

Water balance

Thirst and ADH

SIADHs

Diabetes insipidus

Osmolality of blood

$$\begin{aligned}\text{Posm} &= 2 [\text{Na}(+)] + \text{glucose (mg/dL)}/18 + \text{BUN (mg/dL)}/2.8 \\ &= 280 \text{ mosmol/L} \\ &= 275\text{-}295 \text{ mOsm/kg of water}\end{aligned}$$

Alterations in sodium conc.

Hypo or Hyper

Hyponatremia

Hypotonic or Hypertonic

Hypotonic hyponatremia :
dilutional

Hypervolemic :

Euovolemic

Hypovolemic

Hypervolemic dil. hyponatremia

- Congestive heart failure,
- Cirrhosis, and
- advanced kidney disease

Euvolemic dil.hyponat

- Inappropriate thirst or
- SIADH

Hypovolemic dil. Hyponat.

- Diuretic use,
- Excessive sweating in hot weather,
- Vomiting and diarrhea.

Hypernatremia

- Serum sodium level above 145 mEq/L
and
- Serum osmolality greater than 295 mOsm/kg

Causes

- Net gain of sodium ex: no water or
- Net loss of water ex watery diarrhoea

POTASSIUM BALANCE

An increase in serum potassium levels of only 0.3 to 0.4 mEq/L can cause

serious cardiac dysrhythmias and even death.

Mechanisms of Regulation

- (1) Renal mechanisms that conserve or eliminate potassium
- (2) Transcellular shift of potassium between the ICF and ECF compartments.

Renal Regulation

- Filtered in the glomerulus,
- Reabsorbed along with sodium and water in the proximal tubule and with sodium and chloride in the thick ascending loop of Henle, and then
- Secreted into the late distal and cortical collecting tubules for elimination in the urine

Aldosterone

Na. k. ATPase chanal in the kidney

Metabolic acidosis and alkalosis

k.H. antiporter in the collecting duct

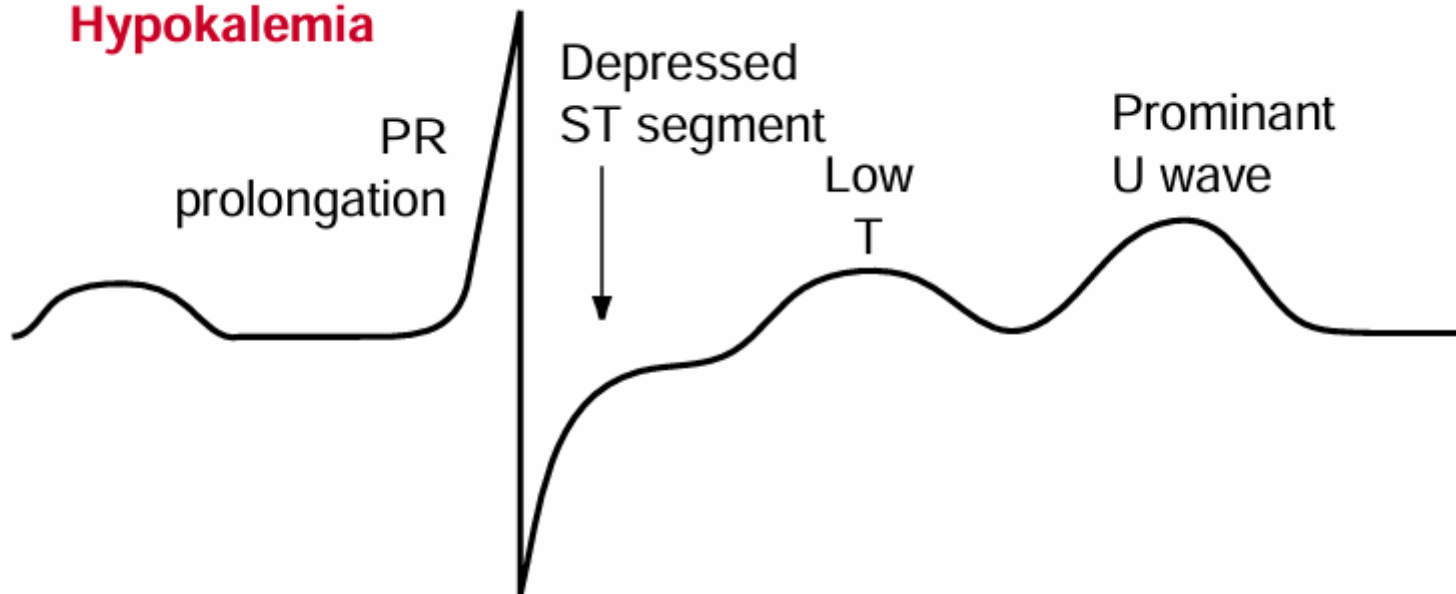
Extracellular-Intracellular Shifts

- Insulin,
- β -adrenergic stimulation,
- Serum osmolality, and
- Acid-base disorders.

Hypokalemia

- (1) Inadequate intake;
- (2) Excessive losses through the kidney, skin, and gastrointestinal tract; and
- (3) Redistribution between the ICF and ECF compartments.

Hypokalemia



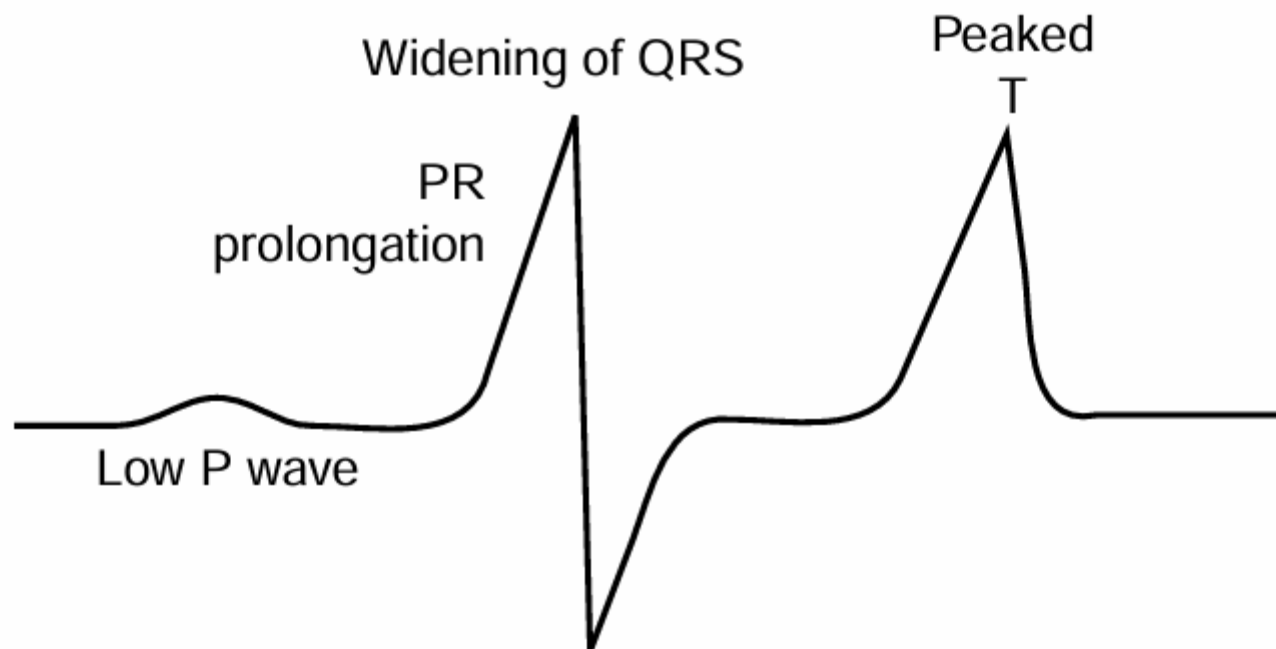
Hyperkalemia

It seldom occurs in healthy persons because the body is extremely effective in preventing excess potassium accumulation in the ECF

Causes

- (1) Decreased renal elimination,
- (2) Excessively rapid administration, and
- (3) Movement of potassium from the ICF to ECF compartment.

Hyperkalemia



Thank you