Simplified Reagent Handling

Introduction
The salicylate class of drugs has analgesic, antipyretic and anti-inflammatory properties. Because of these therapeutic benefits and the general lack of serious side effects at normal doses, aspirin (acetylsalicylic acid) is widely available and frequently consumed. Also, aspirin interferes with platelet aggregation and thus prolongs bleeding time. Low dose aspirin has been recommended as prophylactic therapy for some individuals at risk for myocardial infarction.1 Salicylates are routinely prescribed in rheumatoid diseases. In vivo levels of approximately 15-30 mg/dL are commonly encountered in acute rheumatoid inflammation. Salicylate reduces the pain and inflammation associated with rheumatoid arthritis.2

Clinical Toxicology
The pharmacologic actions of aspirin are primarily due to salicylate. Therapeutic serum salicylate concentrations are generally lower than 6 mg/dL for analgesic-antipyretic effects and 15 to 30 mg/dL for anti-inflammatory actions.2 A normal dose of regular aspirin is rapidly absorbed from the gastrointestinal tract, with peak serum concentration achieved within two hours. This peak value may be delayed for 12 hours or longer for enteric-coated or slow-release formulations.3 Once absorbed, aspirin has a very short half-life ($t_{1/2} \approx 15$ min) because of its rapid hydrolysis to salicylate. Metabolic pathways may become saturated at high therapeutic doses; consequently, serum salicylate concentration increases disproportionately with dosage. At high therapeutic or toxic doses, the salicylate elimination half-life is prolonged (15 - 30 hours versus two to three hours at low dose) and a much larger portion of the dose is excreted in urine as salicylate.4

Most patients poisoned with aspirin have simple respiratory alkalosis secondary to direct stimulation of the respiratory center and hyperventilation, or a mixed respiratory alkalosis and metabolic acidosis.5 The primary acid-base disturbance observed with salicylate overdose depends on age and severity of intoxication. Respiratory alkalosis predominates in children over age four and adults, except in very severe cases that may progress through a mixed respiratory alkalosis to metabolic acidosis. The symptoms of salicylate intoxication include tinnitus, diaphoresis, hyperthermia, hyperventilation, nausea, vomiting and acid-base disturbances. Central nervous system (CNS) effects include lethargy, disorientation and, in severe cases, coma and seizures. The mean plasma salicylate concentration in fatal cases is often between 70 and 90 mg/dL.5 The rate of decreasing plasma salicylate concentration is critical in determining the clinical outcome.6 Salicylate intoxication is also associated with Reye’s syndrome, characterized by acute noninflammatory encephalopathy and severe hepatopathy.1 About a third of adults die, a mortality similar to that seen in children.

Monitoring salicylate serum concentration is very important in predicting the extent of toxicity in overdose cases. Treatment for salicylate intoxication focuses on decreasing further absorption, increasing elimination and correcting acid-base and electrolyte disturbances. The following are recommended treatment strategies for salicylate intoxication.6

1. Stabilization
   a. Hydration
   b. Monitor electrolytes status
   c. Treatment of metabolic acidosis
   d. Treatment of hypoglycemia (for patients who present with CNS depression)

2. Gut decontamination

Methodology
The liquid, ready-to-use SYNCHRON® Systems Salicylate reagent measures salicylate concentration by a timed-endpoint method. In the reaction, salicylate hydroxylase catalyzes the conversion of salicylate and NADH to catechol and NAD in the presence of oxygen. The SYNCHRON system automatically proportions the appropriate sample and reagent volume into a cuvette. The system monitors the change in absorbance at 340 nm. This change in absorbance is directly proportional to the concentration of salicylate in the sample and is used by the SYNCHRON system to calculate and express the salicylate concentration.

\[
\text{Salicylate} + \text{NADH} + \text{H}^+ + \text{O}_2 \xrightarrow{\text{Salicylate Hydroxylase}} \text{Catechol} + \text{NAD}^+ + \text{CO}_2 + \text{H}_2\text{O}
\]
Performance Characteristics

Correlation

Within-Run Imprecision*

Typical precision was evaluated by assaying three levels of serum control according to the NCCLS Guideline EP5-A.7

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<th>N</th>
<th>Mean (µg/dL)</th>
<th>SD</th>
<th>%CV</th>
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Total Imprecision*

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Ordering Information

SYNCHRON Salicylate (SALY) Reagent, 2 x 45 Tests 378194

SYNCHRON Salicylate Calibrator (included in reagent kit)
SYNCHRON Control, Multi-Level, 6 x 20 mL 657365

References


*The precision and correlation studies were obtained during limited evaluation and are not intended to represent performance specifications for this reagent.
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