**Pathology of
Pneumonia**

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Introduction:

5000 sq meters of area….! (olympic track)

Filters >10,000 L of air / day…!

Normal lungs are sterile.

Delicate, thin **resp. mem** – gas exch.

Filter, humidify, sterilize, highly **sensitive**.

**RTI** – Resp. tract inf. commonest in medical practice.

Enormous morbidity & mortality.

Pneumonia – inflammation of alveoli.

**Normal Lung**

**Normal Lung**

Etiology:

Decreased resistance - General/immune

Virulent infection - Lobar pneumonia

Defective Clearing mechanism

Cough/gag Reflex – Coma, paralysis, sick.

Mucosal Injury – smoking, toxin aspiration

Low Alveolar defense - Immunodeficiency

Pulmonary edema – Cardiac failure, embol.

Obstructions – foreign body, tumors

Patterns of Lung disorders:

**Airway**

Bronchitis, Bronchiectasis, Bronchiolitis.

Tumors / Cancer

**Parenchyma**

Pneumonia.

Lung abscess, TB

Hyaline membrane dis (HMD & ARDS)

Pneumoconiosis

Tumors / Cancer

**Pleura**:

Pleural effusion (TB)

Tumors / Cancer

Pathogenesis of Pulmonary Infections

Step 1: Entry

Aspiration (ie Pneumococcus)

Inhalation (ie Mtb and viral pathogens)

Inoculation (contaminated equipment)

Colonization (in patients with COPD)

Hematogenous spread (patients with sepsis)

Direct spread (adjacent abscess)

Pathogenesis:

Pathogenesis:

Pneumonia Types:

**Etiologic Types:**

**Infective**

Viral

Bacterial

Fungal

Tuberculosis

**Non Infective**

Toxins

chemical

Aspiration

**Morphologic types:**

**Lobar**

**Broncho**

**Interstitial**

**Duration:**

Acute

Chronic

**Clinical:**

Primary / secondary.

Typical / Atypical

Community a / hospital a

Lobar Pneumonia:

whole lobe, exudation - consolidation

95% - Strep pneum.(Klebsiella in aged, DM, alcoholics)

High fever, rusty sputum, Pleuritic chest pain.

Four stages: (\*also in bronchopneumonia)

**Congestion** – 1d – vasodilatation congestion.

**Red** **Hepatization** 2d Exudation+RBC

**Gray** **Hepatizaiton** 4d neutro & Macrophages.

**Resolution** – 8d few macrophages, normal.

**Pathogenesis of Pneumonia**

Lobar
Pneumonia:

Lobar
Pneumonia:

Lobar Pneumonia – Gray hep…

Lobar Pneumonia:

Lobar Pneumonia: Congestion

Lobar Pneumonia: Red hepat.

Lobar Pneumonia: Grey hepat.

Broncho-pneumonia

Bronchopneumonia (patchy)

Extremes of age. (infancy and old age)

Staph, Strep, Pneumo & H. influenza

Patchy consolidation – not limited to lobes.

Suppurative inflammation

Usually bilateral

Lower lobes common

Broncho-pneumonia

Broncho-pneumonia

Bronchopneumonia:

Bronchopneumonia - CT

Bronchopneumonia

Broncho – **Pneumonia** - Lobar

Extremes of age.

Secondary.

Both genders.

Staph, Strep, H.infl.

Patchy consolidation

Around Small airway

Not limited by anatomic boundaries.

Usually bilateral.

Middle age – 20-50

Primary in a healthy

males common.

95% pneumoc (Klebs.)

Entire lobe consolidation

Diffuse

Limited by anatomic boundaries.

Usually unilateral

Broncho – **Pneumonia** - Lobar

Interstitial / atypical Pneumonia

Primary atypical pneumonia in the immunocompetant host (Mycoplasma or Chlamydia)

Interstitial pneumonitis

immunocompromised host : Pneumocystic carinii; CMV

Immunocompetant host: Influenza A

Gross features:

Lungs are heavy but not firmly consolidated

Microscopic features:

Septal mononuclear infiltrate

Alveolar air spaces either ‘empty’ or filled with proteinaceous fluid with few or no inflammatory cells

Interstitial Pneumonia:

Chronic Pneumonia

Chronic, lymphoid infiltrate,

No classic stages.

Lung destruction – cavity, abscess etc.

Organisms

Mycobacterium tuberculosis

Histoplasma capsulatum

Aspergillosis

Actinomyces

Comm – **Pneumonia** - Nosoc

In healthy adults

Gram positive.

Streptococcus pneumoniae (90%)

Strep. Pyogenes, Staph, H. influenzae and Klebsiella in elderly or with COPD.

In \*sick patients.

gram-negative bacilli

Pseudomonas aeruginosa, Escherichia coli, Enterobacter, Proteus, and Klebsiella.

Pathogenesis of Clinical features:

\*Alveolar inflammation.

Tachypnoea, Dyspnoea, Resp Acidosis 🡪 Solid/airless lungs – decreased oxygenation.

Dull percussion - Consolidation – Exudation

Rusty sputum - RBC & Inflammatory cells.

Fever – Inflammatory mediators.

Complications of Pneumonia

**Abscesses**

Localized suppurative necrosis, Right side often in aspiration.

Staphylococcus; Klebsiella; Pneudomonas

**Pleuritis / Pleural effusion.**

Inflammation of the pleura ( Streptococcus pneumoniae)

Blood rich exudate (esp. rickettsial diseases)

**Empyema**

Pus in the pleural space.

**Septicemia**

Abscess formation

Lung Abscess:

Abscess formation

Lung Abscess:

Lung Fungal Abscess: Candida