

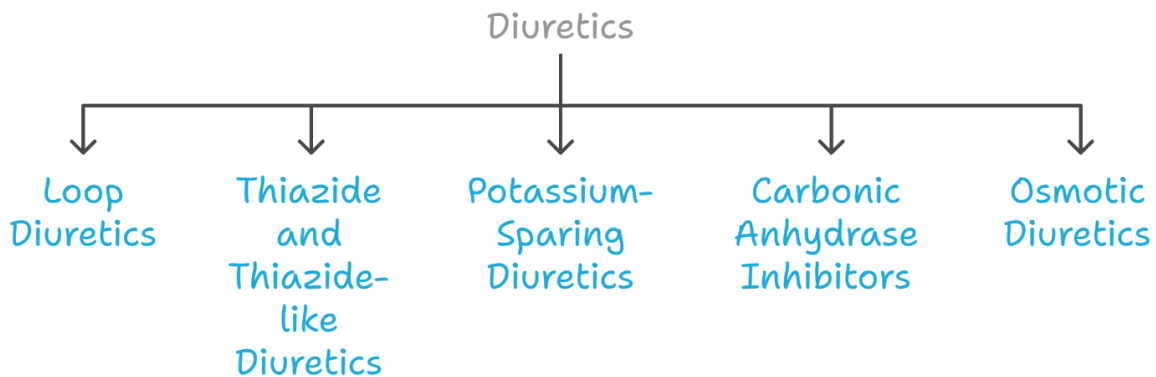
Drugs Acting on the Kidney

Diuretics

Definition

- Diuretics are drugs that **promote the excretion of water and electrolytes**, primarily **sodium**, by the kidneys.
- They are used to treat conditions involving **fluid overload** or **hypertension**.

Classification



A. Loop Diuretics

- *Furosemide, Torsemide, Bumetanide, Ethacrynic acid*

B. Thiazide and Thiazide-like Diuretics

- *Hydrochlorothiazide, Chlorthalidone, Indapamide*

C. Potassium-Sparing Diuretics

- *Spironolactone, Eplerenone* (aldosterone antagonists)
- *Amiloride, Triamterene* (epithelial sodium channel blockers)

D. Carbonic Anhydrase Inhibitors

- *Acetazolamide*

E. Osmotic Diuretics

- *Mannitol*

Pharmacological Actions

Class	Mechanism of Action
Loop diuretics	Inhibit $\text{Na}^+ - \text{K}^+ - 2\text{Cl}^-$ transporter in thick ascending limb → potent diuresis

Thiazides	Inhibit $\text{Na}^+\text{-Cl}^-$ co-transporter in distal tubule → mild diuresis
Potassium-sparing	Inhibit Na^+ reabsorption in late distal tubule/collecting duct → conserve K^+
Carbonic anhydrase inhibitors	↓ H^+ secretion and Na^+ reabsorption in proximal tubule
Osmotic diuretics	Create osmotic gradient → draw water into tubules (mainly in proximal tubule & loop)

Dose (Examples)

Drug	Typical Dose
Furosemide	20–80 mg/day (oral or IV)
Hydrochlorothiazide	12.5–25 mg/day
Spironolactone	25–100 mg/day
Amiloride	5–10 mg/day
Acetazolamide	250–500 mg/day
Mannitol (IV)	0.25–1 g/kg as infusion (used in emergencies)

Indications

- **Edema** (CHF, cirrhosis, nephrotic syndrome)
- **Hypertension** (thiazides as first-line)
- **Hypercalcemia** (loop diuretics)
- **Hypokalemia** (potassium-sparing diuretics used to prevent it)
- **Glaucoma, altitude sickness** (acetazolamide)
- **Acute renal failure with oliguria** (mannitol)
- **Cerebral edema or raised ICP** (mannitol)

Contraindications

Class	Contraindications
Loop diuretics	Anuria, severe electrolyte depletion
Thiazides	Gout, sulfa allergy, severe renal failure
Potassium-sparing diuretics	Hyperkalemia, renal failure, Addison's disease
Acetazolamide	Sulfa allergy, liver disease (risk of hepatic encephalopathy)

Mannitol

Heart failure, pulmonary edema, active intracranial bleeding (except for brain edema)

Anti-Diuretics

Definition

- Anti-diuretics are drugs that **reduce urine output** by promoting **water reabsorption** in the kidney.
- These are primarily used to treat **diabetes insipidus** and **nocturnal enuresis**.

Classification

A. Vasopressin (ADH) and Analogues

- **Vasopressin** (natural)
- **Desmopressin (DDAVP)** – synthetic analog with selective V_2 receptor activity

B. Vasopressin Receptor Agonists

- **Desmopressin** (selective V_2 agonist)

C. Other Drugs with Anti-diuretic Effect

- **Chlorpropamide** (enhances ADH action – rarely used)
- **Carbamazepine** (used in central DI)

Pharmacological Actions

- **Desmopressin:** Acts on V_2 receptors in renal collecting ducts → ↑ aquaporin-2 insertion → ↑ water reabsorption
- **Vasopressin:** Acts on both V_1 (vasoconstriction) and V_2 (renal) receptors

Dose (Examples)

Drug	Route	Typical Dose
Desmopressin (oral)	0.1–0.4 mg/day in divided doses	
Desmopressin (intranasal)	10–20 mcg 1–2 times/day	
Vasopressin (IV/IM)	5–10 units 2–4 times/day (rarely used in DI now)	

Indications

- **Central diabetes insipidus** (Desmopressin preferred)

- **Nocturnal enuresis** in children
- **Hemophilia A and von Willebrand disease** (Desmopressin promotes factor VIII release)
- **Postoperative polyuria or cranial surgery** (if DI develops)
- **Esophageal variceal bleeding** (Vasopressin due to vasoconstriction)

Contraindications

Drug	Contraindications
Desmopressin	Hyponatremia, severe heart failure, risk of fluid overload
Vasopressin	Coronary artery disease, hypertension, epilepsy, asthma (due to vasoconstriction)
Chlorpropamide	Type 1 diabetes, hepatic impairment



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