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Ente del Terzo Settore

Sezione Regione Lombardia


POMERIGGI MICROBIOLOGICI LOMBARDI
MICROORGANISMI ESIGENTI: QUANDO, COME E PERCHÉ

Haemophilus spp, fenotipi attesi, meccanismi di resistenza acquisita, antibiogramma e diagnostica di laboratorio.

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Microbiologia e Virologia
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13 maggio 2026

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 European Committee
on Antimicrobial
Susceptibility Testing

European Committee on Antimicrobial Susceptibility Testing
Breakpoint tables for interpretation of MICs and zone diameters
Version 16.0, valid from 2026-01-01

This document should be cited as "The European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters. Version 16.0, 2026. <https://www.eucast.org>."

Content	Page	Additional information
Changes	4	
Haemophilus influenzae		General • Indication "endocarditis" removed for ampicillin and amoxicillin Revised breakpoints • Ampicillin iv (meningitis) [changed from IE to Note] • Amoxicillin iv (meningitis) [changed from IE to Note] • Trimethoprim-sulfamethoxazole (MIC and zone diameter) New comments • Penicillins comment 3/C
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↓ ↓

Haemophilus influenzae
Expert Rules and Expected Phenotypes

[Guidance documents](#)

MIC determination (broth microdilution according to ISO standard 20776-1)
Medium: Cation-adjusted Mueller-Hinton broth + 5% lysed horse blood and 20 mg/L β-NAD (MH-F broth)
Inoculum: 5x10⁸ CFU/mL
Incubation: Sealed panels, air, 35±1°C, 18-20h
Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth. See "EUCAST Reading Guide for broth microdilution" for further information.
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.

EUCAST Clinical Breakpoint Tables v. 16.0, valid from 2026-01-01
For abbreviations and explanations of breakpoints, see the Notes sheet

Disk diffusion (EUCAST standardized 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. See "EUCAST Reading Guide for disk diffusion" for further information.
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.

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*.

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Haemophilus influenzae
Expert Rules and Expected Phenotypes

[Guidance documents](#)

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Reading: Unless otherwise stated, read MICs at the lowest concentration of the agent that completely inhibits visible growth.

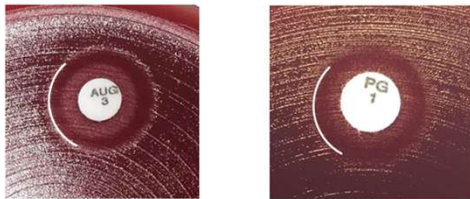
Ritastare/Indicare il valore di MIC più alto

Risultato invalido

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H. influenzae and beta-lactam agents

Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk.



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Haemophilus influenzae

Expert Rules and Expected Phenotypes

[Guidance documents](#)

EUCAST Clinical Breakpoint Tables v. 16.0, valid from 2026-01-01

For abbreviations and explanations of breakpoints, see the Notes sheet

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Expected Resistant Phenotypes Version 1.2 January 2023

Table 3 Expected resistant phenotype (susceptibility not expected) in gram-negative bacteria other than *Enterobacterales* and non-fermentative gram-negative bacteria. Gram-negative bacteria other than *Enterobacterales* and non-fermentative gram-negative bacteria listed are also expected to be resistant to glycopeptides, lipoglycopeptides, lincosamides, and oxazolidinones.

Rule	Organisms	Fusidic acid	Streptogramins	Trimethoprim	Nalidixic acid
3.1	<i>Haemophilus influenzae</i>	R	R		
3.2	<i>Moraxella catarrhalis</i>			R	
3.3	<i>Neisseria</i> spp.			R	
3.4	<i>Campylobacter fetus</i>	R	R	R	R
3.5	<i>Campylobacter jejuni</i> , <i>Campylobacter coli</i>	R	R	R	

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EUCAST Expert Rules v 3.2

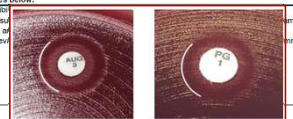
Haemophilus

June 2019

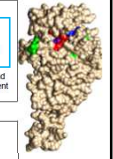
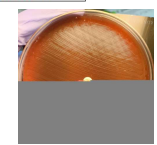
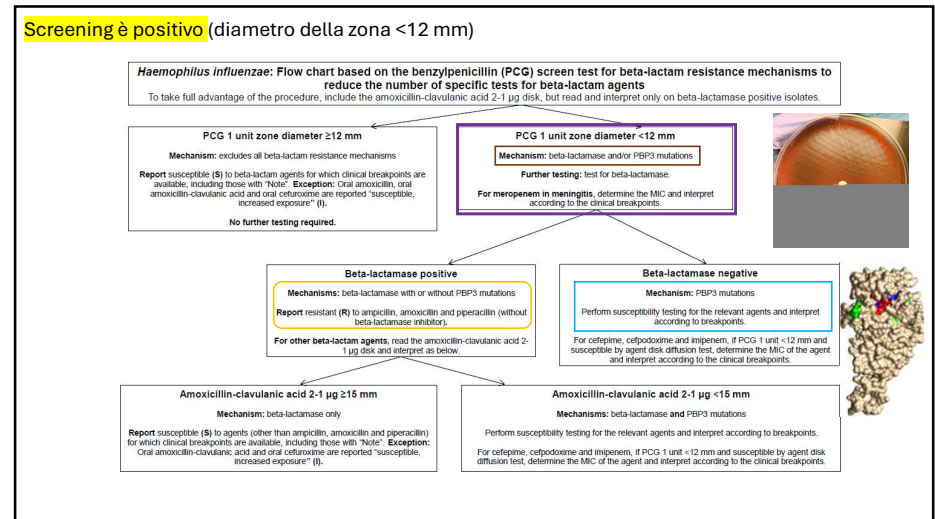
Rule No.	Organism(s)	Indicator Agent	Agents Affected	Rule	Remarks	Grade	References
Beta-lactams							
1	<i>Haemophilus influenzae</i>	benzylpenicillin (disk diffusion) screening test	other beta-lactams	IF susceptible in the benzylpenicillin screening test THEN report all indicated beta-lactams susceptible; IF resistant in the benzylpenicillin screening test THEN follow the <i>H. influenzae</i> flow chart in breakpoint table.	Resistance to benzylpenicillin will detect all relevant resistance mechanisms to beta-lactam agents in <i>Haemophilus influenzae</i> . It does not, however, distinguish between resistance caused by PBP mutations and/or beta-lactamase	A	Skaare et al., 2015
Fluoroquinolones							
2	<i>Haemophilus influenzae</i>	nalidixic acid screening test	all fluoroquinolones	IF susceptible in the nalidixic acid screening test THEN report susceptible to all indicated fluoroquinolones; IF resistant in the nalidixic acid screening test, THEN report resistant to ciprofloxacin, levofloxacin and moxifloxacin, OR determine the susceptibility of the agent to be used in therapy AND if susceptible add a cautionary remark that resistance may develop during therapy.	Decreased susceptibility to fluoroquinolones in <i>H. influenzae</i> due to target topoisomerase mutations can be more reliably detected in tests with nalidixic acid. First step mutants show MICs between 0.125 and 1mg/L. High-level fluoroquinolone resistance in this organism has rarely been described. Until there is evidence of clinical significance of these isolates they should be reported as resistant	C	Puig et al., 2015; Shoji et al., 2014
Tetracyclines							
3	<i>Haemophilus influenzae</i>	Tetracycline	doxycycline minocycline	IF susceptible to tetracycline THEN report doxycycline and minocycline susceptible. IF resistant to tetracycline THEN report doxycycline and minocycline resistant OR determine the susceptibility of the agent to be used in therapy.	Implicit rule from breakpoint table	C	

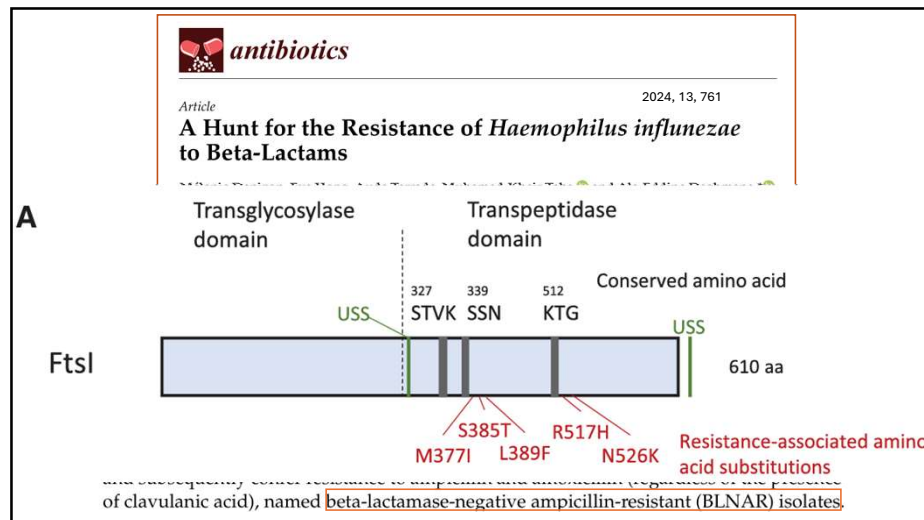
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Penicillins ¹	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Benzylpenicillin	IE	IE			IE	IE		1/A. The benzylpenicillin 1 unit disk diffusion screening test shall be used to exclude beta-lactam resistance mechanisms.
Benzylpenicillin (screen only) ²	NA	NA		1 unit	12 ^{A,B}	12 ^{A,B}		When the screen is negative (zone diameter ≥12 mm) all penicillins for which clinical breakpoints are available, including those with "Note", can be reported susceptible without further testing, except for amoxicillin oral and amoxicillin-clavulanic acid oral, which if reported, should be reported "susceptible, increased exposure" (I). When the screen is positive (zone diameter <12 mm), see flow chart below.
Ampicillin (indications other than meningitis) ²	1	1		2	16 ^{A,B}	16 ^{A,B}		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.
Ampicillin iv (meningitis) ²	Note ³	Note ³	★		Note ³	Note ³		3(a). In meningitis, <i>S. pneumoniae</i> positive in the benzylpenicillin 1 unit screen (zone diameter ≥12 mm) can be reported susceptible.
Ampicillin-sulbactam	1 ^{A,B}	1 ^{A,B}			Note ^{3,A}	Note ^{3,B}		4. For susceptibility testing purposes, the concentration of sulbactam is fixed at 4 mg/L.
Amoxicillin iv (indications other than meningitis) ²	2	2			Note ^{3,A}	Note ^{3,B}		5/D. Susceptibility can be inferred from amoxicillin-clavulanic acid iv.
Amoxicillin iv (meningitis) ²	Note ³	Note ³	★		Note ³	Note ³		6. For susceptibility testing purposes, the concentration of clavulanic acid is fixed at 2 mg/L.
Amoxicillin oral ²	0.001	2 ^A		2.4	Note ^{3,A}	Note ^{3,B}		7. For susceptibility testing purposes, the concentration of tazobactam is fixed at 4 mg/L.
Amoxicillin-clavulanic acid iv	2 ^A	2 ^A		2.4	15 ^{A,B}	15 ^{A,B}		B. Read the outer edge of zones where an otherwise clear inhibition zone contains an area of growth around the disk (see pictures below).
Amoxicillin-clavulanic acid oral	0.001 ^A	2 ^A		2.4	50 ^{A,B}	15 ^{A,B}		E. Serratia
Piperacillin ²	IE	IE			IE	IE		F. Isolates not resistant to G. ATU refer
Piperacillin-tazobactam	0.25 ^A	0.25 ^A		30-6	27 ^{A,B}	27 ^{A,B}	26-28 ^{A,B}	
Ticarcillin-clavulanic acid	IE	IE			IE	IE		
Femoxillin	IE	IE			IE	IE		
Phenoxymethylpenicillin	IE	IE			IE	IE		
Oxacillin	-	-			-	-		
Cloxacillin	-	-			-	-		
Dicloxacillin	-	-			-	-		
Flucloxacillin	-	-			-	-		
Mecillinam oral (pivmecillinam) (uncomplicated UTI only)	-	-			-	-		

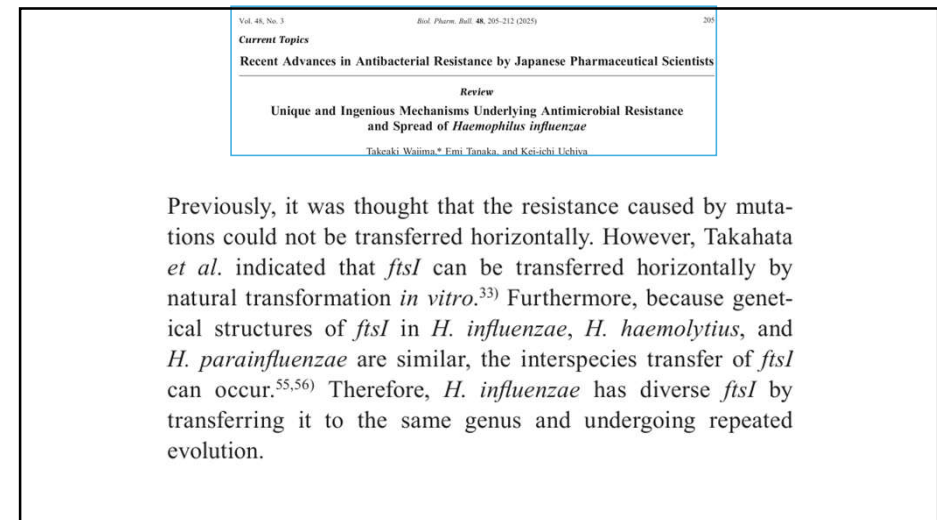


Screening per diffusione su disco da 1 unità di benzilpenicillina deve essere utilizzato per **escludere i meccanismi di resistenza ai beta-lattamici**. **Screening è negativo** (diametro della zona **≥12 mm**), tutte le penicilline per le quali sono disponibili i breakpoint clinici, comprese quelle con "Nota", possono essere riportate come sensibili senza ulteriori test, **ad eccezione di amoxicillina per via orale e amoxicillina-acido clavulanico per via orale**, che se riportate, dovrebbero essere indicate come "sensibile, esposizione aumentata" (I).





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Haemophilus influenzae				Guidance documents			
Expert Rules and Expected Phenotypes							
2/D. The addition of a beta-lactamase inhibitor does not add clinical benefit. The beta-lactamases produced by the organism either do not modify the parent cephalosporin or are not affected by the inhibitor.							
	Disk content (µg)	Zone diameter breakpoints (mm)					
		S ≥	R <	ATU			
	-	-	-	-			
	-	-	-	-			
	-	-	-	-			
	-	-	-	-			
Cefazolin	-	-	-	-			
Cefepime	0.25	0.25		30	28 ^{A,B}	28 ^{A,B}	28-33 ^{B,C}
Cefepime-enmetazobactam ²	Note ²	Note ²			Note ^D	Note ^D	
Cefiderocol	IE	IE			IE	IE	
Cefixime	0.125	0.125		5	26 ^{A,B}	26 ^{A,B}	
Cefotaxime	0.125	0.125		5	27 ^{A,B}	27 ^{A,B}	25-27 ^{B,C}
Cefoxitin	IE	IE			IE	IE	
Cefopodoxime	0.25	0.25		10	26 ^{A,B}	26 ^{A,B}	26-29 ^{B,C}
Ceftaroline	0.03	0.03			Note ^A	Note ^A	
Ceftazidime	-	-			-	-	
Ceftazidime-avibactam	-	-			-	-	
Ceftibuten	1	1		30	25 ^{A,B}	25 ^{A,B}	
Ceftobiprole	IE	IE			IE	IE	
Ceftolozane-tazobactam (pneumonia) ³	0.5	0.5		30-10	23 ^{A,B}	23 ^{A,B}	22-23 ^{B,C}
Ceftriaxone	0.125	0.125		30	32 ^{A,B}	32 ^{A,B}	31-33 ^{B,C}
Cefuroxime iv	1	2	2 ⁴	30	27 ^{A,B}	25 ^{A,B}	25-27 ^{B,C}
Cefuroxime oral	0.001	1		30	50 ^{A,B}	27 ^{A,B}	25-27 ^{B,C}

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Haemophilus influenzae				Guidance documents			
Expert Rules and Expected Phenotypes							
Carbapenems ^{1,2}	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Doripenem	1	1		10	23 ^{A,B}	23 ^{A,B}	
Ertapenem	0.5	0.5		10	23 ^{A,B}	23 ^{A,B}	
Imipenem	2	2		10	20 ^{A,B}	20 ^{A,B}	6-19 ^{B,C}
Imipenem-relebactam ³	Note ³	Note ³			Note ^E	Note ^E	
Meropenem (indications other than meningitis)	2	2		10	20 ^{A,B}	20 ^{A,B}	
Meropenem (meningitis)	0.25	0.25			Note ^{A,B}	Note ^{A,D}	
Meropenem-vaborbactam ³	Note ³	Note ³			Note ^E	Note ^E	
3/E. The addition of the beta-lactamase inhibitor does not add clinical benefit. The beta-lactamases produced by the organism either do not modify the parent carbapenem or are not affected by the inhibitor.							
D. For benzylpenicillin screen positive isolates zone <12 mm determine MIC in meningitis.							

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Haemophilus influenzae

Expert Rules and Expected Phenotypes

Guidance documents

EUCAST Clinical Breakpoint Tables v. 16.0, valid from 2026-01-01

For abbreviations and explanations of breakpoints, see the Notes sheet

Macrolides ¹ , lincosamides and streptogramins	MIC breakpoints (mg/L)		Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >		ATU	S ≥	R <
Azithromycin	Note ¹	Note ¹		Note ^A	Note ^A	
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	
Clindamycin	-	-		-	-	
Quinupristin-dalfopristin	-	-		-	-	

Nota 1/A

Le prove cliniche sull'efficacia dei macrolidi nelle infezioni respiratorie da *H. influenzae* sono contrastanti a causa dell'elevata frequenza di guarigione spontanea. Nel caso fosse necessario testare un macrolide, dovrebbero essere utilizzati i cut-off epidemiologici (ECOFFs) per rilevare ceppi con resistenza acquisita. I cut-off epidemiologici per ciascun agente sono: azitromicina 4 mg/L, claritromicina 32 mg/L ed eritromicina 16 mg/L.

Non ci sono dati sufficienti disponibili per stabilire un ECOFF per la roxithromicina.

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Haemophilus influenzae

EUCAST Clinical Breakpoint Table v. 2.0, valid from 2012-01-01

Glycopeptides	MIC breakpoint (mg/L)		Disk content (µg)	Zone diameter breakpoint (mm)		Notes Numbers for comments on MIC breakpoints Letters for comments on disk diffusion
	S ≤	R >		S ≥	R <	
Teicoplanin	-	-		-	-	
Telavancin	-	-		-	-	
Vancocyclin	-	-		-	-	

Macrolides ¹ , lincosamides and streptogramins	MIC breakpoint (mg/L)		Disk content (µg)	Zone diameter breakpoint (mm)		Notes Numbers for comments on MIC breakpoints Letters for comments on disk diffusion
	S ≤	R >		S ≥	R <	
Azithromycin	0.12 ¹	4 ¹		Note ^A	Note ^A	
Clarithromycin	1 ¹	32 ¹		Note ^A	Note ^A	
Erythromycin	0.5	16	15	50	10	
Roxithromycin	1 ¹	16 ¹		Note ^A	Note ^A	
Telithromycin	0.12	8	15	50	12	
Clindamycin	-	-		-	-	
Quinupristin-dalfopristin	-	-		-	-	

¹ Correlation between macrolide MICs and clinical outcome is weak for *H. influenzae*. Therefore, breakpoints for macrolides and related antibiotics have been set to categorise wild type *H. influenzae* as intermediate.

^{2A} Erythromycin can be used to determine susceptibility to azithromycin, clarithromycin and roxithromycin.

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Haemophilus influenzae EUCAST Clinical Breakpoint Tables v. 8.0, valid from 2018-01-01

Macrolides ¹ , lincosamides and streptogramins	MIC breakpoint (mg/L)		Disk content (µg)	Zone diameter breakpoint (mm)		Notes
	S ≤	R >		S ≤	R <	
Azithromycin	Note ^a	Note ^a		Note ^a	Note ^a	¹ HA. Clinical evidence for the efficacy of macrolides in <i>H. influenzae</i> respiratory infections is conflicting due to high spontaneous 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 ^a	Note ^a		Note ^a	Note ^a	
Erythromycin	Note ^a	Note ^a		Note ^a	Note ^a	
Roxithromycin	Note ^a	Note ^a		Note ^a	Note ^a	
Telithromycin	Note ^a	Note ^a		Note ^a	Note ^a	
Clindamycin	-	-	-	-	-	
Quinupristin-dalfopristin	-	-	-	-	-	

Vol. 48, No. 3 *Biol. Pharm. Bull.* 48, 205-212 (2025) 205

Current Topics
Recent Advances in Antibacterial Resistance by Japanese Pharmaceutical Scientists

Review
Unique and Ingenious Mechanisms Underlying Antimicrobial Resistance and Spread of *Haemophilus influenzae*
Takeaki Wajima,* Emi Tanaka, and Kei-ichi Uchida

Japan, an increase in macrolide-non-susceptible BLNAR isolates was reported after 2010.⁶³ These strains had nonsense or frameshift mutations in *acrR*, a negative multidrug efflux pump AcrAB, which elevated and conferred clarithromycin resistance⁵⁸ (Table 3). In addition to the *acrR* mutation, a certain amino acid in AcrB confers azithromycin non-susceptibility in a unique manner⁵⁹ (Table 3). Thus, BLNAR easily becomes resistant through the acquisition of mutations.

These isolates showed higher resistance to macrolides than the *acrR* mutant (Table 3). Genetic analyses suggested that genetic elements, including resistance genes, could come from Streptococci which colonize the same niche as *H. influenzae*.⁶⁴ Furthermore, similar isolates were reported in Norway and Belgium.^{65,66} In particular, in Norway, an outbreak of *mef A/E*-positive *H. influenzae* occurred.⁶⁵ *mef A/E* was located on ICE and could be transferred to susceptible strains through conjugation.⁶⁵ To date, exogenous macrolide-resistant genes have not attracted significant attention. However, these reports suggest that macrolide-resistant strains are prevalent below the surface.

Table 1. Criteria for Antimicrobial Susceptibility

	CLSI M100-33rd ed			EUCAST v13.1	
	S	I	R	S ≤	R >
Ampicillin	≤1	2	≥4	1	1
Ampicillin/sulbactam	≤2/1	–	≥4/2	1	1
Amoxicillin/clavulanic acid	≤4/2	–	≥8/4	2	2
Ceftriaxone	≤2	–	–	0.125	0.125
Meropenem	≤0.5	–	–	2	2
Clarithromycin	≤8	16	≥32	–	≥32
Azithromycin	≤4	–	–	–	≥4
Levofloxacin	≤2	–	–	0.06	0.06

Unique and Ingenious Mechanisms Underlying Antimicrobial Resistance and Spread of *Haemophilus influenzae*. Biol. Pharm. Bull. 48, 205–212 (2025)

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<i>Haemophilus influenzae</i>		Guidance documents		EUCAST Clinical Breakpoint Tables v. 16.0, valid from 2026-01-01				
Expert Rules and Expected Phenotypes				For abbreviations and explanations of breakpoints, see the Notes sheet				
Fluoroquinolones	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		Notes	
	S ≤	R >	ATU		S ≥	R <		ATU
Ciprofloxacin	0.03	0.03		5	32 ^a	30 ^a	Numbered notes relate to general comments and/or MIC breakpoints. Lettered notes relate to the disk diffusion method. A. The modified acid disk diffusion test can be used to screen for fluoroquinolone resistance. See Note B. B. Isolates categorised as screen negative can be reported susceptible to ciprofloxacin, levofloxacin, moxifloxacin and Screening negativo: riportare sensibile ai FQ Screening positivo: testare i singoli FQ o riportare resistenti	
Delafloxacin	IE	IE		5	30 ^a	30 ^a		
Levofloxacin	0.06	0.06		5	30 ^a	30 ^a		
Moxifloxacin	0.125	0.125		5	28 ^a	28 ^a		
Nalidixic acid (screen only)	NA	NA		30	22 ^b	22 ^b		
Norfloxacin (uncomplicated UTI only)	-	-		-	-	-		
Ofloxacin	0.06	0.06		5	30 ^a	30 ^a		
Unique and Ingenious Mechanisms Underlying Antimicrobial Resistance and Spread of <i>Haemophilus influenzae</i> . Biol. Pharm. Bull. 48, 205–212 (2025)								

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Haemophilus influenzae
Expert Rules and Expected Phenotypes

EUCAST Clinical Breakpoint Tables v. 16.0, valid from 2026-01-01
For abbreviations and explanations of breakpoints, see the Notes sheet

Guidance documents

Tetracyclines	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)			Notes
	S ≤	R >	ATU		S ≥	R <	ATU	
Doxycycline	1 ¹	1 ¹			Note ^a	Note ^a		11A. Tetracycline can be used to screen for resistance in tetracycline agents. Isolates categorised as susceptible to tetracycline can be reported susceptible to doxycycline and minocycline. Isolates categorised as resistant to tetracycline should be tested for susceptibility to individual agents or reported resistant.
Erythromycin	IE	IE			IE	IE		
Minocycline	1 ¹	1 ¹		30	24 ^a	24 ^a		
Tetracycline	2 ¹	2 ¹		30	25 ^a	25 ^a		
Tigecycline	IE	IE			IE	IE		

Nota 1/A Tetraciclina può essere usata per lo screening.
Tetraciclina Sensibili: Sensibili a doxiciclina e minociclina
Tetraciclina Resistenti: testare i singoli antibiotici o referarli resistenti

Haemophilus influenzae
Expert Rules and Expected Phenotypes

EUCAST Clinical Breakpoint Tables v. 16.0, valid from 2026-01-01
For abbreviations and explanations of breakpoints, see the Notes sheet

Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Chloramphenicol ¹	2	2		30	28	28	
Colistin	-	-		-	-	-	
Daptomycin	-	-		-	-	-	
Fosfomicin iv	IE	IE			IE	IE	
Fosfomicin oral	-	-		-	-	-	
Fusidic acid	-	-		-	-	-	
Lefamulin	IE	IE			IE	IE	
Metrizidazole	-	-		-	-	-	
Nitrofurantoin (uncomplicated UTI only)	-	-		-	-	-	
Nitrofurantoin (uncomplicated UTI only)	-	-		-	-	-	
Rifampicin (for prophylaxis only)	1	1		5	18	18	
Spectinomycin	-	-		-	-	-	
Trimethoprim (uncomplicated UTI only)	-	-		-	-	-	
Trimethoprim-sulfamethoxazole ²	0.5	0.5		1.25-23.75	23	23	

Haemophilus influenzae
Expert Rules and Expected Phenotypes

EUCAST Clinical Breakpoint Tables v. 15.0, valid from 2025-01-01
For abbreviations and explanations of breakpoints, see the Notes sheet

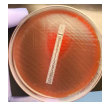
Miscellaneous agents	MIC breakpoints (mg/L)			Disk content (µg)	Zone diameter breakpoints (mm)		
	S ≤	R >	ATU		S ≥	R <	ATU
Chloramphenicol ¹	2	2		30	28	28	
Colistin	-	-		-	-	-	
Daptomycin	-	-		-	-	-	
Fosfomicin iv	IE	IE			IE	IE	
Fosfomicin oral	-	-		-	-	-	
Fusidic acid	-	-		-	-	-	
Lefamulin	IE	IE			IE	IE	
Metrizidazole	-	-		-	-	-	
Nitrofurantoin (uncomplicated UTI only)	-	-		-	-	-	
Nitrofurantoin (uncomplicated UTI only)	-	-		-	-	-	
Rifampicin (for prophylaxis only)	1	1		5	18	18	
Spectinomycin	-	-		-	-	-	
Trimethoprim (uncomplicated UTI only)	-	-		-	-	-	
Trimethoprim-sulfamethoxazole ²	0.5	1		1.25-23.75	23	29	

Haemophilus spp., an emerging multidrug-resistant sexually transmitted pathogen

2020 Elsevier

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Multidrug-resistant *H. parainfluenzae*, defined as resistant to ≥ 3 antibiotic families, were described among 28.7% of patients with an STI in a recent 5-year Spanish survey, especially in young men [15]. In Switzerland, two cases of XDR *H. parainfluenzae* infections were reported in MSM [12]. One of our patients with resistance to third-generation cephalosporins received an intramuscular injection of ceftriaxone a few weeks before for GU (patient #4). Another with an intermediate susceptibility to macrolides received a few days before AZM for a non-documented urethritis (patient #5). In these cases, emerging resistance under antibiotic pressure can be suggested.



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PRIMO ISOLAMENTO ITALIANO DI HAEMOPHILUS PARAINFLUENZAE RESISTENTE ALLE CEFALOSPORINE DI TERZA GENERAZIONE   

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Introduzione
Haemophilus parainfluenzae è un comune commensale delle vie aeree superiori dell'uomo che in alcuni casi può causare infezioni a livello genitale. Il microorganismo è compreso tra i principali patogeni responsabili di uretriti dopo *Neisseria gonorrhoeae*, *Chlamydia trachomatis* e *Mycoplasma genitalium*. L'infezione si presenta soprattutto in uomini omosessuali e/o in seguito a rapporti a rischio e si manifesta con sintomi uretrali sostanzialmente simili a quelle causate da *N. gonorrhoeae*. Per le infezioni da *H. parainfluenzae* esistono diverse opzioni terapeutiche, ma ceppi resistenti agli antibiotici sono emergenti. Mentre per *Haemophilus influenzae* i più comuni meccanismi di resistenza sono noti, per *H. parainfluenzae* queste informazioni sono tuttora scarse. Qui riportiamo un caso di uretrite causato da *H. parainfluenzae* resistente alle cefalosporine di terza generazione.

Materiali e Metodi
L'identificazione batterica è stata ottenuta mediante analisi diretta delle colonie con spettrometria di massa MALDI-TOF (ViteAMS, bioMérieux). La sensibilità agli antibiotici è stata determinata in prima battuta con il metodo Kirby-Bauer (testo di diffusione su Mueller-Hinton Fluidous Agar) e confermata con Etest e microdiffusione in brodo. In accordo con i criteri EUCAST, in assenza di breakpoint specifici per *H. parainfluenzae*, i valori di MIC sono stati interpretati applicando quelli stabiliti per *H. influenzae*.

Figure 1. *H. parainfluenzae* in tampone uretrale osservato al microscopio ottico dopo colorazione di Gram.

ANTIBIOTICO	MIC (mg/L)	S/R
Penicillina screen	R	
Ampicillina	>32 (R)	
Amoxicillina/ clavulanato	24 (R)	
Ceftriaxone	2 (R)	
Cefotaxime	>32 (R)	
Ciprofloxacina	0.016 (S)	
Trometoprim/ sulfametossazolo	0.016 (S)	
Ertapenem	2 (R)	
Imipenem	1.05 (S)	



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