Anti-Neoplastic Agents

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

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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).

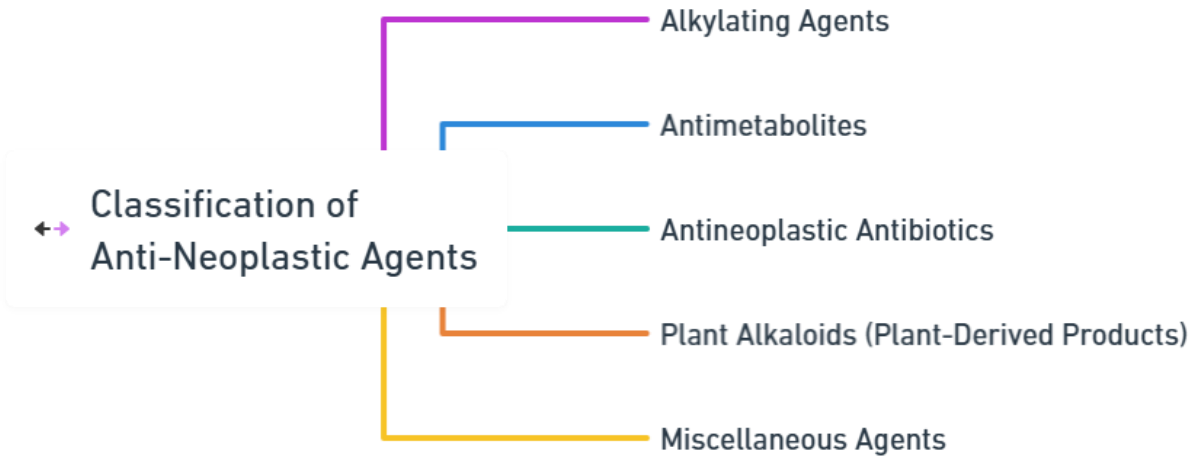
3. Disruption of Cellular Processes:

- 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:



Classification of Anti-Neoplastic Agents

1. Alkylating Agents

- Cause cross-linking of DNA strands, leading to inhibition of replication and transcription.
  - **Cyclophosphamide*** *(Nitrogen mustard derivative)*
  - **Busulfan** *(Alkyl sulfonate)*
  - **Cisplatin*** *(Platinum coordination complex)*

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2. Antimetabolites

- Interfere with nucleotide synthesis by mimicking purines or pyrimidines.
  - **Methotrexate** *(Folic acid antagonist)*
  - **Mercaptopurine** *(Purine analog)*
  - **Fluorouracil*** *(Pyrimidine analog – 5-FU)*

3. Antibiotic Antineoplastics (Cytotoxic Antibiotics)

- Intercalate DNA strands or generate free radicals, leading to DNA damage.
  - **Dactinomycin** *(Also known as Actinomycin D)*
  - **Doxorubicin Hydrochloride** *(Anthracycline group)*

4. Plant Alkaloids / Mitotic Inhibitors

- Inhibit mitosis by interfering with microtubule assembly or function.
  - **Vinblastine Sulphate** *(Vinca alkaloid)*

5. Hormonal Agents / Androgens

- Used for hormone-sensitive tumors; modulate hormonal environment.
  - **Dromostanolone Propionate** *(Androgenic anabolic steroid)*

Various Anti-Neoplastic Agents

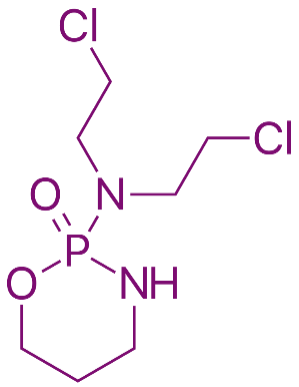
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1. Cyclophosphamide*

Chemical Name:

- 2-[Bis(2-chloroethyl)amino]tetrahydro-2H-1,3,2-oxazaphosphorine 2-oxide

Chemical Structure:



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- Core Structure: *Oxazaphosphorine ring*
- Marked Compound: Bis(2-chloroethyl)amino group*

Uses:

- Broad-spectrum alkylating agent
- Treats:
  - Hodgkin’s & non-Hodgkin’s lymphoma
  - Leukemias
  - Breast and ovarian cancers
  - Multiple myeloma
  - Immunosuppressive therapy in autoimmune disorders (e.g., lupus nephritis)

Stability & Storage:

- Hygroscopic and light-sensitive
- Store in **airtight, amber-colored containers** at room temperature (15–25°C)
- Protect from moisture and light

Formulations & Strengths:

- Tablets: 25 mg, 50 mg
- Injection: 100 mg, 500 mg, 1 g, 2 g vials (as lyophilized powder for reconstitution)

Popular Brand Names:

- Endoxan
- Cytoxan
- Genoxal

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2. Busulfan

Chemical Name:

- 1,4-Butanediol dimethanesulfonate

Uses:

- Alkylating agent primarily for:
  - Chronic myelogenous leukemia (CML)

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- Conditioning regimen before bone marrow transplant

Stability & Storage:

- Stable under dry conditions
- Store at room temperature (15–25°C)
- Protect from light and moisture

Formulations & Strengths:

- Tablets: 2 mg
- Injection (IV): 6 mg/mL in 10 mL vial (Busulfex)

Popular Brand Names:

- Myleran
- Busulfex

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3. Mercaptopurine

Chemical Name:

- 1,7-Dihydro-6H-purine-6-thione

Uses:

- Antimetabolite (purine analogue)
- Used in:
  - Acute lymphoblastic leukemia (ALL)
  - Crohn’s disease and ulcerative colitis (off-label)
  - Maintenance therapy in leukemias

Stability & Storage:

- Light- and moisture-sensitive
- Store in a **cool, dry place below 25°C**, in tightly closed containers

Formulations & Strengths:

- Tablets: 50 mg
- Oral suspension (some regions)

Popular Brand Names:

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