

HYPERKALEMIA

DEFINITION:

- Serum potassium level greater than 5.0 mEq/L.
- **Pseudohyperkalemia:** Occurs with marked leukocytosis or thrombocytosis and from hemolysis of a blood specimen; indicated by a **serum potassium concentration (clotted) 0.2-0.3 mEq/L greater than a plasma potassium concentration (unclotted).**

INCIDENCE IN CRITICAL ILLNESS: Less common than hypokalemia.

ETIOLOGY:

- **Excessive potassium administration.**
- **Impaired potassium excretion:** **Renal failure;** mineralocorticoid deficiency (Addison's disease, type 4 renal tubular acidosis, heparin-induced inhibition of aldosterone synthesis, hereditary enzyme deficiencies); pseudohypoaldosteronism (chronic kidney failure in diabetes mellitus and tubulointerstitial disease); medications (potassium-sparing diuretics, ACE inhibitors, ARBs, NSAIDs, trimethaphan, cyclosporine, tacrolimus, pentamidine, trimethoprim, azole antifungals, fluoride, herbal supplements, penicillin G potassium); ureterojejunosomy (increased jejunal resorption of urinary potassium).
- **Shift of potassium out of cells:** Hypertonicity; tissue destruction (rhabdomyolysis, burns, trauma); cellular destruction (tumor lysis, acute intravascular hemolysis); medications (beta-adrenergic blockers, digoxin, succinylcholine, lysine, arginine); familial hyperkalemic periodic paralysis; insulin deficiency or resistance.
- **Traditionally, it was thought that an inverse relationship between serum pH and serum potassium level existed. However, this has been disproven; the relationship is complex and incompletely understood.**

CLINICAL MANIFESTATIONS:

- **Mild hyperkalemia is usually asymptomatic.**
- **Cardiovascular:** Characteristic ECG changes (**peaked T waves**, wide QRS complex, AV conduction blocks, sine waves, ventricular fibrillation, asystole).
- **Neuromuscular:** Paresthesias; weakness of the extremities, symmetrical flaccid paralysis, ascending to the trunk and respiratory muscles (cranial nerve sparing).

TREATMENT:

- **Emergent treatment:** Indicated for a serum potassium level **> 6.5 mEq/L** or ECG changes consistent with hyperkalemia.
- **Renal excretion of potassium:** **Plasma volume expansion + furosemide.**
- **Direct antagonism of the hyperkalemic effect on cell membrane polarization (cardiac cell membrane stabilization):** **Calcium chloride.**
- **Movement of extracellular potassium into the intracellular compartment:** **Regular insulin + glucose;** **albuterol;** sodium bicarbonate (controversial); **aminophylline.**
- **Gastrointestinal excretion of potassium:** **Sodium polystyrene sulfonate.**
- **Extracorporeal removal of potassium:** **Intermittent hemodialysis or continuous renal replacement therapy.**

KEY REFERENCES:

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- Adroque HJ, Madias NE. Changes in plasma potassium concentration during acute acid-base disturbances. *Am J Med* 1981;71:456-467.