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
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 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.

## New York State Department of Health

**Serum Aluminum Test Results, 2011 Event #2**

**ROBUST STATISTICAL SUMMARY**

**TARGET VALUE ASSIGNMENT AND STATISTICS**

<table>
<thead>
<tr>
<th>Results (µg/L serum)</th>
<th>SE11-06</th>
<th>SE11-07</th>
<th>SE11-08</th>
<th>SE11-09</th>
<th>SE11-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robust Mean</td>
<td>61</td>
<td>82</td>
<td>31</td>
<td>142</td>
<td>104</td>
</tr>
<tr>
<td>Robust Standard Deviation</td>
<td>4.5</td>
<td>4.8</td>
<td>3.2</td>
<td>9.1</td>
<td>8.9</td>
</tr>
<tr>
<td>Standard Uncertainty</td>
<td>1.1</td>
<td>1.2</td>
<td>0.8</td>
<td>2.3</td>
<td>2.2</td>
</tr>
<tr>
<td>RSD (%)</td>
<td>7.3</td>
<td>5.8</td>
<td>10.2</td>
<td>6.4</td>
<td>8.6</td>
</tr>
</tbody>
</table>

**Acceptable Range:**

- **Upper Limit:**
  - SE11-06: 73
  - SE11-07: 98
  - SE11-08: 37
  - SE11-09: 170
  - SE11-10: 125

- **Lower Limit:**
  - SE11-06: 49
  - SE11-07: 66
  - SE11-08: 25
  - SE11-09: 114
  - SE11-10: 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

<table>
<thead>
<tr>
<th>Lab Code</th>
<th>Method</th>
<th>Results (µg/L serum)</th>
<th>Info Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SE11-06</td>
<td>SE11-07</td>
</tr>
<tr>
<td>110</td>
<td>ETAAS-Z</td>
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<td>82</td>
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<tr>
<td>114</td>
<td>ETAAS-Z</td>
<td>62</td>
<td>80</td>
</tr>
<tr>
<td>147</td>
<td>ETAAS-Z</td>
<td>65</td>
<td>86</td>
</tr>
<tr>
<td>156</td>
<td>ICP-MS</td>
<td>51</td>
<td>72</td>
</tr>
<tr>
<td>159</td>
<td>ETAAS-Z</td>
<td>63</td>
<td>81</td>
</tr>
<tr>
<td>160</td>
<td>ETAAS-Z</td>
<td>67</td>
<td>83</td>
</tr>
<tr>
<td>164</td>
<td>ICP-MS</td>
<td>54</td>
<td>74</td>
</tr>
<tr>
<td>179</td>
<td>DRC/CC-ICP-MS</td>
<td>63</td>
<td>83</td>
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<td>197</td>
<td>ICP-MS</td>
<td>59</td>
<td>81</td>
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<td>DRC/CC-ICP-MS</td>
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<td>82</td>
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<tr>
<td>324</td>
<td>HR-ICP-MS</td>
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<td>ICP-MS</td>
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<tr>
<td>363</td>
<td>ICP-MS</td>
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<td>79</td>
</tr>
<tr>
<td>366</td>
<td>ETAAS-Z</td>
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<td>77</td>
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<td>458</td>
<td>ETAAS Other</td>
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<td>85</td>
</tr>
<tr>
<td>465</td>
<td>ICP-MS</td>
<td>55</td>
<td>72</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Method</th>
<th>Results (µg/L serum)</th>
<th>SE11-06</th>
<th>SE11-07</th>
<th>SE11-08</th>
<th>SE11-09</th>
<th>SE11-10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRC/CC-ICP-MS</strong></td>
<td>Mean: 67</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
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<td>2</td>
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<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Standard Deviation: 6</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>ETAAS Other</strong></td>
<td>Mean: 63</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Number of Sample Measurements: 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>ETAAS-Z</strong></td>
<td>Mean: 62</td>
<td>9</td>
<td>9</td>
<td>9</td>
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<td>9</td>
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<td>Number of Sample Measurements: 9</td>
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<td>9</td>
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<td>9</td>
</tr>
<tr>
<td></td>
<td>Standard Deviation: 3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td><strong>HR-ICP-MS</strong></td>
<td>Mean: 55</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td><strong>ICP-MS</strong></td>
<td>Mean: 60</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
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<td>Number of Sample Measurements: 12</td>
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<td>12</td>
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<td>12</td>
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<tr>
<td></td>
<td>Standard Deviation: 6</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>RSD (%): 10.4</td>
<td>8.4</td>
<td>12.4</td>
<td>6.4</td>
<td>8.1</td>
<td></td>
</tr>
</tbody>
</table>

| **All Laboratories** | Mean: 61 | 25 | 25 | 25 | 25 | 25 |
| **Standard Deviation:** | 5 | 5 | 5 | 4 | 13 | 9 |
| **RSD (%):** | 8.6 | 6.7 | 13.0 | 9.4 | 9.0 | |
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 µg/L (15.15 µmol/L) to 2510 µg/L (39.50 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 three out of 21 participant laboratories (14.3%) reporting 2 or more of the 5 results outside the acceptable ranges.


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

<table>
<thead>
<tr>
<th>TARGET VALUE ASSIGNMENT AND STATISTICS</th>
<th>Results (µg/L serum)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SE11-06</td>
</tr>
<tr>
<td>Robust Mean</td>
<td>998</td>
</tr>
<tr>
<td>Robust Standard Deviation</td>
<td>60</td>
</tr>
<tr>
<td>Standard Uncertainty</td>
<td>16</td>
</tr>
<tr>
<td>RSD (%)</td>
<td>6.0</td>
</tr>
<tr>
<td>Acceptable Range:</td>
<td></td>
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<tr>
<td>Upper Limit:</td>
<td>1148</td>
</tr>
<tr>
<td>Lower Limit:</td>
<td>848</td>
</tr>
</tbody>
</table>

**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**

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

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

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Results (µg/L serum)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SE11-06</td>
</tr>
<tr>
<td><strong>DRC/CC-ICP-MS</strong></td>
<td></td>
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<tr>
<td>Number of Sample Measurements:</td>
<td>3</td>
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<tr>
<td>Mean:</td>
<td>993</td>
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<tr>
<td>Standard Deviation:</td>
<td>49</td>
</tr>
<tr>
<td>RSD (%):</td>
<td>–</td>
</tr>
<tr>
<td><strong>ETAAS other</strong></td>
<td></td>
</tr>
<tr>
<td>Number of Sample Measurements:</td>
<td>1</td>
</tr>
<tr>
<td>Mean:</td>
<td>970</td>
</tr>
<tr>
<td>RSD (%):</td>
<td>–</td>
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<td><strong>ETAAS-Z</strong></td>
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<td>RSD (%):</td>
<td>–</td>
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<td><strong>FAAS</strong></td>
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<td>RSD (%):</td>
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<td>Number of Sample Measurements:</td>
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<td>Mean:</td>
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<tr>
<td>RSD (%):</td>
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</tr>
<tr>
<td><strong>ICP-AES/OES</strong></td>
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</tr>
<tr>
<td>Number of Sample Measurements:</td>
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<td>Standard Deviation:</td>
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<tr>
<td>RSD (%):</td>
<td>–</td>
</tr>
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<td><strong>ICP-MS</strong></td>
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</tr>
<tr>
<td>Number of Sample Measurements:</td>
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<tr>
<td>Mean:</td>
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<tr>
<td>Standard Deviation:</td>
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<tr>
<td>RSD (%):</td>
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### All Laboratories

<table>
<thead>
<tr>
<th></th>
<th>Results (µg/L serum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Sample Measurements:</td>
<td>21</td>
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<tr>
<td>Mean:</td>
<td>1005</td>
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<tr>
<td>Standard Deviation:</td>
<td>83</td>
</tr>
<tr>
<td>RSD (%):</td>
<td>8.3</td>
</tr>
</tbody>
</table>

**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 Se⁴⁺ 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 µg/L (1.63 µmol/L) to 366 µg/L (4.64 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, 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.


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

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<thead>
<tr>
<th></th>
<th>SE11-06</th>
<th>SE11-07</th>
<th>SE11-08</th>
<th>SE11-09</th>
<th>SE11-10</th>
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**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**

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| Target Values: 135 | 229 | 129 | 162 | 366 |

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.
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**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 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 ±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.


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

**TARGET VALUE ASSIGNMENT AND STATISTICS**  

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**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**

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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.
## STATISTICAL SUMMARY BY METHOD

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### 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
<table>
<thead>
<tr>
<th>Serum Antimony (µg/L)</th>
<th>Lab Code</th>
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<th>SE11-10</th>
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<th>SE11-10</th>
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<thead>
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<th>SE11-07</th>
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<th>Method</th>
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<th>SE11-07</th>
<th>SE11-08</th>
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<td>2</td>
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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

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<thead>
<tr>
<th>Serum Cobalt (µg/L)</th>
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<th>Method</th>
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<th>SE11-08</th>
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<th>SE11-10</th>
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<tbody>
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<td>&lt;1.0</td>
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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

<table>
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<tr>
<th>Serum Iodine (µg/L)</th>
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<th>Method</th>
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<th>SE11-07</th>
<th>SE11-08</th>
<th>SE11-09</th>
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<tbody>
<tr>
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<table>
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<tr>
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<th>SE11-07</th>
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<th>SE11-09</th>
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<tr>
<th>Serum Lead (µg/L)</th>
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### Serum Manganese (µg/L)

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<th>SE11-08</th>
<th>SE11-09</th>
<th>SE11-10</th>
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<tr>
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<td>DRC/CC-ICP-MS</td>
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<td>1.7</td>
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**Arithmetic mean (n=5)**

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**SD**

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### Serum Mercury (µg/L)

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### Serum Molybdenum (µg/L)

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<td>ICP-MS</td>
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### Serum Nickel (µg/L)

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### Serum Silver (µg/L)

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### Serum Tin (µg/L)

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### Serum Tellurium (µg/L)

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### Serum Thallium (µg/L)

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### Serum Thorium (µg/L)

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### Serum Uranium (µg/L)

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### Serum Vanadium (µg/L)

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<th>SE11-08</th>
<th>SE11-09</th>
<th>SE11-10</th>
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<tbody>
<tr>
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<td>1.70</td>
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<td>1.5</td>
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<td>2.7</td>
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# New York State Department of Health
## Trace Elements in Serum
### METHOD NOTES

#### ATOMIC SPECTROMETRY METHODS

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<tr>
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<th>Description</th>
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<td>ETAAS-Z (Electrothermal atomic absorption spectrometry with Zeeman background correction)</td>
</tr>
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<td>A-2</td>
<td>ETAAS other (i.e., D₂, S-H background correction)</td>
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<tr>
<td>A-3</td>
<td>FAAS (Flame atomic absorption spectrometry)</td>
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<td>A-4</td>
<td>CV-AAS (Cold vapor atomic absorption spectrometry)</td>
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<td>HG-AAS (Hydride generation atomic absorption spectrometry)</td>
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<td>AFS (Atomic fluorescence spectrometry)</td>
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<td>A-7</td>
<td>Other</td>
</tr>
</tbody>
</table>

#### INDUCTIVELY COUPLED PLASMA

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1</td>
<td>ICP-MS (Inductively coupled plasma - mass spectrometry)</td>
</tr>
<tr>
<td>P-2</td>
<td>DRC/CC-ICP-MS (ICP-MS used in the Dynamic Reaction Cell or Collision Cell mode)</td>
</tr>
<tr>
<td>P-3</td>
<td>ICP-AES/OES (ICP atomic/optical emission spectrometry)</td>
</tr>
<tr>
<td>P-4</td>
<td>HR-ICP-MS (High resolution ICP-MS)</td>
</tr>
<tr>
<td>P-5</td>
<td>ETV-ICP-MS (Electrothermal vaporization ICP-MS)</td>
</tr>
<tr>
<td>P-6</td>
<td>ID-ICP-MS (Isotope dilution ICP-MS)</td>
</tr>
<tr>
<td>P-7</td>
<td>Other</td>
</tr>
</tbody>
</table>

#### ELECTROCHEMICAL METHODS

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>E-1</td>
<td>ASV (Anodic stripping voltammetry without digestion)</td>
</tr>
<tr>
<td>E-2</td>
<td>ASV-LeadCare® (Anodic stripping voltammetry using the ESA LeadCare® system)</td>
</tr>
<tr>
<td>E-3</td>
<td>Fluoride specific electrode</td>
</tr>
<tr>
<td>E-4</td>
<td>Other</td>
</tr>
</tbody>
</table>

#### MOLECULAR FLUORIMETRY

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>F-1</td>
<td>EtOAc (Ethyl acetate-acetic acid extraction method for determination of erythrocyte protoporphyrin)</td>
</tr>
<tr>
<td>F-2</td>
<td>Aviv hematofluorometry (for determination of EP at hematocrit 35)</td>
</tr>
<tr>
<td>F-3</td>
<td>Helena ZPP (for determination of zinc protoporphyrin in µmol ZPP/mol heme)</td>
</tr>
<tr>
<td>F-4</td>
<td>Other</td>
</tr>
</tbody>
</table>

#### OTHER METHODS

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