PCDD/Fs in Bay & Wetland Cores

Dioxin Strategy Group Meeting
October 26 2011

SFEI
Core Dioxin Goals

- Distribution of dioxin inventory
  1. Is there a legacy pool
  2. Risk to biota (humans)
  3. Loading trend (pre/post industrial)
Sections Previously Analyzed

• For metals, PCBs, OCPs, PBDEs
Sections Analyzed for PCDD/Fs

- No more material in previously analyzed sections
  - Interpolate section ages in between
- Top 3 + bottom sections each Bay core adjacent to already analyzed sections
  - Current = top 3, pre industrial = bottom
  - Generally covers sediment mixed zone in Bay (usually 10-15cm)
PCDD/Fs in Wetland Cores

- PCDD/Fs in wetlands show past peaks

Concentrations in ug/kg fine sediment (<63um)
PCDD/Fs in Bay Cores

- PCDD/Fs in Bay more uniform, slightly elevated near surface

Concentrations in ug/kg fine sediment (<63um)
PCDD/Fs in Bay Cores

- PCDD/Fs in Bay slightly elevated near surface

Concentrations in µg/kg fine sediment (<63um)

*note different scale
PCDD/F Mass

- Mass dominated by octa- and hepta-

![Chart showing PCDD/F mass distribution]
<table>
<thead>
<tr>
<th>Congener</th>
<th>KOW</th>
<th>BSAF</th>
<th>BEFsed</th>
<th>BEFwater</th>
<th>TEF1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,7,8-TCDD</td>
<td>7.02</td>
<td>0.059</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1,2,3,7,8-PeCDD</td>
<td>7.5</td>
<td>0.054</td>
<td>0.92</td>
<td>1.13</td>
<td>1</td>
</tr>
<tr>
<td>1,2,3,4,7,8-HxCDD</td>
<td>7.8</td>
<td>0.018</td>
<td>0.31</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,6,7,8-HxCDD</td>
<td>7.8</td>
<td>0.0073</td>
<td>0.12</td>
<td>0.16</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,7,8,9-HxCDD</td>
<td>7.8</td>
<td>0.0081</td>
<td>0.14</td>
<td>0.18</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,4,6,7,8-HpCDD</td>
<td>8.2</td>
<td>0.0031</td>
<td>0.051</td>
<td>0.072</td>
<td>0.01</td>
</tr>
<tr>
<td>OCDD</td>
<td>8.6</td>
<td>0.00074</td>
<td>0.012</td>
<td>0.017</td>
<td>0.0001</td>
</tr>
<tr>
<td>2,3,7,8-TCDF</td>
<td>6.5</td>
<td>0.047</td>
<td>0.8</td>
<td>0.48</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,7,8-PeCDF</td>
<td>7</td>
<td>0.013</td>
<td>0.22</td>
<td>0.22</td>
<td>0.05</td>
</tr>
<tr>
<td>2,3,4,7,8-PeCDF</td>
<td>7</td>
<td>0.095</td>
<td>1.6</td>
<td>1.59</td>
<td>0.5</td>
</tr>
<tr>
<td>1,2,3,4,7,8-HxCDF</td>
<td>7.5</td>
<td>0.0045</td>
<td>0.076</td>
<td>0.094</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,6,7,8-HxCDF</td>
<td>7.5</td>
<td>0.011</td>
<td>0.19</td>
<td>0.23</td>
<td>0.1</td>
</tr>
<tr>
<td>2,3,4,6,7,8-HxCDF</td>
<td>7.5</td>
<td>0.04</td>
<td>0.67</td>
<td>0.84</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,7,8,9-HxCDF</td>
<td>7.5</td>
<td>0.037</td>
<td>0.63</td>
<td>0.78</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,4,6,7,8-HpCDF</td>
<td>8</td>
<td>0.00065</td>
<td>0.011</td>
<td>0.015</td>
<td>0.01</td>
</tr>
<tr>
<td>1,2,3,4,7,8,9-HpCDF</td>
<td>8</td>
<td>0.023</td>
<td>0.39</td>
<td>0.52</td>
<td>0.01</td>
</tr>
<tr>
<td>OCDF</td>
<td>8.8</td>
<td>0.001</td>
<td>0.016</td>
<td>0.023</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

EPA-820-B-95-005 page 87 for Great Lakes trophic level 4 fish
(TL4 Fish) TEQs %

- TEQ dominated by penta-, tetra-
TEQs (TL4 Fish Consumption)
TL4 TEQ vs PCDD/F Mass

\[ y = 175.95x + 23.278 \]

\[ R^2 = 0.8791 \]
TL4 TEQ vs Raw (TL2) TEQ

\[ y = 0.6169x + 0.116 \]

\[ R^2 = 0.9788 \]
Summary Review

- Cores shallow sections provide PCDF/F inventory of “active” sediment
- Like other contaminants, Bay PCDD/Fs lower and more uniform
- Wetland and Bay cores show past PCDD/F peak, and minimal PCDD/Fs in deepest sections
Summary Review (cont…)

- TEQs calculated for TL4 fish consumption (sediment BEFs x body burden TEFs)
  - Water BEFs generally higher
  - Dose based TEFs lower but already include differential biouptake

- Total mass mostly octa, hepta, TEQs mostly penta, tetra
  - However, total PCDD/Fs still $\sim \propto$ TEQs, so TEQs have same trends (core profiles would look alike)
  - Similar to PCB case where >95% risk is from usually undetected coplanars
Next Steps

- Dioxin in wetland cores generally show decreasing trends, suggesting greatly reduced loads.
- Bay core suggests no hidden inventory, exposure risk likely to improve over current state.
- Surface & core sediment data, ongoing loads to be combined in updated simple mass balance ("1-box")