

Appendix 4: Bacterial Meningitis

Table 1: Recommendations for Empiric antimicrobial therapy for purulent meningitis based on patient age and specific predisposing condition*		
Predisposing factor	Common bacterial pathogens	Antimicrobial therapy
Age		
<1 month	Streptococcus agalactiae, Escherichia coli, Listeria monocytogenes	Ampicillin + cefotaxime; OR ampicillin + an aminoglycoside
1 to 23 months	Streptococcus pneumoniae, Neisseria meningitidis, S. agalactiae, Haemophilus influenzae, E. coli	Vancomycin + Ceftriaxone or cefotaxime Δ∅
2 to 50 years	N. meningitidis, S. pneumoniae	Vancomycin + Ceftriaxone or cefotaxime Δ∅
>50 years	S. pneumoniae, N. meningitidis, L. monocytogenes, aerobic gram-negative bacilli	Vancomycin+ ampicillin + Ceftriaxone or cefotaxime Δ
Head trauma		
Basilar skull fracture	S. pneumoniae, H. influenzae, group A beta-hemolytic streptococci	Vancomycin + Ceftriaxone or cefotaxime Δ
Penetrating trauma	Staphylococcus aureus, coagulase-negative staphylococci (especially Staphylococcus epidermidis), aerobic gram-negative bacilli (including Pseudomonas aeruginosa)	Vancomycin + cefepime; OR vancomycin + ceftazidime; OR vancomycin + meropenem
Post neurosurgery	Aerobic gram-negative bacilli (including P. aeruginosa), S. aureus, coagulase-negative staphylococci (especially S. epidermidis)	Vancomycin + cefepime; OR vancomycin + ceftazidime; OR vancomycin + meropenem
Immunocompromised state	S. pneumoniae, N. meningitidis, L. monocytogenes, aerobic gram-negative bacilli (including P. aeruginosa)	Vancomycin + ampicillin + cefepime; OR vancomycin + meropenem§
* For recommended dosages for adults, refer to the UpToDate table on recommended intravenous dosages of antimicrobial therapy for adults with bacterial meningitis.		
Δ Some experts would add rifampin if dexamethasone is also given.		
∅ Add ampicillin if meningitis caused by Listeria monocytogenes is suspected.		
§ Meropenem provides sufficient coverage for Listeria when used as part of an initial regimen. However, if Listeria is identified, the patient should generally be switched to a regimen that includes ampicillin. Refer to the UpToDate topic that discusses treatment of Listeria for a discussion of regimen selection.		

Table 2: Recommendations for specific antimicrobial therapy of bacterial meningitis based on isolated pathogen and susceptibility testing

PATHOGEN	lab results	RECOMMENDED THERAPY (1st line options)	DAYS OF THERAPY	ALTERNATIVE THERAPY (2 nd line agents or in case of intolerance of recommended therapy)
Streptococcus pneumoniae	Penicillin MIC: < 0.1 mcg per mL	Penicillin or ampicillin	10 to 14	Ceftriaxone or Cefotaxime
	Penicillin MIC: 0.1 to 1 mcg per mL	Ceftriaxone or Cefotaxime		cefepime, Meropenem (C-III), moxifloxacin (B-II) or chloramphenicol
	Penicillin MIC: ≥ 2 mcg per mL or Ceftriaxone MIC: ≥ 1 mcg per mL	Vancomycin + Ceftriaxone or Cefotaxime		
	Ceftriaxone MIC: > 1 mcg per mL	Vancomycin + Ceftriaxone or Cefotaxime ± rifampin		
Neisseria meningitidis	Penicillin MIC < 0.1 mcg/mL	Penicillin G or ampicillin	5 to 7	Ceftriaxone or Cefotaxime
	Penicillin MIC 0.1 to 1.0 mcg/mL	Ceftriaxone or Cefotaxime		moxifloxacin, ciprofloxacin or meropenem or Chloramphenicol
Hemophilus influenzae	Beta-lactamase negative	ampicillin	at least 7	Ceftriaxone or Cefotaxime or cefepime, fluoroquinolone
	Beta-lactamase positive	Ceftriaxone or Cefotaxime (A-I)	7 to 10	Cefepime, moxifloxacin, aztreonam, chloramphenicol
Streptococcus agalactiae (group B streptococcus)	Usually in children	Ampicillin or penicillin G ± Gentamicin	14 to 21	Vancomycin or cefotaxime (B-III)
Listeria monocytogenes		Ampicillin or Penicillin G ± Gentamicin	ampicillin: 21, Gentamicin (For 7 to 10 days and 21 in poor responders)	Trimethoprim/sulfamethoxazole (If a penicillin- or cephalosporin-allergic patient cannot be desensitized to ampicillin)
Enterobacteriaceae		Ceftriaxone, ceftazidime, or cefepime (A-II) ± Gentamicin	21 to 28	Ciprofloxacin, aztreonam, meropenem, or trimethoprim/sulfamethoxazole
Staphylococci	Methicillin susceptible	Nafcillin or oxacillin	Seven to 10 days after shunt removal or cerebrospinal fluid sterilization	Vancomycin, meropenem, linezolid, daptomycin
	Methicillin resistant	Vancomycin ± rifampin		Daptomycin or linezolid, (B-III) consider adding rifampin
Pseudomonas aeruginosa		Cefepime or ceftazidime	21	Aztreonam, ciprofloxacin, meropenem
Enterococcus species	if Ampicillin susceptible	Ampicillin + Gentamicin		linezolid (if Ampicillin and vancomycin resistant linezolid will be used as the recommended exclusive sole therapy)
	if Ampicillin resistant	Vancomycin + gentamicin		
Staphylococcus epidermidis		Vancomycin ± rifampin		linezolid