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United States Environmental Protection Agency

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Dioxin

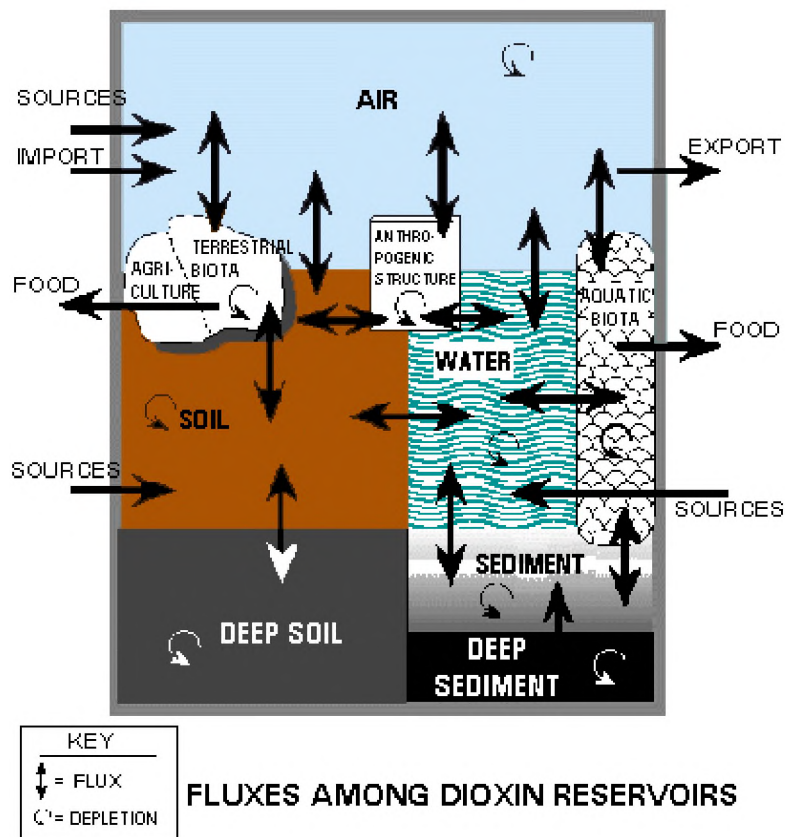
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DIOXIN EXPOSURE INITIATIVE (DEI)

Overview

In September of 1994, the United States Environmental Protection Agency (EPA) released it's public review draft of the Dioxin Reassessment. At that time the EPA also announced that it would initiate a Dioxin Exposure Initiative (DEI) to fill critical data gaps regarding the sources of dioxin that contribute to human exposure.



The DEI 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. The DEI is jointly funded and managed by EPA's Office of Prevention, Pesticides, and Toxic Substances, and the Office of Research and Development.

As illustrated in this figure, the cycling of dioxin through the environment is a complex process, involving multiple **Sources, Flows, Reservoirs, and Sinks**.

Sources to air are dominated by the combustion of wastes and fuels. Sources to water include storm runoff, air deposition, and waste water discharges from certain industrial processes. Contributions to land include air deposition and the land spreading of waste water treatment sludge.

Flows include: air born transport of dioxin vapor and dioxin contaminated particulates; water transport of dioxin contaminated suspended particulates; transport from land through wind and water erosion, transport by biota through trophic exchange, and the movement through commerce contaminated materials.

Reservoirs include soil, sediment and manufactured materials which contain dioxins that are temporarily stored but may later be released into the circulating environment.

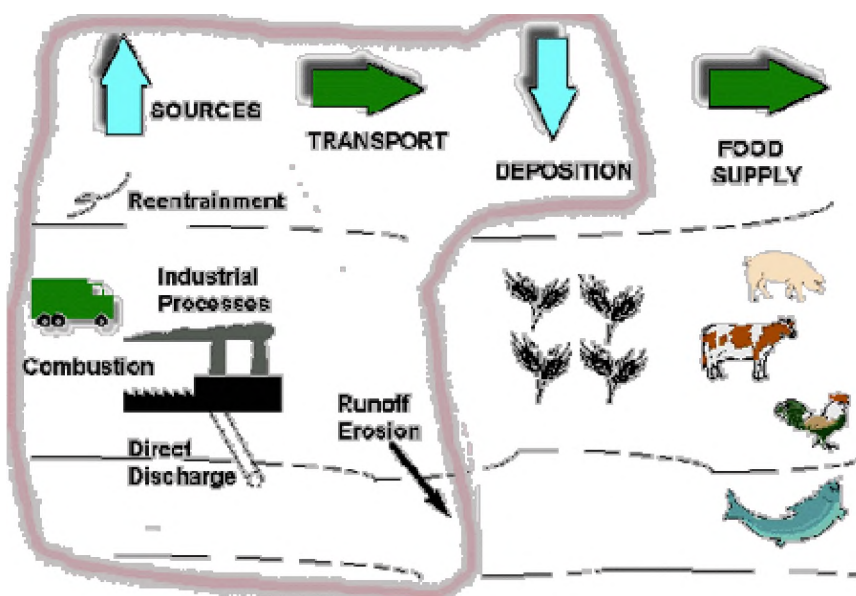
Sinks represent the long term storage and isolation of dioxin in undisturbed soil and sediment.

Although we have a general qualitative understanding of dioxin cycling in the environment, our quantitative understanding is limited.

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.

- DEI Publications
- Sources
- Exposures
- Trends

I.SOURCES FORWARD

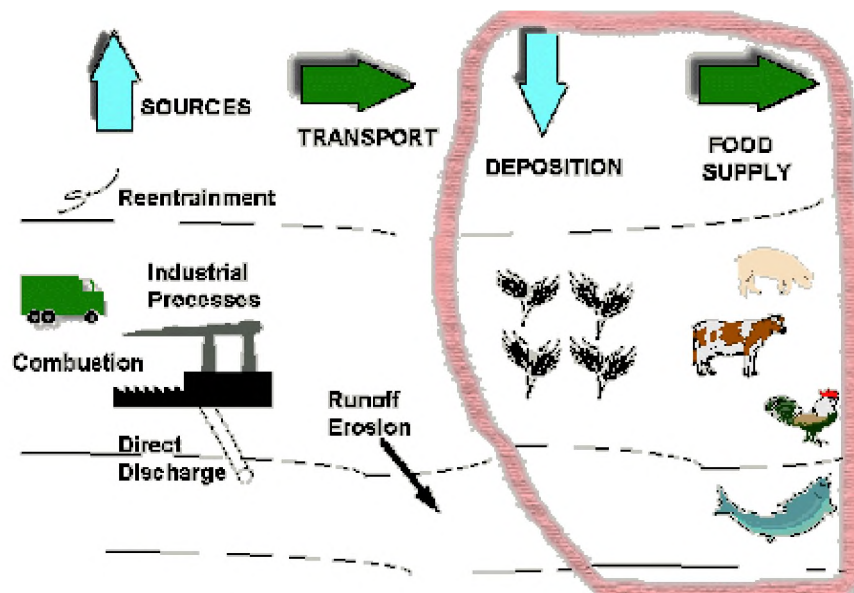


In pursuing the first approach, sources forward, EPA has adopted a substrategy which divides source identification into three steps: source nomination, source confirmation, and source characterization. Nomination of a source can come about based on information such as theoretical chemistry, similarity 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.

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II.HUMAN EXPOSURE BACKWARD

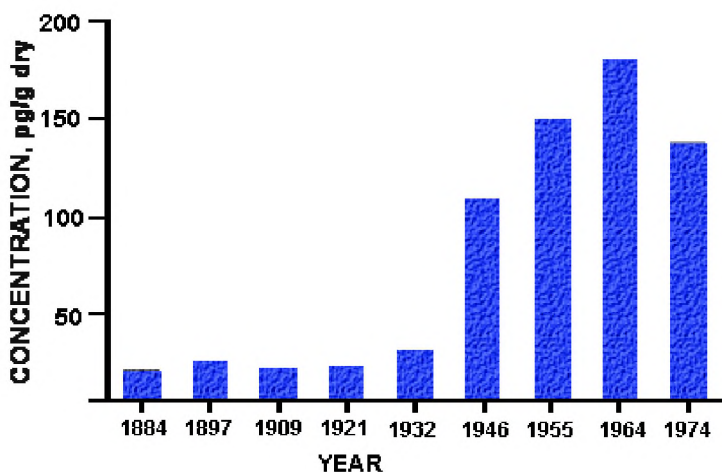


In its second approach, the initiative is starting with quantification of human body burdens, and modeled intake. This modeled intake will be compared to the intake derived from newly measured levels of dioxin in the diet to see if they quantitatively confirm the diet hypothesis of exposure. The food 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.

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III.TRENDS

Concentrations of Total Dioxins in Bottom Sediment Layers Corresponding to Year of Deposition

Beaver Lake, Olympic Peninsula, Washington

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 DEI is looking at dioxin levels in lake sediments in several regions across the United States. The DEI is also using pharmacokinetic modeling to reconstruct past doses of 2,3,7,8-TCDD. Data that is currently being collected on food and ambient air can serve as baseline measurements for tracking future trends.

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