



HUMAN HEALTH RESEARCH PROGRAM

www.epa.gov/ord

EPA RESEARCH LEADING THE WAY IN UNDERSTANDING DIOXIN RISKS STANDARDS

Issue:

Dioxins are a byproduct of routine combustion processes such as the burning of household trash, commercial or industrial incineration, volcanic eruptions, and forest fires. They tend to accumulate in the fatty tissue of the animals we eat. Numerous studies have shown that human exposure to high levels of dioxins can produce serious adverse health effects. Even extremely small exposures may be problematic.

Science Objective:

Researchers in the U.S. Environmental Protection Agency's Office of Research and Development are contributing to the assessment of dioxin contamination in several significant ways. First, they have introduced the concept of using what is known as *steady state body burden* as the primary measure of exposure. Traditionally, scientists might simply look at how much of a chemical was ingested or came into contact with someone's skin – what's called a daily dose. But because dioxins are so persistent, remaining in the environment and in the body for years, it is important to know what was eaten yesterday, last month, and even ten years ago, to produce the total amount that's in the body – the steady state body burden.

Human health research also supports a method of assessing exposure to mixtures of dioxins that is called the *toxic equivalency (TEQ)* approach. Essentially, this approach takes an integrative measure of the potency of each compound (the Toxic Equivalency Factor, or TEF) and multiplies it by the total exposure amount to assess risk. This method underscores the concept that risk assessment of chemicals not only involves a measurement of *how much* but also *how dangerous*.

Finally, the Agency has introduced the concept of *human relevance* in the study of dioxin contamination. This concept considers that the effects of dioxins are not unique to a particular species; they cause similar effects in most every species.

Application and Impact:

EPA research is helping to guide the world's ability to assess dioxin contamination and reduce the potential for human exposure. For example, the method used to determine *steady state body burden* is now the widely accepted standard method for measuring dioxin contamination as well as all persistent chemicals. Similarly, the *toxic equivalency factor* approach is the interna-

tional standard for assessing exposure to combinations of dioxins and is the accepted method for measuring all persistent chemicals that are structurally related, act in the same way, and cause the same effect. And finally, while there is some debate among scientists as to whether humans are as sensitive to dioxins as are other animals, EPA's work has added to the evidence that people are indeed very sensitive to dioxin exposures.

In the United States, the potential human health risks associated with dioxin contamination has led to voluntary industry practices limiting the levels in certain consumer products. Major sources from 20 years ago have been largely eliminated.

REFERENCES:

DeVito M.J.; Birnbaum L.S.; Farland W.H.; Gasiewicz T.A. Comparisons of estimated human body burdens of dioxinlike chemicals and TCDD body burdens in experimentally exposed animals. *Environ Health Perspect.*, 1995 Sep; 103(9):820-31.

Birnbaum L.S.; Tuomisto J. Non-carcinogenic effects of TCDD in animals. *Food Addit Contam.* 2000 Apr; 17(4):275-88.

CONTACT:

Linda S. Birnbaum, Ph.D., D.A.B.T., EPA's Office of Research and Development, 919-541-2655, Birnbaum.Linda@epa.gov