



## Human Blood Testing for Dioxins

The Michigan Department of Community Health (MDCH) has received many requests for information about human blood testing for dioxins. Tests to measure the level of dioxins and similar chemicals in a person's blood are not readily available to the public. These tests are very costly and it is not likely that they will be paid for by medical insurance. In addition, it is very difficult to interpret the results of such tests. For these reasons, **MDCH does not recommend that individuals have their blood tested for dioxins.** However, this fact sheet has been developed to answer questions and to assist individuals and their physicians in obtaining dioxin blood tests should they pursue testing.

### What are dioxins?

Dioxins and dioxin-like compounds are a group of chlorinated chemicals with similar structures and chemical properties. The group includes chlorinated dioxins, furans, and some polychlorinated biphenyls (PCBs) and is often referred to collectively as simply "dioxins." Each chemical in the group is called a dioxin *congener*. When found in the environment or in human blood samples, dioxins are usually a mixture of several of these congeners. While there are 210 dioxin and furan congeners and 209 PCB congeners, a much smaller group of 7 dioxins, 10 furans, and 12 PCBs are of most concern for human health.

### Are all dioxins and furans the same?

Although all dioxin congeners are thought to act in the same way, they are not all equally toxic. The most toxic congener in the dioxin group is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Scientists have developed toxic equivalency factors (TEF) to compare the relative toxicity of other congeners to that of TCDD. TCDD is assigned a TEF value of "1" and the remaining 16 dioxins/furans and 12 PCBs of concern are assigned a TEF that estimates its toxicity compared to TCDD. For example, a TEF of 0.5 (one-half) is assigned to a congener that is half as toxic as TCDD.

### What are dioxin TEQs?

The dioxin toxic equivalent (TEQ) is a way to express a concentration of a mixture of dioxins based on its estimated toxicity compared to TCDD. The levels of dioxin congeners measured in environmental or biological samples are multiplied by their TEF to produce a TCDD toxic equivalent or TEQ concentration. The resulting TEQs for all dioxin congeners measured in a sample are then added together to determine the total dioxin TEQ concentration for that sample.

### How likely is it that I have dioxins in my body?

All people in the United States are believed to have some level of dioxins in their body fat and blood. Dioxins are found throughout the environment and most people are exposed to low background levels in air, soil, or food. The level in a person's body is called the dioxin *body burden*.

People who work in occupations that expose them to dioxins or who live in areas where environmental levels of dioxins are higher may have higher dioxin body burdens. People may also have higher dioxin body burdens if they eat fish, meat, or dairy products that contain higher levels of dioxins.

### **What tests are available for measuring dioxins in human blood?**

Two types of tests are available for determining dioxin levels in blood samples.

*Bioassay* tests will provide an estimate of the total TEQ concentration, but cannot provide a measure of individual dioxin congeners in a sample. These tests use genetically modified mammal cells that respond when exposed to the dioxin-like chemicals in a blood sample. Bioassays are generally used only for screening because the test can also respond to other chemicals that may be in the sample. An advantage of the screening level bioassay is a far lower cost than other test methods.

*High-resolution gas chromatography/mass spectroscopy* (HR-GC/MS) analysis is the preferred test to measure individual congeners as well as the total dioxin TEQ concentration. The US Environmental Protection Agency has developed Method 8290 to guide laboratories in performing this analysis. Lipid (blood fat) analysis should also be done on the blood sample so that the results of the test can be given as units of dioxin TEQ per unit of blood lipid. While the HR-GC/MS test is more specific, it is also more costly than the screening bioassay test.

### **How much will it cost to have a blood sample analyzed for dioxins?**

A screening level bioassay will likely cost from \$350 to \$400. HR-GC/MS may cost from \$1,200 to \$1,500. These tests are not likely to be covered by medical insurance.

### **How much blood is needed for dioxin analysis?**

About 80 milliliters of blood (eight medium-sized tubes) are needed to perform both the HR-GC/MS test for dioxins and the lipid analysis. The US Centers for Disease Control (CDC) has developed a procedure for collecting, preparing, and shipping blood samples for dioxin analysis. People or their doctors may obtain the procedure from the MDCH web site (<http://www.michigan.gov/mdch-toxics>) or from the laboratory performing the blood analysis.

### **How can I tell if the level of dioxin TEQ in my blood is elevated?**

The CDC has estimated the dioxin TEQ level in people in the United States who have been exposed to background levels of dioxins. These estimates are based on age, because dioxin body burdens tend to increase, as a person gets older. Please contact the MDCH for assistance in interpreting the results of dioxin blood tests.

### **Will the dioxin in my body make me sick?**

A safe level of dioxin body burden is not known at this time. In general, a lower level of exposure to these contaminants will result in a lower body burden and a lower likelihood of health effects. There are steps that you can take to reduce your exposure. Please contact the MDCH for information about the potential health effects of dioxins and how you can reduce your exposure.

### **Where can I get my blood analyzed for dioxins?**

There are very few laboratories that can reliably measure dioxins in a blood sample. The information provided below is not meant as an endorsement or an assurance of the quality of service provided by any laboratory. Individuals who want their blood sampled, must make their own contacts and arrangements through their personal physician. MDCH cannot collect, prepare or ship blood samples.

Alta Analytical Perspectives  
2714 Exchange Drive  
Wilmington, NC 28405  
Phone: 910-794-1613  
Fax: 910-794-3919  
Contact: Yves Tondeur, Ph.D.

Eno River Labs, LLC  
2445 South Alston Avenue  
Durham, NC 27713  
Phone 919-281-4031  
Fax: 919-281-4070  
Contact: Norman Hoffa

Keika Ventures, LLC  
PO Box 4704  
Chapel Hill, NC 27515  
Phone: 866-333-1092  
Fax: 919-361-0696  
Contact: Lorri L. White

**For additional information contact Linda Dykema, MDCH, at 1-800-648-6942 or at [dykema@michigan.gov](mailto:dykema@michigan.gov).**