

## PHARMA PATHO & GENETICS 2019

Q1. Define Anti tuberculin Drugs.

:- Refer to 2022 Q1. (a)

(B) List different anti tuberculin drugs

:- Antitubercular drugs are medications used to treat tuberculosis (TB). They are classified into first-line and second-line drugs based on their efficacy, toxicity, and role in treatment.

First-Line Antitubercular Drugs (Most effective with fewer side effects)

1. Isoniazid (INH) – Bactericidal; inhibits mycolic acid synthesis.
2. Rifampicin (RIF) – Bactericidal; inhibits bacterial RNA synthesis.
3. Pyrazinamide (PZA) – Bactericidal; disrupts mycobacterial membrane function.
4. Ethambutol (EMB) – Bacteriostatic; inhibits arabinosyl transferase, affecting cell wall synthesis.
5. Streptomycin (SM) – Aminoglycoside; inhibits protein synthesis (less commonly used today).

Second-Line Antitubercular Drugs (Used for drug-resistant TB or when first-line drugs are not suitable)

1. Fluoroquinolones

Levofloxacin

Moxifloxacin

Ciprofloxacin

2. Injectable Agents

Amikacin

Kanamycin

Capreomycin

3. Thioamides

Ethionamide

Prothionamide

4. Cycloserine – Inhibits cell wall synthesis.
5. Para-aminosalicylic acid (PAS) – Inhibits folate metabolism.

6. Bedaquiline – Inhibits ATP synthase; used for multidrug-resistant TB (MDR-TB)
7. Delamanid – Inhibits mycolic acid synthesis; used for MDR-TB.
8. Pretomanid – Used in combination for extensively drug-resistant TB (XDR-TB)

(c) Refer to 2022 Q1. (C)

Q2. Write short note on –

(A)Bronchodilators.

:- Bronchodilators

Bronchodilators are medications that relax the muscles around the airways, widening them and making breathing easier. They are primarily used to treat respiratory conditions like asthma, chronic obstructive pulmonary disease (COPD), and bronchitis.

Types of Bronchodilators

1. Beta-2 Agonists (Stimulate beta-2 receptors, relaxing airway muscles)

Short-acting (SABA): Salbutamol (Albuterol), Terbutaline (Quick relief for asthma attacks)

Long-acting (LABA): Salmeterol, Formoterol (Used for long-term control)

2. Anticholinergics (Block acetylcholine, reducing airway constriction)

Short-acting: Ipratropium bromide

Long-acting (LAMA): Tiotropium, Aclidinium

3. Methylxanthines (Inhibit phosphodiesterase, leading to bronchodilation)

Theophylline, Aminophylline (Less commonly used due to side effects)

Uses of Bronchodilators

Relieve bronchospasms in asthma and COPD

Improve airflow and oxygenation

Prevent exercise-induced bronchoconstriction

Side Effects

Increased heart rate, tremors, headaches (Beta-2 agonists)

Dry mouth, urinary retention (Anticholinergics)

Nausea, insomnia, arrhythmias (Methylxanthines)

(b) Fluid & electrolyte therapy.

### **:- Fluid & Electrolyte Therapy – Short Note**

Fluid and electrolyte therapy is essential for maintaining the body's hydration, electrolyte balance, and acid-base homeostasis. It is commonly used in medical settings to manage dehydration, electrolyte imbalances, and various disease conditions.

#### **1. Indications**

- Dehydration (e.g., due to vomiting, diarrhea, burns, fever)
- Electrolyte imbalances (e.g., hyponatremia, hyperkalemia)
- Shock and hypovolemia
- Maintenance therapy in patients unable to take oral fluids
- Postoperative fluid management

#### **2. Types of Fluids**

- **Crystalloids:** Balanced salt solutions that pass freely between compartments.
  - Examples: Normal saline (0.9% NaCl), Ringer's lactate, Dextrose solutions
- **Colloids:** Contain large molecules that remain in the vascular compartment, drawing fluid into circulation.
  - Examples: Albumin, Dextran, Hydroxyethyl starch

#### **3. Electrolytes and Their Functions**

- **Sodium ( $\text{Na}^+$ ):** Regulates fluid balance and blood pressure
- **Potassium ( $\text{K}^+$ ):** Essential for nerve conduction and muscle contraction
- **Calcium ( $\text{Ca}^{2+}$ ):** Important for bone health, clotting, and muscle function
- **Magnesium ( $\text{Mg}^{2+}$ ):** Involved in enzyme activity and neuromuscular function
- **Chloride ( $\text{Cl}^-$ ):** Maintains osmotic balance and acid-base status
- **Bicarbonate ( $\text{HCO}_3^-$ ):** Key in acid-base homeostasis

#### **4. Fluid Therapy Strategies**

- **Resuscitation:** Rapid fluid replacement in shock or severe dehydration
- **Replacement:** Correcting ongoing losses (e.g., diarrhea, burns)

- **Maintenance:** Meeting daily fluid and electrolyte needs (e.g., IV fluids in NPO patients)

## 5. Monitoring

- **Clinical signs:** Blood pressure, urine output, skin turgor, mucous membranes
- **Laboratory tests:** Serum electrolytes, blood urea nitrogen (BUN), creatinine, arterial blood gases

Proper fluid and electrolyte therapy prevents complications like fluid overload, hyponatremia, or hyperkalemia and ensures optimal physiological function.

**(C)** complications of diuretic therapy

## Complications of Diuretic Therapy

Diuretic therapy is used to manage conditions like hypertension, heart failure, and edema by promoting urine excretion. However, it can lead to several complications due to fluid and electrolyte disturbances.

### 1. Electrolyte Imbalances

- **Hypokalemia** (low potassium) – Common with loop and thiazide diuretics, leading to muscle weakness, arrhythmias
- **Hyperkalemia** (high potassium) – Seen with potassium-sparing diuretics, causing cardiac disturbances
- **Hyponatremia** (low sodium) – Can result in confusion, seizures, coma
- **Hypocalcemia** – Occurs with loop diuretics, leading to tetany, osteoporosis
- **Hypercalcemia** – Seen with thiazide diuretics, causing kidney stones

### 2. Volume Depletion & Hypotension

- Excessive diuresis can lead to **dehydration**, dizziness, and orthostatic hypotension
- Can cause **acute kidney injury (AKI)** due to reduced renal perfusion

### 3. Metabolic Abnormalities

- **Metabolic alkalosis** – Due to excessive loss of hydrogen ions with diuresis
- **Hyperuricemia & Gout** – Thiazides and loop diuretics can increase uric acid levels
- **Hyperglycemia** – Thiazide diuretics may impair glucose tolerance

#### 4. Ototoxicity

- High-dose **loop diuretics** (e.g., furosemide) can cause hearing loss or tinnitus, especially when given rapidly via IV

#### 5. Drug Interactions

- **Lithium toxicity** – Due to reduced renal clearance
- **Digoxin toxicity** – Enhanced by hypokalemia
- **NSAIDs** – May reduce the effectiveness of diuretics

#### Conclusion

Careful monitoring of electrolytes, renal function, and hydration status is essential to prevent complications associated with diuretic therapy.

(d) Drugs used in hypertension.

#### **:- Drugs Used in Hypertension – Short Note**

Hypertension (high blood pressure) is managed with various classes of antihypertensive drugs that lower blood pressure and reduce the risk of cardiovascular complications.

#### **1. Major Classes of Antihypertensive Drugs**

##### **1. Diuretics** – Reduce blood volume by increasing urine output

- **Thiazide diuretics** (e.g., Hydrochlorothiazide) – First-line treatment
- **Loop diuretics** (e.g., Furosemide) – Used in severe hypertension, heart failure
- **Potassium-sparing diuretics** (e.g., Spironolactone) – Used in resistant hypertension

##### **2. Beta-Blockers** (e.g., Metoprolol, Propranolol)

- Reduce heart rate and cardiac output
- Used in patients with heart disease, post-MI, heart failure

##### **3. Calcium Channel Blockers (CCBs)**

- **Dihydropyridines** (e.g., Amlodipine, Nifedipine) – Vasodilation, used in elderly & African descent
- **Non-dihydropyridines** (e.g., Verapamil, Diltiazem) – Reduce heart rate, used in arrhythmias

#### ✓ 4. Renin-Angiotensin System Inhibitors

- **ACE Inhibitors (e.g., Enalapril, Ramipril)** – Reduce vasoconstriction & fluid retention
- **Angiotensin Receptor Blockers (ARBs) (e.g., Losartan, Valsartan)** – Alternative to ACE inhibitors

#### ✓ 5. Alpha-Blockers (e.g., Prazosin, Doxazosin)

- Cause vasodilation, used in resistant hypertension & BPH

#### ✓ 6. Centrally Acting Drugs (e.g., Clonidine, Methyldopa)

- Reduce sympathetic outflow; Methyldopa is safe in pregnancy

#### ✓ 7. Direct Vasodilators (e.g., Hydralazine, Minoxidil)

- Used in severe or resistant hypertension

### Conclusion

Drug selection depends on patient-specific factors such as age, comorbidities, and severity of hypertension. Lifestyle modifications along with medication improve blood pressure control and reduce complications.

Q3. Short answer question :-

(a) Name two drugs used in peptic ulcer.

**:- Two Drugs Used in Peptic Ulcer (2 Marks)**

#### 1. Omeprazole (Proton Pump Inhibitor - PPI)

- Reduces stomach acid secretion by inhibiting the proton pump ( $H^+/K^+$  ATPase).
- Used for gastric and duodenal ulcers, GERD, and H. pylori eradication.

#### 2. Ranitidine ( $H_2$ Receptor Blocker) (Note: Withdrawn in many countries due to safety concerns; Famotidine is an alternative)

- Blocks histamine ( $H_2$  receptors) in the stomach, reducing acid production.
- Used for ulcer healing and acid-related disorders.

(B) Anti leprosy therapy.

**:- Anti-Leprosy Therapy (2 Marks)**

Leprosy is treated with **Multi-Drug Therapy (MDT)** to prevent resistance. The standard regimen includes:

1. **Rifampicin** – Bactericidal; kills *Mycobacterium leprae*.
2. **Dapsone** – Bacteriostatic; inhibits bacterial folate synthesis.
3. **Clofazimine** – Anti-inflammatory and bactericidal; used in multibacillary cases.

◆ **Duration:**

- **Paucibacillary (PB) Leprosy** – 6 months
- **Multibacillary (MB) Leprosy** – 12 months

MDT is provided free by the WHO and is highly effective in curing leprosy.

(c) Emergency drugs used during resuscitation.

**:- Emergency Drugs Used During Resuscitation (2 Marks)**

1. **Adrenaline (Epinephrine)** – First-line drug in cardiac arrest; increases heart rate, blood pressure, and cardiac output.
2. **Atropine** – Used in bradycardia to increase heart rate by blocking the vagus nerve.

Other important drugs include Amiodarone (for arrhythmias), Dopamine (for shock), and Sodium Bicarbonate (for acidosis).

(d) two advantage of intra venous route of administration of drugs.

**Two Advantages of Intravenous (IV) Route of Drug Administration (2 Marks)**

1. **Rapid Onset of Action** – Delivers drugs directly into the bloodstream, ensuring immediate effect, crucial in emergencies.
2. **Precise Dosage Control** – Allows accurate drug concentration and continuous infusion if needed.

(e) Two uses of aspirin.

**:- Two Uses of Aspirin (2 Marks)**

1. **Pain and Fever Relief** – Used as an analgesic and antipyretic to reduce pain, inflammation, and fever.

2. **Cardiovascular Protection** – Low-dose aspirin prevents heart attacks and strokes by inhibiting platelet aggregation.

## SECTION – B (Pathology and Genetics)

Q4. Define Hepatitis, discuss its causes pathological changes and complication of hepatitis.

**:- Hepatitis**

### **Definition:**

Hepatitis is an inflammation of the liver caused by viral infections, toxins, autoimmune diseases, or metabolic disorders, leading to liver dysfunction.

### **Causes of Hepatitis**

1. **Viral Infections** – Most common cause, including:
  - Hepatitis A, B, C, D, and E viruses
  - Epstein-Barr virus (EBV), Cytomegalovirus (CMV)
2. **Toxins & Drugs**
  - Alcohol-induced hepatitis
  - Drug-induced (e.g., paracetamol overdose, anti-tubercular drugs)
  - Exposure to toxic chemicals (e.g., aflatoxins)
3. **Autoimmune Hepatitis** – The immune system attacks liver cells, leading to chronic inflammation.
4. **Metabolic & Genetic Disorders**
  - Wilson's disease (copper accumulation)
  - Hemochromatosis (iron overload)

### **Pathological Changes in Hepatitis**

1. **Acute Hepatitis**
  - Inflammation & swelling of hepatocytes
  - Ballooning degeneration and necrosis of liver cells
  - Infiltration of inflammatory cells (lymphocytes & macrophages)



- Kupffer cell hyperplasia (liver macrophages activated)

## 2. Chronic Hepatitis

- Persistent inflammation with fibrosis formation
- Bridging fibrosis (fibrous tissue connecting portal tracts)
- May progress to **cirrhosis** (permanent liver scarring)

## Complications of Hepatitis

1. **Acute Liver Failure** – Severe liver dysfunction leading to jaundice, encephalopathy, and multi-organ failure.
2. **Chronic Hepatitis & Cirrhosis** – Long-term inflammation results in fibrosis, nodular regeneration, and liver dysfunction.
3. **Liver Cancer (Hepatocellular Carcinoma)** – Hepatitis B & C increase the risk of liver cancer.
4. **Portal Hypertension** – Increased pressure in the portal vein leading to varices, ascites, and splenomegaly.
5. **Hepatorenal Syndrome** – Kidney failure due to severe liver disease.
6. **Hepatic Encephalopathy** – Accumulation of toxins (e.g., ammonia) affecting brain function, causing confusion and coma.

## Conclusion

Hepatitis can range from mild self-limiting conditions to severe life-threatening complications. Early diagnosis and appropriate management can prevent disease progression and complications.

Q5. Write short notes.

(a) Different between Chronic Bronchitis and Emphysema.

**:- Difference Between Chronic Bronchitis and Emphysema (5 Marks)**

Feature	Chronic Bronchitis	Emphysema
Definition	Inflammation of the bronchi leading to excessive mucus production and airway obstruction.	Destruction of alveolar walls leading to air trapping and reduced gas exchange.

Feature	Chronic Bronchitis	Emphysema
<b>Cause</b>	Mainly caused by smoking, pollution, and recurrent infections.	Primarily caused by smoking and $\alpha$ 1-antitrypsin deficiency.
<b>Pathological Changes</b>	Mucus gland hypertrophy, goblet cell hyperplasia, airway inflammation, and fibrosis.	Loss of alveolar elasticity, alveolar wall destruction, and enlarged air spaces.
<b>Clinical Features</b>	Productive cough for $\geq 3$ months in 2 consecutive years, wheezing, cyanosis ("blue bloater").	Dyspnea, minimal cough, barrel chest, pursed-lip breathing ("pink puffer").
<b>Complications</b>	Frequent lung infections, respiratory failure, pulmonary hypertension, cor pulmonale.	Pneumothorax, respiratory failure, weight loss due to increased work of breathing.

Both are types of **Chronic Obstructive Pulmonary Disease (COPD)** but differ in their primary pathology and clinical presentation.

(b) Ethical issues related to genetic counselling.

**:- Ethical Issues Related to Genetic Counselling (5 Marks)**

1. **Confidentiality & Privacy** – Protecting genetic information from unauthorized access to prevent discrimination.
2. **Informed Consent** – Ensuring individuals understand the risks, benefits, and limitations of genetic testing before proceeding.
3. **Psychological Impact** – Managing anxiety, depression, or guilt related to genetic findings, especially in hereditary diseases.
4. **Reproductive Choices** – Ethical concerns in prenatal screening, selective abortion, and designer babies.
5. **Genetic Discrimination** – Risk of discrimination in employment, insurance, and social settings based on genetic predisposition.

Genetic counseling must balance medical guidance with ethical responsibility, ensuring patient autonomy and well-being.

(c) Importance of clinical pathology.

**:- Importance of Clinical Pathology (5 Marks)**

1. **Disease Diagnosis** – Helps in detecting infections, metabolic disorders, hematological conditions, and organ dysfunction through laboratory tests (e.g., blood, urine, tissue analysis).
2. **Monitoring Treatment** – Assesses the effectiveness of therapies (e.g., blood sugar levels in diabetes, kidney function in renal disease).
3. **Early Disease Detection** – Identifies diseases in early stages, improving prognosis (e.g., cancer markers, lipid profile for heart disease risk).
4. **Guiding Medical Decisions** – Provides critical data for selecting appropriate treatments and interventions.
5. **Prevention & Public Health** – Supports screening programs for genetic disorders, infectious diseases, and lifestyle-related conditions, promoting early intervention.

Clinical pathology plays a crucial role in modern medicine by aiding diagnosis, treatment, and prevention of diseases.

(D) Vascular event in acute inflammation.

**:- Vascular Events in Acute Inflammation (5 Marks)**

Acute inflammation involves a series of vascular changes to deliver immune cells and proteins to the injury site. The key vascular events include:

1. **Vasodilation** – Initial transient vasoconstriction followed by dilation of blood vessels, increasing blood flow (redness and warmth).
2. **Increased Vascular Permeability** – Endothelial cells contract, allowing plasma proteins and leukocytes to move into tissues (swelling/edema).
3. **Exudation of Fluid & Proteins** – Leakage of protein-rich fluid (exudate) into tissues, contributing to edema and delivering immune components.
4. **Stasis & Margination** – Slow blood flow due to plasma loss leads to leukocyte accumulation along vessel walls for migration.
5. **Leukocyte Extravasation** – White blood cells (WBCs) adhere to the endothelium and migrate through vessel walls to the inflammation site.

These vascular changes facilitate immune defense and tissue repair in acute inflammation.

(e) CSF Sample collection method.

### **CSF Sample Collection Method (5 Marks)**

Cerebrospinal Fluid (CSF) is collected through **lumbar puncture (LP)**, also known as a **spinal tap**, to diagnose infections, neurological disorders, and other conditions.

#### **Procedure:**

1. **Patient Positioning** – The patient lies in a lateral recumbent position or sits leaning forward to expose the lower back.
2. **Site Selection** – The puncture is performed between **L3-L4 or L4-L5 intervertebral spaces** to avoid spinal cord injury.
3. **Aseptic Preparation** – The skin is cleaned with antiseptic, and local anesthesia is administered.
4. **Needle Insertion** – A sterile spinal needle is inserted into the subarachnoid space to withdraw CSF.
5. **Sample Collection** – CSF is collected in sterile tubes for biochemical, cytological, and microbiological analysis.

#### **Precautions & Complications:**

- Maintain strict aseptic technique to prevent infection.
- Monitor for **post-lumbar puncture headache**, bleeding, or nerve damage.

CSF analysis helps diagnose conditions like **meningitis, encephalitis, multiple sclerosis, and hemorrhages**.

(f) Wound Healing :-

### **Wound Healing – Short Note (5 Marks)**

Wound healing is the **biological process** of tissue repair after injury. It occurs in **four phases**:

1. **Hemostasis (Clot Formation)** – Immediate response; platelets aggregate, forming a clot to stop bleeding.
2. **Inflammatory Phase (0-3 Days)** – White blood cells (neutrophils, macrophages) remove debris and release growth factors.

3. **Proliferative Phase (4-24 Days)** – Fibroblasts produce collagen, new blood vessels form (**angiogenesis**), and granulation tissue develops.
4. **Remodeling/Maturation Phase (21 Days - Months)** – Collagen is reorganized, wound contracts, and scar tissue strengthens.

**Types of Wound Healing:**

- **Primary Intention** – Clean wounds with minimal tissue loss (e.g., surgical incisions).
- **Secondary Intention** – Large wounds heal by granulation (e.g., ulcers, burns).
- **Tertiary Intention** – Delayed closure of contaminated wounds after infection control.

**Factors Affecting Healing: Infections, diabetes, nutrition, oxygen supply, and immune status.** Proper care enhances recovery and prevents complications like **chronic wounds** and **hypertrophic scars**.

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