

Microorganism, susceptibility	Standard therapy	Alternative therapies
Streptococcus pneumoniae		
Penicillin MIC		
<0.1 µg/mL	Penicillin G or ampicillin	Third-generation cephalosporin, ^a chloramphenicol
0.1–1.0 µg/mL ^b	Third-generation cephalosporin ^a	Cefepime (B-II), meropenem (B-III)
≥2.0 µg/mL	Vancomycin plus a third-generation cephalosporin ^{a,c}	Fluoroquinolone ^d (B-II)
Cefotaxime or ceftazidime MIC ≥1.0 µg/mL	Vancomycin plus a third-generation cephalosporin ^{a,c}	Fluoroquinolone ^d (B-II)
Neisseria meningitidis		
Penicillin MIC		
<0.1 µg/mL	Penicillin G or ampicillin	Third-generation cephalosporin, ^a chloramphenicol
0.1–1.0 µg/mL	Third-generation cephalosporin ^a	Chloramphenicol, fluoroquinolone, meropenem
Listeria monocytogenes		
	Ampicillin or penicillin G ^e	Trimethoprim-sulfamethoxazole, meropenem (B-III)
Streptococcus agalactiae		
	Ampicillin or penicillin G ^e	Third-generation cephalosporin ^a (B-II)
Escherichia coli and other Enterobacteriaceae^f		
	Third-generation cephalosporin (A-I)	Aztreonam, fluoroquinolone, meropenem, trimethoprim-sulfamethoxazole, ampicillin
Pseudomonas aeruginosa^g		
	Cefepime ^h or ceftazidime ^h (A-II)	Aztreonam, ⁱ dipiroxacin, ⁱ meropenem ⁱ
Haemophilus influenzae		
β-Lactamase negative		
	Ampicillin	Third-generation cephalosporin, ^a cefepime, chloramphenicol, fluoroquinolone
β-Lactamase positive		
	Third-generation cephalosporin (A-I)	Cefepime (A-I), chloramphenicol, fluoroquinolone
Staphylococcus aureus		
Methicillin susceptible		
	Nafcillin or oxacillin	Vancomycin, meropenem (B-III)
Methicillin resistant		
	Vancomycin ^j	Trimethoprim-sulfamethoxazole, linezolid (B-III)
Staphylococcus epidermidis		
	Vancomycin ^j	Linezolid (B-III)
Enterococcus species		
Ampicillin susceptible		
	Ampicillin plus gentamicin	...
Ampicillin resistant		
	Vancomycin plus gentamicin	...
Ampicillin and vancomycin resistant		
	Linezolid (B-III)	...

NOTE. All recommendations are A-II, unless otherwise indicated.
^a Ceftriaxone or cefotaxime.
^b Ceftriaxone/cefotaxime-susceptible isolates.
^c Consider addition of rifampin if the MIC of ceftriaxone is >2 µg/mL.
^d Gatifloxacin or moxifloxacin.
^e Addition of an aminoglycoside should be considered.
^f Consider addition of rifampin.
^g Choice of a specific antimicrobial agent must be guided by in vitro susceptibility test results.

Microorganism	Duration of therapy, days
<i>Neisseria meningitidis</i>	7
<i>Haemophilus influenzae</i>	7
<i>Streptococcus pneumoniae</i>	10–14
<i>Streptococcus agalactiae</i>	14–21
Aerobic gram-negative bacilli ^a	21
<i>Listeria monocytogenes</i>	≥21

^a Duration in the neonate is 2 weeks beyond the first sterile CSF culture or ≥3 weeks, whichever is longer.

neonates:

- there are insufficient data to make a recommendation on the use of adjunctive dexamethasone in neonates with bacterial meningitis

children:

- adjunctive dexamethasone (0.15 mg/kg every 6 h for 2–4 days) has confirmed benefit for *H. influenzae* type b meningitis and, if commenced with or before antimicrobial therapy, suggested benefit for pneumococcal meningitis in children. Evidence of clinical benefit was greatest for hearing outcomes.

adults:

- level one evidence supports the use of dexamethasone (0.15 mg/kg q6h for 2–4 days with the first dose administered 10–20 min before, or at least concomitant with, the first dose of antimicrobial therapy) in adults with suspected or proven pneumococcal meningitis
 - Dexamethasone should only be continued if the CSF Gram stain reveals gram-positive diplococci, or if blood or CSF cultures are positive for *S. pneumoniae*.
 - Adjunctive dexamethasone should not be given to adult patients who have already received antimicrobial therapy, because administration of dexamethasone in this circumstance is unlikely to improve patient outcome
 - The data are inadequate to recommend adjunctive dexamethasone to adults with meningitis caused by other bacterial pathogens
 - Concerns have been raised about whether use of adjunctive dexamethasone may be harmful in patients with pneumococcal meningitis caused by highly penicillin- or cephalosporin-resistant strains; these patients may require antimicrobial therapy with vancomycin, and the diminished inflammatory response induced by dexamethasone might reduce CSF vancomycin penetration and delay CSF sterilization. This finding has been observed in experimental animal models of resistant pneumococcal meningitis

specific antimicrobial therapy

criteria for CT prior to lumbar puncture

therapy based on presumptive gram stain identification

duration of therapy

bacterial meningitis
 (created by Paul Young 02/10/07)

empirical therapy

the role of dexamethasone

Criterion	Comment
Immunocompromised state	HIV infection or AIDS, receiving immunosuppressive therapy, or after transplantation
History of CNS disease	Mass lesion, stroke, or focal infection
New onset seizure	Within 1 week of presentation; some authorities would not perform a lumbar puncture on patients with prolonged seizures or would delay lumbar puncture for 30 min in patients with short, convulsive seizures
Papilloedema	Presence of venous pulsations suggests absence of increased intracranial pressure
Abnormal level of consciousness	...
Focal neurologic deficit	Including dilated nonreactive pupil, abnormalities of ocular motility, abnormal visual fields, gaze palsy, arm or leg drift

Microorganism	Recommended therapy	Alternative therapies
<i>Streptococcus pneumoniae</i>	Vancomycin plus a third-generation cephalosporin ^{a,b}	Meropenem (C-III), fluoroquinolone ^d (B-II)
<i>Neisseria meningitidis</i>	Third-generation cephalosporin ^a	Penicillin G, ampicillin, chloramphenicol, fluoroquinolone, aztreonam
<i>Listeria monocytogenes</i>	Ampicillin ^d or penicillin G ^d	Trimethoprim-sulfamethoxazole, meropenem (B-III)
<i>Streptococcus agalactiae</i>	Ampicillin ^d or penicillin G ^d	Third-generation cephalosporin ^a (B-III)
<i>Haemophilus influenzae</i>	Third-generation cephalosporin ^a (A-I)	Chloramphenicol, cefepime (A-I), meropenem (A-I), fluoroquinolone
<i>Escherichia coli</i>	Third-generation cephalosporin ^a (A-I)	Cefepime, meropenem, aztreonam, fluoroquinolone, trimethoprim-sulfamethoxazole

Predisposing factor	Common bacterial pathogens	Antimicrobial therapy
Age		
<1 month	<i>Streptococcus agalactiae</i> , <i>Escherichia coli</i> , <i>Listeria monocytogenes</i> , <i>Klebsiella</i> species	Ampicillin plus cefotaxime or ampicillin plus an aminoglycoside
1–23 months	<i>Streptococcus pneumoniae</i> , <i>Neisseria meningitidis</i> , <i>S. agalactiae</i> , <i>Haemophilus influenzae</i> , <i>E. coli</i>	Vancomycin plus a third-generation cephalosporin ^{a,b}
2–50 years	<i>N. meningitidis</i> , <i>S. pneumoniae</i>	Vancomycin plus a third-generation cephalosporin ^{a,b}
>50 years	<i>S. pneumoniae</i> , <i>N. meningitidis</i> , <i>L. monocytogenes</i> , aerobic gram-negative bacilli	Vancomycin plus ampicillin plus a third-generation cephalosporin ^{a,b}
Head trauma		
Basilar skull fracture	<i>S. pneumoniae</i> , <i>H. influenzae</i> , group A β-hemolytic streptococci	Vancomycin plus a third-generation cephalosporin ^a
Penetrating trauma	<i>Staphylococcus aureus</i> , coagulase-negative staphylococci (especially <i>Staphylococcus epidermidis</i>), aerobic gram-negative bacilli (including <i>Pseudomonas aeruginosa</i>)	Vancomycin plus cefepime, vancomycin plus ceftazidime, or vancomycin plus meropenem
Postneurosurgery		
	Aerobic gram-negative bacilli (including <i>P. aeruginosa</i>), <i>S. aureus</i> , coagulase-negative staphylococci (especially <i>S. epidermidis</i>)	Vancomycin plus cefepime, vancomycin plus ceftazidime, or vancomycin plus meropenem
CSF shunt		
	Coagulase-negative staphylococci (especially <i>S. epidermidis</i>), <i>S. aureus</i> , aerobic gram-negative bacilli (including <i>P. aeruginosa</i>), <i>Propionibacterium acnes</i>	Vancomycin plus cefepime, ^c vancomycin plus ceftazidime, ^c or vancomycin plus meropenem ^c

^a Ceftriaxone or cefotaxime.
^b Some experts would add rifampin if dexamethasone is also given.
^c In infants and children, vancomycin alone is reasonable unless Gram stains reveal the presence of gram-negative bacilli.