Hydroxyurea

Hydroxyrurea is an antimetabolite medication, which acts by suppressing ribonucleotide reductase, an enzyme that reduces ribonucleotides into deoxyribonucleotides, which are necessary for DNA synthesis. Because of this medication, DNA replication is halted in the S-phase of the cell cycle. Hydroxyurea is indicated for use in chronic myelogenous leukemia (CML), melanoma, and in sickle cell disease. Notable side effects of this drug inlcude gastrointestinal distress, as well as myelosuppression.



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Mechanism

Inhibits Ribonucleotide Reductase
Inhibiting-chains on Red-duck
This medication works through inhibition of the enzyme ribonucleotide reductase. This enzyme reduces ribonucleotides into deoxyribonucleotides, which are necessary for DNA synthesis.

Decreased DNA Synthesis
Down-arrow DNA Building
By inhibiting ribonucleotide reductase with hydroxyurea, DNA synthesis is decreased.

S-phase Specific
S Building
Hydroxyurea leads to prolonged inhibition of DNA replication, and as a result, cellular division is arrested in the S phase. This is also known as activating the S phase "checkpoint." Thus, by inhibiting DNA replication, hydroxyurea stops or severely slows down the cell replication cycle.

Indications

Melanoma
Melon-gnome
This medication is also used to treat malignant melanoma.

Chronic Myelogenous Leukemia (CML)
CaMeL
This medication is used to treat chronic myelogenous leukemia (CML). Its use has been largely replaced by imatinib, but is still used because of cost-effectiveness.

Sickle Cell Disease
Sickle
Hydroxyurea is a mainstay of therapy in sickle cell disease, because it effectively reverses sickling of cells. It causes an increase of Fetal hemoglobin (HbF), and inhibits Hemoglobin S (HbS) aggregation.

Through Increased HbF (Fetal Hemoglobin)
He-man-globe with Fetus
This drug enhances fetal hemoglobin (HbF) production. Fetal hemoglobin's reduction in the severity of the disease comes from its ability to inhibit the formation of hemoglobin aggregates within red blood cells that contain hemoglobin S (HbS), which is seen in sickle cell anemia.

Side Effects

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Myelosuppression

Red and White blood cells Supressed

A very common side effect of hydroxyurea is bone marrow depression; patients often develop neutropenia and thrombocytopenia. Hematologic recovery usually happens 2 weeks after stopping medications administration, however.

GI Distress

GI with Flare-gun

Hydroxyurea can lead to acute mucocutaneous toxicity. Patients can have severe GI distress, with diarrhea, constipation, nausea and vomiting.

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