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Limited Perspective on Dioxin Toxicity

The World Health Organization (WHO) recently reduced the Toxic Equivalent Factor (TEF) for 23478-Pentachlorodibenzofuran (PeCDF) from 0.5 to 0.3. Some of the local media have reported that, since the downgraded 23478-PeCDF molecule constitutes approximately 50% of the Total Equivalent Quotient (TEQ) of dioxins being found in the Tittabawassee River, dioxin toxicity in the river has been reduced by nearly 20%. There may a misconception that dioxins are not as dangerous as once believed. This reporting lacks a historical perspective.

The WHO has revised a number of TEFs between 1987 and 2006. Of the 17 most toxic dioxins and furans, TEFs for 13 of the congeners have been increased (an average toxicity increase of more than 6X) and only two TEFs have been reduced. Conger 23478-PeCDF has the unusual distinction of having its TEF increased in 1997 (from 0.1 to 0.5) but then decreased in 2006 from 0.5 to 0.3. While this may not be comforting to some residents (and one newspaper editor) who would prefer to have stability in dioxin toxicity, revision is the nature of science.

In the past decade, the scientific community has developed data that 13 out of the 17 most toxic dioxins and furans are, in fact, more toxic than originally believed. TEF revisions will continue to occur but it is doubtful that dioxin toxicity will ever become a non-concern to exposed residents.

In 2005, The Dow Chemical Company sampled a number of locations in the Tittabawassee River. One location (SHL-02788) was found to have a dioxin contamination level of 4,514 ppt-TEQ in the top 4 inches of river sediment. Based on the recent 2006 revision, dioxin contamination in that location is now 3,550 ppt-TEQ a 21% reduction.

However, using the TEFs for 1987, the dioxin contamination in that location would have been calculated as 2,110 ppt-TEQ. While overall dioxin toxicity has indeed dropped in 2006, the revised toxicity is still greater than it was in 1987. It should also be noted that whatever TEQ value is calculated 2,100 ppt, 3,550 ppt or 4,514 ppt all levels are significantly in excess of the Michigan cleanup standard of 90 ppt-TEQ. Incidently, the 90 ppt-TEQ cleanup standard is not effected by revisions in TEF values.

One final point : Even though TEQ calculations may change as TEFs are revised, the actual number of dioxin molecules found at location SHL-02788 does not change. One *pound* of river bottom silt carried from that location to someones riverside property will still contain 138,815 *Trillion* molecules of the seventeen most toxic dioxins and furans, irregardless of TEF values. Scientists are not certain as to how many dioxin molecules are required to cause cancer in humans. However, just on the off chance that there may be enough toxic molecules in that one pound of river bottom silt to be harmful, residents would be well advised to avoid contact with silt from location SHL-02788 and from most other locations in the Tittabawassee River.