



# urine toxic and essential elements

*Urine toxic and essential elements analysis is an invaluable tool for the assessment of retention of toxic metals in the body and the status of essential nutrient elements. Toxic metals do not have any useful physiological function, adversely affect virtually every organ system and disrupt the homeostasis of nutrient elements.*

**A**nalysis of the levels of toxic metals in urine after the administration of a metal detoxification agent is an objective way to evaluate the accumulation of toxic metals. Acute metal poisoning is rare. More common, however, is a chronic, low-level exposure to toxic metals that can result in significant retention in the body that can be associated with a vast array of adverse health effects and chronic disease. One cannot draw valid conclusions about adverse health effects of metals without assessing net retention. For an individual, toxicity occurs when net retention exceeds physiological tolerance. Net retention is determined by the difference between the rates of assimilation and excretion of metals. To evaluate net retention, one compares the levels of metals in urine before and after the administration of a pharmaceutical metal detoxification agent such as EDTA, DMSA or DMPS. Different compounds have different affinities for specific metals, but all function by sequestering "hidden" metals from deep tissue stores and mobilizing

the metals to the kidneys for excretion in the urine. Guidelines for urine collection periods after administration of the most commonly utilized agents are provided in the table below:

Detoxification Agents	Half Life	Collection Period
EDTA	~1 hr	6 – 24 hrs
DMPS (IV)	~1 hr	6 hrs
DMPS (oral)	~9 hrs	6 hrs
DMSA	4 hrs	6 hrs

It is important to perform both pre- and post-provocation urinalysis to permit distinction between ongoing exposures to metals (pre-) and net bodily retention. The pre-provocation urine collection can also be utilized to assess the rate of creatinine clearance if a serum specimen is also submitted.

Many clinicians also request the analysis of essential elements in urine specimens to evaluate nutritional status and the efficacy of mineral supplementation during metal detoxification therapy. Metal detoxification agents can significantly increase the excretion of specific nutrient elements such as zinc, copper, manganese and molybdenum.

Chromium metabolism authorities suggest that 24-hour chromium excretion likely provides the best assessment of chromium status. Early indication of renal dysfunction can be gleaned from urinary wasting of essential elements such as magnesium, calcium, potassium and sodium in an unprovoked specimen.

Variability in urine volume can drastically affect the concentration of elements. To compensate for urine dilution variation, elements are expressed per unit creatinine for timed collections. For 24-hour collections, elements are reported as both units per 24 hours and units per creatinine.

## URINE ELEMENTS

- **Assessment of toxic metal retention and essential element status/wasting**
- **Monitors detoxification therapy**
- **Analysis by ICP-MS**
- **Result specific commentary provided**
- **Variable urine collection periods**

- Assessment of toxic metal retention and essential element status/wasting
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- Variable urine collection periods

### URINE ESSENTIAL ELEMENTS

**DD DOCTOR'S DATA**  
 LAB#: U000000-0000-0  
 PATIENT: Sample Patient  
 SEX: Female  
 AGE: 39

CLIENT#: 12345  
 DOCTOR:  
 Doctor's Data, Inc.  
 3755 Illinois Ave.  
 St. Charles, IL 60174

ELEMENTS	RESULT µg/mg CREAT	REFERENCE RANGE	PERCENTILE					
			2.5 <sup>th</sup>	16 <sup>th</sup>	50 <sup>th</sup>	84 <sup>th</sup>	97.5 <sup>th</sup>	
Sodium	1550	1000- 5200						
Potassium	2330	850- 3200						
Phosphorus	360	250- 1300						
Calcium	44	55- 400						
Magnesium	120	45- 230						
Zinc	0.9	0.1- 2						
Copper	0.24	0.01- 0.09						
Sulfur	850	280- 1500						
Manganese	0.003	0.0005- 0.01						
Molybdenum	0.12	0.016- 0.18						
Boron	2.5	0.8-						
Chromium	0.08	0.01-						
Lithium	0.013	0.001-						
Selenium	0.17							
Strontium	0.11							
Vanadium	0.02							

	RESULT mg/dL
Barium	0.002
Cobalt	0.001
Iron	< dl
Zirconium	0.0008

Comments:  
 Date Collected: 12/12/2008  
 Date Received: 12/13/2008  
 Date Completed: 12/14/2008

Essential elements are representative of a healthy population under non-challenge or non-provoked conditions. No safe reference levels for toxic metals have been established.

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### URINE TOXIC METALS

**DD DOCTOR'S DATA**  
 LAB#: U000000-0000-0  
 PATIENT: Sample Patient  
 SEX: Female  
 AGE: 39

CLIENT#: 12345  
 DOCTOR:  
 Doctor's Data, Inc.  
 3755 Illinois Ave.  
 St. Charles, IL 60174

METALS	RESULT µg/g CREAT	REFERENCE RANGE	POTENTIALLY TOXIC METALS		
			WITHIN REFERENCE RANGE	ELEVATED	VERY ELEVATED
Aluminum	< dl	< 35			
Antimony	< dl	< 1			
Arsenic	64	< 130			
Beryllium	< dl	< 0.5			
Bismuth	< dl	< 15			
Cadmium	1.2	< 2			
Lead	38	< 5			
Mercury	46	< 4			
Nickel	9.5	< 12			
Platinum	< dl	< 1			
Thallium	0.1	< 0.8			
Thorium	< dl	< 0.3			
Tin	0.9	< 10			
Tungsten	< dl	< 1			
Uranium	< dl	< 0.2			

	RESULT mg/dL	REFERENCE RANGE	CREATININE				
			2SD LOW	1SD LOW	MEAN	1SD HIGH	2SD HIGH
Creatinine	21	35- 225					

Comments:  
 Date Collected: 12/12/2008  
 Date Received: 12/13/2008  
 Date Completed: 12/14/2008

Method: ICP-MS  
 <dl: less than detection limit  
 Provoking Agent: DMSA

Collection Period: timed: 6 hours  
 Volume: 1400 ml  
 Provocation: POST PROVOCATIVE

Toxic metals are reported as µg/g creatinine to account for urine dilution variations. Reference ranges are representative of a healthy population under non-challenge or non-provoked conditions. No safe reference levels for toxic metals have been established.

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