Evaluation of Greiner VACUETTE® NH Trace Element Sodium Heparin tubes for trace elements determination

**Background:**

Greiner-Bio-One, Austria has sold plastic evacuated tubes (VACUETTE®) for venous blood collection since 1986. In addition to the standard product line, Greiner-Bio-One also has an extensive range of special tubes including tubes for trace element testing.

Sodium heparin activates antithrombins, thus blocking the coagulation cascade and producing a whole blood/plasma sample instead of clotted blood plus serum.

The tubes are composed of clear plastic. The caps are made of plastic with rubber stopper.

**Study Objective:**

Trace elements are inorganic components that are found in the body in a concentration of < 0.01% of the body mass, which are amounts of < 10⁻⁶ g/g bodyweight. Normal ranges of the tested trace elements are listed below in Table 1.

The aim of evaluation of VACUETTE® NH Trace Element Sodium Heparin tubes was to demonstrate the analytical performance and suitability for trace element analysis in blood for a variety of trace elements.

**Study design and procedure:**

The study and its results are applicable to all VACUETTE® NH Trace Element Sodium Heparin tubes.

For the study, the following product was used:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Draw Volume</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>456080</td>
<td>6 ml</td>
<td>VACUETTE® Trace Element NH Sodium Heparin</td>
</tr>
</tbody>
</table>

10 tubes were filled to the fill line with Millipore water (filling was carried out without any metal-containing devices). After filling, the tubes were inverted 8 times. Standards, controls and the samples were measured by ICP-MS. The tubes were tested for the following trace elements:

Table 1

<table>
<thead>
<tr>
<th>Element</th>
<th>Normal range in whole blood [ppb]¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag</td>
<td>N.A.</td>
</tr>
<tr>
<td>Al</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>As</td>
<td>&lt; 12</td>
</tr>
<tr>
<td>Ba</td>
<td>100</td>
</tr>
</tbody>
</table>

¹ see Ref (1)

Results

The mean values of testing results of VACUETTE® NH Trace Element Sodium Heparin tubes are shown in Table 2.

Table 2

<table>
<thead>
<tr>
<th>Element</th>
<th>Typical contamination level in empty VACUETTE® NH Trace Element Sodium Heparin tube [ppb]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag</td>
<td>&lt; 1.0¹</td>
</tr>
<tr>
<td>Al</td>
<td>&lt; 1.0x¹</td>
</tr>
<tr>
<td>As</td>
<td>&lt; 1.0x¹</td>
</tr>
</tbody>
</table>
### Element | Typical contamination level in empty VACUETTE® NH Trace Element Sodium Heparin tube [ppb]
--- | ---
Ba | < 1.0 \(^1\)
Be | < 1.0 \(^1\)
Bi | < 1.0 \(^1\)
Cd | < 0.5 \(^1\)
Cr | < 1.0 \(^1\)
Co | < 1.0 \(^1\)
Cu | < 1.0 \(^1\)
Hg | < 0.5 \(^1\)
I | < 1.0 \(^1\)
Li | < 1.0 \(^1\)
Mn | < 1.0 \(^1\)
Mo | < 1.0 \(^1\)
Ni | < 1.0 \(^1\)
Pb | < 0.5
Se | < 1.0 \(^1\)
Sb | < 1.0 \(^1\)
Sn | < 1.0 \(^1\)
Te | < 1.0 \(^1\)
Th | < 1.0 \(^1\)
Tl | < 0.2 \(^1\)
U | < 1.0 \(^1\)
Zn | < 2.2

\(^1\) detection limit of ICP-MS

**Conclusion:**

From these results it can be concluded that the Greiner VACUETTE® NH Trace Element Sodium Heparin tube is suitable for trace element analysis in blood for the tested trace elements. The contamination level found for Zinc (Zn) is far below the normal range of Zn in whole blood.

**References:**

5. FDA Approval Greiner Trace Element Tubes