
Wadsworth Center

New York State Department of Health

TRACE ELEMENTS IN SERUM

Event #1, 2011

March 28, 2011

March 28, 2011

**Trace Elements in Serum
Event #1, 2011**

Dear Laboratory Director:

Results from the first 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.

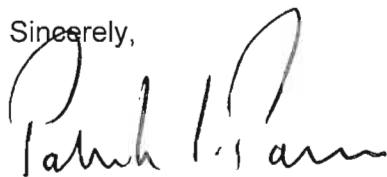
PT Materials

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, April 27th, 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, May 25th, 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 #1, 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 34 µg/L (1.26 µmol/L) to 114 µg/L (4.23 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, 93.1%* of test results reported were judged as satisfactory, with one out of 26 participant laboratories (3.8%) 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.

*Amended 4/13/11

New York State Department of Health
Serum Aluminum Test Results, 2011 Event #1
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
Robust Mean	34	50	99	114	85
Robust Standard Deviation	3.4	3.9	11.8	13.1	7.6
Standard Uncertainty	0.8	1.0	3.0	3.3	1.9
RSD (%)	9.8	7.8	11.9	11.5	8.9
Acceptable Range:					
Upper Limit:	41	60	119	137	102
Lower Limit:	27	40	79	91	68

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 #1
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-01	SE11-02	SE11-03	SE11-04	SE11-05	
Target Values:		34	50	99	114	85	
110	ETAAS-Z	34	50	104	116	89	Info
114	ETAAS-Z	39	53	94	117	83	
147	ETAAS-Z	32	47	94	107	83	
156	ICP-MS	37	58	113	134	101	
159	ETAAS-Z	37	49	95	107	83	
160	ETAAS-Z	32	47	88	96	79	Info
164	ICP-MS	34	51	102	115	88	
179	DRC/CC-ICP-MS	40	55	111	133	106 ↑	
197	ICP-MS	29	48	117	132	98	
200	DRC/CC-ICP-MS	69 ↑	105 ↑	185 ↑	206 ↑	170 ↑	
206	ICP-MS	39	53	>100	>100	84	Info
287	ETAAS-Z	26 ↓	44	83	101	75	
293	ICP-MS	33	49	92	108	79	
305	ICP-MS	35	50	101	119	83	
324	HR-ICP-MS	34	51	110	138 ↑	92	
325	ETAAS-Z	33	67 ↑	86	100	86	Info
355	ICP-MS	36	50	103	121	90	Info
357	ICP-MS	27	45	88	100	81	
358	ICP-MS	33	48	97	113	84	
362	ICP-MS	40	60	109	127	97	
363	ICP-MS	33	47	95	113	86	
366	ETAAS-Z	34	49	97	109	84	Info
367	ETAAS-Z	36	52	106	115	86	Info
401	ICP-AES/OES	27	40	80	94	73	Info
458	ETAAS Other	32	52	106	112	70	Info
465	ICP-MS	34	49	87	103	78	

Percent satisfactory results for all participants: 93.1 %

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.

Amended 4/13/11

New York State Department of Health
Serum Aluminum Test Results, 2011 Event #1
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
DRC/CC-ICP-MS					
Number of Sample Measurements:	1	1	2	2	1
Mean:	40	55	148	170	106
Standard Deviation:	?	?	52	52	?
RSD (%):	—	—	—	—	—
ETAAS Other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	32	52	106	112	70
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	9	9	9	9	9
Mean:	34	51	94	108	83
Standard Deviation:	4	7	8	8	4
RSD (%):	11.0	13.0	8.2	7.0	4.9
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	34	51	110	138	92
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	1	1	1	1	1
Mean:	27	40	80	94	73
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	12	12	11	11	12
Mean:	34	51	100	117	87
Standard Deviation:	4	4	10	11	8
RSD (%):	10.9	8.7	9.8	9.5	8.7
All Laboratories					
Number of Sample Measurements:	25	25	25	25	25
Mean:	34	51	102	117	86
Standard Deviation:	4	5	20	22	8
RSD (%):	11.3	10.7	19.6	18.8	9.9

notes: ? Insufficient data for calculation.

New York State Department of Health
Event #1, 2011

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 1042 $\mu\text{g/L}$ (16.40 $\mu\text{mol/L}$) to 2559 $\mu\text{g/L}$ (40.27 $\mu\text{mol/L}$).

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, 95.2% of test results reported were judged as satisfactory, with one out of 21 participant laboratories (4.8%) 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 #1
ROBUST STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

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

	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
Robust Mean	2183	1311	2559	1688	1042
Robust Standard Deviation	130	82	121	95	64
Standard Uncertainty	36	22	33	26	18
RSD (%)	6.0	6.3	4.7	5.7	6.2
Acceptable Range:					
Upper Limit:	2511	1508	2943	1941	1198
Lower Limit:	1856	1114	2175	1435	886

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 #1
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-01	SE11-02	SE11-03	SE11-04	SE11-05	
	Target Values:	2183	1311	2559	1688	1042	
107	DRC/CC-ICP-MS	2066	1250	2510	1626	1029	Info
110	ICP-MS	2274	1342	2669	1742	1079	
114	ICP-MS	2190	1350	2640	1730	1030	
147	ICP-MS	2281	1321	2630	1722	1093	Info
156	FAAS	2180	1260	2460	1650	940	
159	ICP-AES/OES	2170	1290	2540	1680	1040	
160	ETAAS-Z	2119	1262	2564	1672	997	
164	ICP-MS	2050	1197	2418	1578	987	
179	DRC/CC-ICP-MS	2280	1340	2660	1760	1080	
197	ICP-MS	2540 ↑	1460	2920	1850	1170	
200	FAAS	2127	1334	2477	1543	965	Info
206	ICP-MS	2160	1270	2510	1700	1040	
293	ICP-MS	2169	1247	2525	1647	1030	Info
305	ICP-MS	2010	1230	2420	1560	1000	
324	HR-ICP-MS	1950	1124	2293	1455	905	Info
325	FAAS	2670 ↑	1530 ↑	3060 ↑	1980 ↑	1140	Info
360	FAAS	2060	1380	2440	1670	1070	
362	ICP-MS	2270	1410	2660	1790	1100	
366	ETAAS other	2323	1380	2542	1749	1087	Info
401	DRC/CC-ICP-MS	2245	1329	2646	1768	1088	Info
457	ICP-AES/OES	2115	1277	2562	1681	1004	Info

Percent satisfactory results for all participants: 95.2 %

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 #1
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	2197	1306	2605	1718	1066
Standard Deviation:	115	49	83	80	32
RSD (%):	—	—	—	—	—
ETAAS other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	2323	1380	2542	1749	1087
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	1	1	1	1	1
Mean:	2119	1262	2564	1672	997
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	4	4	4	4	4
Mean:	2259	1376	2609	1711	1029
Standard Deviation:	278	114	301	188	93
RSD (%):	12.3	8.3	11.5	11.0	9.1
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	1950	1124	2293	1455	905
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	2	2	2	2	2
Mean:	2143	1284	2551	1681	1022
Standard Deviation:	39	9	16	1	25
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	9	9	9	9	9
Mean:	2216	1314	2599	1702	1059
Standard Deviation:	155	86	155	94	57
RSD (%):	7.0	6.6	6.0	5.5	5.4
All Laboratories					
Number of Sample Measurements:	21	21	21	21	21
Mean:	2202	1313	2578	1693	1042
Standard Deviation:	167	91	169	113	65
RSD (%):	7.6	6.9	6.6	6.7	6.2

notes: ? Insufficient data for calculation.

New York State Department of Health
Event #1, 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 113 $\mu\text{g/L}$ (1.43 $\mu\text{mol/L}$) to 299 $\mu\text{g/L}$ (3.79 $\mu\text{mol/L}$).

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, 100.0% 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 #1
ROBUST STATISTICAL SUMMARY**

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
Robust Mean	119	299	113	243	206
Robust Standard Deviation	4.0	8.9	6.5	5.4	6.9
Standard Uncertainty	1.2	2.7	2.0	1.6	2.1
RSD (%)	3.3	3.0	5.8	2.2	3.4
Acceptable Range:					
Upper Limit:	143	359	136	292	247
Lower Limit:	95	239	90	194	165

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 #1
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-01	SE11-02	SE11-03	SE11-04	SE11-05	
	Target Values:	119	299	113	243	206	
107	DRC/CC-ICP-MS	114	288	109	232	197	Info
110	DRC/CC-ICP-MS	116	288	108	235	196	
114	ICP-MS	120	299	112	232	206	
147	ICP-MS	119	295	112	245	203	Info
156	ICP-MS	122	311	121	253	215	
159	ETAAS-Z	122	296	108	240	201	
164	ETAAS-Z	116	302	114	243	205	
179	DRC/CC-ICP-MS	117	294	106	245	204	
197	ICP-MS	114	297	117	245	198	
200	DRC/CC-ICP-MS	117	297	107	242	202	Info
206	ICP-MS	119	298	116	243	207	
293	DRC/CC-ICP-MS	134	340	123	280	231	Info
305	ICP-MS	122	278	111	231	204	
324	HR-ICP-MS	115	311	101	244	213	Info
366	ETAAS-Z	118	320	122	241	226	Info
367	DRC/CC-ICP-MS	121	303	112	248	205	Info
401	DRC/CC-ICP-MS	127	321	122	268	224	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.

New York State Department of Health
Serum Selenium Test Results, 2011 Event #1
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
DRC/CC-ICP-MS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	121	304	112	250	208
Standard Deviation:	7	19	7	18	14
RSD (%):	6.0	6.4	6.3	7.1	6.5
ETAAS-Z					
Number of Sample Measurements:	3	3	3	3	3
Mean:	119	306	115	241	211
Standard Deviation:	3	12	7	2	13
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	115	311	101	244	213
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	6	6	6	6	6
Mean:	119	296	115	242	206
Standard Deviation:	3	11	4	8	6
RSD (%):	2.5	3.6	3.4	3.5	2.7
All Laboratories					
Number of Sample Measurements:	17	17	17	17	17
Mean:	120	302	113	245	208
Standard Deviation:	5	15	6	13	10
RSD (%):	4.2	4.9	5.7	5.1	5.0

notes: ? Insufficient data for calculation.

New York State Department of Health
Event #1, 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 666 $\mu\text{g/L}$ (10.19 $\mu\text{mol/L}$) to 1837 $\mu\text{g/L}$ (28.09 $\mu\text{mol/L}$).

Acceptable ranges for serum zinc are based on fixed criteria of $\pm 15\%$, or $\pm 15 \mu\text{g/L}$ below 100 $\mu\text{g/L}$. 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, 91.9% of test results reported were judged as satisfactory, with three out of 27 participant laboratories (11.1%) 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 #1
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results ($\mu\text{g/L}$ serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
Robust Mean	796	666	1837	1010	836
Robust Standard Deviation	60	50	108	78	56
Standard Uncertainty	14	12	26	19	13
RSD (%)	7.5	7.6	5.9	7.7	6.6
Acceptable Range:					
Upper Limit:	915	766	2113	1162	961
Lower Limit:	677	566	1562	859	711

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 #1
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum)					Info Only
		SE11-01	SE11-02	SE11-03	SE11-04	SE11-05	
Target Values:		796	666	1837	1010	836	
107	DRC/CC-ICP-MS	755	652	1857	983	826	Info
110	ICP-MS	853	720	1971	1082	897	
114	ICP-MS	920 ↑	800 ↑	2000	1170 ↑	940	
147	ICP-MS	817	623	1869	974	824	
156	ICP-MS	656 ↓	555 ↓	1558 ↓	923	799	
159	ICP-AES/OES	800	690	1780	1000	840	
160	FAAS	810	690	1890	1040	870	
164	ICP-MS	733	616	1770	939	800	
179	DRC/CC-ICP-MS	830	690	1940	1040	860	
197	ICP-MS	830	660	1900	970	810	
200	FAAS	791	719	1805	1079	824	Info
206	ICP-MS	730	650	1750	990	800	
287	FAAS	790	660	1740	950	780	
293	ICP-MS	759	582	1668	922	732	Info
305	ICP-MS	740	660	1750	940	780	
324	HR-ICP-MS	879	808 ↑	1883	1091	907	
325	FAAS	1110 ↑	780 ↑	2070	1110	930	Info
355	ICP-MS	780	649	1802	1005	836	
357	ICP-MS	780	670	1820	960	810	
358	ICP-MS	818	681	1923	1026	857	
360	FAAS	730	540 ↓	1770	1010	780	
362	ICP-MS	760	650	1820	1020	860	
363	ICP-MS	860	710	1890	1120	920	
366	FAAS	767	640	1701	891	786	
401	DRC/CC-ICP-MS	811	680	1948	1046	863	
457	ICP-AES/OES	727	594	1752	917	768	
458	FAAS	1136 ↑	725	2053	1102	930	

Percent satisfactory results for all participants: 91.9 %

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 #1
STATISTICAL SUMMARY BY METHOD

	Results ($\mu\text{g/L}$ serum)				
	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	799	674	1915	1023	850
Standard Deviation:	39	20	50	35	21
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	876	679	1861	1026	843
Standard Deviation:	171	77	149	82	68
RSD (%):	19.5	11.3	8.0	8.0	8.0
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	879	808	1883	1091	907
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	2	2	2	2	2
Mean:	764	642	1766	959	804
Standard Deviation:	52	68	20	59	51
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	14	14	14	14	14
Mean:	788	659	1821	1003	833
Standard Deviation:	67	60	119	75	57
RSD (%):	8.5	9.1	6.5	7.5	6.8
All Laboratories					
Number of Sample Measurements:	27	27	27	27	27
Mean:	814	670	1840	1011	838
Standard Deviation:	105	65	118	72	56
RSD (%):	12.9	9.7	6.4	7.1	6.6

notes: ? Insufficient data for calculation.

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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

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Serum Antimony (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	<0.058	<0.058	<0.058	<0.058	<0.058

Serum Arsenic (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
197	DRC/CC-ICP-MS	<10	<10	<10	<10	<10

Serum Barium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	1.922	2.266	2.128	2.115	1.826
197	ICP-MS	<2.0	2.2	2.2	2.1	<2.0

Serum Beryllium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
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 Bismuth (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	0.079	<0.015	<0.015	<0.015	<0.015

Serum Cadmium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	<0.025	<0.025	<0.025	0.033	0.031
197	DRC/CC-ICP-MS	<0.5	<0.5	<0.5	<0.5	<0.5

Serum Cobalt (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	3.471	1.067	1.538	4.962	2.381
179	ICP-MS	3.1	0.9	1.4	4.6	2.1
197	ICP-MS	3.1	1.0	1.3	4.5	2.0
Arithmetic mean (n=3)		3.2	1.0	1.4	4.7	2.2
SD		0.2	0.1	0.1	0.2	0.2

Serum Chromium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	1.087	1.607	3.255	0.952	4.795
164	ETAAS-Z	1.2	1.7	3.3	1.0	4.9
179	DRC/CC-ICP-MS	1.0	1.5	2.8	0.9	4.5
197	ICP-MS	<1.0	1.3	2.7	<1.0	4.1
305	ICP-MS	1.1	1.5	2.8	0.9	4.7
Arithmetic mean (n=5)		1.1	1.5	3.0	0.9	4.6
SD		0.1	0.1	0.3	0.0	0.3

Serum Iodine (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	63.671	57.342	54.43	49.494	52.405

Serum Iron (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
457	ICP-AES/OES	371	485	546	2170	495

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Serum Lead (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
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

Serum Manganese (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
107	DRC/CC-ICP-MS	<LOD	<LOD	<LOD	<LOD	4.17
147	ICP-MS	1.945	3.571	3.901	2.473	8.516
179	DRC/CC-ICP-MS	1.7	3.5	3.5	2.2	8.5
197	ICP-MS	2.1	3.9	4.2	2.9	8.8
305	ICP-MS	2.4	3.8	4.6	2.6	8.9
Arithmetic mean (n=5)		2.0	3.7	4.1	2.5	7.8
SD		0.3	0.2	0.5	0.3	2.0

Serum Molybdenum (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	0.675	0.636	0.723	1.228	0.845

Serum Nickel (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	<0.305	<0.305	<0.305	<0.305	<0.305

Serum Silver (µg/L)						
Lab Code	Method	BE10-11	BE10-12	BE10-13	BE10-14	BE10-15
147	ICP-MS	0.115	0.134	0.213	0.502	0.092

Serum Tin (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	<0.570	<0.570	1.437	<0.570	<0.570
197	ICP-MS	<5.0	<5.0	<5.0	<5.0	<5.0

Serum Tellurium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
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	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	0.531	1.284	3.536	1.686	0.419
197	ICP-MS	<1.0	1.1	3.1	1.5	<1.0

Serum Uranium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
147	ICP-MS	<0.014	<0.014	<0.014	<0.014	<0.014

Serum Vanadium (µg/L)						
Lab Code	Method	SE11-01	SE11-02	SE11-03	SE11-04	SE11-05
107	DRC/CC-ICP-MS	0.92	2.42	1.69	0.51	3.57
147	ICP-MS	0.944	2.398	1.694	0.505	3.597
179	DRC/CC-ICP-MS	1.1	2.7	1.7	0.5	3.9
Arithmetic mean (n=3)		1.0	2.5	1.7	0.5	3.7
SD		0.1	0.2	0.0	0.0	0.2

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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.
