HYPERNATREMIA

DEFINITION: Serum sodium concentration [Na^+] greater than 145 mEq/dL.

INCIDENCE IN CRITICAL ILLNESS: 15%.

ETIOLOGY:

- **Hypovolemic hypernatremia:** Total body water deficit + lesser degree of total body sodium deficit.
  - **Renal losses** (urine [Na^+] > 20 mmol/L): Diuretic excess; postobstructive uropathy; intrinsic renal disease.
  - **Extrarenal losses** (urine [Na^+] < 20 mmol/L): Excessive sweating; burns; diarrhea, fistulas.
- **Euvolemic hypernatremia:** Decrease in total body water + normal total body sodium.
  - Urine [Na^+] is variable.
  - **Renal losses:** Diabetes insipidus; hypodipsia.
  - **Extrarenal losses:** Insensible losses (respiratory; dermal).
- **Hypervolemic hypernatremia:** Increase in total body water + greater degree of increase in total body sodium.
  - Least common subtype of hypernatremia.
  - Urine [Na^+] is typically > 20 mmol/L.
  - **Excessive sodium intake:** 3% NaCl; NaCl tablets; hypertonic $NaHCO_3$.
  - **Primary hyperaldosteronism.**
  - **Cushing's syndrome.**
  - **Hypertonic dialysis.**

CLINICAL MANIFESTATIONS:

- **Hypovolemic hypernatremia:** Volume depletion (tachycardia, orthostatic hypotension, flat neck veins, dry mucous membranes, decreased skin turgor).
- **Euvolemic hypernatremia:** Edema is absent.
- **Hypervolemic hypernatremia:** Edema may be present.
- **Neurological manifestations:** Confusion, weakness, lethargy → seizures, coma, death.

TREATMENT:

- **Free Water Deficit = [0.6 x Total Body Weight] x [(Measured [Na^+]/140)-1].**
- **Half the free water deficit is replaced in the first 12-24 hours, no more rapidly than 2 mEq/L/hour. The second half of the deficit is replaced over the ensuing 48 hours.**
- **Correct hypernatremia with caution.**
- **Cerebral edema if correction occurs too quickly.**
- **Hypovolemic hypernatremia:** Treatment of the underlying cause of volume loss. Correction of the volume deficit with isotonic fluid. Correction of the free water deficit.
- **Euvolemic hypernatremia:** Correction of the free water deficit.
  - Central diabetes insipidus: Desmopressin.
  - Nephrogenic diabetes insipidus: Thiazide diuretics; NSAIDs; amiloride.
- **Hypervolemic hypernatremia:** Removal of excess sodium. Furosemide diuresis. Hemodialysis in patients with renal failure.

KEY REFERENCES:

- Palevsky PM, Bhagrath R, Greenberg A. Hypernatremia in hospitalized patients. *Ann Intern Med* 1996;124:197-203.
- Snyder NA, Feigal DW, Arieff AI. Hypernatremia in elderly patients: A heterogeneous, morbid and iatrogenic entity. *Ann Intern Med* 1987;107:319-323.