



DOSAGE OF ANTIBIOTICS (AVAIALBLE IN BELGIUM) IN ADULT PATIENTS INTEGRATING THE NEW EUCAST BREAKPOINT TABLES (VERSION 13;0 VALID AS FROMJANUAR1ST 2023)

Introduction

Following the recommendations from the Belgian National Antibiogram Committee (NAC), most microbiology laboratories in Belgium apply the European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines for the interpretation and reporting of antimicrobial susceptibility testing (AST) results.

The EUCAST recommendations have the advantage of considering microbiological, pharmacological, and clinical parameters in establishing breakpoints of sensitivity and resistance of bacteria to different antibiotics.

Important changes in the interpretation of AST have been introduced by EUCAST in 2019 and mostly result from the introduction of **a new "I" result category which now stands** for "susceptible at increased exposure". This new definition emphasizes the relationship between the concentration of the antimicrobial agent at the site of infection and the breakpoints for categorization (S, I and R).

There are now two categories of "susceptibility" which refers to the isolates categorized as S (susceptible at standard dosage) or I (susceptible at high dose). The latter highlights the importance of increasing the individual dose, the frequency of dosing, the route of administration and relying on the pharmacokinetics of agents at the infected site, which may all significantly increase the exposure. The creation of the new "I" category intends to promote the use of narrow-spectrum antibiotics with an "I" result by adjusting to the correct high posology, rather than switching to broader spectrum antibiotics prescribed at standard dosage (S result).

Below is a Belgian adaptation of the EUCAST recommendations and some dosages may not be identical to those in the EUCAST dosage table. These adaptations result from additional considerations: recent clinical data from the literature (e.g. temocillin and urinary tract infections) and/or specific therapeutical experience of nosocomial infections in Belgium for some agents (e.g. ceftazidime) leading to the general use of higher dosage instead of standard dosage recommended by EUCAST (expert opinion). High dosage regimens are still recommended for empirical treatment (without/before the susceptibility test results of the causative pathogen available).

How to read the table:

To achieve proper use of the new EUCAST definitions, one must ensure that the daily posology of antibiotics used locally matches with the dosage levels recommended. The table below shows the standard dosages and high dosages of each antibiotic (other than antimycobacterial agents). The standard dosages must be used for the treatment of infections with bacteria categorized as "susceptible to standard dosage" (S), and the high dosages are required for the treatment of infections with bacteria categorized as "susceptible to high dosage" (I).

These dosages apply to adult patients of normal weight (not obese), excluding the context of renal or hepatic impairment. **They may not fully apply to specific clinical situations that require higher dosages such as** septic shock, neutropenia, infective endocarditis, central nervous system infection, bone and joint infection, infection on prosthetic material, etc.

Higher dosages and/or longer infusion times for "time-dependent" antibiotics (β-lactams for example) can also make it possible to obtain the PK/PD targets of efficacy, but the risk of toxicity must be taken into account. For some antibiotics, proposed dosage regimens for continuous administration might require further adjustments, since the maximum duration of stability of the molecule must be considered.

For some antibiotics, when there is no I result according to EUCAST breakpoints, no high dose is recommended in the table.







ANTI-INFECTIVE AGENT	STANDARD DOSAGE (SD) FOR EUCAST "S" STRAINS	HIGH DOSAGE (HD) FOR EUCAST "I" STRAINS	COMMENTS
PENICILLINS			
Amoxicillin iv.	1 to 2 g every 8 hours ¹ .	2 g every 4 hours.	
Amoxicillin po.	500 mg every 8 hours.	1 g every 8 hours.	• Infections due to <i>Enterobacterales</i> : the SD ² can only be used to treat uncomplicated UTI ² .
Benzylpenicillin iv (penicillin G).	2 MIU ² every 6 hours ¹ .	2 to 4 MIU ² every 4 hours ¹ .	 Meningitis due to Streptococcus pneumoniae: strains with a MIC ≤ 0.06 μg/ml are susceptible to doses of 4 MIU² every 4 hours. Other infections due to Streptococcus pneumoniae: the dosage can be adjusted to the MIC₂ (if available): MIC² < 0.5 μg/ml: 2 MIU² every 6 hours. MIC² 1 μg/ml: 4 MIU² every 6 hours or 2 MIU₂ every 4 hours. MIC² 2 μg/ml: 4 MIU² every 4 hours.
Amoxicillin-clavulanate iv.	(1 g + 200 mg) every 6 to 8 hours.	[(2 g + 200 mg) every 8 hours] or [(1 g + 200 mg) every 4 hours].	
Amoxicillin-clavulanate po.	(500 mg + 125 mg) every 8 hours.	(875 mg + 125 mg) every 8 hours.	• Infections due to <i>Enterobacterales</i> : the SD ² can only be used to treat uncomplicated UTI ² .
Flucloxacillin iv.	1 to 2 g every 6 hours ¹ .	None ³ .	Dosages vary by indication (up to 2 g every 4 hours).
Flucloxacillin po.	1 g every 8 hours.	None ³ .	
Piperacillin-tazobactam iv.	[(4 g + 500 mg) every 6 hours] or [(4 g + 500 mg) every 8 hours by Extended 4-hour infusions].	[(4 g + 500 mg) every 6 hours by 4-hour extended infusions] or [(16 g + 2 g)/day by continuous infusion.	
Temocillin iv.	No more "S" results reported for Enterobacterales.	2 g every 8 or 12 hours.	 2 g every 12 hours may be used in the context of uncomplicated UTI² and of complicated UTI² with bacteraemia due to strains with a MIC² < 8 μg/ml. Other infections: (2 g every 8 hours) or [6 g/day by continuous infusion (after a loading dose of 2 g)].

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.







ANTI-INFECTIVE AGENT	STANDARD DOSAGE (SD) FOR EUCAST "S" STRAINS	HIGH DOSAGE (HD) FOR EUCAST "I" STRAINS	COMMENTS
CEPHALOSPORINS			
Cefadroxil po.	500 mg to 1 g every 12 hours.	None ³ .	
Cefalexin po.	500 mg every 6 hours.	None ³ .	
Cefazolin iv.	1 g every 8 hours ¹ .	2 g every 8 hours.	
Cefepime iv.	2 g every 8 hours [(1 g every 8 hours) or (2 g every 12 hours) in stable, non-obese patients with uncomplicated infections,].	2 g every 8 hours.	Severe infections due to <i>Pseudomonas aeruginosa</i> : [2 g every 8 hours by extended 4-hour infusions] or [6 g/day by continuous infusion (after a loading dose of 2 g over 30 minutes)].
Cefiderocol iv.	2 g every 8 hours by extended 8-hour infusions.	None ³ .	Currently not marketed in Belgium (consult hospital pharmacist).
Cefotaxime iv.	2 g every 8 hours.	(2 g every 8 hours over 30 minutes) or (2 g every 8 hours by extended 4-hour infusions).	Meningitis and other CNS² infections: 2 g every 4 hours.
Ceftaroline iv.	600 mg every 12 hours over 1 hour.	600 mg every 8 hours over 2 hours.	
Ceftazidime iv.	2 g every 8 hours [(1 g every 8 hours) or (2 g every 12 hours) in stable, non-obese patients with uncomplicated infections,].	2 g every 8 hours.	Severe infections due to <i>Pseudomonas aeruginosa</i> : [2 g every 8 hours by extended 4-hour infusions] or [6 g/day by continuous infusion (after a loading dose of 2 g over 30 minutes)].
Ceftazidime-avibactam iv.	(2 g + 500 mg) every 8 hours over 2 hours.	None ³ .	
Ceftolozane-tazobactam iv.	[(1 g + 500 mg) every 8 hours by extended infusion over 1 hour] or [(2 g + 1 g) every 8 hours over 1 hour] (see comments).		 Standard dosage. IA² infections and UTI²: [(1 g + 500 mg) every 8 hours by extended infusion over 1 hour. HAP² (including VAP2): (2 g + 1 g) every 8 hours over 1 hour.

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.







ANTI-INFECTIVE AGENT	STANDARD DOSAGE (SD) FOR EUCAST "S" STRAINS	HIGH DOSAGE (HD) FOR EUCAST "I" STRAINS	COMMENTS
CEPHALOSPORINS (continue	ed)		
Ceftriaxone iv.	2 g every 12 or 24 hours (see comments).		 Standard dosage. Meningitis and other CNS² infections, infections due to Staphylococcus aureus: 2 g every 12 hours. Other infections: 2 g every 24 hours. Uncomplicated gonorrhoea: single dose of 1 g im.
Cefuroxime iv.	1.5 g every 8 hours.	1.5 g every 8 hours.	
Cefuroxime axetil po.	500 mg every 8 hours.	500 mg every 8 hours.	
CARBAPENEMS, MONOBACT	TAMS		
Aztreonam iv.	1 to 2 g every 8 hours ¹ .	2 g every 6 hours.	 Severe infections due to Pseudomonas aeruginosa: 2 g every 6 hours by extended 3-hour infusions.
Meropenem iv.	1 g every 8 hours.	2 g every 8 hours by extended 3-hour infusions.	
Meropenem-vaborbactam iv.	(2 g + 2 g) every 8 hours by extended 3-hour infusions.		
AZALIDES, LINCOSAMIDES, (NEO)MACROLIDES		
Azithromycin po.	500 mg every 24 hours.	None ³ .	
Clarithromycin po.	500 mg every 12 hours.	None ³ .	
Clarithromycin iv.	500 mg every 12 hours.	None ³ .	
Clindamycin iv.	600 mg every 8 hours.	None ³ .	Dosages vary by indication [up to (900 mg every 8 hours) or (600 mg every 6 hours)].
Clindamycin po.	300 mg every 6 to 8 hours ¹ .	None ³ .	Dosages vary by indication (up to 600 mg every 8 hours).
Erythromycin iv.	500 mg every 6 to 8 hours.	None ³ .	Dosages vary by indication.
Roxithromycin po.	150 mg every 12 hours.	None ³ .	

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.







ANTI-INFECTIVE AGENT	STANDARD DOSAGE (SD) FOR EUCAST "S" STRAINS	HIGH DOSAGE (HD) FOR EUCAST "I" STRAINS	COMMENTS
TETRACYCLINES			
Doxycycline po.	100 mg every 12 hours.	None ³ .	
Minocycline po.	100 mg every 12 hours.	None ³ .	
Tigecycline iv.	1 loading dose of 100 mg,	None ³ .	
	followed, starting 12 hours after		
	the start of the loading dose, by		
	50 mg every 12 hours.		
FLUOROQUINOLONES			
Ciprofloxacin iv.	400 mg every 12 hours.	400 mg every 8 hours.	
Ciprofloxacin po.	500 mg every 12 hours.	750 mg every 12 hours.	
Levofloxacin iv.	500 mg every 24 hours.	500 mg every 12 hours.	
Levofloxacin po.	500 mg every 24 hours.	500 mg every 12 hours.	
Moxifloxacin iv.	400 mg every 24 hours.	None ³ .	
Moxifloxacin po.	400 mg every 24 hours.	None ³ .	
Ofloxacin po.	400 mg every 12 hours.	400 mg every 12 hours.	
1 MINIO 01 V 00 01 D 50			
AMINOGLYCOSIDES	1051 00 "	L. 1152 1 6	
Amikacin iv.	25 to 30 mg/kg every 24 hours.	No HD ² defined.	• If treatment duration exceeds 3 days, TDM² indicated.
Gentamicin iv.	5 to 7 mg/kg every 24 hours.	No HD ² defined.	• (3 mg/kg every 24 hours) or (1 mg/kg every 8 hours) for the treatment of endocarditis. TDM ² indicated.
			 If treatment duration exceeds 3 days (other indications than endocarditis), TDM² indicated.
Tobramycin iv.	5 to 7 mg/kg every 24 hours.	No HD ² defined.	If treatment duration exceeds 3 days, TDM² indicated.

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.







ANTI-INFECTIVE AGENT	STANDARD DOSAGE (SD) FOR EUCAST "S" STRAINS	HIGH DOSAGE (HD) FOR EUCAST "I" STRAINS	COMMENTS
GLYCOPEPTIDES			
Teicoplanin iv.	5 loading doses of 10 to 12 mg/kg administered with intervals of 12 hours on days 1 to 3, followed, as from day 4, by TDM ² guided doses of 6 to 12 mg/kg every 24 hours ¹ .	None ³ .	 Dosages vary by indication. Target trough concentration for uncomplicated infections due to MRSA²: 15 to 30 μg/ml. Target trough concentration in patients with severe or complicated infections due to MRSA²: 20 to 40 μg/ml. TDM² should not be started during the first 4 treatment days.
Vancomycin iv.	 1 loading dose of 25 to 30 mg/kg over 2 hours, followed immediately by a TDM² guided continuous infusion of 30 to 40 mg/kg/day. 1 loading dose of 25 to 30 mg/kg over 1 hour, followed (12 hours after the start of the loading dose) by a TDM² guided intermittent infusion of ± 15 mg/kg every 12 hours. 	None ³ .	 Dosages vary by indication. Target concentration of 20 to 30 μg/ml in case of TDM² guided continuous infusion. Target trough concentration of 15 to 20 μg/ml in case of TDM² guided intermittent infusions.
MISCELLANEOUS ANTIBIOTIC	OS .		
Colistin iv.	1 loading dose of 9 MIU ² , followed, starting 12 hours after the start of the loading dose, by 4.5 MIU ² every 12 hours.	None ³ .	
Fidaxomicin po.	200 mg every 12 hours.	None ³ .	
Fosfomycin iv.	16 to 18 g/day div in 3 or 4 doses.	None ³ .	Dosages vary by indication.Currently not marketed in Belgium (consult hospital pharmacist).
Fosfomycin (trometamol) po.	Single dose of 3 g.	None ³ .	Only indicated for the treatment of uncomplicated UTI ² .
Linezolid iv.	600 mg every 12 hours.	None ³ .	

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.



Société belge d'infectiologie et de microbiologie clinique

Belgische vereniging voor infectiologie en klinische microbiologie





ANTI-INFECTIVE AGENT	STANDARD DOSAGE (SD) FOR EUCAST "S" STRAINS	HIGH DOSAGE (HD) FOR EUCAST "I" STRAINS	COMMENTS	
MISCELLANEOUS ANTIBIOTIC	MISCELLANEOUS ANTIBIOTICS (continued)			
Linezolid po.	600 mg every 12 hours.	None ³ .		
Metronidazole iv.	500 mg every 8 hours.	None ³ .		
Metronidazole po.	500 mg every 8 hours.	None ³ .		
Nitrofurantoin po.	100 mg every 6 to 8 hours.	None ³ .	Only indicated for the treatment of uncomplicated UTI ² .	
Rifampicin iv.	600 mg every 24 hours.	None ³ .		
Rifampicin po.	600 mg every 24 hours.	None ³ .		
Trimethoprim +	(160 mg + 800 mg) every 12	(240 mg + 1.2 g) every 12 hours.	Higher dosages (maximum 960 mg + 4.8 g per day) are required in	
sulfamethoxazole iv.	hours.		some conditions:	
			 Infections due to Stenotrophomonas maltophilia: (4 mg + 20 	
			mg)/kg every 8 to 12 hours (maximum 960 mg + 4.8 g per day).	
			o Infections due to <i>Pneumocystis jirovecii</i> : (4 to 5 mg + 20 to 25	
			mg)/kg every 6 hours.	
Trimethoprim +	(160 mg + 800 mg) every 12	(240 mg + 1.2 g) every 12 hours.	Higher dosages (maximum 960 mg + 4.8 g per day) are required in	
sulfamethoxazole po.	hours.		some conditions:	
			 Infections due to Stenotrophomonas maltophilia: (4 mg + 20 	
			mg)/kg every 8 to 12 hours (maximum 960 mg + 4.8 g per day).	
			o Infections due to <i>Pneumocystis jirovecii</i> : (4 to 5 mg + 20 to 25	
			mg)/kg every 6 hours.	

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.







Participated in the redaction of this document.

For SBIMC-BVIKM: Pha Caroline BRIQUET (clinical pharmacology, Cliniques Universitaires Saint-Luc Bruxelles), Prof Dr Bénédicte DELAERE (infectiology, CHU UCL-Namur), Prof Dr Deborah DE GEYTER (microbiology, UZ Brussel), Pha Lotte DE SCHEPPER (clinical pharmacology, UZ Gent), Dr Andrea NEBBIOSO (paediatrics, Hôpitaux Iris-Sud/Iris Zuid Ziekenhuizen Ixelles/Elsene), Prof Dr Denis PIÉRARD (microbiology, VUB Brussel), Dr Luit TEN KATE (infectiology, UZ Antwerpen), Pha Jennifer DE WEERT (BVIKM-SBIMC), BSci Jan VANCAUWENBERGHE (BVIKM-SBIMC).

For NAC: Prof Dr Jerina BOELENS (microbiology, UZ Gent), Dr Laetitia BRASSINE (microbiology, Cliniques de l'Europe/Europaziekenhuizen, Uccle/Ukkel), Prof Dr Olivier DENIS (microbiology (CH UCL-Namur), Pha Clin Biol Julie DESCY (microbiology, Clinique André Renard, Liège), Pha Clin Biol Stefanie DE SMET (microbiology, UZ Leuven), Dr Sarah Gils (microbiology, MCH Leuven), Dr Bénédicte LISSOIR (microbiology, GHdC, Charleroi), Dr Koen MAGERMAN (microbiology, Jessaziekenhuis Hasselt), Prof Dr Veerle MATHEEUSSEN (microbiology, UZ Antwerpen), Prof Dr Hector RODRIGUEZ (microbiology, Cliniques Universitaires Saint-Luc Bruxelles), Prof Dr Daniel TE-DIN HUANG (chair, microbiology, CHU-UCL Namur), Dr Anne-Marie VAN DEN ABEELE (microbiology, AZ Sint-Lucas Gent), Prof Dr Ingrid WYBO (microbiology, UZ Brussel), Dr Nicolas YIN (microbiology, LHUB-ULB Bruxelles).

- 1. A higher dosage is recommended in specific clinical conditions (endocarditis, meningitis, osteomyelitis, ...).
- 2. CNS = central nervous system, HD = high dosage, MIC = minimal inhibitory concentration, HAP = hospital acquired pneumonia, IA = intra-abdominal, MIU = million inter-national units, MRSA = methicillin-resistant *Staphylococcus aureus*, SD = standard dosage, TDM = therapeutic drug monitoring, UTI = urinary tract infection, VAP = ventilator associated pneumonia.
- 3. No "I" results according to EUCAST breakpoints and/or no high dosage defined.