Wadsworth Center

New York State Department of Health

TRACE ELEMENTS IN SERUM

Event #3, 2011

November 25, 2011

NEW YORK
state department of
HEALTH

Nirav R. Shah, M.D., M.P.H.
Commissioner

Sue Kelly
Executive Deputy Commissioner

November 25, 2011

Trace Elements in Serum
Event #3, 2011

Dear Laboratory Director:

Results from the third 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. In addition to Al, Cu, Se and Zn, serum pools were supplemented with the trace elements manganese (Mn), chromium (Cr), thallium (Tl), vanadium (V) and cobalt (Co).

The next PT event for trace elements in serum is scheduled to be mailed Wednesday, January 25th, 2012. 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, February 22nd, 2012.**

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

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 Al^{3+} 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 29 µg/L (1.07 µmol/L) to 200 µg/L (7.41 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, 92.3% of test results reported were judged as satisfactory, with two out of 26 participant laboratories (7.7%) 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 #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
Robust Mean	**29**	**70**	**135**	**200**	**88**
Robust Standard Deviation	3.9	3.4	6.2	11.3	4.8
Standard Uncertainty	1.0	0.8	1.5	2.8	1.2
RSD (%)	13.6	4.9	4.6	5.7	5.5
Acceptable Range:					
Upper Limit:	35	84	162	240	106
Lower Limit:	23	56	108	160	70

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 #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum) SE11-11	SE11-12	SE11-13	SE11-14	SE11-15	Info Only
	Target Values:	29	70	135	200	88	
110	ETAAS-Z	30	74	148	218	93	
114	ETAAS-Z	33	72	>100	>100	89	
147	ETAAS-Z	29	68	137	193	89	Info
156	ICP-MS	25	70	140	221	88	
159	ETAAS-Z	32	74	138	222	97	
160	ETAAS-Z	33	69	129	196	88	
164	ICP-MS	26	66	132	197	85	
179	DRC/CC-ICP-MS	31	78	152	223	101	
197	ICP-MS	29	71	128	197	109 ↑	
200	DRC/CC-ICP-MS	40 ↑	81	125	190	62 ↓	Info
206	ICP-MS	25	61	126	192	88	
287	ETAAS-Z	24	66	138	192	80	
293	ICP-MS	32	71	131	199	89	Info
305	ICP-MS	28	70	137	200	89	
324	HR-ICP-MS	33	71	145	215	89	Info
325	ETAAS-Z	14 ↓	27 ↓	59 ↓	84 ↓	43 ↓	Info
355	ICP-MS	29	70	139	215	91	
357	ICP-MS	29	71	135	205	91	
358	ICP-MS	26	65	132	200	85	
362	ICP-MS	34	73	137	200	87	
363	ICP-MS	28	68	134	196	84	
366	ETAAS-Z	30	71	137	190	91	Info
367	ETAAS-Z	29	70	134	191	85	Info
401	ICP-AES/OES	22 ↓	63	126	205	79	Info
458	ETAAS Other	25	61	141	105 ↓	76	
465	ICP-MS	31	68	139	204	87	

Percent satisfactory results for all participants: 92.3 %

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 #3
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	2	2	2	2	2
Mean:	36	80	139	207	82
Standard Deviation:	6	2	19	23	28
RSD (%):	—	—	—	—	—
ETAAS Other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	25	61	141	105	76
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	9	9	8	8	9
Mean:	28	66	128	186	84
Standard Deviation:	6	15	28	43	16
RSD (%):	21.2	22.4	22.1	23.2	19.1
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	33	71	145	215	89
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	1	1	1	1	1
Mean:	22	63	126	205	79
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	12	12	12	12	12
Mean:	29	69	134	202	89
Standard Deviation:	3	3	4	8	7
RSD (%):	9.9	4.8	3.3	4.1	7.3
All Laboratories					
Number of Sample Measurements:	26	26	25	25	26
Mean:	29	68	133	194	86
Standard Deviation:	5	10	17	32	12
RSD (%):	16.9	14.0	12.6	16.4	14.1

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 956 µg/L (15.04 µmol/L) to 2452 µg/L (38.59 µmol/L).

Acceptable ranges for serum copper are based on fixed criteria of ±15%, or ±95 µg/L below 635 µg/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 (±10%).

Discussion. Based on the above criteria, 91.4% of test results reported were judged as satisfactory, with two out of 21 participant laboratories (9.5%) 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 #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
Robust Mean	**2452**	**1315**	**956**	**1254**	**1434**
Robust Standard Deviation	155	104	41	67	100
Standard Uncertainty	42	28	11	18	27
RSD (%)	6.3	7.9	4.3	5.3	7.0
Acceptable Range:					
Upper Limit:	2820	1512	1099	1442	1649
Lower Limit:	2084	1118	813	1066	1219

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 #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum) SE11-11	SE11-12	SE11-13	SE11-14	SE11-15	Info Only
	Target Values:	2452	1315	956	1254	1434	
107	DRC/CC-ICP-MS	2836 ↑	1549 ↑	1146 ↑	1490 ↑	1659 ↑	Info
110	ICP-MS	2611	1402	1032	1357	1527	
114	ICP-MS	2220	1190	880	1140	1300	
147	ICP-MS	2357	1360	972	1296	1429	Info
156	FAAS	2460	1390	1000	1290	1510	
159	ICP-AES/OES	2340	1260	940	1210	1390	
160	ETAAS-Z	2560	1220	930	1170	1440	
164	ICP-MS	2263	1245	931	1211	1360	
179	DRC/CC-ICP-MS	2510	1350	990	1300	1480	
197	ICP-MS	2410	1300	940	1240	1430	
200	ICP-MS	2504	1392	953	1284	1462	Info
206	ICP-MS	2430	1350	930	1180	1330	
293	ICP-MS	2451	1334	972	1251	1461	Info
305	ICP-MS	2465	1212	948	1212	1391	
324	HR-ICP-MS	2463	1297	965	1253	1434	Info
325	FAAS	2820	1530 ↑	1230 ↑	1530 ↑	1650 ↑	Info
360	FAAS	2300	1250	910	1200	1340	
362	ICP-MS	2470	1300	970	1260	1440	
366	ETAAS other	2300	1224	905	1216	1368	Info
401	DRC/CC-ICP-MS	2321	1138	852	1234	1259	Info
457	ICP-AES/OES	2673	1441	1059	1381	1588	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 #3
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	2556	1346	996	1341	1466
Standard Deviation:	261	206	147	133	200
RSD (%):	—	—	—	—	—
ETAAS other					
Number of Sample Measurements:	1	1	1	1	1
Mean:	2300	1224	905	1216	1368
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ETAAS-Z					
Number of Sample Measurements:	1	1	1	1	1
Mean:	2560	1220	930	1170	1440
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	2527	1390	1047	1340	1500
Standard Deviation:	266	140	165	171	155
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	2463	1297	965	1253	1434
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	2	2	2	2	2
Mean:	2507	1351	1000	1296	1489
Standard Deviation:	235	128	84	121	140
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	10	10	10	10	10
Mean:	2418	1309	953	1243	1413
Standard Deviation:	114	73	39	62	68
RSD (%):	4.7	5.6	4.1	5.0	4.8
All Laboratories					
Number of Sample Measurements:	21	21	21	21	21
Mean:	2465	1321	974	1272	1440
Standard Deviation:	166	107	86	99	105
RSD (%):	6.7	8.1	8.8	7.7	7.3

notes: ? Insufficient data for calculation.

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 120 µg/L (1.52 µmol/L) to 264 µg/L (3.34 µmol/L).

Acceptable ranges for serum selenium are based on fixed criteria of ±20%, or ±2 µg/L below 10 µg/L. These criteria are a little less stringent than those proposed by the OELM Network of EQAS organizers (±15% or ±8 µg/L below 55 µg/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% 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 #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
Robust Mean	**131**	**238**	**190**	**264**	**120**
Robust Standard Deviation	5.0	8.5	8.0	11.0	4.1
Standard Uncertainty	1.5	2.6	2.4	3.3	1.2
RSD (%)	3.8	3.6	4.2	4.2	3.4
Acceptable Range:					
Upper Limit:	157	286	228	317	144
Lower Limit:	105	190	152	211	96

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 #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum) SE11-11	SE11-12	SE11-13	SE11-14	SE11-15	Info Only
	Target Values:	131	238	190	264	120	
107	DRC/CC-ICP-MS	117	210	167	243	102	Info
110	DRC/CC-ICP-MS	131	235	187	259	118	
114	ICP-MS	126	249	195	269	136	
147	ICP-MS	134	235	199	261	123	Info
156	ICP-MS	128	229	180	254	116	
159	ETAAS-Z	129	227	184	248	122	
164	ICP-MS	135	242	194	262	119	
179	DRC/CC-ICP-MS	137	244	199	275	124	
197	ICP-MS	139	247	193	262	122	
200	DRC/CC-ICP-MS	134	238	189	277	122	Info
206	ICP-MS	124	227	182	255	119	
293	DRC/CC-ICP-MS	135	246	194	276	123	Info
305	ICP-MS	132	234	183	257	120	
324	HR-ICP-MS	129	240	196	268	117	Info
366	ETAAS-Z	125	244	210	281	132	Info
367	DRC/CC-ICP-MS	135	242	193	269	120	Info
401	DRC/CC-ICP-MS	134	236	189	268	116	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 #3
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	132	236	188	267	118
Standard Deviation:	7	12	10	12	8
RSD (%):	5.2	5.1	5.4	4.6	6.4
ETAAS-Z					
Number of Sample Measurements:	2	2	2	2	2
Mean:	127	236	197	265	127
Standard Deviation:	3	12	18	23	7
RSD (%):	—	—	—	—	—
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	129	240	196	268	117
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	7	7	7	7	7
Mean:	131	238	189	260	122
Standard Deviation:	5	9	8	5	7
RSD (%):	4.1	3.6	4.0	2.0	5.3
All Laboratories					
Number of Sample Measurements:	17	17	17	17	17
Mean:	131	237	190	264	121
Standard Deviation:	6	10	10	11	7
RSD (%):	4.3	4.1	5.0	4.0	5.9

notes: ? Insufficient data for calculation.

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 606 µg/L (9.27 µmol/L) to 1522 µg/L (23.28 µmol/L).

Acceptable ranges for serum zinc are based on fixed criteria of ±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, 95.6% of test results reported were judged as satisfactory, with one out of 27 participant laboratories (3.7%) 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 #3
ROBUST STATISTICAL SUMMARY

TARGET VALUE ASSIGNMENT AND STATISTICS

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
Robust Mean	**606**	**1364**	**1522**	**884**	**766**
Robust Standard Deviation	39	89	77	48	37
Standard Uncertainty	9	21	18	12	9
RSD (%)	6.4	6.5	5.0	5.5	4.8
Acceptable Range:					
Upper Limit:	697	1569	1750	1017	881
Lower Limit:	515	1159	1294	751	651

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 #3
PERFORMANCE OF PARTICIPATING LABORATORIES

Lab Code	Method	Results (µg/L serum) SE11-11	SE11-12	SE11-13	SE11-14	SE11-15	Info Only
	Target Values:	606	1364	1522	884	766	
107	DRC/CC-ICP-MS	646	1492	1663	977	816	Info
110	ICP-MS	647	1448	1611	962	822	
114	ICP-MS	1150 ↑	1260	1490	830	720	
147	ICP-MS	580	1353	1529	882	758	Info
156	ICP-MS	566	1286	1470	820	699	
159	ICP-AES/OES	590	1310	1490	860	760	
160	FAAS	630	1420	1560	910	790	
164	ICP-MS	560	1276	1450	842	721	
179	DRC/CC-ICP-MS	640	1460	1600	940	810	
197	ICP-MS	550	1350	1520	850	790	
200	ICP-MS	562	1413	1491	870	719	Info
206	ICP-MS	640	1430	1490	880	760	
287	FAAS	570	1350	1450	850	700	
293	ICP-MS	595	1380	1517	889	772	Info
305	ICP-MS	587	1198	1390	812	700	
324	HR-ICP-MS	606	1347	1522	881	771	Info
325	FAAS	1020 ↑	2040 ↑	2130 ↑	1500 ↑	1170 ↑	Info
355	ICP-MS	615	1329	1530	924	788	
357	ICP-MS	610	1330	1510	880	750	
358	ICP-MS	634	1414	1608	919	789	
360	FAAS	560	1330	1490	840	770	
362	ICP-MS	600	1190	1340	790	690	
363	ICP-MS	650	1430	1570	920	810	
366	FAAS	604	1318	1466	882	751	Info
401	DRC/CC-ICP-MS	588	1268	1432	902	706	Info
457	ICP-AES/OES	585	1417	1601	900	778	Info
458	FAAS	620	1470	1610	900	790	

Percent satisfactory results for all participants: 95.6 %

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 #3
STATISTICAL SUMMARY BY METHOD

	Results (µg/L serum)				
	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
DRC/CC-ICP-MS					
Number of Sample Measurements:	3	3	3	3	3
Mean:	625	1407	1565	940	777
Standard Deviation:	32	121	119	38	62
RSD (%):	—	—	—	—	—
FAAS					
Number of Sample Measurements:	6	6	6	6	6
Mean:	667	1488	1618	980	829
Standard Deviation:	175	277	258	256	171
RSD (%):	26.2	18.6	16.0	26.1	20.6
HR-ICP-MS					
Number of Sample Measurements:	1	1	1	1	1
Mean:	606	1347	1522	881	771
Standard Deviation:	?	?	?	?	?
RSD (%):	—	—	—	—	—
ICP-AES/OES					
Number of Sample Measurements:	2	2	2	2	2
Mean:	588	1364	1546	880	769
Standard Deviation:	4	76	78	28	13
RSD (%):	—	—	—	—	—
ICP-MS					
Number of Sample Measurements:	15	15	15	15	15
Mean:	636	1339	1501	871	753
Standard Deviation:	146	83	72	48	43
RSD (%):	22.9	6.2	4.8	5.5	5.6
All Laboratories					
Number of Sample Measurements:	27	27	27	27	27
Mean:	637	1382	1538	904	774
Standard Deviation:	134	154	139	127	88
RSD (%):	21.0	11.1	9.0	14.1	11.4

notes: ? Insufficient data for calculation.

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	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	<0.058	<0.058	<0.058	<0.058	<0.058

Serum Arsenic (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.543	0.386	1.438	0.344	0.295
197	DRC/CC-ICP-MS	<10	<10	<10	<10	<10

Serum Barium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.921	1.219	1.218	1.414	1.039
197	ICP-MS	<2.0	<2.0	<2.0	<2.0	<2.0

Serum Beryllium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	<3.42	<3.42	<3.42	<3.42	<3.42
197	ICP-MS	<0.2	<0.2	<0.2	<0.2	<0.2

Serum Bismuth (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.125	0.09	0.075	0.056	0.035

Serum Cadmium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	<0.0247	<0.0247	<0.0247	<0.0247	<0.0247
197	DRC/CC-ICP-MS	<0.5	<0.5	<0.5	<0.5	<0.5

Serum Chromium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.78	2.902	0.64	4.373	1.357
164	ICP-MS	0.9	3.1	0.8	4.3	1.5
179	DRC/CC-ICP-MS	0.8	2.9	0.7	4.4	1.4
197	ICP-MS	1.3	3.7	1.3	4.7	1.8
305	ICP-MS	0.8	3.3	0.6	4.5	1.4
Arithmetic mean (n=5)		**0.9**	**3.2**	**0.8**	**4.5**	**1.5**
SD		0.2	0.3	0.3	0.2	0.2

Serum Cobalt (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.721	1.674	0.21	0.292	3.483
179	ICP-MS	0.8	1.8	0.3	0.5	3.3
197	ICP-MS	1.0	2.0	<1.0	<1.0	3.7
Arithmetic mean (n=3)		**0.8**	**1.8**	**0.3**	**0.4**	**3.5**
SD		0.1	0.2	0.1	0.1	0.2

Serum Iodine (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	51.899	55.063	51.519	55.696	39.873

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Serum Lead (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	<4.144	<4.144	<4.144	<4.144	<4.144
197	DRC/CC-ICP-MS	<0.4	<0.4	<0.4	<0.4	<0.4

Serum Lithium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	1.409	0.633	0.84	1.416	0.749

Serum Manganese (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
107	DRC/CC-ICP-MS	0.70	2.28	7.02	1.13	4.60
147	ICP-MS	0.934	2.374	6.923	1.28	4.39
179	DRC/CC-ICP-MS	0.8	2.4	6.8	1.2	4.6
197	ICP-MS	1.4	3.1	8.0	2.2	5.4
305	ICP-MS	1.0	2.5	6.7	1.4	4.8
Arithmetic mean (n=5)		**1.0**	**2.5**	**7.1**	**1.4**	**4.8**
SD		0.3	0.3	0.5	0.4	0.4

Serum Molybdenum (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	2.956	0.574	1.286	0.921	0.716

Serum Nickel (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.424	0.535	0.414	<0.305	<0.305

Serum Silver (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.163	0.136	0.183	0.191	0.113

Serum Tin (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	<0.570	<0.570	<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	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
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	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	0.235	1.76	0.63	4.456	2.042
197	ICP-MS	<1.0	1.9	<1.0	4.7	2.2

Serum Uranium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
147	ICP-MS	<0.0136	<0.0136	<0.0136	<0.0136	<0.0136

Serum Vanadium (µg/L)

Lab Code	Method	SE11-11	SE11-12	SE11-13	SE11-14	SE11-15
179	DRC/CC-ICP-MS	1.1	1.5	3.5	1.8	0.6

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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., 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)

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 μmol ZPP/mol heme)

F-4 Other

OTHER METHODS

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