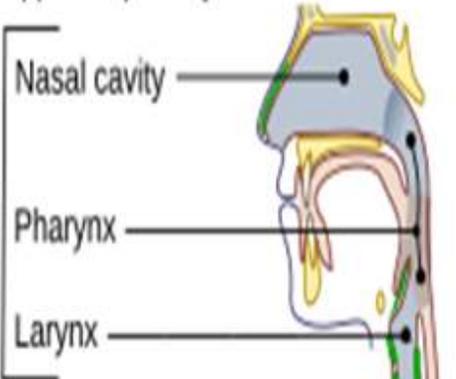


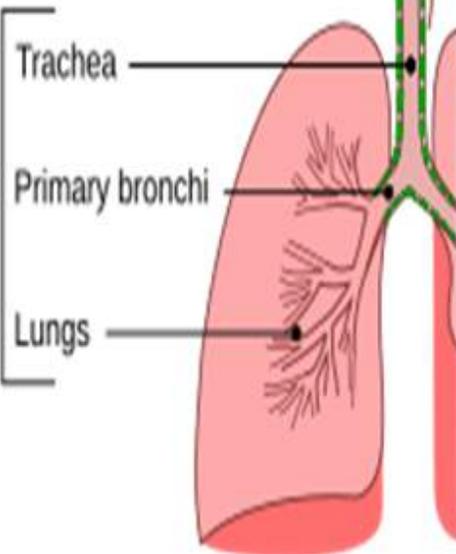
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**Pharmacology of respiratory system  
Treatment of respiratory infections  
Dr. Mohammad Salem Hareedy  
2025**

Upper respiratory tract



Lower respiratory tract



## Upper respiratory tract infections

- Sinusitis
- Nasopharyngitis
- Otitis media
- Laryngitis

## Lower respiratory tract infections

- Trachitis
- Bronchitis
- Bronchiolitis
- Pneumonia

## Medications used for treating bacterial resp. infections

### Supportive treatment

**1- Anti-inflammatory agents** (like non-steroidal anti-inflammatory drugs) could be useful in most cases.

**Corticosteroids** may be used cautiously in severe inflammatory reactions.

**2- Decongestants** could be used to relief congestion (e.g., xylometazoline, pseudoephedrine).

**3- Antipyretics:** paracetamol or non-steroidal anti-inflammatory drugs can be used for symptomatic treatment of fever.

## **Specific treatment (Antibacterial drugs)**

- Antibacterial drug(s) are selected according to the site of infection, the pathogenic organism, age, presence of complications and history of allergy to any previously used antibacterial drugs.
- Most antibacterial drug groups can reach easily the respiratory system and can be used for management of respiratory infections.

# Treatment of Acute bacterial sinusitis

## Indications of antibacterial therapy:

- 1- Severe symptoms.
- 2- Moderate symptoms without improvement for 7 days of supportive treatment.

Antibacterial drugs used:

- 1- **Amoxicillin** or **amoxicillin- clavulanic acid**
  - 2- **ceftriaxone** or other 3<sup>rd</sup> generation cephalosporins like **Cefdinir**
  - 3- **Trimethoprim-sulfamethoxazole**
- If failure occur after antibacterial drug therapy: endoscopy is used for aspiration and **culture sensitivity is done.**

## Treatment of acute Otitis media

### I-Supportive treatment

### II-Antibacterial drugs used:

- 1- **Amoxicillin** (high dose) or **amoxicillin- Clavulanic acid**
- 2- **Azithromycin** or **clarithromycin** (for penicillin allergic individuals).
- 3- **ceftriaxone** or other cephalosporins (e.g. **cefuroxime**) can be used.

### III-Surgical drainage may be needed

## Treatment of bacterial pharyngitis and tonsillitis

❑ Eradication of group A beta hemolytic streptococci is necessary to avoid complications like rheumatic fever.

### Antibacterial drugs used:

- 1- **Penicillins** (penicillin V (oral) or penicillin G (parenteral)). **Long-acting penicillin G can eradicate the infection.**
- 2- **Oral cephalosporins** (e.g. cephalexin).
- 3- **Macrolides** (e.g., erythromycin, and azithromycin)

## Treatment of lower resp. infections (bronchi and lungs)

### Treatment of acute bronchitis

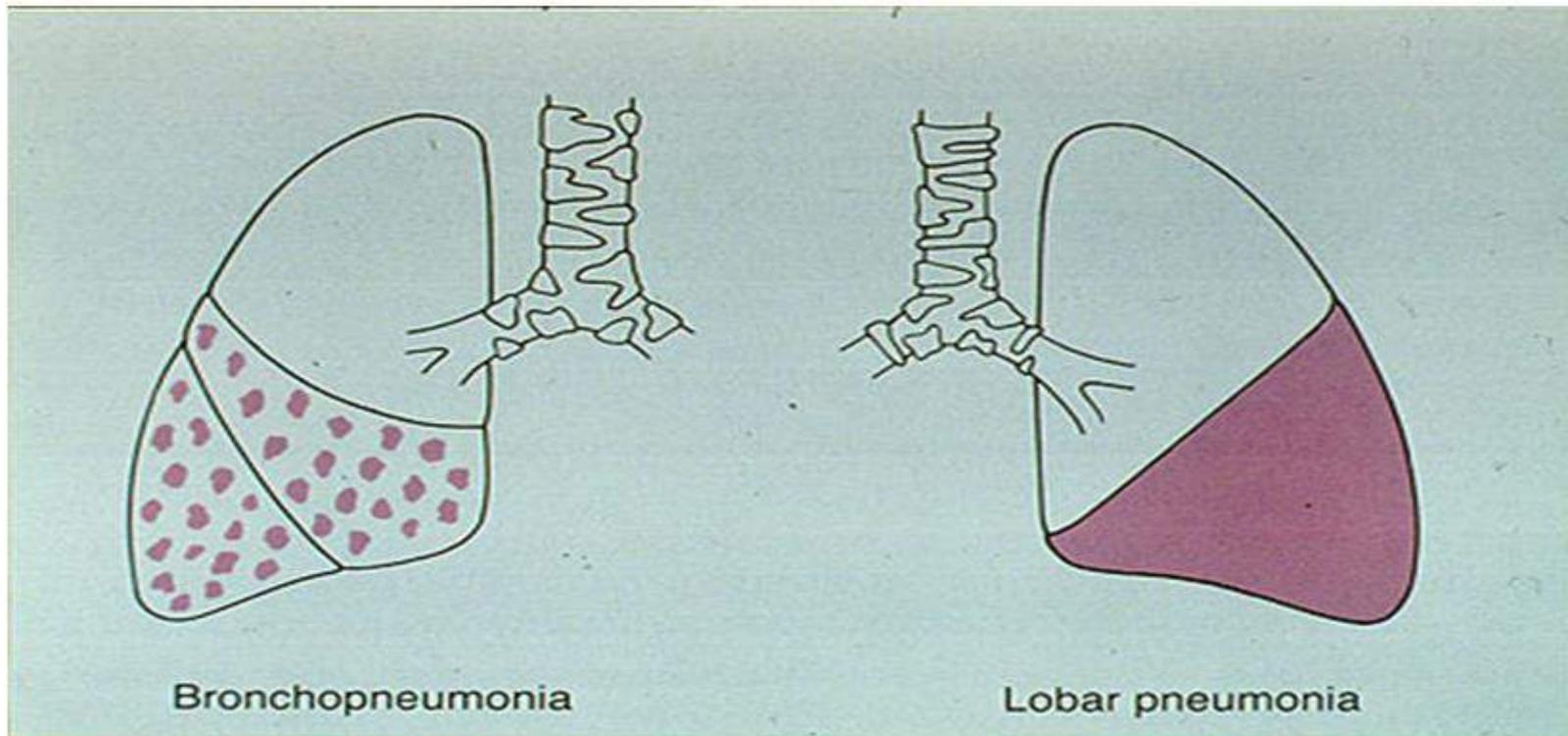
- 1- Antibacterial drugs: **Amoxicillin** is used for mild - moderate cases which don't need hospitalization.
- 2- **Tetracyclines**, **Macrolides**, and **Trimethoprim-sulfamethoxazole** are effective against mycoplasma, Chlamydia, and B. pertussis.
- 3- **Expectorants** and **muclitics** may be needed.
- 4- Resistant cases may need further investigations including culture and sensitivity.

# Treatment of pneumonia

## Types of pneumonia

**Lobar Pneumonia:** Lobar pneumonia affects one or more lobes of a lung. It often presents with distinct consolidation of lung tissue in a specific areas, resulting in symptoms like high fever, chest pain, and cough which may be productive.

**Bronchopneumonia (lobular):** is characterized by the inflammation and infection of lung tissues including small airways and bronchioles. It often appears as patchy infiltrates on a chest X-ray and may result from various causative agents.



Typical pneumonia usually appears as lobar pneumonia on x-ray, while atypical pneumonia tends to appear as interstitial pneumonia (bronchopneumonia). However, the **underlying pathogen cannot be conclusively identified based on imaging results alone.**

## Empiric treatment of pneumonia

**1-Typical and lobar** pneumonia are frequently caused by **streptococci** and are usually sensitive to **beta lactam** antibacterial drugs (**e.g., Penicillins & cephalosporins**)

➤ Penicillin V and amoxicillin or amoxicillin-calvulanate are used **orally**.

➤ **ceftriaxone** can be used by **injection**.

2- **Bronchopneumonia** is frequently caused by **atypical organisms** (which may lack cell wall) like *Mycoplasma pneumoniae*, *Legionella*, *Chlamydia*, etc.

➤ Macrolides (azithromycin), tetracycline, and Fluoroquinolones can be used for treatment.

3- If **gram negative** organisms are suspected; **ciprofloxacin** or **aminoglycosides** should be used.

❑ Culture and sensitivity should guide the definitive antibacterial therapy for patients with pneumonia.

• **Community-Acquired Pneumonia (CAP)**: CAP is contracted in non-healthcare settings, such as the community, at home, or in public places. **Streptococcus pneumonia** is a common cause of CAP, but the specific causative agent may vary depending on factors like age and underlying health conditions.

• **Hospital-Acquired Pneumonia (HAP)**: HAP is acquired during a hospital stay (> 48 h). Patients in intensive care units (ICUs) or those on mechanical ventilation (ventilator related pneumonia) are at higher risk. HAP is often caused by **drug-resistant bacteria**.

## Treatment of Community-Acquired Pneumonia

- For mild cases caused by strept. Pneumonia; oral **Amoxicillin or IV penicillin G** can be given, **macrolide** (e.g., azithromycin) for penicillin allergic patients.
- For resistant cases; **Combination therapy** with a **macrolide** and a **beta-lactam** or using a respiratory **fluoroquinolone (e.g., levofloxacin)** alone.

## Treatment of hospital-Acquired Pneumonia (HAP)

The causative organism could be a Methicillin sensitive staph. aureus (MRSA) or gram-negative bacteria.

➤ **Vancomycin or linezolid** could be beneficial in MRSA.

**Gram negative organisms** like *pseudomonas* or *Klebsiella* may cause HAP and treatment by one or more of the following:

- 1- **Gentamicin** or other aminoglycosides.
- 2- **Ceftazidime** (anti-pseudomonal cephalosporins).
- 3- **Imipenem-cilastatin** or other Carbapenems.
- 4- **Ciprofloxacin** or another fluoroquinolone.

## Aspiration pneumonia

It occurs when food or liquid is breathed into the airways or lungs, instead of being swallowed. Treatment should cover both anaerobic bacteria and Gram-negative organisms.

### Antibacterial drugs used:

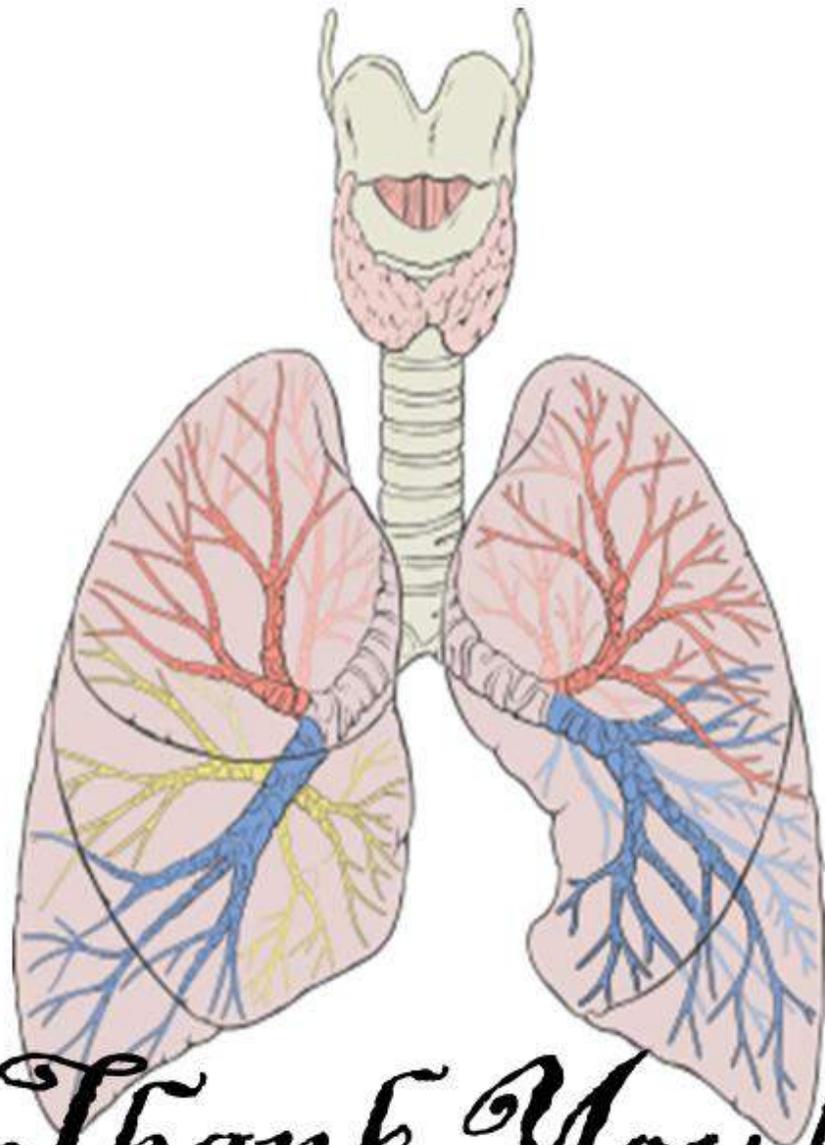
- ❑ For gram negative organisms (as mentioned before);  
Gentamicin, Ceftazidime, Carbapenems, Ciprofloxacin can be used.
  
- ❑ For anaerobes: one or more of the following can be used:
  - **Clindamycin** (covers gram positive & negative anaerobes).
  - **Penicillin** covers the gram-positive anaerobes.
  - **Metronidazole** covers gram negative ones.

## Pharmacological notes

- Fluoroquinolones should be avoided for patients younger than 18 years and during pregnancy.
- Testing for hypersensitivity to beta lactams necessary (to avoid anaphylaxis) especially before injecting penicillin G and third generation cephalosporins
- Both aminoglycosides and cephalosporins have a potential nephrotoxicity. Dose adjustment is needed in renal impairment.
- Macrolides (erythromycin) inhibits CYP450 and cause drug interactions.
- Clavulanic acid is hepatotoxic.
- The risk of arrhythmia with some quinolones could be hazardous to cardiac patients

## Treatment of viral respiratory tract infections

- Viral infections of the respiratory tract need non-specific treatment in most cases.
- Antipyretics, anti-inflammatory and fluids could be enough.
- **Inhaled ribavirin** may be needed in severe respiratory syncytial virus-related Bronchiolitis in hospitalized children.
- **Oseltamivir and zanamivir** could be used in severe influenza viral infections.



*Thank You!*