
Wadsworth Center

NEW YORK STATE DEPARTMENT OF HEALTH

Trace Elements Laboratory

TRACE ELEMENTS IN URINE

Proficiency Test Report

Event #3, 2014

November 18th, 2014

Howard A. Zucker, M.D., J.D.
Acting Commissioner of Health

NEW YORK
state department of
HEALTH

Sue Kelly
Executive Deputy Commissioner

November 18, 2014

**Trace Elements in Urine
Event #3, 2014**

Dear Laboratory Director:

Results from the third proficiency test (PT) event for 2014 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. 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, Ti, 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.

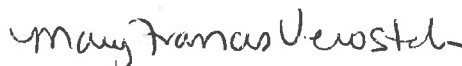
The next PT event for trace elements in urine is scheduled to be mailed Wednesday, January 14th, 2015. Please inform our laboratory staff at (518) 474-7161 if the test materials have not arrived within five days of the scheduled mail out date. **The deadline for reporting results is Wednesday, February 11th, 2015.**

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. 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 As³⁺. 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 arsenic range from 28.6 µg/L (0.38 µmol/L) to 184.4 µg/L (2.46 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, 100% of test results reported were judged as satisfactory, with none of the 23 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Urine Arsenic Test Results, 2014 Event #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

Results ($\mu\text{g/L}$ urine)

	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
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Robust Mean	184.4	28.6	60.6	104.7	48.0
Robust Standard Deviation	10.9	2.3	3.9	6.4	3.4
Standard Uncertainty	2.8	0.6	1.0	1.7	0.9
RSD (%)	5.9	8.0	6.4	6.1	7.0
Number of Sample Measurements	23	23	23	23	23
Acceptable Range:					
Upper Limit	221.3	34.6	72.7	125.6	57.6
Lower Limit	147.5	22.6	48.5	83.8	38.4

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, 2014 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE14-11	UE14-12	UE14-13	UE14-14	UE14-15	
Target Values:		184.4	28.6	60.6	104.7	48.0	
103	DRC/CC-ICP-MS	186.5	28.1	58.7	106.5	47.8	Info
106	DRC/CC-ICP-MS	188.7	28.6	61.4	106.4	48.4	Info
107	DRC/CC-ICP-MS	180	28	59	100	46	Info
110	DRC/CC-ICP-MS	188.0	29.1	61.1	104.0	48.4	
114	ICP-MS	170.0	26.0	57.0	98.0	42.0	
116	ICP-MS	187.3	27.0	57.0	97.7	45.9	Info
147	ICP-MS	173.8	26.4	59.0	97.4	43.4	Info
156	DRC/CC-ICP-MS	170.0	25.0	56.0	97.0	44.0	
164	ICP-MS	180.0	32.0	62.0	107.0	50.0	
179	ICP-MS	186.0	31.0	63.0	103.0	49.0	
197	DRC/CC-ICP-MS	184.0	31.0	64.0	108.0	50.0	
200	ICP-MS	204	33.8	61.9	112	50.8	Info
206	DRC/CC-ICP-MS	190.4	28.0	62.2	108.0	50.2	
208	ICP-MS	169.2	30.3	57.8	101.4	47.9	
293	DRC/CC-ICP-MS	196.3	29.1	64.6	115.4	51.5	Info
305	ICP-MS	193.0	30.0	70.0	106.0	51.0	
312	DRC/CC-ICP-MS	177.0	26.0	52.0	92.0	43.0	
324	HR-ICP-MS	201.7	30.1	64.7	111.3	50.2	Info
339	HR-ICP-MS	177.3	26.0	57.4	100.7	44.0	Info
366	ICP-MS	173.0	29.0	54.0	102.0	47.0	Info
367	DRC/CC-ICP-MS	199.0	30.2	67.1	120.0	53.0	Info
391	DRC/CC-ICP-MS	181.9	27.33	62.42	109.6	50.98	Info
401	DRC/CC-ICP-MS	186.0	27.3	61.7	107.6	49.0	Info

Percent satisfactory results for all participants: 100.0 %

notes: ↑ Reported outside upper limit
↓ Reported outside lower limit
▼: Result unacceptable
▲: Result not reported

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, 2014 Event #3
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ urine)				
	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	12	12	12	12	12
Mean:	185.7	28.1	60.9	106.2	48.5
Standard Deviation:	8.0	1.7	4.0	7.5	3.0
RSD (%):	4.3	5.9	6.6	7.1	6.2
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	189.5	28.1	61.1	106.0	47.1
Standard Deviation:	17.3	2.9	5.2	7.5	4.4
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	9	9	9	9	9
Mean:	181.8	29.5	60.2	102.7	47.4
Standard Deviation:	11.8	2.7	4.7	4.9	3.2
RSD (%):	6.5	9.0	7.8	4.8	6.7
All Laboratories					
Number of Sample Measurements:	23	23	23	23	23
Mean:	184.5	28.7	60.6	104.8	48.0
Standard Deviation:	10.1	2.2	4.2	6.5	3.1
RSD (%):	5.5	7.6	6.9	6.2	6.4

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. 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 Cd²⁺. 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 1.8 µg/L (16 nmol/L) to 9.7 µg/L (86 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, 98.3% of test results reported were judged as satisfactory, with none of the 24 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Urine Cadmium Test Results, 2014 Event #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ urine)				
	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
Robust Mean	4.3	5.0	1.8	3.2	9.7
Robust Standard Deviation	0.3	0.3	0.1	0.2	0.7
Standard Uncertainty	0.1	0.1	<0.1	0.1	0.2
RSD (%)	6.1	6.7	7.6	7.6	7.6
Number of Sample Measurements	24	24	24	24	24
Acceptable Range:					
Upper Limit	5.3	6.0	2.8	4.2	11.2
Lower Limit	3.3	4.0	0.8	2.2	8.2

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, 2014 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE14-11	UE14-12	UE14-13	UE14-14	UE14-15	
Target Values:		4.3	5.0	1.8	3.2	9.7	
103	DRC/CC-ICP-MS	4.7	5.4	1.9	3.4	10.2	Info
106	ICP-MS	4.3	5.2	1.8	3.2	9.5	Info
107	DRC/CC-ICP-MS	4.5	5.1	1.9	3.3	10.0	Info
110	ICP-MS	4.5	5.2	1.8	3.2	9.6	
114	ICP-MS	3.5	4.5	1.6	2.9	8.6	
116	ICP-MS	4.5	5.3	1.9	3.5	10.4	Info
147	ICP-MS	4.0	4.8	1.7	3.0	9.1	Info
156	ICP-MS	4.5	4.9	1.7	2.8	9.1	
164	ICP-MS	4.2	4.7	1.7	3.0	9.0	
179	ICP-MS	4.3	5.1	1.9	3.5	10.4	
197	DRC/CC-ICP-MS	4.2	4.8	1.7	3.1	9.1	
200	ICP-MS	4.4	3.8 ↓	1.7	3.1	9.6	Info
206	ICP-MS	4.6	5.4	1.8	3.3	9.5	
208	ICP-MS	4.3	5.3	1.8	3.3	9.6	
293	ICP-MS	4.6	5.3	1.9	3.4	10.2	Info
305	ICP-MS	4.0	5.0	2.0	3.0	10.0	
312	ICP-MS	4.2	5.0	1.9	3.3	10.0	
324	HR-ICP-MS	4.6	5.4	1.8	3.4	10.6	Info
339	HR-ICP-MS	3.8	4.4	1.5	2.7	8.3	Info
366	ICP-MS	4.3	4.8	1.7	3.1	11.0	Info
367	DRC/CC-ICP-MS	5.0	5.7	2.1	3.9	11.9 ↑	Info
391	DRC/CC-ICP-MS	4.18	5.01	1.73	3.12	9.50	Info
401	DRC/CC-ICP-MS	4.2	4.9	1.6	3.0	9.2	Info
472	ICP-MS	4.4	5.2	1.7	3.0	8.9	Info

Percent satisfactory results for all participants: 98.3 %

notes: ↑ Reported outside upper limit
↓ Reported outside lower limit
▼: Result unacceptable
▲: Result not reported

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 Cadmium Test Results, 2014 Event #3
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ urine)				
	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	6	6	6	6	6
Mean:	4.5	5.2	1.8	3.3	10.0
Standard Deviation:	0.3	0.3	0.2	0.3	1.0
RSD (%):	7.5	6.6	9.9	9.9	10.4
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	4.2	4.9	1.7	3.1	9.5
Standard Deviation:	0.6	0.7	0.2	0.5	1.6
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	16	16	16	16	16
Mean:	4.3	5.0	1.8	3.2	9.7
Standard Deviation:	0.3	0.4	0.1	0.2	0.6
RSD (%):	6.5	8.1	6.1	6.6	6.7
All Laboratories					
Number of Sample Measurements:	24	24	24	24	24
Mean:	4.3	5.0	1.8	3.2	9.7
Standard Deviation:	0.3	0.4	0.1	0.3	0.8
RSD (%):	7.2	8.0	7.7	8.2	8.3

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. 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 16.8 µg/L (84 nmol/L) to 68.6 µg/L (342 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, 99.1% of test results reported 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 Mercury Test Results, 2014 Event #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

Results ($\mu\text{g/L}$ urine)

	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
Robust Mean	47.0	68.6	16.8	32.4	39.0
Robust Standard Deviation	4.4	7.5	2.1	2.8	3.3
Standard Uncertainty	1.2	2.0	0.6	0.8	0.9
RSD (%)	9.3	10.9	12.6	8.8	8.5
Number of Sample Measurements	22	22	22	22	22
Acceptable Range:					
Upper Limit	61.1	89.2	21.8	42.1	50.7
Lower Limit	32.9	48.0	11.8	22.7	27.3

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, 2014 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE14-11	UE14-12	UE14-13	UE14-14	UE14-15	
Target Values:		47.0	68.6	16.8	32.4	39.0	
103	DRC/CC-ICP-MS	41.1	58.5	15.9	29.8	36.5	Info
107	DRC/CC-ICP-MS	46	68	15	32	39	Info
109	AFS	49.4	78.5	18.7	36.0	45.3	Info
110	ICP-MS	48.7	68.6	16.5	32.6	40.0	
114	ICP-MS	40.0	60.0	14.0	25.0	32.0	
147	CV-AAS	46.4	68.1	17.8	33.9	40.7	Info
156	ICP-MS	43.0	61.0	16.0	30.0	37.0	
164	ICP-MS	47.0	69.0	17.0	31.0	38.0	
179	ICP-MS	47.0	67.0	17.0	31.0	38.0	
197	DRC/CC-ICP-MS	48.0	69.0	18.0	33.0	41.0	
199	ICP-MS	48.8	71.7	14.2	33.0	39.5	Info
200	ICP-MS	56.0	80.0	16.5	34.4	40.2	Info
206	ICP-MS	48.9	69.8	21.0	34.0	41.0	
208	CV-AAS	56.4	80.6	19.0	36.2	43.0	
293	ICP-MS	41.9	70.1	17.7	32.5	36.3	Info
305	ICP-MS	54.0	76.0	21.0	36.0	51.0 ↑	
312	ICP-MS	45.0	69.0	17.0	29.0	38.0	
339	HR-ICP-MS	42.0	58.2	14.5	26.3	28.1	Info
366	ICP-MS	44.0	58.0	19.0	33.0	35.0	Info
367	CV-AAS	49.2	67.2	15.2	32.1	39.2	Info
391	DRC/CC-ICP-MS	60.72	82.40	17.08	41.18	49.51	Info
401	DRC/CC-ICP-MS	44.2	62.9	13.5	28.9	35.1	Info

Percent satisfactory results for all participants: 99.1 %

notes: ↑ Reported outside upper limit
↓ Reported outside lower limit
▼: Result unacceptable
▲: Result not reported

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, 2014 Event #3
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ urine)				
	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
AFS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	49.4	78.5	18.7	36.0	45.3
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
CV-AAS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	50.7	72.0	17.3	34.1	41.0
Standard Deviation:	5.2	7.5	1.9	2.1	1.9
RSD (%):	—	—	—	—	—
DRC/CC-ICP-MS					
Number of Sample Measurements:	5	5	5	5	5
Mean:	48.0	68.2	15.9	33.0	40.2
Standard Deviation:	7.5	9.0	1.8	4.9	5.7
RSD (%):	15.7	13.2	11.1	14.8	14.1
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	42.0	58.2	14.5	26.3	28.1
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	12	12	12	12	12
Mean:	47.0	68.4	17.2	31.8	38.8
Standard Deviation:	4.7	6.4	2.2	2.9	4.6
RSD (%):	10.0	9.3	12.9	9.1	11.8
All Laboratories					
Number of Sample Measurements:	22	22	22	22	22
Mean:	47.6	68.8	16.9	32.3	39.2
Standard Deviation:	5.3	7.3	2.1	3.5	5.1
RSD (%):	11.2	10.6	12.3	10.9	12.9

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. 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 Pb²⁺. 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 36.2 µg/L (0.17 µmol/L) to 143.9 µg/L (0.69 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, 98.2% 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, 2014 Event #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

Results ($\mu\text{g/L}$ urine)

	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
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Robust Mean	81.3	101.4	36.2	47.2	143.9
Robust Standard Deviation	4.5	4.3	2.1	2.8	9.4
Standard Uncertainty	1.2	1.1	0.6	0.7	2.5
RSD (%)	5.6	4.2	5.9	5.9	6.5
Number of Sample Measurements	22	22	22	22	22
Acceptable Range:					
Upper Limit	121.3	141.4	76.2	87.2	183.9
Lower Limit	41.3	61.4	0.0	7.2	103.9

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, 2014 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L urine)					Info Only
		UE14-11	UE14-12	UE14-13	UE14-14	UE14-15	
Target Values:		81.3	101.4	36.2	47.2	143.9	
103	DRC/CC-ICP-MS	84.8	106.1	37.8	49.8	151.9	Info
106	ICP-MS	82.4	103.5	37.5	47.9	148.3	Info
107	ICP-MS	88.0	110.0	38.0	50.0	150.0	Info
110	ICP-MS	81.0	101.0	35.4	46.7	143.0	
114	ICP-MS	57.0	72.0	25.0	31.0	96.0 ↓	
116	ICP-MS	83.7	105.0	37.1	48.8	146.2	Info
147	ICP-MS	81.0	101.7	36.7	47.9	144.6	Info
156	DRC/CC-ICP-MS	87.0	100.0	38.0	50.0	150.0	
164	ICP-MS	79.0	99.0	35.0	45.0	135.0	
179	ICP-MS	84.0	104.0	37.0	48.0	143.0	
197	DRC/CC-ICP-MS	78.8	100.3	37.4	48.5	145.3	
200	ICP-MS	64.0	79.7	23.2	31.1	111.8	Info
206	ICP-MS	76.0	98.2	34.3	45.0	137.8	
208	ICP-MS	78.9	101.5	36.1	45.8	137.9	
293	ICP-MS	84.4	103.6	36.8	48.8	146.2	Info
305	ICP-MS	84.0	109.0	41.0	49.0	158.0	
312	ICP-MS	84.0	101.0	36.0	49.0	146.0	
324	HR-ICP-MS	93.9	117.8	39.7	52.3	154.3	Info
339	HR-ICP-MS	74.4	89.8	33.7	43.5	113.6	Info
366	ICP-MS	82.0	102.0	35.0	45.0	162.0	Info
391	ETAAS-Z	54.64	68.81	23.90	34.64	95.35 ↓	Info
472	ICP-MS	80.5	100.6	36.1	47.5	143.8	Info

Percent satisfactory results for all participants: 98.2 %

notes: ↑ Reported outside upper limit
↓ Reported outside lower limit
▼: Result unacceptable
▲: Result not reported

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 Lead Test Results, 2014 Event #3
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ urine)				
	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	83.5	102.1	37.7	49.4	149.1
Standard Deviation:	4.2	3.4	0.3	0.8	3.4
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	1	1	1	1	1
Mean:	54.6	68.8	23.9	34.6	95.4
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	84.2	103.8	36.7	47.9	134.0
Standard Deviation:	13.8	19.8	4.2	6.2	28.8
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	16	16	16	16	16
Mean:	79.4	99.5	35.0	45.4	140.6
Standard Deviation:	8.0	9.8	4.5	5.8	16.1
RSD (%):	10.0	9.9	13.0	12.8	11.5
All Laboratories					
Number of Sample Measurements:	22	22	22	22	22
Mean:	79.2	98.8	35.0	45.7	139.1
Standard Deviation:	9.5	11.7	4.8	5.9	18.3
RSD (%):	12.0	11.8	13.6	12.8	13.2

notes: ? Insufficient data for calculation.

A Standard Deviation displayed as 0.0 should be interpreted as <0.1

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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

Ba
Be
Co
Cs
Mo
Pt
Sb
Tl
U
W

Additional Elements

Al
Cr
Cu
Mn
Ni
Se
Sn
Te
V
Zn

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Urine Aluminum (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
114	ICP-MS	53	58	14	27	81
147	DRC/CC-ICP-MS	54.8	50.5	<13.5	25.2	69.3
164	ICP-MS	47	53	14	24	71
179	DRC/CC-ICP-MS	45	51	13	23	66
197	ICP-MS	39	46	<20	<20	65
206	DRC/CC-ICP-MS	>20	>20	19.0	>20	>20
305	ICP-MS	45	51	14	28	70
312	ICP-MS	44	48	10	21	63
324	HR-ICP-MS	46.7	51.5	13.2	26.1	72.5
Arithmetic Mean		47	51	14	25	70
SD		5	4	3	2	6
n		8	8	7	7	8

Urine Antimony (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	ICP-MS	4.4	5.0	1.7	2.9	9.0
110	ICP-MS	4.55	5.29	1.75	3.09	9.41
114	ICP-MS	4	5	2	3	9
147	ICP-MS	4.29	4.98	1.69	2.93	8.95
197	ICP-MS	4.4	5.2	1.7	2.9	9.4
206	ICP-MS	4.1	4.7	1.7	2.9	8.7
312	ICP-MS	4.1	5.3	2.1	3.1	9.2
472	ICP-MS	4.4	5.1	1.6	3.1	9.1
Arithmetic Mean		4.3	5.1	1.8	3.0	9.1
SD		0.2	0.2	0.2	0.1	0.2
n		8	8	8	8	8

Urine Barium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
106	ICP-MS	7.3	8.3	2.7	4.1	11.9
107	ICP-MS	7.3	8.2	2.7	4.1	12
110	ICP-MS	7.31	8.26	2.63	4.05	12.1
116	ICP-MS	7.38	8.31	2.77	4.19	12.2
147	ICP-MS	6.91	8.07	2.61	3.95	11.3
197	ICP-MS	7.0	7.7	2.6	3.9	11.4
312	ICP-MS	7.7	8.6	2.5	4.2	12
Arithmetic Mean		7.3	8.2	2.64	4.1	12
SD		0.3	0.3	0.09	0.1	0.4
n		7	7	7	7	7

Urine Beryllium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
106	ICP-MS	5.6	6.6	2.4	4.1	12.9
107	ICP-MS	5.4	6.3	2.1	3.8	12
110	ICP-MS	5.54	6.19	2.22	4.14	11.9
116	ICP-MS	5.54	6.35	2.40	4.31	13.0
147	ICP-MS	5.18	6.51	2.14	3.99	11.80
197	ICP-MS	5.7	6.7	2.2	4.0	11.8
312	ICP-MS	5.6	5.6	2.0	3.6	11
472	ICP-MS	5.2	6.2	2.2	4.4	12.9
Arithmetic Mean		5.5	6.3	2.2	4.0	12.2
SD		0.2	0.3	0.1	0.3	0.7
n		8	8	8	8	8

NOTE: Summary statistics for UE14-15 aluminum corrected on January 26th, 2015.

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Urine Bismuth (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
114	ICP-MS	<1.0	<1.0	<1.0	<1.0	<1.0
147	ICP-MS	0.366	0.274	<0.104	<0.104	<0.104
197	ICP-MS	<1.0	<1.0	<1.0	<1.0	<1.0
206	ICP-MS	<1.0	<1.0	<1.0	<1.0	<1.0
305	ICP-MS	<0.5	<0.5	<0.5	<0.5	<0.5
312	ICP-MS	0.13	0.17	<0.008	<0.008	<0.008

Urine Cesium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	ICP-MS	24	28	10	16	48
110	ICP-MS	25.0	28.7	10.4	16.7	48.9
147	ICP-MS	23.1	27.5	9.78	15.6	45.1
312	ICP-MS	26	27	10	16	47
366	ICP-MS	21.0	24.0	9.1	15.0	44.0
	Arithmetic Mean	24	27	9.9	16	47
	SD	2	2	0.5	1	2
	n	5	5	5	5	5

Urine Chromium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	45.3	46.8	4.05	7.14	21.9
107	DRC/CC-ICP-MS	48.0	50.0	4.6	8.5	25.0
110	DRC/CC-ICP-MS	49.5	51.5	5.10	8.55	25.1
114	ICP-MS	38.4	40.5	3.9	6.6	19.6
147	DRC/CC-ICP-MS	47.2	47.7	4.37	7.44	22.7
156	DRC/CC-ICP-MS	46	48	4.2	7.8	23
164	DRC/CC-ICP-MS	46.1	48.5	4.1	7.5	22.8
179	DRC/CC-ICP-MS	48.3	49.6	4.5	7.6	23.3
197	DRC/CC-ICP-MS	45.3	47.1	4.4	7.7	23.2
206	DRC/CC-ICP-MS	46.5	48.6	4.6	8.0	24.5
305	ICP-MS	49.6	52.9	4.4	7.7	24.6
312	DRC/CC-ICP-MS	38	45	3.7	6.8	20
324	HR-ICP-MS	39.3	37.5	*2.6	5.7	19.5
366	ICP-MS	38.0	40.0	3.3	6.2	19.0
391	DRC/CC-ICP-MS	46.96	48.66	4.74	7.93	23.24
401	DRC/CC-ICP-MS	42.7	45.0	4.0	7.1	21.9
*Outlier	Arithmetic Mean	45	47	4.3	7.4	22
	SD	4	4	0.4	0.8	2
	n	16	16	15	16	16

Urine Cobalt (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	2.96	3.52	8.40	28.3	4.77
107	ICP-MS	3.4	4.0	9.0	30	5.1
110	ICP-MS	3.5	4.13	9.64	33.4	5.66
114	ICP-MS	3.2	3.9	8.2	27.6	4.9
147	ICP-MS	2.95	3.62	8.49	28.8	4.78
156	DRC/CC-ICP-MS	3	3.5	8	27	4.7
164	ICP-MS	2.9	3.7	8.2	29.0	4.6
179	DRC/CC-ICP-MS	3.1	3.7	8.5	29	5
197	ICP-MS	3.0	3.7	8.1	27.9	4.6
206	ICP-MS	3.1	3.5	8.4	28.1	4.9
305	ICP-MS	3.2	3.8	8.6	28.7	4.8
312	ICP-MS	3.2	3.8	8.6	29	4.8
324	HR-ICP-MS	3.3	4.0	9.4	33.0	5.2
391	DRC/CC-ICP-MS	2.93	3.49	*5.31	*4.54	*27.87
401	DRC/CC-ICP-MS	2.8	3.5	8.3	27.7	4.7
*Outlier	Arithmetic Mean	3.1	3.7	8.6	29	4.9
	SD	0.2	0.2	0.5	2	0.3
	n	15	15	14	14	14

NOTE: Summary statistics for UE14-15 cobalt corrected on January 26th, 2015.

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Urine Copper (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
110	ICP-MS	231	268	88.5	172	513
114	ICP-MS	208	244	79	148	438
147	ICP-MS	221	255	83.9	159	471
164	ICP-MS	209	241	83	147	437
179	DRC/CC-ICP-MS	226	260	87	164	492
197	ICP-MS	256.9	289.6	99.3	187.3	558.6
206	ICP-MS	205.2	235.2	83.4	150.9	460.8
305	ICP-MS	238	261	86	163	463
312	ICP-MS	220	248	81	151	456
324	HR-ICP-MS	272.4	314.5	102.8	196.5	588.4
401	DRC/CC-ICP-MS	210.5	239.8	79.5	151.4	455.4
Arithmetic Mean		227	260	87	163	485
SD		21	24	8	16	49
n		11	11	11	11	11

Urine Iodine (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	ICP-MS	130	120	56	46	46
114	ICP-MS	107.2	110.8	47.0	36.9	37.0
156	DRC/CC-ICP-MS	110	110	53	42	42
164	ICP-MS	122	120	56	45	45
179	ICP-MS	125	121	54	44	43
197	ICP-MS	124	120	63	49	50
206	ICP-MS	113.8	112.2	51.1	42.1	41.7
312	ICP-MS	145	137	63	50	50
Arithmetic Mean		122	119	55	44	44
SD		12	9	6	4	4
n		8	8	8	8	8

Urine Lithium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
147	ICP-MS	12.9	13.4	6.43	4.88	4.80

Urine Manganese (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	6.27	7.16	2.17	4.07	11.8
107	DRC/CC-ICP-MS	6.6	7.4	2.3	4.1	12
110	DRC/CC-ICP-MS	6.27	7.31	2.11	3.98	12.3
114	ICP-MS	6.8	8.2	*3.9	5.2	11.6
147	DRC/CC-ICP-MS	6.4	7.47	2.18	4.04	11.9
179	DRC/CC-ICP-MS	5.8	6.7	2.0	3.6	11.2
206	ICP-MS	6.0	6.6	2.3	3.7	11.9
305	ICP-MS	6.5	7.4	2.5	4.1	11.6
312	DRC/CC-ICP-MS	6.4	7.3	2.7	3.9	11
324	HR-ICP-MS	7.3	8.4	2.4	4.7	14.0
391	DRC/CC-ICP-MS	5.92	6.70	2.01	*11.56	*3.78
*Outlier Arithmetic Mean		6.4	7.3	2.3	4.1	11.9
SD		0.4	0.6	0.2	0.5	0.8
n		11	11	10	10	10

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Urine Molybdenum (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	73.2	81.1	40.1	61.5	139
107	ICP-MS	74	82	39	61	140
110	ICP-MS	74.6	83.7	40.5	63.8	144
147	ICP-MS	72.0	83.0	39.5	62.4	141
179	ICP-MS	72	79	38	60	134
197	ICP-MS	*85.6	*99.7	*47.9	*71.0	152.2
312	ICP-MS	74	79	39	63	138
324	HR-ICP-MS	77.1	86.2	40.8	64.9	145.0
*Outlier	Arithmetic Mean	74	82	40	62	142
	SD	2	3	1	2	5
	n	7	7	7	7	8

Urine Nickel (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	DRC/CC-ICP-MS	73.0	73.0	5.0	11.0	14.0
110	ICP-MS	69.7	71.7	5.70	10.4	13.8
114	ICP-MS	62.4	63.0	5.8	*16.0	*22.5
147	DRC/CC-ICP-MS	66.4	72.8	4.87	10.2	13.3
164	ICP-MS	61.4	59.3	4.7	9.2	11.1
179	DRC/CC-ICP-MS	65.1	65.0	5.0	9.9	12.0
197	ICP-MS	66.9	68.2	4.6	10.0	13.0
206	ICP-MS	>20.0	>20.0	5.0	10.4	11.5
312	ICP-MS	59	57	4.6	8.6	11
324	HR-ICP-MS	74.5	76.0	5.3	11.6	14.6
391	DRC/CC-ICP-MS	60.33	60.81	4.43	11.79	8.87
401	DRC/CC-ICP-MS	56.3	58.0	3.7	8.1	10.9
*Outlier	Arithmetic Mean	65	66	4.9	10	12
	SD	6	7	0.6	1	2
	n	11	11	12	11	11

Urine Platinum (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	ICP-MS	2.0	2.3	0.67	1.5	4.8
110	ICP-MS	2.06	2.47	0.620	1.49	4.84
147	ICP-MS	1.87	2.17	0.523	1.31	4.10
312	ICP-MS	2.1	2.4	0.65	1.4	4.6
472	ICP-MS	2.1	2.4	0.7	1.5	4.6
Arithmetic Mean		2.0	2.3	0.63	1.44	4.6
SD		0.1	0.1	0.07	0.08	0.3
n		5	5	5	5	5

Urine Selenium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	74.2	83.8	31.2	48.5	122
110	DRC/CC-ICP-MS	68.0	79.5	33.2	48.2	112
114	ICP-MS	77	82	33	51	124
147	ICP-MS	72.1	78.6	32.3	49.7	123
179	DRC/CC-ICP-MS	73	85	34	51	129
206	ICP-MS	69.2	76.8	32.7	47.7	119.2
305	ICP-MS	80	87	36	*57	144
312	ICP-MS	85	84	29	48	119
*Outlier	Arithmetic Mean	75	82	33	49	124
	SD	6	4	2	1	9
	n	8	8	8	7	8

Urine Silver (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
147	ICP-MS	<0.108	<0.108	<0.108	2.51	2.52

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Urine Strontium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	ICP-MS	70	270	37	37	37

Urine Tellurium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
110	ICP-MS	4.40	5.19	1.15	2.95	9.60
197	ICP-MS	4.1	4.7	1.3	3.1	9.5
206	ICP-MS	3.8	4.2	1.3	3.0	8.7
312	ICP-MS	4.3	5.1	1.3	2.9	9.1
	Arithmetic Mean	4.2	4.8	1.26	2.99	9.2
	SD	0.3	0.5	0.08	0.09	0.4
	n	4	4	4	4	4

Urine Thallium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	11.0	12.8	4.38	7.95	24.6
106	ICP-MS	10.9	12.8	4.3	7.9	24.3
107	ICP-MS	11	13	4.3	7.9	24
110	ICP-MS	10.8	12.6	4.30	7.81	24.0
114	ICP-MS	10.6	12.2	4.2	7.6	23.1
116	ICP-MS	11.0	12.8	4.37	8.01	24.1
147	ICP-MS	10.8	12.7	4.37	7.89	23.9
179	ICP-MS	11	12	4	8	23
197	ICP-MS	10.8	12.7	4.6	8.9	27.0
206	ICP-MS	9.8	>10.0	4.1	7.2	>10.0
305	ICP-MS	10	11	4	7	21
312	ICP-MS	11	12	4.2	8.1	24
324	HR-ICP-MS	11.6	13.5	4.4	8.1	24.9
472	ICP-MS	10.4	12.0	4.2	7.6	23.2
	Arithmetic Mean	10.8	12.5	4.3	7.9	24
	SD	0.5	0.6	0.2	0.4	1.3
	n	14	13	14	14	13

Urine Thorium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
147	ICP-MS	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046

Urine Tin (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
107	ICP-MS	13	14	4.4	8.1	25
110	ICP-MS	12.3	14.0	4.20	7.90	24.1
147	ICP-MS	11.2	13.30	4.00	7.61	23.6
312	ICP-MS	11	13	4	7.7	23
472	ICP-MS	11.8	13.6	3.8	7.7	23.1
	Arithmetic Mean	11.9	13.6	4.1	7.8	23.8
	SD	0.8	0.4	0.2	0.2	0.8
	n	5	5	5	5	5

Urine Tungsten (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	4.17	4.91	1.66	2.96	9.18
107	ICP-MS	4.2	4.9	1.7	3.0	9.2
110	ICP-MS	4.38	5.08	1.70	3.06	9.49
147	ICP-MS	4.3	5.17	1.74	3.09	9.51
312	ICP-MS	4.2	4.8	1.7	3.0	9.2
324	HR-ICP-MS	4.2	4.9	*1.1	*2.5	9.0
472	ICP-MS	4.2	5.0	1.7	3.0	9.0
<i>*Outlier</i>	Arithmetic Mean	4.24	5.0	1.70	3.02	9.2
	SD	0.08	0.1	0.03	0.05	0.2
	n	7	7	6	6	7

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Urine Uranium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
103	DRC/CC-ICP-MS	0.563	0.657	0.231	0.408	1.24
106	ICP-MS	0.56	0.66	0.22	0.41	1.26
107	ICP-MS	0.60	0.71	0.23	0.44	1.4
110	ICP-MS	0.553	0.648	0.216	0.388	1.17
116	ICP-MS	0.533	0.629	0.212	0.393	1.15
147	ICP-MS	0.526	0.624	0.209	0.386	1.18
197	ICP-MS	<1.0	<1.0	<1.0	<1.0	1.0
312	ICP-MS	0.53	0.65	0.22	0.41	1.2
324	HR-ICP-MS	*0.32	*0.40	<LOD	*0.10	0.90
472	ICP-MS	0.5	0.6	0.2	0.4	1.1
*Outlier	Arithmetic Mean	0.55	0.65	0.22	0.40	1.2
	SD	0.03	0.03	0.01	0.02	0.1
	n	8	8	8	8	10

Urine Vanadium (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
147	DRC/CC-ICP-MS	4.52	5.20	1.67	2.95	9.23
179	DRC/CC-ICP-MS	4.1	4.9	1.4	2.7	8.1
197	ICP-MS	4.50	5.10	1.70	3.00	9.30
312	DRC/CC-ICP-MS	5.9	*7.1	1.6	3.2	10
*Outlier	Arithmetic Mean	4.8	5.1	1.6	3.0	9.2
	SD	0.8	0.2	0.1	0.2	0.8
	n	4	3	4	4	4

Urine Zinc (µg/L)						
Lab Code	Method	UE14-11	UE14-12	UE14-13	UE14-14	UE14-15
110	ICP-MS	332	372	145	254	596
114	ICP-MS	300	348	146	230	514
147	ICP-MS	324	360	147	244	576
164	ICP-MS	322	354	140	220	515
179	DRC/CC-ICP-MS	331	366	143	251	593
197	ICP-MS	317.00	347.00	<200	231.00	557.00
206	ICP-MS	298	314	139	215	514
305	ICP-MS	305	330	129	231	531
312	ICP-MS	311	369	139	230	552
324	HR-ICP-MS	*376.0	413.0	168.0	281.0	664.0
401	DRC/CC-ICP-MS	300.7	333.4	117.7	215.7	529.5
*Outlier	Arithmetic Mean	314	355	141	237	558
	SD	13	26	13	20	46
	n	10	11	10	11	11

**New York State Department of Health
Trace Elements in Urine
METHOD NOTES**

ATOMIC SPECTROMETRY METHODS

- A-1 ETAAS-Z (Electrothermal atomic absorption spectrometry with Zeeman background correction)
- A-2 ETAAS Other (i.e., D₂, 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)

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)

ELECTROCHEMICAL METHODS

- E-1 ASV (Anodic stripping voltammetry without digestion)
- E-2 ASV-LeadCare® Blood Lead Testing System
- E-5 ASV-LeadCare® II Blood Lead Testing System
- E-6 ASV-LeadCare® Ultra™ Blood Lead Testing System
- E-3 Fluoride specific electrode

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 $\mu\text{mol ZPP/mol heme}$)

OTHER METHODS

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