

PHARMACOTHERAPY OF PNEUMONIA



INFECTION



INFLAMMATION



PHARMACOTHERAPY



Presented by
Dr. Tapsi Tanzin



LEARNING OBJECTIVES



Definition, etiology, pathophysiology



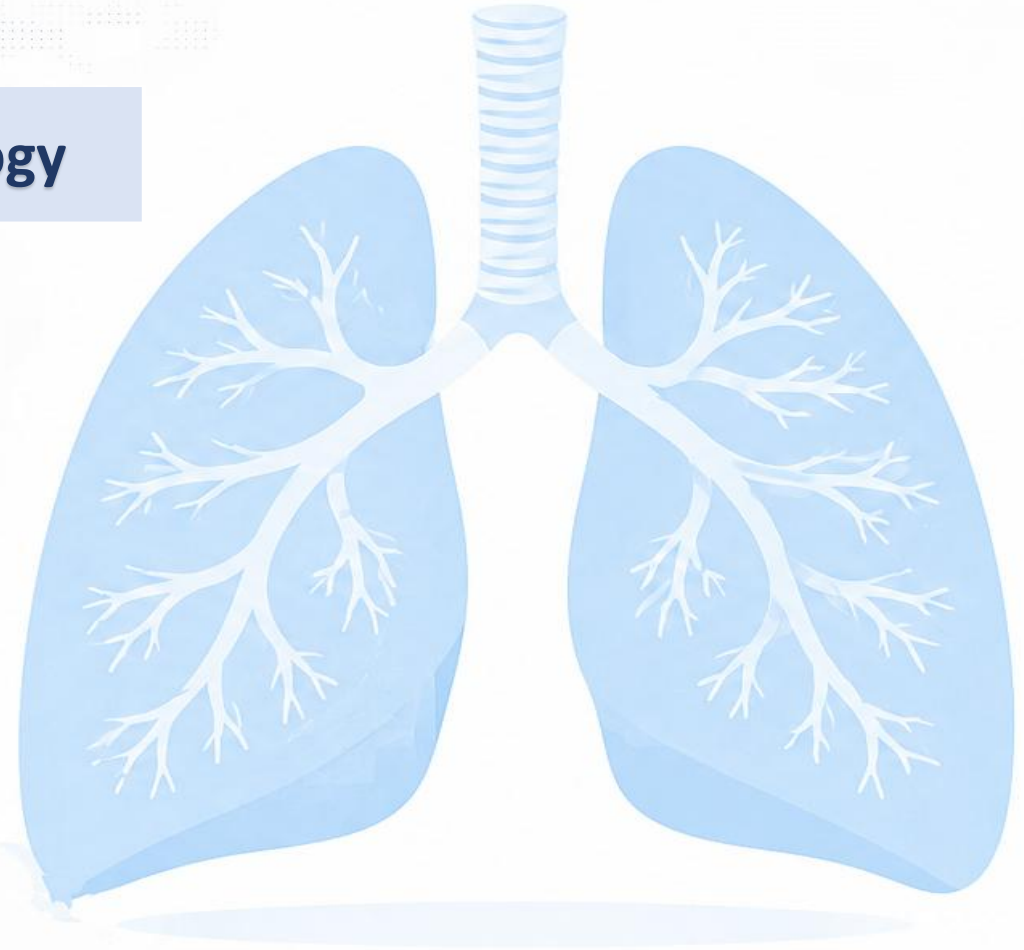
Symptoms and diagnosis



Pharmacotherapy

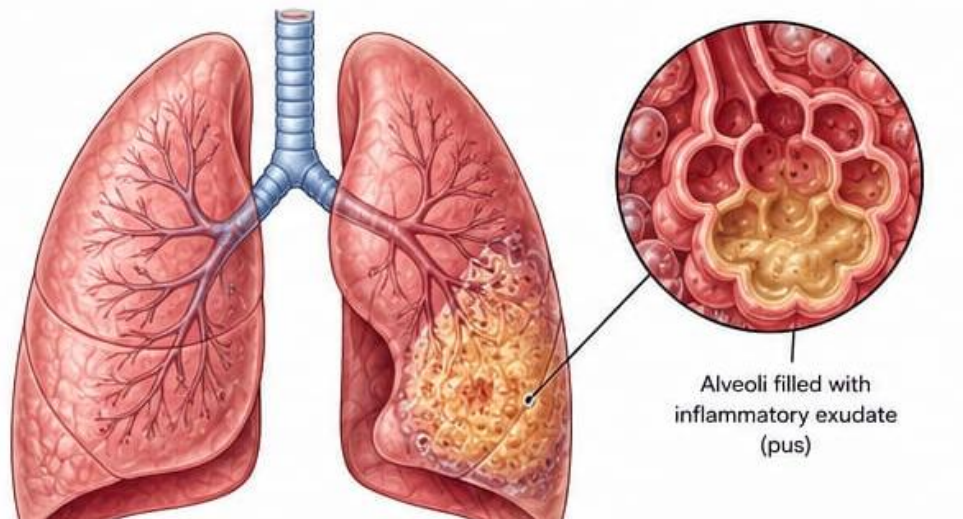


Prevention



Pneumonia

Pneumonia is an inflammatory condition of lung caused by microbial infection resulting in inflammatory exudate and consolidation within the lung parenchyma.





The impact of Pneumonia

— A Global Health Crisis —

2nd



Leading cause of death

“In under 5 children”



In Bangladesh,

Pneumonia accounts for about **18%** of all death in under 5 children and approximately **24000** child deaths annually



Among infectious diseases, it is the **1st** cause of death in under 5 children.

Organism Involved

BACTERIA



Streptococcus pneumoniae



Haemophilus influenzae



Staphylococcus aureus



Klebsiella pneumoniae



Pseudomonas aeruginosa

VIRUSES



Influenza virus
(Types A & B)



Respiratory
syncytial virus
(RSV)



SARS-CoV-2
(COVID-19)



Adenovirus



Parainfluenza
virus

FUNGI



Pneumocystis jirovecii



Aspergillus
species



Histoplasma capsulatum

Risk Factors



OLDER AGE

Adults 65 years and older are at higher risk.



YOUNG CHILDREN

Children under 5 years, especially infants, are more vulnerable.



CHRONIC HEALTH CONDITIONS

Such as heart disease, diabetes, kidney disease, or liver disease.



CHRONIC LUNG DISEASES

Such as COPD, asthma, or bronchiectasis.



SMOKING



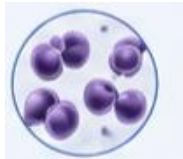
RECENT INFECTIONS OR HOSPITALIZATION



WEAKENED IMMUNE SYSTEM

Classification of Pneumonia:

Based on Etiology



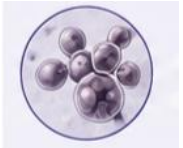
Bacterial



Viral



Fungal



Parasitic



Aspiration Pneumonia

Based on Anatomical site



Lobar



Broncho



Interstitial

Based on setting of Acquisition






Community Acquired



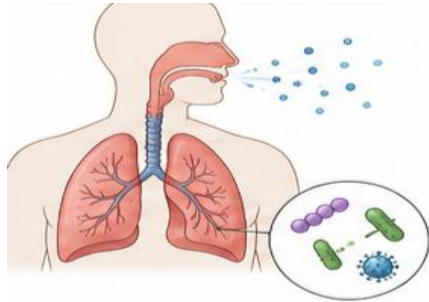
Hospital Acquired



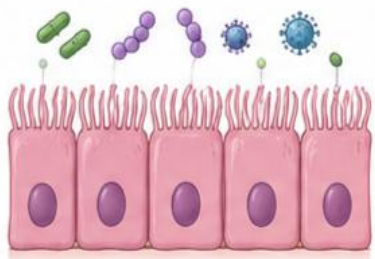
ventilator Associated

CAP	VAP	HAP
		
<ul style="list-style-type: none"> • Pneumonia develop outside the hospital • Most common organism : Streptococci Pneumonia, Mycoplasma 	<ul style="list-style-type: none"> • Pneumonia occurring ≥ 48 hours after endotracheal intubation/ mechanical ventilation • Most common organism: Pseudomonas, MRSA 	<ul style="list-style-type: none"> • Develops ≥ 48 hours after hospitalization • Most common organism: Pseudomonas, MRSA

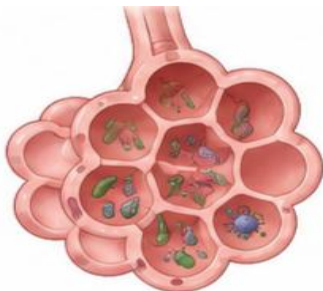
Pathogenesis



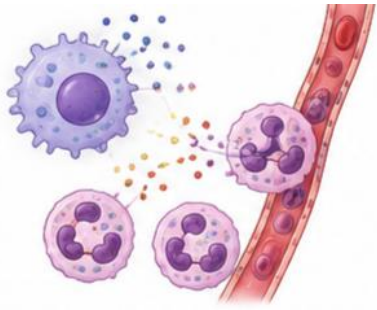
Entry of Pathogen through respiratory tract.



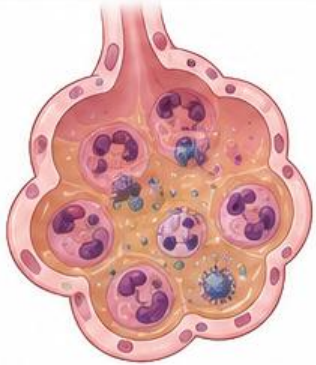
Colonize in the respiratory epithelium.



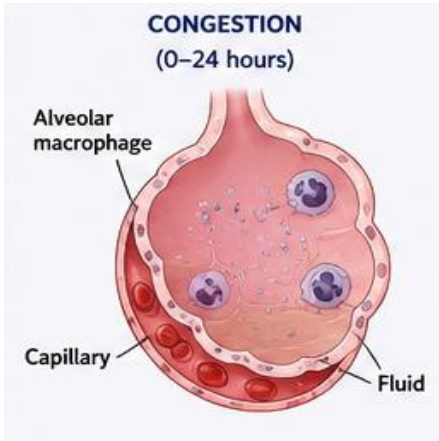
Pathogen Invade alveoli and multiply triggering inflammatory response



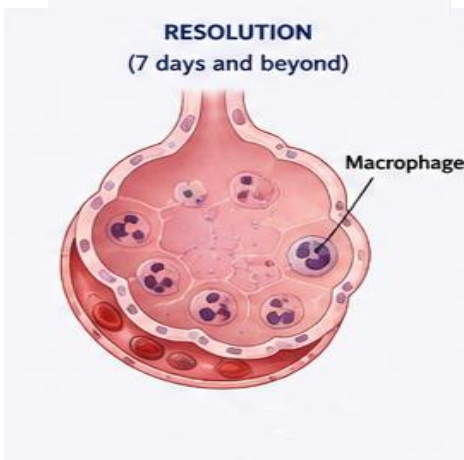
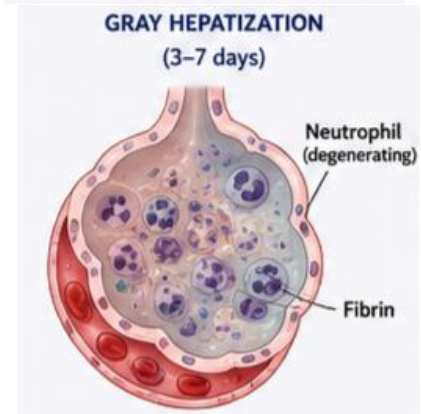
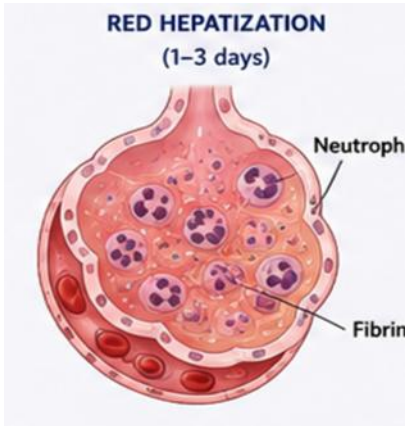
Alveolar macrophage release cytokines and chemokines recruiting neutrophil and other inflammatory cells



Inflammation increase vascular permeability and exudation of protein rich fluid, fibrin and inflammatory cells



Vascular congestion occur in alveoli with thin serous fluid, few neutrophil and macrophage



Alveoli filled with exudate and become firm, red, liver like)

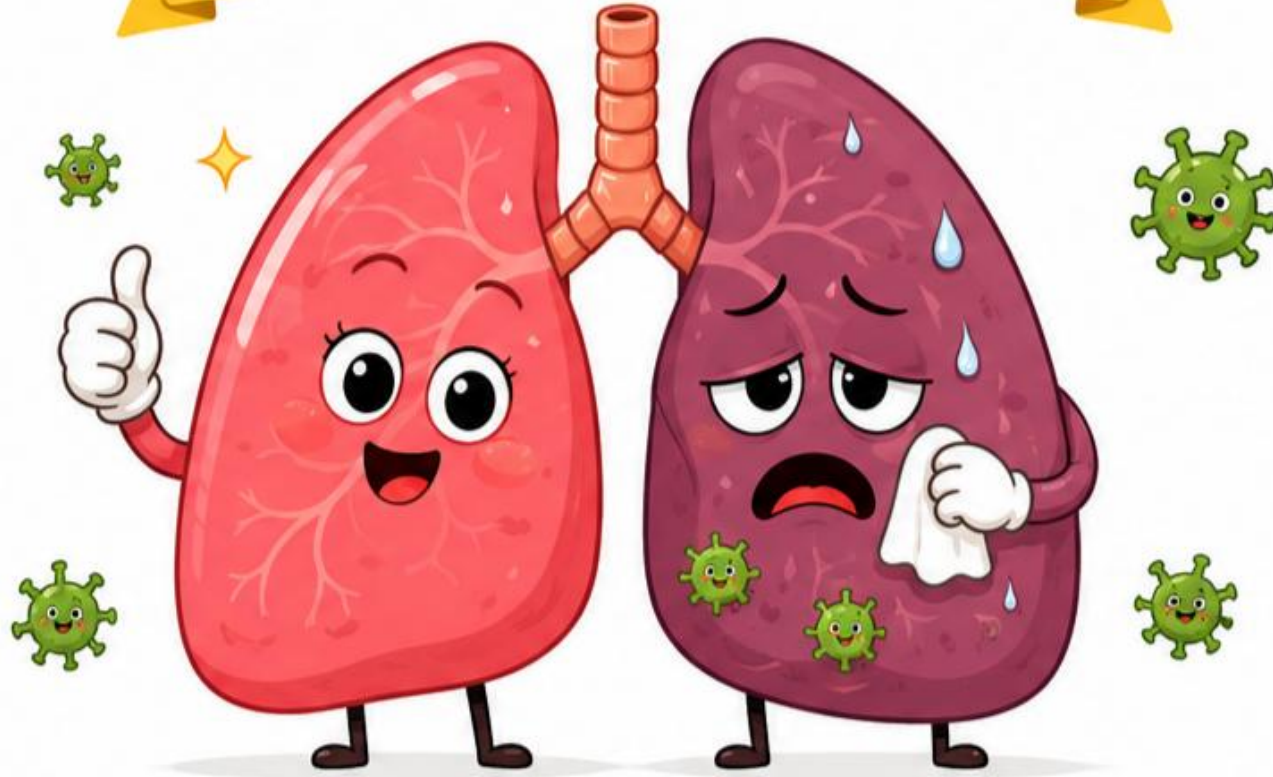


- **Disintegration of RBCs**
- **Persistent fibrin and neutrophil**
- **Lung firm, dull and gray**



- **Enzymatic digestion of exudate**
- **Clearance by macrophages**
- **Restoration of normal alveoli**

When your lungs need some extra care!



Symptoms

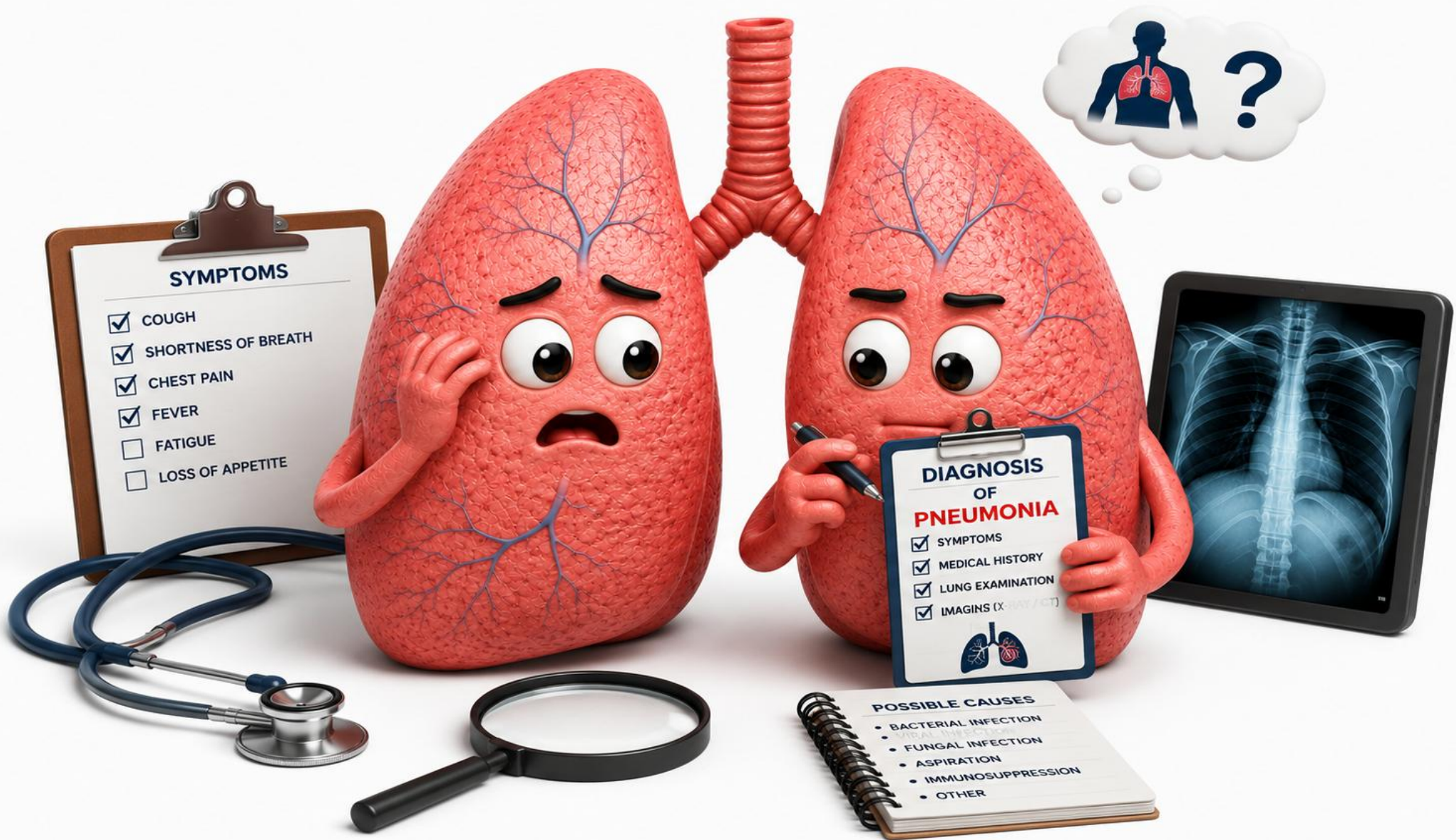
1.RESPIRATORY FEATURES

- Cough with sputum
- Dyspnea
- Pleuritic chest pain
- Tachypnea
- Hemoptysis
(occasionally)
- Chest discomfort or
heaviness



2.SYSTEMIC FEATURES

- Fever (usually high)
with chills
- Malaise, fatigue
- Headache
- Delirium or confusion
(in elderly)



1 CLINICAL EVALUATION



- **History:** (cough, fever, dyspnea, chest pain)
- **Physical examination** crackles, decreased breath sounds)
- **Vital signs** assessment (temperature, pulse, respiratory rate, oxygen saturation)

2 IMAGING



- **Chest X-ray (first-line)**
 - Shows lung infiltrates or consolidation

3 LABORATORY TEST



- **CBC**
- **Sputum examination**
- **CRP / Procalcitonin**
- **Blood cultures** (severe cases)
- **PCR/viral tests when indicated**



Pharmacotherapy Of Pneumonia

General Principles:

- Assess severity(e:g: CURB-65 score).
- Identify likely pathogen.
- Start empirical antibiotic therapy promptly.
- Modify treatment according to culture and sensitivity results.
- Provide supportive care.

Treatment of Community acquired Pneumonia

CRITERIA		Points
C	Confusion	1
U	Urea Blood urea ≥ 7 mmol/L	1
R	Respiratory rate ≥ 30 breath /min	1
B	Blood Pressure Systolic < 90 mmHg Diastolic ≤ 60 mmHg	1
65	Age ≥ 65 age	1
Total Score 5		

Interpretation of CURB-65 Scoring

CURB-65 Score	Severity	Recommended Treatment
0-1	Low Risk	Outpatient treatment
2-3	Moderate severity	Hospitalization
3-5	Severe Pneumonia	ICU admission required

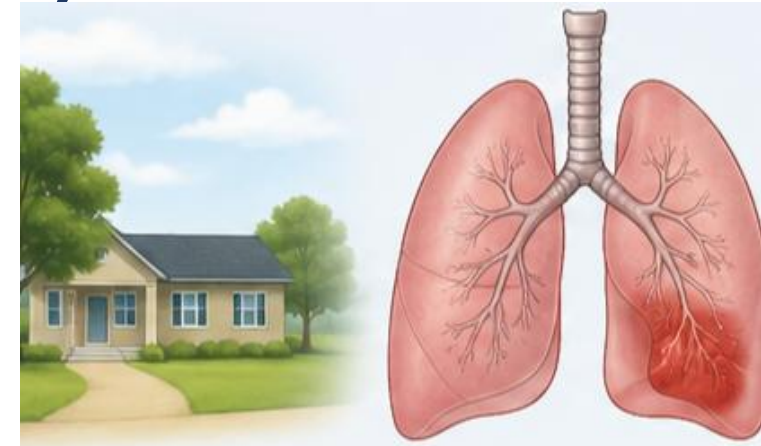
Treatment Of Community-Acquired-Pneumonia:

Low severity CAP: (when CURB-65 is 1-2)

- Amoxicillin
- If patient is allergic to Penicillin then choose
- Doxycycline
- OR
- Clarithromycin

Moderate severity CAP: (CURB-65 2-3)

- Amoxicillin-Clavulanate
- If patient is allergic to Penicillin
- Doxycycline
- OR
- Respiratory Fluoroquinolone
(Levofloxacin, Moxifloxacin)



Treatment Of Community-Acquired-Pneumonia:

Severe CAP: (CURB-65 is 3-5)

Co-amoxiclav or Cefuroxime or Ceftriaxone

PLUS

Clarithromycin or Benzylpenicillin

PLUS

Levofloxacin



Treatment Of Hospital-Acquired-Pneumonia:

Without MDR Risk Factors:

- Piperacillin-Tazobactam/
- Cefepime/
- Levofloxacin

With high risk of MDR gram negative organisms:

- Anti-pseudomonal β lactam
 - Piperacillin/
 - Cefepime/
 - Meropenem

PLUS

Levofloxacin
- **If MRSA is suspected**

Vancomycin or Linezolid



Treatment Of Ventilator-Associated-Pneumonia:

Empirical Therapy:

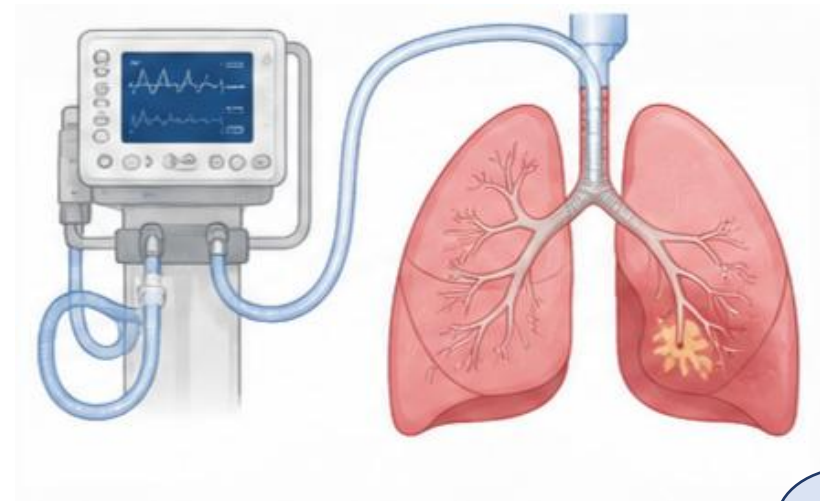
- Piperacillin-Tazobactam/ Cefepime/ Meropenem

PLUS

Vancomycin or Linezolid

De-escalation

- Adjust antibiotics based on culture reports and clinical response



Antiviral Therapy:

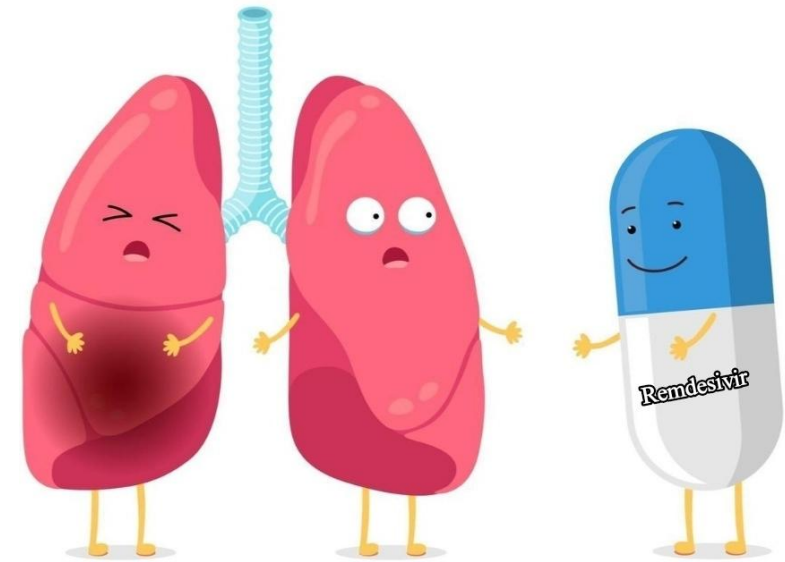
- **In case Influenza Pneumonia**

Oseltamivir

Zanamivir

- **COVID-19 Pneumonia :**

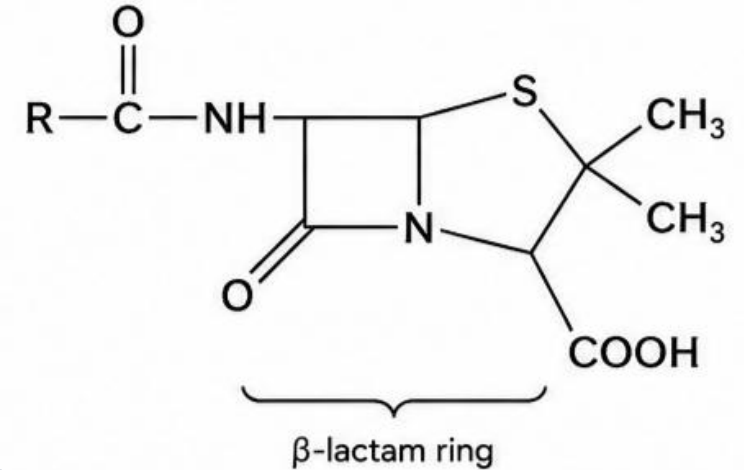
Remdesivir



Amoxicillin (Penicillin)



CHEMICAL STRUCTURE



Clinical Use

1. Streptococcal infection
2. Syphilis
3. Otitis media
4. Endocarditis
5. Meningococcal infection

Mechanism of action

- Penicillin binds to the enzyme transpeptidase in bacterial cell wall and suppress transpeptidation reaction.
- Defective cell wall formation > Lysis cell wall > Death of bacteria.

Adverse effects

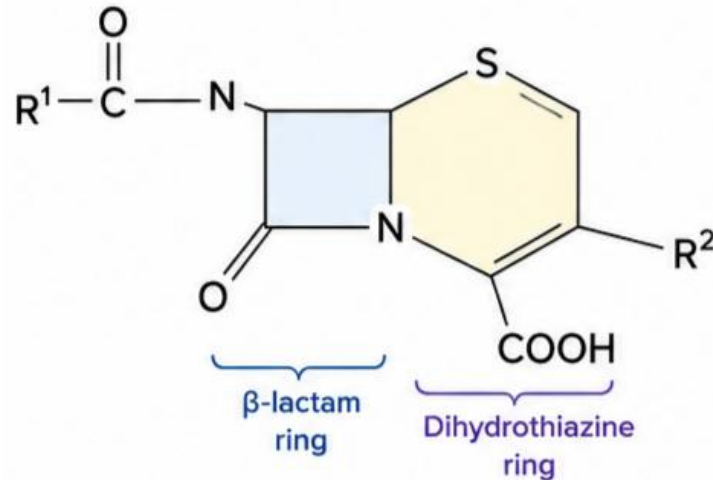
1. Hypersensitivity reaction
2. Rash
3. Diarrhea
4. Interstitial nephritis
5. Hemolytic anemia

Ceftriaxone (Cephalosporin)

Clinical uses:

1. Respiratory tract infections
2. Urinary tract infections
3. Skin and soft tissue infections
4. Bacterial meningitis
5. Gonorrhoea
6. Septicemia

CHEMICAL STRUCTURE



Mechanism

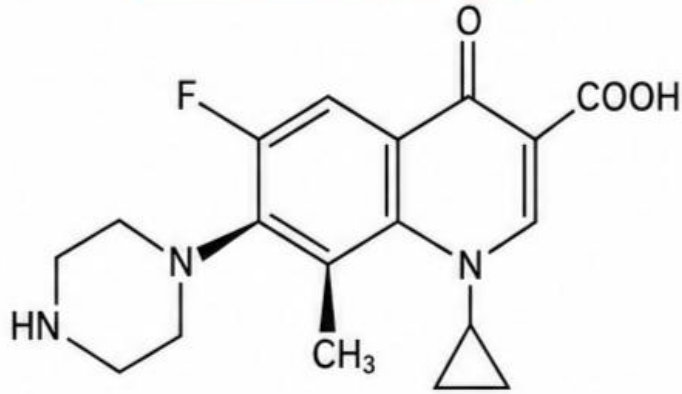
- Bind to Penicillin Binding Proteins (PBPs), Inhibit transpeptidation.
- Weaken cell wall formation > cell lysis > death



Adverse effects:

1. Hypersensitivity reactions
2. GIT upset
3. Nephrotoxicity (rare)
4. Disulfiram-like reaction (with alcohol)

CHEMICAL STRUCTURE



Clinical Uses:

1. Respiratory tract infection
2. Urinary tract infection
3. Enteric fever
4. Bones, joints and soft tissue infection

Levofloxacin



Mechanism:

Inhibit bacterial topoisomerase II and topoisomerase IV resulting in blockage of nucleotide synthesis

Contraindications:

1. Pregnancy
2. Child below 18 years
3. Known hypersensitivity

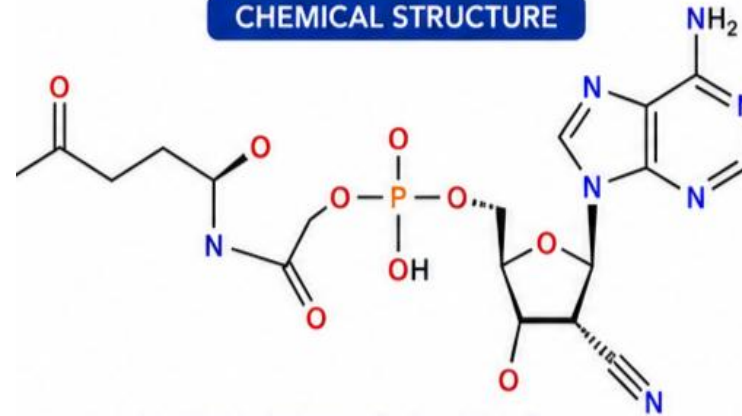
Adverse effects:

1. GIT upset
2. CNS side effects- headache, dizziness, hallucination.
3. Reversible arthropathy
4. Tendinitis
5. Q-T prolongation

Remdesivir



CHEMICAL STRUCTURE



Molecular formula: $C_{27}H_{35}N_6O_8P$
Molecular weight: 602.6 g/mol

Adverse effects:

Rash
Hypotension
Headache
Elevated liver enzymes

Mechanism :

- Intracellularly converted to the active nucleoside triphosphate.
- Acts as an adenosine analog.
- Inhibits viral RNA-dependent polymerase.

Clinical Uses:

Treatment of COVID-19 patients.

VACCINATION PROTECTS YOU. PREVENTS PNEUMONIA.



PNEUMOCOCCAL VACCINES

help protect against pneumonia caused by pneumococcus bacteria.



RECOMMENDED FOR ALL

Especially for children, adults 65+, and people with certain health conditions.



SAFE & EFFECTIVE

Pneumococcal vaccines are safe, effective, and trusted worldwide.



STRONGER PROTECTION, HEALTHIER LUNGS

Vaccination helps reduce the risk of pneumonia, hospitalization, and death.



**GET VACCINATED.
STAY PROTECTED.**



TALK TO YOUR DOCTOR TODAY.

A vaccine today can protect you and your loved ones for a healthier tomorrow.





Healthy Lungs,
Better Life

THANK YOU!

Thank you for your attention
and participation.

Let's work together for
healthy lungs! ❤️

