04 Salicylate Poisoning

1. TOXICITY IN CHILDREN

	Acute ingestion	End-organ toxicity
Mild:	150-300 mg/kg	Tinnitus, Hearing loss, Dizziness, Nausea/vomiting.
Moderate:	300-500 mg/kg	Tachypnea, Hyperpyrexia, Diaphoresis, Ataxia, Anxiety.
Severe:	> 500 mg/kg	AMS, Seizures, Acute lung injury, Renal Failure, Cardiac arrhythmias, Shock.

2. SALICYLATE LEVEL

Therapeutic concentration
- 10 - 30 mg/dL

Mild Toxicity
- 30 - 50 mg/dL

Moderate Toxicity
- 50 - 100 mg/dL

Severe Toxicity
- > 100 mg/dL

Note: In case of severe toxicity, level must be repeated every 1-2 hrs with urine PH till levels start declaining.

3. WHY THINGS ARE HAPPENING?

Nausea & Vomiting	Stimulation of the Chemoreceptor zone at the floor of the 4th ventricle of the brain.
Reversible ototoxicity " tinnitus "	The exact mechanism causing this is still unknown. However, Inhibition of cochlear COX by salicylate increases arachidonate, enabling calcium flux and neural excitatory effects of N-methyl-d-aspartic acid (NMDA) on cochlear spinal ganglion neurons.
Tachypnea and Respiratory Alkalosis	Stimulation of the medullary respiratory center.
Metabolic Acidosis	Inhibition of Krebs cycle enzymes and uncoupling of oxidative phosphorylation in conjunction with lipid disturbance. This creates the combined lactic and ketoacidosis leading for metabolic acidosis.
Mixed Acid-Base Disturbance	Young children can have a respiratory alkalosis, but this is often transient and missed because of their smaller ventilatory reserves. In older children (>4 years old), the acid-base disturbance is usually a mixed disturbance with early respiratory alkalosis, followed by increased anion gap metabolic acidosis, and possibly late respiratory acidosis. Acidosis suggests the need for more urgent intervention because the protective effect of alkalemia on CNS penetration of salicylate is already lost.
Peripheral Hyperglycemia	Glycogenolysis and inhibition of gluconeogenesis. Later, hypoglycemia may supervene as glucose stores are depleted.
CNS Hypoglycemia	High rates of oxidative metabolism in the CNS leads to low CNS glucose concentration even in the presence of peripheral hyperglycemia.
Coagulopathy	Inhibition of platelet function, disturbances in vitamin K–dependent and vitamin K–independent clotting factors.

4. TREATMENT GOALS

I. Immediate resuscitation with stabilization of ABC

II. Correction of volume depletion and metabolic derangements.

- Volume losses caused by vomiting, tachypnea, and diaphoresis lead to significant volume depletion. Patients with severe salicylate poisoning may lose 4 to 6 L of water per square meter.
- Correct hypokalemia aggressively. It promotes absorption of salicylates and impairs alkalinization required to enhance elimination. Hypokalemia impairs the ability of the kidney to create alkaline urine and is exacerbated by administration of sodium bicarbonate, so potassium must be added to IV fluids after UOP has been established.

III. GI Decontamination (Activated Charcoal)

IV. Reduction in body Salicylate burden

- Administration of sodium bicarbonate works by increasing urinary pH, ionizes filtered aspirin, increasing tubular secretion and inhibiting its tubular reabsorption (ion trapping)
- Hemodialysis is considered the extracorporeal technique of choice for the treatment of serious salicylate toxicity because hemodialysis can correct acid-base and electrolyte abnormalities while rapidly reducing the body salicylate burden.
- Indications for hemodialysis include: clinical deterioration or failure of improvement despite intensive supportive care, lack of success in alkalinizing serum and urine, renal insufficiency or failure, severe acid-base disturbance, altered mental status, and acute lung injury. Consider hemodialysis for salicylism requiring respiratory and ventilatory support

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Source: Fleisher & Ludwig's Textbook of Pediatric Emergency Medicine 8th Edition
Tintinalli's Emergency Medicine Textbook 9th Edition