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Project Summary

Environmental Levels of PCB in Great Lakes Fish

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This report reviews and evaluates previously reported PCB levels in a variety of fish sampled from various locations in the Great Lakes. Higher concentrations in fish appear to be related to near-shore sampling where higher exposure to bottom sediments occurs to the flora and fauna comprising the food chains for the specific fish collected. Highest concentrations of PCBs were found in lake trout and fat trout taken from Lake Superior and in fish collected from the lower end of Lake Michigan. There is a need to identify past and/or present sources contributing PCB contaminants to the off-shore areas as well as to identify major sources of runoff contributing PCBs to the waters of the Great Lakes system. Additional information as to food-chain constituents is needed to more rapidly assess prey-predator relationships in the various regions of the system.

This Project Summary was developed by EPA's Environmental Research Laboratory, Duluth, MN, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The intent of this review was to identify, based on available data reported to us, the major species of fish contributing PCBs to the human diet and the major sources of contamination. This review first identified levels of contamination by given sampling area in samples of lake trout in Great Lakes waters, since this species was most extensively studied; it then identified levels by location for other species of fish which form part of the human diet or may serve as food sources for fish at higher trophic levels. Our primary concern was for human exposure, even though we fully recognized the importance of a total ecological systems approach, particularly with respect to predator-prey relationships. In fact, the latter are necessary to fully understand and appreciate the potential for human exposure through ingestion of fish. One other facet that is not directly considered in this review is the potential for infant exposure to PCBs through breast feeding and subsequent accumulations of these agents in fatty tissue.

Conclusions

The following conclusions may be drawn based upon the data available to the authors and the assumptions referred to in the text.

1. There is a dearth of information on PCB levels in many species of fish collected from various locations. In many instances, only one or two samples were collected annually or biennially.

2. Where more data were available for specific fish from given locations, it was demonstrated that the PCB concentrations reported varied in a log-normal manner.

3. Based upon data reported for fish collected from certain areas of Lake Superior, the concentrations generally were lower, whereas near-shore samples included in these same areas showed higher bottom mud and sediment concentrations in the near-shore areas.

Recommendations

1. All subsequent investigations of fish and other sources of PCBs in the Great Lakes should be coordinated through a central organization which can specify the kinds of fish to be collected, numbers of fish, and locations for sample collection.

2. There is a greater need for reporting the portion of the fish examined (i.e., the total fish or edible fraction) to provide a better base for comparing samples. Similarly, methods used for analysis should be reported and a uniform system of quality control should include all laboratories carrying out these studies. The specific standard used for estimating the PCB concentration should be indicated, and information on the actual isomers identified should be reported.

3. With the isolation of areas of higher fish contamination, a concerted effort should be made to indicate whether such contamination levels reflect current discharges of PCBs or sources that have accumulated over time.

4. Stomach contents of the fish caught should be examined to identify feeding habits in the various parts of the lake system during different seasons of the year.

Species of Fish Sampled

The most extensive data available for study were on lake trout, but data in variable number were reported for fat trout, carp, catfish, yellow perch, whitefish, walleye, sucker, red sucker, black crappie, brown bullhead, herring, fresh water drum, bloater, burbot, brown trout, rainbow trout, muskie, salmon, chinook salmon, cisco, and smelt. Similar species were not sampled from all sites, probably due to the fact that all species were not found at all locations. The species of most interest are those that have been identified as major food sources. These, in order of preference as indicated by preliminary data from the epidemiological questionnaire on eating habits of commercial fishermen, are yellow perch, lake whitefish, lake herring, and lake trout.

Results

Data are presented in the form of semi-logarithmic plots of PCB concentration (log scale) *vs.* length (arithmetic scale) or weight (wet) (log scale) *vs.* length (arithmetic scale); as logarithmic plots of PCB concentration (log scale) *vs.* weight (wet) (log scale); and as logarithmic probability plots of PCB concentrations. In addition, fish body burden (mg) *vs.* fish weight (grams) was plotted on log-log paper and demonstrated a better linear relationship than that reported by others using an arithmetic plot.

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The complete report, entitled "Environmental Levels of PCB in Great Lakes Fish," (Order No. PB 83-264 481; Cost: $10.00, subject to change) will be available only from:
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Telephone: 703-487-4650
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