

# Salicylate Toxicity

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PGY-1

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- A mother rushes her 3 year old son to the ER after she found him drinking Pepto Bismol in the bathroom. She doesn't know how much he drank or how full the bottle was because her husband had been taking it frequently and she thinks he may have left it out. She thinks her son got into it about 45 minutes ago, and she came straight to the hospital. He is otherwise healthy and takes no other medicines at home. She says on the drive over he was complaining of his stomach hurting and he vomited once.

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- On initial presentation, his temp is 37.7, HR 130, BP 91/47, RR 30, O2% 100%. He is alert and per Mom, acting appropriately. His exam is positive for RUQ abdominal tenderness and he has one more episode of emesis while you are in the room. You also notice that he seems to be breathing harder.
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In order to monitor this child's toxicity levels, you:

- A. Order a salicylate level stat and again 6 hours later when peak serum concentration would be reached.
- B. Order other labs first and get a salicylate level after 3 hours, based on the timeframe Mom reports, as toxicity levels will appear in about 4-5 hours.
- C. Order salicylate level stat and another level every 1-2 hours for approximately 20 hours or until a downward trend is noted along with clinical progress.
- D. Order a salicylate level immediately and then use the Done Nomogram to correlate serum drug concentration with clinical toxicity.

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- **Answer: C**

Serial serum salicylate concentrations should be checked every 1-2 hours until a consistent downward trend is seen and improved clinical status are noted

- -The majority of salicylate poisonings are due to accidental ingestion in 2-4 year olds.
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- -One of the main things to recognize in salicylate toxicity is the marked variability in time response of an individual to salicylates.
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  - -Even in overdose due to accidental ingestion in a patient with no other medical problems, the plasma concentration of salicylate, clinical response, degree of toxicity at a given concentration of salicylate, and the time required for renal excretion vary greatly for children of the same age and size who ingested comparable amounts of salicylate.
  - -Done nomogram: DO NOT USE. No clinical utility. Intended for use within 6 hrs of single, acute, oral ingestion of non-enterically coated aspirin. Poor predictive value.

## Common Products :

Magnesium Subsaliolate, Salicylic Acid, Methyl Salicylate, Bismuth Salicylate, Acetylsalicylic acid (ASA)



- Salicylate levels should be checked immediately, and again every 1-2 hours until a downward trend is noted and the patient is clinically stable or improving.
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- In therapeutic dosing, the half life is 2-4 hours, but in poisoning the elimination time is as long as 20 hours or greater. Once the liver pathways are overwhelmed in overdose, the kinetics switch from first order to zero order, causing the slow elimination time.
  - Erratic or ongoing absorption may lead to plateau or multiple peaks
  - Therapeutic levels are generally 15-30 mg/dL. (reached in 1 hour)
  - Symptomatic levels > 30 mg/dL. (overdose peak conc 4-6 hrs or more)
  - Hemodialysis indicated if levels > 100 mg/dL and nephrology needed right away.
  - Ingestion of just 4-5 mL of salicylate can be fatal to a child
    - Example: 5 mL of oil of wintergreen=7g salicylate=22 adult aspirin tablets

A 15 yo male presents to the ER after ingesting an unknown substance. He has no other medical issues, but EMS states he has appeared confused, agitated, sweaty, and complaining of ringing in his ears. His temp is 103.5, HR 140, BP 129/84, RR is 30, and O2% is 98%. You are concerned for CNS toxicity. You may expect to see what abnormal lab findings?

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- A. hyponatremia, normal urine, and late respiratory alkalosis
- B. high anion gap metabolic acidosis, thrombocytopenia and hypokalemia
- C. early hypoglycemia with rebound hyperglycemia, and thrombocytopenia
- D. hyperglycemia, hyperkalemia, and metabolic alkalosis

Answer: B

## HIGH ANION GAP METABOLIC ACIDOSIS, THROMBOCYTOPENIA, AND HYPOKALEMIA

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- **Phase 1:** 0-12 hours
  - Nausea/Vomiting/No symptoms
  - Hyperventilation (respiratory center stimulation in medulla) w/ early respiratory alkalosis w/ compensatory alkauria due to K<sup>+</sup> and bicarb excreted in urine
- **Phase 2:** 12-24 hours
  - RUQ pain, Increased LFTs, Increased PT
  - Paradoxical aciduria, secondary to loss of K<sup>+</sup>, continued respiratory alkalosis
- **Phase 3:** \*\*4-6 hrs after ingestion in infant, but could be 24+ hrs in adol or adult
  - Dehydration, hypokalemia, High anion gap metabolic acidosis

## Manifestations of Salicylate toxicity

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- Initial respiratory alkalosis
- Anion gap metabolic acidosis
- Hyponatremia (secondary to volume depletion)
- Hyperglycemia initially, followed by hypoglycemia (initial glycogenolysis for increased tissue demand, then hypogly bc of impaired gluconeogenesis)
- Coagulopathy due to platelet dysfunction, may see bruising/bleeding
- Hypokalemia (K<sup>+</sup> moves intracellularly in response to initial alkalemia and K<sup>+</sup> loss in urine)
- Impairs urinary alkalization\*\*\* which is needed for optimal excretion of salicylate. Essential to maintain normal serum K<sup>+</sup>.

- Early signs:

- N/V, diaphoresis, tinnitus, vertigo, CNS effects (hyperventilation, vertigo, hyperactivity)
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- Later signs:

- agitation, seizure, stupor, delirium, hallucinations, lethargy

- \*\*Hyperthermia=sign of severe toxicity especially in kids because usually they can tolerate hyperpyrexia better than adults.
- \*\*Initial respiratory alkalosis rarely seen in infants or young children as they lack inspiratory reserve volume and may be unable to respond with same degree of hyperventilation as adolescents/adults.
- Absence of hyperventilation may cause delay in seeking medical care, so children may present with greater degree of metabolic acidosis as parents may not recognize toxicity until more severe toxicity develops

## Evaluation and Treatment

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- History-as much info about ingestion
- PE: N/V? Inc resp rate and depth? Tinnitus? AMS? Volume Status?
- Labs:
  - UA(ketones, glucose, pH, specific gravity),
  - ABG or VBG with lactate concentration
  - CMP--evaluate for Anion-gap metabolic acidosis (lactic acid, ketoacids, salicylic acid and metabolites, Potassium)
  - Serum Salicylate concentration
- IV Hydration
- Sodium Bicarbonate (Alkalinize urine=goal of tx)
  - renal elimination of salicylate\*\*
- Monitor Vitals/Clinical picture

# References

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- “Salicylate poisoning in Children and adolescents.” Uptodate.com
- “Specific toxin Recognition and Overdose Management, Salicylates.” Dr. Anthony Scalzo, Pediatric Emergency Medicine Physician, Toxicology, Director of Missouri Poison Control Center.
- “Salicylates and NSAIDs.” Review of Toxicology. NYU course.