

# Minerals

## SODIUM

▶ [\\_Maryam Fida\( o-1827\)](#)

- ▶ Source: Essentials of Medical Biochemistry (Mushtaq Ahmad)
  - ▶ Chatterjea Textbook of Medical Biochemistry
    - ▶ World Wide Web

- ▶ **Non-electrolytes** - Glucose, urea etc. do not dissociate in solution
- ▶ NaCl, KCl in solution dissociate into  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Cl}^-$  ions. These are called *Electrolytes*
- ▶ Water molecules completely surround these ions preventing union of positively and negatively charged ions
- ▶ +ve ions - Cations
- ▶ -ve ions - Anions

# Electrolytes Function

- ▶ Maintenance of osmotic pressure
- ▶ Optimum ionic balance for tissue activity
- ▶ Regulation of pH of body fluids
- ▶ Regulate neuromuscular excitability

# Sodium

- ▶ Present as sodium ion ( $\text{Na}^+$ ) in most foods
- ▶ 98% loss occurs in urine



# Functions - Na<sup>+</sup>

- ▶ **Fluid Balance:** Maintains crystalloid osmotic pressure of ECF. Helps in retaining water in ECF
- ▶ **Neuromuscular excitability:** Na and K antagonize action of Mg and Ca
- ▶ **Acid Base Balance:** Na - H<sup>+</sup> exchange in renal tubule to acidify urine

- ▶ **Resting Membrane Potential:**  $\text{Na}^+$  more outside Separation of charges called *Polarization*
- ▶ It creates a potential difference of -70 to -90 millivolts across the membrane (Resting Membrane Potential)
- ▶ **Action Potential:** Nerve muscle stimulation. Rapid Depolarization causing  $\text{Na}$  inflow

### Other Actions of $\text{Na}$ include:

- ▶  $\text{Cl}^-$  ions for **HCL** come from  $\text{NaCl}$
- ▶ Helps in absorption of Glucose from small intestine and from tubules

# Clinical Conditions

## Hypernatremia

- ▶ High plasma Na conc.
- ▶ Due to decrease in body water or increase in body Na



## Hypernatremia

- ▶ *Simple Dehydration*: Excessive sweating with no replacement
- ▶ *Diabetes Insipidus*: Lack of ADH
- ▶ *Osmotic Loading*: Mannitol or urea. Osmotic effect of these causes water to go with them but very little Na

# Hypernatremia

- ▶ Excess Na intake: Excessive IV NaCl in children, Administration of  $\text{NaHCO}_3$
- ▶ Steroid therapy: Mineralocorticoids
- ▶ Primary Hyperaldosteronism or Conn's Syndrome: Excess Aldosterone

# Hyponatremia

- ▶ *Diuretic Medication*: promote Na excretion by kidney. Total body Na lowered      Total Extracellular Water decreased
- ▶ *Excessive sweating*: replaced by salt deficient fluids such as water or IV glucose
- ▶ Vomiting, Diarrhoea

# Atrial Natriuretic peptide (ANP)

- ▶ Produced by Atrial Muscle fibres
- ▶ Increases urinary  $\text{Na}^+$  loss
- ▶ Increased secretion by increased extracellular vol.
- ▶ CNP (C for Cysteine) is another natriuretic peptide