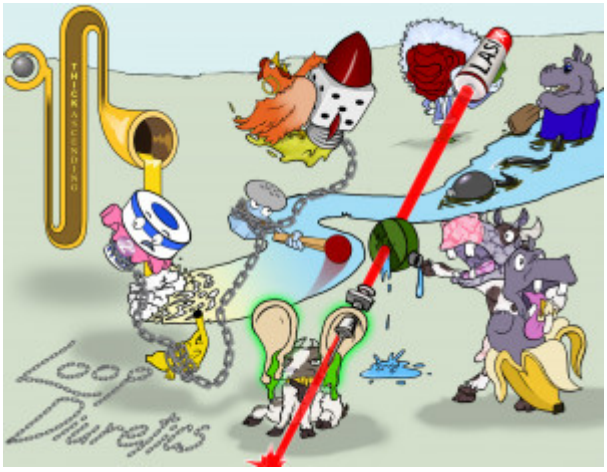
Loop Diuretics

Loop diuretics are a class of diuretics that inhibit the NaK2Cl symporter in the thick ascending limb of the loop of Henle. Furosemide is the generic name for one of the most commonly used loop diuretic and has the trade name of Lasix. These drugs are sulfa drugs as they contain a sulfonamide group and can cause an allergic reaction in patients with a sulfa allergy. Loop diuretics often also lead to hypokalemia and hypocalcemia and can reduce the urate excretion leading to hyperuricemia and gout. Ototixicity is also a serious but rare adverse effect of loop diuretics.



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Mechanism of Action

Thick Ascending Limb of Loop of Henle
Thick Ascending Limb of the Loop of Henle
Loop diuretics act on the Na+, K+, 2Cl- symporter in the thick ascending limb of the loop of Henle. The medullary thick ascending limb is mostly impermeable to water.

Inhibits Na+-K+-2Cl-
Inhibiting-chains on Salt-shaker, Banana, and Chlorine-dispenser in (2) Tutu
Loop diuretics act on the Na+, K+, 2Cl- transporter in the thick ascending limb of the loop of Henle. They inhibit sodium and chloride reabsorption by competing for the Cl-binding site. Loop diuretics prevent the generation of a hypertonic renal medulla which prevents urine from being concentrated and leads to increased urine production.

Sulfa Drug
Sulfur-match
Furosemide (Lasix) contains a sulfonamide group and can cause an allergic reaction in patients with a sulfa allergy. Patients with hypersensitivities to sulfa drugs may be prescribed ethacrynic acid (Edecrin), a loop diuretic without a sulfur component. Ethacrynic acid should be remembered because it has a greater risk of ototoxicity compared to Furosemide.

Drug Names

Furosemide
Fur-rose
Furosemide is the generic name for a commonly prescribed potent loop diuretic. Other loop diuretics include torsemide (Diuver), bumetanide (Bumex), and ethacrynic acid (Edecrin).

Lasix
Laser
Lasix is the brand name of Furosemide and is one of the most commonly used loop diuretics.

Side Effects

Ototoxicity from Rapid Injection
Ears with a Toxic-green-glow from Fast Syringe
Ototoxicity (damage to the ear) is a serious but rare adverse effect of loop diuretics. Symptoms may be limited to tinnitus and vertigo, but serious cases can result in hearing loss.

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Gout

Gout-goat

High levels of uric acid in the blood are the underlying cause of gout. This increase can occur for several reasons, including diet, medications, genetics, or underexcretion of urate from the kidneys. Diuretics have been associated with hyperuricemia and gout.

Dehydration

Empty-canteen

Excessive use of diuretics may cause hypovolemia which may manifest as dehydration with skin tenting and excessive thirst as well as low blood pressure.

Hypocalcemia

Hippo-calcified-cow

Inhibition of the Na+, K+, 2Cl transporter causes a failure of reabsorption of calcium which may cause hypocalcemia. Hypocalcemia may manifest as ECG changes, muscle spasms, or tetany. Remember, the Chvostek sign and Trousseau's sign are indicators of hypocalcemia.

Hypokalemia

Hippo-banana

Because loop diuretics prevent the reabsorption of sodium and chloride ions in the loop of Henle, there is an increased amount of sodium and water that passes through the collecting tubules. This increase causes a reflex secretion of potassium into the urine by increased aldosterone secretion. Also, volume depletion due to increased urine output causes increased secretion of aldosterone, further increasing the secretion of potassium into the collecting duct and the urine, leading to hypokalemia.

Hypokalemia may manifest as ECG changes, muscle tingling or weakness, fatigue, and constipation.

Orthostatic Hypotension

Oar Hippo-BP

Orthostatic hypotension occurs when a person’s blood pressure suddenly falls when standing up or stretching. Educate the patient to rise slowly or dangle their feet off the bed before standing.

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