

Blood, Dust and Soil Analyses: Notes and Abbreviations

This section includes all laboratory blood, dust, and soil data collected as part of the UMDES. Chemical analysis was performed by Alta Laboratories. Data were collected and processed between October 2004 and May 2006. TEQ values were calculated using the World Health Organization (WHO) 2005 toxic equivalency factors (TEFs).

In 2005, the WHO re-evaluated the 1998 WHO TEFs. The following table shows the differences between the WHO 1998 TEFs and the WHO 2005 TEFs.

Summary of WHO 1998 and WHO 2005 TEF values

| Compound | WHO 1998 TEF | WHO 2005 TEF* |
|--------------------------------------|--------------|---------------|
| <i>chlorinated dibenzo-p-dioxins</i> | | |
| 2,3,7,8-TCDD | 1 | 1 |
| 1,2,3,7,8-PeCDD | 1 | 1 |
| 1,2,3,4,7,8-HxCDD | 0.1 | 0.1 |
| 1,2,3,6,7,8-HxCDD | 0.1 | 0.1 |
| 1,2,3,7,8,9-HxCDD | 0.1 | 0.1 |
| 1,2,3,4,6,7,8-HpCDD | 0.01 | 0.01 |
| OCDD | 0.0001 | 0.0003 |
| <i>chlorinated dibenzofurans</i> | | |
| 2,3,7,8-TCDF | 0.1 | 0.1 |
| 1,2,3,7,8-PeCDF | 0.05 | 0.03 |
| 2,3,4,7,8-PeCDF | 0.5 | 0.3 |
| 1,2,3,4,7,8-HxCDF | 0.1 | 0.1 |
| 1,2,3,6,7,8-HxCDF | 0.1 | 0.1 |
| 1,2,3,7,8,9-HxCDF | 0.1 | 0.1 |
| 2,3,4,6,7,8-HxCDF | 0.1 | 0.1 |
| 1,2,3,4,6,7,8-HpCDF | 0.01 | 0.01 |
| 1,2,3,6,7,8,9-HpCDF | 0.01 | 0.01 |
| OCDF | 0.0001 | 0.0003 |
| <i>non-ortho substituted PCBs</i> | | |
| PCB 77 | 0.0001 | 0.0001 |
| PCB 81 | 0.0001 | 0.0003 |
| PCB 126 | 0.1 | 0.1 |
| PCB 169 | 0.01 | 0.03 |
| <i>mono-ortho substituted PCBs</i> | | |
| PCB 105 | 0.0001 | 0.0003 |
| PCB 114 | 0.0005 | 0.0003 |
| PCB 118 | 0.0001 | 0.0003 |
| PCB 123 | 0.0001 | 0.0003 |
| PCB 156 | 0.0005 | 0.0003 |
| PCB 157 | 0.0005 | 0.0003 |
| PCB 167 | 0.00001 | 0.0003 |
| PCB 189 | 0.0001 | 0.0003 |

* numbers in bold indicate a change in TEF

Reference: Van den Berg et al:

The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. ToxSci Advance Access, 7 July 2006.

Previously, TEQ values presented in UMDES tables and figures were calculated using the 1998 WHO TEFs. With the 2005 WHO TEFs available, the tables and figures have been re-created using TEQ values calculated based on the 2005 WHO TEFs. The UMDES tables and figures based on the WHO 2005 TEFs can be

compared with the tables and figures based on the WHO 1998 TEFs (also available on the UMDES website at: <http://www.sph.umich.edu/dioxin/handouts.html>).

Abbreviations used in tables and figures:

TEQ = Toxic equivalency, relative to TCDD, based on the WHO 29 congeners and the TEFs from the **2005 WHO** expert meeting.

LOD = Limit of Detection

M/S = Midland and Saginaw Counties

FP = Floodplain

M/S FP = This population is defined by residing on properties that are in the FEMA 100-year floodplain (wholly or partially) OR by answering 'YES' to the question "To your knowledge, has any portion of your property ever been flooded by the Tittabawassee River?", or both.

M/S Near FP = This population is defined by living in residences that are within Census Blocks that overlap the FEMA 100-year floodplain, but for which the participant's property is not in the FEMA 100-year flood plain AND for which the participant did not answer 'YES' to the question "To your knowledge, has any portion of your property ever been flooded by the Tittabawassee River?"

M/S Out FP = This population is defined by living in residences in Midland/Saginaw counties on properties that are not included in the FP, Near FP, or in the modeled plume downwind of the Dow plant in Midland.

M/S Plume = This population is defined by living in residences in Midland/Saginaw near the plume from the former Dow incinerator. Areas included were those with modeled ground concentrations of 75 ppt dioxin TEQ or higher. To form mutually exclusive groups, only plume samples in M/S Out FP are considered as plume samples in tables and figures presented here. Two plume samples in Near FP were counted as Near FP.

Jackson/Calhoun = This population is defined by living in residences in Jackson and Calhoun Counties.

HP = House Perimeter samples

SCZ = Soil Contact Zone samples

FP = Floodplain samples

Box Plots: For each boxplot, the horizontal line across the box is the 50th percentile (median), the lower and upper margins of the box are the 25th percentile and 75th percentile, respectively; the upper ticked line ("whisker") extends to the 99th percentile; the lower ticked line extends to the 1st percentile; the stars show values below the 1st percentile or above the 99th percentile.

Ways of handling values below the LOD:

- Lower bound: Each value below LOD is replaced by zero.
- Upper bound: Each value below LOD is replaced by the LOD.
- Square root method (sqr2): Each value below LOD is replaced by the $LOD / \sqrt{2}$.
- The lower and upper bound values were provided by Alta; the square root method values were calculated by UM.

Statistical tests for pair-wise comparisons between regions:

Three different tests were used. The first tests for an overall shift in the distribution. The next two test for differences in the upper tails of the distribution. The tests compared:

- the mean of log₁₀-transformed TEQ or ppt congener concentrations,
- the proportion above the Jackson/Calhoun 75th percentile, and
- the proportion above the Jackson/Calhoun 95th percentile

For blood, each comparison was made both unadjusted and adjusted for age, age squared, and BMI.