Sulfonamides Side Effects

Sulfonamides are a group of bacteriostatic antibiotics that contain a sulfonamide moiety. These drugs have a wide spectrum encompassing most Gram-positive and many Gram-negative organisms including Nocardia and Chlamydia. Sulfonamides are structural analogs and competitive antagonists of para-aminobenzoic acid (PABA) and compete with para-aminobenzoic acid (PABA) for incorporation into folic acid. Incorporation of sulfonamides causes inhibition of the enzyme dihydropteroate synthetase in the folic acid synthesis pathway. Because folic acid is necessary for vital cell functions like DNA synthesis, bacteria that are deprived of folate will eventually die. Commonly used sulfonamides include sulfamethoxazole, sulfisoxazole, and sulfadiazine.Approximately 3% of the general population experience adverse reactions when treated with sulfonamide antimicrobials. Many people are allergic to the sulfonamide moiety and experience hypersensitivity reactions characterized by an overreaction of the body's immune response. Common symptoms include rashes, hives, itchy eyes, and swollen tongue or face. Some individuals can have an anaphylactic reaction. Sulfonamides are also associated with causes hemolysis of red blood cells in G6PD deficiency individuals. Additionally, they can cause nephrotoxicity and photosensitivity. In the plasma, sulfonamides can bind to albumin and displace bilirubin to cause kernicterus in infants and can also displace warfarin, causing unexpected increases in clotting time and uncontrolled bleeding in individuals on warfarin therapy.



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Side Effects

Hypersensitivity
Hiker-sensitive crying
Many people are allergic to the sulfonamide moiety and experience hypersensitivity reactions characterized by an excessive immune response. Common symptoms include rashes, hives, itchy eyes, and swollen tongue or face. Some individuals can have an anaphylactic reaction.

Nephrotoxicity
Kidney with Toxic-green-glow
Sulfonamides can cause nephrotoxicity via crystalluria, or crystals in the urine. Sulfonamides are acetylated in the liver and in this form are insoluble in acidic urine, causing precipitation to form crystals. This can lead to kidney damage, but can be prevented by adequate oral hydration and alkalinization of the urine.

Photosensitivity
Photo-camera causing Sensitive-crying
Photosensitivity, or an increased sensation and intolerance to sunlight, is a common adverse reaction experienced by some patients on sulfonamide antibiotics.

Kernicterus in Infants
Colonel with Baby
Kernicterus is caused by elevation of bilirubin leading to accumulation in the gray matter of the central nervous system, potentially causing irreversible neurological damage. Sulfonamides can bind with albumin at the same receptor site as bilirubin, causing displacement of bilirubin and subsequently, kernicterus. Infants are particularly vulnerable to kernicterus because the glucuronidation system has not adequately matured to metabolize bilirubin.

Displaces Warfarin from Albumin
War-fairy Displaced from Family Album
TMP-SMX is known to increase blood concentrations of warfarin via displacement of warfarin from albumin in the plasma. This can cause unexpected increases in clotting time and uncontrolled bleeding for individuals on anticoagulation with warfarin therapy.

Considerations

Hemolysis with G6PD Deficiency
Hemolysing RBCs coming out of Glue (6) Sax-P-Dehydrator
Sulfonamides can cause increased oxidative stress in the body and precipitate hemolytic anemia in individuals with G6PD deficiency. Glucose 6 phosphate dehydrogenase deficiency is an X linked recessive disorder characterized by a deficiency of the enzyme glucose 6 phosphate dehydrogenase (G6PD). This enzyme is involved in the pentose phosphate pathway and supplies reducing substances by converting NADP to NADPH. This NADPH is used by glutathione reductase to maintain levels of glutathione in cells, which helps protect red blood cells against oxidative damage caused by free radicals and peroxides.

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