
Wadsworth Center

New York State Department of Health

TRACE ELEMENTS IN URINE

Event #3, 2007

October 18, 2007



STATE OF NEW YORK DEPARTMENT OF HEALTH

Wadsworth Center The Governor Nelson A. Rockefeller Empire State Plaza P.O. Box 509 Albany, New York 12201-0509

Richard F. Daines, M.D.
Commissioner

Wendy E. Saunders
Chief of Staff

October 18, 2007

Trace Elements in Urine Event #3, 2007

Dear Laboratory Director:

Results from the third Trace Elements in Urine proficiency test (PT) event have been tabulated and summarized. Target values for Arsenic, Cadmium and Lead have been established along with acceptable ranges. **Target values for urine mercury (U-Hg) were not established due to a lack of consensus among the reference laboratories. The situation with regard to U-Hg is discussed more fully in the narrative section.**

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, each pool was acidified to 1% v/v nitric acid, and then stored at -80°C. After thawing each pool, precipitated salts were removed by decanting, and then filtered through a 10.0-µm Teflon membrane. Sulfamic acid was added to the filtered urine pools as a mercury preservative. Each pool was supplemented with solutions containing As, Cd, Hg and Pb as inorganic salts. In addition, these pools were spiked with additional trace elements that comprise the "NHANES suite" and include: Ba, Be, Co, Cs, Mo, Pt, Sb, Tl, U and W. After spiking, each pool was stirred for 24 hours to ensure sample homogeneity prior to aliquoting into acid-leached polypropylene vials.

The next PT event for trace elements in urine is scheduled to be mailed January 8th, 2008. Please inform our laboratory staff at (518) 474-4484 if the test materials have not arrived within five days of the scheduled mailout date. The postmark deadline for reporting results is February 5th, 2008.

Thank you for your participation.

Sincerely,

Patrick J. Parsons, Ph.D.
Section Head, Trace Elements Proficiency Testing Program

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, each pool was acidified to 1% v/v nitric acid, and then stored at -80°C. After thawing each pool, precipitated salts were removed by decanting, and then filtered through a 10.0- μ m Teflon membrane. Sulfamic acid was added to the filtered urine pools as a mercury preservative. Each pool was supplemented with inorganic As³⁺, and then stirred for 24 hours to ensure sample homogeneity prior to aliquoting into acid-leached polypropylene vials.

Target values were established as the mean of 16 referee laboratories using quadrupole-based ICP-MS or ETAAS instrumentation. Values range from 32.4 μ g/L (0.43 μ mol/L) to 321.3 μ g/L (4.29 μ mol/L). Among the referee group, imprecision (SD) varied from \pm 3.4 μ g/L (0.05 μ mol/L) to \pm 19.7 μ g/L (0.26 μ mol/L), increasing with As concentration.

Acceptable ranges were fixed at \pm 20% or \pm 10 μ g/L (0.13 μ mol/L) around the target value, whichever is greater.

Discussion. Based upon these criteria, 84.6% of all reported test results were satisfactory, with 5 out of 26 laboratories (19.2%) reporting 2 or more results outside the acceptable range.

New York State Department of Health
Urine Arsenic Test Results, 2007 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results ($\mu\text{g/L}$ urine)					Info Only
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15	
Target Values:		32.4	53.6	93.0	175.0	321.3	
102	DRC/CC-ICP-MS	29.2	48.1	85.5	160.4	289.1	
107	DRC/CC-ICP-MS	29.3	50.0	89.0	168.0	314.0	
109	ETAAS-Z	30	55	98	174	336	
110	DRC/CC-ICP-MS	33.6	58.6	102.8	194.5	362.2	
114	ICP-MS	41	56	90	174	199 ↓	
116	DRC/CC-ICP-MS	31.2	52.2	102.0	176.4	319.1	Info
147	ICP-MS	33.5	54.3	92.9	174.5	325.8	
156	ICP-MS	33.5	51.2	92.5	166	314	
159	ICP-MS	36	58	93	176	294	
164	ICP-MS	31	54	98	180	330	
179	ICP-MS	30.8	49.8	88.3	175.2	314.4	
197	DRC/CC-ICP-MS	32	55	95	179	331	
200	ICP-MS	31.1	50.9	89.1	169	311	
206	ICP-MS	41.9	59.3	97.2	173.6	308.6	
208	ICP-MS	30.3	44.9	77.3	138 ↓	238.8 ↓	
293	FAAS	14.1 ↓	29.2 ↓	43.8 ↓	90.0 ↓	145.0 ↓	Info
305	DRC/CC-ICP-MS	34.2	59	102.1	192.7	356.1	
312	ICP-MS	34	56	92	179	331	
324	DRC/CC-ICP-MS	25.5	44.4	83.9	164.7	292.7	Info
339	HR-ICP-MS	29.0	45.3	85.6	161	316	
359	ICP-MS	37.9	58.9	98.8	185.2	329.1	
366	ICP-MS	20.5 ↓	39.0 ↓	75.0	128.8 ↓	186.0 ↓	Info
385	DRC/CC-ICP-MS	28.8	52.5	87.6	177	308	
391	DRC/CC-ICP-MS	27.0	48.3	89.7	168.6	313.7	Info
401	ETAAS other	20 ↓	38 ↓	74 ↓	145	274	Info
404	HR-ICP-MS	579.7 ↑	715.6 ↑	861.1 ↑	987.5 ↑	1200.1 ↑	Info

Percent satisfactory results for all participants: 84.6 %

notes: ↑ reported outside upper limit
↓ reported outside lower limit

Info only: results included for informational purposes only.

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, 2007 Event #3
STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

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

Lab Code	Method	Results ($\mu\text{g/L}$ urine)				
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
102	DRC/CC-ICP-MS	29.2	48.1	85.5	160.4	289.1
107	DRC/CC-ICP-MS	29.3	50.0	89.0	168.0	314.0
109	ETAAS-Z	30	55	98	174	336
110	DRC/CC-ICP-MS	33.6	58.6	102.8	194.5	362.2
147	ICP-MS	33.5	54.3	92.9	174.5	325.8
156	ICP-MS	33.5	51.2	92.5	166	314
159	ICP-MS	36	58	93	176	294
164	ICP-MS	31	54	98	180	330
179	ICP-MS	30.8	49.8	88.3	175.2	314.4
197	DRC/CC-ICP-MS	32	55	95	179	331
200	ICP-MS	31.1	50.9	89.1	169	311
206	ICP-MS	41.9	59.3	97.2	173.6	308.6
305	DRC/CC-ICP-MS	34.2	59	102.1	192.7	356.1
312	ICP-MS	34	56	92	179	331
339	HR-ICP-MS	29.0	45.3	85.6	161	316
385	DRC/CC-ICP-MS	28.8	52.5	87.6	177	308
Number of Sample Measurements:		16	16	16	16	16
Target value:		32.4	53.6	93.0	175.0	321.3
Standard Deviation:		3.4	4.1	5.4	9.4	19.7
RSD (%):		10.4	7.7	5.9	5.4	6.1
Acceptable Range:						
Upper Limit:		42.4	64.3	111.6	210.0	385.6
Lower Limit:		22.4	42.9	74.4	140.0	257.0

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, 2007 Event #3
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ urine)				
	UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	9	9	9	9	9
Mean:	30.1	52.0	93.1	175.7	320.7
Standard Deviation:	2.9	4.9	7.6	11.8	25.3
RSD (%):	9.7	9.4	8.1	6.7	7.9
ETAAS other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	20.0	38.0	74.0	145.0	274.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	1	1	1	1	1
Mean:	30.0	55.0	98.0	174.0	336.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	14.1	29.2	43.8	90.0	145.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	29.0	45.3	85.6	161.0	316.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	12	12	12	12	12
Mean:	33.5	52.7	90.3	168.3	290.1
Standard Deviation:	5.7	6.0	7.4	17.1	52.0
RSD (%):	16.9	11.4	8.2	10.2	17.9
All Laboratories					
Number of Sample Measurements:	25	25	25	25	25
Mean:	30.6	50.7	88.9	166.8	297.5
Standard Deviation:	6.1	7.4	12.2	21.9	52.4
RSD (%):	20.1	14.7	13.8	13.1	17.6

notes: ? Insufficient data for calculation.

**New York State Department of Health
Urine Arsenic Test Results, 2007 Event #3
STATISTICAL SUMMARY BY CLASS**

	Results ($\mu\text{g/L}$ urine)				
	UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
Evaluated					
Number of Sample Measurements:	3	3	3	3	3
Mean:	36.4	53.3	88.7	165.7	255.6
Standard Deviation:	5.5	7.4	10.8	24.7	66.7
RSD (%):	—	—	—	—	—
Info					
Number of Sample Measurements:	6	6	6	6	6
Mean:	23.1	41.9	78.1	145.6	255.1
Standard Deviation:	6.1	8.2	19.7	32.3	72.4
RSD (%):	26.3	19.7	25.2	22.2	28.4
Reference					
Number of Sample Measurements:	16	16	16	16	16
Mean:	32.4	53.6	93.0	175.0	321.3
Standard Deviation:	3.4	4.1	5.4	9.4	19.7
RSD (%):	10.4	7.7	5.9	5.4	6.1
All Laboratories					
Number of Sample Measurements:	25	25	25	25	25
Mean:	30.6	50.7	88.9	166.8	297.5
Standard Deviation:	6.1	7.4	12.2	21.9	52.4
RSD (%):	20.1	14.7	13.8	13.1	17.6

notes: ? Insufficient data for calculation.

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, each pool was acidified to 1% v/v nitric acid, and then stored at -80°C. After thawing each pool, precipitated salts were removed by decanting, and then filtered through a 10.0-µm Teflon membrane. Sulfamic acid was added to the filtered urine pools as a mercury preservative. Each pool was supplemented with inorganic Cd²⁺, and then stirred for 24 hours to ensure sample homogeneity prior to aliquoting into acid-leached polypropylene vials.

Target values were established as the mean of 23 referee laboratories using either quadrupole-based ICP-MS or ETAAS instrumentation. Values range from 1.0 µg/L (9 nmol/L) to 27.8 µg/L (247 nmol/L). Among the referee group, imprecision (SD) varied from ±0.2 µg/L (2 nmol/L) to ±1.8 µg/L (16 nmol/L), increasing with Cd concentration.

Acceptable ranges were 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 these criteria, 96.9% of all reported test results were satisfactory, with only 1 out of 26 laboratories (3.8%) reporting 2 or more results outside the acceptable range.

New York State Department of Health
Urine Cadmium Test Results, 2007 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results ($\mu\text{g/L}$ urine)					Info Only
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15	
Target Values:		4.1	27.8	15.8	11.6	1.0	
102	ICP-MS	4.0	27.5	15.4	11.6	1.1	
103	ETAAS-Z	4.1	26.2	16.6	12.6	<0.5	
107	DRC/CC-ICP-MS	4.0	27.4	14.7	10.6	0.8	
110	ICP-MS	4.0	26.9	15.6	11.6	1.1	
114	ICP-MS	4.3	26.7	14.9	11.2	1.1	
116	ICP-MS	3.7	26.1	14.7	10.8	0.9	
147	ICP-MS	4.5	30.8	17.7	13.0	1.2	
156	ICP-MS	4.1	26.7	15.7	11.6	0.9	
159	ICP-MS	4	29.7	16	12.5	0.7	
164	ICP-MS	3.9	25.8	14.7	11.1	1.1	
179	ICP-MS	4.5	29.3	16.5	12.8	1.2	
197	ICP-MS	4.6	30.3	17.3	12.9	1.2	
200	ICP-MS	4.3	29.6	16.7	12.4	1.1	
206	ICP-MS	4.1	25.5	14	10.4	0.9	
208	ICP-MS	4.4	28.1	15.2	11.5	1.1	
293	ICP-MS	4.1	28.0	15.6	11.8	1.0	
305	ICP-MS	3.9	29.8	17.5	10.9	<1.0	
312	ICP-MS	4.3	30	17	12	1.1	
324	ICP-MS	4.4	28.3	16.5	12.3	11.1 \uparrow	Info
339	HR-ICP-MS	3.6	26.7	14.6	10.8	0.7	
359	ICP-MS	3.8	24.2	14	10.6	1	
366	ICP-MS	4.2	27.9	16.8	11.6	0.8	
367	ETAAS-Z	3.5	26.8	12.8 \downarrow	9.2 \downarrow	0.9	Info
385	ICP-MS	3.9	25.8	14.7	11.1	1.0	
391	DRC/CC-ICP-MS	4.3	29.8	17.3	12.5	0.9	
404	HR-ICP-MS	4.4	30.6	16.2	13.5 \uparrow	1.3	Info

Percent satisfactory results for all participants: 96.9 %

notes: \uparrow reported outside upper limit
 \downarrow reported outside lower limit

Info only: results included for informational purposes only.

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, 2007 Event #3
STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

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

Lab Code	Method	Results ($\mu\text{g/L}$ urine)				
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
102	ICP-MS	4.0	27.5	15.4	11.6	1.1
103	ETAAS-Z	4.1	26.2	16.6	12.6	<0.5
107	DRC/CC-ICP-MS	4.0	27.4	14.7	10.6	0.8
110	ICP-MS	4.0	26.9	15.6	11.6	1.1
114	ICP-MS	4.3	26.7	14.9	11.2	1.1
116	ICP-MS	3.7	26.1	14.7	10.8	0.9
147	ICP-MS	4.5	30.8	17.7	13.0	1.2
156	ICP-MS	4.1	26.7	15.7	11.6	0.9
159	ICP-MS	4	29.7	16	12.5	0.7
164	ICP-MS	3.9	25.8	14.7	11.1	1.1
179	ICP-MS	4.5	29.3	16.5	12.8	1.2
197	ICP-MS	4.6	30.3	17.3	12.9	1.2
200	ICP-MS	4.3	29.6	16.7	12.4	1.1
206	ICP-MS	4.1	25.5	14	10.4	0.9
208	ICP-MS	4.4	28.1	15.2	11.5	1.1
293	ICP-MS	4.1	28.0	15.6	11.8	1.0
305	ICP-MS	3.9	29.8	17.5	10.9	<1.0
312	ICP-MS	4.3	30	17	12	1.1
339	HR-ICP-MS	3.6	26.7	14.6	10.8	0.7
359	ICP-MS	3.8	24.2	14	10.6	1
366	ICP-MS	4.2	27.9	16.8	11.6	0.8
385	ICP-MS	3.9	25.8	14.7	11.1	1.0
391	DRC/CC-ICP-MS	4.3	29.8	17.3	12.5	0.9
Number of Sample Measurements:		23	23	23	23	21
Target value:		4.1	27.8	15.8	11.6	1.0
Standard Deviation:		0.3	1.8	1.2	0.8	0.2
RSD (%):		6.3	6.6	7.3	6.9	15.7
Acceptable Range:						
Upper Limit:		5.1	32.0	18.2	13.3	2.0
Lower Limit:		3.1	23.6	13.4	9.9	0.0

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, 2007 Event #3
STATISTICAL SUMMARY BY METHOD**

	Results ($\mu\text{g/L}$ urine)				
	UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	4.2	28.6	16.0	11.6	0.9
Standard Deviation:	0.2	1.7	1.8	1.3	0.1
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	2	2	2	2	1
Mean:	3.8	26.5	14.7	10.9	0.9
Standard Deviation:	0.4	0.4	2.7	2.4	?
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	4.0	28.7	15.4	12.2	1.0
Standard Deviation:	0.6	2.8	1.1	1.9	0.4
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	20	20	20	20	18
Mean:	4.2	27.9	15.8	11.7	1.0
Standard Deviation:	0.3	1.9	1.1	0.8	0.1
RSD (%):	6.1	6.7	7.2	6.6	13.7
All Laboratories					
Number of Sample Measurements:	26	26	26	26	23
Mean:	4.1	27.9	15.7	11.7	1.0
Standard Deviation:	0.3	1.8	1.3	1.0	0.2
RSD (%):	6.9	6.5	8.0	8.4	16.3

notes: ? Insufficient data for calculation.

**New York State Department of Health
Urine Cadmium Test Results, 2007 Event #3
STATISTICAL SUMMARY BY CLASS**

	Results ($\mu\text{g/L}$ urine)				
	UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
Info					
Number of Sample Measurements:	3	3	3	3	2
Mean:	4.1	28.6	15.2	11.7	1.1
Standard Deviation:	0.5	1.9	2.1	2.2	0.3
RSD (%):	—	—	—	—	—
Reference					
Number of Sample Measurements:	23	23	23	23	21
Mean:	4.1	27.8	15.8	11.6	1.0
Standard Deviation:	0.3	1.8	1.2	0.8	0.2
RSD (%):	6.3	6.6	7.3	6.9	15.7
All Laboratories					
Number of Sample Measurements:	26	26	26	26	23
Mean:	4.1	27.9	15.7	11.7	1.0
Standard Deviation:	0.3	1.8	1.3	1.0	0.2
RSD (%):	6.9	6.5	8.0	8.4	16.3

notes: ? Insufficient data for calculation.

Urine Mercury

PT Sample Stability - Important Information

Target values for urine mercury (U-Hg) were not established due to a lack of consensus among the reference laboratories.

We have reason to believe that PT sample stability continues to be problematic for U-Hg. Consequently, we are suspending PT grading for U-Hg until the problem has been fully resolved.

We plan to continue circulating urine PT samples spiked with inorganic Hg, and stabilized with both 1% (v/v) nitric acid and with 1% (m/v) sulfamic acid. We suspect the problem may be donor related, but this needs to be confirmed

Communications with other PT schemes confirms that U-Hg is troublesome for them, as well, and discussions are underway to address ongoing issues surrounding PT sample stability.

We apologize for any inconvenience this may cause in your ongoing QA/QC programs.

New York State Department of Health
Urine Mercury Test Results, 2007 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results ($\mu\text{g/L}$ urine)					Info Only
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15	
107	DRC/CC-ICP-MS	68.5	101.2	166.6	61.7	15.8	Info
108	CV-AAS	61	83	125	50	15	
109	Atomic Spectrometry Other	63.4	93.6	164	49.8	15.2	Info
110	ICP-MS	63.6	93.8	149.0	49.4	15.4	
114	ICP-MS	75	111	177	61	20	
147	CV-AAS	65.0	94.4	152.9	53.0	16.3	
156	CV-AAS	64.7	95.6	145	49.9	13.6	
159	ICP-MS	51	87	146	48	15	
164	ICP-MS	62	98	171	56	14	
179	ICP-MS	64.3	85.9	150.9	48.1	14.7	
197	ICP-MS	59	88	151	49	15	
200	ICP-MS	52.0	68.4	105	37.7	14.1	Info
206	ICP-MS	56	80	145	45	14	
208	ICP-MS	66.7	101.9	236.5	60.9	17.2	
293	CV-AAS	51.0	75.0	104.0	47.6	7.0	Info
305	ICP-MS	70.7	105.4	157.2	61.4	17.6	
312	ICP-MS	57	89	144	46	13	
324	ICP-MS	80.3	106.5	202.1	66.3	15.5	Info
339	HR-ICP-MS	5.8	11.0	56.2	18.5	3.9	Info
347	CV-AAS	61	88	150	46	13	Info
359	ICP-MS	46.8	73.7	137.9	49.7	13.4	
366	ICP-MS	48.0	79.0	168.0	57.0	14.8	Info
367	CV-AAS	57.8	79.2	143.0	47.3	12.7	Info
391	Atomic Spectrometry Other	29.0	60.5	167.0	52.0	10.0	Info
401	CV-AAS	74	106	186	57	18	Info
404	HR-ICP-MS	54.3	89.0	187.4	40.4	16.6	Info

Percent satisfactory results for all participants: 100.0 %

notes: ↑ reported outside upper limit
↓ reported outside lower limit

Info only: results included for informational purposes only.

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

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, each pool was acidified to 1% v/v nitric acid, and then stored at -80°C. After thawing each pool, precipitated salts were removed by decanting, and then filtered through a 10.0-µm Teflon membrane. Sulfamic acid was added to the filtered urine pools as a mercury preservative. Each pool was supplemented with inorganic Pb²⁺, and then stirred for 24 hours to ensure sample homogeneity prior to aliquoting into acid-leached polypropylene vials.

Target values were established as the mean of 16 referee laboratories using quadrupole-based ICP-MS or ETAAS instrumentation. Values range from 12.0 µg/L (0.06 µmol/L) to 458.6 µg/L (2.21 µmol/L). Among the referee group, imprecision (SD) varied from ±2.1 µg/L (0.01 µmol/L) to ±18.8 µg/L (0.09 µmol/L), increasing with Pb concentration.

Acceptable ranges were 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 these criteria, 90.8% of all reported test results were satisfactory, with only 4 out of 26 laboratories (15.4%) reporting 2 or more results outside the acceptable range.

New York State Department of Health
Urine Lead Test Results, 2007 Event #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results ($\mu\text{g/L}$ urine)					Info Only
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15	
Target Values:		458.6	121.1	236.2	175.6	12.0	
102	ICP-MS	453.7	123.1	238.4	178.0	12.4	
103	ETAAS-Z	428	115	221	166	5	
107	DRC/CC-ICP-MS	465.0	125.0	248.0	186.0	13.0	
110	ICP-MS	462.4	123.2	240.8	179.9	12.4	
114	ICP-MS	443	116	223	168	12	
116	ICP-MS	476.4	123.2	250.2	184.1	12.0	
147	ICP-MS	445.5	118.3	225.9	163.3	12.1	
156	ICP-MS	459	120	238	179	15.4	
159	ICP-MS	416	117	217	163	11	
164	ICP-MS	495	132	258	192	13	
179	ICP-MS	462.8	125.1	247.2	186.1	12.8	
197	ICP-MS	482.7	122.6	239.1	177.4	12.1	
200	ICP-MS	471	127	243	185	13.5	
206	ICP-MS	422	118	236	164	12	
208	ICP-MS	438.6	118.4	170 ↓	169.4	11.6	
293	ICP-MS	439	116	228	170	12	Info
305	ICP-MS	579.4 ↑	138.8	285.4 ↑	213.4	15	
312	ICP-MS	466	111	221	160	11	
324	ICP-MS	452	113	215	163	11.6	
339	HR-ICP-MS	453	125	235	178	12.3	
359	ICP-MS	421.6	113	220.9	159.4	11.9	
366	ETAAS-Z	580.0 ↑	156.0	301.0 ↑	224.0 ↑	15.6	Info
383	ETAAS-Z	551.3 ↑	154.2	285.4 ↑	222.4 ↑	19.2	
385	ICP-MS	466	116	235	175	11.7	Info
391	ETAAS other	438.7	120.9	244.6	184.9	15.0	Info
404	HR-ICP-MS	307.5 ↓	130.8	187.7 ↓	127.5 ↓	18.5	Info

Percent satisfactory results for all participants: 90.8 %

notes: ↑ reported outside upper limit
↓ reported outside lower limit

Info only: results included for informational purposes only.

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, 2007 Event #3
STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

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

Lab Code	Method	Results ($\mu\text{g/L}$ urine)				
		UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
102	ICP-MS	453.7	123.1	238.4	178.0	12.4
103	ETAAS-Z	428	115	221	166	5
107	DRC/CC-ICP-MS	465.0	125.0	248.0	186.0	13.0
110	ICP-MS	462.4	123.2	240.8	179.9	12.4
114	ICP-MS	443	116	223	168	12
116	ICP-MS	476.4	123.2	250.2	184.1	12.0
147	ICP-MS	445.5	118.3	225.9	163.3	12.1
156	ICP-MS	459	120	238	179	15.4
164	ICP-MS	495	132	258	192	13
179	ICP-MS	462.8	125.1	247.2	186.1	12.8
197	ICP-MS	482.7	122.6	239.1	177.4	12.1
200	ICP-MS	471	127	243	185	13.5
206	ICP-MS	422	118	236	164	12
312	ICP-MS	466	111	221	160	11
324	ICP-MS	452	113	215	163	11.6
339	HR-ICP-MS	453	125	235	178	12.3
Number of Sample Measurements:		16	16	16	16	16
Target value:		458.6	121.1	236.2	175.6	12.0
Standard Deviation:		18.8	5.6	12.1	10.1	2.1
RSD (%):		4.1	4.6	5.1	5.8	17.6
Acceptable Range:						
Upper Limit:		504.5	161.1	276.2	215.6	52.0
Lower Limit:		412.7	81.1	196.2	135.6	0.0

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, 2007 Event #3
STATISTICAL SUMMARY BY METHOD**

	Results ($\mu\text{g/L}$ urine)				
	UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	465.0	125.0	248.0	186.0	13.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	438.7	120.9	244.6	184.9	15.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	3	3	3	3	3
Mean:	519.8	141.7	269.1	204.1	13.3
Standard Deviation:	80.8	23.2	42.4	33.0	7.4
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	380.3	127.9	211.4	152.8	15.4
Standard Deviation:	102.9	4.1	33.4	35.7	4.4
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	19	19	19	19	19
Mean:	460.6	120.6	233.3	175.3	12.4
Standard Deviation:	35.6	6.9	22.5	13.4	1.2
RSD (%):	7.7	5.7	9.7	7.7	9.4
All Laboratories					
Number of Sample Measurements:	26	26	26	26	26
Mean:	460.6	123.8	236.7	177.6	12.9
Standard Deviation:	53.1	11.2	27.4	20.3	2.6
RSD (%):	11.5	9.1	11.6	11.4	20.6

notes: ? Insufficient data for calculation.

**New York State Department of Health
Urine Lead Test Results, 2007 Event #3
STATISTICAL SUMMARY BY CLASS**

	Results ($\mu\text{g/L}$ urine)				
	UE07-11	UE07-12	UE07-13	UE07-14	UE07-15
Evaluated					
Number of Sample Measurements:	5	5	5	5	5
Mean:	481.4	128.3	235.7	185.5	13.7
Standard Deviation:	77.7	17.6	49.6	29.9	3.4
RSD (%):	16.1	13.7	21.0	16.1	24.9
Info					
Number of Sample Measurements:	5	5	5	5	5
Mean:	446.2	127.9	239.3	176.3	14.6
Standard Deviation:	97.0	16.8	40.8	34.5	2.8
RSD (%):	21.7	13.1	17.0	19.6	19.3
Reference					
Number of Sample Measurements:	16	16	16	16	16
Mean:	458.6	121.1	236.2	175.6	12.0
Standard Deviation:	18.8	5.6	12.1	10.1	2.1
RSD (%):	4.1	4.6	5.1	5.8	17.6
All Laboratories					
Number of Sample Measurements:	26	26	26	26	26
Mean:	460.6	123.8	236.7	177.6	12.9
Standard Deviation:	53.1	11.2	27.4	20.3	2.6
RSD (%):	11.5	9.1	11.6	11.4	20.6

notes: ? Insufficient data for calculation.

**New York State Department of Health
Event #3, 2007**

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 Nutritional 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

NYS Elements

Al
Cr
Cu
Mn
Ni
Se
Sn
Te
V
Zn

New York State Department of Health
Event #3, 2007
Urine Additional Elements

UE07-11

Lab Code	102	110	116	159	164	179	197	287	305	312	339	347	359	385	391	n	Mean	SD	%RSD
Element (µg/L)	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ETAAS	ETAAS	ICP-MS	HR-ICP-MS	ETAAS	ICP-MS	ICP-MS	DRC-ICP-MS				
Al		35.5 (DRC)			37	38.3	55		38	35			39			7	39.7	6.9	17.4
Ba	8.6	7.92	7.57											8.2		4	8.1	0.4	5.4
Be	5.3	5.01	5.58							4.2				4.2		5	4.9	0.6	13.0
Co	2.2	2.22	2.52	2.3						2				2.2		6	2.2	0.2	7.6
Cr		10.1			10.8 (ETAAS)	11.4 (DRC)	9.8 (DRC)				11.0	11.4			10.1	7	10.8	0.7	6.2
Cs	30.6	28.8	27.7											30.1		4	29.3	1.3	4.5
Cu		211		221	204	207 (DRC)	212.6	199.6	224							7	211.3	8.8	4.2
Mn		5.53		6.4		5.1 (DRC)			5.6						4.3	5	5.7	0.5	9.6
Mo	146.8	145	143											148		4	145.7	2.2	1.5
Ni		9.10		9	7.2					7.3						4	8.2	1.0	12.8
Pt	2.0	1.95	1.90							1.5				1.9		5	1.9	0.2	10.8
Sb	4.3	4.13	4.07							4.2				4.3		5	4.2	0.1	2.4
Se	79.6	103 (DRC)	90.9 (DRC)			79.7			91					79.5 (DRC)		6	87.3	9.5	10.9
Sn		11.5								11						2	11.3	0.4	3.1
Te		3.89														1	3.9	NA	NA
Tl	10.1	10.1	9.93	9.3		10	8.8			9.1				9.7	8.6	9	9.6	0.5	5.2
U	0.5	0.504	0.496							0.4				0.5		5	0.5	0.0	9.3
V		3.83 (DRC)														1	3.8	NA	NA
W	4.3	4.27	4.21							3.8				4.3		5	4.2	0.2	5.1
Zn		447		455	362	441.8 (DRC)	455		436							6	432.8	35.5	8.2

**New York State Department of Health
Event #3, 2007
Urine Additional Elements**

UE07-12

Lab Code	102	110	116	159	164	179	197	287	305	312	339	347	359	385	391	n	Mean	SD	%RSD
Element (µg/L)	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ETAAS	ETAAS	ICP-MS	HR-ICP-MS	ETAAS	ICP-MS	ICP-MS	DRC-ICP-MS				
Al		65.3 (DRC)			64	69.8	86		66	49			77.1			7	68.2	11.5	16.9
Ba	14.4	13.8	12.7											13.8		4	13.7	0.7	5.2
Be	10.6	10.9	12.4							9				8.8		5	10.3	1.5	14.3
Co	4.5	4.60	4.79	4.7						4.1				4.4		6	4.5	0.2	5.5
Cr		19.1			20.8 (ETAAS)	21.9 (DRC)	19.6 (DRC)				22.2	24.1			20.1	7	21.3	1.8	8.7
Cs	53.6	52.5	47.7											51.8		4	51.4	2.6	5.0
Cu		411		440	400	412.2 (DRC)	423.7	374.6	454							7	416.5	26.1	6.3
Mn		10.4		12		10.2 (DRC)			10						9.3	5	10.7	0.9	8.6
Mo	199.0	200	198											205		4	200.5	3.1	1.6
Ni		14.4		16	11.3					12						4	13.4	2.2	16.2
Pt	4	4.11	3.81							3.4				3.9		5	3.8	0.3	7.1
Sb	8.8	8.79	7.79							8.5				8.5		5	8.5	0.4	4.8
Se	124.4	148 (DRC)	137 (DRC)			122.9			134					136 (DRC)		6	133.7	9.2	6.9
Sn		22.0								22						2	22.0	0.0	0.0
Te		8.35														1	8.4	NA	NA
Tl	20.6	20.7	20.8	19.8		20.2	17.8			18				19.8	18.0	9	19.7	1.2	6.0
U	1.0	1.00	0.950							0.8				1.0		5	0.95	0.1	9.12
V		8.91 (DRC)														1	8.9	NA	NA
W	8.6	8.66	8.26							7.7				8.7		5	8.4	0.4	5.0
Zn		647		695	531	635.3 (DRC)	653		642							6	633.9	54.6	8.6

New York State Department of Health
Event #3, 2007
Urine Additional Elements

UE07-13

Lab Code	102	110	116	159	164	179	197	287	305	312	339	347	359	385	391	n	Mean	SD	%RSD
Element (µg/L)	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ETAAS	ETAAS	ICP-MS	HR-ICP-MS	ETAAS	ICP-MS	ICP-MS	DRC-ICP-MS				
Al		130.0 (DRC)			117	129.5	139		144	95			116.3			7	124.4	16.5	13.3
Ba	25.4	24.4	21.5											24.0		4	23.8	1.7	7.0
Be	20.5	21.6	27.7							17				17.3		5	20.8	4.3	20.8
Co	12.7	13.1	14.1	13.1						11.2				12.4		6	12.8	1.0	7.5
Cr		38.0			40.3 (ETAAS)	40.8 (DRC)	37.7 (DRC)				43.2	49.9			39.6	7	41.7	4.5	10.8
Cs	96.2	95.3	87.6											93.1		4	93.1	3.9	4.1
Cu		796		855	760	798.4 (DRC)	813.6	737	900							7	808.6	55.2	6.8
Mn		19.8		21.6		19.5 (DRC)			19						18.5	5	20.0	1.1	5.7
Mo	298.4	305	304											300		4	301.9	3.2	1.0
Ni		28.5		25	19.6					22						4	23.8	3.8	16.2
Pt	7.8	8.19	7.57							7.1				7.7		5	7.7	0.4	5.1
Sb	17.0	17.4	15.1							17				16.6		5	16.6	0.9	5.4
Se	218.7	245 (DRC)	235 (DRC)			208.3			218					225 (DRC)		6	225.0	13.2	5.9
Sn		42.1								42						2	42.1	0.1	0.2
Te		16.2														1	16.2	NA	NA
Tl	40.0	40.5	42.0	37		39.6	35			37				39.4	36.3	9	38.8	2.3	5.9
U	1.9	1.97	1.91							1.8				1.9		5	1.9	0.1	3.2
V		15.4 (DRC)														1	15.4	NA	NA
W	16.6	17.0	15.9							15				16.7		5	16.2	0.8	4.9
Zn		1028		1059	820	1012 (DRC)	1028		1031							6	996.4	87.7	8.8

New York State Department of Health
Event #3, 2007
Urine Additional Elements

UE07-14

Lab Code	102	110	116	159	164	179	197	287	305	312	339	347	359	385	391	n	Mean	SD	%RSD
Element (µg/L)	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ETAAS	ETAAS	ICP-MS	HR-ICP-MS	ETAAS	ICP-MS	ICP-MS	DRC-ICP-MS				
Al		97.7 (DRC)			89	177.9	113		97	71			86.5			7	104.6	34.8	33.2
Ba	19.7	19.0	17.1											18.7		4	18.6	1.1	5.9
Be	15.3	16.4	19.6							13				13.0		5	15.5	2.7	17.8
Co	6.2	6.51	6.79	6.5						5.4				6.1		6	6.3	0.5	7.7
Cr		25.3			29.6 (ETAAS)	31.6 (DRC)	28.4 (DRC)				32.5	39.1			29.1	7	31.1	4.7	15.0
Cs	73.9	73.3	66.3											71.0		4	71.1	3.5	4.9
Cu		592		612	578	602.3 (DRC)	609.5	541.2	680							7	602.1	42.1	7.0
Mn		14.8		16.4		15.6 (DRC)				14					13.5	5	15.2	1.0	6.8
Mo	248.6	252	250											255		4	251.4	2.8	1.1
Ni		19.1		20	15.1					16						4	17.6	2.4	13.5
Pt	15.8	16.4	15.3							14				15.8		5	15.5	0.9	5.9
Sb	12.7	13.0	11.1							12				12.5		5	12.3	0.7	6.1
Se	171.6	199 (DRC)	181 (DRC)			161.9			171					183 (DRC)		6	177.9	12.8	7.2
Sn		33.4								31						2	32.2	1.7	5.3
Te		12.4														1	12.4	NA	NA
Tl	29.8	30.2	30.6	27.7		31.6	26.1			27				29.4	25.8	9	29.1	1.9	6.6
U	1.5	1.46	1.44							1.3				1.4		5	1.4	0.1	5.4
V		12.5 (DRC)														1	12.5	NA	NA
W	12.5	12.7	11.9							11				12.7		5	12.2	0.7	6.0
Zn		826		870	678	808.7 (DRC)	837		847							6	811.1	68.4	8.4

New York State Department of Health
Event #3, 2007
Urine Additional Elements

UE07-15

Lab Code	102	110	116	159	164	179	197	287	305	312	339	347	359	385	391	n	Mean	SD	%RSD
Element (µg/L)	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ETAAS	ETAAS	ICP-MS	HR-ICP-MS	ETAAS	ICP-MS	ICP-MS	DRC-ICP-MS				
Al		13.7 (DRC)			19	14.6	24		13	7.9			11.2			7	14.8	5.3	35.8
Ba	4.3	4.03	3.59											4		4	4.0	0.3	7.4
Be	1.0	1.07	1.17							0.7				0.8		5	0.9	0.2	20.4
Co	0.6	0.656	0.633	0.7				<1.0						0.7		6	0.7	0.0	6.6
Cr		3.12			3.1 (ETAAS)	3.2 (DRC)	2.8 (DRC)				3.0	4.0			2.3	7	3.2	0.4	12.9
Cs	13.2	12.9	11.9											12.5		4	12.6	0.6	4.5
Cu		55.1		57	54	50.2 (DRC)	60.8	44.1	60							7	54.5	5.8	10.7
Mn		1.72		2.1		1.3 (DRC)			2						0.6	5	1.8	0.3	19.4
Mo	107.2	105	101											106		4	104.8	2.7	2.6
Ni		6.24		6	3.7					4.4						4	5.1	1.2	24.2
Pt	0.4	0.397	0.394							0.1				0.4		5	0.3	0.1	39.4
Sb	1.0	0.978	0.855							1				0.9		5	0.9	0.1	6.9
Se	48.8	55.7 (DRC)	54.9 (DRC)			45.6			60					54.9 (DRC)		6	53.3	5.2	9.8
Sn		3.50								3.6						2	3.6	0.1	2.0
Te		0.667														1	0.7	NA	NA
Tl	2.1	2.09	2.05	1.9		<5.0	1.8			1.8				2.0	1.6	9	2.0	0.1	6.6
U	9.9	9.99	9.80							9.9				9.7		5	9.7	0.4	3.6
V		0.726 (DRC)														1	0.7	NA	NA
W	1.0	0.960	0.961							0.8				0.9		5	0.9	0.1	8.4
Zn		292		317	239	288.9 (DRC)	298		292							6	287.8	26.0	9.0

**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)
- 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 $\mu\text{mol ZPP/mol heme}$)
- F-4 Other

OTHER METHODS

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