



CHANGE IN BACKGROUND SERUM LEVELS WITH THE NEW 2005 TEFS

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INTRODUCTION & OBJECTIVES

In 2005 the World Health Organization (WHO) met to reevaluate the current information on the 29 compounds with dioxin-like activity. Though no congeners were added to or removed from the list, the estimated activity or toxic equivalency factor (TEF) for 14 congeners was changed. WHO authors hypothesized that the changed TEFs would reduce the total TEQ by 10% – 25%.

The University of Michigan Dioxin Exposure Study interviewed and tested serum for dioxin-like congeners from 946 adults in Michigan, USA, including 251 individuals as part of a control population. The control population was chosen for having no unique point-source exposure to dioxins, furans or dioxin-like PCBs. The impact of the recent WHO reevaluation on serum levels in this population are summarized in this poster.

METHODS

Background serum data is taken from the reference population of the University of Michigan Dioxin Exposure Study (UMDES). Two counties in Michigan, USA (Jackson and Calhoun Counties) were sampled to provide comparison levels for the exposure study of three Michigan counties surrounding a Dow Chemical Plant; the comparison population had no unique point-source exposure to dioxins. Adults 18 years and older, who had lived in their current residence for five or more years were randomly selected and invited to participate. The final population-weighted sample of 251 individuals who donated blood was 95% white and 62% female with a mean age of 50 years and a mean BMI of 29 kg/m².

Serum samples were analyzed by Vista Analytical for serum lipids and the 29 dioxin-like congeners recognized by the World Health Organization. All results presented are lipid adjusted and population weighted. Results falling below the limit of detection were estimated using the LOD/√2.

RESULTS

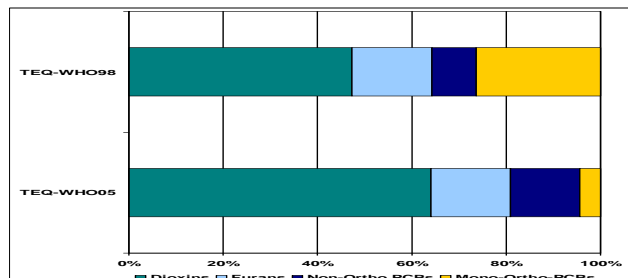
- Table 1 lists the 14 dioxin-like congeners updated by the WHO during the 2005 reevaluation; TEFs from both the 1998 and 2005 evaluations are provided for comparison purposes.

Table 1: Weights for the 14 Congeners with Updated TEFs

	Congener	WHO 1998	WHO 2005
Dibenzo- <i>p</i> -dioxins	OCDD	0.0001	0.0003
Dibenzofurans	1,2,3,7,8-PeCDF	0.05	0.03
	2,3,4,7,8-PeCDF	0.5	0.3
	OCDF	0.0001	0.0003
Non-ortho PCBs	PCB 81	0.0001	0.0003
	PCB 169	0.01	0.03
Mono-ortho PCBs	PCB 105	0.0001	0.00003
	PCB 114	0.0005	0.00003
	PCB 118	0.0001	0.00003
	PCB 123	0.0001	0.00003
	PCB 156	0.0005	0.00003
	PCB 157	0.0005	0.00003
	PCB 167	0.00001	0.00003
	PCB 189	0.0001	0.00003

- Figure 2 displays the percent contribution to the total TEQ by congener class for the UMDES reference population. Dioxins now contribute 64% to the total TEQ (vs. 47.3% in the past) while the mono-ortho PCBs now make up only 4.4% (vs. 26.4%). The percent contribution to the TEQ by the dibenzofurans remained essentially unchanged (17.0% vs. 16.9%).

Figure 1: Percent Contribution to the TEQ₂₉ by Congener Class



- Table 3 provides a comparison of the new and old TEQs by age group for the UMDES reference population. Overall, median serum TEQ levels have been reduced by 25% with the change in TEFs. This decrease ranges from about 16% in the youngest age group to 31% in the oldest group.

Table 2: Age Stratified Serum Data for the 1998 & 2005 TEFs

Age (yrs)	N	TEQ-WHO1998					TEQ-WHO2005				
		Min	P25	P50	P75	Max	Min	P25	P50	P75	Max
Overall	251	5.2	15.9	24.8	36.2	150	4.7	12.4	18.5	25.3	109
18-29	16	5.2	6.8	9.2	11.1	13.9	4.7	5.7	7.8	9.2	12.1
30-44	66	6.1	12.9	18.1	22.8	45.1	4.9	9.9	14	18.2	34.6
45-59	98	9.5	22.1	28.1	35.0	108	6.6	15.7	20.8	24.2	73.4
60+	71	15.9	34.2	45.5	55.4	150	11.4	25.3	31.3	40.2	109

CONCLUSIONS

The 2005 WHO reevaluation has reduced the expected dioxin-like activity due to chlorinated compounds in the general adult population by about 25%. This reduction is due almost entirely to the downgrading of the mono-ortho PCBs. Mono-ortho PCBs now make up only 4.4% of the total TEQ as compared to 26.4% from the 1998 TEF system. Correspondingly, dibenzo-*p*-dioxins now make up 64% of the TEQ versus 47.3%.

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