

National Institute for Environmental Studies
Certified Reference Material No.18
“Human Urine”

This Certified Reference Material (CRM) is intended for use in the quality assurance of the analysis of arsenic species and other selected trace elements in urine. One unit of NIES CRM No.18 Human Urine consists of two bottles, each bottle containing freeze-dried urine corresponding to approximately 10 ml. It was produced and is distributed by The National Institute for Environmental Studies (NIES), Ibaraki, Japan.

Preparation of the CRM

The starting material for this CRM was a composite stock of urine collected from non-occupationally-exposed Japanese males. The urine stock was filtered through membrane filters (5 μ m and 0.45 μ m). Portions (10.00 ± 0.05 g) of the filtered urine were dispensed into 950 glass bottles. The urine was then freeze-dried. Each bottle was sealed with a Teflon-lined silicone cap with aluminum closures.

Homogeneity

The homogeneity of this CRM was assessed by measuring the concentration of Na, Mg, P, K, Ca, Zn and As by ICP atomic emission spectrometry and ICP mass spectrometry, in four 1 ml-subsamples from each of 6 randomly selected bottles after pressurized HNO₃ digestion. No significant between-bottle variation was detected for these elements.

Certified and Reference Values

Certified Values were determined for the concentrations of total arsenic, dimethylarsenic acid, arsenobetaine, selenium and zinc, based on the collaborative inter-laboratory analysis. Certified Values are listed in Table 1. Means of the acceptable mean values from the collaborating laboratories were assigned as Certified Values with twice the standard deviation of the mean representing the uncertainty ranges. Reference Values were given for the concentrations of lead and copper, based on IDMS determination in a single laboratory (NIES), and they are listed in Table 1. The Certified

and Reference Values are valid only for freshly reconstituted material.

Instructions for Use

Storage

The NIES CRM No.18 Human Urine should be stored at 4°C

Use

Add 9.57g of purified water to each bottle. Gently swirl the bottle to completely dissolve the freeze-dried material. Do not shake vigorously: it will result in foaming.

Warning

This CRM is not sterilized. Use appropriate procedures for health protection when handling.

Stability

Unreconstituted NIES CRM No.18 Human Urine is assumed to be stable under the appropriate storage conditions specified above. NIES will monitor the stability of this CRM and if any signs of instability are detected, users will be notified. Note that the Certified and Reference Values are valid only for freshly reconstituted material. However, NIES assumes, but does not guarantee, that a reconstituted sample is stable for up to 1 month when it is stored at 4°C in the dark.

TABLE 1 Certified and Reference Values for NIES CRM No. 18 Human Urine¹

	Unit	Certified Value	analytical methods ²
Total arsenic	mg/L	0.137±0.011	a,b,c,d,e,f
Arsenobetaine	mg/L as As	0.069±0.012	g,h
Dimethylarsinic acid	mg/L as As	0.036±0.009	g,i
Total selenium	mg/L	0.059±0.005	d,e,f,j
Total zinc	mg/L	0.62±0.05	f,k,l
	Unit	Reference Value	
Total copper	mg/L	0.010	
Total lead	mg/L	0.0011	

1. The freeze-dried urine powder to be reconstituted with 9.57g of purified water. Specific gravity of the reconstituted urine is 1.015 (23°C).
2. a, inductively coupled plasma mass spectrometry (ICP-MS); b, ICP high resolution mass spectrometry (ICP-HRMS); c, microwave induced nitrogen plasma mass spectrometry (MIP-MS); d, electrothermal atomic absorption spectrometry (ETAAS); e, hydride generation AAS (HGAAS); f, instrumental neutron activation analysis (INAA); g, high performance liquid chromatography-ICP-MS detection (HPLC-ICP-MS); h, HPLC-MIP-MS; i, HPLC-HG-ICP-MS; j, fluorimetry; k, ICP atomic emission spectrometry (ICP-AES); l, isotope dilution ICP-MS (ID-ICP-MS)