**WHICH SPECIMEN TUBE IS BEST FOR SERUM/PLASMA OR WHOLE BLOOD TRACE ELEMENT ANALYSIS?**

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**Introduction**
Trace elements are typically found in the body at concentrations of <100 mg/L. Contamination from collection techniques, the laboratory environment and plastic/glassware are known to complicate trace element analyses and accurate measurement of these low concentrations necessitates a metal-free testing environment and consumables along with highly sensitive analytical techniques.

The aim of this study was to examine the suitability of different collection tubes for trace element analysis in plasma and whole blood.

**Methods**
Blood from 16 subjects was collected into eight different Greiner Bio-One Vacutette collection tubes (8mL Serum Clot Activator with gel, 8mL Lithium Heparin with and without gel, 8mL K$_3$-EDTA, 5mL K$_2$-EDTA with gel separator, 6mL Sodium Heparin Trace Element, 500µL K$_2$ EDTA Minicollect) and a 500µL BD Microtainer K$_2$-EDTA Low Lead Microtainer.

Elements tested were serum or plasma aluminium, chromium, cobalt, copper, selenium and zinc and whole blood cadmium, lead and mercury (table 1).

Analyses were performed on a Perkin Elmer ELAN DRC ICP-MS using a OneFAST sample introduction system and median values compared between the tube types.

**Results**
- No significant differences were seen across the collection tubes for zinc, copper, cobalt, lead and cadmium (figures 1,2,6,9).
- Median chromium values were significantly higher in serum, p<0.0001. (figure 5)
- EDTA plasma with gel separator had higher median values for selenium (figure 3) and cobalt (figure 6).
- Aluminium comparisons (figure 4) showed contamination was present in most collection tubes: the better performers being an in-house nitric acid washed plain container and the trace element tube. EDTA gel plasma samples that were analysed for aluminium after extended period of time in secondary containers showed an increased aluminium concentration. When these same samples were analysed without delay the median concentration were reduced. (figure 4, EG run 2)
- The Minicollect EDTA samples showed a higher median mercury value however this was not significant. (figure 7)

**Discussion**
- Our evaluation showed that with extended time in a secondary polypropylene container, aluminium may be extracted from the plastic in the presence of EDTA. As our samples are prepared and run in batches and may sit in a secondary container for a period of time, EDTA-anticoagulated samples are unsuitable for aluminium analysis.
- Stainless steel needles are a known source of contamination for chromium analysis. This contamination can be reduced by discarding the first tube collected or by utilising the order in which blood is drawn to advantage. As serum was collected first, it was the most contaminated (figure 5).

**Conclusion**
This evaluation will change the sample collection tubes our laboratory recommends/accepts for trace element analyses. EDTA plasma will not be accepted for aluminium analysis. Serum will not be accepted for aluminium, chromium or cobalt analyses. EDTA gel plasma will not be accepted for selenium, aluminium or cobalt analysis. For adult lead and mercury analyses we will recommend the trace element tube and for paediatric populations the BD Microtainer.