

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**Pharmacology of respiratory system**

**Lecture 1**

**Treatment of respiratory infections**

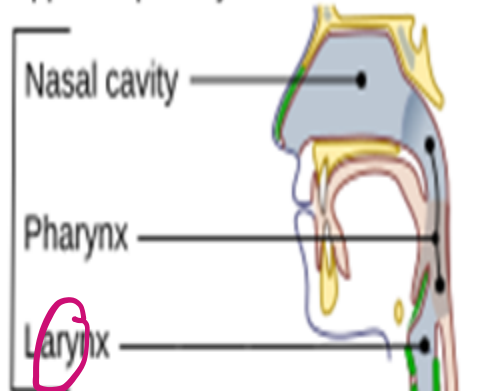
**by**

**Dr. Mohammad Salem Hareedy**

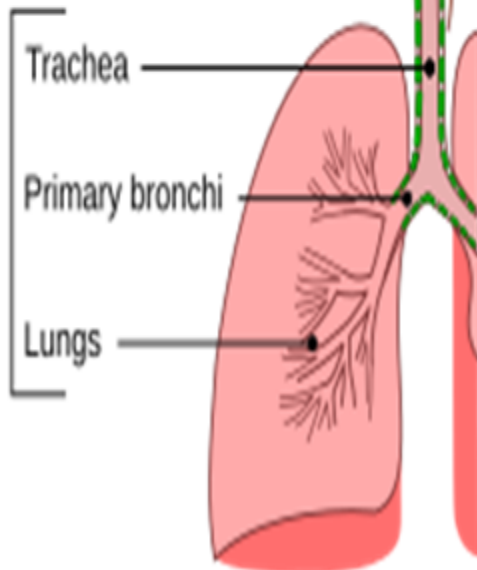
**2024**

لجنة الطب والجراحة – NOor Almaharmah

## Upper respiratory tract



## Lower respiratory tract



## Upper respiratory tract infections

- Sinusitis
- Nasopharyngitis
- Otitis media
- Laryngitis

## Lower respiratory tract infections

- Trachitis
- Bronchitis
- Bronchiolitis
- Pneumonia

تراخيا  
trachia

# Medications used for treating bacterial resp. infections

## Supportive treatment

Symptomatic medication

- 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. → Covid-19 related pneumonia.
- 2- Decongestants** (e.g. xylometazoline or pseudoephedrine) may be used to relieve congestion.
- 3- Antipyretics:** paracetamol or non-steroidal anti-inflammatory drugs can be used for symptomatic treatment of fever.

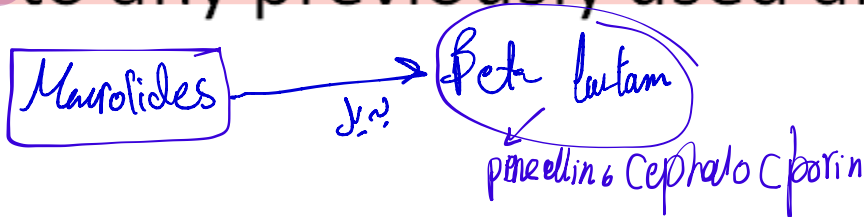
بازی  
بakterial  
infection  
نفسه

VD  
redness

توسعه

## 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:

 <sup>المشروع (+)</sup> **Amoxicillin** or **amoxicillin-clavulanic acid**

 **ceftriaxone** <sup>injection</sup> or other 3<sup>rd</sup> generation cephalosporins

 **Cefdinir** <sup>oral</sup>  $\rightarrow$  <sup>أكثر</sup> <sup>negative</sup>

 **3- Trimethoprim-sulfamethoxazole** <sup>paranasal sinus</sup>  $\checkmark$   
<sup>(b-lactam) allergy</sup>  $\checkmark$

If failure occur after antibacterial drug therapy:

endoscopy is used for aspiration and **culture sensitivity**

is done.

الأعراض تنطرد البكتيريا

Supportive موجهة بحسن

7 انبأ ملاحظة الاعراض بعد الادوية الموصفة لها

# Treatment of acute Otitis media

Common children  
'rare in adults'.

## 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.

اي واحد من ال  
عادي

## III-Surgical drainage may be needed

نحتاج حياطة الأذن

# Treatment of bacterial pharyngitis and tonsillitis

ما في supportive حوالين مناسب بال علاج

□ Eradication of group A beta hemolytic streptococci is necessary to avoid complications like rheumatic fever. *→ Rapid good AB drug.*

Most common.

## Antibacterial drugs used:

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

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

لو تنزلت عن Lung  
Pneumonia

demidix / - - - / - - -

trachia

## 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**.

MBC

ما الو Cell wall كل ما انزل  
لحقت مخافه منهم

مذيان  
للبلغم

3- **Expectorants** and **muclitics** may be needed.

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

الا دوره عبارة عن دوره عن ال

Lung تنزل  
لو تركتناهم بتنزل ال pneumonia

branchiol macro → Tri → Tetra

# 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.

bronchiol // less severe // متفرقة وبهائي ال Lung

Lobar → Typical (Amoxicillin)

bronchopneumonia → Atypical (macrolid)

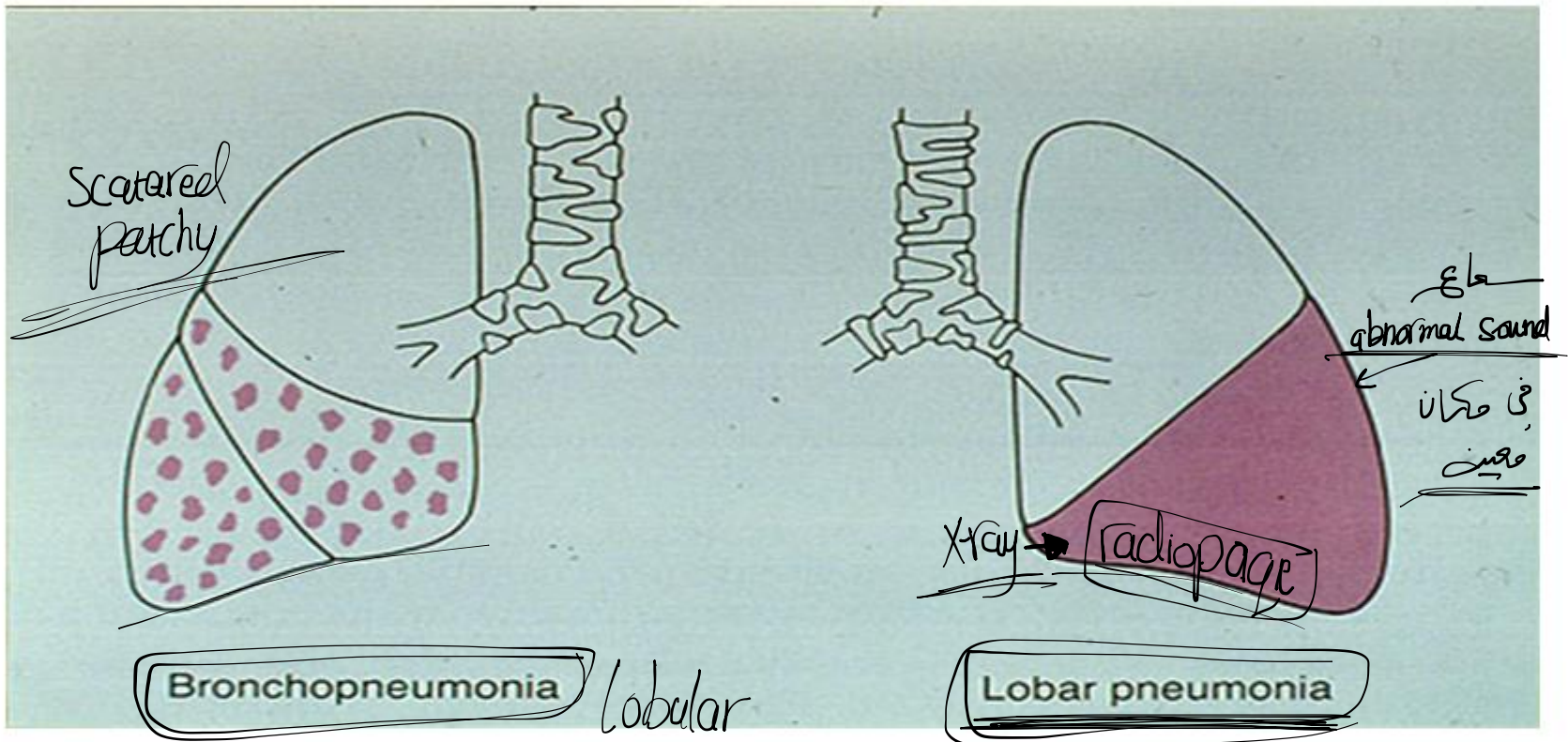
لا تتركها  
Cell wall

لا تتركها  
Pencilin

• **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*, *Legionella* and *Chlamydia pneumoniae*, often presents with **milder symptoms** such as a dry cough and low-grade fever. Extra-pulmonary systemic manifestation could occur. **It 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

B-lactam  
OH

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.

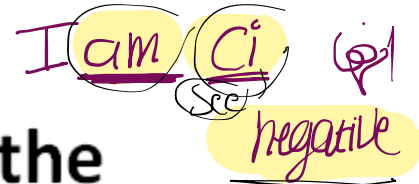
2- **Bronchopneumonia** is frequently caused by **atypical organisms** (which lack cell wall) like mycoplasma, etc.



★ **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.

علاجها سهل

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

↑ easier to deal with.

Resistance (ve, -ve)

• **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.

اسودت بتدخل على ال  
Lung  
لسهولة

# Treatment of Community-Acquired Pneumonia

G

➤ For mild cases caused by strept. Pneumonia; oral Amoxicillin or IV penicillin G can be given, macrolide (e.g. azithromycin) for penicillin allergic patients.

Severe Case → C

➤ For resistant cases; Combination therapy with a macrolide and a beta-lactam or using a respiratory fluoroquinolone (e.g. levofloxacin) alone.

2 p.o. q.m.

good reach for drugs.

B lactam is not good for community ~~resistant~~ P Severe case واحد

## Treatment of hospital-Acquired Pneumonia (HAP)

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

*Methicillin resistant Staph aureus*

➤ 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:

*+ H. influenza.*

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

*injection*

زيد بالمستشفى لانو اكل طحين وفيه  
كربوهيدرات و غلوكوز واثر عليه  
بطريقة سلبية ...

*Very specific  
Cephalosporin*

*-ve gram  
aerobes*

كل واحد كماله أو كلهم حسب الحالة



## 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:

→ amino  
→ Ceftriaxone  
→ Fluoroquinolones  
→ Carbapenems

❑ 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.

Metronidazole...

بالميترو بكونو في نقص

بالاكسجين ف ما في هوا

(مسكرين الشبايك)



# Pharmacological notes

➤ Fluoroquinolones should be avoided for children and patients less than 18 years and during pregnancy.

يقفل نمو  
epiphyseal Cartilage

➤ Monitor for hypersensitivity of beta lactam

➤ Perform a hypersensitivity test (to avoid anaphylaxis) before injecting penicillin G and third generation cephalosporins. Allergic test. Community

➤ Both aminoglycosides and cephalosporins have a potential nephrotoxicity. Renal patients

renal patient  
ماكانه فعاه (P) حار وجوبه ما  
قد صتره بالمستشفى حار وهو (P) سو الادوية  
المناسبة لاهو

طقل

➤ Macrolides (erythromycin) inhibits CYP450 and cause drug interactions. toxicity

الادوية بالتام

➤ Clavulanic acid is hepatotoxic.

Anti Beta lactams

مرفق كبد

منسجل ب  
Cephalosporin // macrolide

## Treatment of viral respiratory tract infections

*mostly self limited.  
give treatment in dangerous cases.*

- **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**.

*RSV*

*severe viral infection*

*A/B*

الحمد لله  
قلب

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