Diuresis , Diuretics, Acid base balance & Applied Physiology

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Diuresis

- **Diuresis** – Excess excretion of water in the urine
- **Diuretics** – Substances that causes excess excretion of urine
- **Natriuresis** – Excess excretion of sodium in the urine
- **Kaliuresis** – Excess excretion of potassium in the urine

Classification

Water diuresis

- Excretion of large amount of water without excess solute loss
- Absence or decreased ADH
- Hypotonic
- Eg.Diabetes insipidus

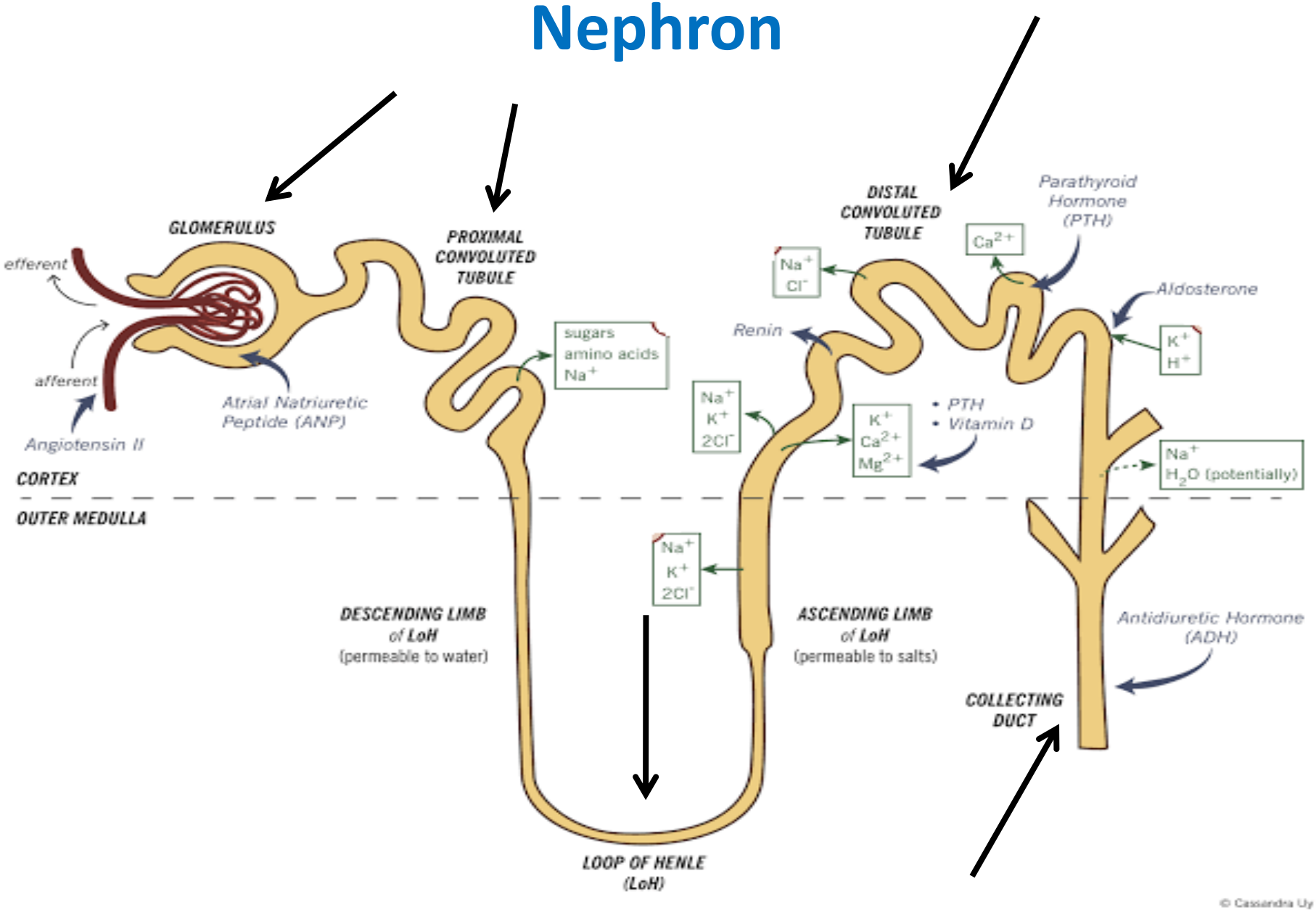
Osmotic diuresis

- Excretion of large amount of water with increased excretion osmotically active solutes
- ADH secretion normal
- Isotonic
- Eg.Diabetes mellitus

Kidney

- Formation of urine
- Regulates ECF volume
- Maintains Acid Base balance
- Excretion of urea, creatine, uric acid etc
- Regulation of electrolytes composition
- Regulation of plasma osmolality
- Regulation of erythropoiesis
- Hormones secretion

Nephron



Diuretics

- **High efficacy Diuretics**

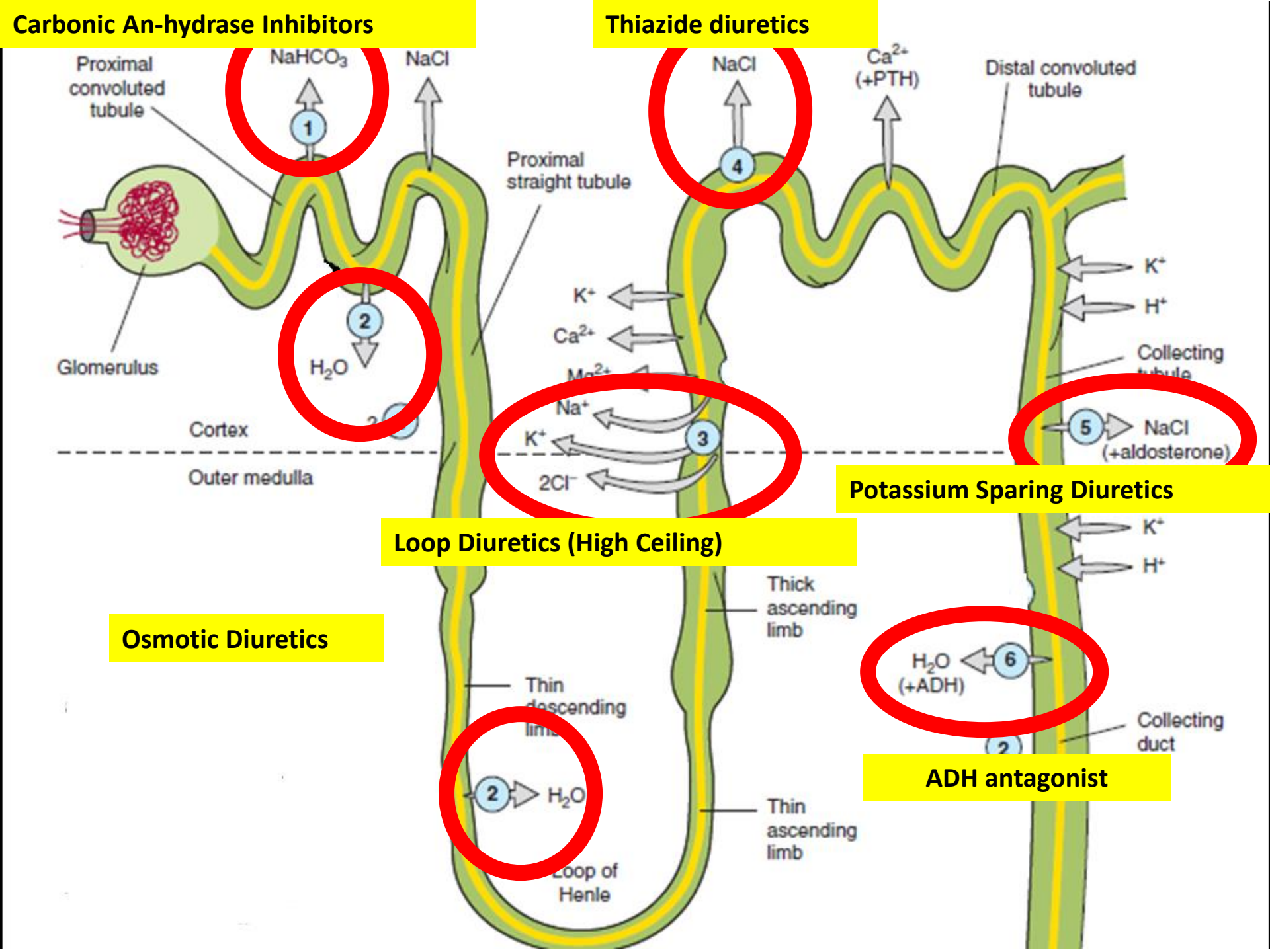
  Loop Diuretics

- **Medium efficacy diuretics**

  Thiazide diuretics & Thiazide like diuretics

- **Weak or adjunctive diuretics**

  Carbonic anhydrase inhibitors, Potassium sparing diuretic, Osmotic diuretics


Carbonic An-hydrase Inhibitors
Thiazide diuretics
Proximal convoluted tubule
$NaHCO_3$
NaCl
NaCl
Ca^{2+} (+PTH)
Distal convoluted tubule
Proximal straight tubule
Glomerulus
H_2O
K^+
Ca^{2+}
Mg^{2+}
Na^+
K^+
$2Cl^-$
K^+
H^+
Collecting tubule
NaCl (+aldosterone)
Cortex
Outer medulla
Potassium Sparing Diuretics
Loop Diuretics (High Ceiling)
K^+
H^+
Thick ascending limb
Osmotic Diuretics
H_2O (+ADH)
Thin descending limb
H_2O
Collecting duct
ADH antagonist
Thin ascending limb
Loop of Henle

- **Carbonic Anhydrase Inhibitors** Acetazolamide, Brinzolamide, Dorzolamide
- **Osmotic Diuretic** Mannitol, Glycerine, Urea, Isosorbide
- **Loop Diuretics** Frusemide/ Furosemide, Bumetanide, Torsemide, Ethacrynic acid
- **Thiazide Diuretics** Hydrochlorothiazide, Clopamide, Benzthiazide,

  Thiazide like Diuretics Chlorthalidone, Metolazone, Xipamide, Indapamide

- **Potassium Sparing Diuretics**
  - **Aldosterone Antagonist -** Spironolactone, Canrenone, Eplerone
  - **Direct Acting (ENaC inhibitors)**
    Amiloride (more potent),Triamterene

- **ADH Antagonists** Tolvaptan,Mozavaptan

Applied Physiology

Renal failure

- Types – Acute & Chronic
- Acute RF – stoppage of renal functioning suddenly, partial or complete
- Chronic RF – progressive loss of renal function due to damage of nephrons

Causes of RF

- Pre renal – due to decreased blood supply
- Post renal – due to defective function of collecting system
- Renal – abnormalities inside the kidney

Management

- ARF – treat the cause , medical management

- CRF – Dialysis

  Renal transplantation

Renal function tests

- Physical test
- Routine blood test
- Estimation of Glomerular filtration rate
- Tubular function tests
- Measurement of renal plasma and blood flow
- Ultrasonography
- X ray
- Intravenous pyelography
- CT and MRI

Acid Base balance

- Normal pH of blood – 7.35 to 7.45
- Acidosis – increase in hydrogen ion concentration – reduces pH
- Alkalosis – decrease in hydrogen ion concentration – increases pH
- Buffering – pH stabilizing
- Buffers – substance that bind or release hydrogen ions in a solution

Buffers

- Three major buffers are
  - Bicorbonate buffer system
  - Phosphate buffer system
  - Proteins

Renal control in ACID – BASE balance

- Acid base balance is an important function of kidneys
- They maintain the AB balance by secreting acidic and basic urine
- Hydrogen ions and bicorbonate absorption and secretion in renal tubular system maintains the AB balance

Acid Base Disorders

- Respiratory Acidosis
- Respiratory Alkalosis
- Metabolic Acidosis
- Metabolic Alkalosis

Thank you