U. S. Department of Commerce
Frederick B. Dent
Secretary

National Bureau of Standards
Richard W. Roberts, Director

National Bureau of Standards
Certificate of Analysis
Standard Reference Material 913
URIC ACID

This Standard Reference Material is certified as a chemical of known purity. It is intended primarily for use in the calibration and standardization of procedures for uric acid determinations employed in clinical analysis and for routine critical evaluation of daily working standards used in these procedures.

Purity	99.7 percent
Volatile matter	0.14 percent
Ash	0.057 percent

The value of the purity has an estimated inaccuracy of 0.1 percent.

The ash was found to be composed principally of salts of sodium and potassium. Aluminum, calcium, iron, phosphorus, and silicon were found in proportions estimated to be between 1 and 10 percent of the ash. Cobalt, copper, manganese, nickel, and zinc were each present to an extent not exceeding 1 percent of the ash.

The uric acid used for this Standard Reference Material was obtained from the Pfanstiehl Laboratories, Inc., of Waukegan, Illinois. Analyses were performed by D. P. Enagonio, R. A. Paulson, W. P. Schmidt, V. C. Stewart, R. S. Tipson, and B. F. West of the Analytical Chemistry Division.

The overall direction and coordination of technical measurements leading to the certification were under the chairmanship of R. Schaffer.

The technical and support aspects concerning the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by T. W. Mears.

Washington, D. C. 20234
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J. Paul Cali, Chief
Office of Standard Reference Materials

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The uric acid used in this Standard Reference Material was found to be homogeneous by paper and thin–layer chromatography with several solvent systems. This homogeneity was further verified by gas–liquid chromatography of the trimethylsilylated material.

Volatile material was determined by heating the sample overnight at 110 °C.

An emission spectrometric analysis for metallic constituents in the ash from this Standard Reference Material showed the following present as major constituents: sodium, potassium, aluminum, calcium, iron, phosphorus, and silicon. Neutron activation analysis of the bulk Standard Reference Material indicated the presence of the following approximate concentrations of elements: sodium, 170 ppm; copper, 2.4 ppm, manganese, 0.028 ppm.

The ultraviolet absorption spectra of the material exhibited the following absorption maxima:

In lithium carbonate solution, pH = 7.6

at 292 nm, ϵ_{max} = 12,560 ± 10

at 236 nm, ϵ_{max} = 10,000 ± 80

In a glycine-buffered solution, pH = 9.6

at 292 nm, ϵ_{max} = 12,650 ± 50

at 234 nm, ϵ_{max} = 9,890 ± 50

The measures of uncertainty given are the standard deviation of a single measurement. They should not be considered to be a certified measure of inaccuracy for the extinction coefficients.

A 100–g sample of uric acid was extracted successively with 500 cm^3 each of water, absolute ethanol, benzene, and water. The ultraviolet absorption spectrum of each of these extracts showed no absorption bands other than those of uric acid. Only uric acid was detected by thin–layer chromatography of these same extracts.

This Standard Reference Material is for "in vitro" diagnostic use only.

This material is for use as a standard in clinical chemistry. A "stock standard" solution containing 1 mg/ml of uric acid may be prepared as follows. Transfer 1.00 g of SRM 913 to a 1000-ml volumetric flask. Dissolve separately 0.60 g of lithium carbonate (SRM 924) in 150 ml warm deionized water, filter, and heat filtrate to 60 °C. A slight turbidity at this point may be ignored. Add the warm lithium carbonate solution to the uric acid (SRM 913) and mix until completely dissolved. It may be necessary to warm the flask under hot running water during mixing. Cool to room temperature. The solution usually remains slightly turbid. Add 20 ml of 40% formaldehyde. Dilute to about 500 ml with deionized water, then slowly add with mixing 25 ml of 1 N sulfuric acid. Dilute to the mark with deionized water, mix well, and place in a glass-stoppered, dark-brown bottle and store in a refrigerator at 4 °C [1,2].

A "working" standard solution containing 5 μg/ml may be prepared by transferring 0.50 ml of the above "stock" standard solution to a 100-ml volumetric flask and diluting to the mark with deionized water. Store solution in refrigerator at 4 °C. Prepare fresh weekly.

Similar standard solutions prepared without the use of formaldehyde and sulfuric acid are described by Faulkner and King [3].

This Standard Reference Material should be stored in a well-closed container at room temperature (30 °C or less). It should not be subjected to heat or direct sunlight during storage. Under proper storage, experience at NBS indicates this material to be stable for at least 5 years. If the material purity degrades beyond the limits certified, purchasers will be notified by NBS. It is recommended that material not be used after 5 years from date of purchase.

There are several opinions in the literature regarding the stability of uric acid solutions [1,4,5,6,7,8]. It is recommended that the 1 mg/ml "stock" standard solution be considered stable for 3 months when stored in a well-stoppered, all-glass, dark-brown bottle at 4 °C. The 5 μg/ml "working" standard solution should be prepared fresh weekly and stored in the same manner.

References:

[1] Caraway, W. T., Uric Acid, in Standard Methods of Clinical Chemistry, Vol. 4, David Seligson, Editor-in-Chief, pp. 239-247, Academic Press, Inc., New York, N. Y. 1963.

[2] Natelson, S., Uric Acid, in Standard Methods of Clinical Chemistry, Vol. 1, Miriam Reiner, Editor-in-Chief, pp. 123–135, Academic Press, Inc., New York, N. Y., 1953.

[3] Faulkner, W. R., and King, J. W., Renal Function Tests, in Fundamentals of Clinical Chemistry, N. W. Tietz, Editor, pp. 726-729, W. B. Saunders Company, Philadelphia, Pa. 1970.

[4] Feichtmeir, T., and Wrenn, H., Direct determination of uric acid using uricase. Am. J. Clin. Path. 25, 833-845 (1955).

[5] Dubbs, C., Davis, F. W., and Adams, W. S., Simple microdetermination of uric acid. J. Biol. Chem. 218, 497-504 (1956).

[6] Liddle, L., Seegmiller, J. E., and Laster, L., The enzymetric spectrophotometric method for determination of uric acid. J. Lab. and Clin. Med. 54, 903-913 (1959).

[7] Henry, R. J., Sobel, C., and Kim, J., A modified carbonate-phosphotungstate method for the determination of uric acid and comparison with the spectrophotometric uricase method. Am. J. Clin. Path. 28, 152-160 (1957).

[8] Henry, R. J., Clinical Chemistry, Principles and Technics, pp. 276-287. Hoeber Medical Division, Harper and Row, New York, N. Y. 1967.

This Standard Reference Material has been measured and certified at the Laboratories of the National Bureau of Standards, Gaithersburg, Maryland. All inquiries should be addressed to:

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The date of issuance and certification of this Standard Reference Material was September 24, 1968.