NEW YORK STATE | Department of Health | Wadsworth Center

TRACE ELEMENTS IN WHOLE BLOOD

Proficiency Test Report

Event #2, 2015

July 2nd, 2015

ANDREW M. CUOMO
Governor

HOWARD A. ZUCKER, M.D., J.D.
Commissioner

SALLY DRESLIN, M.S., R.N.
Executive Deputy Commissioner

July 2, 2015

Trace Elements in Whole Blood
Event #2, 2015

Dear Laboratory Director:

Results from the second proficiency test (PT) event in 2015 for Trace Elements in Whole Blood have been tabulated and summarized. Target values for Arsenic, Cadmium, Mercury and Lead in whole blood 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. The data for blood lead were previously reported in the Blood Lead PT Report issued July 2nd, 2015, and are reproduced here for completeness.

PT Materials
Test materials for the second event were prepared from caprine (goat) whole blood obtained from animals dosed with lead acetate to create physiologically bound lead (Pb). A total of five blood pools were supplemented with arsenic (as inorganic As^{3+}), cadmium (as Cd^{2+}) and mercury (as inorganic Hg^{2+}). In addition to As, Cd, Pb and Hg, blood pools were supplemented with the trace elements manganese (Mn), thallium (Tl), tin (Sn), titanium (Ti), nickel (Ni), cobalt (Co), chromium (Cr), silver (Ag), tungsten (W) and vanadium (V).

Additional Elements to Become Graded for Performance Assessment
PT results for select trace elements, including Co and Cr, are graded as part of this PT event, although the data are used for "Educational Purposes" only, to inform laboratory participants of where improved practices may be necessary. Laboratories that test and report these, and other, trace elements on patient specimens should continue to report results obtained for whole blood PT samples.

The next PT event for trace elements in whole blood is scheduled to be mailed Wednesday, September 16th, 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, October 7th, 2015.**

Thank you for your participation.

Yours 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
Biggs Laboratory - Wadsworth Center
New York State Department of Health
PO Box 509
Albany NY 12201-0509
www.wadsworth.org/testing/lead/index.htm

Whole Blood Arsenic

Test materials for arsenic were prepared from caprine (goat) whole blood preserved with K_2EDTA anticoagulant. A total of five pools were supplemented with arsenic as inorganic As^{3+}.

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 whole blood arsenic range from 6.1 µg/L (0.08 µmol/L) to 50.8 µg/L (0.68 µmol/L).

Acceptable range: The acceptable range for arsenic is set at ±6 µg/L or ±20%, whichever is greater. Thus, it is fixed at ±6 µg/L for concentrations below 30 µg/L.

Discussion: Based upon the above criteria, 95.8% of test results reported were judged as satisfactory, with none of the 19 laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Blood Arsenic Test Results, 2015 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (μg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Robust Mean	**25.2**	**6.1**	**10.8**	**50.8**	**9.7**
Robust Standard Deviation	3.3	2.1	2.1	7.0	1.9
Standard Uncertainty	0.9	0.7	0.7	2.0	0.6
RSD (%)	13.1	34.5	19.6	13.8	19.6
Number of Sample Measurements	19	15	16	19	16
Acceptable Range:					
Upper Limit	31.2	12.1	16.8	61.0	15.7
Lower Limit	19.2	0.1	4.8	40.6	3.7

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

New York State Department of Health
Blood Arsenic Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L whole blood)					Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10	
	Target Values:	25.2	6.1	10.8	50.8	9.7	
103	DRC/CC-ICP-MS	26.9	4.4	10.4	54.0	8.7	Info
110	DRC/CC-ICP-MS	23.3	4.6	9.2	51.2	7.9	
114	ICP-MS	28.0	9.0	13.0	50.0	13.0	
147	ICP-MS	24.4	4.4	9.4	52.7	8.2	Info
156	DRC/CC-ICP-MS	25.0	<5.0	9.2	50.0	8.6	
164	ICP-MS	28.0	6.0	12.0	57.0	10.0	
179	DRC/CC-ICP-MS	26.0	<12.0	<12.0	56.0	<12.0	
197	DRC/CC-ICP-MS	21.0	<10.0	<10.0	45.0	<10.0	
200	ICP-MS	23.4	6.7	11.0	41.2	9.9	Info
206	DRC/CC-ICP-MS	24.4	<10.0	<10.0	52.4	<10.0	
208	ICP-MS	21.6	7.5	12.0	40.1 ↓	10.8	
293	DRC/CC-ICP-MS	28.8	5.4	11.5	61.6 ↑	9.9	Info
305	ICP-MS	23.0	5.0	9.0	47.0	9.0	
312	DRC/CC-ICP-MS	22.0	6.0	9.0	42.0	8.0	
324	ICP-MS	31.3 ↑	10.9	15.0	50.5	15.4	Info
359	ICP-MS	27.1	9.1	13.4	55.9	12.3	
388	ICP-MS	30.3	5.9	12.3	61.2 ↑	10.9	
391	DRC/CC-ICP-MS	24.8	4.4	9.1	52.4	8.3	Info
484	ICP-MS	20.9	3.7	7.9	44.6	7.4	

Percent satisfactory results for all participants: 95.8 %

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
Blood Arsenic Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	9	5	6	9	6
Mean:	24.7	5.0	9.7	51.6	8.6
Standard Deviation:	2.4	0.7	1.0	5.8	0.7
RSD (%):	9.8	14.4	10.3	11.1	8.5
ICP-MS					
Number of Sample Measurements:	10	10	10	10	10
Mean:	25.8	6.8	11.5	50.0	10.7
Standard Deviation:	3.6	2.3	2.2	6.9	2.4
RSD (%):	14.1	33.7	19.0	13.8	22.3
All Laboratories					
Number of Sample Measurements:	19	15	16	19	16
Mean:	25.3	6.2	10.8	50.8	9.9
Standard Deviation:	3.1	2.1	2.0	6.3	2.2
RSD (%):	12.2	33.7	18.4	12.3	21.9

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

Whole Blood Cadmium

Test materials for cadmium were prepared from caprine (goat) whole blood preserved with K_2EDTA anticoagulant. A total of five blood pools were supplemented with different amounts of cadmium (as Cd^{2+}).

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 whole blood cadmium range from 2.0 µg/L (18 nmol/L) to 18.4 µg/L (164 nmol/L).

Acceptable ranges are based on the OSHA criteria of ±15%, or ±1 µg/L around the target value, whichever is greater. So, the range is fixed at ±1 µg/L for concentrations below 6.6 µg/L, where above 6.6 µg/L, it is ±15%.

Discussion: Based upon the above criteria, 96.2% of the results reported by all participants were satisfactory, with one of the 26 laboratories (3.8%) reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Blood Cadmium Test Results, 2015 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (μg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Robust Mean	**9.4**	**4.5**	**4.0**	**18.4**	**2.0**
Robust Standard Deviation	0.7	0.4	0.3	1.4	0.1
Standard Uncertainty	0.2	0.1	0.1	0.3	<0.1
RSD (%)	7.4	8.8	6.6	7.5	7.5
Number of Sample Measurements	26	26	26	26	26
Acceptable Range:					
Upper Limit	10.8	5.5	5.0	21.2	3.0
Lower Limit	8.0	3.5	3.0	15.6	1.0

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

New York State Department of Health
Blood Cadmium Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L whole blood)					Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10	
	Target Values:	9.4	4.5	4.0	18.4	2.0	
103	DRC/CC-ICP-MS	9.8	4.6	4.4	18.9	1.9	Info
106	ICP-MS	10.1	4.4	4.1	19.4	1.9	Info
107	ICP-MS	9.7	4.6	4.2	19	2.1	Info
109	ICP-MS	9.7	4.5	4.1	19.3	2.0	Info
110	ICP-MS	9.4	4.4	4.0	18.6	2.0	
114	ICP-MS	8.7	13.0 ↑	3.5	16.6	1.8	
116	DRC/CC-ICP-MS	9.6	4.8	4.2	20.5	2.0	Info
147	ICP-MS	9.8	4.4	4.2	18.9	2.0	Info
156	DRC/CC-ICP-MS	8.9	4.5	4.0	18.0	1.9	
164	ICP-MS	8.9	4.2	3.9	17.4	1.8	
179	DRC/CC-ICP-MS	9.5	4.3	4.0	19.3	2.0	
197	DRC/CC-ICP-MS	9.9	4.4	4.2	18.4	2.2	
200	ICP-MS	8.9	4.4	3.7	18.3	1.9	Info
206	ICP-MS	9.5	4.8	4.3	18.7	2.3	
208	ICP-MS	6.4 ↓	3.0 ↓	3.1	12.0 ↓	1.7	
293	ICP-MS	9.4	5.0	3.9	18.4	2.0	Info
305	ICP-MS	10.7	5.2	4.5	19.9	2.4	
312	ICP-MS	8.0	4.0	3.5	15.0 ↓	1.9	
324	ICP-MS	8.6	3.7	3.3	16.4	1.8	Info
325	ETAAS-Z	10.7	5.0	4.4	17.4	2.2	Info
359	ICP-MS	9.8	4.3	4.2	20.2	2.0	
366	ETAAS-Z	8.8	5.1	4.0	17.5	1.9	Info
388	ICP-MS	8.8	4.1	3.8	17.2	1.8	
391	DRC/CC-ICP-MS	9.0	4.1	3.8	17.8	1.8	Info
401	DRC/CC-ICP-MS	9.7	4.6	4.2	19.8	2.0	Info
410	ICP-MS	10.2	4.7	4.5	19.6	2.0	Info

Percent satisfactory results for all participants: 96.2 %

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
Blood Cadmium Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	9.5	4.5	4.1	19.0	2.0
Standard Deviation:	0.4	0.2	0.2	1.0	0.1
RSD (%):	4.1	5.1	4.7	5.2	6.4
ETAAS-Z					
Number of Sample Measurements:	2	2	2	2	2
Mean:	9.8	5.1	4.2	17.5	2.1
Standard Deviation:	1.3	0.1	0.3	0.1	0.2
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	17	17	17	17	17
Mean:	9.2	4.9	3.9	17.9	2.0
Standard Deviation:	1.0	2.2	0.4	2.1	0.2
RSD (%):	10.7	44.3	10.2	11.5	9.2
All Laboratories					
Number of Sample Measurements:	26	26	26	26	26
Mean:	9.3	4.8	4.0	18.2	2.0
Standard Deviation:	0.9	1.7	0.4	1.8	0.2
RSD (%):	9.4	36.4	8.9	9.9	8.3

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

Whole Blood Mercury

Test materials for mercury were prepared from caprine (goat) whole blood preserved with K_2EDTA anticoagulant. A total of five pools were supplemented with different amounts of mercury as inorganic Hg^{2+}.

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 whole blood mercury range from 3.2 µg/L (16 nmol/L) to 57.5 µg/L (287 nmol/L).

Acceptable ranges were fixed at ±30%, or ±3 µg/L around the target value, whichever is greater. That is, the range is fixed at ±3 µg/L for concentrations below 10 µg/L, while above 10 µg/L, it is ±30%.

Discussion: Based on the above criteria, 96.9% of results reported by all participants were satisfactory, with one of the 26 laboratories (3.8%) reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Blood Mercury Test Results, 2015 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Robust Mean	**24.0**	**12.9**	**3.2**	**57.5**	**3.8**
Robust Standard Deviation	2.3	1.0	0.3	5.9	0.3
Standard Uncertainty	0.6	0.2	0.1	1.5	0.1
RSD (%)	9.5	7.8	8.3	10.3	9.2
Number of Sample Measurements	26	26	22	25	23
Acceptable Range:					
Upper Limit	31.2	16.8	6.2	74.7	6.8
Lower Limit	16.8	9.0	0.2	40.3	0.8

New York State Department of Health
Blood Mercury Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L whole blood)					Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10	
	Target Values:	24.0	12.9	3.2	57.5	3.8	
103	DRC/CC-ICP-MS	23.8	13.1	3.2	57.8	3.8	Info
106	DRC/CC-ICP-MS	23.4	13.2	3.1	59.9	3.7	Info
107	DRC/CC-ICP-MS	21	13	3.0	58	3.6	Info
109	ICP-MS	24.7	12.7	3.1	59.3	3.8	Info
110	ICP-MS	23.8	12.6	3.1	56.9	3.7	
114	ICP-MS	25.8	4.1 ↓	3.9	61.0	4.6	
116	DRC/CC-ICP-MS	24.7	13.6	3.2	61.6	3.8	Info
147	ICP-MS	23.5	13.1	3.0	59.0	3.8	Info
156	ICP-MS	22.0	11.0	<3.0	53.0	<3.0	
164	ICP-MS	28.0	15.0	4.0	65.0	5.0	
179	DRC/CC-ICP-MS	25.0	13.0	3.0	61.0	3.0	
197	DRC/CC-ICP-MS	22.0	11.0	<5.0	52.0	<5.0	
200	ICP-MS	22.4	12.4	3.6	50.2	4.0	Info
206	ICP-MS	24.6	12.4	<3.0	57.6	3.7	
208	ICP-MS	19.5	10.7	3.1	44.5	3.7	
293	ICP-MS	23.8	13.1	3.4	55.1	3.9	Info
305	ICP-MS	24.0	17.0 ↑	3.0	55.0	6.0	
312	ICP-MS	22.0	12.0	2.7	52.0	3.2	
359	ICP-MS	26.8	14.6	3.7	71.2	4.3	
366	ICP-MS	21.5	13.1	2.8	50.0	3.3	Info
388	ICP-MS	21.6	11.4	2.5	49.1	2.7	
391	CV-AAS	35.7 ↑	16.0	4.1	86.8 ↑	5.1	Info
401	DRC/CC-ICP-MS	25.1	12.8	3.8	62.2	3.8	Info
410	ICP-MS	25.9	13.8	3.3	63.3	3.9	Info
453	Atomic Spectrometry Other	24.5	12.7	3.0	56.2	3.4	Info
484	ICP-MS	27.3	13.7	<5.0	>60.0	<5.0	

Percent satisfactory results for all participants: 96.9 %

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
Blood Mercury Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Atomic Spectrometry					
Number of Sample Measurements:	1	1	1	1	1
Mean:	24.5	12.7	3.0	56.2	3.4
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
CV-AAS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	35.7	16.0	4.1	86.8	5.1
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
DRC/CC-ICP-MS					
Number of Sample Measurements:	7	7	6	7	6
Mean:	23.6	12.8	3.2	58.9	3.6
Standard Deviation:	1.6	0.8	0.3	3.5	0.3
RSD (%):	6.7	6.5	9.3	5.9	8.6
ICP-MS					
Number of Sample Measurements:	17	17	14	16	15
Mean:	24.0	12.5	3.2	56.4	4.0
Standard Deviation:	2.3	2.7	0.4	6.8	0.8
RSD (%):	9.7	21.2	13.8	12.0	19.8
All Laboratories					
Number of Sample Measurements:	26	26	22	25	23
Mean:	24.3	12.7	3.3	58.3	3.9
Standard Deviation:	3.1	2.3	0.4	8.3	0.7
RSD (%):	12.6	17.8	13.1	14.2	18.4

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

Whole Blood Lead

Test materials for lead were prepared from caprine (goat) whole blood obtained from animals dosed with lead acetate to create physiologically-bound Pb. Whole blood was collected into collection bags containing K_2EDTA anticoagulant.

Target values were established as the mean of 19 measurements performed by 17 reference laboratories using ICP-MS and ETAAS methods. Values range from 5 µg/dL to 17 µg/dL. Among the reference group, imprecision (SD) varied from 0.4 - 0.8 µg/dL.

Acceptable ranges are based on the CLIA '88 criteria (Federal Register Volume 57, Number 40, §§ 493.2 and 493.937, February 28, 1992). The criteria are set at ±10% or ±4 µg/dL, whichever is greater.

Discussion Based on the CLIA '88 criteria, 99.8% of results reported by all participants were judged as satisfactory, with none of 82 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/dL whole blood)					Normalized Mean	Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10		
	Target values:	12	17	10	5	5		
103	DRC/CC-ICP-MS	12	17	10	5	5	1.00	
104	ETAAS-Z	12	18	10	5	5	1.03	
106	ICP-MS	12	17	10	6	5	1.00	Info
107	ASV-LeadCare II	12	17	9	6	5	1.00	Info
107	ICP-MS	12	17	9.7	5.5	4.8	1.00	
109	ASV-LeadCare II	11	15	8	5	4	0.90	Info
109	ICP-MS	12.6	16.5	9.6	5.4	4.6	1.04	
109	ETAAS-Z	12	18	10	5	4	1.03	
110	ICP-MS	12	16	10	5	4	0.97	
110	ETAAS-Z	12	16	9	5	4	0.97	
110	ASV-LeadCare II	16	21	11	6	5	1.22	Info
112	ETAAS-Z	13	18	10	5	5	1.07	
114	ICP-MS	12	17	10	5	5	1.00	
116	DRC/CC-ICP-MS	12	17	10	6	5	1.00	Info
121	ETAAS-Z	14	20	12	6	5	1.18	Info
123	ETAAS-Z	10	13	8	5	4	0.76	
126	ICP-MS	11	16	9	5	4	0.93	
131	ETAAS-Z	12	15	10	7	4	0.94	
143	ETAAS-Z	11	17	9	5	4	0.96	
144	ETAAS-Z	11	16	9	5	4	0.93	
147	ICP-MS	12	16	10	5	5	0.97	
150	ETAAS-Z	15	21	11	6	6	1.20	
156	DRC/CC-ICP-MS	12	15	10	6	5	0.94	

Notes: ↑ reported value outside upper limit

↓ reported value outside lower limit

Normalized Mean: The average of each reported result divided by the corresponding target value. It measures bias.
Info Only: results included for informational purposes only.
ND: non-detect
◤: Result unacceptable

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/dL whole blood)					Normalized Mean	Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10		
	Target values:	12	17	10	5	5		
158	ICP-MS	13	17	10	6	5	1.04	
160	ICP-MS	12	16	9	5	5	0.97	
164	ICP-MS	12	17	10	6	5	1.00	
166	ETAAS-Z	12	16	9	5	4	0.97	
168	ETAAS-Z	14	18	10	6	6	1.11	
179	DRC/CC-ICP-MS	12	17	10	6	5	1.00	
197	ICP-MS	11	15	9	5	4	0.90	
198	ETAAS-Z	12	17	10	5	5	1.00	
200	ICP-MS	11	16	10	6	5	0.93	
204	ASV-LeadCare Ultra	13	16	9	6	4	1.01	
206	ICP-MS	12	16	9	5	5	0.97	
208	ETAAS-Z	10	14	8	4	4	0.82	
237	ETAAS-Z	12	17	10	6	5	1.00	
254	ETAAS-Z	11	15	9	5	4	0.90	
255	ETAAS-Z	14	17	10	6	5	1.08	
269	ETAAS-Z	9	12 ↓	9	4	3	0.71	
272	ETAAS-Z	13	16	9	5	3	1.01	
279	ETAAS-Z	12	17	10	5	4	1.00	
290	ICP-MS	11	14	9	5	4	0.87	
291	ASV-LeadCare Ultra	12	17	10	6	5	1.00	
293	ICP-MS	12	16	9	5	4	0.97	
295	ASV-3010	8	13	7	4	2	0.76	
301	ETAAS Other	11	15	9	5	4	0.90	

Notes: ↑ reported value outside upper limit

↓ reported value outside lower limit

Normalized Mean: The average of each reported result divided by the corresponding target value. It measures bias.
Info Only: results included for informational purposes only.
ND: non-detect
◣: Result unacceptable

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/dL whole blood)					Normalized Mean	Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10		
	Target values:	12	17	10	5	5		
305	FAAS	12	16	10	6	5	0.97	
312	ICP-MS	11	14	8	5	4	0.87	
317	ETAAS-Z	13	17	10	6	5	1.04	
324	ETAAS-Z	11.5	17.0	9.4	5.0	4.0	1.00	
325	ETAAS-Z	12	16	9	5	5	0.97	
333	ETAAS-Z	12	16	10	6	7	0.97	
337	ASV-LeadCare II	12	17	8	<3	5	1.00	
340	ETAAS-Z	11	15	9	4	4	0.90	
343	ASV-LeadCare Ultra	13	17	9	5	3	1.04	Info
343	ASV-LeadCare	12	16	8	5	5	0.97	Info
343	ASV-LeadCare II	13	16	8	5	4	1.01	Info
345	ASV-LeadCare II	13	17	10	4	5	1.04	
348	ETAAS-Z	13	17	10	6	5	1.04	
349	ETAAS-Z	11	15	8	4	3	0.90	
350	ASV-LeadCare Ultra	11	15	9	5	4	0.90	
365	ETAAS-Z	12	17	10	6	5	1.00	
366	ICP-MS	12	17	10	5.2	4	1.00	Info
368	ASV-3010	12	16	10	6	4	0.97	
369	ASV-LeadCare Ultra	10	16	9	3	4	0.94	
374	ASV-LeadCare Ultra	13	18	9	6	4	1.07	
384	ASV-3010	11	14	7	3	<1	0.87	
388	ICP-MS	11	16	8	4	3	0.93	
389	ETAAS-Z	12	16	9	5	4	0.97	

Notes: ↑ reported value outside upper limit

↓ reported value outside lower limit

Normalized Mean: The average of each reported result divided by the corresponding target value. It measures bias.
Info Only: results included for informational purposes only.
ND: non-detect
◣: Result unacceptable

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/dL whole blood)					Normalized Mean	Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10		
	Target values:	12	17	10	5	5		
391	ETAAS-Z	10.4	14.7	8.2	4.8	4.2	0.86	Info
393	ASV-LeadCare II	12	15	8	4	4	0.94	
401	DRC/CC-ICP-MS	12.0	16.4	9.7	5.4	4.8	0.97	Info
410	ICP-MS	12	17	10	5	5	1.00	Info
461	ASV-LeadCare Ultra	12	16	9	6	4	0.97	
464	ASV-LeadCare II	14	21	10	5	5	1.20	
466	ASV-LeadCare II	12	16	8	4	5	0.97	
469	ICP-MS	11	15	9	5	4	0.90	
470	ASV-LeadCare II	11	16	8	5	4	0.93	
476	ASV-LeadCare	13	16	8	4	5	1.01	
477	ASV-LeadCare II	11	14	7	5	4	0.87	
482	ASV-LeadCare II	12	15	7	4	5	0.94	
484	ICP-MS	13	15	8	5	3	0.98	

Percent satisfactory results for all participants: 99.8 %

Notes: ↑ reported value outside upper limit

↓ reported value outside lower limit

Normalized Mean: The average of each reported result divided by the corresponding target value. It measures bias.
Info Only: results included for informational purposes only.
ND: non-detect
◣: Result unacceptable

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
STATISTICAL SUMMARY

Lab Code	Method	TARGET VALUE ASSIGNMENT AND STATISTICS Results (µg/dL whole blood)				
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	12	17	10	5	5
104	ETAAS-Z	12	18	10	5	5
107	ICP-MS	12	17	9.7	5.5	4.8
109	ICP-MS	12.6	16.5	9.6	5.4	4.6
109	ETAAS-Z	12	18	10	5	4
110	ICP-MS	12	16	10	5	4
110	ETAAS-Z	12	16	9	5	4
112	ETAAS-Z	13	18	10	5	5
147	ICP-MS	12	16	10	5	5
156	DRC/CC-ICP-MS	12	15	10	6	5
160	ICP-MS	12	16	9	5	5
164	ICP-MS	12	17	10	6	5
166	ETAAS-Z	12	16	9	5	4
179	DRC/CC-ICP-MS	12	17	10	6	5
198	ETAAS-Z	12	17	10	5	5
200	ICP-MS	11	16	10	6	5
293	ICP-MS	12	16	9	5	4
324	ETAAS-Z	11.5	17.0	9.4	5.0	4.0
325	ETAAS-Z	12	16	9	5	5
Number of Sample Measurements:		19	19	19	19	19
Mean (target value):		**12**	**17**	**10**	**5**	**5**
Standard Deviation:		0.4	0.8	0.4	0.4	0.5
RSD (%):		3.2	5.0	4.6	8.0	10.0
Acceptable Range: Upper Limit:		16	21	14	9	9
Lower Limit:		8	13	6	1	1

notes: Results reported as less than the detection limits are treated as zero for statistical and grading purposes.

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
STATISTICAL SUMMARY BY CLASS

	Results (µg/dL whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Evaluated					
Number of Sample Measurements:	50	50	50	49	49
Mean:	11.8	15.9	9.0	5.0	4.3
Standard Deviation:	1.3	1.7	1.0	0.9	0.9
RSD (%):	10.9	10.4	10.9	17.6	20.2
Info					
Number of Sample Measurements:	13	13	13	13	13
Mean:	12.4	17.0	9.5	5.4	4.5
Standard Deviation:	1.4	1.7	1.2	0.5	0.6
RSD (%):	11.2	10.3	13.1	9.2	14.1
Reference					
Number of Sample Measurements:	19	19	19	19	19
Mean:	12.0	16.6	9.7	5.3	4.7
Standard Deviation:	0.4	0.8	0.4	0.4	0.5
RSD (%):	3.2	5.0	4.6	8.0	10.0
All Laboratories					
Number of Sample Measurements:	82	82	82	81	81
Mean:	11.9	16.2	9.2	5.2	4.4
Standard Deviation:	1.2	1.6	1.0	0.8	0.8
RSD (%):	9.8	9.7	10.5	14.7	17.3

notes: ? Insufficient data for calculation.

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/dL whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
ASV-3010					
Number of Sample Measurements:	3	3	3	3	2
Mean:	10.3	14.3	8.0	4.3	3.0
Standard Deviation:	2.1	1.5	1.7	1.5	1.4
RSD (%):	—	—	—	—	—
ASV-LeadCare					
Number of Sample Measurements:	2	2	2	2	2
Mean:	12.5	16.0	8.0	4.5	5.0
Standard Deviation:	0.7	0.0	0.0	0.7	0.0
RSD (%):	—	—	—	—	—
ASV-LeadCare II					
Number of Sample Measurements:	12	12	12	11	12
Mean:	12.4	16.7	8.5	4.8	4.6
Standard Deviation:	1.4	2.2	1.2	0.8	0.5
RSD (%):	11.6	13.4	14.6	15.6	11.2
ASV-LeadCare Ultra					
Number of Sample Measurements:	7	7	7	7	7
Mean:	12.0	16.4	9.1	5.3	4.0
Standard Deviation:	1.2	1.0	0.4	1.1	0.6
RSD (%):	9.6	5.9	4.1	21.1	14.4
DRC/CC-ICP-MS					
Number of Sample Measurements:	5	5	5	5	5
Mean:	12.0	16.5	9.9	5.7	5.0
Standard Deviation:	0.0	0.9	0.1	0.5	0.1
RSD (%):	0.0	5.3	1.3	8.1	1.8
ETAAS Other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	11.0	15.0	9.0	5.0	4.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	30	30	30	30	30
Mean:	12.0	16.4	9.5	5.2	4.5
Standard Deviation:	1.3	1.8	0.9	0.7	0.9
RSD (%):	11.0	11.1	9.3	14.0	20.0
FAAS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	12.0	16.0	10.0	6.0	5.0
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—

notes: ? Insufficient data for calculation.
A Standard Deviation displayed as 0.0 should be interpreted as <0.1 (see DRC/CC-ICP-MS and HR-ICP-MS participants)

New York State Department of Health
Blood Lead Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/dL whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
ICP-MS					
Number of Sample Measurements:	21	21	21	21	21
Mean:	11.8	16.0	9.3	5.2	4.4
Standard Deviation:	0.6	1.0	0.7	0.5	0.7
RSD (%):	5.5	6.0	7.7	9.3	14.9
All Laboratories					
Number of Sample Measurements:	82	82	82	81	81
Mean:	11.9	16.2	9.2	5.2	4.4
Standard Deviation:	1.2	1.6	1.0	0.8	0.8
RSD (%):	9.8	9.7	10.5	14.7	17.3

notes: ? Insufficient data for calculation.
A Standard Deviation displayed as 0.0 should be interpreted as <0.1 (see DRC/CC-ICP-MS and HR-ICP-MS participants)

Additional Trace Elements Reported in Whole Blood

Participant laboratories reported their analytical results for any additional trace elements (other than As, Cd, Hg and Pb) that are routinely reported so that a more complete characterization can be recorded for these proficiency test materials. Results for the additional trace elements cobalt (Co) and chromium (Cr) are reported here. Although these data are provided solely for educational and informational purposes, target values and acceptable ranges are provided. The New York State grading criteria were established after discussions with the FDA and with other trace element PT scheme organizers. Departures from the acceptable ranges should trigger an internal Quality Assurance review.

Additional Elements

Co and Cr

Whole Blood Cobalt

Test materials for cobalt were prepared from caprine (goat) whole blood preserved with K_2EDTA anticoagulant. A total of five pools were supplemented with cobalt as inorganic Co^{2+}.

The Target Values assigned for each PT material is the arithmetic mean of the results reported by all participants for the event. Values for whole blood cobalt range from 1.6 µg/L to 22.6 µg/L after outlier exclusion.

Acceptable range: The acceptable range for cobalt is set at ±1.5 µg/L or ±20%, whichever is greater. Thus, it is fixed at ±1.5 µg/L for concentrations below 7.5 µg/L. These NYS grading criteria were established after discussions with the FDA and with other trace element PT scheme organizers.

Discussion: Based upon the above criteria, 92.7% of test results reported were within the acceptable ranges, with one of the 11 laboratories (9.1%) reporting 2 or more of the 5 results outside the acceptable ranges. Upward and downward indicator arrows next to individual results should be used as part of a laboratory's on-going internal quality assessment (QA) program. Note that this grading scheme is intended for educational purposes. Departures from the acceptable ranges should trigger an internal QA review.

New York State Department of Health
Blood Cobalt Test Results, 2015 Event #2
STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (μg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Arithmetic Mean*	**12.4**	**6.5**	**1.6**	**22.6**	**7.1**
Standard Deviation	0.7	0.5	0.3	1.7	0.5
RSD (%)	5.8	6.9	21.1	7.6	6.6
Number of Sample Measurements*	10	10	10	11	10
Acceptable Range:					
Upper Limit	14.9	8.0	3.1	27.1	8.6
Lower Limit	9.9	5.0	0.1	18.1	5.6

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

* Outliers identified by Grubbs' test excluded

New York State Department of Health
Blood Cobalt Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L whole blood)					Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10	
	Target Values:	12.4	6.5	1.6	22.6	7.1	
103	DRC/CC-ICP-MS	13.1	6.84	1.66	23.3	7.36	Info
110	ICP-MS	13.4	7.1	2.6	24.2	7.7	
147	ICP-MS	12.7	6.60	1.59	23.5	7.25	Info
156	DRC/CC-ICP-MS	12	6.8	1.6	22	7.3	
164	ICP-MS	12.6	6.5	1.5	22.5	7.2	
197	ICP-MS	11.9	6.1	1.4	21.7	6.7	
206	ICP-MS	12.8	6.9	1.6	22.4	7.5	
305	ICP-MS	11.7	5.7	1.6	21.1	6.5	
312	ICP-MS	11	6.0	1.4	19	6.2	
324	ICP-MS	16.0 ↑	8.8 ↑	4.3 ↑	25.6	9.3 ↑	Info
391	DRC/CC-ICP-MS	12.6	6.3	1.5	22.8	7.1	Info

Percent satisfactory results for all participants: 92.7 %

notes: ↑ Reported outside upper limit   **notes:** Results reported as less than the method detection limit are excluded from statistical calculations.
↓ Reported outside lower limit   **Info only:** results included for informational purposes only.
◣: Result unacceptable
◢: Result not reported

New York State Department of Health
Blood Cobalt Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	12.6	6.6	1.6	22.7	7.3
Standard Deviation:	0.6	0.3	0.1	0.7	0.1
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	8	8	8	8	8
Mean:	12.8	6.7	2.0	22.5	7.3
Standard Deviation:	1.5	1.0	1.0	2.0	1.0
RSD (%):	11.8	14.4	50.4	8.9	13.1
All Laboratories					
Number of Sample Measurements:	11	11	11	11	11
Mean:	12.7	6.7	1.9	22.6	7.3
Standard Deviation:	1.3	0.8	0.9	1.7	0.8
RSD (%):	10.1	12.2	45.9	7.6	11.0

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

Whole Blood Chromium

Test materials for chromium were prepared from caprine (goat) whole blood preserved with K_2EDTA anticoagulant. A total of five pools were supplemented with chromium as inorganic Cr^{3+}.

The Target Values assigned for each PT material is the arithmetic mean of the results reported by all participants for the event. Values for whole blood chromium range from 2.7 µg/L (52 nmol/L) to 21.9 µg/L (421 nmol/L) after outlier exclusion.

Acceptable range: The acceptable range for chromium is set at ±2 µg/L or ±20%, whichever is greater. Thus, it is fixed at ±2 µg/L for concentrations below 10 µg/L. These NYS grading criteria were established after discussions with the FDA and with other trace element PT scheme organizers.

Discussion: Based upon the above criteria, 97.5% of test results reported were within the acceptable ranges, with none of the 8 laboratories reporting 2 or more of the 5 results outside the acceptable ranges. Upward and downward indicator arrows next to individual results should be used as part of a laboratory's on-going internal quality assessment (QA) program. Note that this grading scheme is intended for educational purposes. Departures from the acceptable ranges should trigger an internal QA review.

New York State Department of Health
Blood Chromium Test Results, 2015 Event #2
STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
Arithmetic Mean*	**13.7**	**2.7**	**2.9**	**21.9**	**9.3**
Standard Deviation	1.0	0.3	0.5	1.6	0.8
RSD (%)	7.5	12.5	17.5	7.2	9.1
Number of Sample Measurements*	8	8	7	8	8
Acceptable Range:					
Upper Limit	16.4	4.7	4.9	26.3	11.3
Lower Limit	11.0	0.7	0.9	17.5	7.3

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

  *   Outliers identified by Grubbs' test excluded

New York State Department of Health
Blood Chromium Test Results, 2015 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L whole blood)					Info Only
		BE15-06	BE15-07	BE15-08	BE15-09	BE15-10	
	Target Values:	13.7	2.7	2.9	21.9	9.3	
103	DRC/CC-ICP-MS	14.8	2.83	3.38	23.1	9.61	Info
110	DRC/CC-ICP-MS	14.1	2.8	5.4 ↑	22.4	9.7	
147	DRC/CC-ICP-MS	15.0	2.85	3.34	24.9	10.5	Info
156	DRC/CC-ICP-MS	13	2.7	3	21	9.1	
164	DRC/CC-ICP-MS	12.8	2.4	2.9	20.6	9.1	
197	DRC/CC-ICP-MS	14.1	3.2	3.3	22.1	9.7	
305	ICP-MS	13.5	2.5	2.5	21.2	8.9	
312	DRC/CC-ICP-MS	12	2.1	2.0	20	7.6	

Percent satisfactory results for all participants: 97.5 %

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
Blood Chromium Test Results, 2015 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L whole blood)				
	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	13.7	2.7	3.3	22.0	9.3
Standard Deviation:	1.1	0.4	1.0	1.7	0.9
RSD (%):	8.1	13.1	30.9	7.6	9.6
ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	13.5	2.5	2.5	21.2	8.9
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
All Laboratories					
Number of Sample Measurements:	8	8	8	8	8
Mean:	13.7	2.7	3.2	21.9	9.3
Standard Deviation:	1.0	0.3	1.0	1.6	0.8
RSD (%):	7.5	12.5	30.9	7.2	9.1

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

Additional Trace Elements Reported in Whole Blood

Participant laboratories reported their analytical results for any additional trace elements (other than As, Cd, Hg and Pb) that are routinely reported so that a more complete characterization can be recorded for these proficiency test materials. Results for additional trace elements are reported here, but no target value is implied nor are any acceptable ranges provided. These data are provided solely for educational and informational purposes.

In addition to As, Cd, Pb and Hg, the whole blood pools were supplemented with the following additional trace elements as indicated below

Additional Elements

Mn, Sn, Tl, Ti, V, W, Ni, Ag

Blood Aluminum (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	<5.4	<5.4	<5.4	<5.4	<5.4
305	ICP-MS	11.4	10.3	11.7	16.9	22.6
359	ICP-MS	31.5	27.3	33.4	43.2	27.6

Blood Antimony (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	<0.258	<0.258	<0.258	<0.258	<0.258
110	ICP-MS	<0.10	<0.10	<0.10	<0.10	<0.10
147	ICP-MS	<0.04	<0.04	<0.04	0.0535	<0.04
206	DRC/CC-ICP-MS	<1.0	<1.0	<1.0	<1.0	<1.0

Blood Barium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	12.0	10.0	13.9	9.97	16.9
197	ICP-MS	12.8	10.6	14.4	10.1	17.3
312	ICP-MS	11.8	9.6	12.4	8.8	15.1
	Arithmetic Mean	**12.2**	**10.1**	**13.6**	**9.6**	**16.4**
	SD	0.5	0.5	1.0	0.7	1.2
	n	3	3	3	3	3

Blood Beryllium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	ICP-MS	<0.14	0.2	0.3	0.3	0.2
147	ICP-MS	<1.8	<1.8	<1.8	<1.8	<1.8
197	ICP-MS	0.2	0.3	0.3	0.2	0.2

Blood Bismuth (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
197	ICP-MS	<1.0	<1.0	<1.0	<1.0	<1.0
206	DRC/CC-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

Blood Cesium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	ICP-MS	0.4	0.5	0.5	0.6	0.5

Blood Copper (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	ICP-MS	1279	1447	1372	1218	1543
147	ICP-MS	1112	1290	1226	1067	1353
197	ICP-MS	1040	1260	1150	1050	1320
312	ICP-MS	960	1110	970	890	1130
	Arithmetic mean	**1098**	**1277**	**1180**	**1056**	**1337**
	SD	136	138	167	134	169
	n	4	4	4	4	4

Blood Iodine (μg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	53.8	91.6	52.7	73.3	57.6

Blood Lithium (μg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	1.15	1.78	1.65	1.62	1.69

Blood Manganese (μg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	30.2	22.5	29.0	25.3	11.3
107	DRC/CC-ICP-MS	30	22	29	27	12
110	ETAAS-Z	29.0	21.7	28.7	25.9	11.9
114	ICP-MS	26.2	20.8	27.0	24.1	11.9
147	ICP-MS	29.2	20.9	28.3	25.5	11.8
156	ICP-MS	28	20	26	24	12
179	DRC/CC-ICP-MS	29.7	23.1	29.7	26.7	13.4
206	DRC/CC-ICP-MS	34.6	25.7	33.4	30.5	13.7
293	ICP-MS	27.0	21.3	24.5	22.8	9.8
305	ICP-MS	26.8	19.9	24.8	22.0	10.9
312	DRC/CC-ICP-MS	26	18	22	22	8
324	ICP-MS	22.5	16.0	16.9	*14.8	5.7
391	DRC/CC-ICP-MS	29.4	20.4	26.5	25.0	10.2
*Outlier	Arithmetic mean	**28.4**	**20.9**	**26.6**	**25.1**	**11.0**
	SD	2.9	2.4	4.1	2.4	2.2
	n	13	13	13	12	13

Blood Molybdenum (μg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	128	22.2	89.1	26.8	46.4
147	ICP-MS	120	20.8	81.3	25.4	43.4
197	ICP-MS	132.5	23.4	91.4	28.4	49.1
305	ICP-MS	115.2	21.1	79.8	25.4	43.8
312	ICP-MS	110	20	71	23	40
324	ICP-MS	140.8	22.2	87.8	26.5	47.8
	Arithmetic mean	**124**	**22**	**83**	**26**	**45**
	SD	11	1	8	2	3
	n	6	6	6	6	6

Blood Nickel (μg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	DRC/CC-ICP-MS	18.5	8.2	*32.8	13.4	12.9
147	ICP-MS	18.9	8.10	3.48	13.5	12.6
197	ICP-MS	19.6	8.9	3.7	13.8	13.5
312	ICP-MS	17	7	4	12	11
*Outlier	Arithmetic mean	**18.5**	**8.1**	**3.7**	**13.2**	**12.5**
	SD	1.1	0.8	0.3	0.8	1.1
	n	4	4	3	4	4

Blood Platinum (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	ICP-MS	<0.10	<0.10	<0.10	<0.10	<0.10
312	ICP-MS	<0.2	<0.2	<0.2	<0.2	<0.2

Blood Selenium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	293	295	328	335	316
107	DRC/CC-ICP-MS	330	340	360	380	360
109	ICP-MS	298	297	322	339	323
114	ICP-MS	278	290	294	332	334
147	ICP-MS	280	293	330	333	314
305	ICP-MS	348	366	387	422	378
312	ICP-MS	278	278	287	309	282
359	ICP-MS	302.1	305.5	336.6	347.1	322.7
	Arithmetic Mean	**301**	**308**	**331**	**350**	**329**
	SD	26	30	33	35	29
	n	8	8	8	8	8

Blood Silver (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	8.76	1.76	5.75	4.07	4.65
197	ICP-MS	8.6	1.9	5.8	4.0	4.7

Blood Strontium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	32.1	23.1	36.7	25.3	28.9

Blood Tellurium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	<0.08	<0.08	<0.08	<0.08	<0.08

Blood Thorium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
147	ICP-MS	<0.03	<0.03	<0.03	<0.03	<0.03

Blood Thallium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	4.85	10.5	8.43	7.76	2.28
110	ICP-MS	4.9	10.8	8.6	8.0	2.4
147	ICP-MS	4.91	10.5	7.81	8.03	2.39
156	DRC/CC-ICP-MS	5	10	8.6	7.9	2.3
179	ICP-MS	5	11	9	8	2
197	ICP-MS	4.7	9.9	8.1	7.4	2.3
206	ICP-MS	5.0	11.2	8.5	7.9	2.4
305	ICP-MS	3.8	7.9	6.5	5.9	1.8
312	ICP-MS	4.2	9.1	6.7	6.4	1.9
324	ICP-MS	4.7	9.8	8.1	7.3	2.2
	Arithmetic mean	**4.7**	**10.1**	**8.0**	**7.5**	**2.2**
	SD	0.4	1.0	0.8	0.7	0.2
	n	10	10	10	10	10

Blood Tin (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	ICP-MS	3.3	13.8	4.7	6.9	11.6
147	ICP-MS	3.11	13.5	4.55	6.97	11.7
156	DRC/CC-ICP-MS	2.9	12	4.6	7.3	10
197	ICP-MS	<5.0	14.5	5.1	7.4	12.5
	Arithmetic Mean	**3.1**	**13.5**	**4.7**	**7.1**	**11.5**
	SD	0.2	1.1	0.2	0.2	1.0
	n	3	4	4	4	4

Blood Tungsten (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
324	ICP-MS	4.1	12.8	1.7	10.6	7.6

Blood Uranium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
103	DRC/CC-ICP-MS	<0.00748	<0.00748	<0.00748	<0.00748	<0.00748
110	ICP-MS	<0.02	<0.02	<0.02	<0.02	<0.02
147	ICP-MS	<0.0071	<0.0071	<0.0071	<0.0071	<0.0071
312	ICP-MS	<0.1	<0.1	<0.1	<0.1	<0.1

Blood Vanadium (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	DRC/CC-ICP-MS	8.3	8.8	1.9	7.7	15.7
147	DRC/CC-ICP-MS	8.42	8.98	1.96	7.76	16.3
312	DRC/CC-ICP-MS	7.4	7.8	1.2	6.8	13
324	ICP-MS	*19.8	*18.0	*9.3	*16.6	31.5
Outlier	**Arithmetic Mean**	**8.0**	**8.5**	**1.7**	**7.4**	**19.1**
	SD	0.6	0.6	0.4	0.5	8.4
	n	3	3	3	3	4

Blood Zinc (µg/L)

Lab Code	Method	BE15-06	BE15-07	BE15-08	BE15-09	BE15-10
110	ICP-MS	1883	2044	1968	2211	1863
114	ICP-MS	2010	2320	2030	2450	2060
147	ICP-MS	1830	2033	1941	2261	1856
197	ICP-MS	1570	1790	1630	1910	1690
206	DRC/CC-ICP-MS	*197.8	*219.5	*196.7	*239.6	*200.4
312	ICP-MS	1690	1810	1540	1910	1590
Outlier	**Arithmetic mean**	**1797**	**1999**	**1822**	**2148**	**1812**
	SD	171	215	221	235	180
	n	5	5	5	5	5

ATOMIC SPECTROMETRY METHODS

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

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

A-3   FAAS (Flame atomic absorption spectrometry)

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

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

A-6   AFS (Atomic fluorescence spectrometry)

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 μmol ZPP/mol heme)

OTHER METHODS

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