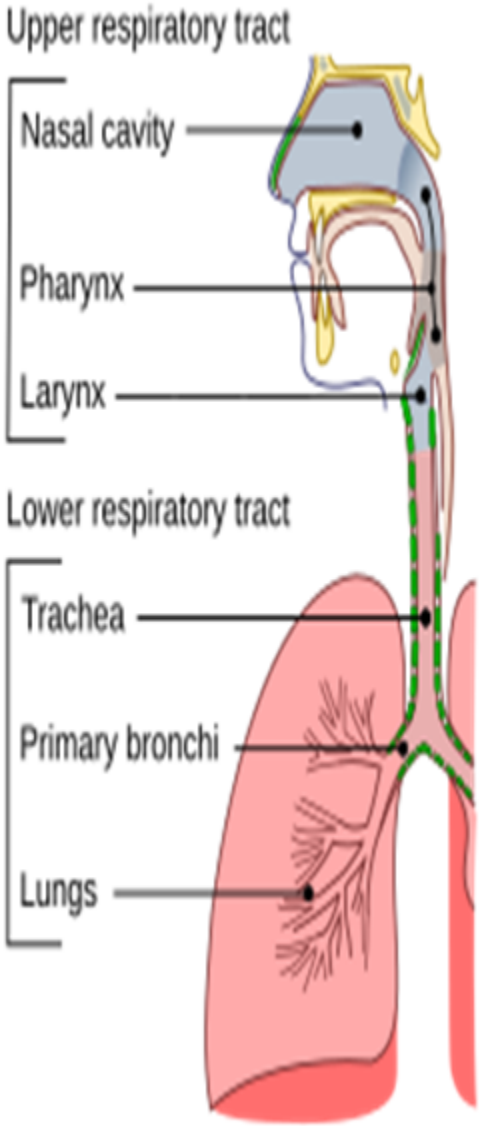
بسم الله الرحمن الرحيم

Pharmacology of respiratory system
Lecture 1
Treatment of respiratory infections

by
Dr. Mohammad Salem Hareedy

2024



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 (e.g. xylometazoline or pseudoephedrine) may be used to relief congestion.

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 3rd 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 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 **muclytics** may be needed.

4- Resistant cases may need further investigations including culture and sensitivity.

Treatment of pneumonia

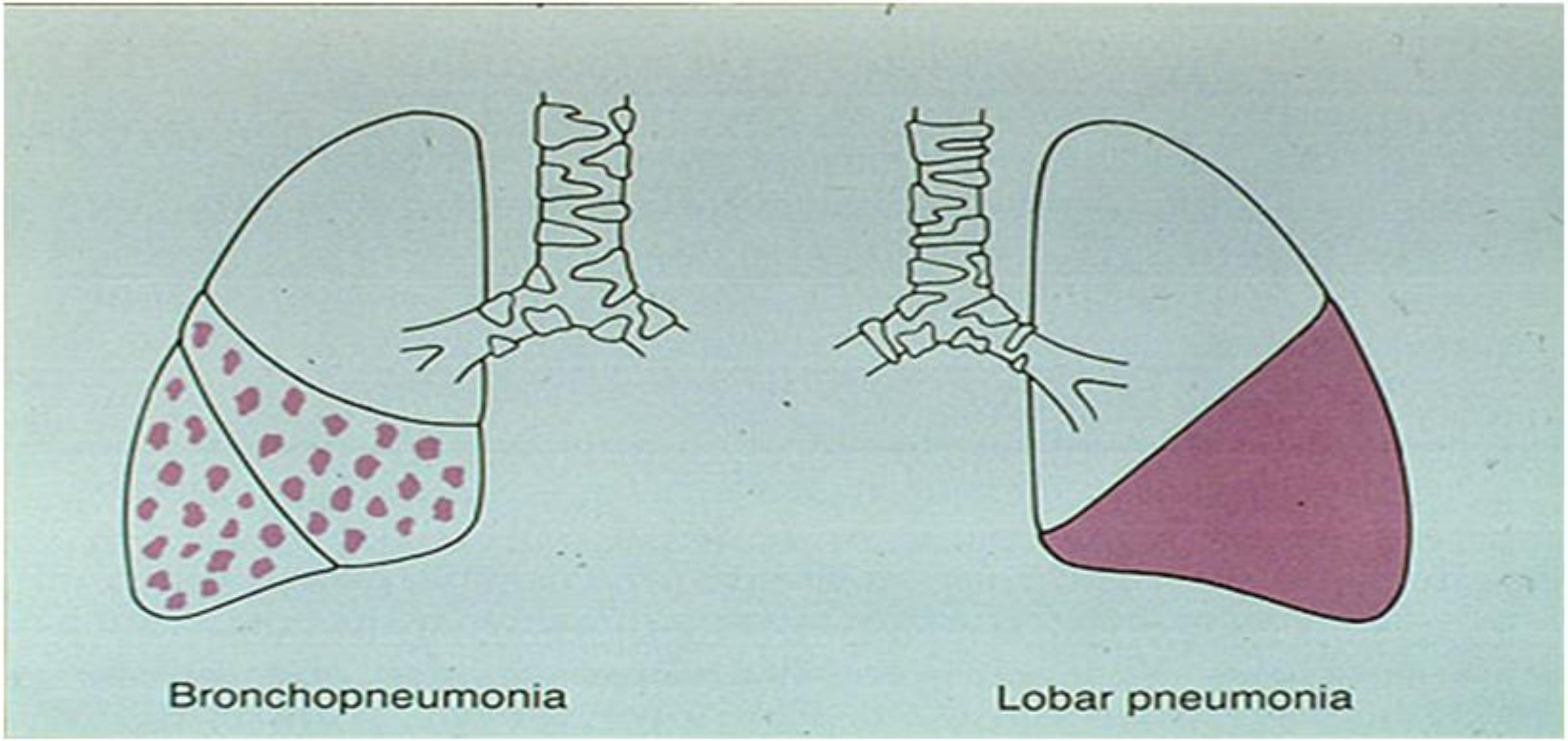
Types of pneumonia

•**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:** is characterized by the classic symptoms of high fever, productive cough, and pleuritic chest pain. It is often caused by **bacteria and responds well to antibiotic treatment.**

- **Atypical Pneumonia:** is caused by **atypical pathogens** like *Mycoplasma pneumoniae*, *Liegonella* and *Chlamydophila pneumoniae*, often presents with **milder symptoms** such as a dry cough and low-grade fever. Extra-pulmonary systemic manifestation could occur. I**t may require different antibiotics** or **antiviral medications**.



Typical pneumonia usually appears as lobar pneumonia on x-ray, while atypical pneumonia tends to appear as interstitial pneumonia. 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 sensitive to **beta lactam** antibacterial drugs **(Penicillins and 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 lack cell wall) like mycoplasma, etc.

- Macrolides (azithromycin), tetracycline, and even 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 or MRSA or gram negative bacteria.

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

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

1- Gentamicin or other **aminoglycosides**.
2- **Ceftazidime** (anti-pseudomonal cephalosporins).
3- **Carbapenems** (e.g. imipenem-cilastatin).
4- Ciprofloxacin or other **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.

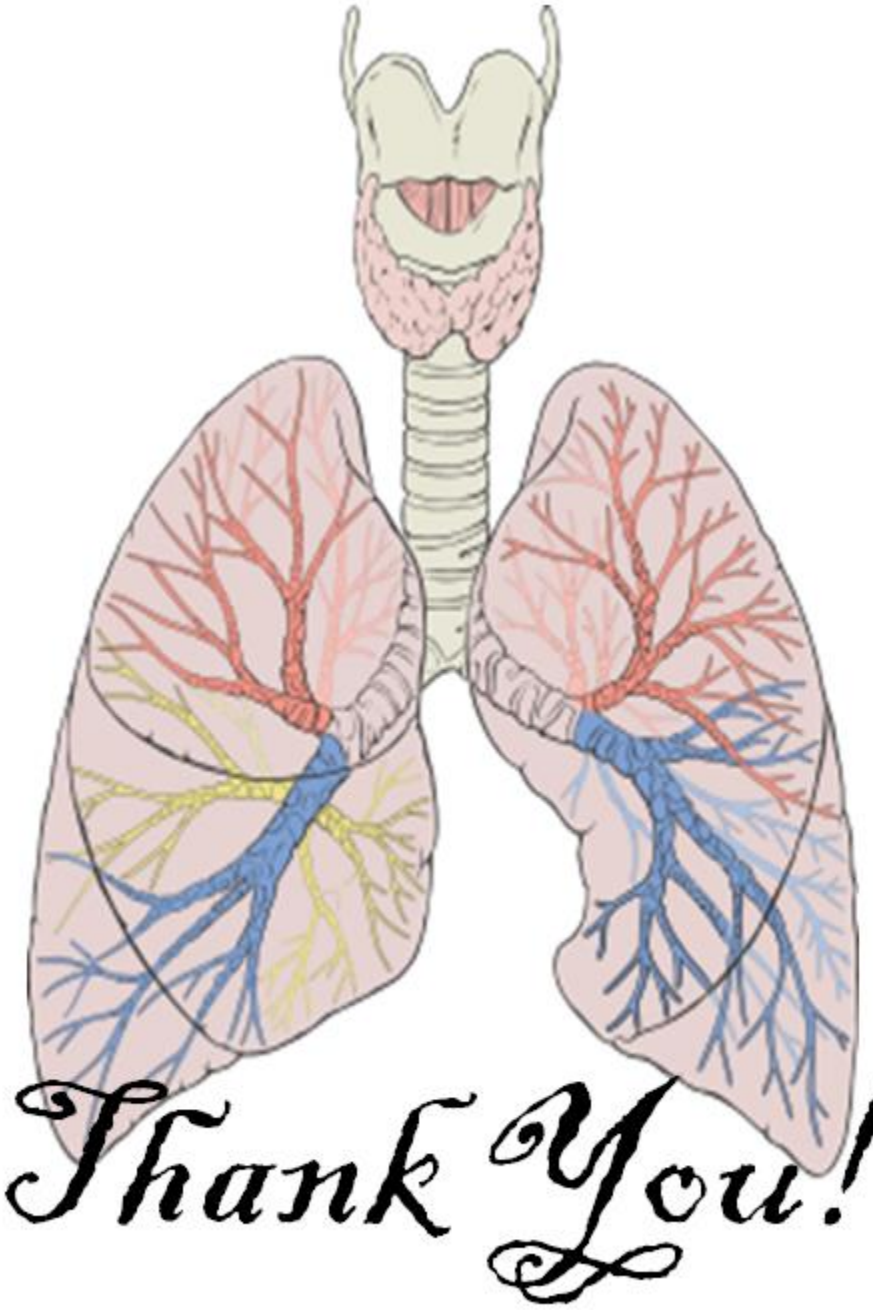
- For anaerobes: one or more of the following can be used:
  - **Clindamycin** (covers gram positive and negative anaerobes).
  - Penicillin covers the gram positive anaerobes.
  - Metronidazole covers gram negative ones.

Pharmacological notes

- Fluoroquinolones should be avoided for children and patients less than 18 years and during pregnancy.
- Monitor for hypersensitivity of beta lactam
- Perform a hypersensitivity test (to avoid anaphylaxis) before injecting penicillin G and third generation cephalosporins
- Both aminoglycosides and cephalosporins have a potential nephrotoxicity.
- Macrolides (erythromycin) inhibits CYP450 and cause drug interactions.
- Clavulanic acid is hepatotoxic.

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.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