



PAEDIATRIC ACUTE CARE GUIDELINE

Poisoning - Salicylate

Scope (Staff):	All Emergency Department Clinicians
Scope (Area):	Emergency Department

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Poisoning - Salicylate

This guideline is a general approach to salicylate poisoning. For specific details please contact **Poisons Information: 131126** or refer to the Toxicology Handbook.

Agents:

- Acetyl salicylic acid (Aspirin)
- Methyl salicylic acid
 - Oil of Wintergreen
 - Infant teething gels (including *Bongela*, *Sedagel*)

Background

- Accidental overdose from aspirin is very uncommon in the paediatric population, but methyl salicylate overdose is associated with significant toxicity even with very small ingestions.
- Chronic toxicity has been reported from frequent application of teething gels.
- Life-threatening consequences of salicylate overdose include:
 - Seizures
 - Cerebral and pulmonary oedema

Risk Assessment:

- Most acute accidental paediatric exposures of aspirin do not result in life threatening toxicity
- A 10kg child can develop life threatening poisoning with the ingestion of a small sip of preparations of methyl salicylate

- Patients who ingest a large dose of salicylate may not manifest significant signs of toxicity before 6-12 hours, with subsequent rapid clinical deterioration.
 - Early effects will be present before 6 hours.
 - If large numbers of tablets are ingested, a large concretion (bezoar) may form in the gut, delaying absorption.
- If there is suspicion of deliberate self-poisoning patients are to be referred for evaluation in hospital, regardless of the dose ingested

Typical Clinical Course:

Common early effects following acute salicylate ingestion include:

- Gastrointestinal distress
- Tinnitus or altered hearing
- Hyperventilation

Life threatening effects following significant salicylate overdose are:

- Altered mental status
- Seizures
- Fever
- Pulmonary oedema
- Acid-base abnormalities
 - Early – Respiratory alkalosis and metabolic acidosis
 - Late – Respiratory acidosis and high anion gap metabolic acidosis
- Hyper / hypo glycaemia
- Hypokalaemia

Ingested dose	Symptoms and Disposition
< 150mg/kg	Minimal Toxicity Patients do not require decontamination or referral to hospital except in cases of deliberate overdose
150-300mg/kg	Mild to moderate intoxication <ul style="list-style-type: none"> • Nausea, vomiting • Hearing disturbance, tinnitus • Increased respiratory rate • Primary respiratory alkalosis Patients should be referred to hospital for evaluation and observation and may be discharged only if asymptomatic at six hours post ingestion. Supportive care, decontamination and enhanced elimination are likely if symptomatic.

> 300mg	Life-threatening effects <ul style="list-style-type: none"> • Metabolic acidosis (late onset and pre-morbid) • Seizures • Altered mental state • Hypotension Patients are to be admitted to PICU for decontamination and enhanced elimination techniques. Intubation and hyperventilation may be required.
> 500mg/kg	Potential lethal dose <p>Patients are to be admitted to PICU for decontamination and enhanced elimination techniques. Intubation and hyperventilation are likely to be required.</p>

Assessment

The principles of assessment of a potential salicylate overdose include:

- Nature of salicylate preparation
- Maximum potential dose ingested
- Time of ingestion
- Other potential co-ingestions
- Reason for ingestion
- Clinical or laboratory features of toxicity

Risk Assessment

- Clinical symptoms following a salicylic acid (aspirin) overdose progresses over hours
- Severe toxicity may not be apparent until 6-12 hours post ingestion
- The severity of clinical features is dose related
- Paediatric patients rarely ingest sufficient amounts of aspirin to cause toxicity

Other forms of higher concentration salicylate that are potentially toxic may be ingested and are highly toxic to a child

- Oil of wintergreen: 1mL = 1400mg of aspirin
- Methyl salicylate: 5mg = 7.5 mg of aspirin

Investigations

Screening tests in deliberate overdoses:

- 12 lead ECG

- BSL
- Paracetamol level

Specific tests:

- Blood gas
 - Respiratory alkalosis (from hyperventilation)
 - High anion gap metabolic acidosis
 - Actual acidaemia is late stage and heralds imminent demise without intervention.
- Plasma salicylate level
 - 3mL required (preferable in non gel tube)
 - Therapeutic range is 140-300mg/L
 - To be measured in all patients whom significant salicylate intoxication is suspected
 - Result should be interpreted in conjunction with clinical findings, particularly the plasma pH
 - In the event of significant intoxication, serial levels may be taken every 2-4 hours to identify ongoing or delayed absorption
- Other tests:
 - UEC – hypokalaemia

Management

Resuscitation

Airway, Breathing, Circulation

- Severe salicylism causing coma or respiratory compromise requires intubation and ventilation
 - Controlled hyperventilation should be employed to maintain compensatory respiratory alkalosis
- IV fluid – maintenance plus replacement (gastrointestinal and insensible losses)

Seizures

- Treat with benzodiazepines, urgent intubation and hyperventilation

Decontamination

- Activated charcoal (oral) 1g/kg (maximum 50g) should be given to any patient with clinical signs of salicylate poisoning

- Activated charcoal can be given up to 8 hours after an acute ingestion of > 150mg/kg
- A second dose of activated charcoal is indicated after four hours if serum salicylate levels continue to rise
- Ensure that the airway is secure prior to administration of charcoal

Enhanced Elimination

Urinary Alkalinisation

- At levels greater than 200 mg/L, hepatic metabolism of aspirin is saturated and renal elimination becomes more important. However, in acid urine, aspirin is not ionized and is rapidly reabsorbed by the proximal tubule.
- Alkalinisation of the urine traps ionized aspirin in the renal tubule and markedly increases its elimination.

Indications for urinary alkalinisation:

- Patient is symptomatic
- Serum salicylate level exceeds 300mg/L
- History of ingestion greater than 300mg/kg

Method:

- **Note** – if urinary alkalinisation is required, PICU and toxicology services should be engaged
- Give 2 mEq/kg of sodium bicarbonate as an initial intravenous bolus over 5 minutes
- Start infusion of 150 mEq of sodium bicarbonate in 1000 mL of 5% glucose, with initial rate of 2-4 mL/kg/hr
- A burette or infusion pump is required to prevent accidental volume overload in small children
- Check the urine pH and titrate the infusion to maintain a urinary pH greater than 7.5
- Check serum potassium every 2-4 hours (along with salicylate level)
 - Hypokalaemia is common with urinary alkalinisation and intravenous potassium supplementation is often required.

Cease urinary alkalinisation when:

- Patient is clinically well
- Serum salicylate level is below 300 mg/L
- Normal acid-base status

Haemodialysis

Haemodialysis is the definitive therapy for severe salicylate intoxication. It rapidly removes aspirin from the serum and extracellular space, assists rapid movement of salicylate out of the brain, and assists correction of metabolic disorders.

Indications:

- Evidence of impending severe intoxication:
 - Altered mental status
 - Seizures
 - Cardiovascular instability
 - Hyperthermia
 - Pulmonary oedema (rare in children and young adults)
- Rising serum salicylate levels above 500 mg/L beyond 6 hours after ingestion, despite aggressive decontamination and urinary alkalinisation.
- Mixed respiratory alkalosis/metabolic acidosis on arterial blood gases but pH in the normal range (i.e. patient no longer has alkalotic serum pH)
- Patient acidaemic (pH less than 7.35) with mixed respiratory and metabolic acidosis
- Serum level greater than 1000 mg/L at any time
- Failure of elimination:
- Renal failure

Antidote

There is no specific antidote for salicylate poisoning

Disposition

Patients who can be managed at home:

- Asymptomatic paediatric patients with accidental potential ingestion of less than or equal to 150 mg/kg

Patients who require monitoring in a health care facility:

- Asymptomatic patients with a history of ingestion of potentially greater than 150 mg/kg
- All patients with abdominal pain, nausea, vomiting or altered hearing (usually tinnitus)
- All patients with deliberate self-poisoning
- Patients requiring urinary alkalinisation or observation for periods greater than 8 hours should be admitted.

Discharge criteria:

- Patients may be discharged from the emergency department if they are clinically well and serum salicylate levels have not increased over a period of 8 hours
- If salicylate levels rise above the therapeutic range (300 mg/L), then two consecutive decreasing salicylate levels are required before discharge

Nursing


- Respiratory rate and depth, heart rate and temperature increase in salicylate intoxication. Observations should be done at least hourly until these parameters normalise.
- Observe for signs of tinnitus, hearing loss, agitation, restlessness, diaphoresis and CNS disturbance
- Any significant changes should be reported immediately to the medical team
- Continual cardiac monitoring
- Fluid input and output
- Blood glucose level – all patients with altered mental status

References

1. Murray L, Little M, Pascu O, Hoggett K. Toxicology Handbook 3rd Edition Churchill Livingstone 2015.
2. Toxinz Poisons Information online, 2013 National Poisons Centre, New Zealand
3. Barnett AK and Boyer EW (2013) Salicylate Poisoning in Children and Adolescents. Uptodate. Accessed at www.uptodate.com

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