**Normal Chest X-ray:**

**1. Lungs**

* **Appearances**: Clear, no abnormal opacities (no signs of infection, fluid, mass, or collapse).
* **Lung fields**: Equal in size, with visible vascular markings extending to the periphery.
* **Costophrenic angles**: Sharp and clear (blunting could indicate fluid).
* **No consolidation**, **nodules**, or **masses**.

**2. Heart**

* **Size**: Should be less than half the width of the chest on a PA (posteroanterior) film — called the **cardiothoracic ratio**.
* **Shape**: Normal borders; no enlargement or abnormal contour.

**3. Mediastinum and Trachea**

* **Trachea**: Should be central.
* **Mediastinum**: Normal width, no signs of widening (could indicate masses or bleeding).
* **Aortic arch** and other vessels should be normal for age.

**4. Diaphragm**

* **Right diaphragm** is usually slightly higher than the left.
* Should have a smooth, domed shape.
* No signs of elevation or flattening (flattening may suggest hyperinflation like in COPD).

**5. Bones and Soft Tissues**

* **Ribs, clavicles, spine**: Intact, no fractures or lesions.
* **Soft tissues**: No swelling, subcutaneous emphysema, or abnormal densities.

**6. Pleura**

* **No pleural thickening**, **effusion** (fluid), or **pneumothorax** (air).

**Pneumonia can be caused by different types of germs:**

## 1. Bacteria

## 1. Streptococcus pneumoniae (Pneumococcus)

* **Most common cause** of bacterial pneumonia worldwide.
* Often follows a **cold or flu**, when the body is weak.
* Can cause **lobar pneumonia** (affecting one lobe of lung).
* **Symptoms**: sudden fever, chills, chest pain, productive cough with **rust-colored sputum**.
* Preventable by **pneumococcal vaccine** (PCV13, PPSV23).

**Causes / Risk Factors**

* Caused by **Gram-positive diplococcus** *Streptococcus pneumoniae*.
* Common after **viral infections** (cold, influenza).
* Higher risk in:
  + Elderly (>65 years)
  + Children <5 years
  + Patients with chronic illness (COPD, diabetes, heart disease)
  + Immunocompromised (HIV, cancer, post-surgery)
  + Alcoholics, smokers

**Symptoms**

* Sudden **high fever & chills**
* **Sharp chest pain** (pleuritic)
* **Productive cough** with **rust-colored sputum** (classic sign)
* Shortness of breath, rapid breathing
* Fatigue, body weakness
* In severe cases: confusion (elderly), sepsis, low blood pressure

**Treatment**

* **Antibiotics** (first line):
  + **Amoxicillin** or **Penicillin G** (if no resistance).
  + **Macrolides** (Azithromycin, Clarithromycin) if resistant or allergic.
  + **Cephalosporins** (Ceftriaxone, Cefotaxime) in hospitalized patients.
  + **Fluoroquinolones** (Levofloxacin, Moxifloxacin) in severe/resistant cases.
* **Supportive care**:
  + Oxygen therapy if breathing difficulty.
  + IV fluids for dehydration.
  + Paracetamol for fever/pain.
* **Prevention**:
  + **PCV13** (children, immunocompromised, elderly).
  + **PPSV23** (elderly and high-risk adults).

**2. Haemophilus influenzae**

* Second most common cause (especially in children, elderly, and COPD patients).
* Causes **bronchopneumonia** (patchy infection in both lungs).
* **Symptoms**: fever, shortness of breath, productive cough.
* Can be prevented with the **Hib vaccine**.

**Causes / Risk Factors**

* Caused by **Gram-negative coccobacillus** *Haemophilus influenzae*.
* **Second most common cause** of bacterial pneumonia.
* More frequent in:
  + **Children** (especially unvaccinated)
  + **Elderly**
  + Patients with **COPD, asthma, or chronic lung disease**
  + **Smokers** and **immunocompromised** individuals
* Infection usually spreads from the **upper respiratory tract** down to the lungs.
* Can cause **bronchopneumonia** → patchy infection in multiple areas of both lungs.

**🔹 Symptoms**

* **Fever and chills**
* **Productive cough** (sputum often yellow or green)
* **Shortness of breath / wheezing**
* **Chest pain** (sometimes)
* In children: may also cause **epiglottitis, meningitis, ear infections**
* Severe cases: can lead to **bacteremia (blood infection) or sepsis**

**🔹 Treatment**

* **Antibiotics** (first choice):
  + **Amoxicillin-clavulanate**
  + **Cephalosporins** (Ceftriaxone, Cefotaxime)
  + **Macrolides** (Azithromycin, Clarithromycin)
  + **Fluoroquinolones** (Levofloxacin, Moxifloxacin) for resistant strains
* **Supportive care**:
  + Oxygen therapy (if breathing difficulty)
  + IV fluids for hydration
  + Fever control with paracetamol/ibuprofen
* **Prevention**:
  + **Hib vaccine** (Haemophilus influenzae type b vaccine) – protects children and high-risk adults from severe infections.

**3. Staphylococcus aureus**

* Often causes pneumonia **after influenza infection**.
* Can form **abscesses** or cause **necrotizing pneumonia** (lung tissue destruction).
* More common in **hospital-acquired pneumonia (HAP)** or patients on ventilators.

**Causes / Risk Factors**

* Caused by **Gram-positive cocci** *Staphylococcus aureus*.
* Often occurs **after influenza infection** (secondary bacterial pneumonia).
* Common in:
  + **Hospital-acquired pneumonia (HAP)**
  + **Ventilator-associated pneumonia (VAP)**
  + **Immunocompromised patients**
  + **IV drug users**
* Can spread through the bloodstream → **hematogenous spread** from skin infections, endocarditis, or abscesses.

**Symptoms**

* **High fever & chills**
* **Productive cough** (sputum may be purulent or blood-stained)
* **Shortness of breath**
* **Pleuritic chest pain**
* **Complications** (unique to S. aureus):
  + **Lung abscesses** (pus-filled cavities)
  + **Necrotizing pneumonia** (destruction of lung tissue)
  + **Empyema** (pus in pleural space)
  + Can progress to **sepsis**

**Treatment**

* **Antibiotics (based on sensitivity):**
  + **Methicillin-sensitive S. aureus (MSSA):**
    - Nafcillin, Oxacillin, or Cefazolin
  + **Methicillin-resistant S. aureus (MRSA):**
    - **Vancomycin** (IV)
    - **Linezolid** (alternative)
* **Supportive care:**
  + Oxygen therapy for hypoxemia
  + IV fluids, electrolyte balance
  + Drainage if abscess or empyema forms
* **Prevention:**
  + Good infection control in hospitals
  + Proper sterilization of ventilators & equipment

**4. Klebsiella pneumoniae**

* Common in **alcoholics, diabetics, or hospitalized patients**.
* Produces **thick, jelly-like sputum (currant jelly sputum)**.
* Causes severe, often **fatal** pneumonia with lung destruction.

**Causes / Risk Factors**

* Caused by **Gram-negative bacillus** *Klebsiella pneumoniae*.
* Found in the **normal gut flora**, but becomes pathogenic in weakened individuals.
* **High-risk groups:**
  + **Alcoholics** (classic association)
  + **Diabetics**
  + **Hospitalized patients** (especially ICU)
  + Patients on **ventilators**
  + People with **weakened immunity**
* Often associated with **hospital-acquired pneumonia (HAP)**.

**🔹 Symptoms**

* **High fever & chills**
* **Productive cough** with **thick, sticky, blood-tinged sputum** → called **“currant jelly sputum”** (classic sign).
* **Severe chest pain & shortness of breath**
* Rapid progression to **lung necrosis & cavitation** (tissue destruction).
* Can lead to **empyema (pus in pleural cavity)** and **septicemia**.
* Higher **mortality rate** compared to other bacterial pneumonias.

**🔹 Treatment**

* **Antibiotics (based on sensitivity testing, as resistance is common):**
  + **Carbapenems** (Imipenem, Meropenem) – often used for severe infections.
  + **Cephalosporins** (Ceftriaxone, Cefotaxime) – if sensitive.
  + **Aminoglycosides** (Gentamicin, Amikacin) – sometimes in combination.
  + **Polymyxins** (Colistin) – for multidrug-resistant strains.
* **Supportive care:**
  + Oxygen therapy and ventilator support if needed.
  + IV fluids & electrolytes.
  + Drainage if abscess/empyema forms.
* **Prevention:**
  + Strict **hospital infection control** practices.
  + Limit unnecessary use of antibiotics (to prevent resistance).

## 5. ****Mycoplasma pneumoniae****

* Known as **“walking pneumonia”** (milder form).
* Affects **young adults & students** living in crowded areas (hostels, army).
* **Symptoms**: dry cough, headache, fatigue (less severe than other bacterial pneumonias).
* Doesn’t show up well on X-ray, often misdiagnosed.

**Causes / Risk Factors**

* Caused by **Mycoplasma pneumoniae**, a **bacteria without a cell wall**.
* Commonly causes **mild, atypical pneumonia**.
* **High-risk groups:**
  + **Young adults and students** (hostels, military barracks, dormitories)
  + People in **crowded living conditions**
  + Can occur **year-round**, often in **schools or workplaces**

**🔹 Symptoms**

* **Mild, gradual onset** of illness
* **Dry cough** (non-productive)
* **Headache**, **fatigue**, and general malaise
* **Low-grade fever** (less severe than classic bacterial pneumonia)
* Sometimes **sore throat** or mild **shortness of breath**
* **Chest X-ray**: may show subtle or patchy infiltrates; often **misdiagnosed**

**🔹 Treatment**

* **Antibiotics effective against atypical bacteria:**
  + **Macrolides**: Azithromycin, Clarithromycin
  + **Tetracyclines**: Doxycycline (for adults)
  + **Fluoroquinolones**: Levofloxacin, Moxifloxacin (in resistant cases)
* **Supportive care:**
  + Rest and hydration
  + Antipyretics (paracetamol) for fever
  + Symptomatic treatment for cough (if needed)
* **Prevention:**
  + Avoid close contact in crowded spaces during outbreaks
  + Good hand hygiene and respiratory etiquette.

**6. Legionella pneumophila**

* Causes **Legionnaires’ disease** (severe pneumonia).
* Spread through **contaminated water systems** (AC cooling towers, showers).
* **Symptoms**: high fever, cough, diarrhea, confusion.
* Can be very dangerous in elderly or immunocompromised patients.

**Causes / Risk Factors**

* Caused by **Legionella pneumophila**, a **Gram-negative bacterium**.
* Causes **Legionnaires’ disease**, a severe form of pneumonia.
* **Transmission:**
  + Inhalation of **aerosols from contaminated water systems**
    - Air conditioning cooling towers
    - Showers, faucets, hot tubs
    - Fountains and plumbing systems
* **High-risk groups:**
  + Elderly (>50 years)
  + Smokers
  + Immunocompromised patients (HIV, cancer, transplant recipients)
  + People with chronic lung disease

**🔹 Symptoms**

* **High fever** and chills
* **Cough** (may be dry or productive)
* **Shortness of breath / rapid breathing**
* **Diarrhea, nausea, vomiting** (extra-pulmonary symptom)
* **Confusion or altered mental status** (especially in elderly)
* Muscle aches and headache
* Severe cases can lead to **respiratory failure, shock, or multi-organ failure**

**🔹 Treatment**

* **Antibiotics effective against Legionella:**
  + **Macrolides**: Azithromycin (first-line)
  + **Fluoroquinolones**: Levofloxacin, Moxifloxacin (alternative or severe cases)
  + **Tetracyclines**: Doxycycline (sometimes used)
* **Supportive care:**
  + Oxygen therapy for breathing difficulty
  + IV fluids for dehydration
  + Intensive care for severe cases (ventilator support if needed)
* **Prevention:**
  + Proper maintenance and disinfection of water systems
  + Avoid stagnant water in AC units and fountains

**2.** **Viruses**

**1.** **Influenza Virus (Flu)**

* Most common viral cause in adults.
* Often leads to **secondary bacterial pneumonia** (especially Streptococcus pneumoniae or Staphylococcus aureus).
* **Symptoms:** sudden fever, chills, body aches, cough, sore throat, fatigue.
* **Causes / Risk Factors**
* Caused by **Influenza viruses**: types A, B, and C (Type A most severe).
* **Primary viral pneumonia** can occur, or it may cause **secondary bacterial pneumonia** (commonly *Streptococcus pneumoniae* or *Staphylococcus aureus*).
* **High-risk groups:**
* Elderly (>65 years)
* Children <5 years
* Pregnant women
* Immunocompromised individuals
* Patients with chronic diseases (asthma, diabetes, heart disease)
* **Transmission:** Respiratory droplets from infected individuals.
* **🔹 Symptoms**
* **Sudden onset** of high fever and chills
* **Body aches (myalgia)** and headache
* **Fatigue and weakness**
* **Cough** (usually dry) and **sore throat**
* Sometimes **runny nose, nausea, vomiting**
* Severe cases may develop **shortness of breath** and **secondary bacterial pneumonia**
* **🔹 Treatment**
* **Supportive care:**
* Rest and hydration
* Oxygen therapy if hypoxia occurs
* Antipyretics for fever (paracetamol, ibuprofen)
* **Antiviral therapy** (if started within 48 hours of symptom onset):
* **Oseltamivir (Tamiflu)**
* **Zanamivir** (inhaled)
* **Peramivir** (IV, in severe cases)
* **Prevention:**
* Annual **influenza vaccination** (inactivated or live-attenuated)
* Hand hygiene, masks, and avoiding crowded places during outbreaks
* Prompt treatment of secondary bacterial infections if they occur.

**2. Respiratory Syncytial Virus (RSV)**

* Most common cause in **infants and young children**.
* Can cause **bronchiolitis** along with pneumonia.
* **Symptoms:** runny nose, wheezing, cough, difficulty breathing, fever.

**Causes / Risk Factors**

* Caused by **Respiratory Syncytial Virus (RSV)**, a **single-stranded RNA virus**.
* Most common cause of **viral pneumonia and bronchiolitis in infants and young children**.
* **Transmission:** Respiratory droplets from coughing, sneezing, or direct contact.
* **High-risk groups:**
  + Infants (<1 year), especially premature babies
  + Young children (<2 years)
  + Elderly individuals (>65 years)
  + Immunocompromised patients
  + Children with chronic lung disease or congenital heart disease

**🔹 Symptoms**

* **Runny nose** and nasal congestion
* **Wheezing** and cough
* **Difficulty breathing / rapid breathing**
* **Fever** (usually low to moderate)
* Poor feeding and irritability in infants
* Severe cases may lead to **hypoxia** and hospitalization

**🔹 Treatment**

* **Supportive care** (main treatment):
  + Oxygen therapy for hypoxia
  + Hydration (oral or IV fluids)
  + Suctioning of nasal secretions in infants
  + Fever management with paracetamol
* **Antiviral therapy:**
  + **Ribavirin** (rarely used; only in severe cases or high-risk patients)
* **Prevention:**
  + Good hand hygiene and avoiding contact with sick individuals
  + **Palivizumab** (monoclonal antibody) prophylaxis for high-risk infants
  + Avoid crowded places for infants during RSV season’

**3. Coronaviruses**

* Includes **SARS-CoV-2 (COVID-19)** and other strains like SARS-CoV, MERS-CoV.
* Can cause severe pneumonia and **acute respiratory distress syndrome (ARDS)**.
* **Symptoms:** fever, dry cough, fatigue, shortness of breath, loss of taste/smell (specific to COVID-19).

**Causes / Risk Factors**

* Caused by **coronaviruses**:
  + **SARS-CoV-2** → COVID-19
  + **SARS-CoV** → Severe Acute Respiratory Syndrome
  + **MERS-CoV** → Middle East Respiratory Syndrome
* **Transmission:**
  + Respiratory droplets, aerosols, or contact with contaminated surfaces.
* **High-risk groups:**
  + Elderly (>60 years)
  + People with **chronic diseases** (diabetes, heart disease, lung disease)
  + Immunocompromised individuals
  + Healthcare workers or those in close contact with infected patients

**🔹 Symptoms**

* **Fever**
* **Dry cough**
* **Fatigue / body aches**
* **Shortness of breath / difficulty breathing**
* **Loss of taste or smell** (specific to COVID-19)
* Sore throat, headache, nasal congestion
* Severe cases:
  + **Pneumonia** with lung infiltrates
  + **Acute Respiratory Distress Syndrome (ARDS)**
  + Multi-organ failure in critical cases

**🔹 Treatment**

* **Supportive care:**
  + Oxygen therapy for hypoxia
  + Mechanical ventilation in severe ARDS
  + Fluids and electrolyte balance
  + Antipyretics for fever
* **Antiviral / specific therapies (for COVID-19):**
  + **Remdesivir**
  + **Paxlovid** (nirmatrelvir + ritonavir)
  + **Monoclonal antibodies** (for high-risk patients, depending on variants)
* **Prevention:**
  + COVID-19 vaccination (primary series + boosters)
  + Masks, social distancing, and hand hygiene
  + Isolation of infected individuals.

**4.Adenoviruses**

* Common in **children and military recruits**.
* Can cause mild to severe pneumonia.
* **Symptoms:** fever, sore throat, cough, conjunctivitis (sometimes).

**Causes / Risk Factors**

* Caused by **Adenoviruses**, a group of **double-stranded DNA viruses**.
* Can cause **mild to severe pneumonia**, depending on the strain.
* **High-risk groups:**
  + **Children**, especially under 5 years
  + **Military recruits** living in close quarters
  + Immunocompromised patients
* **Transmission:**
  + Respiratory droplets from coughing or sneezing
  + Direct contact with contaminated surfaces or fomites

**🔹 Symptoms**

* Fever
* **Sore throat**
* **Cough** (may be dry or productive)
* **Conjunctivitis** (red eyes) in some cases
* Nasal congestion, runny nose
* Severe cases: **shortness of breath, hypoxia, or pneumonia requiring hospitalization**

**🔹 Treatment**

* **Supportive care** (main treatment):
  + Oxygen therapy for breathing difficulty
  + Hydration and rest
  + Antipyretics for fever
  + Symptomatic treatment for cough
* **Antiviral therapy:**
  + Usually **not required** in healthy individuals
  + **Cidofovir** may be used in **severe or immunocompromised cases**
* **Prevention:**
  + Good **hand hygiene** and respiratory etiquette
  + Avoid close contact with infected individuals
  + Military recruits sometimes receive **live oral adenovirus vaccines** (specific strains).

**5. Parainfluenza Viruses**

* Cause pneumonia, especially in **young children**.
* Can also cause **croup** (barking cough).

**Causes / Risk Factors**

* Caused by **Parainfluenza viruses (types 1–4)**, **RNA viruses** of the Paramyxoviridae family.
* Commonly affects **young children**.
* Can cause **bronchitis, pneumonia, and croup (barking cough)**.
* **Transmission:**
  + Respiratory droplets from coughing or sneezing
  + Direct contact with contaminated surfaces
* **High-risk groups:**
  + Infants and toddlers (<5 years)
  + Immunocompromised individuals

**🔹 Symptoms**

* **Fever** (usually mild to moderate)
* **Cough** (dry or productive)
* **Shortness of breath / rapid breathing**
* **Croup**: harsh, barking cough, hoarseness
* Runny nose and nasal congestion
* Wheezing in some cases
* Severe cases may require hospitalization for **hypoxia or pneumonia**

**🔹 Treatment**

* **Supportive care** (mainstay):
  + Oxygen therapy for breathing difficulty
  + Hydration and rest
  + Antipyretics for fever (paracetamol/ibuprofen)
  + Suctioning for infants with nasal congestion
* **Antiviral therapy:**
  + Generally **not required**, as most cases are self-limiting
* **Prevention:**
  + Hand hygiene, avoiding contact with sick children
  + Isolating infected children in daycare or school settings
  + No routine vaccine available.

**6. Other viruses**

* **Human metapneumovirus (hMPV)** – similar to RSV, mostly in children and elderly.
* **Varicella-zoster virus (chickenpox virus)** – rarely causes pneumonia in adults.

**1. Human Metapneumovirus (hMPV)**

* **Causes / Risk Factors:**
  + RNA virus, closely related to RSV.
  + Common in **children under 5 years** and **elderly**.
  + Transmitted via respiratory droplets.
* **Symptoms:**
  + Fever, cough, runny nose
  + Wheezing, shortness of breath
  + Mild to moderate pneumonia
* **Treatment:**
  + Supportive care: oxygen therapy, hydration, fever control
  + Usually self-limiting; antivirals are not routinely used

**🔹 2. Varicella-Zoster Virus (VZV, Chickenpox Virus)**

* **Causes / Risk Factors:**
  + DNA virus causing chickenpox.
  + Pneumonia is **rare**, mostly in **adults** or immunocompromised patients.
  + Occurs via **reactivation or primary infection**.
* **Symptoms:**
  + Fever, cough, shortness of breath
  + Sometimes rash associated with chickenpox
  + Can progress to severe pneumonia or respiratory failure in adults
* **Treatment:**
  + **Antivirals:** Acyclovir (especially in adults or severe cases)
  + Supportive care: oxygen therapy, hydration, fever control
* **Prevention:**
  + Chickenpox vaccine (especially in children and non-immune adults).

**3.** **Fungi**

**1. Histoplasma capsulatum**

* Found in **bird and bat droppings**.
* Causes **histoplasmosis**, often in the Ohio and Mississippi River valleys.
* Usually **mild in healthy people**, severe in immunocompromised patients.

**Causes / Risk Factors**

* Caused by **Histoplasma capsulatum**, a **dimorphic fungus**.
* Found in **soil contaminated with bird or bat droppings**.
* **Transmission:** Inhalation of fungal spores.
* **High-risk groups:**
  + People in **Ohio and Mississippi River valleys** (endemic areas)
  + Immunocompromised individuals (HIV/AIDS, transplant patients)
  + People with chronic lung disease

**🔹 Symptoms**

* Often **mild or asymptomatic** in healthy individuals
* Fever, chills
* Cough (dry or productive)
* Chest pain
* Fatigue, body aches
* Severe cases (immunocompromised) may show:
  + Shortness of breath
  + Hypoxia
  + Dissemination to other organs (liver, spleen, CNS)

**🔹 Treatment**

* **Mild cases:** Often **self-limiting**, no treatment needed
* **Moderate to severe cases:**
  + **Itraconazole (oral)** – first-line
  + **Amphotericin B (IV)** – severe or disseminated disease
* **Supportive care:** Oxygen therapy, hydration, rest, fever management

**🔹 Prevention**

* Avoid exposure to **bird or bat droppings**
* Use **protective masks** in endemic areas
* Immunocompromised individuals may require **prophylactic antifungals.**

**2. Coccidioides immitis / C. posadasii**

* Causes **coccidioidomycosis (Valley Fever)**.
* Found in **desert soil in Southwestern USA and Mexico**.
* Can cause **pneumonia and systemic infection**.

**Causes / Risk Factors**

* Caused by **Coccidioides immitis** or **Coccidioides posadasii**, **dimorphic fungi**.
* Found in **desert soil** of Southwestern USA (Arizona, California) and Mexico.
* **Transmission:** Inhalation of fungal spores from disturbed soil (dust storms, construction, farming).
* **High-risk groups:**
  + Residents of **endemic desert regions**
  + Immunocompromised individuals (HIV/AIDS, transplant recipients)
  + People with chronic lung disease

**🔹 Symptoms**

* Fever, chills
* Cough (dry or productive)
* Chest pain
* Fatigue and body aches
* Rash may occur in some cases (desert rheumatism)
* Severe or disseminated infection can affect **skin, bones, CNS**, causing meningitis or systemic disease
* Shortness of breath in severe pulmonary involvement

**🔹 Treatment**

* **Mild cases:** Often **self-limiting**, may not require antifungal therapy
* **Moderate to severe cases:**
  + **Fluconazole or Itraconazole (oral)** – first-line treatment
  + **Amphotericin B (IV)** – for severe or disseminated disease
* **Supportive care:** Oxygen therapy, hydration, rest

**🔹 Prevention**

* Avoid exposure to **dust in endemic areas**
* Use **masks or respirators** during construction, farming, or soil disruption
* Immunocompromised individuals may require **prophylactic antifungals.**

**3. Blastomyces dermatitidis**

* Found in **soil rich in decaying organic matter**.
* Causes **blastomycosis**, can affect lungs and skin.

**Causes / Risk Factors**

* Caused by **Blastomyces dermatitidis**, a **dimorphic fungus**.
* Found in **soil rich in decaying organic matter**, especially near rivers and wooded areas.
* **Transmission:** Inhalation of fungal spores from disturbed soil.
* **High-risk groups:**
  + Residents in endemic regions (e.g., Ohio and Mississippi River valleys, Great Lakes region)
  + Immunocompromised individuals (HIV/AIDS, transplant recipients)
  + People with chronic lung disease

**🔹 Symptoms**

* Fever, chills
* Cough (dry or productive, sometimes with blood)
* Chest pain
* Shortness of breath
* Fatigue and body aches
* **Disseminated disease:**
  + Skin lesions (ulcerative or wart-like)
  + Rarely affects bones, genitourinary tract, or CNS

**🔹 Treatment**

* **Mild to moderate cases:**
  + **Itraconazole (oral)** – first-line therapy
* **Severe or disseminated cases:**
  + **Amphotericin B (IV)** – especially for immunocompromised patients
* **Supportive care:** Oxygen therapy, hydration, fever control

**🔹 Prevention**

* Avoid exposure to **dusty soil or decaying organic matter** in endemic areas
* Use **masks or respirators** if exposure is unavoidable
* Immunocompromised individuals may need **prophylactic antifungals.**

**4. Aspergillus species**

* Common in the environment (soil, decaying vegetation).
* Can cause **invasive aspergillosis** in immunocompromised patients.
* Rarely infects healthy lungs.

**Causes / Risk Factors**

* Caused by **Aspergillus species**, commonly **A. fumigatus**.
* Found in **soil, decaying vegetation, compost, and dust**.
* **Transmission:** Inhalation of airborne spores.
* **High-risk groups:**
  + Immunocompromised individuals:
    - **HIV/AIDS patients**
    - **Organ transplant recipients**
    - **Cancer patients** (chemotherapy)
    - **Long-term corticosteroid users**
  + Rarely affects healthy individuals

**🔹 Symptoms**

* Fever and chills
* Cough (may be dry or produce blood-tinged sputum)
* Shortness of breath and rapid breathing
* Chest pain
* Severe cases may progress to **hemoptysis** (coughing blood), **lung necrosis**, or **disseminated infection** affecting other organs

**🔹 Treatment**

* **First-line antifungal:** Voriconazole (oral or IV)
* **Alternative antifungals:**
  + Amphotericin B (for severe or refractory cases)
  + Posaconazole or Isavuconazole (for resistant infections)
* **Supportive care:** Oxygen therapy, hydration, fever management
* **Surgical intervention:** Rarely required for localized lung lesions or abscesses

**🔹 Prevention**

* Avoid exposure to **dusty environments or decaying vegetation** if immunocompromised
* Use **HEPA filtration** in hospital wards for high-risk patients
* Prophylactic antifungals may be used in **severely immunocompromised patients.**

**5. Cryptococcus neoformans / Cryptococcus gattii**

* Found in **soil contaminated with bird droppings**, especially pigeons.
* Can cause **severe pneumonia and meningitis**, mainly in immunocompromised patients (HIV/AIDS).

**Causes / Risk Factors**

* Caused by **Cryptococcus neoformans** or **Cryptococcus gattii**, **encapsulated yeast fungi**.
* Found in **soil contaminated with bird droppings**, especially **pigeons**.
* **Transmission:** Inhalation of fungal spores.
* **High-risk groups:**
  + Immunocompromised patients:
    - **HIV/AIDS**
    - Organ transplant recipients
    - Long-term corticosteroid users
  + Rarely affects healthy individuals (more common with C. gattii)

**🔹 Symptoms**

* Fever and chills
* Cough (dry or productive)
* Shortness of breath and chest pain
* Fatigue and malaise
* **Severe cases / immunocompromised patients:**
  + Can disseminate to **central nervous system**, causing **meningitis**
  + Headache, neck stiffness, altered mental status

**🔹 Treatment**

* **Mild to moderate pulmonary infection:**
  + **Fluconazole (oral)** – first-line
* **Severe or disseminated infection:**
  + **Amphotericin B (IV) + Flucytosine**, followed by **Fluconazole maintenance**
* **Supportive care:** Oxygen therapy, hydration, fever management

**🔹 Prevention**

* Avoid exposure to **bird droppings**, especially pigeon habitats
* Use protective masks in high-risk areas
* Maintain **immune health** and follow prophylactic antifungals in severely immunocompromised patients.

**6. Pneumocystis jirovecii (formerly P. carinii)**

* Opportunistic fungus causing **Pneumocystis pneumonia (PCP)**.
* Occurs almost exclusively in **immunocompromised patients**, especially **HIV/AIDS**.

**Causes / Risk Factors**

* Caused by **Pneumocystis jirovecii**, an **opportunistic fungus**.
* Almost exclusively affects **immunocompromised patients**, especially:
  + **HIV/AIDS patients** with low CD4 counts (<200 cells/µL)
  + Organ transplant recipients
  + Patients on long-term corticosteroids or chemotherapy
* **Transmission:** Likely via inhalation of airborne spores from infected individuals, though exact route is not fully known.

**🔹 Symptoms**

* Gradual onset of **fever**
* **Non-productive (dry) cough**
* **Shortness of breath** and rapid breathing
* Fatigue and weight loss
* Severe cases may develop **hypoxia** and **respiratory failure**

**🔹 Treatment**

* **First-line therapy:**
  + **Trimethoprim-sulfamethoxazole (TMP-SMX)** – oral or IV depending on severity
* **Alternative therapies** (if TMP-SMX intolerant):
  + Pentamidine (IV)
  + Atovaquone (oral)
  + Clindamycin + Primaquine
* **Adjunctive therapy:**
  + **Corticosteroids** in moderate to severe PCP with hypoxia
* **Supportive care:** Oxygen therapy, hydration, rest

**🔹 Prevention**

* **Prophylactic TMP-SMX** in high-risk HIV/AIDS patients (CD4 <200)
* Minimize exposure to respiratory infections in immunocompromised patients
* Maintain good immune health where possible.