

The University of Michigan Dioxin Exposure Study  
University of Michigan School of Public Health  
1420 Washington Heights, Ann Arbor 48109-2029  
Toll Free Line: 1.888.689.0006  
Website: <http://www.umdioxin.org>

Date

Name & Address

Dear Mr/Ms XXX:

Thank you for participating in the University of Michigan Dioxin Exposure Study. This letter summarizes the results of chemical analyses of the blood sample you provided for the study.

You also may have had soil and/or house dust sampled from your home or property. Chemical analyses of soil and house dust have not been completed. If soil and/or dust were collected for the study, and if you indicated that you wanted to receive the results of analyses of those samples, you will receive separate letters containing those results.

The University of Michigan Dioxin Exposure Study seeks to understand how people are exposed to dioxin-like chemicals. The study will examine the impact of where people have lived, what they eat, their jobs, their hobbies, and their environment, including their soil and household dust, on levels of dioxins in their blood. The study will not look at the effects of dioxins on people's health. We anticipate that the full results of the study will be available in late 2006.

There are hundreds of different types of dioxin-like chemicals. They fall in three broad classes that share similar chemical structures: dioxins, furans and polychlorinated

biphenyls (PCBs). Within each class, the individual members are called 'congeners'. Analyses of your blood involved measuring 29 different congeners of dioxins, furans and PCBs. These 29 congeners were chosen because they have been identified by the World Health Organization (WHO), the United States Environmental Protection Agency (USEPA), and the Michigan Department of Environmental Quality (MDEQ) as having dioxin-like toxicity, and are believed to be the most important in terms of potential health effects. Table 1 provides the concentration of each of the 29 congeners found in your blood. If the level of a congener in your blood was below the level at which the laboratory can reliably provide a measurement, one half of the reliably measurable level is shown in Table 1.

Scientists have assigned relative potency values, or Toxic Equivalency Factors (TEFs), to each of the 29 dioxin-like compounds; the TEFs are also listed in Table 1. The TEF for each congener relates its toxicity to that of 2,3,7,8-tetrachlordibenzo-p-dioxin (2,3,7,8-TCDD), the best characterized of these chemicals. The total dioxin toxic equivalent (TEQ) concentration is calculated by multiplying the concentration of each congener by its TEF and adding up the products. The TEQ is the most important indicator of the combined effect of these 29 compounds, and is expressed in picograms per gram (pg/g) of blood lipid. (The number of picograms per gram is the same as parts per trillion.)

The level of total dioxin TEQ in the blood sample you provided, based on these 29 congeners, is \_\_\_\_ pg/g of blood lipid.

Almost everyone has measurable dioxins in their blood. The human health effects of dioxins at blood levels similar to yours are not known. Scientists at the Centers for Disease Control and Prevention (CDC) are working on finding current estimates for the level of dioxin-like compounds in the blood of a person with no known exposure to dioxins other than background exposure. Background exposure means that a person was never exposed to dioxin in a job setting or by an industrial chemical release. Most persons living in the United States have been exposed to small amounts of dioxins in

food. While the new estimates are not yet finalized, the CDC has preliminary data from 4 different U.S. studies that you can use as a comparison for the levels of dioxin-like compounds found in your blood sample<sup>1</sup>.

Table 2 shows the preliminary CDC estimates for background dioxin TEQ levels in pg/g of blood lipid. The table lists the estimates of dioxin TEQ by age group because dioxin levels in blood tend to increase with age. Please note that the dioxin estimates in Table 2 are based on only 21 of the 29 dioxin congeners that we measured for the University of Michigan Dioxin Exposure Study. The 21 congeners used to calculate the CDC estimated background TEQ levels are identified in Table 1.

Table 2. Preliminary estimates for background dioxin TEQ levels (pg/g of blood lipid) based on 21 measured congeners, by age-group.

Age Group In years	Mean	50 <sup>th</sup> Percentile	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	Minimum	Maximum
15-29	6.4	5.4	7.8	11.7	14.0	0.0	53.9
30-44	11.8	9.8	16.6	21.1	23.2	0.2	50.4
45-59	16.9	14.9	22.3	29.5	32.8	0.8	55.4
60+	36.1	32.3	45.6	69.2	85.4	3.4	146.4

The level of total dioxin TEQ in the blood sample you provided, based on these 21 congeners is \_\_\_\_ pg/g of blood lipid.

The level of dioxin-like compounds in your blood sample falls between the \_\_\_\_ and the \_\_\_\_ percentile of dioxin-like compound levels in the blood of people in your age group. [Alternative versions for the preceding sentence, depending on the individual result: 1) The level of dioxin-like compounds in your blood sample was above the 95<sup>th</sup> percentile of dioxin-like compound levels in the blood of people in your age group. 2) The level of dioxin-like compounds in your blood sample was below the 50<sup>th</sup> percentile

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<sup>1</sup> Patterson D.G., Patterson D., Canady R., Wong L., Lee R., Turner W., Caudill S., Grassman J., Needham L., Henderson A. Age Specific Dioxin TEQ Reference Range. Organohalogen Compounds. 2004;66:2878-2883.

of dioxin-like compound levels in the blood of people in your age group. ] (For example, the 90<sup>th</sup> percentile TEQ for persons 45-59 years old is 29.5 pg/g, meaning that 90 percent of persons in this age group would be expected to have blood TEQ less than or equal to this number.)

In order to have scientifically valid results about the relationship between levels of dioxins in soil, household dust and blood, the entire study must be completed and analyzed. Individual or partial results do not permit scientists to make valid conclusions. This means that it is not possible at this time to make any judgments about the association between levels of dioxins in soil and household dust and levels of dioxins in your blood.

We greatly appreciate your participation in the University of Michigan Dioxin Exposure Study. If you have any questions or would like more information, you can visit our web site, or contact us using the information shown below. Additionally, the Community Advisory Panel for the University of Michigan Dioxin Exposure Study will be holding a public meeting on Thursday, March 10, 2005, starting at 6:00pm at the Freeland Elementary School (710 Powley Drive, Freeland). I, along with members of the study team, will be there to answer questions.

Sincerely,

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Table 1: Results of Blood Concentrations of Dioxin-like Compounds

Congener	TEF	Serum Concentration*	Contribution to TEQ (based on 29 congeners)	Contribution to TEQ (based on 21 congeners)
<b>Dioxins:</b>				
2,3,7,8-TCDD	1			
1,2,3,7,8-PentaCDD	1			
1,2,3,4,7,8-HexaCDD	0.1			
1,2,3,6,7,8-HexaCDD	0.1			
1,2,3,7,8,9-HexaCDD	0.1			
1,2,3,4,6,7,8-HeptaCDD	0.01			
OctaCDD	0.0001			
<b>Furans:</b>				
2,3,7,8-TetraCDF	0.1			
1,2,3,7,8-PentaCDF	0.05			
2,3,4,7,8-PentaCDF	0.5			
1,2,3,4,7,8-HexaCDF	0.1			
1,2,3,6,7,8-HexaCDF	0.1			
1,2,3,7,8,9-HexaCDF	0.1			
2,3,4,6,7,8-HexaCDF	0.1			
1,2,3,4,6,7,8-HeptaCDF	0.01			
1,2,3,4,7,8,9-HeptaCDF	0.01			
OctaCDF	0.0001			
<b>Polychlorinated biphenyls (PCBs):</b>				
3,4,4',5'-TetraCB (81)	0.0001			
3,3',4,4'-TetraCB (77)	0.0001			
3,3',4,4',5'-PentaCB (126)	0.1			
3,3',4,4',5,5'-HexaCB (169)	0.01			
2,3,3',4,4'-PentaCB (105)	0.0001			
2,3,4,4',5'-PentaCB (114)	0.0005			
2,3',4,4',5'-PentaCB (118)	0.0001			
2',3,4,4',5'-PentaCB (123)	0.0001			
2,3,3',4,4',5'-HexaCB (156)	0.0005			
2,3,3',4,4',5'-HexaCB (157)	0.0005			
2,3',4,4',5,5'-HexaCB (167)	0.00001			
2,3,3',4,4',5,5'-HeptaCB (189)	0.0001			
		<b>Your Overall TEQ:</b>		

\* All results shown are expressed as picograms per gram (pg/g) of blood lipid, which is the same as parts per trillion (PPT)

\*\* The level of this congener in your blood was below the level at which the laboratory can reliably provide a measurement so one half of the reliably measurable level is shown.

Abbreviations:

CDD - chlorinated dibenzodioxins

CDF - chlorinated dibenzofurans

CB - chlorinated biphenyls

TEF – toxic equivalency factor

TEQ – toxic equivalency