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THE US EPA DIOXIN EXPOSURE INITIATIVE

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INTRODUCTION/BACKGROUND

In September of 1994 EPA released its public review draft of the dioxin reassessment. At that time the Agency also announced that it would initiate a Dioxin Exposure Initiative to fill critical data gaps regarding the sources of dioxin that contribute to human exposure. The Exposure Initiative was identified as a multi-year effort that would extend beyond the current reassessment effort; however, particular emphasis would be placed on gaining as much information as possible that could be incorporated into the final reassessment. This data will also be critical to supporting EPA development and implementation of an agency-wide dioxin risk management strategy. In FY 95 EPA has invested $1.7 million on the initiative. Because of the significant delay in EPA receiving its' FY 96 congress appropriations the FY 96 level of funding for the initiative yet to be determined

The fundamental goal of the initiative is to quantitatively link dioxin sources to general population exposure. This is being accomplished by pursuing two simultaneous lines of inquiry, One approach is to focus on identifying sources of dioxin-like compounds and work forward along their pathways of transport and deposition. The second is to start with human body burdens and work backwards through the process of bioaccumulation and uptake. As these two lines of inquiry merge, they should provide an adequate understanding to enable EPA to target future exposure reductions efforts to those sources and pathways that most significantly contribute to human risk.

An additional goal of the initiative is to estimate, where possible, past trends in dioxin exposure and to establish a current baseline for monitoring future trends.

SOURCES FORWARD

In pursuing the first approach, sources forward, EPA has adopted a substrategy which divides source identification into three steps: source nomination, source conformation, and

source characterization. Nomination of a source can come about based on information such as theoretical chemistry, similarity of a process to known dioxin sources, or emissions data of uncertain quality. Once a source is nominated it is then a candidate for confirmation. Confirmation is a limited monitoring or testing effort intended to confirm that dioxins are, or are not, a product of the candidate source. Confirmation testing will use conditions which are thought to be most conducive to dioxin formation. If no dioxins are found then no further testing will be needed. If dioxins are found, then the source becomes a candidate for source characterization. Source characterization attempts to provide a basis for quantitatively estimating national emission totals for a source category. This is an inherently expensive activity and, for some sources, could absorb a major portion of the entire initiative budget; consequently, the initial focus of source identification portion of the initiative is on nomination and confirmation.

It is also the goal of the initiative to use EPA resources to leverage investment, by industry and other agencies, to pay for a significant portion of this work. We have ongoing discussions with the diesel industry, the PVC industry, the metal smelting and refining industries, all of which are resulting in significant cooperative efforts.

Other major components of the sources forward approach are: the adaptation of RELMAP (an acid deposition model capable of regional modeling of multiple sources) to model dioxin transport and deposition; establishment of a small deposition monitoring network; and an effort to identify and characterize reservoir sources. Collectively, these efforts should enable us to describe the current contributions which known sources make to deposition on feed crops, and allow us to predict future rates of deposition when emission rates change. Additionally, should the air model predict less deposition than the monitoring indicates, the model would enable us to speculate on the size and location of unidentified sources.

HUMAN EXPOSURE BACKWARD

In its second approach, the initiative is starting with quantification of human body burdens, and modeled intake. This modeled intake will be compared to the intake derived from newly measured levels of dioxin in the diet to see if they quantitatively confirm the diet hypothesis of exposure. The food measurements will also provide a basis for determining what portions of the diet contribute most to general population exposure. Similarly, livestock exposures will be estimated on the basis of levels in animal feeds and compared with exposures derived from animal body burdens to quantitatively confirm the leaf-to-animal hypothesis. If, in the process of these studies, there are indications of additional pathways of exposure outside of the air-to-leaf-to-animal-to-human route, these will also be explored. Finally, levels in animal feeds will be compared to predicted levels derived from air deposition rates to complete the linking of dioxin sources to human exposure.

To help carry out the dietary components of the initiative, we have major cooperative efforts with both the US Department of Agriculture (USDA) and the US Food and Drug Administration (FDA). These include joint efforts with USDA on beef, pork, poultry and eggs, and with FDA on fish milk and dairy products.

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TRENDS

The determination of past trends in emissions, depositions, and exposure could provide a more powerful context in which to develop dioxin strategies. To get a better picture of past deposition and, by inference, emissions and exposure, the initiative is looking at dioxin levels in lake sediments in several regions across the US. Additionally, the data on levels in food and data from the deposition network can serve as baseline measurements for tracking future trends.