A 5-year longitudinal follow up trend in levels of POP plasma concentrations extracted using a 96-well plate method

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Introduction:
Longitudinal Sample Collection:

The Prospective Investigation of the Vasculature in Uppsala Seniors (PIVUS) Cohort

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>70</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>Sample number</td>
<td>1,016</td>
<td>822</td>
<td>603</td>
</tr>
</tbody>
</table>

About 50% females

High-throughput Sample Preparation:

- **150 µL plasma/serum**
  - Pretreated with sulfuric acid in water and acetonitrile in water

- **96-well SPE plate**
  - Oasis HLB 60mg sorbent/well (Waters)

- **96-well clean-up plate**
  - 40% H₂SO₄ modified silica and NaSO₄

Instrumental Analysis:

- 23 POPs: 16 (tetra-deca) PCBs, 4 OC-Pesticides, OCDD and BDE 47

- Epidemiological study
- Assess Individual-based trend in plasma levels of POPs
- Large sample number
- Low plasma volume
Results and Discussion:

The percent change (shown as decimal) in 18 of the 23 POPs detected in the first 465 plasma samples from the PIVUS cohort after the five year follow up (2001-2004 to 2006-2009). *Significant changes in concentration were indicated by p-values < 0.05.

Comparison of POP concentrations in PIVUS cohort (age 75) to NHANES pooled serum samples (age 60+)

<table>
<thead>
<tr>
<th></th>
<th>PCB 74</th>
<th>PCB 99</th>
<th>PCB 118</th>
<th>PCB 105</th>
<th>PCB 153</th>
<th>PCB 138</th>
<th>PCB 156</th>
<th>PCB 157</th>
<th>PCB 180</th>
<th>PCB 189</th>
<th>PCB 194</th>
<th>PCB 206</th>
<th>PCB 209</th>
<th>OCDD</th>
<th>HCB</th>
<th>DDE</th>
<th>Trans-nonachlor (TNK)</th>
<th>BDE 47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (NHANES 60+) 2007-08 (pg/g)</td>
<td>66</td>
<td>54</td>
<td>99</td>
<td>19</td>
<td>407</td>
<td>303</td>
<td>75</td>
<td>18</td>
<td>306</td>
<td>143</td>
<td>7</td>
<td>100</td>
<td>56</td>
<td>45</td>
<td>-</td>
<td>75</td>
<td>3210</td>
<td>325</td>
</tr>
<tr>
<td>Median (PIVUS 75) 2006-09 (pg/mL)</td>
<td>60.7</td>
<td>56.7</td>
<td>127</td>
<td>32.7</td>
<td>1020</td>
<td>611</td>
<td>106</td>
<td>20</td>
<td>818</td>
<td>333</td>
<td>15.3</td>
<td>98</td>
<td>18</td>
<td>18.7</td>
<td>&lt;LOD</td>
<td>232</td>
<td>1800</td>
<td>97.3</td>
</tr>
<tr>
<td>MDL NBS</td>
<td>12.2</td>
<td>18.1</td>
<td>41.2</td>
<td>16</td>
<td>45.2</td>
<td>45.7</td>
<td>3.4</td>
<td>2.3</td>
<td>6.7</td>
<td>5.3</td>
<td>3</td>
<td>2.1</td>
<td>2.3</td>
<td>2.9</td>
<td>6.1</td>
<td>167</td>
<td>32</td>
<td>5.5</td>
</tr>
<tr>
<td>% Above LOD</td>
<td>99</td>
<td>98</td>
<td>99</td>
<td>87</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>77</td>
<td>100</td>
<td>100</td>
<td>81</td>
<td>100</td>
<td>80</td>
<td>94</td>
<td>0</td>
<td>75</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Results and Discussion:

Comparison of the change in POP concentrations measured in the PIVUS cohort (age 70 to 75) to longitudinally sampled Norwegian men (median age 65 to 71).
Summary and Conclusions:

96-well plate method:
+ Increased sample throughput
+ Reliable and precise quantification of Stockholm Convention POPs
+ Cost-effective and time-efficient (process 73 to 146 samples/week)

PIVUS cohort:
• Significant decrease in all POPs with exception to BDE 47 and \( p,p' \)-DDE
• Significant increase in \( p,p' \)-DDE concentrations
  • Not observed in other background level trend studies
• Higher concentrations of PCBs 153, 138, 180, 170, and HCB vs. NHANES 60+
• Lower concentrations of PCBs 206 and 209, \( p,p' \)-DDE, and trans-nonachlor vs. NHANES 60+
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References:


