

TRACE ELEMENTS IN URINE

Proficiency Test Report

Event #1, 2015

March 2nd, 2015



Department of Health

ANDREW M. CUOMO Governor HOWARD A. ZUCKER, M.D., J.D. Acting Commissioner SALLY DRESLIN, M.S., R.N. Executive Deputy Commissioner

March 2, 2015

Trace Elements in Urine Event #1, 2015

Dear Laboratory Director:

Results from the first proficiency test (PT) event for 2015 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, 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, May 6th, 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, June 3rd, 2015.

Thank you for your participation.

Sincere

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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** <u>Statistical methods for use in proficiency</u> testing by interlaboratory comparisons. Values for urine arsenic range from 25.2 μ g/L (0.34 μ mol/L) to 113.7 μ g/L (1.52 μ mol/L).

Acceptable ranges. The acceptable range is fixed at $\pm 20\%$ or $\pm 6 \mu g/L$ for target values $\leq 30 \mu g/L$. 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 22 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health Urine Arsenic Test Results, 2015 Event #1 ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS										
		Results (µg/L urine)								
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05					
Robust Mean	64.0	81.0	25.2	29.1	113.7					
Robust Standard Deviation	4.7	5.3	1.5	1.7	7.9					
Standard Uncertainty	1.3	1.4	0.4	0.5	2.1					
RSD (%)	7.4	6.6	6.0	5.9	7.0					
Number of Sample Measurements	22	22	22	22	22					
Accentable Bange										
Upper Limit	76.8	97.2	31.2	35.1	136.4					
Lower Limit	51.2	64.8	19.2	23.1	91.0					

New York State Department of Health Urine Arsenic Test Results, 2015 Event #1 PERFORMANCE OF PARTICIPATING LABORATORIES

Lab		Results (µg/L urine)						
Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05	Only	
		Target Values: 64.0	81.0	25.2	29.1	113.7		
103	DRC/CC-ICP-MS	67.7	85.0	25.9	30.1	121.4	Info	
106	DRC/CC-ICP-MS	67.0	80.9	25.1	29.2	113.6	Info	
107	DRC/CC-ICP-MS	63	78	24	27	110	Info	
110	DRC/CC-ICP-MS	66.3	87.5	25.8	32.1	121.0		
114	ICP-MS	57.0	82.0	23.0	30.0	119.0		
116	DRC/CC-ICP-MS	59.2	74.9	23.0	26.6	111.0	Info	
147	ICP-MS	56.4	70.3	22.5	25.6	99.6	Info	
156	DRC/CC-ICP-MS	56.0	72.0	21.0	25.0	100.0		
164	ICP-MS	71.0	86.0	30.0	30.0	121.0		
179	ICP-MS	64.0	81.0	26.0	30.0	112.0		
197	DRC/CC-ICP-MS	63.0	85.0	26.0	32.0	120.0		
200	ICP-MS	64.9	82.5	25.9	30.1	115.0	Info	
206	DRC/CC-ICP-MS	61.9	78.2	25.1	29.0	115.6		
208	ICP-MS	66.5	80.3	27.1	28.4	110.3		
293	DRC/CC-ICP-MS	64.6	81.7	25.5	29.0	115.4	Info	
305	ICP-MS	73.0	97.0	28.0	31.0	127.0		
312	DRC/CC-ICP-MS	56.0	72.5	24.3	24.8	99.3		
339	HR-ICP-MS	59.8	75.9	22.9	28.0	107.7	Info	
366	DRC/CC-ICP-MS	68.0	79.0	28.0	29.0	98.0	Info	
367	DRC/CC-ICP-MS	69.0	87.0	26.0	31.0	123.0	Info	
391	DRC/CC-ICP-MS	64.8	84.4	24.8	28.8	113.6	Info	
401	DRC/CC-ICP-MS	64.5	82.3	24.9	29.5	115.3	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, 2015 Event #1
STATISTICAL SUMMARY BY METHOD

		Result	ts (µg/L uri	ne)	
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
DRC/CC-ICP-MS					
Number of Sample Measurements:	14	14	14	14	14
Mean:	63.6	80.6	25.0	28.8	112.7
Standard Deviation:	4.2	5.1	1.6	2.3	8.3
RSD (%):	6.5	6.3	6.5	7.9	7.4
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	59.8	75.9	22.9	28.0	107.7
Standard Deviation:	?	?	?	?	?
RSD (%):	_	_	_	_	_
ICP-MS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	64.7	82.7	26.1	29.3	114.8
Standard Deviation:	6.3	7.9	2.7	1.8	8.8
RSD (%):	9.8	9.6	10.2	6.2	7.7
All Laboratories					
Number of Sample Measurements:	22	22	22	22	22
Mean:	63.8	81.1	25.2	28.9	113.1
Standard Deviation:	4.8	6.0	2.0	2.1	8.2
RSD (%):	7.6	7.4	8.1	7.1	7.2

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** <u>Statistical methods for use in proficiency</u> testing by interlaboratory comparisons. Values for urine cadmium range from 1.7 μ g/L (15 nmol/L) to 12.8 μ g/L (114 nmol/L).

Acceptable ranges. The acceptable range is fixed at $\pm 15\%$ or $\pm 1 \mu g/L$ (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, 95.5% of test results reported were judged as satisfactory, with one of the 22 participant laboratories (4.5%) reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health Urine Cadmium Test Results, 2015 Event #1 ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS										
		Results (μ g/L urine)								
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05					
Robust Mean	12.8	3.2	4.8	10.1	1.7					
Robust Standard Deviation	0.7	0.2	0.2	0.5	0.1					
Standard Uncertainty	0.2	<0.1	0.1	0.1	<0.1					
RSD (%)	5.3	5.6	5.2	5.0	6.3					
Number of Sample Measurements	22	22	22	22	22					
Acceptable Range:	14 7	4.2	5.8	11.6	27					
Lower Limit	10.9	2.2	3.8	8.6	0.7					

New York State Department of Health Urine Cadmium Test Results, 2015 Event #1 PERFORMANCE OF PARTICIPATING LABORATORIES

Lab	Results (µg/L urine)							Info
Code	Method	U	E15-01	UE15-02	UE15-03	UE15-04	UE15-05	Only
		Target Values:	12.8	3.2	4.8	10.1	1.7	
103	DRC/CC-ICP-MS		13.2	3.2	4.9	9.9	1.7	Info
106	ICP-MS		13.0	3.3	4.9	10.1	1.7	Info
107	DRC/CC-ICP-MS		15	† 3.4	5.0	11	1.8	Info
110	ICP-MS		12.8	3.2	4.8	9.9	1.7	
114	ICP-MS		12.2	3.1	4.7	9.4	1.6	
116	ICP-MS		13.3	3.4	5.0	10.2	1.7	Info
147	ICP-MS		12.4	3.1	4.7	10.1	1.6	Info
156	ICP-MS		12.0	2.9	4.5	9.6	1.6	
164	ICP-MS		12.6	3.3	4.5	9.8	1.7	
179	ICP-MS		12.8	3.2	4.8	10.5	1.7	
197	DRC/CC-ICP-MS		12.8	3.2	5.0	10.2	1.8	
200	ICP-MS		12.9	3.3	4.7	9.8	1.7	Info
206	ICP-MS		13.2	3.3	4.9	9.5	1.6	
208	ICP-MS		12.4	2.9	4.8	9.9	1.6	
293	ICP-MS		14.2	3.4	5.2	10.9	1.8	Info
305	ICP-MS		15.0	† 4.0	6.0	† 11.0	2.0	
312	ICP-MS		12.0	3.4	4.7	10.1	1.7	
339	HR-ICP-MS		10.8	↓ 2.7	4.1	8.8	1.4	Info
366	ICP-MS		12.5	2.9	4.5	8.1	↓ 1.2	Info
367	DRC/CC-ICP-MS		14.6	3.7	5.5	11.1	2.0	Info
391	DRC/CC-ICP-MS		11.9	3.1	4.5	10.2	1.7	Info
401	DRC/CC-ICP-MS		12.9	3.1	4.7	10.1	1.7	Info

Percent satisfactory results for all participants: 95.5 %

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, 2015 Event #1
STATISTICAL SUMMARY BY METHOD

		Result	ts (µg/L uri	ne)		
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05	
DRC/CC-ICP-MS						
Number of Sample Measurements:	6	6	6	6	6	
Mean:	13.4	3.3	4.9	10.4	1.8	
Standard Deviation:	1.2	0.2	0.3	0.5	0.1	
RSD (%):	8.8	7.1	6.9	4.8	6.6	
HR-ICP-MS						
Number of Sample Measurements:	1	1	1	1	1	
Mean:	10.8	2.7	4.1	8.8	1.4	
Standard Deviation:	?	?	?	?	?	
RSD (%):	_	_	_	_	_	
ICP-MS						
Number of Sample Measurements:	15	15	15	15	15	
Mean:	12.9	3.2	4.8	9.9	1.7	
Standard Deviation:	0.8	0.3	0.4	0.7	0.2	
RSD (%):	6.3	8.5	7.7	6.9	9.9	
All Laboratories						
Number of Sample Measurements:	22	22	22	22	22	
Mean:	12.9	3.2	4.8	10.0	1.7	
Standard Deviation:	1.0	0.3	0.4	0.7	0.2	
RSD (%):	7.9	8.6	8.0	7.0	10.0	

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** <u>Statistical methods for use in proficiency</u> testing by interlaboratory comparisons. Values for urine mercury range from 18.6 µg/L (93 nmol/L) to 83.8 µg/L (418 nmol/L).

Acceptable ranges. The acceptable range is fixed at $\pm 30\%$ or $\pm 3 \mu g/L$ (15 nmol/L) for target values $\leq 10 \mu g/L$. The criteria are consistent with those in place for blood Hg.

Discussion. Based upon the above criteria, 96.2% of test results reported were judged as satisfactory, with none of the 21 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health Urine Mercury Test Results, 2015 Event #1 ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS										
		Results (µg/L urine)								
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05					
Daharat Maar										
Robust Mean	18.6	25.5	62.7	48.4	83.8					
Robust Standard Deviation	2.0	2.1	5.2	5.3	5.4					
Standard Uncertainty	0.5	0.6	1.4	1.5	1.5					
RSD (%)	10.7	8.4	8.2	11.0	6.5					
Number of Sample Measurements	21	21	21	21	21					
Accentable Bange										
Upper Limit	24.2	33.2	81.5	62.9	108.9					
Lower Limit	13.0	17.8	43.9	33.9	58.7					

New York State Department of Health Urine Mercury Test Results, 2015 Event #1 PERFORMANCE OF PARTICIPATING LABORATORIES

Lab		Results (μ g/L urine)						
Lab Code	Method	UI	E15-01	UE15-02	UE15-03	UE15-04	UE15-05	Only
		Target Values:	18.6	25.5	62.7	48.4	83.8	
103	DRC/CC-ICP-MS		18.1	24.2	60.1	45.6	79.8	Info
107	DRC/CC-ICP-MS		21	29	74	52	95	Info
109	AFS		19.8	26.2	62.6	51.9	85.6	Info
110	ICP-MS		18.7	26.3	63.0	47.7	84.9	
114	ICP-MS		24.0	32.0	80.0	58.0	113.0 🕇	
147	CV-AAS		17.6	25.0	59.8	46.0	80.1	Info
156	ICP-MS		17.0	24.0	59.0	44.0	83.0	
164	ICP-MS		19.0	27.0	64.0	50.0	86.0	
179	ICP-MS		17.0	23.0	58.0	44.0	79.0	
197	DRC/CC-ICP-MS		22.0	30.0	75.0	57.0	101.0	
199	ICP-MS		19.7	27.2	69.8	53.1	94.1	Info
200	ICP-MS		19.2	26.8	69.0	72.4	† 88.2	Info
206	ICP-MS		17.4	24.8	57.4	47.7	78.1	
208	CV-AAS		17.9	24.1	61.3	47.9	80.3	
293	ICP-MS		16.8	25.3	60.9	47.3	82.2	Info
305	ICP-MS		28.0	† 31.0	70.0	52.0	87.0	
312	ICP-MS		18.4	24.9	61.5	46.3	83.1	
339	HR-ICP-MS		12.2	↓ 21.1	46.3	43.0	71.6	Info
366	ICP-MS		19.4	24.0	62.0	41.0	82.0	Info
367	CV-AAS		17.8	25.8	65.0	49.1	86.4	Info
401	DRC/CC-ICP-MS		14.0	19.5	50.4	39.1	67.7	Info

Percent satisfactory results for all participants: 96.2 %

notes: † Reported outside upper limit Reported outside lower limit Result unacceptable

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

▲: Result not reported

New York State Department of Health Urine Mercury Test Results, 2015 Event #1 STATISTICAL SUMMARY BY METHOD

		Result	ts (µg/L uri	ne)		
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05	
AFS						
Number of Sample Measurements:	1	1	1	1	1	
Mean:	19.8	26.2	62.6	51.9	85.6	
Standard Deviation:	?	?	?	?	?	
RSD (%):	—	_	—	—	—	
CV-AAS						
Number of Sample Measurements:	3	3	3	3	3	
Mean:	17.8	25.0	62.0	47.7	82.3	
Standard Deviation:	0.2	0.9	2.7	1.6	3.6	
RSD (%):	-	_	—	—	_	
DRC/CC-ICP-MS						
Number of Sample Measurements:	4	4	4	4	4	
Mean:	18.8	25.7	64.9	48.4	85.9	
Standard Deviation:	3.6	4.8	11.8	7.8	15.0	
RSD (%):	19.1	18.8	18.2	16.1	17.5	
HR-ICP-MS						
Number of Sample Measurements:	1	1	1	1	1	
Mean:	12.2	21.1	46.3	43.0	71.6	
Standard Deviation:	?	?	?	?	?	
RSD (%):	_	_	—	—	_	
ICP-MS						
Number of Sample Measurements:	12	12	12	12	12	
Mean:	19.6	26.4	64.6	50.3	86.7	
Standard Deviation:	3.3	2.7	6.6	8.3	9.3	
RSD (%):	16.8	10.4	10.2	16.6	10.7	
All Laboratories						
Number of Sample Measurements:	21	21	21	21	21	
Mean:	18.8	25.8	63.3	49.3	85.1	
Standard Deviation:	3.3	3.0	7.8	7.1	9.7	
RSD (%):	17.3	11.7	12.4	14.5	11.4	

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** <u>Statistical methods for use in proficiency</u> testing by interlaboratory comparisons. Values for urine lead range from 24.0 μ g/L (0.12 μ mol/L) to 187.0 μ g/L (0.90 μ mol/L).

Acceptable ranges. The acceptable range is fixed at $\pm 10\%$ or $\pm 40 \ \mu$ g/L (0.19 μ mol/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 20 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health Urine Lead Test Results, 2015 Event #1 ROBUST STATISTICAL SUMMARY

TARG	ET VALUE	ASSIGNMENT	AND STATIS	STICS						
	Results (µg/L urine)									
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05					
Robust Mean	187.0	46.4	70.1	84.4	24.0					
Robust Standard Deviation	9.8	2.2	4.2	4.6	1.3					
Standard Uncertainty	2.7	0.6	1.2	1.3	0.4					
RSD (%)	5.2	4.8	5.9	5.4	5.4					
Number of Sample Measurements	20	20	20	20	20					
Acceptable Range:										
Upper Limit	227.0	86.4	110.1	124.4	64.0					
Lower Limit	147.0	6.4	30.1	44.4	0.0					

New York State Department of Health Urine Lead Test Results, 2015 Event #1 PERFORMANCE OF PARTICIPATING LABORATORIES

Lah			Resu	lts (µg/L ui	rine)		Info
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05	Only
		Target Values: 187.0	46.4	70.1	84.4	24.0	
103	DRC/CC-ICP-MS	185.7	45.5	68.4	83.0	23.3	Info
106	ICP-MS	196.2	48.4	73.6	88.9	24.7	Info
107	ICP-MS	200	51	76	92	26	Info
110	ICP-MS	192.0	47.3	71.2	86.1	24.1	
114	ICP-MS	181.0	44.0	67.0	81.0	23.0	
116	ICP-MS	188.9	46.8	70.7	86.8	24.1	Info
147	ICP-MS	181.5	45.6	68.4	82.5	22.8	Info
156	DRC/CC-ICP-MS	180.0	46.0	69.0	84.0	23.0	
164	ICP-MS	191.0	47.0	71.0	86.0	25.0	
179	ICP-MS	185.0	45.0	70.0	83.0	24.0	
197	DRC/CC-ICP-MS	202.6	50.6	76.4	93.4	26.0	
200	ICP-MS	180.1	45.1	66.2	80.7	24.8	Info
206	ICP-MS	175.8	44.8	65.4	78.8	22.3	
208	ICP-MS	193.6	48.8	74.2	88.5	24.7	
293	ICP-MS	199.5	48.9	73.8	89.5	24.9	Info
305	ICP-MS	196.0	50.0	73.0	83.0	23.0	
312	ICP-MS	186.0	45.9	69.9	84.1	23.2	
339	HR-ICP-MS	147.2	44.6	63.7	85.4	23.3	Info
366	ICP-MS	185.0	43.0	69.0	73.0	22.0	Info
391	ETAAS-Z	163.1	43.5	64.3	76.7	25.1	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 Lead Test Results, 2015 Event #1 STATISTICAL SUMMARY BY METHOD

		Resul	ts (µg/L uri	ne)		
	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05	
DRC/CC-ICP-MS						
Number of Sample Measurements:	3	3	3	3	3	
Mean:	189.4	47.4	71.3	86.8	24.1	
Standard Deviation:	11.8	2.8	4.5	5.7	1.7	
RSD (%):	—	—	—	—	—	
ETAAS-Z						
Number of Sample Measurements:	1	1	1	1	1	
Mean:	163.1	43.5	64.3	76.7	25.1	
Standard Deviation:	?	?	?	?	?	
RSD (%):	_	_	_	_	_	
HR-ICP-MS						
Number of Sample Measurements:	1	1	1	1	1	
Mean:	147.2	44.6	63.7	85.4	23.3	
Standard Deviation:	?	?	?	?	?	
RSD (%):	_	_	_	_	_	
ICP-MS						
Number of Sample Measurements:	15	15	15	15	15	
Mean:	188.8	46.8	70.6	84.3	23.9	
Standard Deviation:	7.5	2.3	3.1	4.8	1.1	
RSD (%):	4.0	4.9	4.4	5.7	4.8	
All Laboratories						
Number of Sample Measurements:	20	20	20	20	20	
Mean:	185.5	46.6	70.1	84.3	24.0	
Standard Deviation:	13.0	2.4	3.7	5.0	1.2	
RSD (%):	7.0	5.1	5.3	5.9	4.8	

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
Ва	Al
Be	Cr
Co	Cu
Cs	Mn
Мо	Ni
Pt	Se
Sb	Sn
ТІ	Те
U	V
W	Zn

ne Aluminum (µg/L)									
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05			
114	ICP-MS	95	23	38	7	13			
147	DRC/CC-ICP-MS	86.3	25.2	35.6	<13.5	14.1			
164	ICP-MS	92	25	34	8	14			
179	DRC/CC-ICP-MS	89	23	35	7	13			
197	ICP-MS	93	22	34	<20	<20			
206	DRC/CC-ICP-MS	>20	>20	>20	19	>20			
305	ICP-MS	96	*31	40	14	*35			
312	ICP-MS	88.8	23.8	33.9	7.5	13.4			
*Outlier	Arithmetic Mean	91	24	36	10	14			
	SD	4	1	2	5	1			
	n	7	6	7	6	5			

ne Antimony (µ	g/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	12.7	3.01	4.75	0.787	1.57
107	ICP-MS	12	3.1	4.6	0.81	1.6
110	ICP-MS	12.4	3.08	4.60	0.793	1.55
114	ICP-MS	11	3	4	<1	*1
147	ICP-MS	11.5	2.93	4.41	0.761	1.47
197	ICP-MS	13.0	3.2	4.8	<1.0	1.6
206	ICP-MS	11.6	3.4	4.5	<2.0	<2.0
312	ICP-MS	11.8	3.1	4.5	0.8	1.5
*Outlier	Arithmetic Mean	12.0	3.1	4.5	0.79	1.5
	SD	0.7	0.1	0.2	0.02	0.1
	n	8	8	8	5	6

		•	÷·-			
	n	8	8	8	5	6
ne Barium (µg/I	L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
106	ICP-MS	16.2	4.0	6.0	1.1	2.1
107	ICP-MS	15	3.9	5.9	1.2	2.1
110	ICP-MS	15.6	3.96	6.02	1.19	2.10
116	ICP-MS	15.1	3.98	5.76	1.17	2.07
147	ICP-MS	15.8	4.08	6.04	1.15	2.11
197	ICP-MS	15.4	3.8	5.8	<2.0	2.0
312	ICP-MS	16.9	3.9	5.9	1.1	2.1
	Arithmetic Mean	15.7	3.95	5.9	1.15	2.08
	SD	0.7	0.09	0.1	0.04	0.04
	n	7	7	7	6	7

Urine Beryllium (µg,	/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
106	ICP-MS	17.7	4.3	6.4	1.1	2.3
107	ICP-MS	15	3.7	5.6	0.95	1.9
110	ICP-MS	15.9	4.10	5.91	0.961	2.14
116	ICP-MS	17.6	4.53	6.74	1.03	2.16
147	ICP-MS	15.1	3.80	5.88	1.04	1.89
197	ICP-MS	13.8	3.7	5.1	1.1	1.8
312	ICP-MS	14.7	4.5	6.4	1.2	2.2
	Arithmetic Mean	16	4.1	6.0	1.05	2.1
	SD	1	0.4	0.6	0.09	0.2
	n	7	7	7	7	7

Urine Bismuth (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
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	<0.008	<0.008	<0.008	<0.008	<0.008
Urine Cesium (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
107	ICP-MS	61	16	24	5.0	8.9
110	ICP-MS	65.4	17.0	25.1	5.03	9.08
147	ICP-MS	63.5	16.9	24.6	4.97	8.93
312	ICP-MS	63.5	16.3	24.5	4.9	8.7

63

2

4

16.6

0.5

4

24.6

0.5

4

4.98

0.06

4

8.9

0.2

4

Arithmetic Mean

SD

n

e Chromium (µ	ıg/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	33.0	8.19	12.5	2.13	4.18
107	DRC/CC-ICP-MS	30	8.1	12	2.5	4.2
110	DRC/CC-ICP-MS	32.9	8.73	12.7	2.45	4.54
114	ICP-MS	32.0	8.2	12.3	2.2	4.3
147	DRC/CC-ICP-MS	29.0	7.12	10.8	1.87	3.57
156	DRC/CC-ICP-MS	31	7.8	11	2.1	4
164	DRC/CC-ICP-MS	28.1	6.7	10.6	1.8	3.8
179	DRC/CC-ICP-MS	30.3	7.5	11.4	1.9	3.9
197	DRC/CC-ICP-MS	32.6	8.3	12.7	2.2	4.4
206	DRC/CC-ICP-MS	32.0	8.9	12.3	2.1	4.3
305	ICP-MS	34.2	8.2	11.9	2.1	4.2
312	DRC/CC-ICP-MS	28.8	8.1	11.0	2.5	4.0
366	DRC/CC-ICP-MS	29	7.0	11.0	1.7	3.1
401	DRC/CC-ICP-MS	29.5	7.3	11.0	1.9	3.8
	Arithmetic Mean	31	7.9	11.7	2.1	4.0
	SD	2	0.7	0.8	0.3	0.4
	n	14	14	14	14	14

Urine Cobalt (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	6.67	6.95	3.56	0.570	1.43
107	ICP-MS	6.4	6.5	3.4	0.57	1.3
110	ICP-MS	6.66	6.89	3.63	0.584	1.51
114	ICP-MS	6.1	6.4	3.3	<1.0	1.3
147	ICP-MS	6.07	6.36	3.33	0.532	1.30
156	DRC/CC-ICP-MS	5.9	5.9	3.2	<1.0	1.2
164	ICP-MS	5.7	6.0	3.2	0.5	1.2
179	DRC/CC-ICP-MS	6.7	7.2	3.7	0.6	1.4
197	ICP-MS	6.1	6.4	3.5	<1.0	1.3
206	ICP-MS	6.1	6.3	3.4	<1.0	1.4
305	ICP-MS	6.3	6.7	3.6	0.5	1.4
312	ICP-MS	6.4	7.9	3.5	<0.08	1.4
366	ICP-MS	6.4	6.0	3.3	0.5	1.1
391	DRC/CC-ICP-MS	6.6	7.0	3.6	0.7	1.5
401	DRC/CC-ICP-MS	6.1	6.5	3.3	0.6	1.3
	Arithmetic Mean	6.3	6.6	3.4	0.57	1.3
	SD	0.3	0.5	0.2	0.06	0.1
	n	15	15	15	10	15

ne Copper (µg/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
110	ICP-MS	641	163	238	44.1	84.7
114	ICP-MS	590	152	226	44	81
147	ICP-MS	599	152	230	41.7	78.1
164	ICP-MS	577	142	214	39	73
179	DRC/CC-ICP-MS	664	166	250	45	86
197	ICP-MS	649.5	168.5	250.6	51.9	90.1
206	ICP-MS	581.5	156.2	220.2	43.6	76.8
305	ICP-MS	658	156	237	44	82
312	ICP-MS	598	151	226	42.4	80.7
401	DRC/CC-ICP-MS	688.2	168.5	252.5	44.5	85.9
	Arithmetic Mean	625	158	234	44	82
	SD	40	9	13	3	5
	n	10	10	10	10	10

	n	10	10	10	10	10
ine Iodine (μg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
107	ICP-MS	49	50	50	50	50
114	ICP-MS	40.2	41.7	40.7	42.7	41.1
156	DRC/CC-ICP-MS	43	44	44	44	43
164	ICP-MS	41	43	43	43	43
179	ICP-MS	43	44	43	43	43
197	ICP-MS	40	41	42	41	42
206	ICP-MS	41.4	42.3	41.8	42.3	41.7
312	ICP-MS	48.2	49.8	47.5	49.2	49.1
	Arithmetic Mean	43	44	44	44	44
	SD	4	4	3	3	3
	n	8	8	8	8	8

	n	8	8	8	8	8
			-	-	-	
Urine Lithium (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
147	ICP-MS	4.68	4.94	4.85	4.91	4.87
147	ICP-MS	4.68	4.94	4.85	4.91	4.87

Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	15.9	3.89	6.00	1.11	1.93
107	DRC/CC-ICP-MS	18	3.8	5.8	1.1	2.0
110	DRC/CC-ICP-MS	16.3	4.25	6.16	0.947	2.08
114	ICP-MS	15.8	4.0	5.9	<2.5	<2.5
147	DRC/CC-ICP-MS	15.2	3.80	5.93	0.961	1.88
179	DRC/CC-ICP-MS	17.3	4.3	6.4	1.4	2.3
206	ICP-MS	15.7	4.2	5.9	1.5	2.2
305	ICP-MS	15.6	3.9	6.1	1.0	2.0
312	DRC/CC-ICP-MS	13.8	*3.0	5.1	0.9	1.6
391	DRC/CC-ICP-MS	15.7	4.4	5.9	1.4	*5.2
*Outlier	Arithmetic Mean	16	4.1	5.9	1.1	2.0
	SD	1	0.2	0.3	0.2	0.2
	n	10	9	10	9	8

Urine Molybdenum	(µg/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	183.7	63.3	83.2	34.5	44.6
107	ICP-MS	180	62	81	34	44
110	ICP-MS	184	64.2	83.4	35.1	44.8
147	ICP-MS	171.0	60.9	78.5	33.0	41.9
179	ICP-MS	176	63	84	35	44
197	ICP-MS	177.2	65.4	84.1	35.9	44.2
312	ICP-MS	168	60.1	77.7	32.8	42.4
	Arithmetic Mean	177	63	82	34	44
	SD	6	2	3	1	1
	n	7	7	7	7	7
Urine Nickel (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
107	DRC/CC-ICP-MS	16	5.8	7.3	2.0	2.9
110	ICP-MS	17.6	5.53	6.91	<2.2	2.48
114	ICP-MS	15.8	5.6	6.8	<2.5	2.8
147	DRC/CC-ICP-MS	16.6	5.87	7.16	1.63	2.65
164	ICP-MS	16.8	5.2	6.5	1.8	2.7
179	DRC/CC-ICP-MS	16.0	5.2	6.7	1.6	2.7
197	ICP-MS	16.7	5.6	7.1	<2.0	2.6
206	ICP-MS	13.3	*2.4	*4.1	<2.0	<2.0
312	ICP-MS	14.9	5.4	6.3	2.0	2.7
391	DRC/CC-ICP-MS	16.1	5.5	6.9	1.6	3.3
401	DRC/CC-ICP-MS	15.3	6.3	6.4	1.8	2.8
*Outlier	Arithmetic Mean	16	5.6	6.8	1.8	2.8
	SD	1	0.3	0.3	0.2	0.2
	n	11	10	10	7	10
Urine Platinum (µg/	'L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
107	ICP-MS	6.6	1.6	2.3	0.40	0.79
110	ICP-MS	6.34	1.56	2.38	0.395	0.799
147	ICP-MS	5.81	1.40	2.20	0.396	0.712
312	ICP-MS	6.3	1.5	2.3	0.4	0.7
	Arithmetic Mean	6.3	1.52	2.30	0.398	0.75
	SD	0.3	0.09	0.07	0.003	0.05
	-	4	4	4	4	4

Urine Selenium (µg,	/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	168.4	50.3	71.5	24.4	32.6
110	DRC/CC-ICP-MS	172	50.4	62.1	21.0	29.4
114	ICP-MS	149	47	66	23	31
147	ICP-MS	154	48.7	64.8	22.2	29.9
179	DRC/CC-ICP-MS	166	50	70	23	31
206	ICP-MS	157.8	49.8	64.4	26.2	29.9
305	ICP-MS	174	54	73	25	33
312	ICP-MS	153	51.4	73.7	25.2	35.2
	Arithmetic Mean	162	50	68	24	32
	SD	10	2	4	2	2
	n	8	8	8	8	8

Urine Strontium (µ	g/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	37.9	37.2	37.4	36.9	37.0
107	ICP-MS	36	36	36	36	36
Urine Tellurium (µg	g/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
110	ICP-MS	13.0	3.13	4.75	0.886	1.60
197	ICP-MS	13.1	3.1	4.9	<1.0	1.6
206	ICP-MS	11.7	2.8	4.4	1.1	1.6
312	ICP-MS	10.9	3.3	5.0	0.8	1.6
	Arithmetic Mean	12	3.1	4.8	0.9	1.6
	SD	1	0.2	0.3	0.2	-
	n	4	4	4	3	4
Urine Thallium (µg,	/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	29.4	7.25	10.9	1.90	3.71
106	ICP-MS	31.5	7.9	12.0	2.1	4.0
107	ICP-MS	34	8.4	13	2.1	4.1
110	ICP-MS	32.0	7.90	11.9	2.05	4.01
114	ICP-MS	31.6	7.8	11.6	2.1	4.0
116	ICP-MS	31.6	7.78	11.8	2.09	4.01
147	ICP-MS	30.0	7.44	11.3	1.94	3.82
179	ICP-MS	31	8	11	2	4
197	ICP-MS	29.5	7.2	11.1	2.0	3.7
206	ICP-MS	>25.0	7.3	10.9	1.9	3.6
305	ICP-MS	30	7	11	2	4
312	ICP-MS	29.0	7.1	10.8	1.9	3.6
	Arithmetic Mean	31	7.6	11.4	2.01	4
	SD	1	0.4	0.6	0.08	0.2
				4.0	4.0	

Urine Thorium (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
147	ICP-MS	<0.005	<0.005	<0.005	<0.005	<0.005

ne Tin (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
107	ICP-MS	32	8.0	12	2.2	4.2
110	ICP-MS	32.0	7.96	12.0	2.17	4.14
147	ICP-MS	31.6	7.76	11.80	2.10	3.93
312	ICP-MS	29.8	7.6	11.1	2.1	4.0
	Arithmetic Mean	31	7.8	11.7	2.14	4.1
	SD	1	0.2	0.4	0.05	0.1
	n	4	4	4	4	4

ne Tungsten (µg	:/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
107	ICP-MS	12	3.2	4.6	0.83	1.6
110	ICP-MS	12.7	3.14	4.71	0.784	1.60
147	ICP-MS	12.2	3.09	4.49	0.853	1.53
312	ICP-MS	11.5	2.9	4.1	0.7	1.4
	Arithmetic Mean	12.1	3.1	4.5	0.79	1.53
	SD	0.5	0.1	0.3	0.07	0.09
	n	4	4	4	4	4

Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
103	DRC/CC-ICP-MS	1.62	0.397	0.595	0.104	0.200
106	ICP-MS	1.6	0.4	0.6	0.1	0.2
107	ICP-MS	1.7	0.43	0.63	0.11	0.22
110	ICP-MS	1.58	0.396	0.588	0.103	0.206
116	ICP-MS	1.55	0.379	0.578	0.103	0.199
147	ICP-MS	1.52	0.371	0.571	0.0960	0.194
197	ICP-MS	1.4	<1.0	<1.0	<1.0	<1.0
312	ICP-MS	1.5	0.4	0.6	0.1	0.2
	Arithmetic Mean	1.56	0.40	0.59	0.102	0.203
	SD	0.09	0.02	0.02	0.004	0.008
	n	8	7	7	7	7

ie Vanadium (μ	g/L)					
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
147	DRC/CC-ICP-MS	11.6	2.86	4.31	0.755	1.47
179	DRC/CC-ICP-MS	10.9	2.7	3.9	0.7	1.3
197	ICP-MS	11.00	2.70	4.10	<1.00	1.30
312	DRC/CC-ICP-MS	7.6	2.1	2.9	0.5	1.0
	Arithmetic Mean	10	2.6	3.8	0.7	1.3
	SD	2	0.3	0.6	0.1	0.2
	n	4	4	4	3	4

Urine Zinc (µg/L)						
Lab Code	Method	UE15-01	UE15-02	UE15-03	UE15-04	UE15-05
110	ICP-MS	713	233	312	116	162
114	ICP-MS	655	240	311	140	180
147	ICP-MS	686	238	316	113	152
164	ICP-MS	678	219	297	109	145
179	DRC/CC-ICP-MS	739	241	326	123	162
197	ICP-MS	753	247	327	<200	<200
206	ICP-MS	652	213	280	116	143
305	ICP-MS	716	223	323	113	152
312	ICP-MS	632	227	308	115	152
401	DRC/CC-ICP-MS	686.4	222.3	300.7	111.1	150.4
	Arithmetic Mean	691	230	310	117	155
	SD	39	11	15	9	11
	n	10	10	10	9	9

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 μ mol ZPP/mol heme)

OTHER METHODS

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