

Antimicrobial Reference Laboratory

GUIDELINE RANGES FOR TDM

2026 – 2027

Antimicrobial Reference Laboratory – Guideline Ranges 2026 – 2027

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General Laboratory details

Antimicrobial Reference Laboratory

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Important Changes: This Version 2026-2027
Bedaquiline, Cefazolin and Favipiravir assays under development – currently not available.
Page 5 & 9 – Amikacin Three times a week (TIW) range added.
Page 10 – New test Albendazole Sulfoxide added.

Please state if a non-serum/plasma sample is being sent clearly on the request form and if there is a biohazard risk.

For sample requirements, request form and further information please visit our website:

www.nbt.nhs.uk/severn-pathology/pathology-services/antimicrobial-reference-laboratory

Due to the merger of UHBW and NBT all email addresses will be moved to NHS.net account. A new version will be released with updated contact details.

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TDM preface

Despite advances in antimicrobial therapy, a significant proportion of patients with infection suffer with negative clinical outcomes driven by non-modifiable factors such as age, co-morbidities and severity of infection. With rising antimicrobial resistance (AMR) and a decline in the availability of newer agents, optimising the existing therapeutic agents by applying pharmacokinetic/pharmacodynamic (PK/PD) principles has become a priority in clinical practice.

Therapeutic drug monitoring (TDM) of antimicrobial agents has been used for a number of antimicrobials for decades; mainly to monitor efficacy and prevent dose-related adverse drug reactions.

In recent years, application of TDM has been extended across a wider range of agents as an Antimicrobial Stewardship Strategy (AMS) against growing AMR.

Modern healthcare professionals/organisations are faced with more complex clinical needs with age (extremes of low and high), body habitus with a wide range of Body Mass Indices (BMI), multi-organ co-morbidities and polypharmacy leading to drug-drug interactions. There is a growing pressure amongst clinicians to adopt new technologies to achieve “precision dosing” with a widespread use of TDM in the belief that such intervention will improve patient outcomes. However, hard evidence in the form of Randomised Controlled Trials (RCT) to support such a notion are lacking.

Therefore, therapeutic ranges quoted in this document should be used as a “guide” in terms of patient management rather than as a therapeutic “target” to achieve taking into consideration all the infection related factors including host, pathogen, clinical and antimicrobial options.

We welcome discussion from clinicians in terms of indications, timings, sample type/container, logistics, transport, and interpretation of results on a case-by-case basis. Therefore, please do not hesitate to contact us with the above details during the days and timings specified in this document.

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Aminoglycosides

Agent	Risk group	Expected levels (Guidelines) (mg/L)	Re-assay interval* (days)
Tobramycin (5mg or 7mg/kg Once-daily) ^a	All patients between 2nd-4th dose, earlier if changing renal function, established renal failure, age, or concomitant nephrotoxic drugs.	Pre: <1 mg/L Post: >10 mg/L or 8h post dose (if patient is on 5 mg/kg dose) ^{a1} : 1.5 - 6 mg/L follow Hartford nomogram ^{a2} (if patient is on 7 mg/kg dose)	3
Tobramycin (1 – 1.5mg/kg BD or TDS) ^b		Gram-negative sepsis or pneumonia Pre: <2 mg/L Post: 5 – 10 mg/L Infective endocarditis (IE) Pre: <1 mg/L Post: 3-5 mg/L	3
Amikacin (15mg/kg Once-daily) ^{a,c}		Pre: <5 mg/L Post: 40 - 45 [†] mg/L	6-8
Amikacin (7.5mg/kg BD or TDS) ^d		Pre: <10 mg/L Post: 20 - 30 mg/L	3-7
Amikacin (25mg/kg, TIW) ^f		Pre: <5 mg/L Post: 65-80 mg/L	7-14
Streptomycin (7.5 mg/kg BD) ^{b,e}		Infective endocarditis Pre: <3.0 mg/L Post: 10 - 25 mg/L	7-28

* Assuming initial results are within the expected range

^{a1} Urban & Craig Normogram- [SHC-Aminoglycoside-Dosing-Guide.pdf](#)

^{a2} Nicolau et al. 1995. Antimicrobial Agents & Chemotherapy 39:650-655.

^b Elliott et al. 2004. Journal of Antimicrobial Chemotherapy 54: 971-81.

^c Jenkins et al. 2016. Journal of Antimicrobial Chemotherapy 71: 2754-59. [†] Guideline levels not available; these are levels that are routinely seen.

^d British National Formulary, ©NICE; July 2026 <https://bnf.nice.org.uk/drugs/amikacin/#monitoring-requirements>

^e Note: these are different to the AHA Scientific Statement ranges. Baddour et al. 2015. Circulation 132:1435-86.

^f BTS 2017 Guidelines.

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Glycopeptides/Lipopeptides/Oxazolidinones

Agent	Risk group	Expected levels (Guidelines) (mg/L)	Re-assay interval* (days)
Teicoplanin ^{a,b,c}	a) Skin and soft tissue infection b) Bone and Joint infection d) Infective endocarditis e) OPAT on 25 mg/kg 3x per week	Pre: 15 - 30 but <60 mg/L Pre: 20 - 40 but <60 mg/L Pre: 30 - 40 but <60 mg/L Pre: 20 - 30 mg/L	6-8
Daptomycin ^d (6 - 8mg/kg dose)	Patients with -CPK elevation -high dose therapy (>6 mg/kg) - renal impairment -poor clinical response -endocarditis	Pre: 5 – 24.3 mg/L Superficial infection including cellulitis Pre: 10 – 24.3 mg/L Severe sepsis or deep-seated infection, bacteremia and endocarditis. Pre: >24.3 mg/L associated with increased risk of toxicity ^d	6-8
Linezolid (600mg BD) ^{e,f}	Patients on long-term therapy (>28d) or if on agents with potential drug interactions	Pre: 2 - 8 mg/L Post: 12 - 26 mg/L	8-16

*Assuming initial results are within the expected range

^aTeicoplanin: Summary of Product Characteristics. 2013. European Medicines Agency. Assessment report:

Targocid and associated names. 2014. EMEA/H/A-30/1301. European Medicines Agency.

^bLamont et al, 2009. Journal of Antimicrobial Chemotherapy 64: 181-187.

^cHanai et al. 2022. Journal Antimicrobial Chemotherapy 77: 869-879.

^dBhavnani et al. 2010. Clinical Infectious Diseases 50: 1568-74. Falcone et al. 2013. J. Infection Chemotherapy 19 :732-9, DiPaolo et al. 2013. Int J. Antimicrobial Agents 42 :250-5, Falcone et al. 2013. CID 57 :1568-76, Reiber et al. 2015 Therapeutic Drug Monitoring, 37 :634-40.

^ePea et al. 2012. JAC 67:2034-42. Dong et al. 2014. Eur J. Clinical Microbiology & Infectious Diseases, Epub 12/02/14

^fMatsumoto et al. 2014. International Journal of Antimicrobial Agents 44:242-7. Cattaneo et al. 2016. Expert Opin Drug Metab. Toxicol. 12:533-44

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Antifungal agents

Agent	Risk group	Expected levels (Guidelines) (mg/L)	Re-assay interval* (days)
Flucytosine ^a	Routine within 72h of starting therapy.	Pre: 20 - 50 mg/L Post: 50 - 100 mg/L Pre dose concentrations <20 mg/L have been associated with treatment failure and emergence of resistance. Post dose concentrations >100 mg/L have been associated with toxicity.	4-8
Isavuconazole ^b	Not routinely monitored but may be useful in complex cases or in renal impairment	Pre: 2 - 4 mg/L (usually)	4-8
Itraconazole ^{a, c}	Routine in 1 st week of therapy. Measure 4-7 days after starting therapy	Prophylaxis: Pre: 0.5 - 4.0 mg/L Therapy: Pre: 1.0 - 4.0 mg/L All pre dose levels to be kept below 4.0 mg/L	4-8
Fluconazole ^a	Not routinely monitored but may be useful in complex cases or renal failure	AUC:MIC ratio of >100, call for advice on sampling.	4-8
Posaconazole ^{a,c,d}	Routine in majority of patients. Measure 3-8 days after starting therapy	Prophylaxis: Pre: 0.7 - 3.75 mg/L Therapy: Pre: 1.0 - 3.75 mg/L All pre-dose levels to be kept below 3.75 mg/L	4-8
Voriconazole ^{a,c,e}	Routinely within 5d of starting therapy	Prophylaxis and therapy Pre: 1.0 - 5.5 mg/L or 2.0 - 5.5 mg/L for bulky or disseminated infections	4-8

*Assuming initial results are within the expected range.

^aVermes et al. 2000. Journal of Antimicrobial Chemotherapy 46: 171-179. Ashbee et al. 2014. J. Antimicrobial Chemotherapy 69:1162-1176.

^bBorman et al. 2020. Med Mycol 58 (7): 996-999. ^ Levels that are routinely seen and not true expected levels.

^cAndes et al. 2009. Antimicrobial Agents and Chemotherapy 53: 24-34. Dolton et al. 2015. Current Opinion in Infectious Diseases 27:493-500. Chau et al. 2014 Intern Med J 44:1364-88.

^dDolton et al. 2012. Antimicrobial Agents and Chemotherapy 56: 2806-2813. Dekkers et al. 2016. Curr Fung Infect Rep 10:51-61.

^ePascual et al. 2012. Clinical Infectious Diseases 55:381-90.

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Agents used in Mycobacterial infection^a

Agent	Risk group	Expected levels (Guidelines) (mg/L)	Re-assay interval* (days)
Streptomycin ^b (15 mg/kg OD)	All patients after 2nd-4th dose.	Pre: <5 mg/L in <50y patients Pre: <1 mg/L in >50y patients or patients with renal impairment Post: 15 - 40 mg/L	7-28d
Streptomycin ^c (25 mg/kg BIW)	All patients after 2nd-4th dose.	Pre: <1 mg/L Post: 65 - 80 mg/L	7-28d
Rifampicin ^c ARL recommends: PRE dose sample: up to 1h before dose. POST dose samples: ORAL 1, 2 and 4h after dose. IV 1h after dose.	Patients with -poor clinical progression -poor compliance -malabsorption -drug-drug interaction	Pre: <0.5 mg/L (ideally) Post: <4 mg/L sub-therapeutic Post: 4 - 8 mg/L usually adequate Post: 8 - 24 mg/L ideal	Depending on levels, any dose adjustments & progression
Ethambutol ^{c,d} (15mg/kg OD) (BIW 50mg/kg)	Patients with -poor clinical progression - renal dysfunction -difficulties to assess visual impairment	Pre: <1 mg/L Post: 2 - 6 mg/L Pre: <1 mg/L Post: 4-12 mg/L	Depending on levels, any dose adjustments & progression
Rifabutin ^e ARL recommends: PRE dose sample: up to 1h before dose. POST dose samples: ORAL 1, 2 and 4h after dose. IV 1h after dose.	Patients who fail to respond to treatment. Patients on agents with CYP P450 interactions	Pre: <0.1 mg/L (usually) Post: 0.45 - 0.9 mg/L	Depending on levels, any dose adjustments & progression
Levofloxacin ^e	Patients being treated for MDR TB.	Pre: 0.5 - 2 mg/L Post: 8 - 13 mg/L	Depending on levels, any dose adjustments & progression
Cycloserine ^e	All patients after 4th-6th dose.	Pre: 10 - 20 mg/L Post: (3-4h) 20 - 35 mg/L Levels to be kept below 35 mg/L	10-30d
Moxifloxacin ^e	Patients being treated for MDR TB.	Pre: 0.3 - 0.7 mg/L Post: 3 - 5 mg/L	Depending on levels, any dose adjustments & progression

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Agents used in Mycobacterial infection^a

Continued.....

Agent	Risk group	Expected levels (Guidelines) (mg/L)	Re-assay interval* (days)
Linezolid ^{f,d} (600 mg OD oral) (600 mg BD oral)	Patients being treated for MDR TB.	Pre: <2 mg/L (ideally) Post: 12 - 26 mg/L Pre: 3 - 9 mg/L (usually) Post: 12 - 26 mg/L	Depending on levels, any dose adjustments & progression
Isoniazid ^g (+N-Acetyl-Isoniazid)	Patients with -poor clinical progression -risk of rapid acetylation -poor compliance or malabsorption	Post: (2hr) 3 - 5 mg/L	Depending on levels, any dose adjustments & progression
Amikacin (25mg/kg, TIW) ^h	All patients between 2 nd - 4 th dose, earlier if changing renal function, established renal failure, age, or concomitant nephrotoxic drugs.	Pre: <5 mg/L Post: 65 - 80 mg/L	7-14

* Assuming initial results are within the expected range. BIW: twice a week. TIW: three times a week

^aAssuming that patients are on standard (usually daily) therapy, for patients on intermittent therapy please call to discuss expected levels as these will vary depending on dosing regimen used.

^bBritish National Formulary, ©NICE; July 2026 [Streptomycin](#) | [Drugs](#) | [BNF](#) | [NICE](#)

^cPeloquin 2017. Microbiol Spectrum 5:1-8. Pasipanodya et al. 2013. J. Infectious Diseases 208:1464-73.

^eHolland et al. 2009. Pharmacotherapy 29:503-10. Srivastava et al. 2013. European Respiratory Journal, 42:1449-53. Ramachandran et al, 2015, Drug Safety, 38:253-69. Peloquin 2017. Microbiol Spectrum 5:1-8. Hwang et al. 2013. Int J. Tuberc Lung Dis 17:1257-66. Park et al. 2017. AAC 59:4429-4435

^fSchechter et al. 2010. CID 50: 49-55; McGee et al. 2009. Antimicrobial Agents & Chemotherapy 53: 3981-3984.

Dong et al. 2014. Eur J. Clinical Microbiology & Infectious Diseases, Epub 12/02/14

^gPotter et al, 2020. MDRTB ADR Monitoring Guidance. TB Drug Monographs

^hBTS 2017 Guidelines.

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Other agents

Agent	Risk group	Expected levels (Guidelines) (mg/L)	Re-assay interval* (days)
Aciclovir and its metabolite CMMG ^a	Patients with -renal impairment -on high dose therapy -exhibiting CNS toxicity	For Aciclovir, interpretation of levels needs to be patient specific CMMG: Measured in Pre-dose levels ONLY. Pre: CMMG $\leq$ 2.6 mg/L. Elevated CMMG levels are associated with increased risk of neurotoxicity.	6-8
Ganciclovir ^b	-Young children -Renal impairment or unstable renal function	Pre: 0.5 -1.0 mg/L (prophylaxis) Pre: 1.0 – 2.0 mg/L (therapy) Post: 7 - 9 mg/L (Ganciclovir) Post: 5 - 7 mg/L (Valganciclovir)	4-8
Chloramphenicol ^c	All patients but especially neonates.	Pre: Ideally <10 mg/L but must be <15 mg/L Post: (2h) 10 - 25 mg/L	5-7
Co-trimoxazole ^d (sulphamethoxazole + trimethoprim) ^e	Receiving high-dosage therapy (e.g. Listeria meningitis, PCP) or renal impairment.	Sulphamethoxazole; Pre: <100 mg/L, Post: 120 - 150 but <200 mg/L Trimethoprim; Pre: 5 - 7 mg/L, Post: 5 - 10 but <20 mg/L	6-8
Colistin ^f	All patients on IV treatment	Pre: 2 - 4 mg/L	Day 2-3 (if patient receives a loading dose) Re-assay 5-7d
Albendazole Sulfoxide (ALB-SO) (Standard adult oral dose - 400mg BD)	All patients after 2 weeks of therapy	Post: (3-4h) 0.5 - 1.7 mg/L	Monthly, unless outside the therapeutic range or dose adjustments

*Assuming initial results are within the expected range

^aHellden et al. 2003. Nephrol. Dial. Transplant 18: 1135-1141

^bLuck et al. 2011 International Journal of Antimicrobial Agents 37:445-448. Marston et al J Antimicrob Chemother 2021; 76: 2356–2363. Franck et al Clin Pharmacol Ther, 112: 233-276. <https://doi.org/10.1002/cpt.2431>

^cBritish National Formulary for Children. 2018-19 p354

^dBrown. 2014. Ann Int Care 4:13-22

^eJoos et al. 1995. Antimicrobial Agents & Chemotherapy 39:2661-2666.

^fNation et al. 2014. Lancet Infectious Diseases S1473-3099. Gregorie et al. 2017. Clin Pharmacokinet 56:1441-1460.

Antibiotic Guideline Ranges

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