

Meningitis:

- Until a pathogen is identified, immediate empirical antibiotic coverage is needed.
- changes in the CSF after antibiotic administration usually take up to 12 - 24 hours to occur.
- antibiotics should NOT be withheld, even when lumbar puncture is delayed.
- once a pathogen is identified, antibiotic therapy should be tailored to the specific pathogen.

Etiologies and Empirical Therapy by Age Group

Age	Most Likely Organisms	Empirical Therapy
<1 month	<i>Streptococcus agalactiae</i> Gram-negative enterics (<i>E. coli</i> , <i>Klebsiella</i> spp, <i>Enterobacter</i> spp) <i>Listeria monocytogenes</i>	Ampicillin + cefotaxime or Ampicillin + aminoglycoside <i>> although typically no good penetration but in the <1 month margin we not well developed.</i>
1-23 months	<i>Streptococcus pneumoniae</i> <i>Neisseria meningitidis</i> <i>Haemophilus influenzae</i> <i>Streptococcus agalactiae</i>	Vancomycin + 3rd generation cephalosporin (cefotaxime or ceftriaxone) Vancomycin to cover penicillin-resistant <i>S. pneumoniae</i>
2-50 years	<i>Neisseria meningitidis</i> <i>Streptococcus pneumoniae</i>	Vancomycin + 3rd generation cephalosporin (cefotaxime or ceftriaxone) Vancomycin to cover penicillin-resistant <i>S. pneumoniae</i>
>50 years	<i>Streptococcus pneumoniae</i> <i>Neisseria meningitidis</i> Gram-negative enterics (<i>E. coli</i> , <i>Klebsiella</i> spp, <i>Enterobacter</i> spp) <i>Listeria monocytogenes</i>	Vancomycin + ampicillin + 3rd generation cephalosporin (cefotaxime or ceftriaxone) Vancomycin to cover penicillin-resistant <i>S. pneumoniae</i>

❖ management steps:

- **Supportive care** (administration of fluids, electrolytes, antipyretics, and analgesics) is critically important.
- venous thromboembolism prophylaxis and intracranial pressure (ICP) monitoring.
- **Appropriate antibiotic therapy (empirical or definitive) should be started as soon as possible.**
- **Role of steroids is still controversial but if used: don't use in *L. monocytogenes*, and *Cryptococcus neoformans*).**
 1. reduce cerebral edema, high ICP, neuronal injury, and vasculitis.
 2. reduces both mortality . (Controversial)
 3. lower rates of severe hearing loss, and neurological sequelae in community acquired meningitis.

❖ Gram-Negative Organisms:

- ***Neisseria meningitidis*:**
 - ✓ 7-10 days
 - ✓ Penicillin susceptible:
 - First Choice: Penicillin G or Ampicillin.
 - Alternatives: Cefotaxime or Ceftriaxone.
 - ✓ Penicillin resistant:
 - Antibiotics of First Choice: Cefotaxime or Ceftriaxone.
 - Alternatives: Meropenem or Moxifloxacin
- ***Haemophilus influenzae*:**
 - ✓ 7-10 days
 - ✓ β -lactamase negative:
 - First Choice: Ampicillin.
 - Alternatives: Cefotaxime, Ceftriaxone, Cefepime or Moxifloxacin.
 - ✓ β -lactamase positive:
 - First Choice: Cefotaxime or Ceftriaxone.
 - Alternatives: Cefepime or Moxifloxacin.
- **Enterobacteriaceae (Including *E. coli* and *Klebsiella* spp):**
 - ✓ 21 day
 - First Choice: Cefotaxime or Ceftriaxone.
 - Alternatives: Cefepime, Moxifloxacin, Meropenem or Aztreonam.
- ***Pseudomonas aeruginosa*:**
 - 1st Choice: Cefepime or Ceftazidime \pm Tobramycin.
 - Alternatives: Ciprofloxacin, Meropenem, or Piperacillin-tazobactam + Tobramycin, Colistin, or Aztreonam.

N. Meningitidis , H. Influenzae have same line of treatment almost

❖ Gram-Positive Organism:

- **Streptococcus pneumonia:**
 - ✓ 10-14 day
 - ✓ Penicillin susceptible:
 - 1st Choice: Penicillin G or Ampicillin.
 - Alternative: Cefotaxime, Ceftriaxone, Cefepime or Meropenem.
 - ✓ Penicillin/Ceftriaxone resistant:
 - first Choice: Vancomycin + Cefotaxime or Ceftriaxone.
 - Alternatives: Moxifloxacin.
- **Group B Streptococcus:**
 - ✓ 14-21 day
 - First Choice: Penicillin G or Ampicillin ± Gentamicin.
 - Alternative: Ceftriaxone or Cefotaxime.
- **Listeria monocytogenes:**
 - ✓ 21 days
 - Antibiotics of First Choice: Penicillin G or Ampicillin ± Gentamicin.
 - Alternative: Trimethoprim-sulfamethoxazole, Meropenem.
- **Staphylococcus aureus:**
 - ✓ 14-21 day
 - ✓ methicillin susceptible:
 - 1st Choice: Nafcillin or Oxacillin.
 - Alternative: Vancomycin or Meropenem.
 - ✓ methicillin resistant:
 - First Choice: Vancomycin.
 - Alternative: TMP-SMX or Linezolid.
- **Staph. epidermidis:**
 - ✓ duration 14-21 days.
 - Antibiotics of First Choice: Vancomycin.
 - Alternative: Linezolid.

❖ chemoprophylaxis of Meningitis

- recommended for close contacts of patients infected with: H. influenzae or N. meningitidis.
- Close contacts are house-hold or day-care members who sleep or eat in the same dwelling as the index patient.

Chemoprophylaxis for *Neisseria meningitidis*

Mainly ciprofloxacin except in pregnant women use ceftriaxone

Children < 5years	Ciprofloxacin single dose 30mg/kg po (max 125mg)
Children 5-12 years	Ciprofloxacin 250mg po single dose
Pregnant women	Ceftriaxone 250mg IM stat
Female adults on the oral contraceptive pill	Ciprofloxacin 500mg po single dose
Adults and children >12 years	Ciprofloxacin 500mg po single dose

Rifampin can be used, but the duration of therapy is 2 days.

Chemoprophylaxis for *Haemophilus influenzae*

Infants under 1 year of age	Rifampin 10mg/kg once daily for 4 days
Adults and children	Rifampin 20mg/kg once daily for 4 days up to max of 600mg/day
Pregnant women	Not indicated

Brain abscess:

- commonly **polymicrobial**, thus, empiric antimicrobial therapy should be broad spectrum:
 - ✓ **Vancomycin** + a **third- or fourth-generation cephalosporin** + metronidazole, depending on risk factors. (3 drugs)
 - ✓ **Alternative: vancomycin + meropenem (2 drugs).**
- **Note: Once a pathogen is identified, antibiotic therapy should be tailored to the specific pathogen.**
- Duration of therapy is usually prolonged to 4-8 weeks.
- Anticonvulsant therapy is recommended for at least 1 year due to risk of seizures
- Dexamethasone not recommended unless there is edema
- longer duration of therapy (6-8 weeks or longer) needed in:
 - abscess with organized capsule + necrotic tissue
 - multiloculated abscess.
 - lesion in vital locations
 - Immunocompromised patient
 - needle aspiration rather than open surgical excision.

❖ **Cryptococcus neoformans:**

- Mainly affect persons with underlying impaired immunity.
- **Amphotericin B combined with flucytosine more effective** than **amphotericin B with fluconazole.**
- **Voriconazole in combination with amphotericin B can be used**
- **Flucytosine** is poorly tolerated, causing bone marrow suppression and GI distress
- **careful monitoring of CBC, therapeutic drug monitoring (TDM) and dose adjustment for patients with renal insufficiency are recommended to avoid flucytosine-associated toxicities.**

❖ **mycobacterium tuberculosis:**

- duration of therapy:
 - 9-12 months
 - If rifampin-resistant strains duration may be 18 - 24 months.
 - if HIV +ve = >24 months
- Treatment:
 - First 2 months: isoniazid, rifampin, pyrazinamide, and ethambutol .
 - Remaining period : isoniazid, rifampin.

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