This report cites Veith and Lee (1971a) as finding 2.0-2.8 µg/l ambient PCB concentrations in the Milwaukee River. In reality, all concentrations measured by these investigators were less than 0.34 µg/l, with the exception of one sample which had a concentration of 2.17 µg/l. This sample was taken in a region near the Milwaukee combined sewer outfalls. The PCB residue concentration of 405 µg/g in a fish, which is cited in this report as being from Veith and Lee (1971a), is actually from another report by Veith and Lee (1971b). Examination of the data presented by Veith and Lee (1971b) indicates that this is an abnormally high concentration for fish, and that the fish containing this concentration of PCB's were from the Milwaukee River section which had abnormally high aqueous PCB concentration. Concentrations in fish from other sections of the river ranged from <2 µg/g up to 38 µg/g.

The criteria for aquatic life of 0.001 µg/l appears to be based on Food and Drug Administration guideline of less than 5 µg/g of PCB in fish for human consumption, reproductive failure in mink consuming fish containing 2 µg/g of PCB (Ringer et al., 1972), and the occurrence of PCB residues of about 15 µg/g in fish from Lake Michigan, where PCB concentrations are generally less than 0.01 µg/l. The assumption here apparently is that the concentration of 0.01 µg/l in water is responsible for the concentration of 15 µg/g in fish. This is not necessarily a

valid assumption. Although it has been documented that fish concentrate PCB's from water with efficiencies up to 10^5, these tests have usually been carried out at concentrations much higher than those found in natural water and with the PCB's either dissolved or in acetone dispersion. This does not reflect the natural situation in Lake Michigan where most of the PCB residues in water are associated with particulate matter (Veith and Lee, 1971a) and thus may not be as available for direct uptake by fish. Examination of Table 1 indicates that at least for the Milwaukee River and Lake Michigan, there is no strong correlation between PCB residues in fish and PCB concentrations in water.

It appears unlikely that the high concentrations of PCB residues in Lake Michigan fish are related to the PCB levels in the open water area of Lake Michigan, thus it is unjustified to base a water quality criteria on the assumption of such a relationship. A more likely explanation of the situation in Lake Michigan is that PCB residues are accumulated by benthic organisms and filter and deposit feeders in areas such as Milwaukee that have been heavily contaminated with PCB's. These residues may then be passed through a food chain to the fish in open water. Evidence for this is that Veith (1973) has found that PCB residues in benthic organisms such as Pontoporeia were higher in southern Lake Michigan, which is heavily industrialized and populated, than they were in northern Lake Michigan. For fish that migrate freely in the lake, such as coho salmon, there were no regional variations in PCB concentration, however.

Table 1

Concentrations of PCB's in Water and Fish from the Milwaukee River and Lake Michigan

(Veith and Lee, 1971a; Veith and Lee, 1971b; Veith, 1973)

Location	µg/l in water	µg/g in fish	type of fish
Above dam, Grafton	0.05	14	Redhorse
"		15	Carp
"		2	White Sucker (3)
"		*	Small mouth Bass (3)
"		3	Northern Pike
"		*	Bullhead (7)
Above dam,Thiensville	0.38	13	Carp
"		19	Redhorse (4)
"		16	Carp
"		14	Pumpkinseed (3)
"		11	White Sucker
"		22	Northern Pike
"		21	Bullhead (9)
Estabrook Park	2.17	405	Goldfish (7)
"		139	Goldfish (4)
"		64	White Sucker (2)
Milwaukee Harbor	0.12	20	Chub
"		23	Chub
"		26	Lake Trout
"		4	Yellow Perch
"		18	Coho Salmon
Lake Michigan	<0.01	11.5	Coho Salmon (56)

* Not detected, < 2 µg/g.

MONS 040369

It is apparent that further work is needed on the biological availability of PCB's and other chlorinated hydrocarbons which are associated with suspended solids and with soluble and colloidal organic matter. In addition, work is necessary on the significance of transport of PCB's from contaminated areas to fish in uncontaminated areas by fish food organisms.

BIBLIOGRAPHY

Ringer, R.K. et al. (1972) Effect of Dietary Polychlorinated Biphenyls on Growth and Reproduction of Mink. Amer. Chem. Soc. National Meeting Reprints of Papers 12, 149.

Veith, G.D. (1973) "Chlorinated Hydrocarbons in Fish from Lake Michigan" Report to the Water Quality Office, Environmental Protection Agency, Project 16020 PBE.

Veith, G.D. and Lee, G.F. (1971a) "Chlorobiphenyls (PCB's) in the Milwaukee River" Water Res. 5, 1107-1115.

Veith, G.D. and Lee, G.F. (1971b) "PCB's in Fish from the Milwaukee Region" Proc. 14th Conf. Great Lakes Res. 1971, 157-169.