Wadsworth Center

NEW YORK STATE DEPARTMENT OF HEALTH

Trace Elements Laboratory

TRACE ELEMENTS IN URINE

Proficiency Test Report

Event #2, 2013

July 15th, 2013

NEW YORK
state department of
HEALTH

July 15, 2013

Trace Elements in Urine
Event #2, 2013

Dear Laboratory Director:

Results from the second proficiency test (PT) event for 2013 in the category Trace Elements in Urine have been tabulated and summarized. Target values for Arsenic, Cadmium, Mercury and Lead have been established along with acceptable ranges. Results are graded using element-specific criteria as indicated in each narrative section. A laboratory with an unacceptable significant analytical bias relative to the target value will be expected to investigate the source of the error. A confidential three-digit code number assigned by the PT program identifies participant laboratories.
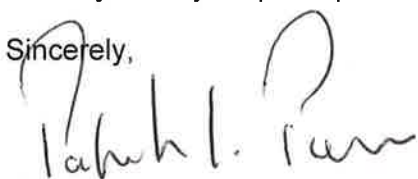
PT Materials

The source of the test materials is human urine obtained from donor volunteers with informed consent. Urine was collected into polyethylene containers and then stored at 4°C. Following collection, urine from each donor was mixed and acidified to 1% v/v with nitric acid, and 1% (v/v) sulfamic acid solution containing 200 mg/mL sulfamic acid and 10% (v/v) Triton-X 100 was added to stabilize Hg. The urine was stored frozen at -80°C; after thawing at room temperature, precipitated salts were removed by centrifugation. The urine was separated into five pools and each was supplemented with different amounts of As, Cd, Hg and Pb as inorganic salts. Each pool was also spiked with additional trace elements that comprise the "NHANES suite" and include: Ba, Be, Co, Cs, Mo, Pt, Sb, Tl, U and W. Each pool was stirred for approximately 24 hours to ensure thorough mixing prior to aliquoting 10-mL samples into acid-leached polypropylene vials. Samples were stored at -80°C prior to circulating for proficiency testing.

The next PT event for trace elements in urine is scheduled to be mailed Wednesday, September 11th, 2013. Please inform our laboratory staff at (518) 474-4484 if the test materials have not arrived within five days of the scheduled mail out date. **The deadline for reporting results is Wednesday, October 9th, 2013.**

Thank you for your participation.

Sincerely,

Patrick J. Parsons, Ph.D.
Chief, Laboratory of Inorganic and Nuclear Chemistry
Deputy Director, Division of Environmental Health

Mary Frances Verostek, Ph.D.
Assistant Section Head
PT Program for Blood Lead /Trace Elements

Urine Arsenic

The source of the test materials is human urine obtained from donor volunteers with informed consent. Urine was collected into polyethylene containers and then stored at 4°C. Following collection, urine from each donor was mixed and acidified to 1% v/v with nitric acid, and 1% (v/v) sulfamic acid solution containing 200 mg/mL sulfamic acid and 10% (v/v) Triton-X 100 was added to stabilize Hg. The urine was stored frozen at -80°C; after thawing at room temperature, precipitated salts were removed by centrifugation. The urine was separated into five pools and each was supplemented with different amounts of inorganic As^{3+}. Each pool was stirred for approximately 24 hours to ensure thorough mixing prior to aliquoting 10-mL samples into acid-leached polypropylene vials. Samples were stored at -80°C prior to circulating for proficiency testing.

The Target Value assigned for each PT material is the robust mean of the results reported by all participants in this event. The robust statistics were obtained utilizing algorithms based on those presented in **ISO 13528:2005E** <u>Statistical methods for use in proficiency testing by interlaboratory comparisons</u>. Values for urine arsenic range from 17.6 µg/L (0.23 µmol/L) to 231.3 µg/L (3.09 µmol/L).

Acceptable ranges. The acceptable range is fixed at ±20% or ±6 µg/L for target values ≤30 µg/L. This provides a more realistic acceptability range at low concentrations of urine As, and the criteria are consistent with those in place for blood As.

Discussion. Based upon the above criteria, 92.5% of test results reported were judged as satisfactory, with one of the 24 participant laboratories (4.2%) reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Urine Arsenic Test Results, 2013 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
Robust Mean	**231.3**	**17.6**	**50.0**	**100.7**	**33.2**
Robust Standard Deviation	11.0	1.6	2.9	5.5	2.4
Standard Uncertainty	2.8	0.4	0.7	1.4	0.6
RSD (%)	4.7	9.0	5.8	5.5	7.3
Number of Sample Measurements	24	24	24	24	24
Acceptable Range:					
Upper Limit	277.6	23.6	60.0	120.8	39.8
Lower Limit	185.0	11.6	40.0	80.6	26.6

notes: Results reported as less than the method detection limit are excluded from statistical calculations.

New York State Department of Health
Urine Arsenic Test Results, 2013 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE13-06	UE13-07	UE13-08	UE13-09	UE13-10	
	Target Values:	231.3	17.6	50.0	100.7	33.2	
103	DRC/CC-ICP-MS	225.1	16.5	49.4	97.5	32.7	Info
106	DRC/CC-ICP-MS	280 ↑	17.4	57.9	95.1	34.6	Info
107	DRC/CC-ICP-MS	228.9	16.8	50.2	100.6	32.7	Info
110	DRC/CC-ICP-MS	259.0	20.5	50.2	103.0	36.7	
114	ICP-MS	223.0	18.0	46.0	102.0	32.0	
116	DRC/CC-ICP-MS	233.8	16.5	46.4	94.4	30.7	Info
147	ICP-MS	224.7	18.1	48.8	101.1	32.8	Info
156	ICP-MS	232.0	19.0	60.6 ↑	107.0	38.3	
164	ICP-MS	225.0	18.0	54.0	104.0	36.0	
179	ICP-MS	231.0	15.0	49.0	101.0	32.0	
197	DRC/CC-ICP-MS	223.0	18.0	48.0	93.0	32.0	
200	ICP-MS	226	16.2	48.9	94.6	31.3	Info
206	DRC/CC-ICP-MS	254.3	25.1 ↑	55.5	112.6	36.0	
293	DRC/CC-ICP-MS	173.8 ↓	12.6	38.4 ↓	77.2 ↓	24.8 ↓	Info
305	ICP-MS	233.3	19.1	53.0	107.3	39.9 ↑	
312	DRC/CC-ICP-MS	230.0	16.0	48.0	99.0	30.0	
324	HR-ICP-MS	224.2	16.4	47.4	97.9	31.6	Info
339	HR-ICP-MS	242	17.3	49.5	99.3	32.1	Info
359	ICP-MS	234.0	19.9	48.6	97.2	32.3	
366	ICP-MS	240.0	18.0	49.0	98.0	31.0	Info
367	DRC/CC-ICP-MS	259.0	18.4	55.4	110.8	36.0	Info
391	DRC/CC-ICP-MS	220.6	16.5	51.0	103.2	32.8	Info
401	DRC/CC-ICP-MS	242.1	18.0	51.5	104.3	34.0	Info
472	DRC/CC-ICP-MS	167.9 ↓	16.9	53.0	107.0	35.3	Info

Percent satisfactory results for all participants: 92.5 %

notes: ↑ reported outside upper limit
         ↓ reported outside lower limit
         ◤: Unacceptable result

notes: Results reported as less than the method detection limit are excluded from statistical calculations.
Info only: results included for informational purposes only.

New York State Department of Health
Urine Arsenic Test Results, 2013 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	13	13	13	13	13
Mean:	230.6	17.6	50.4	99.8	32.9
Standard Deviation:	31.8	2.9	4.9	9.1	3.2
RSD (%):	13.8	16.2	9.7	9.1	9.7
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	233.1	16.9	48.5	98.6	31.9
Standard Deviation:	12.6	0.6	1.5	1.0	0.4
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	9	9	9	9	9
Mean:	229.9	17.9	50.9	101.4	34.0
Standard Deviation:	5.6	1.5	4.4	4.3	3.3
RSD (%):	2.4	8.4	8.6	4.3	9.7
All Laboratories					
Number of Sample Measurements:	24	24	24	24	24
Mean:	230.5	17.7	50.4	100.3	33.2
Standard Deviation:	23.3	2.3	4.4	7.1	3.1
RSD (%):	10.1	12.8	8.8	7.1	9.3

notes: ? Insufficient data for calculation.
A Standard Deviation displayed as 0.0 should be interpreted as <0.1

Urine Cadmium

The source of the test materials is human urine obtained from donor volunteers with informed consent. Urine was collected into polyethylene containers and then stored at 4°C. Following collection, urine from each donor was mixed and acidified to 1% v/v with nitric acid, and 1% (v/v) sulfamic acid solution containing 200 mg/mL sulfamic acid and 10% (v/v) Triton-X 100 was added to stabilize Hg. The urine was stored frozen at -80°C; after thawing at room temperature, precipitated salts were removed by centrifugation. The urine was separated into five pools and each was supplemented with different amounts of inorganic Cd^{2+}. Each pool was stirred for approximately 24 hours to ensure thorough mixing prior to aliquoting 10-mL samples into acid-leached polypropylene vials. Samples were stored at -80°C prior to circulating for proficiency testing.

The Target Value assigned for each PT material is the robust mean of the results reported by all participants in this event. The robust statistics were obtained utilizing algorithms based on those presented in **ISO 13528:2005E** Statistical methods for use in proficiency testing by interlaboratory comparisons. Values for urine cadmium range from 2.5 μg/L (22 nmol/L) to 14.0 μg/L (125 nmol/L).

Acceptable ranges. The acceptable range is fixed at ±15% or ±1 μg/L (9 nmol/L) around the target value whichever is greater. These criteria are used by the U.S. Occupational Safety and Health Administration (OSHA) to assess performance for occupational medicine.

Discussion. Based upon the above criteria, 96.7% of test results reported were judged as satisfactory, with one of the 24 participant laboratories (4.2%) reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Urine Cadmium Test Results, 2013 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

Results (μg/L urine)

	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
Robust Mean	**5.8**	**11.4**	**14.0**	**2.5**	**4.1**
Robust Standard Deviation	0.5	0.6	0.8	0.2	0.3
Standard Uncertainty	0.1	0.1	0.2	<0.1	0.1
RSD (%)	8.2	5.0	5.5	6.6	6.2
Number of Sample Measurements	24	24	24	24	24
Acceptable Range:					
Upper Limit	6.8	13.1	16.1	3.5	5.1
Lower Limit	4.8	9.7	11.9	1.5	3.1

notes: Results reported as less than the method detection limit are excluded from statistical calculations.

New York State Department of Health
Urine Cadmium Test Results, 2013 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE13-06	UE13-07	UE13-08	UE13-09	UE13-10	
	Target Values:	5.8	11.4	14.0	2.5	4.1	
103	DRC/CC-ICP-MS	5.8	11.7	14.1	2.4	4.1	Info
106	ICP-MS	5.8	11.7	14.4	2.6	4.2	Info
107	DRC/CC-ICP-MS	5.9	12.3	14.5	2.7	4.4	Info
110	ICP-MS	5.9	11.3	13.6	2.4	4.0	
114	ICP-MS	5.4	11.2	13.6	2.4	4.0	
116	ICP-MS	5.3	10.7	13.4	2.4	3.8	Info
147	ICP-MS	5.1	10.4	13.0	2.4	4.0	Info
156	ICP-MS	5.8	11.3	14.1	2.4	4.0	
164	ICP-MS	5.4	11.1	13.6	2.5	4.0	
179	ICP-MS	6.1	12.7	15.4	2.7	4.4	
197	DRC/CC-ICP-MS	5.8	11.0	13.4	2.5	4.0	
200	ICP-MS	5.7	11.2	13.8	2.5	3.9	Info
206	ICP-MS	6.3	11.2	14.8	2.6	4.7	
293	ICP-MS	5.7	11.5	14.4	2.6	4.2	Info
305	ICP-MS	6.4	11.8	15.6	2.7	4.7	
312	ICP-MS	6.3	12.0	14.0	2.5	4.2	
324	HR-ICP-MS	6.3	12.6	16.4 ↑	2.7	4.7	Info
339	HR-ICP-MS	5.5	10.8	13.0	2.4	3.8	Info
359	ICP-MS	6.1	11.5	13.8	2.7	4.2	
366	ICP-MS	5.5	11.0	13.0	2.0	3.8	Info
367	DRC/CC-ICP-MS	6.6	13.3 ↑	17.5 ↑	3.1	5.1	Info
391	DRC/CC-ICP-MS	5.2	11.3	14.5	1.3 ↓	3.2	Info
401	DRC/CC-ICP-MS	6.3	11.9	14.3	2.6	4.2	Info
472	ICP-MS	5.2	10.8	13.2	2.3	3.8	Info

Percent satisfactory results for all participants: 96.7 %

notes: ↑   reported outside upper limit   notes: Results reported as less than the method detection limit are excluded from statistical calculations.
　　　 ↓   reported outside lower limit   **Info only:** results included for informational purposes only.
　　　 ↘ : Unacceptable result

New York State Department of Health
Urine Cadmium Test Results, 2013 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	6	6	6	6	6
Mean:	5.9	11.9	14.7	2.4	4.2
Standard Deviation:	0.5	0.8	1.4	0.6	0.6
RSD (%):	8.1	6.8	9.7	24.9	14.8
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	5.9	11.7	14.7	2.6	4.3
Standard Deviation:	0.6	1.3	2.4	0.2	0.6
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	16	16	16	16	16
Mean:	5.8	11.3	14.0	2.5	4.1
Standard Deviation:	0.4	0.5	0.8	0.2	0.3
RSD (%):	7.2	4.8	5.6	7.2	6.9
All Laboratories					
Number of Sample Measurements:	24	24	24	24	24
Mean:	5.8	11.5	14.2	2.5	4.1
Standard Deviation:	0.4	0.7	1.1	0.3	0.4
RSD (%):	7.3	6.0	7.7	13.0	9.5

notes: ? Insufficient data for calculation.
      A Standard Deviation displayed as 0.0 should be interpreted as <0.1

Urine Mercury

The source of the test materials is human urine obtained from donor volunteers with informed consent. Urine was collected into polyethylene containers and then stored at 4°C. Following collection, urine from each donor was mixed and acidified to 1% v/v with nitric acid, and 1% (v/v) sulfamic acid solution containing 200 mg/mL sulfamic acid and 10% (v/v) Triton-X 100 was added to stabilize Hg. The urine was stored frozen at -80°C; after thawing at room temperature, precipitated salts were removed by centrifugation. The urine was separated into five pools and each was supplemented with different amounts of inorganic Hg. Each pool was stirred for approximately 24 hours to ensure thorough mixing prior to aliquoting 10-mL samples into acid-leached polypropylene vials. Samples were stored at -80°C prior to circulating for proficiency testing.

The Target Value assigned for each PT material is the robust mean of the results reported by all participants in this event. The robust statistics were obtained utilizing algorithms based on those presented in **ISO 13528:2005E** Statistical methods for use in proficiency testing by interlaboratory comparisons. Values for urine mercury range from 19.4 µg/L (97 nmol/L) to 96.6 µg/L (482 nmol/L).

Acceptable ranges. The acceptable range is fixed at ±30% or ±3 µg/L (15 nmol/L) for target values ≤10 µg/L. The criteria are consistent with those in place for blood Hg.

Discussion. Based upon the above criteria, 90.9% of test results reported were judged as satisfactory, with two of the 22 participant laboratories (9.1%) reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Urine Mercury Test Results, 2013 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (μg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
Robust Mean	**19.4**	**80.4**	**60.0**	**96.6**	**30.6**
Robust Standard Deviation	2.5	12.0	8.7	12.9	4.3
Standard Uncertainty	0.7	3.2	2.3	3.4	1.1
RSD (%)	13.0	15.0	14.4	13.3	14.1
Number of Sample Measurements	22	22	22	22	22
Acceptable Range:					
Upper Limit	25.2	104.5	78.0	125.6	39.8
Lower Limit	13.6	56.3	42.0	67.6	21.4

notes: Results reported as less than the method detection limit are excluded from statistical calculations.

New York State Department of Health
Urine Mercury Test Results, 2013 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE13-06	UE13-07	UE13-08	UE13-09	UE13-10	
	Target Values:	19.4	80.4	60.0	96.6	30.6	
103	DRC/CC-ICP-MS	16.4	74.5	57.9	91.5	29.6	Info
107	DRC/CC-ICP-MS	22.6	97.0	72.6	116	36.2	Info
109	AFS	19.4	82.1	60.5	97.2	29.5	Info
110	ICP-MS	19.8	86.0	64.3	104.0	31.8	
114	ICP-MS	18.0	60.0	50.0	83.0	35.0	
147	CV-AAS	18.2	77.2	56.3	88.7	27.7	Info
156	ICP-MS	19.9	89.0	66.6	100.0	31.8	
164	ICP-MS	21.0	93.0	65.0	103.0	33.0	
179	ICP-MS	19.0	81.0	55.0	89.0	28.0	
197	DRC/CC-ICP-MS	18.0	85.0	63.0	102.0	31.0	
199	ICP-MS	30.2 ↑	120 ↑	82.6 ↑	123.0	40.4 ↑	Info
206	ICP-MS	22.0	85.0	61.0	98.0	32.0	
293	ICP-MS	17.9	51.1 ↓	58.7	96.8	29.5	Info
305	ICP-MS	23.9	88.9	73.0	114.7	39.3	
312	ICP-MS	21.0	80.0	62.0	100.0	31.0	
324	AFS	18.1	75.6	51.9	84.6	26.7	Info
339	HR-ICP-MS	16.4	73.5	44.3	83.4	24.3	Info
359	ICP-MS	19.5	60.6	49.7	73.3	27.5	
366	ICP-MS	34.0 ↑	130.0 ↑	100.0 ↑	155.0 ↑	49 ↑	Info
367	CV-AAS	19.4	73.6	54.1	85.7	27.2	Info
391	DRC/CC-ICP-MS	15.7	68.6	53.1	85.8	26.4	Info
401	DRC/CC-ICP-MS	16.7	72.7	56.0	93.8	25.3	Info

Percent satisfactory results for all participants: 90.9 %

notes: ↑ reported outside upper limit
        ↓ reported outside lower limit
        ↘: Unacceptable result

notes: Results reported as less than the method detection limit are excluded from statistical calculations.
Info only: results included for informational purposes only.

New York State Department of Health
Urine Mercury Test Results, 2013 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
AFS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	18.8	78.9	56.2	90.9	28.1
Standard Deviation:	0.9	4.6	6.1	8.9	2.0
RSD (%):	—	—	—	—	—
CV-AAS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	18.8	75.4	55.2	87.2	27.5
Standard Deviation:	0.8	2.5	1.6	2.1	0.4
RSD (%):	—	—	—	—	—
DRC/CC-ICP-MS					
Number of Sample Measurements:	5	5	5	5	5
Mean:	17.9	79.6	60.5	97.8	29.7
Standard Deviation:	2.8	11.5	7.7	11.7	4.3
RSD (%):	15.5	14.4	12.6	12.0	14.5
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	16.4	73.5	44.3	83.4	24.3
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	12	12	12	12	12
Mean:	22.2	85.4	65.7	103.3	34.0
Standard Deviation:	5.0	22.9	14.2	20.9	6.2
RSD (%):	22.5	26.8	21.6	20.2	18.1
All Laboratories					
Number of Sample Measurements:	22	22	22	22	22
Mean:	20.3	82.0	61.7	98.6	31.5
Standard Deviation:	4.4	17.8	12.2	17.3	5.8
RSD (%):	21.5	21.7	19.8	17.6	18.3

notes: ? Insufficient data for calculation.
A Standard Deviation displayed as 0.0 should be interpreted as <0.1

Urine Lead

The source of the test materials is human urine obtained from donor volunteers with informed consent. Urine was collected into polyethylene containers and then stored at 4°C. Following collection, urine from each donor was mixed and acidified to 1% v/v with nitric acid, and 1% (v/v) sulfamic acid solution containing 200 mg/mL sulfamic acid and 10% (v/v) Triton-X 100 was added to stabilize Hg. The urine was stored frozen at -80°C; after thawing at room temperature, precipitated salts were removed by centrifugation. The urine was separated into five pools and each was supplemented with different amounts of inorganic Pb^{2+}. Each pool was stirred for approximately 24 hours to ensure thorough mixing prior to aliquoting 10-mL samples into acid-leached polypropylene vials. Samples were stored at -80°C prior to circulating for proficiency testing.

The Target Value assigned for each PT material is the robust mean of the results reported by all participants in this event. The robust statistics were obtained utilizing algorithms based on those presented in **ISO 13528:2005E** Statistical methods for use in proficiency testing by interlaboratory comparisons. Values for urine lead range from 13.7 µg/L (0.07 µmol/L) to 148.4 µg/L (0.72 µmol/L).

Acceptable ranges. The acceptable range is fixed at ±10% or ±40 µg/L (0.19 µmol/L) around the target value, whichever is greater. These criteria are consistent with those established under CLIA '88 (Federal Register Volume 57, Number 40, §§ 493.2 and 493.937, February 28, 1992) for blood lead.

Discussion.   Based upon the above criteria, 100% of test results were judged as satisfactory, with none of the 22 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Urine Lead Test Results, 2013 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (μg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
Robust Mean	**82.6**	**13.7**	**148.4**	**36.5**	**100.9**
Robust Standard Deviation	4.7	0.8	10.7	2.5	7.0
Standard Uncertainty	1.3	0.2	2.9	0.7	1.9
RSD (%)	5.7	5.6	7.2	6.9	6.9
Number of Sample Measurements	22	22	22	22	22
Acceptable Range:					
Upper Limit	122.6	53.7	188.4	76.5	140.9
Lower Limit	42.6	0.0	108.4	0.0	60.9

notes: Results reported as less than the method detection limit are excluded from statistical calculations.

New York State Department of Health
Urine Lead Test Results, 2013 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE13-06	UE13-07	UE13-08	UE13-09	UE13-10	
	Target Values:	82.6	13.7	148.4	36.5	100.9	
103	DRC/CC-ICP-MS	88.5	14.7	158.3	38.5	109.2	Info
106	ICP-MS	82.2	14.4	157.9	37.9	106.3	Info
107	DRC/CC-ICP-MS	86.6	14.5	156.2	38.6	106.3	Info
110	ICP-MS	83.4	13.8	149.0	37.0	102.0	
114	ICP-MS	76.0	13.0	149.0	33.0	94.0	
116	ICP-MS	76.4	13.0	140.8	34.7	96.8	Info
147	ICP-MS	82.3	13.3	148.2	37.5	103.2	Info
156	ICP-MS	84.0	14.0	120.0	32.0	79.0	
164	ICP-MS	85.0	14.0	152.0	38.0	106.0	
179	ICP-MS	87.0	14.0	158.0	39.0	107.0	
197	DRC/CC-ICP-MS	78.7	14.1	146.5	37.3	103.1	
200	ICP-MS	80.7	14.5	143	39.3	101	Info
206	ICP-MS	83.0	13.0	154.0	37.0	102.0	
293	ICP-MS	80.6	13.2	143.4	35.6	95.9	Info
305	ICP-MS	84.0	14.1	147.3	36.6	103.8	
312	ICP-MS	89.0	15.0	160.0	39.0	110.0	
324	HR-ICP-MS	77.6	13.3	141.3	35.6	100.2	Info
339	HR-ICP-MS	72.4	13.3	125	35.0	93.8	Info
359	ICP-MS	73.6	13.8	132.0	34.4	95.0	
366	ICP-MS	84.0	12.0	141.0	32.0	85.0	Info
391	ETAAS-Z	85.2	12.4	172.6	30.6	93.2	Info
472	ICP-MS	89.1	14.1	158.5	39.5	108.6	Info

Percent satisfactory results for all participants: 100.0 %

notes: ↑   reported outside upper limit   notes: Results reported as less than the method detection limit are excluded from statistical calculations.
↓   reported outside lower limit   Info only: results included for informational purposes only.
◥: Unacceptable result

New York State Department of Health
Urine Lead Test Results, 2013 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L urine)				
	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	84.6	14.4	153.7	38.1	106.2
Standard Deviation:	5.2	0.3	6.3	0.7	3.1
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	1	1	1	1	1
Mean:	85.2	12.4	172.6	30.6	93.2
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	75.0	13.3	133.2	35.3	97.0
Standard Deviation:	3.7	0.0	11.5	0.4	4.5
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	16	16	16	16	16
Mean:	82.5	13.7	147.1	36.4	99.7
Standard Deviation:	4.4	0.7	10.6	2.5	8.5
RSD (%):	5.3	5.4	7.2	7.0	8.5
All Laboratories					
Number of Sample Measurements:	22	22	22	22	22
Mean:	82.2	13.7	147.9	36.3	100.1
Standard Deviation:	4.8	0.8	12.0	2.6	7.9
RSD (%):	5.8	5.5	8.1	7.2	7.9

notes: ?   Insufficient data for calculation.
      A Standard Deviation displayed as 0.0 should be interpreted as <0.1

Additional Trace Elements Reported in Urine

Participating laboratories reported analytical results for any other elements that are routinely reported in order to characterize these materials more completely. Results and descriptive statistics are provided for reference purposes. No target value or acceptable range is implied. As, Cd, and Pb were spiked using a stock standard containing all elements in the National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention. Refer to *www.cdc.gov/exposurereport* for more information on recent NHANES data for these elements in urine. In addition, these samples were spiked with leading elements present in other proficiency testing programs. The following table shows the additional elements spiked in the samples.

NHANES Elements	Additional Elements
Ba	Al
Be	Cr
Co	Cu
Cs	Mn
Mo	Ni
Pt	Se
Sb	Sn
Tl	Te
U	V
W	Zn

Urine Aluminum (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
147	DRC/CC-ICP-MS	48.3	<13.5	78.79	17	27.25
164	ICP-MS	53.0	28.0	77.0	20.0	32.0
179	DRC/CC-ICP-MS	50.0	7.0	77.0	19.0	31.0
197	ICP-MS	46.0	<20.0	73.0	<20.0	26.0
206	DRC/CC-ICP-MS	>20.0	6.0	>20.0	14.0	>20.0
305	ICP-MS	40.0	<5.0	65.0	12.0	23.0
312	ICP-MS	49.0	10.0	74.0	24.0	33.0
324	HR-ICP-MS	44.3	5.9	75.4	17.7	31.8
359	ICP-MS	50.2	11.9	72.2	17.4	29.5
391	DRC/CC-ICP-MS	25.3*	20.3	37.0*	20.4	11.1*
	Arithmetic Mean	**48**	**13**	**74**	**18**	**29**
Outlier	SD	4	8	4	4	3
	n	8	7	8	9	8

Urine Antimony (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	5.9	0.9	9.8	2.3	3.9
110	ICP-MS	6.0	0.9	10.0	2.4	4.0
147	ICP-MS	5.6	0.82	9.34	2.28	3.75
197	ICP-MS	5.9	<1.0	9.8	2.4	3.9
206	ICP-MS	5.0	1.0	10.0	2.0	4.0
312	ICP-MS	5.8	0.9	10.0	2.4	4.0
324	HR-ICP-MS	5.9	0.8	9.6	2.3	3.9
359	ICP-MS	4.9	0.8	8.4*	2.0	3.4*
391	DRC/CC-ICP-MS	6.7	1.1	10.3	2.5	4.2
472	ICP-MS	5.8	0.9	9.7	2.3	3.8
	Arithmetic Mean	**5.8**	**0.9**	**9.8**	**2.3**	**3.9**
Outlier	SD	0.5	0.1	0.3	0.2	0.1
	n	10	9	9	10	9

Urine Barium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	9.0	1.7	12.5	3.2	5.2
110	ICP-MS	9.1	1.8	12.9	3.3	5.3
116	ICP-MS	8.0	1.58	11.4	2.92	4.73
147	ICP-MS	8.38	1.55	11.92	3.12	5.04
197	ICP-MS	9.3	<2.0	12.4	3.2	5.2
312	ICP-MS	8.7	1.7	13.0	3.5	5.3
359	ICP-MS	7.6	1.6	11.2	2.9	4.8
472	ICP-MS	9.2	1.8	12.5	3.3	5.1
	Arithmetic Mean	**8.7**	**1.7**	**12.2**	**3.2**	**5.1**
Outlier	SD	0.6	0.1	0.7	0.2	0.2
	n	8	7	8	8	8

Urine Beryllium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	7.4	1.1	12.5	3.0	4.9
110	ICP-MS	8.3	1.5	13.8	3.0	5.6
116	ICP-MS	6.26	0.963	11.8	2.75	4.78
147	ICP-MS	7.32	1.26	14.32	3.24	5.73
197	ICP-MS	7.3	1.1	11.3	2.7	4.4
312	ICP-MS	7.9	1.3	14.0	2.9	5.7
391	DRC/CC-ICP-MS	6.6	0.1*	11.4	2.0*	4.0
472	ICP-MS	7.2	1.2	12.4	3.0	5.0
	Arithmetic Mean	**7.3**	**1.2**	**13**	**2.9**	**5.0**
Outlier	SD	0.6	0.2	1	0.2	0.6
	n	8	7	8	7	8

Urine Bismuth (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
197	ICP-MS	3.4	<1.0	<1.0	<1.0	<1.0
305	ICP-MS	3.1	<0.5	<0.5	<0.5	<0.5
312	ICP-MS	3.6	<0.1	<0.1	<0.1	<0.1

Urine Cesium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	31.2	5.7	48.1	12.6	19.9
110	ICP-MS	32.7	6.2	51.2	13.5	21.4
147	ICP-MS	31.1	5.6	46.78	12.48	19.94
312	ICP-MS	33.0	6.2	52.0	14.0	22.0
359	ICP-MS	29.2	5.8	46.8	12.2	19.4
366	ICP-MS	32.0	5.8	50.0	13.0	20.0
472	ICP-MS	33.2	6.1	47.3	13.2	20.6
	Arithmetic Mean	**32**	**5.9**	**49**	**13.0**	**20.5**
Outlier	SD	1	0.2	2	0.6	0.9
	n	7	7	7	7	7

Urine Chromium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	17.8	2.6	25.1	6.4	9.8
110	DRC/CC-ICP-MS	16.6	2.8	26.3	6.8	10.8
147	DRC/CC-ICP-MS	13.31	2.26	22.93	5.51	9.26
156	DRC/CC-ICP-MS	14.0	2.1	24.0	6.1	9.8
164	ICP-MS	13.6	2.9	23.4	6.6	9.8
179	DRC/CC-ICP-MS	14.6	2.4	25.9	6.5	10.2
197	DRC/CC-ICP-MS	14.2	1.4	23.2	5.4	9.3
206	DRC/CC-ICP-MS	14.8	3.3	25.5	6.9	10.5
305	ICP-MS	14.1	2.4	25.0	6.0	9.8
312	DRC/CC-ICP-MS	15.0	3.0	23.0	5.0	10.0
324	HR-ICP-MS	13.2	2.2	23.9	5.8	9.7
359	ICP-MS	16.0	2.3	24.4	5.8	9.9
391	DRC/CC-ICP-MS	20.0*	2.6	26.3	6.6	10.9
401	DRC/CC-ICP-MS	13.1	1.8	23.4	5.1	8.9
	Arithmetic Mean	**15**	**2.4**	**24**	**6.0**	**9.9**
Outlier	SD	1	0.5	1	0.6	0.6
	n	13	14	14	14	14

Urine Cobalt (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	3.4	0.6	20.6	1.4	44.8
110	ICP-MS	3.1	0.6	20.0	1.3	43.5
147	ICP-MS	3.09	0.54	21.27	1.44	46.14
156	DRC/CC-ICP-MS	2.9	<1.0	18.0	1.2	42.0
164	ICP-MS	2.9	0.5	18.7	1.3	41.6
179	DRC/CC-ICP-MS	3.3	0.6	20.0	1.4	44.0
197	ICP-MS	3.4	<1.0	20.7	1.5	45.5
206	ICP-MS	3.3	0.7	19.4	1.4	41.0
305	ICP-MS	3.1	0.6	21.2	1.4	46.7
312	ICP-MS	3.0	<0.8	21.0	1.0	46.0
324	HR-ICP-MS	3.3	0.6	20.2	1.4	43.9
359	ICP-MS	2.7	0.5	18.0	1.2	39.0
391	DRC/CC-ICP-MS	3.1	0.3*	20.9	1.2	46.1
401	DRC/CC-ICP-MS	3.0	0.7	19.5	1.4	42.8
472	ICP-MS	3.1	0.5	20.9	1.4	45.1
	Arithmetic Mean	**3.1**	**0.6**	**20**	**1.3**	**44**
Outlier	SD	0.2	0.1	1	0.1	2
	n	15	11	15	15	15

Urine Copper (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
110	ICP-MS	281.0	43.9	491.0	121.0	197.0
147	ICP-MS	287	47.27	524	130.2	210
164	ICP-MS	287.0	42.0	519.0	129.0	208.0
179	DRC/CC-ICP-MS	277.0	42.0	506.0	123.0	201.0
197	ICP-MS	307.4	47.2	563.2	135.6	219.5
206	ICP-MS	271.0	43.0	487.0	120.0	197.0
305	ICP-MS	295.0	48.0	486.0	124.0	200.0
312	ICP-MS	280.0	45.0	500.0	120.0	200.0
324	HR-ICP-MS	282.3	39.1	507.2	123.9	203.0
359	ICP-MS	298.0	42.9	447.0	113.0	178.0
391	DRC/CC-ICP-MS	264.5	47.0	510.4	83.2*	163.6
401	DRC/CC-ICP-MS	276.0	42.6	476.4	115.1	193.3
	Arithmetic Mean	**284**	**44**	**501**	**123**	**198**
Outlier	SD	12	3	28	7	15
	n	12	12	12	11	12

Urine Iodine (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	160.0	55.8	28.1	28.5	28.5
164	DRC/CC-ICP-MS	153.0	57.0	32.0	32.0	32.0
179	ICP-MS	151.0	53.0	29.0	29.0	29.0
197	ICP-MS	169.0	55.0	30.0	30.0	30.0
	Arithmetic Mean	**158**	**55**	**30**	**30**	**30**
Outlier	SD	8	2	2	2	2
	n	4	4	4	4	4

Urine Iron (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
391	DRC/CC-ICP-MS	5.9	3.5	11.9	3.8	7.3

Urine Lithium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
147	ICP-MS	21.24	7.29	7.49	7.29	7.56
312	ICP-MS	20.7	7.1	7.6	7.9	7.7
359	ICP-MS	16.4	6.0	6.1	5.7	6.0

Urine Manganese (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
103	DRC/CC-ICP-MS	6.3	0.7	11.7	2.6	4.6
107	DRC/CC-ICP-MS	7.2	1.0	11.6	2.9	4.8
110	DRC/CC-ICP-MS	7.9	1.2	12.5	2.9	5.1
147	DRC/CC-ICP-MS	7.03	1.04	11.59	2.87	4.78
179	DRC/CC-ICP-MS	6.4	1.0	11.3	2.8	4.2
206	ICP-MS	6.6	1.2	12.1	3.1	5.4
305	ICP-MS	7.4	1.2	13.5	3.2	5.4
312	DRC/CC-ICP-MS	7.0	1.0	12.0	3.0	5.0
324	HR-ICP-MS	7.1	1.0	12.2	2.9	5.0
359	ICP-MS	7.1	1.1	10.5	2.5	4.3
366	ICP-MS	8.5	1.8*	12.0	2.8	4.3
391	DRC/CC-ICP-MS	7.0	0.8	11.9	2.8	4.6
	Arithmetic Mean	**7.1**	**1.0**	**11.9**	**2.9**	**4.8**
Outlier	SD	0.6	0.2	0.7	0.2	0.4
	n	12	11	12	12	12

Urine Molybdenum (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	103.9	30.2	129.3	38.5	57.3
110	ICP-MS	106.0	30.8	133.0	39.2	58.2
147	ICP-MS	105	31.29	131	39.25	56.8
179	DRC/CC-ICP-MS	100.0	31.0	124.0	39.0	58.0
197	ICP-MS	115.5	34.5*	138.5	42.7	62.5
312	ICP-MS	110.0	31.0	130.0	39.0	57.0
324	HR-ICP-MS	105.2	29.5	128.3	38.2	56.4
359	ICP-MS	89.2	28.4	117.0	34.5	51.7
472	ICP-MS	102.1	30.0	129.2	38.5	56.9
	Arithmetic Mean	**104**	**30**	**129**	**39**	**57**
*Outlier	SD	7	1	6	2	3
	n	9	8	9	9	9

Urine Nickel (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	9.6	1.5	18.6	3.7	15.6
110	ICP-MS	8.4	<2.2	16.5	2.4	12.7
147	DRC/CC-ICP-MS	8.81	1.6	19.26	3.69	16.38
164	ICP-MS	8.2	1.4	16.2	2.7	14.3
179	DRC/CC-ICP-MS	9.3	1.5	18.8	3.6	16.2
197	ICP-MS	7.9	2.1	17.6	3.1	15.0
206	ICP-MS	9.2	2.4	17.3	2.9	14.5
312	ICP-MS	9.9	2.2	17.0	3.8	15.0
359	ICP-MS	7.3	1.8	13.4	2.8	11.4
391	DRC/CC-ICP-MS	8.3	1.4	16.4	2.7	14.1
401	DRC/CC-ICP-MS	7.0	1.3	16.0	3.3	13.9
472	ICP-MS	9.7	1.8	18.9	3.6	16.0
	Arithmetic Mean	**8.6**	**1.7**	**17**	**3.2**	**15**
*Outlier	SD	0.9	0.4	2	0.5	1
	n	12	11	12	12	12

Urine Platinum (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
110	ICP-MS	2.8	0.3	4.8	1.2	2.0
147	ICP-MS	2.63	0.3	4	0.99	1.65
312	ICP-MS	2.6	0.5	4.5	1.0	1.8
359	ICP-MS	2.4	0.4	4.2	1.0	1.7
472	ICP-MS	2.6	0.4	4.6	1.1	1.8
	Arithmetic Mean	**2.6**	**0.38**	**4.4**	**1.06**	**1.8**
*Outlier	SD	0.1	0.08	0.3	0.09	0.1
	n	5	5	5	5	5

Urine Selenium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
110	DRC/CC-ICP-MS	109.0	12.3	120.0	32.9	55.1
147	ICP-MS	104.00	22.91	125	36.65	54.34
179	DRC/CC-ICP-MS	100.0	21.0	125.0	37.0	54.0
197	ICP-MS	113.0	<50.0	130.0	<50.0	55.0
206	ICP-MS	102.0	22.0	120.0	39.0	52.0
305	ICP-MS	124.0	27.0	132.0	41.0	57.0
312	ICP-MS	120.0	25.0	130.0	37.0	56.0
359	ICP-MS	108.0	26.2	117.0	32.2	53.3
472	DRC/CC-ICP-MS	68.9*	19.5	131.2	35.9	56.0
	Arithmetic Mean	**110**	**22**	**126**	**36**	**55**
*Outlier	SD	9	5	6	3	2
	n	8	8	9	8	9

Urine Strontium (µg/L)

Lab Code	Method	101.1	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	101.0	36.9	22.8	22.8	22.9

Urine Tellurium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
110	ICP-MS	6.0	0.7	9.6	2.4	3.8
197	ICP-MS	5.0	<1.0	9.3	2.3	3.8
206	ICP-MS	5.0	1.0	10.0	2.0	4.0
312	ICP-MS	6.5	0.8	10.0	2.4	4.3
	Arithmetic Mean	**5.6**		**9.7**	**2.3**	**4.0**
Outlier	SD	0.8		0.3	0.2	0.2
	n	4		4	4	4

Urine Thallium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	14.7	2.3	26.2	6.3	10.3
110	ICP-MS	14.1	2.2	25.2	6.0	10.0
116	ICP-MS	12.6	1.98	22.8	5.49	9.13
147	ICP-MS	13.65	2.09	24.53	5.91	9.79
179	ICP-MS	14.0	2.0	24.0	7.0	10.0
197	ICP-MS	11.6	1.9	21.3	5.2	8.5
206	ICP-MS	>10.0	2.1	>10.0	5.5	9.7
305	ICP-MS	14.2	2.3	25.6	6.3	10.3
312	ICP-MS	15.0	2.3	26.0	6.1	10.0
359	ICP-MS	13.8	2.4	21.6	5.2	8.5
391	DRC/CC-ICP-MS	7.7*	1.3*	13.9*	3.3*	5.3*
472	ICP-MS	14.5	2.2	26.4	6.3	10.6
	Arithmetic Mean	**14**	**2.2**	**24**	**5.9**	**9.7**
Outlier	SD	1	0.2	2	0.6	0.7
	n	10	11	10	11	11

Urine Thorium (µg/L)

Lab Code	Method	101.1	UE13-07	UE13-08	UE13-09	UE13-10
147	ICP-MS	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046

Urine Tin (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
107	DRC/CC-ICP-MS	15.1	2.2	25.2	6.3	10.0
110	ICP-MS	14.6	2.2	24.6	6.0	9.7
147	ICP-MS	14.25	2.09	24.7	6.06	9.86
312	ICP-MS	15.0	2.3	26.0	6.1	10.0
359	ICP-MS	12.8	2.2	23.0	5.4	8.8
366	ICP-MS	16.0	2.4	26.0	6.4	12.0*
472	ICP-MS	14.8	2.2	24.4	6.0	9.8
	Arithmetic Mean	**15**	**2.2**	**25**	**6.0**	**9.7**
Outlier	SD	1	0.1	1	0.3	0.5
	n	7	7	7	7	6

Urine Tungsten (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
103	DRC/CC-ICP-MS	6.0	0.9	9.9	2.4	3.9
107	DRC/CC-ICP-MS	5.8	0.9	9.7	2.4	3.8
110	ICP-MS	5.9	0.9	10.1	2.4	4.0
147	ICP-MS	5.87	0.95	9.87	2.43	4
312	ICP-MS	6.0	0.9	10.0	2.4	4.1
324	HR-ICP-MS	5.0	0.8	8.6	2.2	3.5
359	ICP-MS	4.8	0.8	8.5	2.0*	3.3
472	ICP-MS	5.5	0.9	9.3	2.3	3.8
	Arithmetic Mean	**5.6**	**0.88**	**9.5**	**2.36**	**3.8**
*Outlier	SD	0.5	0.05	0.6	0.08	0.3
	n	8	8	8	7	8

Urine Uranium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
103	DRC/CC-ICP-MS	0.7	0.1	1.3	0.3	0.5
107	DRC/CC-ICP-MS	0.8	0.1	1.4	0.3	0.5
110	ICP-MS	0.7	0.1	1.2	0.3	0.5
116	ICP-MS	0.658	0.101	1.06	0.259	0.425
147	ICP-MS	0.645	0.098	1.12	0.267	0.45
197	ICP-MS	<1.0	<1.0	1.3	<1.0	<1.0
312	ICP-MS	0.8	0.1	1.3	0.3	0.5
324	HR-ICP-MS	0.63	0.09*	1.09	0.26	0.44
359	ICP-MS	0.6	0.1	1.1	0.3	0.4
391	DRC/CC-ICP-MS	0.03*	<0.0	0.3*	<0.0	0.2*
472	ICP-MS	0.7	0.1	1.4	0.3	0.5
	Arithmetic Mean	**0.7**	**0.100**	**1.2**	**0.29**	**0.47**
	SD	0.1	0.001	0.1	0.02	0.04
	n	9	8	10	9	9

Urine Vanadium (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
147	DRC/CC-ICP-MS	5.51	0.8	8.72	2.12	3.55
179	DRC/CC-ICP-MS	4.9	0.6	8.1	1.8	3.1
312	DRC/CC-ICP-MS	6.0	0.8	7.0	2.0	3.0
324	HR-ICP-MS	5.3	0.8	9.6	2.3	3.9
359	ICP-MS	7.6	1.0	11.4	2.6	4.6
391	DRC/CC-ICP-MS	4.3	<0.0	6.3	<0.0	1.0
	Arithmetic Mean	**6**	**0.8**	**9**	**2.2**	**3**
*Outlier	SD	1	0.1	2	0.3	1
	n	6	5	6	5	6

Urine Zinc (µg/L)

Lab Code	Method	UE13-06	UE13-07	UE13-08	UE13-09	UE13-10
110	ICP-MS	416.0	93.7	546.0	180.0	253.0
147	ICP-MS	425	101	639	216	290
164	ICP-MS	427.0	85.0	567.0	183.0	254.0
179	DRC/CC-ICP-MS	387.0	87.0	567.0	181.0	267.0
197	ICP-MS	411.0	<200.0	571.0	<200.0	256.0
206	ICP-MS	410.0	100.0	550.0	190.0	260.0
305	ICP-MS	402.0	98.0	541.0	181.0	260.0
312	ICP-MS	410.0	100.0	560.0	180.0	260.0
324	HR-ICP-MS	403.9	97.3	592.1	191.4	273.9
359	ICP-MS	393.0	84.8	477.0	151.0	227.0
391	DRC/CC-ICP-MS	378.7	83.72	521.6	166.4	237.1
401	DRC/CC-ICP-MS	444.7	100.1	576.8	191.6	276.0
	Arithmetic Mean	**409**	**94**	**559**	**183**	**260**
	SD	18	7	39	16	17
	n	12	11	12	11	12

ATOMIC SPECTROMETRY METHODS

A-1   ETAAS-Z (Electrothermal atomic absorption spectrometry with Zeeman background correction)

A-2   ETAAS other (i.e., D_2, S-H background correction)

A-3   FAAS (Flame atomic absorption spectrometry)

A-4   CV-AAS (Cold vapor atomic absorption spectrometry)

A-5   HG-AAS (Hydride generation atomic absorption spectrometry)

A-6   AFS (Atomic fluorescence spectrometry)

A-7   Other

INDUCTIVELY COUPLED PLASMA

P-1   ICP-MS (Inductively coupled plasma - mass spectrometry)

P-2   DRC/CC-ICP-MS (ICP-MS used in the Dynamic Reaction Cell or Collision Cell mode)

P-3   ICP-AES/OES (ICP atomic/optical emission spectrometry)

P-4   HR-ICP-MS (High resolution ICP-MS)

P-5   ETV-ICP-MS (Electrothermal vaporization ICP-MS)

P-6   ID-ICP-MS (Isotope dilution ICP-MS)

P-7   Other

ELECTROCHEMICAL METHODS

E-1   ASV (Anodic stripping voltammetry without digestion)

E-2   ASV-LeadCare® (Anodic stripping voltammetry using the ESA LeadCare® system)

E-3   Fluoride specific electrode

E-4   Other

MOLECULAR FLUORIMETRY

F-1   EtOAc (Ethyl acetate-acetic acid extraction method for determination of erythrocyte protoporphyrin)

F-2   Aviv hematofluorometry (for determination of EP at hematocrit 35)

F-3   Helena ZPP (for determination of zinc protoporphyrin in μmol ZPP/mol heme)

F-4   Other

OTHER METHODS

If your method is not listed in the above list, please describe it briefly.