Diuretics

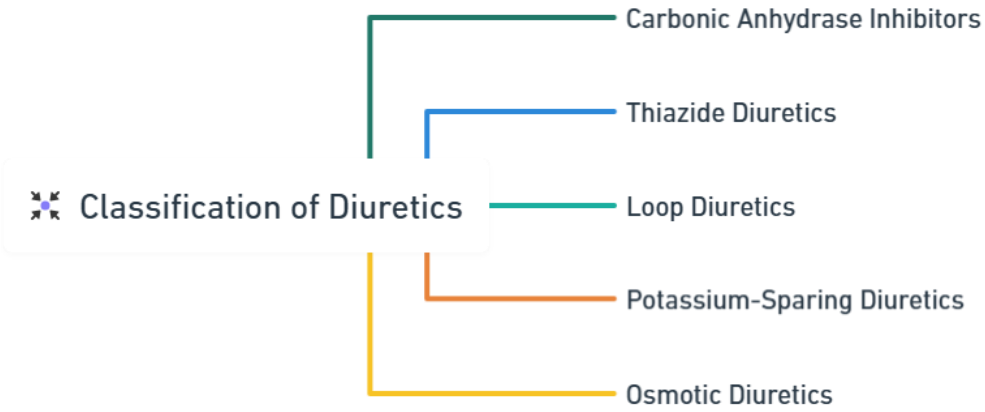
Diuretics: Overview and Classification

- Diuretics are a class of medications that promote the excretion of water and electrolytes (such as sodium and potassium) through the kidneys.
- They are primarily used to manage conditions like hypertension (high blood pressure), heart failure, kidney disorders, and certain cases of edema (fluid retention).
- By increasing urine output, diuretics help reduce blood volume, thereby lowering blood pressure and decreasing the workload on the heart.

Classification of Diuretics

- Diuretics can be categorized based on their mechanism of action and the specific segment of the nephron (the functional unit of the kidney) they act upon.

Below is a concise classification of diuretics along with common examples and their primary mechanisms:



1. Carbonic Anhydrase Inhibitors

➢ Examples:

- *Acetazolamide*
- *Methazolamide*
- Dichlorphenamide

➢ Mechanism of Action:

- Inhibit the enzyme carbonic anhydrase in the proximal tubule of the nephron.
- Reduce reabsorption of bicarbonate, leading to increased excretion of bicarbonate, sodium, potassium, and water.

➢ Clinical Uses:

- Treatment of glaucoma.

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- Prevention of altitude sickness.
- Metabolic alkalosis.

2. Thiazide Diuretics

➢ Examples:

- *Chlorthiazide*
- *Hydrochlorothiazide*
- Hydroflumethiazide
- Cyclothiazide

➢ Mechanism of Action:

- Act on the distal convoluted tubule.
- Inhibit the sodium-chloride symporter, reducing sodium and chloride reabsorption.
- Increase excretion of sodium, chloride, and water, while promoting potassium retention.

➢ Clinical Uses:

- Hypertension management.
- Edema associated with heart failure or nephrotic syndrome.
- Prevention of calcium-containing kidney stones.

3. Loop Diuretics

➢ Examples:

- *Furosemide*
- *Bumetanide*
- Ethacrynic acid

➢ Mechanism of Action:

- Target the ascending limb of the loop of Henle.
- Inhibit the sodium-potassium-chloride (Na^+-K^+-$2Cl^-$) cotransporter.
- Significantly increase excretion of sodium, chloride, potassium, calcium, and magnesium.

➢ Clinical Uses:

- Acute and chronic heart failure.
- Pulmonary edema.

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- Hypertension.
- Acute kidney failure.

4. Potassium-Sparing Diuretics

➢ Examples:

- Spironolactone
- Triamterene
- Amiloride

➢ Mechanism of Action:

- Act on the collecting ducts and late distal tubule.
- Spironolactone: Aldosterone receptor antagonists; block sodium reabsorption and potassium excretion.
- Triamterene and Amiloride: Inhibit epithelial sodium channels (ENaC), reducing sodium reabsorption and potassium loss.

➢ Clinical Uses:

- Heart failure.
- Hypertension.
- Prevention of hypokalemia in patients taking other diuretics.
- Primary hyperaldosteronism (Spironolactone).

5. Osmotic Diuretics

➢ Examples:

- Mannitol

➢ Mechanism of Action:

- Remain in the lumen of the nephron and inhibit water reabsorption by increasing the osmolarity of the filtrate.
- Do not undergo significant reabsorption, thus drawing water into the urine.

➢ Clinical Uses:

- Reduction of intracranial pressure in cases of cerebral edema.
- Treatment of acute kidney failure.

Various Diuretics

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1. Acetazolamide

Chemical Name:

- N-(5-Sulfamoyl-1,3,4-thiadiazol-2-yl)acetamide

Uses:

- Glaucoma (reduces intraocular pressure)
- Acute mountain sickness
- Edema due to congestive heart failure
- Epilepsy (adjunctive therapy)
- Drug-induced metabolic alkalosis

Stability & Storage:

- Stable under dry conditions
- Protect from light and moisture
- Store at room temperature (15°C–30°C)

Formulations:

- Oral Tablets: 125 mg, 250 mg
- Parenteral Injection: 500 mg (reconstitutable vial)

Popular Brand Names:

- Diamox
- Acemox
- Azopt (ophthalmic)

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2. Frusemide* *(also known as Furosemide)*

Chemical Name:

- 4-Chloro-N-furfuryl-5-sulfamoylanthranilic acid

Chemical Structure:

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