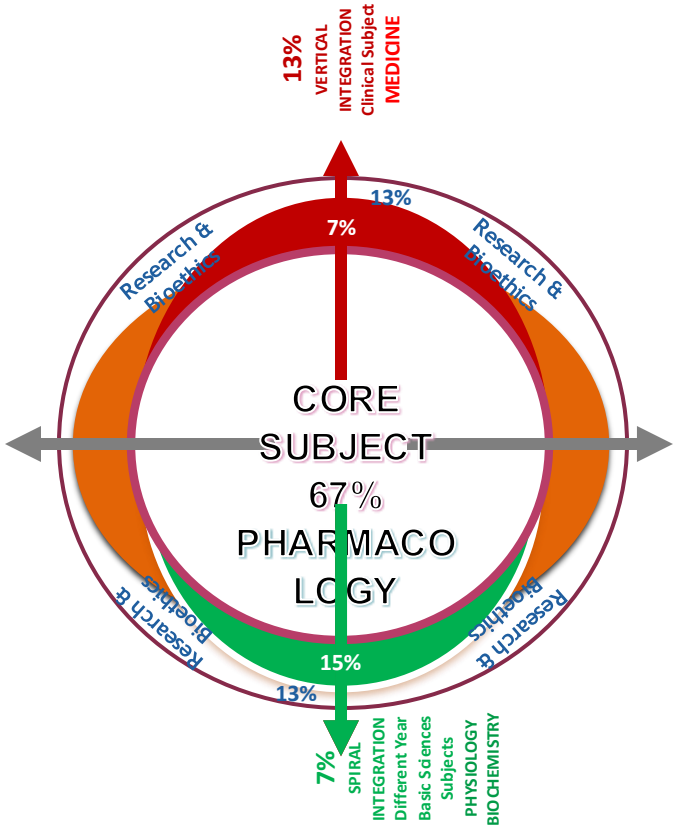
Prof. Umar's Clinically Oriented Integration Model
For Basic Sciences Interactive Lectures



3rd Year Pharmacology LGIS (15 slides)
Core Subject -pharmacology - 10 slides (67%)
Vertical Integration -medicine 2 slides (13 %)
Spiral Integration physiology/anatomy - 1 slides (7%)
Research & Bioethics- 2 slides (13-%)

INTRODUCTION TO DIURETICS

LEARNING OBJECTIVES

At the end of the session, will be able to

- Recall the structure and function of different types of nephron
- Classify diuretics according to the site of action and mechanism of action
- Enumerate clinical uses of diuretics

Antomy/physiology

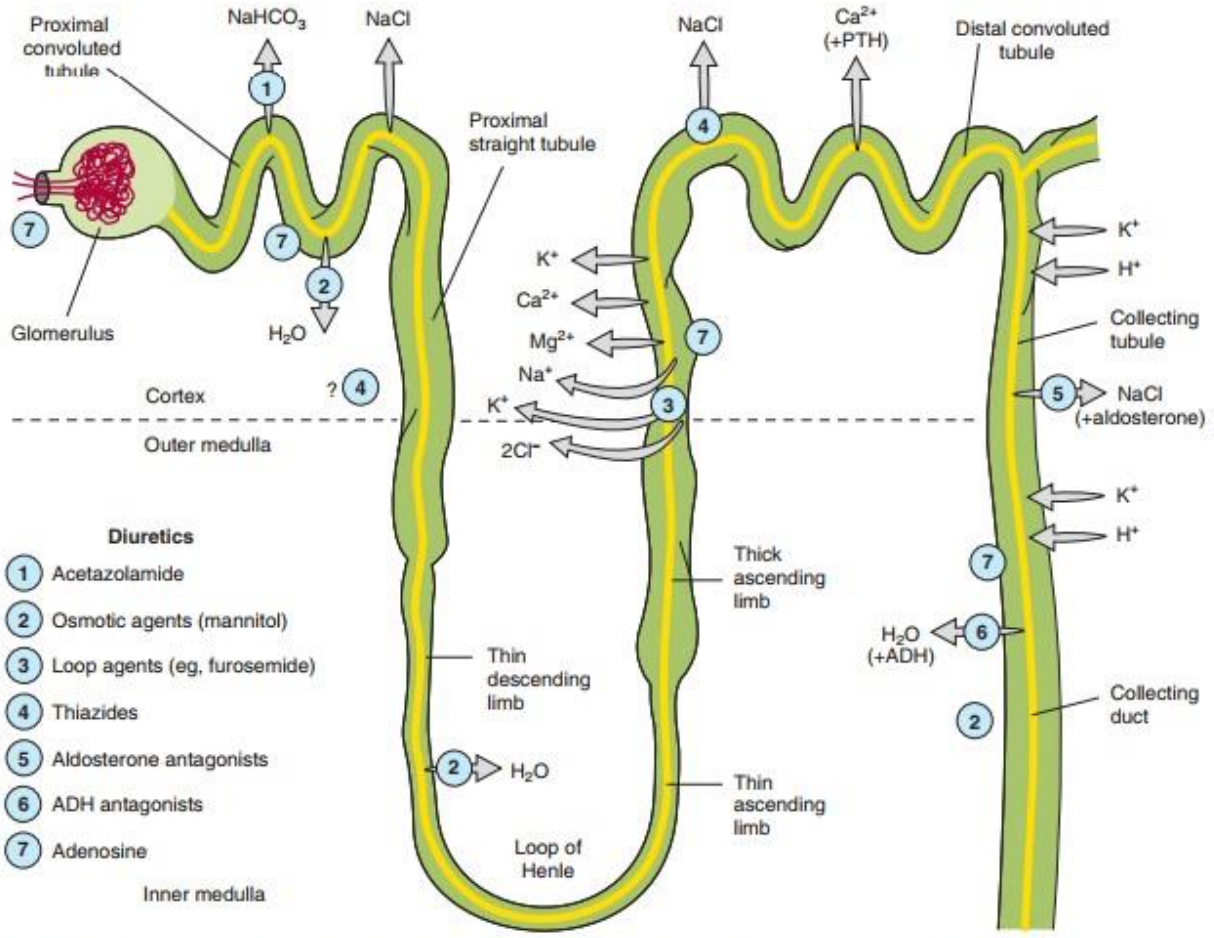


FIGURE 15–1 Tubule transport systems and sites of action of diuretics. ADH, antidiuretic hormone; PTH, parathyroid hormone.

Core

- Agent that increase urine volume-----diuretic
- Agent that increase renal sodium excretion-------natriuretic
- Aquaretics----------osmosis

Core

CLASSIFICATION

- **Carbonic anhydrase inhibitors:**

  acetazolamide

- **Osmotic diuretics:**

  mannitol

Core

CLASSIFICATION

- **High ceiling diuretics (loop diuretics)**
  - Carboxylic acid derivatives: frusemide , bumetanide
  - Phenoxyacetic acid derivatives: ethacrynic acid
- **K-sparing diuretics**
  - Aldosterone antagonists: spironolactone, K canranoate
  - Nonaldosterone antagonists: triamterone , amiloride

Core

Drugs that block NaCl symport

- **Thiazide diuretics**

  Bendrofluthiazide , cyclopenthiazide

  Chlorothiazide , polythiazide

- **Thiazide related compounds**
  - Phthalimidine drivative: chlorothalidone
  - Quinozaloine drivative: quinetrazone
  - Chlorobenzamide derivative: Clopamide
  - Benzene disulphonamide derivative: mifruside
  - MISC : indepamide

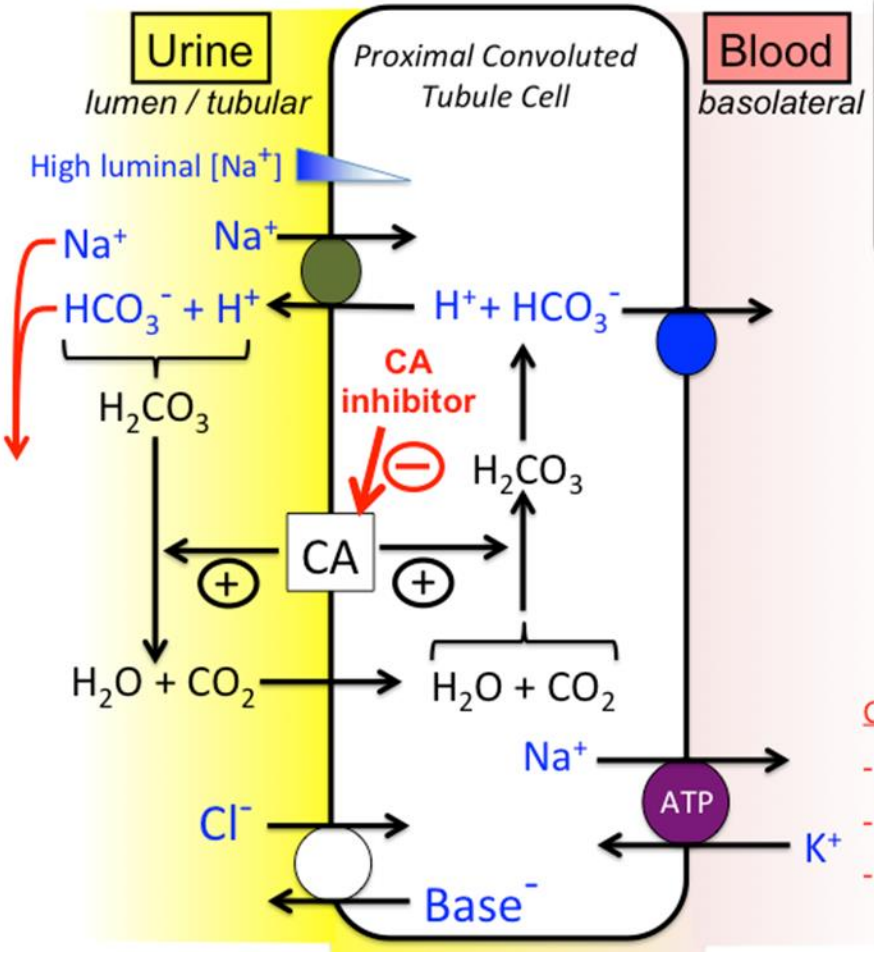
Core

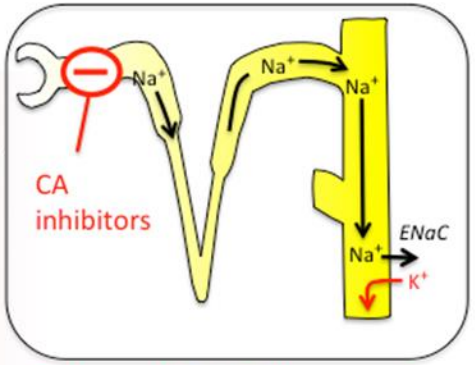
Antidiuretic Hormone Antagonists

- Lithium , demeclocycline
- Vaptans (conivaptan ,tolvaptan)

Core

CARBONIC ANHYDRASE INHIBITORS:





Enhanced Na^+ delivery results in K^+ loss in the collecting duct

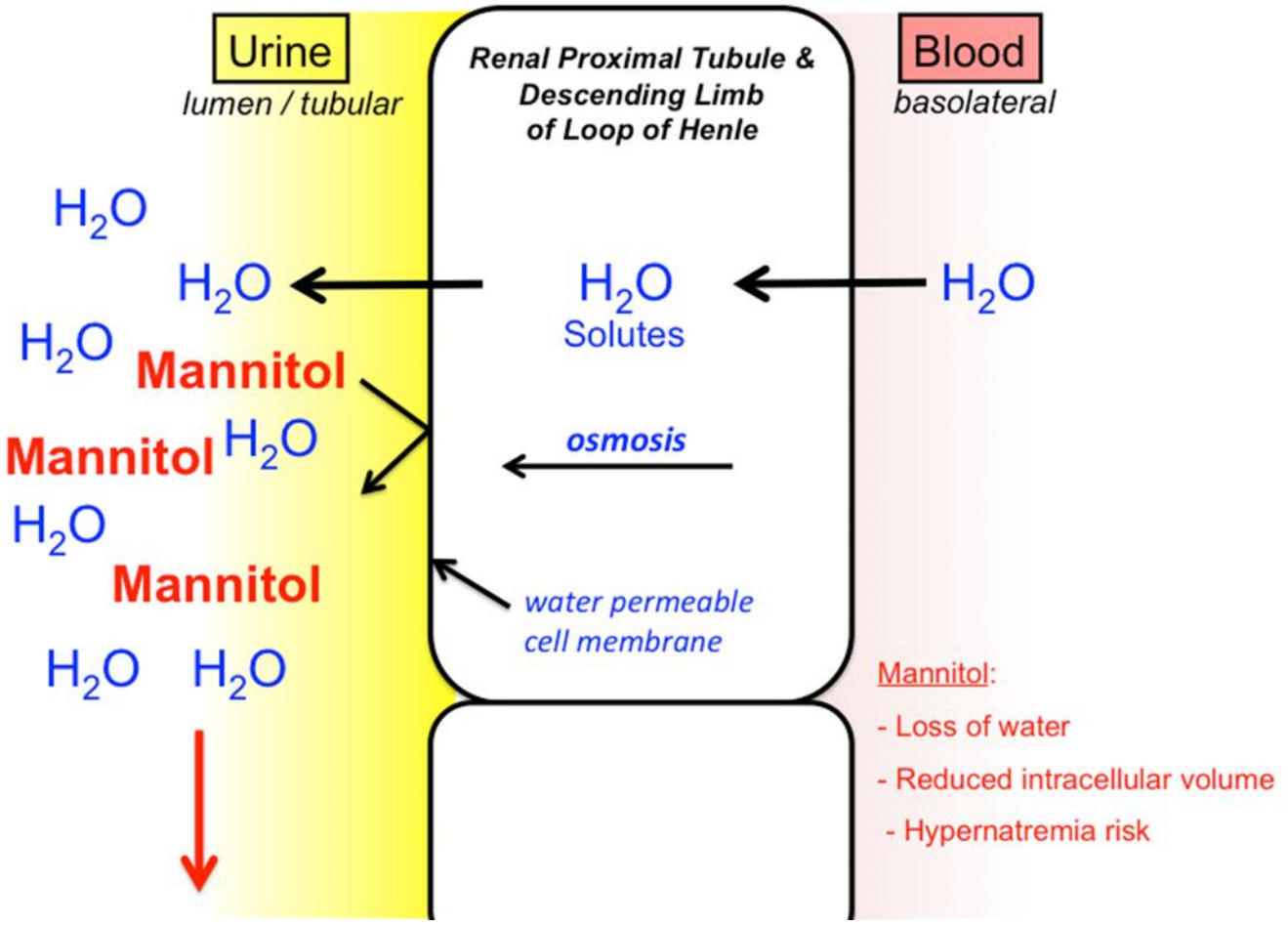
~66% of filtered Na & 85% of $NaHCO_3$ is normally reabsorbed in the proximal tubule

Carbonic Anhydrase Inhibitors:

- Loss of $NaHCO_3$
- Hypokalemic metabolic acidosis
- Tolerance develops after 2-3 days

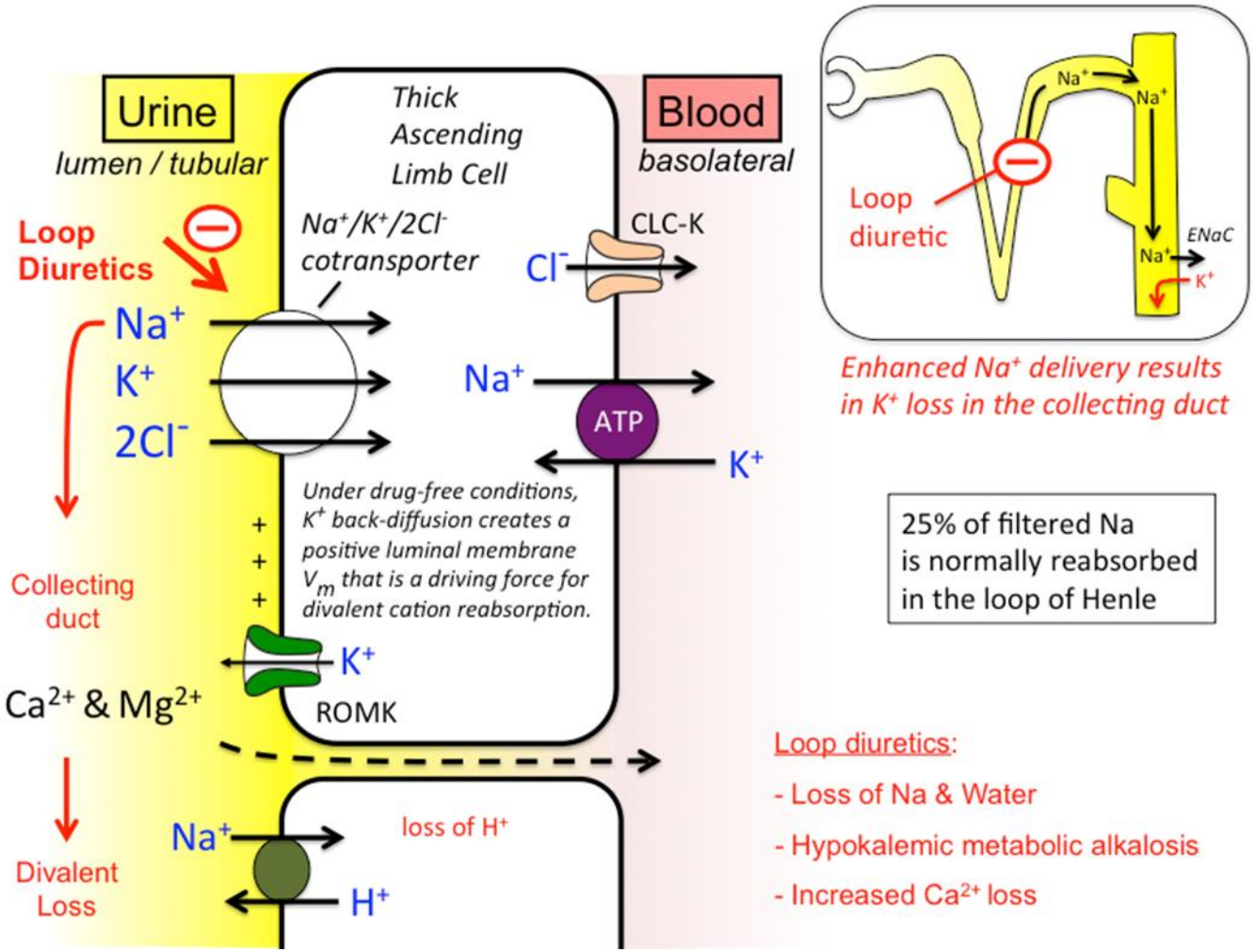
Core

OSMOTIC DIURETICS



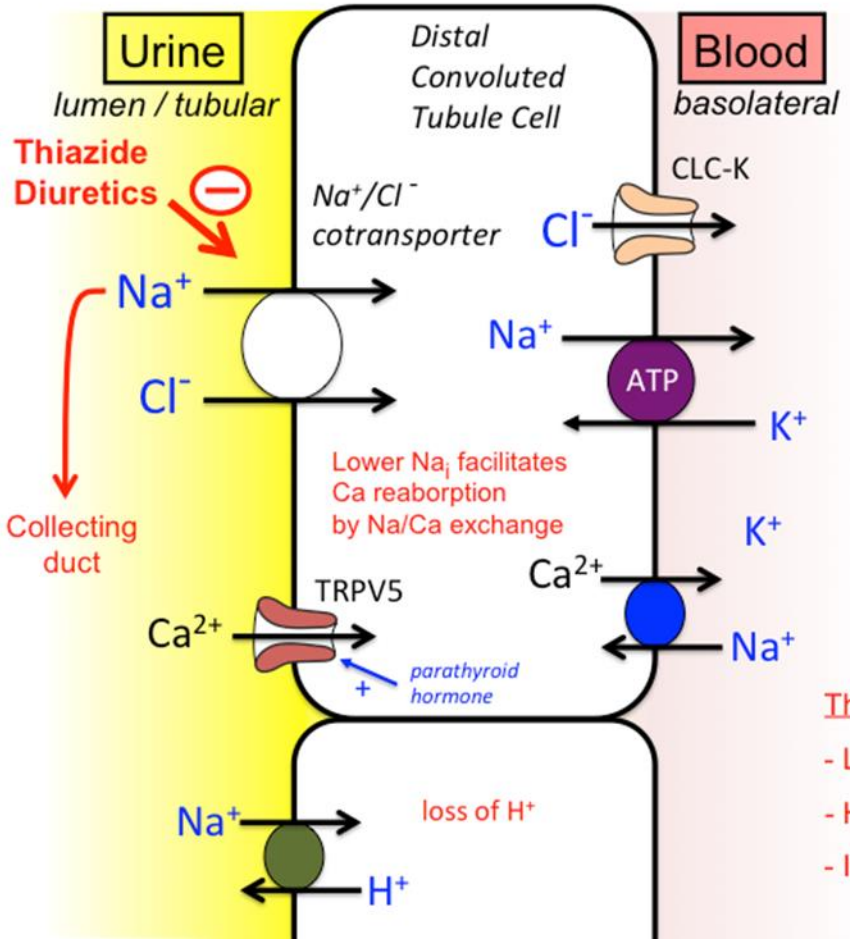
Core

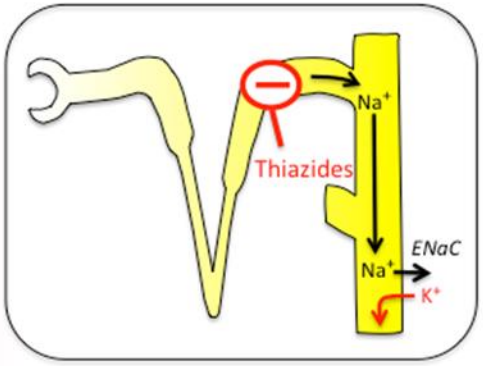
HIGH CEILING DIURETICS (LOOP DIURETICS)



Core

DRUGS THAT BLOCK NaCl SYMPORT (Thiazides And Thiazide Related)





Enhanced Na^+ delivery results in K^+ loss in the collecting duct

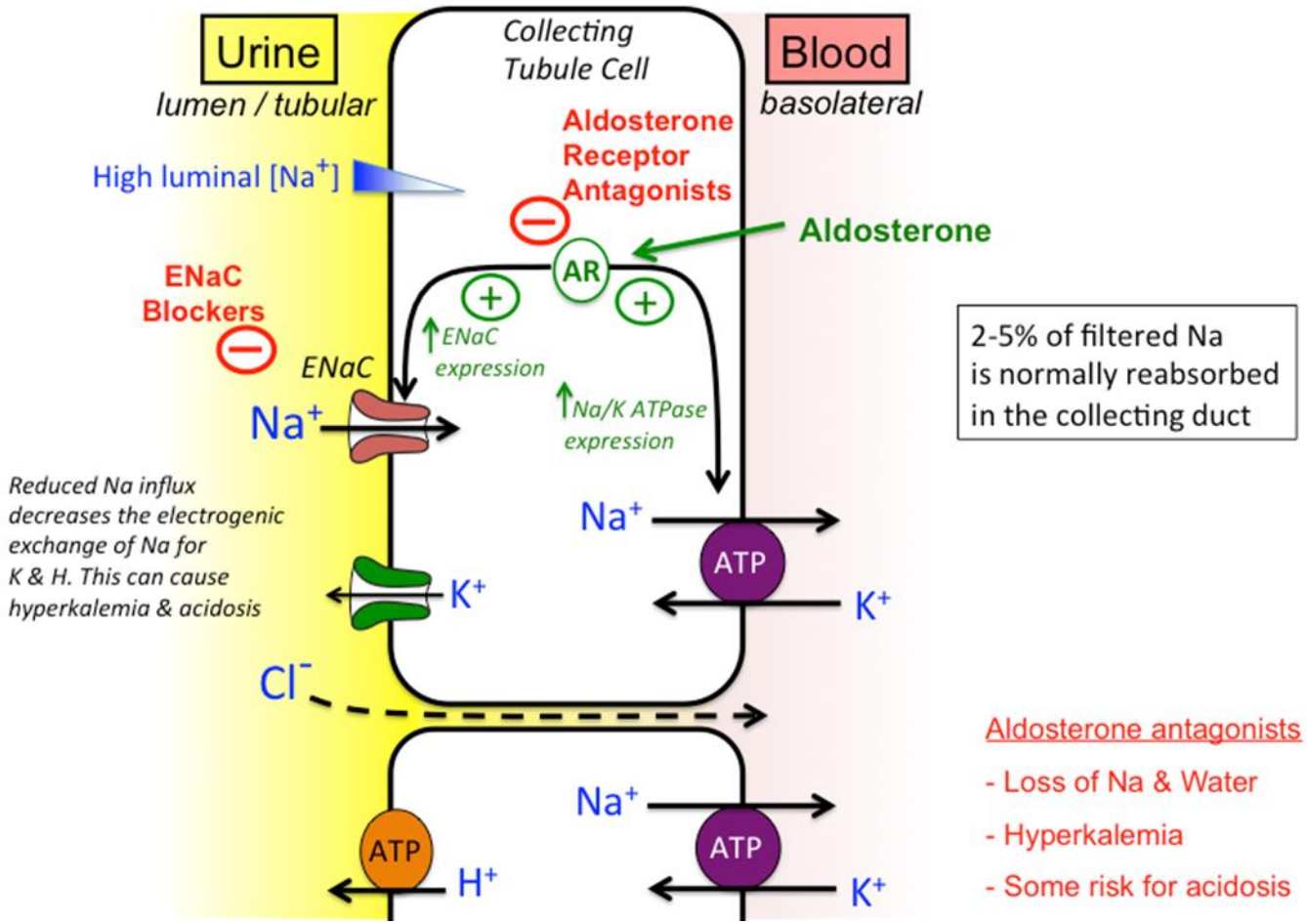
10% of filtered Na
is normally reabsorbed
in the distal convoluted tubule

Thiazide diuretics:

- Loss of Na & Water
- Hypokalemic metabolic alkalosis
- Increased Ca^{2+} reabsorption

Core

K-SPARING DIURETICS



vertical

CLINICAL PHARMACOLOGY OF DIURETICS

Edematous States

- Heart failure
- Kidney disease
- Hepatic cirrhosis

vertical

CLINICAL PHARMACOLOGY OF DIURETICS

Nonedematous States

- Hypertension
- Nephrolithiasis
- Hypercalcemia
- Diabetes insipidus

Further reading

RESEARCH

- Malik BA, Nnodebe I, Fayaz A, Inayat H, Murtaza SF, Umer M, Zaidi SA, Amin A. Effect of acetazolamide as add-on diuretic therapy in patients with heart failure: A meta-analysis. Cureus. 2023 Apr 18;15(4).

Further reading

BIOETHICS

- Diuretics are often abused by athletes to excrete water for rapid weight loss and to mask the presence of other banned substances

Further reading

ARTIFICIAL INTELLIGENCE

- AI helps in prescribing diuretics by analyzing patient data, predicting efficacy and safety, identifying potential interactions, optimizing dosing and monitoring and providing real-time guidance.