melphalan (mel-fa-lan)

**Classification**
Therapeutic: antineoplastics
Pharmacologic: alkylating agents

**Pregnancy Category D**

**Indications**
Used alone or in combination with other agents for: Multiple myeloma, Ovarian cancer. Unlabeled Use:

**Action**
Interference with cell DNA and RNA synthesis by alkylation (cell cycle phase–nonspecific). Therapeutic Effects: Death of rapidly replicating cells, particularly malignant ones. Also has immunosuppressive properties.

**Pharmacokinetics**

- **Absorption:** Incompletely and variably absorbed following oral administration.
- **Distribution:** Rapidly distributed throughout total body water.
- **Protein Binding:** 30%.
- **Metabolism and Excretion:** Rapidly metabolized in the bloodstream. Small amounts (10%) excreted unchanged by the kidneys.
- **Half-life:** 1.5 hr.

**TIME/ACTION PROFILE (effects on blood counts)**

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO</td>
<td>5 days</td>
<td>2–3 wk</td>
<td>5–6 wk</td>
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**Contraindications/Precautions**

- Contraindicated in: Hypersensitivity to melphalan or chlorambucil. **GI, Lactation:** Pregnancy or lactation.
- Use Cautiously in: Active infections; bone marrow reserve; Impaired renal function (dose should be reduced if BUN > 30 mg/dL). **OB:** Women with childbearing potential (should be counseled to avoid pregnancy during treatment). **Pedi:** Safety not established. **Geri:** Begin at lower end of dosing range due to potential for age-related decreased hepatic, renal, or cardiac function.

**Adverse Reactions/Side Effects**

- **Resp:** bronchopulmonary dysplasia, pulmonary fibrosis.
- **GI:** diarrhea, hepatitis, nausea, stomatitis, vomiting.
- **GU:** infertility.
- **Derm:** alopecia, pruritus, rashes.
- **Endo:** menstrual irregularities.
- **Metab:** hyperuricemia.
- **Misc:** allergic reactions, including ANAPHYLAXIS (more common after IV use).

**Interactions**

- **Drug-Drug:** May cause bone marrow depression with other antineoplastics or radiation therapy. May decrease antibody response to live-virus vaccines and risk of adverse reactions. May increase the risk of pulmonary toxicity with carmustine. Concurrent IV use with cyclosporine may ↑ risk of renal failure. Risk of osteosarcoma may be ↑ with concurrent nalidixic acid.

**Route/Dosage**

- **Multiple Myeloma**
  - **PO (Adults):** 150 mcg (0.15 mg)/kg/day for 7 days, followed by 3-wk rest, then 50 mcg (0.05 mg)/kg/day for 4 days followed by 2–4-wk rest, then 25 mg (0.25 mg)/kg/day for 4 days followed by 4–6-wk rest, then 10–15 mg/day for maintenance dose or **7 mg/m²** or 250 mcg (0.25 mg)/kg daily for 5 days q 5–6 wk.
  - **IV (Adults):** 10 mg/m² q 4 wk for 4 doses, then q 4 wk.

- **Ovarian Carcinoma**
  - **PO (Adults):** 200 mcg (0.2 mg)/kg/day for 5 days q 4–5 wk.

**NURSING IMPLICATIONS**

**Assessment**
- Assess for signs of infection (fever, chills, sore throat, cough, dysphagia). Lower back or side pain, difficult or painful urination. Notify health care professional if these symptoms occur.
- Assess for bleeding (bleeding gums, bruising, petechiae, guaiac stools, urine, and emesis). Avoid IM injections and taking rectal temperatures. Apply pressure to venipuncture sites for 10 min.

**Potential Nursing Diagnoses**
- Risk for infection related to cellular depression (RNI)
- Risk for injury related to cellular depression (RNI)
- Acute pain related to treatment (PAC)

**Patient/Family Teaching**
- Instruct patient to take melphalan as directed. Take with food. Take other medications as directed.
- Instruct patient to notify health care professional immediately if signs of infection occur, bleeding occurs, or pain occurs at injection site.
- Instruct patient to report the following symptoms to health care professional: Fever, chills, sore throat, cough, dysphagia, lower back or side pain, difficult or painful urination, bleeding gums, bruising, petechiae, guaiac stools, urine, or emesis. Notify health care professional if signs of fungal infection occur. Instruct patient to avoid IM injections and taking rectal temperatures. Apply pressure to venipuncture sites for 10 min.

**Interferes with**
- Blood testing: Hematology. Use caution when interpreting post-drug blood tests.

**Pharmacologic Class:** Antineoplastics, alkylating agents
May cause nausea and vomiting. Monitor intake and output, appetite, and nutritional intake. Prophylactic antiemetics may be used. Help diet if acid-related.

Monitor for symptoms of gout (increased uric acid, joint pain, edema). Encourage patient to drink at least 2 L of fluid per day. Allopurinol may be given to decrease uric acid levels.

Anemia may occur. Monitor for increased fatigue and dyspnea.

Assess patient for allergy to chlorambucil. Patients may have cross-sensitivity.

Lab Test Considerations: Monitor CBC and differential weekly during therapy. The nadir of leukopenia occurs in 2–3 wk. Notify physician if leukocyte count is <3000/mm³. The nadir of thrombocytopenia occurs in 2–3 wk. Notify physician if platelet count is <100,000/mm³. Recovery of leukopenia and thrombocytopenia occurs in 5–6 wk.

Monitor liver function studies (AST, ALT, ALP, bilirubin) and renal function studies (BUN, creatinine) prior to and periodically during therapy to detect hepatotoxicity and nephrotoxicity.

May cause hyperuricemia. Monitor periodically during therapy.

May cause 5-hydroxyindoleacetic acid (5-HIAA) concentrations as a result of tumor breakdown.

Potential Nursing Diagnoses
Risk for injury (Side Effects)
Risk for infection (Side Effects)

Implementation

Do not confuse Alkeran (melphalan) with Leukeran (chlorambucil) or Myleran (busulfan).

Solution should be prepared in a biologic cabinet. Wear gloves, gown, and mask while handling medication. Discard IV equipment in specially designated container.

If solution contacts skin or mucosa, immediately wash skin or mucosa with soap and water.

PO: May be ordered in divided doses or as a single daily dose.

IV Administration

Intermittent Infusion: Reconstitute with 10 mL of diluent supplied for a concentration of 5 mg/mL and shake vigorously until solution is clear. Diluent: Dilute dose immediately with 0.9% NaCl. Concentration: Not to exceed 2 mg/mL. Rate: Administer over at least 15 min. Do not exceed 2 mg/min. For central line or ≤0.45 mg/min. For peripheral line. Administer within 60 min of reconstitution.

Y-Site Compatibility: acyclovir, aminoglycoside, amikacin, aminophylline, amphotericin B liposomal, ampicillin, ampicillin/sulbactam, argatroban, aspergillus, atracurium, atropine, aztreonam, bivalirudin, bleomycin, bumetanide, butorphanol, calcium gluconate, carboplatin, carmustine, cefazolin, ceftazidime, cefepime, cefoperazone, cephalothin, ceftriaxone, cefuroxime, chloramphenicol, chlorpromazine, cisplatin, clindamycin, cyclophosphamide, cyclosporine, dactinomycin, daunorubicin, dacarbazine, dexamethasone, dexamethasone, diltiazem, dobutamine, doxorubicin, droperidol, enalaprilat, etoposide, famotidine, filgrastim, fluconazole, fludarabine, fluorouracil, furosemide, ganciclovir, gentamicin, granisetron, haloperidol, heparin, hetastarch, hydrocortisone, hydromorphone, idarubicin, ifosfamide, imipenem/cilastatin, linezolid, lorazepam, mannitol, mechlorethamine, meperidine, mesna, methylprednisolone, metoclopramide, methotrexate, methylprednisolone, metronidazole, micafungin, minocycline, mitomycin, mitoxantrone, morphine, nalbuphine, nesiritide, octreotide, ondansetron, palonosetron, pamidronate, pentostatin, piperacillin/tazobactam, potassium acetate, potassium chloride, prochlorperazine, promethazine, ranitidine, sodium bicarbonate, streptozocin, tacro
des, ticarcillin/clavulanate, tigecycline, tirofiban, tobramycin, trimethoprim/sulfamethoxazole, vancomycin, vasopressin, vecuronium, vinblastine, vincristine, vinorelbine, voriconazole, zidovudine, zoledronic acid.

Y-Site Incompatibility: amphotericin B colloidal, chlorpromazine, pandexapine.

Patient/Family Teaching

Instruct patient to take melphalan as directed, even if nausea and vomiting occur. If vomiting occurs shortly after dose is taken, consult health care professional. If a dose is missed, do not take at all.

Instruct patient to notify health care professional if fever, chills, persistent cough, sore throat, or signs of infection occur. Instruct patient to avoid crowds and persons with known infections. Instruct patient to use soft toothbrush and electric razor. Patient must not drink alcoholic beverages or take products containing aspirin or other NSAIDs.

Instruct patient to notify health care professional of skin rash, sunburn, bleeding, fever, persistent cough, nausea, vomiting, anorexia, weight loss, or unusual lumps/masses.

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**melphalan**

- Instruct patient to inspect oral mucosa for redness and ulceration. If ulceration occurs, advise patient to use a sponge brush and to rinse mouth with water after eating and drinking. Consult health care professional if pain interferes with eating. Stomatitis pain may require treatment with opioid analgesics.
- Instruct patient not to receive any vaccinations without advice of health care professional.
- Advise patient that although fertility may be decreased, contraception should be used during melphalan therapy because of potential teratogenic effects on the fetus.
- Emphasize need for periodic lab tests to monitor for side effects.

**Evaluation/Desired Outcomes**
- Decrease in size and spread of malignant tumor.

Why was this drug prescribed for your patient?