⚠️ Key Chemotoxicities and Chemotoxicity Amelioration

📚Key Chemotoxicities

🔑 Must-Know Drug–Toxicity Associations

Drug	Key Toxicity
Cisplatin, Carboplatin	Ototoxicity 👂 + Nephrotoxicity 🫘
Vincristine	Peripheral neuropathy 🧠
Bleomycin, Busulfan	Pulmonary fibrosis 🫁
Doxorubicin, Daunorubicin	Cardiotoxicity ❤️
Trastuzumab	Cardiotoxicity ❤️

💡 Common Toxicities (Seen with MOST Chemotherapy)

Chemotherapy → Targets rapidly dividing cells →

- Bone marrow → Myelosuppression 💉 → Neutropenia / Anemia / Thrombocytopenia
- GI mucosa → Mucositis + nausea / vomiting 🤢
- Hair follicles → Alopecia 💇‍♂️

🛡️ Chemotoxicity Amelioration (Protection Strategies)

📊 Protection Table

Drug	Mechanism	Clinical Use	Mnemonic
Amifostine	Free radical scavenger	Prevents platinum nephrotoxicity	*Amy likes Platinum*

Dexrazoxane	Iron chelator	Prevents anthracycline (doxorubicin) cardiotoxicity	*Dex is used with Dox*
Leucovorin	THF precursor	MTX toxicity rescue; ↑ 5-FU effect	*Leuco-Meth*
Mesna	Binds acrolein (toxic byproduct of cyclophodphsmide)	Prevents hemorrhagic cystitis	MesnA -> Acrolein
Rasburicase	Uric acid → allantoin	Tumor lysis syndrome	*RAS breaks Uric Acid fast*
Ondansetron	5-HT3 antagonist	Acute chemo-induced nausea	*Set-ON nausea OFF (early)*
Metoclopramide	D2 antagonist	Acute nausea	*METO = Move stomach, stop vomiting*
Aprepitant	NK1 antagonist	Delayed nausea	*A - N - D*
Filgrastim	G-CSF analog	Neutropenia	*FILL - GRANulocytes*
Epoetin alfa	Erythropoietin analog	Anemia	*Epotein = Erythropoetin*

🧪 Drug-by-Drug Notes

1️⃣ Amifostine

💡 Mechanism

- Free radical scavenger → Protects normal tissues from oxidative damage

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🔄 Flowchart

Platinum drugs → Free radical formation → Kidney damage

Amifostine → Neutralizes free radicals → Protects kidneys 🛡️

📌 Use

- Prevent nephrotoxicity from cisplatin

2️⃣ Dexrazoxane

💡 Mechanism

- Iron chelator → ↓ free radical formation in heart

🔄 Flowchart

Anthracycline → Free radicals + iron interaction → Cardiac damage

Dexrazoxane → Chelates iron → ↓ oxidative injury → Protects heart ❤️

📌 Use

- Prevent anthracycline cardiotoxicity

3️⃣ Leucovorin (Folinic Acid)

💡 Mechanism

- Provides tetrahydrofolate (THF) → Bypasses DHFR inhibition

🔄 Flowchart

Methotrexate → Inhibits DHFR → ↓ THF → ↓ DNA synthesis

Leucovorin → Restores THF → Rescues normal cells 🛟

📌 Uses

- Methotrexate toxicity rescue
- Enhances 5-FU effect 🎯

4️⃣ Mesna

💡 Mechanism

- Binds acrolein (toxic metabolite)

🔄 Flowchart

Cyclophosphamide/Ifosfamide → Acrolein production → Bladder toxicity

Mesna → Binds acrolein → Detoxifies it → Prevents hemorrhagic cystitis 🚫

📌 Use

- Prevent hemorrhagic cystitis

🇸 Rasburicase

💡 Mechanism

- Converts uric acid → allantoin (more soluble)

🔄 Flowchart

Tumor lysis syndrome → Massive cell breakdown → ↑ uric acid → Kidney damage

Rasburicase → Converts uric acid to allantoin → ↓ uric acid → Protects kidneys 🧪

📌 Use

- Tumor lysis syndrome

6️⃣ Antiemetics

🔄 Flowchart: Chemo-Induced Nausea

Chemotherapy → Serotonin release (acute phase) → Substance P release (delayed phase) → Treatment:

- Ondansetron (5-HT3 blocker) → Acute nausea (within 1-2 hrs)
- Metoclopramide / Prochlorperazine (D2 blockers) → Acute nausea
- Aprepitant (NK1 blocker) → Delayed nausea (>24 hrs)

7️⃣ Growth Factors

💡 Filgrastim / Sargramostim

- Stimulate neutrophil production → Used in neutropenia 🛡️

💡 Epoetin alfa

- Stimulates RBC production → Used in anemia 🩸

🔥 Summary Table

Toxicity	Drug Cause	Prevention
Nephrotoxicity	Cisplatin	Amifostine
Cardiotoxicity	Doxorubicin	Dexrazoxane
Hemorrhagic cystitis	Cyclophosphamide	Mesna
MTX toxicity	Methotrexate	Leucovorin
Tumor lysis	Tumor lysis syndrome	Rasburicase
Neutropenia	Chemo	Filgrastim
Anemia	Chemo	Epoetin alfa

🔑 Must-Know Points

- Cisplatin → kidney + ear toxicity
- Vincristine → neuropathy
- Bleomycin → pulmonary fibrosis
- Doxorubicin → cardiomyopathy
- Mesna → prevents hemorrhagic cystitis

- Leucovorin → MTX rescue + enhances 5-FU
- Aprepitant → delayed nausea

🧠 Quick Recall

Chemo toxicity → Organ-specific damage → Protection drugs →

- Kidney → Amifostine
- Heart → Dexrazoxane
- Bladder → Mesna
- DNA rescue → Leucovorin
- Uric acid → Rasburicase
- Bone marrow → G-CSF / EPO

-> The End <-