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Maryland Poison Center
UNIVERSITY OF MARYLAND SCHOOL OF PHARMACY

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The Maryland Poison Center's Monthly Update: News, Advances, Information

Salicylate Poisonings

Many OTC and prescription medications contain salicylates such as aspirin, methyl salicylate, salicylic acid and others. Poisonings occur due to unintentional pediatric ingestions, dermal absorption from extensive application of topical products, chronic therapeutic intoxications, and self-harm. In 2015, there were close to 59,000 exposures to salicylates reported to U.S. poison centers.

Acid-base disturbances, electrolyte abnormalities, and central nervous system effects are prominent in salicylate-intoxicated patients. Early effects include nausea, vomiting, diaphoresis, confusion, tinnitus and hyperventilation. Hyperthermia, dehydration, hypokalemia and hyper- or hypoglycemia often occur. Respiratory alkalosis from direct respiratory stimulation and anion gap metabolic acidosis from inhibition of oxidative phosphorylation result in a mixed acid-base picture. Severely toxic patients may develop seizures, coma, dysrhythmias, hypotension, cerebral edema and noncardiogenic pulmonary edema. A recent study found that factors associated with severe outcome include older age, respiratory rate, lactate concentration, coma and the presence of co-ingestants. When adjusted for serum salicylate concentration, only age and respiratory rate were predictive of severe outcome *(Clin Toxicol 2017;55(3):175-180).*

In acute overdoses, absorption is poor due to formation of pharmacobezoars, delayed gastric emptying or presence of enteric-coated tablets. As such, peak serum salicylate concentrations may be delayed for up to 12 hours or more. Therefore, obtain serial salicylate concentrations every 1-2 hours until a decreasing trend is evident, and then repeat every 4-6 hours until less than 30 mg/dL. Peak serum salicylate concentrations usually occur earlier with methyl salicylate ingestions. Although it is important to follow the trend of salicylate concentrations, they do not reliably correlate with severity of toxicity. Levels as low as 30-40 mg/dL can be associated with life-threatening symptoms in chronic intoxications. Other labs to follow include basic metabolic panel and in moderate to severe intoxications, blood gas, CBC, renal tests, hepatic tests and INR.

Initial treatment of salicylate poisoning consists of activated charcoal for acute overdoses, fluid resuscitation, correction of metabolic acidosis and hypoglycemia, and electrolyte replacement. Alkalinizing the blood to a pH of 7.45-7.55 with sodium bicarbonate results in "ion trapping", keeping salicylate in the blood and out of the brain and other organs where it causes toxicity. Although a byproduct of sodium bicarbonate administration may be an alkaline urine which increases renal elimination of salicylates, this is not the primary reason for its administration. Exercise caution when considering mechanical ventilation as this intervention may result in abrupt decompensation (see sidebar). Hemodialysis will remove salicylate as well as correct fluid and/or electrolyte disturbances. It is indicated in patients with high serum salicylate concentration regardless of signs and symptoms, any patient with altered mental status, with acute respiratory distress syndrome and if standard therapy is failing *(Ann Emerg Med 2015;66(2):165-81)*. Severe acidemia and impaired kidney function are also suggested indications.

Did you know?

Intubating and ventilating a salicylate toxic patient can worsen toxicity.

Decreasing the patient's respiratory alkalosis by sedation and/or intubation results in worsening acidemia, which can lead to clinical deterioration. Blood pH drops during the intubation procedure. Once intubated, patients often cannot be adequately ventilated to maintain an alkaline blood pH. Because a higher proportion of salicylate is non-ionized in a more acidic environment, salicylate can more rapidly distribute into the brain, lungs and heart. Profound hypercarbia and acidemia have been reported despite high minute ventilation and tidal volumes. Deterioration can occur within hours of intubation leading to worsening outcomes and death. If intubation is absolutely necessary, arrangements should be made for emergent hemodialysis *(Amer J Emerg Med 2017; Jun;35(6):899-903).*

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