P. mirabilis</i>" are now listed as "<i>E. coli</i>, <i>Klebsiella</i> spp. (except <i>K. aerogenes</i>), <i>Raoultella</i> spp. and <i>P. mirabilis</i>" due to changes in taxonomy. • <i>Morganella</i> spp. changed to <i>Morganella morganii</i>. • Species limitation added to cefuroxime oral. <p>New breakpoints</p> <ul style="list-style-type: none"> • Meropenem-vaborbactam (MIC) • Eravacycline (MIC) <p>Revised breakpoints</p> <ul style="list-style-type: none"> • Ertapenem (MIC and zone diameter) • Imipenem (MIC and zone diameter). Separate breakpoints for <i>Morganella morganii</i>, <i>Proteus</i> spp. and <i>Providencia</i> spp. • Ciprofloxacin (zone diameter) • Tigecycline (MIC and zone diameter). Species limitation added (breakpoints valid for <i>E. coli</i> and <i>C. koseri</i>). <p>ATUs added</p> <ul style="list-style-type: none"> • Amoxicillin-clavulanic acid, piperacillin-tazobactam, ceftaroline and ciprofloxacin. <p>New comments</p> <ul style="list-style-type: none"> • Carbapenems comment 3 • Tetracyclines comment 1 <p>Revised comments</p> <ul style="list-style-type: none"> • Carbapenems comment 2 • Aminoglycosides comment 1 • Tetracyclines comment 3/A • Tetracyclines comment B

Version 9.0, 2019-01-01	Changes (cells containing a change, a deletion or an addition) from v. 8.1 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.
<i>Pseudomonas</i> spp.	General <ul style="list-style-type: none"> Information added on species included in the table New breakpoints <ul style="list-style-type: none"> Meropenem-vaborbactam (MIC) Revised breakpoints <ul style="list-style-type: none"> Imipenem (MIC and zone diameter) Aztreonam (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 ATUs added <ul style="list-style-type: none"> Piperacillin-tazobactam, ceftazidime-avibactam and colistin.
<i>Acinetobacter</i> spp.	General <ul style="list-style-type: none"> Information added on species included in the table Revised breakpoints <ul style="list-style-type: none"> Imipenem (MIC and zone diameter) Ciprofloxacin (MIC and zone diameter) Revised comments <ul style="list-style-type: none"> Aminoglycosides comment 1
<i>Staphylococcus</i> spp.	General <ul style="list-style-type: none"> Information added on species included in the table "High Exposure" (HE) added to cefotaxime and ceftriaxone New breakpoints <ul style="list-style-type: none"> Eravacycline (MIC) ATUs added <ul style="list-style-type: none"> "Cefoxitin screen <i>S. epidermidis</i>", ceftaroline, ceftobiprole and "amikacin <i>S. aureus</i>". Removed comments <ul style="list-style-type: none"> Aminoglycosides comment 1
<i>Enterococcus</i> spp.	General <ul style="list-style-type: none"> Information added on species included in the table New breakpoints <ul style="list-style-type: none"> Eravacycline (MIC) Revised breakpoints <ul style="list-style-type: none"> Tigecycline (MIC and zone diameter) Trimethoprim (MIC and zone diameter). Breakpoints replaced with Note. Trimethoprim-sulfamethoxazole (MIC and zone diameter). Breakpoints replaced with Note. Revised comments <ul style="list-style-type: none"> Miscellaneous agents comment 2/A
Streptococcus groups A, B, C and G	General <ul style="list-style-type: none"> "High Exposure" (HE) added to levofloxacin Revised breakpoints <ul style="list-style-type: none"> Tigecycline (MIC and zone diameter) New comments <ul style="list-style-type: none"> Carbapenems comment 2 Glycopeptides and lipoglycopeptides comment B

Version 9.0, 2019-01-01	Changes (cells containing a change, a deletion or an addition) from v. 8.1 are marked yellow. Changed comments are underlined>. Removed comments are shown in strikethrough font style.
<i>Streptococcus pneumoniae</i>	<ul style="list-style-type: none"> • Flow chart updated New breakpoints • Ampicillin (zone diameter) • Amoxicillin oral (MIC) • Amoxicillin-clavulanic acid oral (MIC) Revised breakpoints • Meropenem meningitis (MIC) • Norfloxacin screen (zone diameter) • Trimethoprim-sulfamethoxazole (zone diameter) New comments • Penicillins comment 5 • Penicillins comment C Revised comments • Penicillins comment 1/A • Penicillins comment 4/B • Penicillins comment D • Cephalosporins comment 1/A • Carbapenems comment 1/A • Glycopeptides and lipoglycopeptides comment A
Viridans group streptococci	<ul style="list-style-type: none"> New comments • Glycopeptides and lipoglycopeptides comment B New breakpoints • Eravacycline (MIC)
<i>Haemophilus influenzae</i>	<ul style="list-style-type: none"> • Flow chart updated New breakpoints • Amoxicillin oral (MIC) • Amoxicillin-clavulanic acid oral (MIC and zone diameter) • Piperacillin (changed from Note to IE) • Piperacillin-tazobactam (MIC and zone diameter) Revised breakpoints • Cefpodoxime (MIC and zone diameter) • Ceftriaxone (zone diameter) • Cefuroxime iv (zone diameter) • Cefuroxime oral (zone diameter) • Ertapenem (zone diameter) • Meropenem meningitis (MIC) ATUs added • Ampicillin, amoxicillin-clavulanic acid (iv and oral), piperacillin-tazobactam, cefepime, cefotaxime, cefpodoxime, ceftriaxone, cefuroxime (iv and oral) and imipenem. New comments • Penicillins comment 6 • Penicillins comment B • Cephalosporins comment B • Cephalosporins comment C • Carbapenems comment B Revised comments • Penicillins comment 1/A • Cephalosporins comment 1/A • Carbapenems comment 1/A

Version 9.0, 2019-01-01	Changes (cells containing a change, a deletion or an addition) from v. 8.1 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.
<i>Neisseria gonorrhoeae</i>	Revised breakpoints • Azithromycin (replaced with Note)
<i>Neisseria meningitidis</i>	Revised breakpoints • Chloramphenicol
Gram-positive anaerobes	General • <i>Staphylococcus saccharolyticus</i> added to species list. Revised breakpoints • Ertapenem • Imipenem
<i>Clostridioides difficile</i>	Revised comments • Glycopeptides comment 1 • Miscellaneous agents comment 5
Gram-negative anaerobes	General • <i>Parabacteroides</i> added to species list. Revised breakpoints • Ertapenem • Imipenem
<i>Corynebacterium</i> spp.	General • Information on <i>C. diphtheriae</i> added. New breakpoints • Erythromycin (in preparation) New comments • Glycopeptides comment A
<i>Aerococcus sanguinicola</i> and <i>urinae</i>	New comments • Glycopeptides comment A
<i>Mycobacterium tuberculosis</i>	General • Information added on species included in the table • Information added on development of reference methodology
Topical agents	Revised breakpoints • <i>Acinetobacter</i> spp. and ciprofloxacin • <i>Moraxella</i> spp. and ciprofloxacin, levofloxacin and ofloxacin (from breakpoint changes in EUCAST breakpoint tables v. 8.1)
PK-PD breakpoints	New breakpoints • Meropenem-vaborbactam Revised breakpoints • Ertapenem • Imipenem • Tigecycline New comments • Carbapenems comment 1

Version 9.0, 2019-01-01	Changes (cells containing a change, a deletion or an addition) from v. 8.1 are marked yellow. Changed comments are underlined. Removed comments are shown in strikethrough font style.
Dosages	<ul style="list-style-type: none"> • General information updated New agents • Amoxicillin oral • Amoxicillin-clavulanic acid oral • Meropenem-vaborbactam • Eravacycline Revised dosages • Ampicillin • Ampicillin-sulbactam • Amoxicillin iv • Amoxicillin-clavulanic acid iv • Ticarcillin-clavulanic acid • Oxacillin • Flucloxacillin • Cefazolin • Cefepime • Ceftazidime • Ceftriaxone • Meropenem • Teicoplanin • Clindamycin • Colistin • Daptomycin • Nitrofurantoin New comments (special situations) • Amoxicillin oral • Amoxicillin-clavulanic acid oral Revised comments (special situations) • Benzylpenicillin • Cefotaxime • Ceftriaxone • Imipenem • Meropenem • Ciprofloxacin • Levofloxacin • Ofloxacin • Vancomycin • Cloramphenicol • Nitrofurantoin • Spectinomycin

Enterobacterales*

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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>2. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.</p> <p>3. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.</p> <p>4. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.</p> <p>5. Breakpoints still under consideration.</p> <p>6. Agar dilution is the reference method for mecillinam MIC determination.</p> <p>B. Ignore growth that may appear as a thin inner zone on some batches of Mueller-Hinton agars.</p> <p>C. Susceptibility inferred from ampicillin.</p> <p>D. Ignore isolated colonies within the inhibition zone for <i>E. coli</i>.</p>
Ampicillin	8 ¹	8		10	14 ^{A,B}	14 ^B		
Ampicillin-sulbactam	8 ^{1,2}	8 ²		10-10	14 ^{A,B}	14 ^B		
Amoxicillin	8 ¹	8		-	Note ^C	Note ^C		
Amoxicillin-clavulanic acid	8 ^{1,3}	8 ³		20-10	19 ^{A,B}	19 ^B	19-20	
Amoxicillin-clavulanic acid (uncomplicated UTI only)	32 ^{1,3}	32 ³		20-10	16 ^{A,B}	16 ^B		
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 ⁵	Note ⁵		
Phenoxymethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam (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 ⁶	8 ⁶		10	15 ^D	15 ^D		

Enterobacterales*

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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. The cephalosporin breakpoints for Enterobacterales will detect all clinically important resistance mechanisms (including ESBL and plasmid mediated AmpC). Some isolates that produce beta-lactamases are susceptible to 3rd or 4th generation cephalosporins with these breakpoints and should be reported as tested, i.e. the presence or absence of an ESBL does not in itself influence the categorisation of susceptibility. ESBL detection and characterisation are recommended for public health and infection control purposes.</p> <p>2. The ceftiofloxacin ECOFF (8 mg/L) has a high sensitivity but poor specificity for identification of AmpC-producing Enterobacterales as this agent is also affected by permeability alterations and some carbapenemases. Classical non-AmpC producers are wild type, whereas plasmid AmpC producers or chromosomal AmpC hyperproducers are non-wild type.</p> <p>3. For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L.</p> <p>4. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.</p> <p>5. Breakpoints are based on high dose therapy, see table of dosages.</p>
Cefadroxil (uncomplicated UTI only)	16	16		30	12	12		
Cefalexin (uncomplicated UTI only)	16	16		30	14	14		
Cefazolin	-	-			-	-		
Cefepime	1	4		30	27	24		
Cefixime (uncomplicated UTI only)	1	1		5	17	17		
Cefotaxime	1	2		5	20	17		
Cefoxitin (screen) 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 (UTI only)	1	1		30	23	23		
Ceftobiprole	0.25	0.25		5	23	23		
Ceftolozane-tazobactam	1 ⁴	1 ⁴		30-10	23	23		
Ceftriaxone	1	2		30	25	22		
Cefuroxime iv ^{HE} , <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		
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	
Doripenem								<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>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.</p> <p>3. For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.</p>
Ertapenem	0.5	0.5		10	25	25		
Imipenem	2	4		10	22	17		
Imipenem, <i>Morganella morganii</i> , <i>Proteus</i> spp. and <i>Providencia</i> spp. ²	0.125	4		10	50	17		
Meropenem	2	8		10	22	16		
Meropenem-vaborbactam	8 ³	8 ³		IP	IP	IP		

Enterobacterales*

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. The aztreonam breakpoints for Enterobacterales will detect clinically important resistance mechanisms (including ESBL). Some isolates that produce beta-lactamases are susceptible to aztreonam with these breakpoints and should be reported as tested, i.e. the presence or absence of an ESBL does not in itself influence the categorisation of susceptibility. ESBL detection and characterisation are recommended for public health and infection control purposes.

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.25	0.5	0.5	5	25	22	22-24	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 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. 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. B. Susceptibility of <i>Salmonella</i> spp. to ciprofloxacin can be inferred from pefloxacin disk diffusion susceptibility.
Ciprofloxacin, <i>Salmonella</i> spp. ¹	0.06	0.06			Note ^A	Note ^A		
Pefloxacin (screen), <i>Salmonella</i> spp. ¹	NA	NA		5	24 ^B	24 ^B		
Levofloxacin	0.5	1		5	23	19		
Moxifloxacin	0.25	0.25		5	22	22		
Nalidixic acid (screen)	NA	NA			NA	NA		
Norfloxacin (uncomplicated UTI only)	0.5	1		10	22	19		
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 ^{HE}	8	16		30	18	15		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Aminoglycoside breakpoints are based on once-daily administration of high dose therapy aminoglycoside dosages, see table of dosages. Most often aminoglycosides are given in combination with beta-lactam agents. 2. Breakpoints do not apply to <i>Plesiomonas shigelloides</i> since aminoglycosides have low intrinsic activity against this species.
Gentamicin ^{HE}	2	4		10	17	14		
Netilmicin ^{HE}	2	4		10	15	12		
Tobramycin ^{HE}	2	4		10	17	14		

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	-	-			-	-		

Enterobacterales*

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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 ¹	-	-			-	-		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	-	-			-	-		1. Tetracycline has been 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. Tigecycline has poor activity against <i>Morganella morganii</i> , <i>Proteus</i> spp. and <i>Providencia</i> spp. 2. For tigecycline broth microdilution MIC determination, the medium must be prepared fresh on the day of use. 3/A. For other Enterobacterales, the activity of tigecycline varies from insufficient in <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		IP	IP	IP		
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

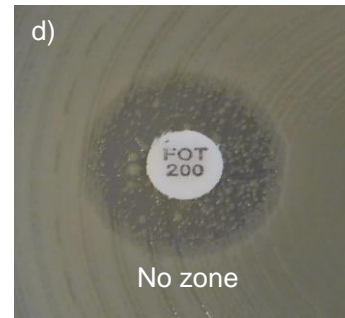
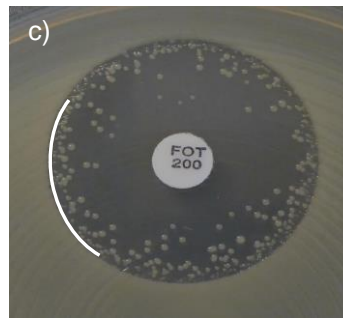
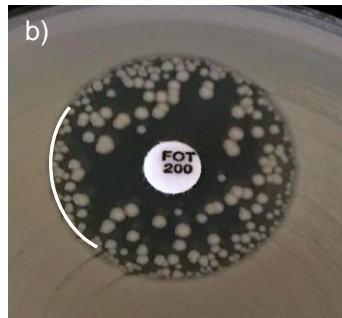
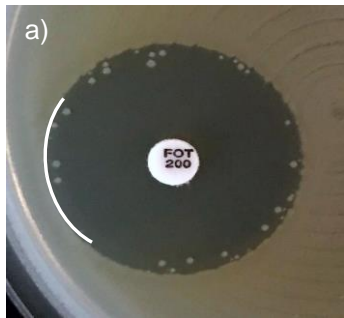
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Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	8	8		30	17	17		
Colistin ¹	2	2			Note ^A	Note ^A		
Daptomycin	-	-			-	-		
Fosfomycin iv	32 ²	32 ²		200 ^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)	2	4		5	18	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

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

Medium: Mueller-Hinton broth

Inoculum: 5×10^5 CFU/mL

Incubation: Sealed panels, air, $35 \pm 1^\circ\text{C}$, $18 \pm 2\text{h}$

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, $35 \pm 1^\circ\text{C}$, $18 \pm 2\text{h}$

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	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Breakpoints are based on high-dose therapy; see table of dosages. 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^{HE}	16	16		30	18	18		
Piperacillin-tazobactam^{HE}	16 ¹	16 ¹		30-6	18	18	18-19	
Ticarcillin^{HE}	16	16		75	18	18		
Ticarcillin-clavulanic acid^{HE}	16 ²	16 ²		75-10	18	18		
Temocillin	-	-			-	-		
Phenoxyethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam (uncomplicated UTI only)	-	-			-	-		

***Pseudomonas* spp.**

Expert Rules and Intrinsic Resistance Tables

Cephalosporins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Breakpoints are based on high dose therapy, see table of dosages. 1. For susceptibility testing purposes, the concentration of avibactam is fixed at 4 mg/L. 2. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime ^{HE}	8	8		30	21	21		
Cefixime	-	-			-	-		
Cefotaxime	-	-			-	-		
Cefoxitin	NA	NA			NA	NA		
Cefpodoxime	-	-			-	-		
Ceftaroline	-	-			-	-		
Ceftazidime ^{HE}	8	8		10	17	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, <i>P. aeruginosa</i>	4 ²	4 ²		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	
Doripenem								Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Breakpoints are based on high dose therapy, see table of dosages. 1. For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.
Ertapenem	-	-			-	-		
Imipenem ^{HE}	4	4		10	20	20		
Meropenem	2	8		10	24	18		
Meropenem-vaborbactam, <i>P. aeruginosa</i>	8 ¹	8 ¹		IP	IP	IP		

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

***Pseudomonas* spp.**

Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin ^{HE}	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. 1. Breakpoints are based on high dose therapy, see table of dosages.
Levofloxacin ^{HE}	1	1		5	22	22		
Moxifloxacin	-	-			-	-		
Nalidixic acid (screen)	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 ^{HE}	8	16		30	18	15		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Aminoglycoside breakpoints are based on once-daily administration of high dose therapy aminoglycoside dosages, see table of dosages. Most often aminoglycosides are given in combination with beta-lactam agents.
Gentamicin ^{HE}	4	4		10	15	15		
Netilmicin ^{HE}	4	4		10	12	12		
Tobramycin ^{HE}	4	4		10	16	16		

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	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Clarithromycin	-	-			-	-		
Erythromycin	-	-			-	-		
Roxithromycin	-	-			-	-		
Telithromycin	-	-			-	-		
Clindamycin	-	-			-	-		
Quinupristin-dalfopristin	-	-			-	-		

***Pseudomonas* spp.**

Expert Rules and Intrinsic Resistance Tables

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	-	-			-	-		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline	-	-			-	-		

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	-	-			-	-		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. 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. A. Use an MIC method (broth microdilution only).
Colistin ¹	2	2	4		Note ^A	Note ^A		
Daptomycin	-	-			-	-		
Fosfomycin iv ²	-	-			-	-		
Fosfomycin oral ²	-	-			-	-		
Fusidic acid	-	-			-	-		
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

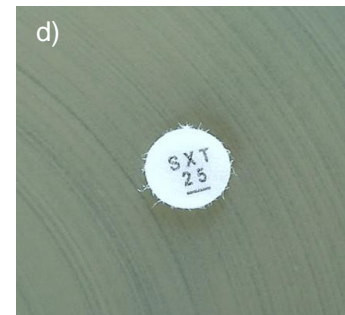
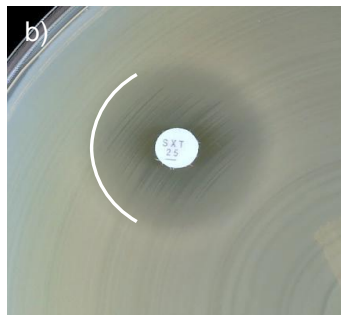
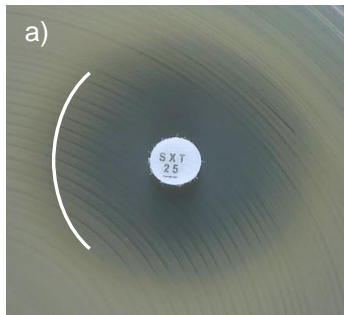
EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Mueller-Hinton broth
Inoculum: 5×10^5 CFU/mL
Incubation: Sealed panels, air, $35 \pm 1^\circ\text{C}$, 18 ± 2 h
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, $35 \pm 1^\circ\text{C}$, 18 ± 2 h
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 \leq	R $>$	ATU		S \geq	R $<$	ATU	
Trimethoprim-sulfamethoxazole ^{1,HE}	4	4		1.25-23.75	16 ^A	16 ^A		1. Trimethoprim:sulfamethoxazole in the ratio 1:19. Breakpoints are expressed as the trimethoprim concentration. 2. Breakpoints are based on high dose therapy; see table of dosages. A. Isolates showing any sign of inhibition zone ≥ 16 mm should be reported susceptible and growth within the inhibition zone should be ignored. The density of growth within the zone may vary from a fine haze to substantial growth (see pictures below).



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

a-c) An outer zone can be seen. Report susceptible if the zone diameter ≥ 16 mm.

d) Growth up to the disk **and** no sign of inhibition zone. Report resistant.

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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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 (uncomplicated UTI only)	-	-			-	-		

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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	
Doripenem ⁺								1. Breakpoints are based on high dose therapy, see table of dosages.
Ertapenem	-	-			-	-		
Imipenem	2	4		10	24	21		
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.

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Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.06	1		5	50	21		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Breakpoints are based on high dose therapy, see table of dosages.
Levofloxacin	0.5	1		5	23	20		
Moxifloxacin	-	-			-	-		
Nalidixic acid (screen)	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 ^{HE}	8	16		30	19	17		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Aminoglycoside breakpoints are based on once-daily administration of high dose therapy aminoglycoside dosages, see table of dosages. Most often aminoglycosides are given in combination with beta-lactam agents.
Gentamicin ^{HE}	4	4		10	17	17		
Netilmicin ^{HE}	4	4		10	16	16		
Tobramycin ^{HE}	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	-	-			-	-		

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

Acinetobacter spp.

Expert Rules and Intrinsic Resistance Tables

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	IE	IE			IE	IE		
Minocycline	IE	IE			IE	IE		
Tetracycline	-	-			-	-		
Tigecycline	IE	IE			IE	IE		

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

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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, which make them resistant to benzylpenicillin, phenoxymethylpenicillin, ampicillin, amoxicillin, piperacillin and ticarcillin. When staphylococci test as susceptible to benzylpenicillin and ceftaxime they can be reported as susceptible to the above agents. However, the efficacy of oral formulations, particularly phenoxymethylpenicillin, is uncertain. Isolates that test as resistant to benzylpenicillin but susceptible to ceftaxime are susceptible to β-lactamase inhibitor combinations, the isoxazolylicins (oxacillin, cloxacillin, dicloxacillin and flucloxacillin), nafcillin and many cephalosporins. With the exception of ceftaroline and ceftobiprole, ceftaxime-resistant isolates are resistant to all beta-lactam agents.</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>, 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 ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Amoxicillin-clavulanic acid	Note ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Piperacillin	Note ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Piperacillin-tazobactam	Note ^{1,3}	Note ^{1,3}			Note ^{A,D}	Note ^{A,D}		
Ticarcillin	Note ¹	Note ¹			Note ^A	Note ^A		
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	Note ^A		
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 (uncomplicated UTI only)	-	-			-	-		

Staphylococcus spp.

Expert Rules and Intrinsic Resistance Tables

Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor ^{HE}	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 ceftaxime susceptibility except for cefixime, ceftazidime, ceftazidime-avibactam, ceftibuten and ceftolozane-tazobactam, which do not have breakpoints and should not be used for staphylococcal infections. Some methicillin-resistant <i>S. aureus</i> are susceptible to ceftaroline and ceftobiprole, see Notes 4/D and 6/F.</p> <p>2. For dosing, see table of dosages.</p> <p>2. <i>S. aureus</i> and <i>S. lugdunensis</i> with ceftaxime MIC values >4 mg/L and <i>S. saprophyticus</i> with ceftaxime 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>3. For staphylococci other than <i>S. aureus</i>, <i>S. lugdunensis</i> and <i>S. saprophyticus</i>, the ceftaxime MIC is a poorer predictor of methicillin resistance than the disk diffusion test.</p> <p>4/D. Methicillin-susceptible isolates can be reported susceptible to ceftaroline without further testing.</p> <p>5/E. Resistant isolates are rare.</p> <p>6/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. Ceftaxime screen for methicillin resistance in <i>S. pseudintermedius</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 ^{HE}	Note ¹	Note ¹			Note ^A	Note ^A		
Cefoxitin (screen), <i>S. aureus</i> and coagulase-negative staphylococci other than <i>S. epidermidis</i>	Note ^{2,3}	Note ^{2,3}		30	22 ^{A,B}	22 ^{A,B}		
Cefoxitin (screen), <i>S. epidermidis</i>	Note ³	Note ³		30	25 ^{A,B}	25 ^{A,B}	25-27	
Cefoxitin (screen), <i>S. pseudintermedius</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 ⁴	2 ^{4,5}	1	5	20 ^D	17 ^{D,E}	19-20	
Ceftaroline, <i>S. aureus</i> (pneumonia)	1 ⁴	1 ⁴	1	5	20 ^D	20 ^D	19-20	
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	-	-			-	-		
Ceftobiprole, <i>S. aureus</i>	2 ⁶	2 ⁶	2	5	17 ^F	17 ^F	16-17	
Ceftolozane-tazobactam	-	-			-	-		
Ceftriaxone ^{HE}	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	
Doripenem								<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 ceftaxime susceptibility.</p>
Ertapenem	Note ¹	Note ¹			Note ^A	Note ^A		
Imipenem	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		

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.

Staphylococcus spp.

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Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin ^{HE} , <i>S. aureus</i>	1	1		5	21 ^A	21 ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1. For breakpoints for other fluoroquinolones (e.g. pefloxacin and enoxacin), refer to breakpoints set by national breakpoint committees.</p> <p>2. Breakpoints are based on high dose therapy, see table of dosages.</p> <p>A. The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. See Note B.</p> <p>B. Isolates categorised as susceptible to norfloxacin can be reported susceptible to ciprofloxacin, levofloxacin, moxifloxacin and ofloxacin. Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.</p>
Ciprofloxacin ^{HE} , Coagulase-negative staphylococci	1	1		5	24 ^A	24 ^A		
Levofloxacin, <i>S. aureus</i>	1	1		5	22 ^A	22 ^A		
Levofloxacin, Coagulase-negative staphylococci	1	1		5	24 ^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)	NA	NA			NA	NA		
Norfloxacin (screen)	NA	NA		10	17 ^B	Note ^B		
Ofloxacin ^{HE} , <i>S. aureus</i>	1	1		5	20 ^A	20 ^A		
Ofloxacin ^{HE} , Coagulase-negative staphylococci	1	1		5	24 ^A	24 ^A		

Aminoglycosides	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Amikacin ¹ , <i>S. aureus</i>	8	16	16	30	18	16	15-19	<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1. Aminoglycoside breakpoints are based on once-daily administration.</p> <p>1. 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.</p>
Amikacin ¹ , Coagulase-negative staphylococci	8	16		30	22	19		
Gentamicin, <i>S. aureus</i>	1	1		10	18	18		
Gentamicin, Coagulase-negative staphylococci	1	1		10	22	22		
Netilmicin, <i>S. aureus</i>	1	1		10	18	18		
Netilmicin, Coagulase-negative staphylococci	1	1		10	22	22		
Tobramycin, <i>S. aureus</i>	1	1		10	18	18		
Tobramycin, Coagulase-negative staphylococci	1	1		10	22	22		

Staphylococcus spp.

Expert Rules and Intrinsic Resistance Tables

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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, <i>S. aureus</i> ²	0.125 ^{3,4}	0.125 ³			Note ^A	Note ^A		
Teicoplanin, <i>S. aureus</i> ²	2	2			Note ^A	Note ^A		
Teicoplanin, Coagulase-negative staphylococci	4	4			Note ^A	Note ^A		
Telavancin, MRSA ²	0.125 ^{3,5}	0.125 ³			Note ^A	Note ^A		
Vancomycin, <i>S. aureus</i> ²	2	2			Note ^A	Note ^A		
Vancomycin, Coagulase-negative staphylococci ²	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		

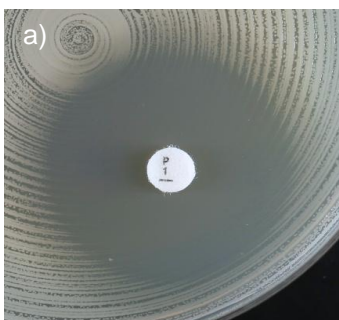
Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1 ¹	2 ¹			Note ^A	Note ^A		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. Isolates 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>
Eravacycline, <i>S. aureus</i>	0.25	0.25		IP	IP	IP		
Minocycline	0.5 ¹	1 ¹		30	23 ^A	20 ^A		
Tetracycline	1 ¹	2 ¹		30	22 ^A	19 ^A		
Tigecycline ²	0.5 ³	0.5 ³		15	18	18		

Staphylococcus spp.

Expert Rules and Intrinsic Resistance Tables

Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	4	4		10	21 ^A	21 ^A		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. 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			Note ^B	Note ^B		

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		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. 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 fosfomicin. 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		
Fosfomicin iv	32 ³	32 ³			Note ^A	Note ^A		
Fosfomicin 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)	2	4		5	17	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. 9.0, valid from 2019-01-01

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

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. <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. 4. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L. 5. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Ampicillin	4	8 ²		2	10	8 ²		
Ampicillin-sulbactam ³	4 ⁴	8 ⁴			Note ^A	Note ^A		
Amoxicillin ³	4	8			Note ^A	Note ^A		
Amoxicillin-clavulanic acid ³	4 ⁵	8 ⁵			Note ^A	Note ^A		
Piperacillin ³	Note ³	Note ³			Note ^A	Note ^A		
Piperacillin-tazobactam ³	Note ³	Note ³			Note ^A	Note ^A		
Ticarcillin	-	-			-	-		
Ticarcillin-clavulanic acid	-	-			-	-		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	-	-			-	-		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam (uncomplicated UTI only)	-	-			-	-		

Enterococcus spp.

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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	
Doripenem								
Ertapenem	-	-			-	-		
Imipenem	4	8		10	21	18		
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

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.
Levofloxacin (uncomplicated UTI only)	4	4		5	15 ^A	15 ^A		
Moxifloxacin	-	-			-	-		
Nalidixic acid (screen)	NA	NA			NA	NA		
Norfloxacin (screen)	NA	NA		10	12 ^B	12 ^B		
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			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

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Azithromycin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
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
	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. 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	0.125	0.125		IP	IP	IP		
Minocycline	-	-			-	-		
Tetracycline	-	-			-	-		
Tigecycline ¹	0.25 ²	0.25 ²		15	18	18		

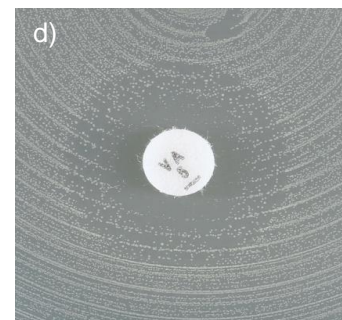
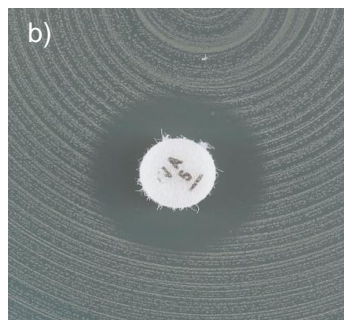
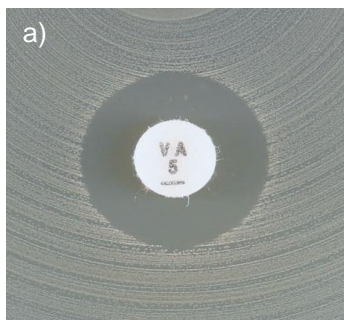
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	4	4		10	19	19		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Tedizolid	IE	IE			IE	IE		

Enterococcus spp.

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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	-	-			-	-		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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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 ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin²	0.25	0.25		1 unit	18	18		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>1/A. The susceptibility of streptococcus groups A, B, C and G to penicillins is inferred from the benzylpenicillin susceptibility with the exception of phenoxymethylpenicillin and isoxazolylpenicillins for streptococcus group B.</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. Streptococcus groups A, B, C and G do not produce beta-lactamase. The addition of a beta-lactamase inhibitor does not add clinical benefit.</p>
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	NA	NA			NA	NA		
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 (uncomplicated UTI only)	-	-			-	-		

Streptococcus groups A, B, C and G

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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.
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	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	
Doripenem								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. Streptococcus groups A, B, C and G do not produce beta-lactamase. The addition of a beta-lactamase inhibitor does not add clinical benefit.
Ertapenem	Note ¹	Note ¹			Note ^A	Note ^A		
Imipenem	Note ¹	Note ¹			Note ^A	Note ^A		
Meropenem	Note ¹	Note ¹			Note ^A	Note ^A		
Meropenem-vaborbactam ²	Note ¹	Note ¹			Note ^A	Note ^A		

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

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. 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 levofloxacin and moxifloxacin. Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Levofloxacin ^{HE}	2	2		5	17 ^A	17 ^A		
Moxifloxacin	0.5	0.5		5	19 ^A	19 ^A		
Nalidixic acid (screen)	NA	NA			NA	NA		
Norfloxacin (screen)	NA	NA		10	12 ^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 ¹	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	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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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	1 ¹		30	23 ^A	20 ^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	4		10	19	16		<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			Note ^A	Note ^A		

Streptococcus groups A, B, C and G

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	19	19		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. Daptomycin MICs must be determined in the presence of Ca ²⁺ (50 mg/L in the medium for broth dilution methods; agar dilution methods have not been validated). Follow the manufacturer's instructions for commercial systems. 3. 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	-	-			-	-		
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

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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: *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 unit disk screen test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (inhibition zone ≥20 mm) all beta-lactam agents for which clinical breakpoints are available, including those with "Note" can be reported susceptible without further testing. When the screen is positive (inhibition zone <20 mm), see flow chart below for interpretation.</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>3. For isolates categorised as intermediate to ampicillin avoid oral treatment with ampicillin, amoxicillin or amoxicillin-clavulanic acid.</p> <p>4/B. Susceptibility inferred from ampicillin (MIC or zone diameter).</p> <p>5. 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. For oxacillin non-susceptible isolates, always determine the MIC of benzylpenicillin.</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	Note ^{1,4}	Note ^{1,4}			Note ^{A,B}	Note ^{A,B}		
Amoxicillin iv	Note ^{1,4}	Note ^{1,4}			Note ^{A,B}	Note ^{A,B}		
Amoxicillin oral	0.5 ¹	1 ¹			Note ^{A,C}	Note ^{A,C}		
Amoxicillin-clavulanic acid iv	Note ^{1,4}	Note ^{1,4}			Note ^{A,B}	Note ^{A,B}		
Amoxicillin-clavulanic acid oral	0.5 ^{1,5}	1 ^{1,5}			Note ^{A,C}	Note ^{A,C}		
Piperacillin	Note ^{1,4}	Note ^{1,4}			Note ^{A,B}	Note ^{A,B}		
Piperacillin-tazobactam	Note ^{1,4}	Note ^{1,4}			Note ^{A,B}	Note ^{A,B}		
Ticarcillin	-	-			-	-		
Ticarcillin-clavulanic acid	-	-			-	-		
Temocillin	-	-			-	-		
Phenoxymethylpenicillin	Note ¹	Note ¹			Note ^A	Note ^A		
Oxacillin (screen)	NA	NA		1	20 ^D	Note ^D		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam (uncomplicated UTI only)	-	-			-	-		

Streptococcus pneumoniae

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Expert Rules and Intrinsic Resistance Tables

Cephalosporins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Cefaclor	0.03	0.5		30	50	28		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1/A. The oxacillin 1 unit disk screen test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (inhibition zone ≥20 mm) all beta-lactam agents for which clinical breakpoints are available, including those with "Note" can be reported susceptible without further testing. When the screen is positive (inhibition zone <20 mm), see flow chart below for interpretation.
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	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Doripenem ⁴								Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1/A. The oxacillin 1 unit disk screen test shall be used to exclude beta-lactam resistance mechanisms. When the screen is negative (inhibition zone ≥20 mm) all beta-lactam agents for which clinical breakpoints are available, including those with "Note" can be reported susceptible without further testing. When the screen is positive (inhibition zone <20 mm), see flow chart below for interpretation. 2. Not for meningitis (meropenem is the only carbapenem used for meningitis). 3. Meropenem is the only carbapenem used for meningitis. B. For use in meningitis determine the meropenem MIC.
Ertapenem ²	0.5	0.5			Note ^A	Note ^A		
Imipenem ²	2	2			Note ^A	Note ^A		
Meropenem ² (indications other than meningitis)	2	2			Note ^A	Note ^A		
Meropenem ³ (meningitis)	0.25	0.25			Note ^{A,B}	Note ^{A,B}		
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.

Streptococcus pneumoniae

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Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. 1. Breakpoints are based on high dose therapy, see table of dosages. 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 levofloxacin and moxifloxacin. Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Levofloxacin ^{HE}	2	2		5	16 ^A	16 ^A		
Moxifloxacin	0.5	0.5		5	22 ^A	22 ^A		
Nalidixic acid (screen)	NA	NA			NA	NA		
Norfloxacin (screen)	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		

Streptococcus pneumoniae

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Expert Rules and Intrinsic Resistance Tables

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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	1 ¹		30	24 ^A	21 ^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	4		10	22	19		<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		

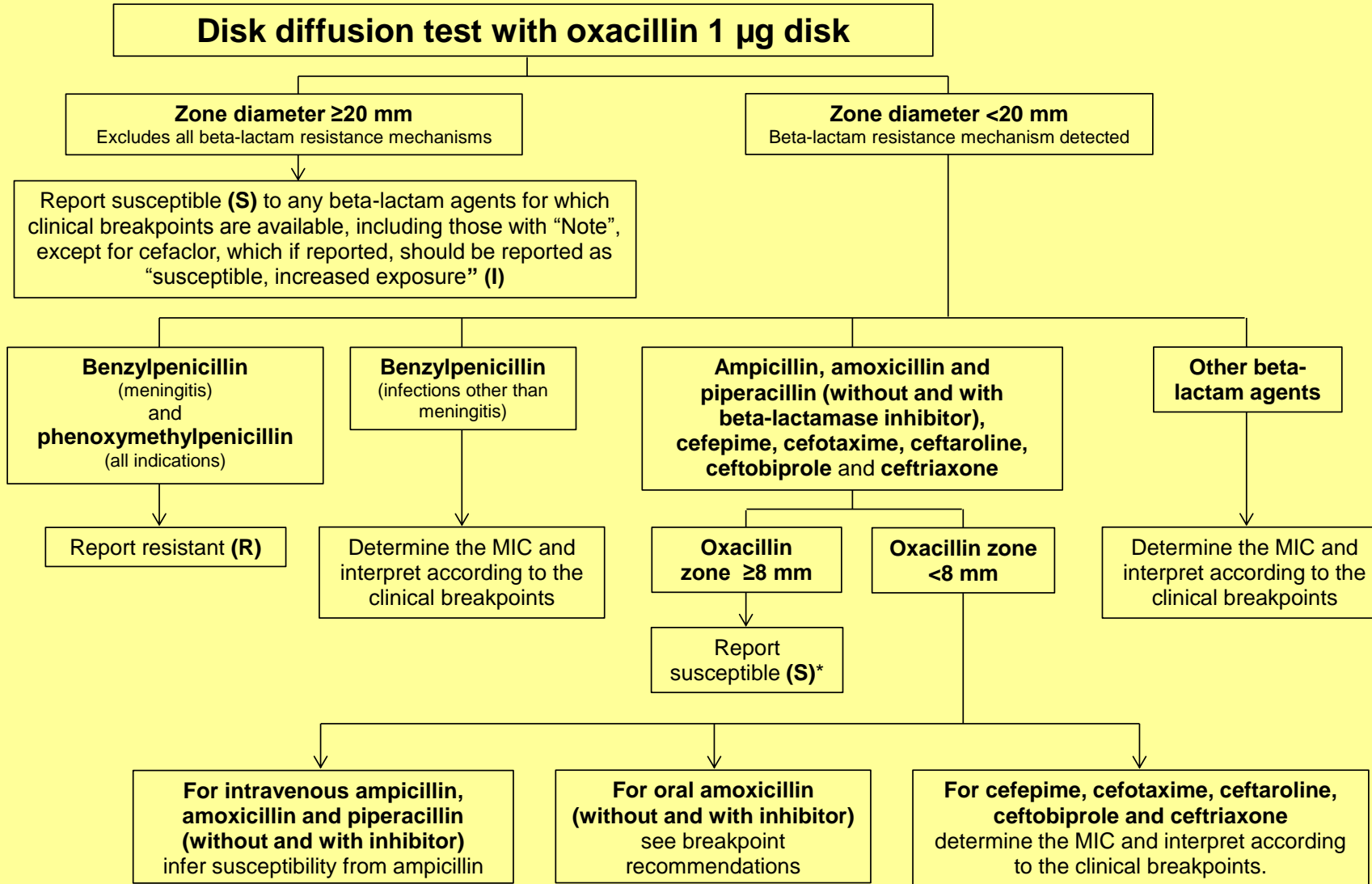
Streptococcus pneumoniae

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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	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	0.06	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		<p>Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.</p> <p>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.</p> <p>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.</p>
Benzylpenicillin (screen)	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 (uncomplicated UTI only)	-	-			-	-		

Viridans group streptococci

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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. 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	
Doripenem								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.
Ertapenem	0.5	0.5			Note ^A	Note ^A		
Imipenem	2	2			Note ^A	Note ^A		
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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Macrolides, lincosamides and streptogramins	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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		IP	IP	IP		
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			Note ^A	Note ^A		

Viridans group streptococci

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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	-	-			-	-		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

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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

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		<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 beta-lactam agents 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 for interpretation.</p> <p>1. Breakpoints are based on intravenous administration.</p> <p>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.</p> <p>3. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.</p> <p>4/C. Susceptibility can be inferred from amoxicillin-clavulanic acid.</p> <p>5. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.</p> <p>6. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.</p> <p>7/E. Susceptibility inferred from ampicillin or amoxicillin.</p> <p>B. ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).</p> <p>D. Susceptibility can be inferred from ampicillin.</p>
Benzylpenicillin (screen) ¹	NA	NA		1 unit	12 ^A	Note ^A		
Ampicillin ²	1	1		2	16 ^A	16 ^A	16-19 ^B	
Ampicillin-sulbactam	1 ^{3,4}	1 ^{3,4}		10-10	Note ^{A,C}	Note ^{A,C}		
Amoxicillin iv ²	2	2			Note ^{A,D}	Note ^{A,D}		
Amoxicillin oral ^{2, HE}	2	2			Note ^{A,D}	Note ^{A,D}		
Amoxicillin-clavulanic acid iv	2 ⁵	2 ⁵		2-1	15 ^A	15 ^A	14-16 ^B	
Amoxicillin-clavulanic acid oral ^{HE}	2 ⁵	2 ⁵		2-1	15 ^A	15 ^A	14-16 ^B	
Piperacillin ²	IE	IE			IE	IE		
Piperacillin-tazobactam	0.25 ⁶	0.25 ⁶		30-6	27 ^A	27 ^A	24-27 ^B	
Ticarcillin	IE	IE			IE	IE		
Ticarcillin-clavulanic acid	IE	IE			IE	IE		
Temocillin	IE	IE			IE	IE		
Phenoxyethylpenicillin	IE	IE			IE	IE		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam (uncomplicated UTI only)	-	-			-	-		

Haemophilus influenzae

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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 beta-lactam agents 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 for interpretation.</p> <p>2/B. ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).</p>
Cefadroxil	-	-			-	-		
Cefalexin	-	-			-	-		
Cefazolin	-	-			-	-		
Cefepime	0.25	0.25		30	28 ^{A,B}	28 ^{A,B}	28-33 ^B	
Cefixime	0.125	0.125		5	26 ^A	26 ^A		
Cefotaxime	0.125	0.125		5	27 ^A	27 ^A	25-27 ^B	
Cefoxitin	NA	NA			NA	NA		
Cefpodoxime	0.25	0.25		10	26 ^{A,B}	26 ^{A,B}	26-29 ^B	
Ceftaroline	0.03	0.03			Note ^A	Note ^A		
Ceftazidime	-	-			-	-		
Ceftazidime-avibactam	-	-			-	-		
Ceftibuten	1	1		30	25 ^A	25 ^A		
Ceftobiprole	IE	IE			IE	IE		
Ceftolozane-tazobactam	IE	IE			IE	IE		
Ceftriaxone	0.125	0.125		30	32 ^A	32 ^A	31-33 ^B	
Cefuroxime iv	1	2	2 ²	30	27 ^A	25 ^A	25-27 ^B	
Cefuroxime oral	0.125	1		30	50	27	25-27 ^B	

Carbapenems ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Doripenem ⁴								<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 beta-lactam agents 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 for interpretation.</p> <p>2. Not for meningitis (meropenem is the only carbapenem used for meningitis).</p> <p>3. Meropenem is the only carbapenem used for meningitis.</p> <p>B. ATU relevant only if the benzylpenicillin 1 unit disk screen is positive (inhibition zone <12 mm).</p> <p>C. For use in meningitis determine the meropenem MIC value.</p>
Ertapenem ²	0.5	0.5		10	23 ^A	23 ^A		
Imipenem ²	2	2		10	20 ^{A,B}	20 ^{A,B}	6-19 ^B	
Meropenem ² (indications other than meningitis)	2	2		10	20 ^A	20 ^A		
Meropenem ³ (meningitis)	0.25	0.25			Note ^C	Note ^C		
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.

Haemophilus influenzae

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
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.
Levofloxacin	0.06	0.06		5	30 ^A	30 ^A		
Moxifloxacin	0.125	0.125		5	28 ^A	28 ^A		
Nalidixic acid (screen)	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	-	-			-	-		
	-	-			-	-		

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

Haemophilus influenzae

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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		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 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	2 ¹		30	24 ^A	21 ^A		
Tetracycline	1 ¹	2 ¹		30	25 ^A	22 ^A		
Tigecycline	IE	IE			IE	IE		

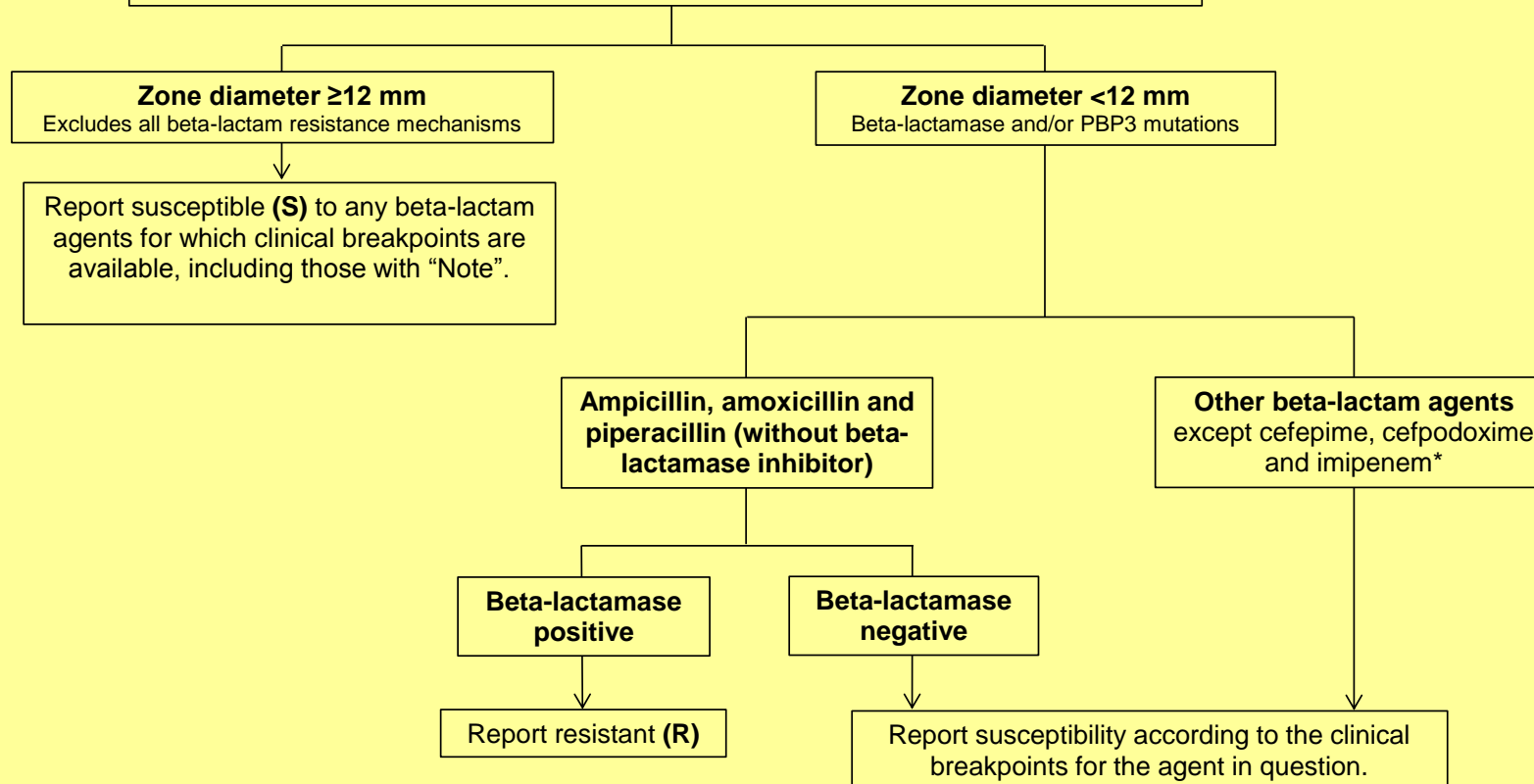
Oxazolidinones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Linezolid	-	-			-	-		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Tedizolid	-	-			-	-		

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Chloramphenicol	2	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		

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

Disk diffusion test with benzylpenicillin 1 unit disk

Always perform in parallel with testing of other beta-lactam agents



*For cefepime, cefpodoxime and imipenem, if resistant by both screen and agent disk diffusion test, report resistant. If resistant by screen test and susceptible by agent disk diffusion test, determine the MIC of the agent and interpret according to breakpoints.

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	
Benzympenicillin	-	-			-	-		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 (uncomplicated UTI only)	-	-			-	-		

Moraxella catarrhalis

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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	0.125	4		30	50	21		

Carbapenems	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
	S ≤	R >	ATU		S ≥	R <	ATU	
Doripenem [†]								1. 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.
Ertapenem [†]	0.5	0.5		10	29	29		
Imipenem [†]	2	2		10	29	29		
Meropenem [†]	2	2		10	33	33		
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	IE	IE			IE	IE		

Moraxella catarrhalis

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.125	0.125		5	31 ^A	31 ^A		A. The nalidixic acid disk diffusion test can be used to screen for fluoroquinolone resistance. See Note B. B. Isolates categorised as susceptible to nalidixic acid can be reported susceptible to ciprofloxacin, levofloxacin, moxifloxacin and ofloxacin. Isolates categorised as non-susceptible may have fluoroquinolone resistance and should be tested against the appropriate agent.
Levofloxacin	0.125	0.125		5	29 ^A	29 ^A		
Moxifloxacin	0.25	0.25		5	26 ^A	26 ^A		
Nalidixic acid (screen)	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		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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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	2 ¹		30	25 ^A	22 ^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. 9.0, valid from 2019-01-01

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	0.06 ¹	1		1. Always test for beta-lactamase. If positive, report resistant to benzylpenicillin, ampicillin and amoxicillin. Tests based on a chromogenic cephalosporin can be used to detect the beta-lactamase. The susceptibility of beta-lactamase negative isolates to ampicillin and amoxicillin can be inferred from benzylpenicillin.
Ampicillin ¹	Note ¹	Note ¹		
Ampicillin-sulbactam	IE	IE		
Amoxicillin ¹	Note ¹	Note ¹		
Amoxicillin-clavulanic acid	Note ¹	Note ¹		
Piperacillin	-	-		
Piperacillin-tazobactam	-	-		
Ticarcillin	-	-		
Ticarcillin-clavulanic acid	-	-		
Temocillin	IE	IE		
Phenoxyethylpenicillin	-	-		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam (uncomplicated UTI only)	-	-		

Neisseria gonorrhoeae

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Cephalosporins	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Cefaclor	-	-		
Cefadroxil	-	-		
Cefalexin	-	-		
Cefazolin	-	-		
Cefepime	-	-		
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	
Doripenem				
Ertapenem	IE	IE		
Imipenem	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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Fluoroquinolones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Ciprofloxacin	0.03	0.06		
Levofloxacin	IE	IE		
Moxifloxacin	IE	IE		
Nalidixic acid (screen)	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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Benzylpenicillin	0.06	0.25		
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 (uncomplicated UTI only)	-	-		

Neisseria meningitidis

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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.
Levofloxacin	IE	IE		
Moxifloxacin	IE	IE		
Nalidixic acid (screen)	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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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	2 ¹		
Tetracycline	1 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 ^{HE}	2	2		1. 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 ¹	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. 9.0, valid from 2019-01-01

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	
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	4	8		
Ampicillin-sulbactam	4 ²	8 ²		
Amoxicillin ¹	4	8		
Amoxicillin-clavulanic acid	4 ³	8 ³		
Piperacillin ¹	8	16		
Piperacillin-tazobactam	8 ⁴	16 ⁴		
Ticarcillin ¹	8	16		
Ticarcillin-clavulanic acid	8 ³	16 ³		
Temocillin	-	-		
Phenoxymethylpenicillin	IE	IE		
Oxacillin	-	-		
Cloxacillin	-	-		
Dicloxacillin	-	-		
Flucloxacillin	-	-		
Mecillinam (uncomplicated UTI only)	-	-		

Gram-positive anaerobes

except *Clostridioides difficile*

Expert Rules and Intrinsic Resistance Tables

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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	
Doripenem				
Ertapenem	0.5	0.5		
Imipenem	2	4		
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. 9.0, valid from 2019-01-01

Fluoroquinolones	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Ciprofloxacin	-	-		
Levofloxacin	-	-		
Moxifloxacin	IE	IE		
Nalidixic acid (screen)	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. 9.0, valid from 2019-01-01

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. 9.0, valid from 2019-01-01

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. 9.0, valid from 2019-01-01

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. 9.0, valid from 2019-01-01

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

Gram-negative anaerobes

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

Carbapenems	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Doripenem				
Ertapenem	0.5	0.5		
Imipenem	2	4		
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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

Miscellaneous agents	MIC breakpoints (mg/L)			Notes
	S ≤	R >	ATU	
Chloramphenicol	8	8		Numbered notes relate to general comments and/or MIC breakpoints.
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. 9.0, valid from 2019-01-01

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	0.125 ¹	0.125 ¹		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 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 ¹	0.5 ¹		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 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 ¹	8 ¹		1. The breakpoints are based on epidemiological cut-off values (ECOFFs), which distinguish wild-type isolates from those with reduced susceptibility.
Rifampicin	1 ¹	1 ¹		

Listeria monocytogenes

Expert Rules and Intrinsic Resistance Tables

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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	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. 9.0, valid from 2019-01-01

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)	NA	NA		30	23 ^B	Note ^B		

Pasteurella multocida

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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)	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. 9.0, valid from 2019-01-01

<p>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: <i>Staphylococcus aureus</i> ATCC 29213 (standard conditions for staphylococci)</p>

<p>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: <i>Campylobacter jejuni</i> ATCC 33560</p>
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Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.5	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.

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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

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	1	1		10	23	23		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.

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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.
Clindamycin	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. 9.0, valid from 2019-01-01

<p>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: <i>Streptococcus pneumoniae</i> ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.</p> <p>¹ For fluoroquinolones, agar dilution may produce clearer endpoints.</p>
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<p>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: <i>Streptococcus pneumoniae</i> ATCC 49619. For agents not covered by this strain, see EUCAST QC Tables.</p>
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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)	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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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	
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. 9.0, valid from 2019-01-01

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

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

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. 9.0, valid from 2019-01-01

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.

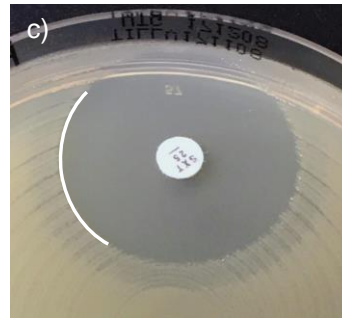
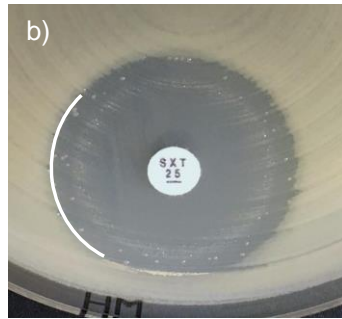
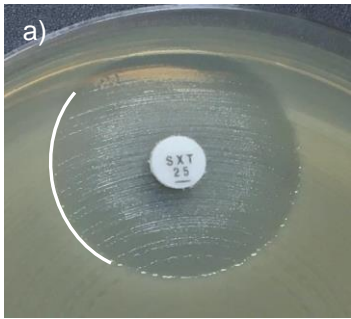
Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Ciprofloxacin	0.25	0.5		5	27	24		Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method.
Levofloxacin	0.5	1		5	27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

Aeromonas spp.

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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	
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.

Mycobacterium tuberculosis

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

Expert Rules and Intrinsic Resistance Tables

Listed breakpoints have been set in parallel with marketing authorisation by EMA. breakpoints for other agents have not yet been established.

Reference methodology is currently under development. Listed breakpoints may change once the development is complete.

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*.

	MIC breakpoints (mg/L)			Notes Numbered notes relate to general comments and/or MIC breakpoints.
	S ≤	R >	ATU	
Delamanid	0.06	0.06		1. Breakpoints apply only to tests performed on Middlebrook 7H11/7H10 medium. Comparability of tests performed by other media has not been established.
Bedaquiline	0.25 ¹	0.25 ¹		

ECOFFs and systemic clinical breakpoints for antimicrobial agents that are used topically

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

In the absence of clinical data on outcome related to MIC of infecting organisms EUCAST does not find it possible to reach a consensus that resolves the conflicting opinions on these two alternative proposals (for details see guidance document on www.eucast.org):

1. Use ECOFFs for all agents when used topically.
2. Use clinical breakpoints when available and ECOFFs when there are no clinical breakpoints.

For information, the table presents systemic clinical breakpoints and ECOFFs for agents that are used both systemically and topically, and ECOFFs for agents that are used topically only (note that the mupirocin breakpoints are the exception).

Organisms		Gentamicin ³	Ciprofloxacin ³	Levofloxacin ³	Ofloxacin ³	Chloramphenicol ³	Colistin ³ (for polymyxin B)	Fusidic acid ³	Neomycin (framycetin)	Bacitracin	Mupirocin	Retapamulin
Enterobacterales	ECOFF ^{1,2}	2	0.125	0.25	0.5	16	2	-	8	-	-	-
	Systemic clinical breakpoints ¹	2/4	0.25/0.5	0.5/1	0.25/0.5	8/8	2/2	-	-	-	-	-
<i>P. aeruginosa</i>	ECOFF ¹	8	0.5	2	2	-	4	-	ND	-	-	-
	Systemic clinical breakpoints ¹	4/4	0.5/0.5	1/1	-	-	2/2	-	-	-	-	-
<i>Acinetobacter</i> spp.	ECOFF ^{1,2}	4	1	0.5	1	-	2	-	ND	-	-	-
	Systemic clinical breakpoints ¹	4/4	0.06/1	0.5/1	-	-	2/2	-	-	-	-	-
<i>S. aureus</i>	ECOFF ¹	2	1	1	1	16	-	0.5	1	ND	1 ⁴	0.5
	Systemic clinical breakpoints ¹	1/1	1/1	1/1	1/1	8/8	-	1/1	-	-	-	-
<i>S. pneumoniae</i>	ECOFF ¹	-	2	2	4	8	-	32	ND	ND	-	-
	Systemic clinical breakpoints ¹	-	-	2/2	-	8/8	-	-	-	-	-	-
Streptococcus A, B, C and G	ECOFF ^{1,2}	-	2	2	4	8	-	32	ND	ND	0.5	0.125
	Systemic clinical breakpoints ¹	-	-	2/2	-	8/8	-	IE	-	-	-	-
<i>H. influenzae</i>	ECOFF ¹	4	0.06	0.06	0.125	1	-	ND	ND	-	-	-
	Systemic clinical breakpoints ¹	IE	0.06/0.06	0.06/0.06	0.06/0.06	2/2	-	-	-	-	-	-
<i>Moraxella</i> spp.	ECOFF ^{1,2}	0.25	0.125	0.125	0.25	2	-	ND	ND	-	-	-
	Systemic clinical breakpoints ¹	IE	0.125/0.125	0.125/0.125	0.25/0.25	2/2	-	-	-	-	-	-

Notes

1 ECOFFs and systemic clinical breakpoints in mg/L.

2 This ECOFF is representative of ECOFFs for the most relevant species.

3 Agents also available for systemic use.

4 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 defined on EUCAST MIC distribution website.

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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	IE	IE	

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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 >	
Doripenem			1. For susceptibility testing purposes, the concentration of vaborbactam is fixed at 8 mg/L.
Ertapenem	0.5	0.5	
Imipenem	2	4	
Meropenem	2	8	
Meropenem-vaborbactam	8 ¹	8 ¹	

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

PK-PD (Non-species related) breakpoints

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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

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

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. 9.0, valid from 2019-01-01

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	4	
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	

Dosages

EUCAST Clinical Breakpoint Tables v. 9.0, valid from 2019-01-01

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.

Penicillins	Standard dose	High dose	Special situations
Benzylpenicillin	0.6 g (1 MU) x 4 iv	1.2 g (2 MU) x 4-6 iv	Meningitis: For a dose of 2.4 g (4 MU) x 6 iv, isolates with MIC ≤ 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 ≤ 0.5 mg/L are susceptible. For a dose of 2.4 (4 MU) g x 4 iv or 1.2 g (2 MU) x 6 iv, isolates with MIC ≤ 1 mg/L are susceptible. For a dose of 2.4 g (4 MU) x 6 iv, isolates with MIC ≤ 2 mg/L are susceptible.
Ampicillin	2 g x 3 iv	2 g x 4 iv	Meningitis: 2 g x 6 iv
Ampicillin-sulbactam	(2 g ampicillin + 1 g sulbactam) x 3 iv	(2 g ampicillin + 1 g sulbactam) x 4 iv	
Amoxicillin iv	1 g x 3-4 iv Under review	2 g x 6 iv	Meningitis: 2 g x 6 iv
Amoxicillin oral	0.5 g x 3	0.75 g -1 g x 3	<i>H. influenzae</i>: High dose only
Amoxicillin-clavulanic acid iv	(1 g amoxicillin + 0.2 g clavulanic acid) x 3-4 iv Under review	(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	(0.875 g amoxicillin + 0.125 g clavulanic acid) x 3	<i>H. influenzae</i>: High dose only
Piperacillin	4 g x 3 iv	4 g x 4 iv	<i>Pseudomonas spp.</i>: 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	<i>Pseudomonas spp.</i>: High dose only
Ticarcillin	3 g x 4 iv	3 g x 6 iv	<i>Pseudomonas spp.</i>: 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	<i>Pseudomonas spp.</i>: 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	0.2 g x 3 oral	0.4 g x 3 oral	

Dosages

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Cephalosporins	Standard dose	High dose	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 depending on species and/or infection type	None	
Cefalexin	0.25-1 g x 2-3 oral depending on species and/or infection type	None	
Cefazolin	1 g x 3-4 (or 2 g x 3) iv depending on species and/or infection type	None	
Cefepime	1 g x 3 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	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 Gonorrhoea: 0.5 g im as a single dose
Cefpodoxime	0.1-0.2 g x 2 oral depending on species and/or infection type	None	
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 over 2 hours	None	
Ceftibuten	0.4 g x 1 oral	None	
Ceftobiprole	0.5 g x 3 iv over 2 hours	None	
Ceftolozane-tazobactam	(1 g ceftolozane + 0.5 g tazobactam) x 3 iv over 1 hour	Under evaluation	
Ceftriaxone	1 g x 1 iv	2 g x 2 iv	Meningitis: 4 g x 1 iv <i>S. aureus</i> : High dose only Gonorrhoea: 0.5 g im as a single dose
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	0.25-0.5 g x 2 oral depending on species and/or infection type	None	

Carbapenems	Standard dose	High dose	Special situations
Doripenem			
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 <i>Acinetobacter</i> spp.: High dose only
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	None	

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

Dosages

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Fluoroquinolones	Standard dose	High dose	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>Acinetobacter</i> spp.: High-dose-only <i>Staphylococcus</i> spp.: High dose only <u>± combination</u> Genorrhoea: 0.5 g oral as a single dose
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>Acinetobacter</i> spp.: High-dose-only Streptococcus 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	0.4 g x 2 oral	None	
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 <u>± combination</u>

Aminoglycosides	Standard dose	High dose	Special situations
Amikacin	20 mg/kg x 1 iv	30 mg/kg x 1 iv	Enterobacterales: High dose only <i>Pseudomonas</i> spp.: High dose only <i>Acinetobacter</i> spp.: High dose only
Gentamicin	5 mg/kg x 1 iv	7 mg/kg x 1 iv	Enterobacterales: High dose only <i>Pseudomonas</i> spp.: High dose only <i>Acinetobacter</i> spp.: High dose only
Netilmicin	5 mg/kg x 1 iv	7 mg/kg x 1 iv	Enterobacterales: High dose only <i>Pseudomonas</i> spp.: High dose only <i>Acinetobacter</i> spp.: High dose only
Tobramycin	5 mg/kg x 1 iv	7 mg/kg x 1 iv	Enterobacterales: High dose only <i>Pseudomonas</i> spp.: High dose only <i>Acinetobacter</i> spp.: High dose only

Glycopeptides and lipoglycopeptides	Standard dose	High dose	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

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Macrolides, lincosamides and streptogramins	Standard dose	High dose	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	
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	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	Special situations
Linezolid	0.6 g x 2 oral or 0.6 g x 2 iv	None	
Tedizolid	0.2 g x 1 oral	None	

Miscellaneous agents	Standard dose	High dose	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	3 g x 1 oral as a single dose	None	
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	50-100 mg x 3-4 oral	None	Dosing is dependent on drug formulation.
Nitroxoline	0.25 g x 3 oral	None	
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	Gonorrhoea: 2 g im as a single dose
Trimethoprim	0.16 g x 2 oral	None	
Trimethoprim-sulfamethoxazole	(0.16 g trimethoprim + 0.8 g sulfa) x 2 oral or (0.16 g trimethoprim + 0.8 g sulfa) x 2 iv	(0.24 g trimethoprim + 1.2 g sulfa) x 2 oral or (0.24 g trimethoprim + 1.2 g sulfa) x 2 iv	<i>Stenotrophomonas maltophilia</i> : High dose only