



**Excerpts from Fluids,
Electrolytes and Acid
Base Balance Lecture**

Basic Concepts

The physiologic and chemical activity of Electrolytes depend on :

- The number of **particles** present per unit volume moles or millimoles (mmol) per liter
- The number of **electric charges** per unit volume (equivalents or milliequivalents per liter)
- The number of **osmotically active** particles or ions per unit volume osmoles or milliosmoles (Mo) per liter

Basic Concepts

- **Gram or mg** per 100 ml expresses the weight of the electrolyte per unit volume.
- **A mole** of a substance is the molecular weight of that substance in grams.
- **A millimole** is that figure expressed in milligrams.
- The expression, however gives no information of the number of osmotically active ions in solution or the electric charge that they carry.

Basic Concepts

Concentration Changes

Sodium is primarily responsible for the osmolarity of the ECF space, determination of the serum concentration of sodium generally indicates the tonicity of body fluids

Hyponatremia

- In pts with normal renal function, symptomatic hyponatremia does not occur until Na level is greater than or equal to 120 mEq/L
- Clinically CNS signs of increased intracranial pressure ICP
- Tissue signs of excessive intracellular water
- Hypertension is probably induced by the rise in ICP

Hyponatremia

- **Chronic hyponatremics are asymptomatic until serum Na falls below 120 mEq /L**
- **In pts with increased cerebrospinal fluid pressure e.g. after closed head injury mild hyponatremia may be fatal.**
- **Severe hyponatremia may lead to relatively rapid development of oliguric renal failure which may not be reversible if therapy is delayed**

Part II

Hypernatremia

- Hypernatremia (serum Na $>$ 150 mEq / L) is uncommon but dangerous.
- The ECF hyperosmolarity results in a shift of intracellular water from within the cell to ECF compartment.
- CNS and tissue signs characterize acute symptomatic Hypernatremia

Hypernatremia

- Dry, sticky mucous membranes are characteristic.
- Body temperature is generally elevated and may approach a lethal level, as in the patient with heatstroke.
- High serum sodium level may indicate a significant deficit of total body water.

Hypernatremia

Hypernatremia results from:

- Unexpected water losses
- Use of salt containing solutions to replace water losses.

Common Parenteral Fluids

Solution	Na	K	Ca	Mg	Cl	HCO ₃	Mo
ECF	142	4	5	3	103	27	280 - 310
Ringer's	130	4	3	--	109	28 *	273
0.9%NaCl	154	--	--	--	154	--	308
D5 45% NaCl	77	--	--	--	77	--	407
D5 W	--	--	--	--	--	--	253
M/6 Na Lactate	167	--	--	--	--	167 *	334
3% NaCl	513	--	--	--	513	--	1026

* Present in solution in lactate that is converted to bicarbonate