

The Michigan Dioxin Exposure Study

The University of Michigan

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September 22, 2005

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The Questions We Want to Answer

- Are dioxin levels in blood increased among people who live in the Tittabawassee River flood plain compared to people who live
 - *Elsewhere in Midland and Saginaw Counties*
 - *Elsewhere in Michigan (Jackson/Calhoun counties)*
- What factors explain the variation in serum dioxin levels among the population?
 - *Soil dioxins, house dust dioxins*
 - *Residential proximity to Tittabawassee River*
 - *Consumption of fish and game*
 - *Occupations*
 - *Age, BMI, sex, etc.*



Study Overview

- **We have collected the following information/samples from each participant:**
 - *Responses to a 1-hour personal interview*
 - *Serum (80 ml blood draw)*
 - *House dust (vacuum filter sample)*
 - *Soil*
- **Blood, house dust, and soil are being analyzed for the WHO 29 list of dioxins, furans, and coplanar PCBs.**



Progress to date

- **We completed our field data collection in Midland/Saginaw and in Jackson/Calhoun counties in early September 2005.**

	Midland/Saginaw floodplain & near floodplain	Midland/Saginaw non-floodplain	Jackson/Calhoun	Total
Interviews	589	375	352	1323
Blood samples	455	246	251	952
Dust samples	365	199	198	762
Soil samples	366	205	194	765
Participants who have all 4 data elements	352	196	183	731

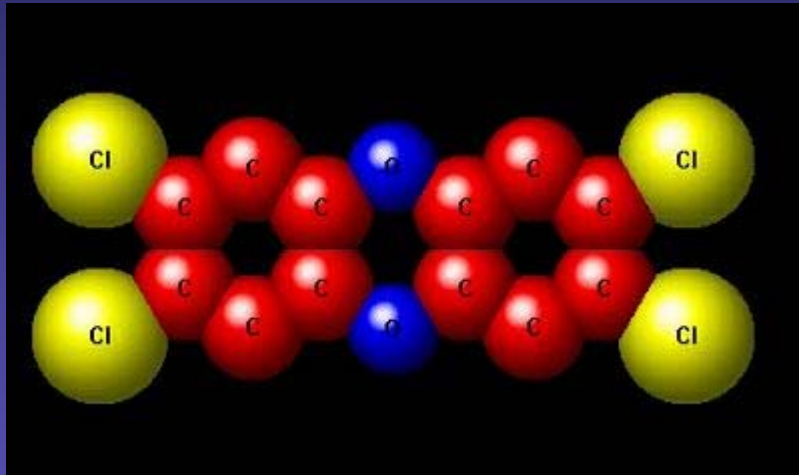


Progress to date

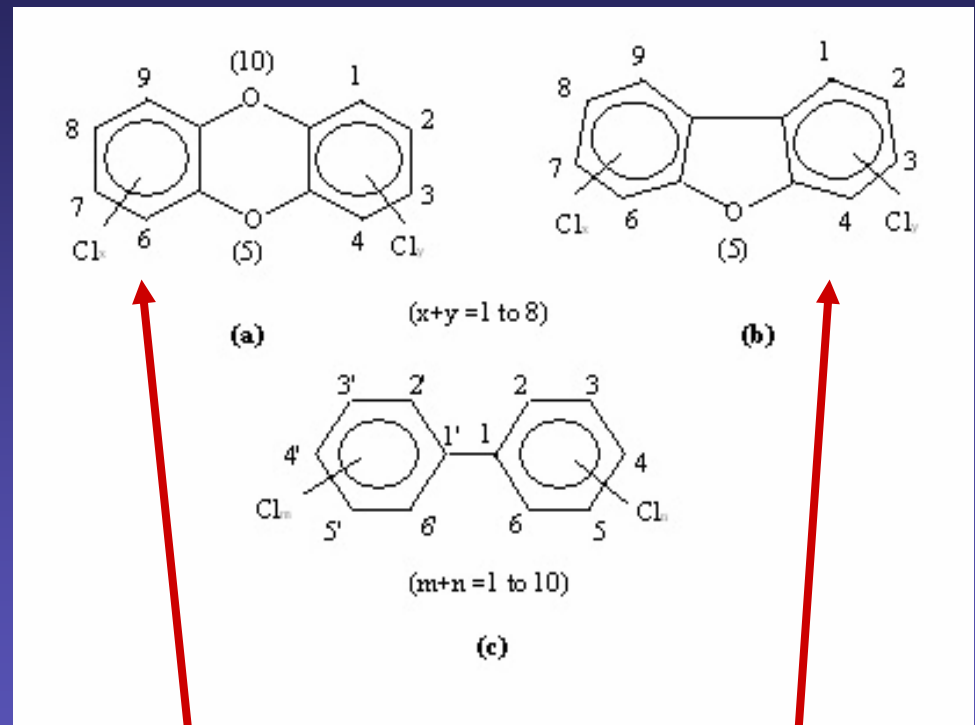
- **Laboratory analyses of blood, dust, and soil for dioxins are expected to be completed during fall 2005.**
- **Letters giving participants their personal results are being mailed out as the laboratory results become available.**
- **We are setting up the data audit with the ATSDR, which is anticipated to begin in fall 2005.**



What are Dioxins, Furans and PCBs?



2,3,7,8-tetrachlorodibenzo-p-dioxin
(TCDD)



Dioxins

PCBs

Furans



Congeners and WHO 29 TEF Values

Dioxin Congener	WHO TEF Value
2,3,7,8-TCDD	1.0
1,2,3,7,8-PnCDD	1.0
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.0001

Furan Congener	WHO TEF Value
2,3,7,8-TCDF	0.1
1,2,3,7,8-PnCDF	0.05
2,3,4,7,8-PnCDF	0.5
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.0001

PCB Congener	WHO TEF Value
PCB 77	0.0001
PCB 81	0.0001
PCB 126	0.1
PCB 169	0.01
PCB 105	0.0001
PCB 114	0.0005
PCB 118	0.0001
PCB 123	0.0001
PCB 156	0.0005
PCB 157	0.0005
PCB 167	0.00001
PCB 189	0.0001



Explanation of Blood Results Letters – Dioxin Results

- Blood, dust, and soil samples were analyzed for 29 dioxin-like compounds and total blood lipids
 - 7 dioxins
 - 10 furans
 - 12 polychlorinated biphenyls
- About 60 confidential letters describing blood results have been mailed to study participants in Jackson and Calhoun Counties.
- Soil and dust results are pending. They will be mailed to participants as they become available.

We are measuring picograms of dioxins per gram of blood lipids

Gram	1 gram (about 1/30 th of an ounce)
Milligram	1/1,000 gram (one thousandth of a gram)
Microgram	1/1,000,000 gram (one millionth of a gram)
Nanogram	1/1,000,000,000 gram (one billionth of a gram)
Picogram	1/1,000,000,000,000 gram (one trillionth of a gram)

A blood dioxin level of 9 means you have 9 picograms of dioxin in one gram of your blood lipids

Congener	TEF	Serum Concentration*	Contribution to TEQ (based on 29 congeners)	Contribution to TEQ (based on 21 congeners)
Dioxins:				
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			
Furans:				
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			
Polychlorinated biphenyls (PCBs):				
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			
			Your Overall TEQ:	

Congener	TEF	Serum Concentration*	Contribution to TEQ (based on 29 congeners)	Contribution to TEQ (based on 21 congeners)
Dioxins:				
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			



Explanation of Blood Results Letters – Dioxin Results

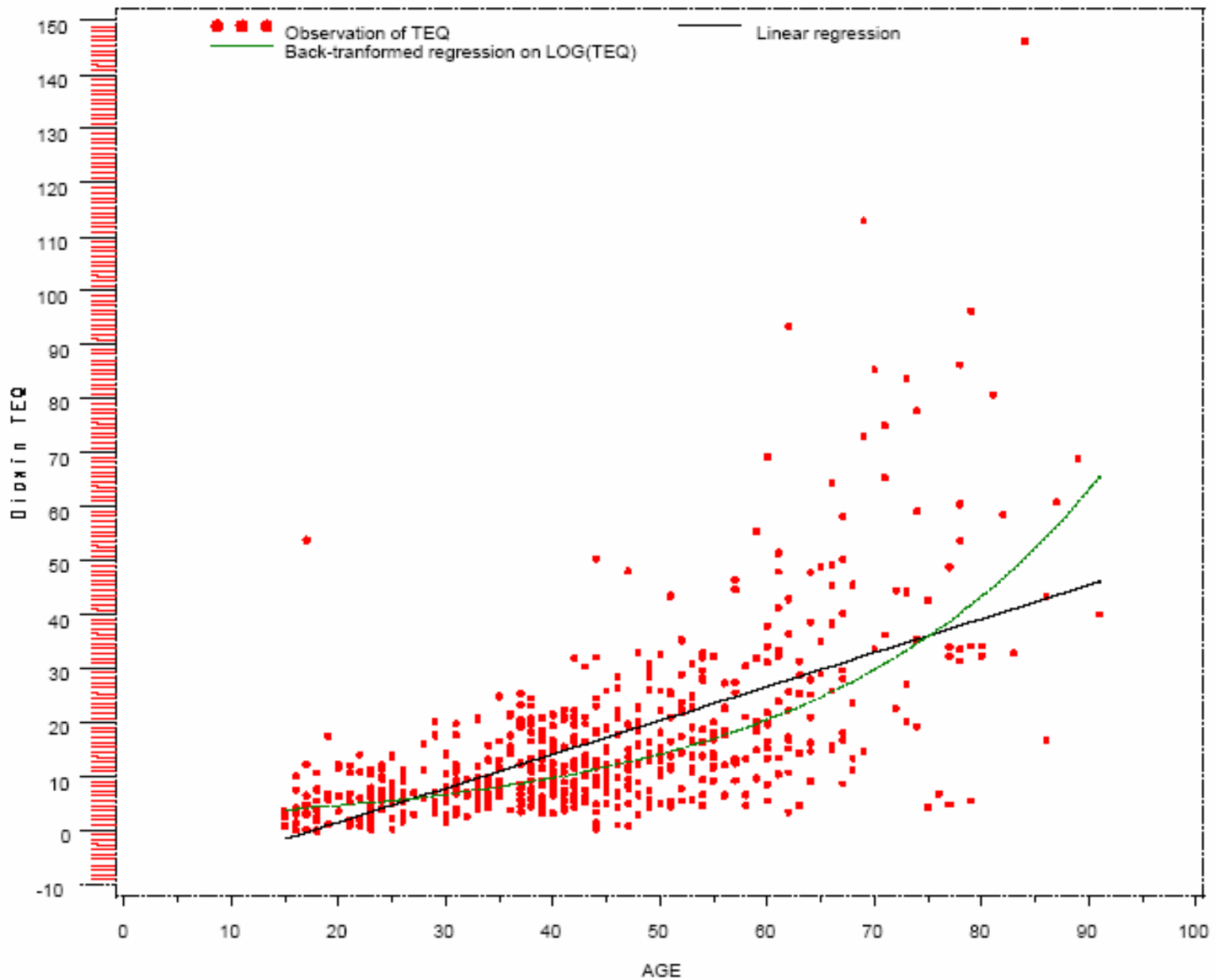
Almost everyone has measurable dioxins in their blood. Scientists at the Centers for Disease Control and Prevention (CDC) are working on finding current estimates for the level of dioxin-like compounds in the blood of a person with no known exposure to dioxins other than background exposure. Background exposure means that a person was never exposed to dioxin in a job setting or by an industrial chemical release. While the new estimates are not yet finalized, the CDC has preliminary data from 4 different U.S. studies that can be used as a comparison for the levels of dioxin-like compounds found in blood samples.

Table 2: Dioxin TEQ reference range by age group based on studies from LA, MO, NC, & NY (in picograms/gram of blood lipids)

Age Group	N	Mean	75th % ile	90th % ile	95th % ile	Min	Max
15-29	116	6.4	7.8	11.7	14.0	0.0	53.9
30-44	199	11.8	16.6	21.1	23.2	0.2	50.4
45-59	160	16.9	22.3	29.5	32.8	0.8	55.4
60+	113	36.1	45.6	69.2	85.4	3.4	146.4
All	588	16.8	20.8	33.7	48.0	0.0	146.4

Data from Donald Patterson, et al. Age specific dioxin TEQ reference range. Organohalogen Compounds, volume 66 (2004)

Figure 1. Dioxin TEQ versus Age for Studies from LA, MO, NC, and NY





Explanation of Blood Results Letters – Dioxin Results

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 the currently available blood samples.



New studies under development

1. Bioavailability
2. Follow-up of houses with unusual results
3. Optimizing Communications



Future Release of Study Results

- **All results of statistical analyses** must be reviewed by the Scientific Advisory Board (SAB) prior to their release to the public.
- We anticipate that these results will be sent to the SAB in the spring and summer of 2005.
- We anticipate that results will be presented at public meetings in the summer and fall of 2006 and will be posted to our website.



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