
Wadsworth Center

New York State Department of Health

TRACE ELEMENTS IN SERUM

Event #2, 2011

June 21, 2011

June 21, 2011

**Trace Elements in Serum
Event #2, 2011**

Dear Laboratory Director:

Results from the second proficiency test (PT) event for 2011 in the category Trace Elements in Serum have been tabulated and are summarized. Target values for Aluminum, Copper, Selenium and Zinc 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.

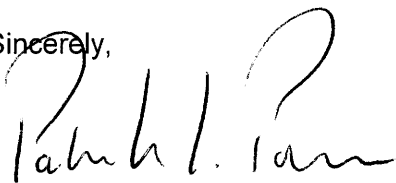
PT Materials

Test materials were prepared from human serum obtained from Tennessee Blood Services, Inc. Serum units were spiked with a suite of additional trace elements as described in each narrative.

The next PT event for Trace Elements in Serum is scheduled to be mailed Wednesday, September 21st, 2011. Please inform our laboratory staff at (518) 474-4484 if the test materials have not arrived within five days of the scheduled mail out date. **The deadline for reporting results is Wednesday, October 19th, 2011.**

Thank you for your participation.

Sincerely,



Patrick J. Parsons, Ph.D.
Chief
Laboratory of Inorganic and Nuclear Chemistry



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

New York State Department of Health
Event #2, 2011

Serum Aluminum

The test materials for serum Al were prepared from human serum obtained from Tennessee Blood Services, Inc. The units were tested by FDA approved methods and found to be Non-reactive for Anti-HIV-1/2, Anti-HCV 3.0 and HBsAg. The serum has also been found to be STS (RPR) Non-reactive and Negative for HIV-1 and HCV by PCR. Serum units were dispensed into acid-washed 500-mL polypropylene containers to make up five (5) serum pools. Each pool was spiked with a suite of additional trace elements including aluminum as Al³⁺ at various concentrations.

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 serum aluminum range from 31 µg/L (1.15 µmol/L) to 142 µg/L (5.26 µmol/L).

Acceptable ranges for serum aluminum are based on fixed criteria of ±20%, or ±5 µg/L below 25 µg/L. These criteria are based on consensus recommendations from several EQAS organizers (1).

Discussion. Based on the above criteria, 93.6% of test results reported were judged as satisfactory, with two out of 25 participant laboratories (8.0%) reporting 2 or more of the 5 results outside the acceptable ranges.

1. Taylor, A., Angerer, J., Claeys, F., Kristiansen, J., Mazarrasa, O., Menditto, A., Patriarca, M., Pineau, A., Schoeters, I., Sykes, C., Valkonen, S. and Weykamp, C. Comparison of procedures for evaluating laboratory performance in external quality assessment schemes for lead in blood and aluminum in serum demonstrates the need for common quality specifications. Clinical Chemistry 2002 48 2000-2007.

New York State Department of Health
Serum Aluminum Test Results, 2011 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ serum)				
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
Robust Mean	61	82	31	142	104
Robust Standard Deviation	4.5	4.8	3.2	9.1	8.9
Standard Uncertainty	1.1	1.2	0.8	2.3	2.2
RSD (%)	7.3	5.8	10.2	6.4	8.6
Acceptable Range:					
Upper Limit:	73	98	37	170	125
Lower Limit:	49	66	25	114	83

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

New York State Department of Health
Serum Aluminum Test Results, 2011 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-06	SE11-07	SE11-08	SE11-09	SE11-10	
	Target Values:	61	82	31	142	104	
110	ETAAS-Z	62	84	30	141	104	
114	ETAAS-Z	62	80	33	151	113	
147	ETAAS-Z	65	86	34	144	109	Info
156	ICP-MS	51	72	23 ↓	124	92	
159	ETAAS-Z	63	81	32	136	104	
160	ETAAS-Z	67	83	38 ↑	139	110	
164	ICP-MS	54	74	30	136	92	
179	DRC/CC-ICP-MS	63	83	30	142	103	
197	ICP-MS	59	81	29	142	102	
200	DRC/CC-ICP-MS	71	89	27	153	114	Info
206	ICP-MS	58	78	29	136	98	
287	ETAAS-Z	63	82	33	130	104	
293	ICP-MS	75 ↑	92	38 ↑	157	115	Info
305	ICP-MS	58	82	31	144	103	
324	HR-ICP-MS	55	81	23 ↓	137	95	Info
325	ETAAS-Z	58	72	31	118	89	Info
355	ICP-MS	63	83	32	144	102	
357	ICP-MS	63	92	34	154	115	
358	ICP-MS	64	85	31	146	110	
362	ICP-MS	65	86	36	149	110	
363	ICP-MS	59	79	30	133	98	
366	ETAAS-Z	58	77	31	136	102	Info
367	ETAAS-Z	60	83	23 ↓	142	109	Info
458	ETAAS Other	63	85	34	191 ↑	132 ↑	
465	ICP-MS	55	72	29	140	94	

Percent satisfactory results for all participants: 93.6 %

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
Serum Aluminum Test Results, 2011 Event #2
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ serum)				
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	67	86	29	148	109
Standard Deviation:	6	4	2	8	8
RSD (%):	—	—	—	—	—
ETAAS Other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	63	85	34	191	132
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	9	9	9	9	9
Mean:	62	81	32	137	105
Standard Deviation:	3	4	4	9	7
RSD (%):	4.8	5.2	12.6	6.8	6.6
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	55	81	23	137	95
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	12	12	12	12	12
Mean:	60	81	31	142	103
Standard Deviation:	6	7	4	9	8
RSD (%):	10.4	8.4	12.4	6.4	8.1
All Laboratories					
Number of Sample Measurements:	25	25	25	25	25
Mean:	61	82	31	143	105
Standard Deviation:	5	5	4	13	9
RSD (%):	8.6	6.7	13.0	9.4	9.0

notes: ? Insufficient data for calculation.

Serum Copper

The test materials for serum Cu were prepared from human serum obtained from Tennessee Blood Services, Inc. The units were tested by FDA approved methods and found to be Non-reactive for Anti-HIV-1/2, Anti-HCV 3.0 and HBsAg. The serum has also been found to be STS (RPR) Non-reactive and Negative for HIV-1 and HCV by PCR. Serum units were dispensed into acid-washed 500-mL polypropylene containers to make up five (5) serum pools. Each pool was spiked with a suite of additional trace elements including copper as Cu^{2+} at various concentrations.

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 serum copper range from 963 $\mu\text{g/L}$ (15.15 $\mu\text{mol/L}$) to 2510 $\mu\text{g/L}$ (39.50 $\mu\text{mol/L}$).

Acceptable ranges for serum copper are based on fixed criteria of $\pm 15\%$, or $\pm 95 \mu\text{g/L}$ below 635 $\mu\text{g/L}$. These criteria are consistent with those proposed by the OELM Network of EQAS organizers (1, 2) for trace elements in serum, and are slightly less stringent than those previously suggested for NYS ($\pm 10\%$).

Discussion. Based on the above criteria, 91.4% of test results reported were judged as satisfactory, with three out of 21 participant laboratories (14.3%) reporting 2 or more of the 5 results outside the acceptable ranges.

1. A. Taylor, J. Angerer, J. Arnaud, F. Claeys, R.L. Jones, O. Mazarrasa, E. Mairiaux, A. Menditto, P.J. Parsons, M. Patriarca, A. Pineau, S. Valkonen, J.-P. Weber and C. Weykamp Accreditation and Quality Assurance 2006 **11** 440-445.

2. J. Arnaud, J.-P. Weber, C.W. Weykamp, P.J. Parsons, J. Angerer, E. Mairiaux, O. Mazarrasa, S. Valkonen, A. Menditto, M. Patriarca, and A. Taylor Clinical Chemistry 2008 **54** 1892-1899.

**New York State Department of Health
Serum Copper Test Results, 2011 Event #2
ROBUST STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

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

	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
Robust Mean	998	1563	2510	1548	963
Robust Standard Deviation	60	106	168	92	65
Standard Uncertainty	16	29	46	25	18
RSD (%)	6.0	6.8	6.7	5.9	6.7
Acceptable Range:					
Upper Limit:	1148	1798	2887	1780	1108
Lower Limit:	848	1329	2134	1316	819

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

New York State Department of Health
Serum Copper Test Results, 2011 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-06	SE11-07	SE11-08	SE11-09	SE11-10	
	Target Values:	998	1563	2510	1548	963	
107	DRC/CC-ICP-MS	938	1551	2462	1523	940	Info
110	ICP-MS	1058	1639	2596	1629	1022	
114	ICP-MS	970	1490	2340	1490	940	
147	ICP-MS	972	1493	2408	1499	934	Info
156	FAAS	1030	1560	2560	1560	980	
159	ICP-AES/OES	1030	1600	2600	1570	1000	
160	ETAAS-Z	1160 ↑	1820 ↑	2720	1680	1050	
164	ICP-MS	912	1429	2279	1409	953	
179	DRC/CC-ICP-MS	1030	1640	2660	1600	990	
197	ICP-MS	940	1430	2240	1390	880	
200	FAAS	1016	1600	2508	1607	1048	Info
206	ICP-MS	960	1510	2430	1500	860	
293	ICP-MS	992	1495	2404	1456	916	Info
305	ICP-MS	964	1490	2435	1482	927	
324	HR-ICP-MS	817 ↓	1258 ↓	2015 ↓	1257 ↓	776 ↓	Info
325	FAAS	1050	1680	2730	1620	1050	Info
360	FAAS	1200 ↑	1760	2780	1750	1140 ↑	
362	ICP-MS	980	1560	2520	1570	930	
366	ETAAS other	970	1524	2477	1544	917	Info
401	DRC/CC-ICP-MS	1011	1635	2570	1577	979	Info
457	ICP-AES/OES	1096	1665	2700	1634	1062	Info

Percent satisfactory results for all participants: 91.4 %

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
Serum Copper Test Results, 2011 Event #2
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	993	1609	2564	1567	970
Standard Deviation:	49	50	99	40	26
RSD (%):	—	—	—	—	—
ETAAS other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	970	1524	2477	1544	917
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	1	1	1	1	1
Mean:	1160	1820	2720	1680	1050
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	4	4	4	4	4
Mean:	1074	1650	2645	1634	1055
Standard Deviation:	85	89	131	81	66
RSD (%):	7.9	5.4	5.0	5.0	6.2
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	817	1258	2015	1257	776
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	2	2	2	2	2
Mean:	1063	1633	2650	1602	1031
Standard Deviation:	47	46	71	45	44
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	9	9	9	9	9
Mean:	972	1504	2406	1492	929
Standard Deviation:	40	64	111	74	46
RSD (%):	4.1	4.3	4.6	5.0	4.9
All Laboratories					
Number of Sample Measurements:	21	21	21	21	21
Mean:	1005	1563	2497	1540	966
Standard Deviation:	83	123	184	108	81
RSD (%):	8.3	7.9	7.4	7.0	8.4

notes: ? Insufficient data for calculation.

New York State Department of Health
Event #2, 2011

Serum Selenium

The test materials for serum Se were prepared from human serum obtained from Tennessee Blood Services, Inc. The units were tested by FDA approved methods and found to be Non-reactive for Anti-HIV-1/2, Anti-HCV 3.0 and HBsAg. The serum has also been found to be STS (RPR) Non-reactive and Negative for HIV-1 and HCV by PCR. Serum units were dispensed into acid-washed 500-mL polypropylene containers to make up five (5) serum pools. Each pool was spiked with a suite of additional trace elements including selenium as Se^{4+} at various concentrations.

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 serum selenium range from 129 $\mu\text{g/L}$ (1.63 $\mu\text{mol/L}$) to 366 $\mu\text{g/L}$ (4.64 $\mu\text{mol/L}$).

Acceptable ranges for serum selenium are based on fixed criteria of $\pm 20\%$, or $\pm 2 \mu\text{g/L}$ below 10 $\mu\text{g/L}$. These criteria are a little less stringent than those proposed by the OELM Network of EQAS organizers ($\pm 15\%$ or $\pm 8 \mu\text{g/L}$ below 55 $\mu\text{g/L}$) (1, 2) for trace elements in serum. As performance for serum Se improves among NYS-permit laboratories, consideration will be given to adopting the OELM criteria.

Discussion. Based on the above criteria, 98.8% of test results reported were judged as satisfactory, with none of the 17 participant laboratories reporting 2 or more of the 5 results outside the acceptable ranges.

1. A. Taylor, J. Angerer, J. Arnaud, F. Claeys, R.L. Jones, O. Mazarrasa, E. Mairiaux, A. Menditto, P.J. Parsons, M. Patriarca, A. Pineau, S. Valkonen, J.-P. Weber and C. Weykamp Accreditation and Quality Assurance 2006 11 440-445.
2. J. Arnaud, J.-P. Weber, C.W. Weykamp, P.J. Parsons, J. Angerer, E. Mairiaux, O. Mazarrasa, S. Valkonen, A. Menditto, M. Patriarca, and A. Taylor Clinical Chemistry 2008 54 1892-1899.

New York State Department of Health
Serum Selenium Test Results, 2011 Event #2
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ serum)				
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
Robust Mean	135	229	129	162	366
Robust Standard Deviation	9.6	19.0	10.2	13.5	30.0
Standard Uncertainty	2.9	5.8	3.1	4.1	9.1
RSD (%)	7.1	8.3	7.9	8.4	8.2
Acceptable Range:					
Upper Limit:	162	275	155	194	439
Lower Limit:	108	183	103	130	293

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

New York State Department of Health
Serum Selenium Test Results, 2011 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-06	SE11-07	SE11-08	SE11-09	SE11-10	
	Target Values:	135	229	129	162	366	
107	DRC/CC-ICP-MS	129	233	124	160	360	Info
110	DRC/CC-ICP-MS	128	213	121	151	348	
114	ICP-MS	129	124 ↓	119	155	324	
147	ICP-MS	135	224	130	161	356	Info
156	ICP-MS	157	257	134	174	395	
159	ETAAS-Z	140	229	125	147	384	
164	DRC/CC-ICP-MS	140	251	135	181	404	
179	DRC/CC-ICP-MS	120	213	119	148	334	
197	ICP-MS	152	252	147	184	415	
200	DRC/CC-ICP-MS	126	214	119	152	352	Info
206	ICP-MS	137	224	142	155	334	
293	DRC/CC-ICP-MS	133	228	133	163	368	Info
305	ICP-MS	140	238	132	171	366	
324	HR-ICP-MS	122	203	113	146	334	Info
366	ETAAS-Z	143	231	137	162	372	Info
367	DRC/CC-ICP-MS	144	246	140	179	404	Info
401	DRC/CC-ICP-MS	133	234	127	162	379	Info

Percent satisfactory results for all participants: 98.8 %

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
Serum Selenium Test Results, 2011 Event #2
STATISTICAL SUMMARY BY METHOD

Results ($\mu\text{g/L}$ serum)					
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	8	8	8	8	8
Mean:	132	229	127	162	369
Standard Deviation:	8	15	8	12	26
RSD (%):	5.8	6.5	6.2	7.6	6.9
ETAAS-Z					
Number of Sample Measurements:	2	2	2	2	2
Mean:	142	230	131	155	378
Standard Deviation:	2	1	8	11	8
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	122	203	113	146	334
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	6	6	6	6	6
Mean:	142	220	134	167	365
Standard Deviation:	11	49	10	12	35
RSD (%):	7.5	22.3	7.3	7.0	9.6
All Laboratories					
Number of Sample Measurements:	17	17	17	17	17
Mean:	136	224	129	162	366
Standard Deviation:	10	30	9	12	28
RSD (%):	7.3	13.3	7.3	7.5	7.5

notes: ? Insufficient data for calculation.

New York State Department of Health
Event #2, 2011

Serum Zinc

The test materials for serum Zn were prepared from human serum obtained from Tennessee Blood Services, Inc. The units were tested by FDA approved methods and found to be Non-reactive for Anti-HIV-1/2, Anti-HCV 3.0 and HBsAg. The serum has also been found to be STS (RPR) Non-reactive and Negative for HIV-1 and HCV by PCR. Serum units were dispensed into acid-washed 500-mL polypropylene containers to make up five (5) serum pools. Each pool was spiked with a suite of additional trace elements including zinc as Zn^{2+} at various concentrations.

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 serum zinc range from 635 µg/L (9.71 µmol/L) to 2582 µg/L (39.49 µmol/L).

Acceptable ranges for serum zinc are based on fixed criteria of $\pm 15\%$, or ± 15 µg/L below 100 µg/L. These criteria are consistent with those proposed by the OELM network of EQAS organizers (1) for trace elements in serum.

Discussion. Based on the above criteria, 92.6% of test results reported were judged as satisfactory, with two out of 27 participant laboratories (7.4%) reporting 2 or more of the 5 results outside the acceptable ranges.

1. A. Taylor, J. Angerer, J. Arnaud, F. Claeys, R.L. Jones, O. Mazarrasa, E. Mairiaux, A. Menditto, P.J. Parsons, M. Patriarca, A. Pineau, S. Valkonen, J.-P. Weber and C. Weykamp Accreditation and Quality Assurance 2006 **11** 440-445.

2. J. Arnaud, J.-P. Weber, C.W. Weykamp, P.J. Parsons, J. Angerer, E. Mairiaux, O. Mazarrasa, S. Valkonen, A. Menditto, M. Patriarca, and A. Taylor Clinical Chemistry 2008 **54** 1892-1899.

**New York State Department of Health
Serum Zinc Test Results, 2011 Event #2
ROBUST STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ serum)				
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
Robust Mean	2582	635	724	1098	1934
Robust Standard Deviation	135	48	63	86	130
Standard Uncertainty	33	12	15	21	31
RSD (%)	5.2	7.6	8.7	7.8	6.7
Acceptable Range:					
Upper Limit:	2969	730	833	1263	2224
Lower Limit:	2195	540	615	933	1644

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

New York State Department of Health
Serum Zinc Test Results, 2011 Event #2
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-06	SE11-07	SE11-08	SE11-09	SE11-10	
	Target Values:	2582	635	724	1098	1934	
107	DRC/CC-ICP-MS	2587	625	710	1102	1967	Info
110	ICP-MS	2701	640	756	1218	2047	
114	ICP-MS	2510	670	730	1200	1920	
147	ICP-MS	2529	575	673	1059	1876	Info
156	ICP-MS	2580	651	716	1120	1980	
159	ICP-AES/OES	2640	630	850 ↑	1100	1990	
160	FAAS	2290	610	680	1000	1620 ↓	
164	ICP-MS	2378	559	648	987	1793	
179	DRC/CC-ICP-MS	2490	540	650	1030	1900	
197	ICP-MS	2490	590	660	1020	1800	
200	FAAS	2538	687	798	1151	1844	Info
206	ICP-MS	2520	600	690	1050	1900	
287	FAAS	2750	670	750	1160	1960	
293	ICP-MS	2498	589	687	1027	1844	Info
305	ICP-MS	2297	531 ↓	625	958	1706	
324	HR-ICP-MS	1760 ↓	410 ↓	476 ↓	725 ↓	1312 ↓	Info
325	FAAS	2880	855 ↑	930 ↑	1080	2100	Info
355	ICP-MS	2566	679	724	1126	1935	
357	ICP-MS	2640	680	780	1190	2060	
358	ICP-MS	2707	645	747	1128	2045	
360	FAAS	2660	630	720	1120	1920	
362	ICP-MS	2570	690	740	1120	1950	
363	ICP-MS	2850	670	780	1180	2150	
366	FAAS	2586	648	710	1070	1899	Info
401	DRC/CC-ICP-MS	2844	667	784	1209	2157	Info
457	ICP-AES/OES	2571	620	727	1049	1928	Info
458	FAAS	2775	670	787	1197	2104	

Percent satisfactory results for all participants: 92.6 %

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
Serum Zinc Test Results, 2011 Event #2
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ serum)				
	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	2640	611	715	1114	2008
Standard Deviation:	183	65	67	90	133
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	2640	681	768	1111	1921
Standard Deviation:	193	81	83	66	165
RSD (%):	7.3	11.9	10.8	6.0	8.6
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	1760	410	476	725	1312
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	2	2	2	2	2
Mean:	2606	625	789	1075	1959
Standard Deviation:	49	7	87	36	44
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	14	14	14	14	14
Mean:	2560	626	711	1099	1929
Standard Deviation:	138	51	49	83	122
RSD (%):	5.4	8.2	6.8	7.6	6.3
All Laboratories					
Number of Sample Measurements:	27	27	27	27	27
Mean:	2563	631	723	1088	1915
Standard Deviation:	219	76	82	102	174
RSD (%):	8.6	12.1	11.3	9.4	9.1

notes: ? Insufficient data for calculation.

New York State Department of Health
Event #2, 2011

Additional Trace Elements Reported in Serum

Participant laboratories reported their analytical results for any additional trace elements (other than Al, Cu, Se and Zn) that are routinely reported so that a more complete characterization can be recorded for these PT 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 Al, Cu, Se and Zn, the serum pools were supplemented with additional trace elements as indicated below.

Additional Elements

Mn, Cr, V, Tl, Co

New York State Department of Health
Serum Additional Elements, 2011Event #2
Page 1

Serum Antimony (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.0584	<0.0584	<0.0584	<0.0584	<0.0584

Serum Arsenic (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
197	DRC/CC-ICP-MS	<10	<10	<10	<10	<10

Serum Barium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	1.54	1.37	1.13	1.41	1.22
197	ICP-MS	<2.0	<2.0	5.9	<2.0	<2.0

Serum Beryllium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.342	<0.342	<0.342	<0.342	<0.342
197	ICP-MS	<0.2	<0.2	<0.2	<0.2	<0.2

Serum Cadmium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.0247	0.0254	0.0284	0.0295	0.0268
197	DRC/CC-ICP-MS	<0.5	<0.5	<0.5	<0.5	<0.5

Serum Chromium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	1.22	3.61	2.07	0.655	1.78
164	DRC/CC-ICP-MS	1.1	3.5	1.9	0.7	1.6
179	DRC/CC-ICP-MS	1.1	3.3	2	0.6	1.7
197	ICP-MS	<1.0	3.2	2	<1.0	1.1
305	ICP-MS	1.3	3.6	2.2	0.7	1.9
Arithmetic mean (n=5)		1.2	3.4	2.0	0.7	1.6
SD		0.1	0.2	0.1	0.0	0.3

Serum Cobalt (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	0.397	4.61	2.81	1.03	0.607
179	ICP-MS	0.4	5.0	3.0	1.2	0.7
197	ICP-MS	<1.0	4.5	2.9	1	<1.0
Arithmetic mean (n=3)		0.4	4.7	2.9	1.1	0.7
SD		0.0	0.3	0.1	0.1	0.1

Serum Iodine (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	50.51	55.7	48.6	62.4	46.8

Serum Iron (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
457	ICP-AES/OES	50.51	55.7	48.6	62.4	46.8

Serum Lead (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.414	<0.414	<0.414	<0.414	<0.414
197	DRC/CC-ICP-MS	<0.4	<0.4	<0.4	<0.4	<0.4

New York State Department of Health
Serum Additional Elements, 2011Event #2
Page 2

Serum Manganese (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
107	DRC/CC-ICP-MS	6.8	0.79	0.66	3.35	1.86
147	ICP-MS	7.36	1.12	1.04	3.89	2.52
179	DRC/CC-ICP-MS	6.4	0.6	0.5	3.1	1.7
197	ICP-MS	7.2	1.2	1.1	3.7	2.4
305	ICP-MS	6.9	1.0	1.0	3.6	2.4
Arithmetic mean (n=5)		6.9	0.9	0.9	3.5	2.2
SD		0.4	0.2	0.3	0.3	0.4

Serum Mercury (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	0.198	0.16	0.169	0.323	0.163

Serum Molybdenum (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	1.44	1.71	1.55	0.988	1.84

Serum Nickel (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	0.875	0.84	0.757	0.675	1.44

Serum Silver (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	0.243	0.173	0.18	0.368	0.263

Serum Tin (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.57	<0.57	<0.570	<0.570	<0.570
197	ICP-MS	<5.0	<5.0	<5.0	<5.0	<5.0

Serum Tellurium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.472	<0.472	<0.472	<0.472	<0.472
197	ICP-MS	<1.0	<1.0	<1.0	<1.0	<1.0

Serum Thallium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	0.56	2.06	3.29	0.893	0.691
197	ICP-MS	<1.0	2.0	3.3	<1.0	<1.0

Serum Thorium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.0232	<0.0232	<0.0232	<0.0232	<0.0232

Serum Uranium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
147	ICP-MS	<0.0136	<0.0136	<0.0136	<0.0136	<0.0136

Serum Vanadium (µg/L)						
Lab Code	Method	SE11-06	SE11-07	SE11-08	SE11-09	SE11-10
107	DRC/CC-ICP-MS	4.05	0.60	1.70	0.94	2.59
179	DRC/CC-ICP-MS	4.1	0.6	1.5	0.9	2.7

New York State Department of Health
Trace Elements in Serum
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.
