



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material 1400

#### Bone Ash

This Standard Reference Material (SRM) is intended primarily for use in evaluating analytical methods for the determination of selected major, minor, and trace elements in bone and in material of a similar matrix. It consists of bone ash that was blended to a high degree of homogeneity and bottled in 50 g units.

Certified and Non-certified Concentrations of Constituent Elements: The certified concentrations of the constituent elements are shown in Table 1. These concentrations are based on the results of a definitive analytical method or the agreement of results by at least two independent analytical methods. Non-certified concentrations, for information only, are provided in Table 2.

#### NOTICE AND WARNINGS TO USERS:

Expiration of Certification: This certification is valid for five years from the date of shipment from NIST. Should any of the certified values significantly change before then, purchasers will be notified by NIST. Please return the attached registration card to facilitate notification.

Storage: The material should be kept tightly closed in its original bottle away from sunlight or ultraviolet radiation.

Use: The bottle should be mixed well by rotating the bottle before each use. The sample should be dried for 4 hours at 105 °C in a conventional drying oven. A minimum sample of 150 mg of the dried material should be used to relate analytical determinations to the certified values on this certificate.

Dissolution Procedure: Samples may be dissolved by heating with hydrofluoric and nitric acids, followed by heating to dryness with perchloric acid, cooling, and adding dilute nitric acid.

Coordination of the analyses was performed by W.F. Koch of the NIST Inorganic Analytical Research Division.

Statistical analysis of the experimental data was performed by S.B. Schiller and L.M. Oakley of the NIST Statistical Engineering Division.

The technical and support aspects involved in the certification and issuance of this SRM were coordinated through the Standard Reference Materials Program by R. Alvarez and T.E. Gills.

Gaithersburg, MD 20899  
December 18, 1992

William P. Reed, Chief  
Standard Reference Materials Program

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Material Source: The material for this SRM was produced by the Monsanto Co., St Louis, MO.

Homogeneity Assessment: Samples from randomly selected bottles of SRM 1400 were tested for homogeneity using x-ray fluorescence spectrometry. No evidence of material heterogeneity was observed in any of the elements measured which included strontium, zinc, copper, iron, phosphorus, calcium, and potassium.

Certified Concentrations and Uncertainties: The certified value is the mean of method results from a definitive analytical method or the weighted mean of results from at least two independent analytical methods or laboratories. The uncertainty is the half-width of a 95% confidence interval for the mean with an allowance for systematic differences between methods.

Table 1. Certified Concentrations of Constituent Elements

<u>Element</u>	<u>Concentration,</u> <u>wt. percent</u>			<u>Element</u>	<u>Concentration</u> <u>µg/g</u>		
Calcium	38.18	±	0.13	Iron	660	±	27
Magnesium	0.684	±	0.013	Lead	9.07	±	0.12
Phosphorus	17.91	±	0.19	Potassium	186	±	8
				Strontium	249	±	7
				Zinc	181	±	3

Non-certified Concentrations: Elements other than those certified are present in this material. Those that were determined but are not certified are provided as additional information on the composition.

Table 2. Non-certified Concentrations of Constituent Elements

<u>Element</u>	<u>Concentration,</u> <u>wt. percent</u>	<u>Element</u>	<u>Concentration</u> <u>µg/g</u>
Silicon	(0.13)	Aluminum	(530)
Sodium	(0.6)	Arsenic	(0.4)
Moisture		Cadmium	(0.03)
2 h @ 105 °C	(0.2)	Copper	(2.3)
-----		Fluorine	(1250)
Loss on Ignition		Manganese	(17)
@ 1000 °C	(0.87)	Selenium	(0.08)

Table 3. Methods and Analysts for Certified Elemental Determinations

<u>Element</u>	<u>Method Code</u>	<u>Element</u>	<u>Method Code</u>
Calcium	TITR	Potassium	FAES ID TIMS TITR
Iron	ICP ID TIMS	Strontium	FAES ID TIMS
Magnesium	INAA ID ICPMS	Zinc	ICP ID TIMS
		Phosphorus	GRAV ICP
		Lead	IDTIMS

Methods Used for Analysis of SRM 1400:

FAAS = Flame Atomic Absorption Spectrometry  
 FAES = Flame Atomic Emission Spectrometry  
 ICP = Inductively-Coupled Plasma Emission Spectrometry  
 ID ICPMS = Isotope Dilution, Inductively Coupled Plasma Mass Spectrometry  
 ID TIMS = Isotope Dilution, Thermal Ionization Mass Spectrometry  
 INAA = Instrumental Neutron Activation Analysis  
 RNAA = Radiochemical Neutron Activation Analysis  
 TITR = Titrimetry  
 XRF = X-ray Fluorescence Spectrometry  
 GRAV = Gravimetry

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