



CURRENT ESTIMATES OF BACKGROUND SERUM TCDD LEVELS IN THE UNITED STATES

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INTRODUCTION & OBJECTIVES

Over the past decade a push has been made to monitor the serum levels of dioxins in the general population - this has been fueled by concerns that body burdens due to background exposures are still sufficient to cause adverse health effects. The aim of this poster is to identify current serum TCDD levels of the United States general population. Data is taken from the 2004-2005 University of Michigan Dioxin Exposure Study (UMDES); a 2001 study by the Agency for Toxic Substances and Disease Registry (ATSDR); and the 2001-2002 National Health and Nutrition Examination Survey (NHANES) of the United States. Current TCDD levels are put into a historical context for comparison.

METHODS

- University of Michigan Dioxin Exposure Study (UMDES): adults age 18 and over were randomly selected from one of five counties in Michigan and invited to donate 80 milliliters of whole blood for analysis. Data from two counties used as a reference population are included in this poster. Serum samples (N = 251) were obtained and analyzed in 2005. Samples that fell below the limit of detection were estimated using LOD/√2. Results are lipid adjusted and population weighted.
- 2001 ATSDR exposure study: residents 15 years of age and older from two parishes (counties) in Louisiana were randomly selected to participate: Calcasieu Parish for its proximity to industrial sources of dioxins; Lafayette Parish as the reference population. No significant differences were found in serum TEQ or congener pattern between the two parishes. Serum TCDD data are from a subsequent publication of the combined parish data using single and multiple imputation methods to estimate serum TCDD levels below LOD. Data is lipid adjusted, but not population weighted.
- 2001-2002 NHANES: NHANES serum analyses for dioxins are limited to a sub-sample of adults age 20 years and over who reside in the United States. Data from pregnant women were omitted for this comparison (final N = 1145). Samples that fell below the limit of detection were estimated using LOD/√2. Results shown are lipid adjusted and population weighted.

RESULTS

Figure 1: Temporal Change in Background Serum TCDD Levels in the USA

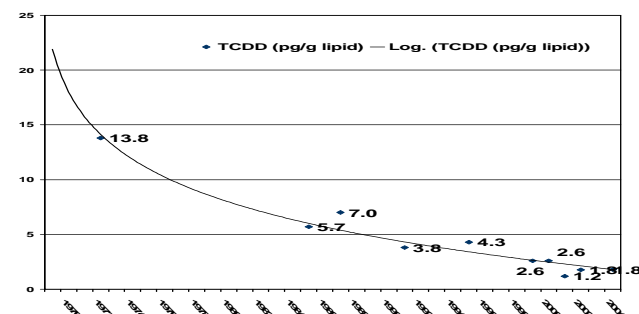


Table 1: References for Figure 1

Year of Sample	N	Conc.	Reference
1973	100	13.8 (pooled)	Schechter A, et al. <i>JOEM</i> 2005; 47:199
1986	17	5.7 (mean)	Kahn PC, et al. <i>JAMA</i> 1988; 259:1661.
1988	79	7.0 (mean)	Fingerhut MA, et al. <i>NEJM</i> 1991; 324:212.
1992	44	3.8 (mean)	Schechter A, et al. In: <i>Dioxins and Health (Second Edition)</i> , Schechter A. and Gasiewicz TA (ed.), Wiley & Sons, New Jersey, 2003: 629
1996	100	4.3 (mean)	Schechter A, et al. In: <i>Dioxins and Health (Second Edition)</i> , Schechter A. and Gasiewicz TA (ed.), Wiley & Sons, New Jersey, 2003: 629
2000	200	2.6 (mean)	Schechter A, et al. In: <i>Dioxins and Health (Second Edition)</i> , Schechter A. and Gasiewicz TA (ed.), Wiley & Sons, New Jersey, 2003: 629
2001-2002	1145	2.6 (mean)	National Health and Nutrition Examination Survey. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2001-2002.
2002	415	1.2 (*)	Caudill SP, et al. <i>Chemosphere</i> 2007; in press.
2003	100	1.8 (pooled)	Schechter A, et al. <i>JOEM</i> 2005; 47:199
2005	251	1.8 (mean)	University of Michigan Dioxin Exposure Study. http://www.umdioxin.org

* Imputed

Figure 1 displays current mean TCDD levels in a historical perspective. References for each datapoint are presented in Table 1. Today's serum TCDD levels for adults in the USA are around 2 pg/g.

Table 2 presents recent data broken down by age group. For the UMDES and ATSDR studies, estimates of median levels fall at or below 1 pg/g for adults under age 45 years. Median levels for persons 45 years and over are around 2 - 3 pg/g. Table 2 also suggests that the 95th percentile serum TCDD level for the oldest age group is about 10 pg/g lipid.

Table 2: Current Serum TCDD Levels by Age Group

Age Group (yrs)	Study	N	Fraction < LOD	Percentile of Serum TCDD (pg/g lipid)			
				50	75	90	95
18-29	UMDES	16	0.75	0.4	0.5	1	3.1
	ATSDR	102	0.94	0.5-0.7	0.6-1.3	0.8-2.1	1.9-3.3
	NHANES	167	0.98	2.3	2.7	3.6	3.9
30-44	UMDES	66	0.32	0.9	1.4	1.8	1.9
	ATSDR	101	0.69	0.6-1.1	1.7-2.3	3.2-3.3	4.0-4.4
	NHANES	323	0.95	2.0	2.7	3.3	3.8
45-59	UMDES	98	0.17	1.5	2.3	2.8	3.5
	ATSDR	110	0.52	0.9-1.7	3.2-3.4	4.3-4.4	5.6-5.9
	NHANES	256	0.90	2.1	2.7	3.5	5.2
60 +	UMDES	71	0.03	2.6	3.9	5.3	7.7
	ATSDR	102	0.31	3.5-3.6	5.9	8.3	11.7
	NHANES	399	0.73	2.4	3.8	7.9	9.9

CONCLUSIONS

The current studies in conjunction with past work all point to a continued decreasing exposure to TCDD by the general population. Over the next decade human levels of TCDD may fall below detection limits despite improving technology; larger volumes of serum may be necessary for detection of some congeners.

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