Where in the Great Lakes is Toxaphene Going?

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Toxaphene is a broad range pesticide, which was used primarily on cotton in the southeastern United States. Its use was banned by the US Environmental Protection Agency in 1986 because of its persistence. Residues of technical toxaphene are found in biota far removed from sites of its application. Because toxaphene is an extremely complex mixture of hexa- to decachlorinated norbornanes and norbornenes and because few of its numerous congeners have been synthesized, toxaphene can only be analyzed effectively with a selective analytical technique. Various methods have been used; however, electron capture gas chromatographic mass spectrometry (EC GC/MS) gives the most reproducible results due to its selectivity and sensitivity. To determine the fate of this compound in the Great Lakes, we have used EC GC/MS to determine total toxaphene concentrations and chlorination level profiles in fish and sediment. In all cases, it was necessary to correct the toxaphene concentrations by subtracting contaminant contributions (such as DDE and chlordane) by using isotopic abundances for toxaphene and for the expected interferences. Trout, walleye, and smelt samples were collected from the Great Lakes in 1982, 1992 (trout and walleye only), and 1994 (smelt only). Analysis of the earlier samples indicates that the toxaphene bioaccumulation mechanism is different for each fish species. Additionally, the chlorination level profile for fish from Lake Erie is significantly different from that of fish from the other four Lakes, suggesting that some unique process is occurring in Lake Erie. We have also analyzed

Lake Ontario sediment and found that toxaphene fluxes maximize in 1973 ± 6 years with a horizon year of 1945 ± 6 years. This compares well with the small amount of production and usage data that is available. By comparing our surface sediment profile to technical toxaphene, we conclude that the transport mechanism to the Great Lakes is mainly atmospheric. Additionally, chlorination level profiles indicate that a post-depositional dechlorination process is occurring. The selectivity of EC GC/MS has allowed us to better understand this complex process.