Preservation of Urine with Sulfamic Acid in Soluble Packages

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Sulfamic acid, in polyvinyl alcohol envelopes, makes a safe and convenient preservative for urine, 10 g/liter of urine being a satisfactory concentration. Of several chemical procedures for urine, this preservative altered the results only for steroids.

Urine samples must be acidified if accurate calcium analyses are to be obtained (1). In many institutions the nursing staff is not permitted to dispense the strong acids traditionally used to decrease the pH of urine, so that the acid must be transferred into the collection vessels in the clinical laboratory. To avoid the dangerous practice of using a caustic liquid acid as a preservative, we have enclosed a dry strong acid in a water-soluble plastic envelope, which can be included with the urine container. In this way a predetermined quantity of acid may be dispensed safely.

The package may be formed from any heat-sealable water-soluble polymer film that does not interfere with the common laboratory test procedures. Several strong acids are available in dry form. Boric acid has been used extensively as a urine preservative, but it is relatively weak, and large quantities are required to decrease the pH. Sulfamic acid is a stable dry acid that is strongly acid in aqueous solution (pK9, 1.0). It is readily obtained in purified form and is safe to handle in water-soluble plastic envelopes.

Preparation of Packages

Polyvinyl alcohol film ("Quicksol A"; Polymer Films, Inc., 5701 32nd Ave., Woodside, N.Y. 11377) 0.002 inches thick, was formed into 4 X 6 cm envelopes by heat sealing. Ten grams of sulfamic acid1 was dispensed into each envelope and the open end was heat-sealed.

Practical-grade sulfamic acid is unsuitable because impurities interfere with creatinine and uric acid determinations. Though handling of the packages is safe, this should be avoided to prevent possible contamination of the urine sample. The packages and their contents dissolve within 3 min on contact with urine, without agitation. They may be stored in a dry environment for at least three months.

Experimental Results

For three-fourths of 52 1-liter urine samples (initial pH, 4.9 to 8.5) less than 5 g of sulfamic acid was required to decrease the pH to less than 3; 9.0 g sufficed for all samples.

When sulfamic acid, enclosed in the plastic envelopes, was added to urine to produce a concentration of 10.0 g/100 ml, no interference was found with the following procedures: sodium and potassium by flame photometry, chloride (2), uric acid (3), creatinine (4), urea nitrogen (5), glucose (6), calcium and magnesium (7), phosphorus (8), and a mechanized adaptation of a traditional α-amino nitrogen procedure (9). Results were erroneously low for both 17-hydroxycorticosteroid (10) and 17-ketosteroid (11) analyses. However, this was not observed when the acid was added directly to the urine, indicating interference by the polyvinyl alcohol and not by the acid.

Discussion

No means of preserving urine from bacterial contamination is ideal, i.e., does not interfere with some tests. Added acid precipitates protein, so sulfamic acid cannot be used if protein is to be determined. Although many organic solvents have been advocated as preservatives, each has been criticized on various grounds (12), and none decreases the pH of the urine so much that calcium and magnesium salts remain soluble.

The sulfamic acid packages are readily prepared in a clinical laboratory with simple heat-sealing equipment. We have used them routinely for two years, without problems. The packages are particularly convenient for preserving urine of out-patients, who may be provided with a convenient disposable container (13) and the preservative. This permits urine samples to be

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analyzed accurately without having to admit a patient to the hospital.

References


