



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 1577b

Bovine Liver

This Standard Reference Material (SRM) is intended primarily for use as a control material and in evaluating analytical methods for the determination of major, minor, and trace elements in animal tissue and other biological matrices.

Certified Values of Constituent Elements: The certified values for the constituent elements are given in Table 1. Certified values are based on results obtained by definitive methods of known accuracy, or alternatively, from results obtained by two or more independent analytical methods. Noncertified values are provided for information only in Table 2. Analytical methods used for the analysis of SRM 1577b, including certified and information values, are given in Table 3.

Notice and Warnings to Users:

Expiration of Certification: This certification is invalid after 5 years from the date of purchase and shipment from NIST. Should any of the certified constituents change within a 5-year period purchasers will be notified by NIST.

Stability: The SRM should be kept in its original bottle and stored between 10-30 °C. It should not be exposed to intense sources of radiation. The bottle should be kept tightly closed and stored in a desiccator away from direct sunlight.

Use: A minimum sample of 250 mg of the dried material (see Instructions for Drying) should be used for any analytical determination to be related to the certified values of this Certificate.

Dissolution procedures should be designed to effect complete solution, but without losses of volatile elements, such as mercury. Dissolution for these determinations should be carried out in a closed system.

Statistical consultation was provided by S.B. Schiller of the Statistical Engineering Division.

The overall direction and coordination of the analyses leading to this certification were under the chairmanship of J.R. DeVoe, Chief of the Inorganic Analytical Research Division.

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

Gaithersburg, MD 20899
August 27, 1991

William P. Reed, Chief
Standard Reference Materials Program

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Table 1. Certified Values of Constituent Elements

<u>Element</u>	<u>Content</u> <u>(wt. percent)</u>	<u>Element</u>	<u>Content</u> <u>($\mu\text{g/g}$)</u>
Chlorine	0.278 \pm 0.006	Molybdenum	3.5 \pm 0.3
Phosphorus	1.10 \pm 0.03	Rubidium	13.7 \pm 1.1
Potassium	0.994 \pm 0.002	Selenium	0.73 \pm 0.06
Sodium	0.242 \pm 0.006	Silver	0.039 \pm 0.007
Sulfur	0.785 \pm 0.006	Strontium	0.136 \pm 0.001
		Zinc	127 \pm 16

<u>Element</u>	<u>Content</u> <u>($\mu\text{g/g}$)</u>	<u>Element</u>	<u>Content</u> <u>($\mu\text{g/g}$)</u>
Cadmium	0.50 \pm 0.03		
Calcium	116 \pm 4		
Copper	160 \pm 8		
Iron	184 \pm 15		
Lead	0.129 \pm 0.004		
Magnesium	601 \pm 28		
Manganese	10.5 \pm 1.7		

The estimated uncertainty of a certified value is the sum of the half-width of a 95% confidence interval for the mean of results and an allowance for systematic error, except for the uncertainty associated with sulfur which is based on scientific judgment and is roughly equivalent to one percent of the certified value. The systematic error is estimated by the maximum absolute deviation between a single method mean and the grand mean. The grand mean was computed using the weighting scheme of Paule and Mandel (NBS Journal of Research 87, pp 377-385).

Table 2. Noncertified Values of Constituent Elements

<u>Element</u>	<u>Content</u> <u>(wt. percent)</u>	<u>Element</u>	<u>Content</u> <u>($\mu\text{g/g}$)</u>
Nitrogen	(10.6)		

<u>Element</u>	<u>Content</u> <u>($\mu\text{g/g}$)</u>	<u>Element</u>	<u>Content</u> <u>($\mu\text{g/g}$)</u>
Arsenic	(0.05)	Cobalt	(0.25)
Aluminum	(3)	Vanadium	(0.123)
Antimony	(0.003)		
Bromine	(9.7)		
Mercury	(0.003)		

Instructions for Drying: Samples of this SRM must be dried before weighing according to the following procedure: Dry for 24 hours at 20 to 25 °C in a vacuum oven at a pressure not greater than 30 Pa (0.2 mm Hg).

Source and Preparation of Material:

The bovine liver for this standard was obtained in the Portland, Oregon area. The gross fat, major blood vessels, and 'skin' were removed and the liver was ground. The ground liver was then mixed, transferred to polyethylene-lined trays, and lyophilized by Oregon Freeze Dry Foods, Inc., Albany, Oregon. After lyophilization, the liver was powdered in a Tornado mill, packaged in moisture-proof bags, and then transported to the National Institute of Standards and Technology.

Table 3.

Analytical Methods Used for the Analysis of SRM 1577b

<u>Method</u>	<u>Elements Determined</u>
ETAAS	Ag, Cd, As, Co
FES	Ca, Na, Sr
ICP	Ca, Cu, Fe, Mg, Mn, Zn, Sr
GFAAS	Cu, Mn, Rb, Zn
DCP	P
IC	Cl, S
IDTIMS	K, Pb, Rb, S, Sr
IDSSMS	Cd, Cu, Mo, Se, Zn
INAA	Cl, Cu, Fe, Mn, Na, Rb, Se, Zn, Al, Br, Co, K, V, Mg, Ag
RNAA	Ag, As, Cd, Cu, Hg, Mo, Se, Sb
POL	Fe
Color	P
Kjeldahl	N
CVAAS	Hg
FAAS	Ca, Mg

ETAAS: Electrothermal atomic absorption spectrometry

FES: Flame atomic emission spectrometry

ICP: Inductively coupled plasma emission spectrometry

GFAAS: Graphite furnace atomic absorption spectrometry

DCP: Direct current plasma emission spectrometry

IC: Ion chromatography

IDTIMS: Isotope dilution thermal ionization mass spectrometry

IDSSMS: Isotope dilution spark source mass spectrometry

INAA: Instrumental neutron activation analysis

RNAA: Radiochemical neutron activation analysis

POL: Polarography

Color: Spectrophotometry

Kjeldahl: Titrimetry

CVAAS: Cold Vapor Atomic Absorption Spectrometry

FAAS: Flame Atomic Absorption Spectrometry

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