Fluorouracil (5-FU)

Fluorouracil, or 5-FU, is an antimetabolite medication which works by inhibiting thymidylate synthase, leading to decreased DNA synthesis. This drug is used for slow-growing solid tumors, and is co-administered with leucovorin to treat gastric adenocarcinoma. It is also used topically to treat basal cell carcinoma. Side effects include myelosuppression, severe diarrhea and mucositis. Myelosuppression is not reversible with leucovorin, as it is with methotrexate.

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Mechanism

Antimetabolite

Anti-metal-balls

Fluorouracil is an antimetabolite, as it interferes with the cell's normal metabolic functioning, inhibiting DNA synthesis. It is a pyramidine analog which competes with thymidylate synthetase to inhibit DNA synthesis.

"Thymine-less Death"

Broken Thyme-Thymine causing Death

Fluorouracil is a pyramidine analog that causes a "thymine-less death" in cells. This is because it decreases thymidine monophosphate (dTMP), as 5-FU competes with deoxyuridine monophosphate (dUMP) for thymidylate synthase, inhibiting its action. Fluorouracil is converted to 5-FdUMP, which competes for thymidylate synthetase. This leads to blocked synthesis of the pyrimidine thymidine, which is a nucleoside required for DNA synthesis and replication. Without DNA synthesis, tumor cells undergo apoptosis.

Indications

Slow-growing Solid Tumors

Slow-snail Tumor-guy

This medication is indicated for treating slowly-growing solid tumors, with examples of stomach, colorectal, breast, ovarian, and pancreatic cancers.

Co-administered with Leucovorin for Stomach Cancer

Combined with Luke-vulture against Stomach Tumor-guy

Leucovorin is a drug that potentiates the activity of 5-fluorouracil (5-FU). 5-FU takes its active form as FdUMP, which then binds and inhibits the enzyme thymidylate synthase, but has a very short half-life. Leucovorin is a reduced folate, which helps with the 5-FU activity, dubbing it a "chemoprotectant." This combination is used to treat stomach and colorectal cancer.

Basal Cell Carcinoma (Topical)

Bass-guitar Car-gnome

5-FU interferes with the ability of abnormal cells to grow on the skin's top layer. It is indicated for topical administration to treat superficial basal cell carcinomas (BCCs). It is also used for actinic keratosis, superficial squamous cell cancers, and Bowen's disease.

Side Effects

Myelosuppression

Suppressed Red and White blood cells

This medication causes myelosuppression, leading to anemia (megaloblastic), neutropenia and thrombocytopenia. Unlike with methotrexate, this myelosuppression is not reversible with Leucovorin.

Mucositis

Mucous-on-fire

There is a high rate of the development of mucositis with 5-fluorouracil. These are defined as inflammatory lesions of the mucosa, and patients develop oral, nasal and alimentary tract mucositis.

Severe Diarrhea

Severed Toilet

Due to the severe gastrointestinal mucositis that is a side effect of 5-FU, patients can develop severe diarrhea. This is typically dose related, and is very common amongst patients.