

# Anti-Neoplastic Agents

## Cancer

### Definition:

- **Cancer** refers to the uncontrolled growth and division of body cells, leading to the formation of abnormal tissues known as **neoplasms** or tumors.
- **Neoplasm:** A mass of tissue that develops abnormally when cells do not undergo timely apoptosis (cell death) or proliferate excessively.

### Conditions of Cancer

- **Disorganized Growth:** Cells do not follow the normal structure and function.
- **Uncontrolled Cell Division:** Continuous proliferation without regulatory signals.
- **Tissue Invasion:** Tumor cells invade adjacent tissues.
- **Lack of Apoptosis:** Cells do not undergo programmed cell death, allowing accumulation.

### Causes of Cancer

#### 1. Genetic Factors:

- Inherited mutations and genetic predispositions.

#### 2. Physical and Chemical Agents:

- **Smoking:** Major risk factor for lung and other cancers.
- **Alcohol Consumption:** Linked to various cancers including liver and breast.
- **Diet:** Poor dietary habits can increase cancer risk.

#### 3. Hormones:

- Imbalances can promote certain cancers, such as breast and prostate cancer.

#### 4. Infections:

- **Viruses:** HPV, Hepatitis B and C.
- **Bacteria and Parasites:** Certain strains linked to cancer development.

#### 5. Radiation:

- **Ionizing Radiation:** X-rays, gamma rays.
- **Non-Ionizing Radiation:** Ultraviolet (UV) light from the sun.

#### 6. Rare Causes:

- **Organ Transplantation:** Immunosuppression increases cancer risk.
- **Trauma:** Chronic injuries may lead to cancer in rare cases.

## Types of Cancer

### **1. Carcinoma:**

- Originates in epithelial cells.
- Common in lungs, breasts, pancreas, skin, and other organs.

### **2. Sarcoma:**

- Arises from connective or supportive tissues.
- Affects muscles, fat, bone, cartilage, or blood vessels.

### **3. Melanoma:**

- Develops in pigment-producing skin cells.
- Highly aggressive and prone to spreading.

### **4. Lymphoma:**

- Affects lymphocytes (a type of white blood cell).
- Includes Hodgkin and non-Hodgkin lymphoma.

### **5. Leukemia:**

- Cancer of the blood and bone marrow.
- Involves the overproduction of abnormal white blood cells.

## Treatment of Cancer

### **1. Chemotherapy:**

- Uses drugs to kill or inhibit the growth of cancer cells.

### **2. Radiation Therapy:**

- Utilizes high-energy radiation to destroy cancer cells.

### **3. Surgery:**

- Physically removes tumors from the body.

### **4. Hormone Therapy:**

- Blocks or removes hormones that fuel certain cancers.

### **5. Biological Response Modifiers:**

- Enhance the immune system's ability to fight cancer.

### **6. Immunotherapy:**

- Uses the body's immune system to target and destroy cancer cells.

### **7. Bone Marrow Transplant:**

- Replaces damaged or diseased bone marrow with healthy marrow.

## Anti-neoplastic agents

### Definition:

- Anti-neoplastic agents are specialized drugs used primarily to treat cancer.
- They work by destroying or inhibiting the growth of cancer cells.
- However, these agents can also affect healthy cells, leading to various side effects.

### Medical Uses

- Cancer Treatment: Used to manage and eliminate various types of cancer.
- Preventing Tumor Growth: Inhibit the proliferation of malignant cells.
- Adjunct Therapy: Combined with other treatments like surgery or radiation to enhance efficacy.

### Side Effects

Common side effects of anti-neoplastic agents include:

#### 1. Gastrointestinal:

- Nausea
- Vomiting
- Mouth ulcers
- Diarrhea
- Constipation
- Abdominal discomfort

#### 2. Hematological:

- Lowering of blood cell counts (e.g., anemia, leukopenia, thrombocytopenia)

#### 3. Dermatological:

- Hair loss (alopecia)
- Rash

#### 4. Other:

- Fatigue
- Increased risk of infections
- Potential for severe, life-threatening side effects

### Mechanism of Action

### 1. Targeting Cell Division:

- Cancer is characterized by abnormal and uncontrolled cell division.
- Anti-neoplastic agents specifically target rapidly dividing cancer cells.

### 2. Cytotoxic Effects:

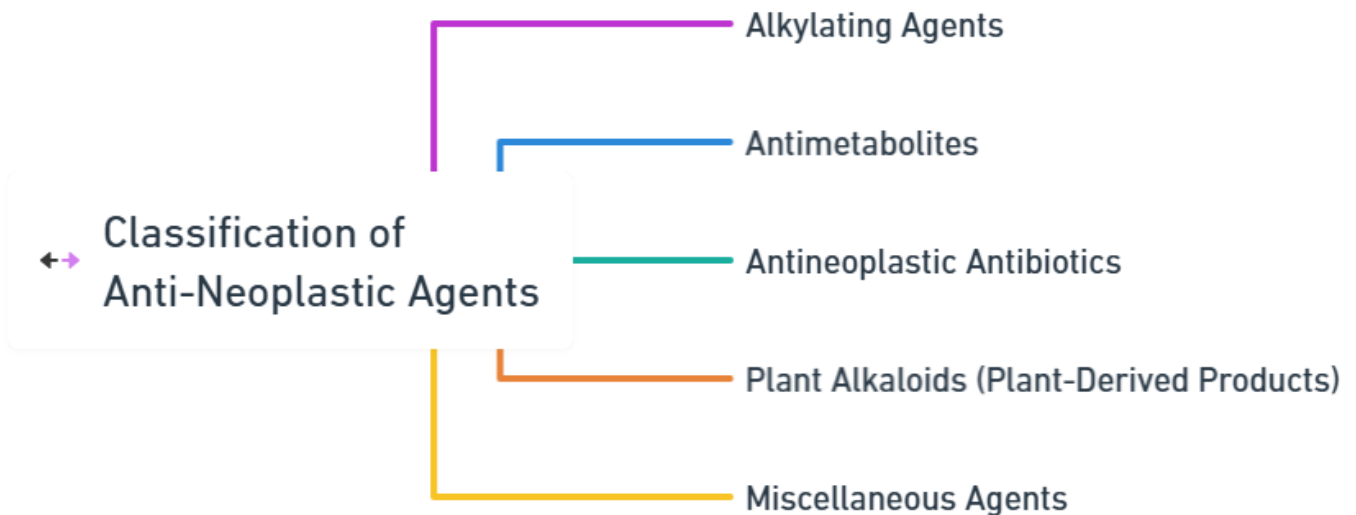
- These drugs are cytotoxic, meaning they can kill or damage cells.
- While effective against cancer cells, they may also harm healthy dividing cells (e.g., bone marrow, gastrointestinal lining, hair follicles).

### 3. Disruption of Cellular Processes:

- Interfere with DNA replication and repair mechanisms.
- Inhibit essential enzymes and proteins required for cell proliferation.

## Classification of Anti-Neoplastic Agents

- Anti-neoplastic agents are classified based on their mechanism of action and origin.
- The primary categories include:



### 1. Alkylating Agents

#### Mechanism:

- Add alkyl groups to DNA, causing cross-linking and preventing DNA replication and transcription.

#### Examples:

- Mechlorethamine
- Cyclophosphamide
- Melphalan
- Chlorambucil

- Busulfan
- Thiotepea

## 2. Antimetabolites

### Mechanism:

- Resemble natural substances in cells, disrupting DNA and RNA synthesis by incorporating into the metabolic pathways.

### Examples:

- Mercaptopurine
- Thioguanine
- Fluorouracil (5-FU)
- Floxuridine
- Cytarabine
- Methotrexate
- Azathioprine

## 3. Antineoplastic Antibiotics

### Mechanism:

- Interfere with DNA and RNA within cancer cells, inhibiting their growth and division.
- Note that these are not traditional antibiotics used for bacterial infections.

### Examples:

- Dactinomycin
- Daunorubicin
- Doxorubicin
- Bleomycin

## 4. Plant Alkaloids (Plant-Derived Products)

### Mechanism:

- Derived from plants, these agents disrupt mitosis (cell division) or inhibit enzymes necessary for cell reproduction.

### Examples:

- Etoposide
- Vinblastine Sulfate
- Vincristine Sulfate



FREE PREVIEW

[Click here to visit our website](#)

PHARMACY PREMIUM NOTES

Complete subject  
and semesters are  
available on  
**FirstHope app only.**



[Scan or click here](#)

Click here to get the app



Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHopeNotes

**Instagram**

@firsthope.official

[Click here to follow >](#)

**YouTube channel**

FirstHope-Pharmacy / Live streams

[Click here to watch >](#)

**WhatsApp channel**

Follow FirstHope on WhatsApp

[Click here to join >](#)

**FirstHope website**

firsthopenotes.com

[Click here to visit >](#)

**B.Pharm / D.Pharm / M.Pharm / Pharm.D**

Preview notes. Complete subjects and semesters in the FirstHope app.