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Exhibit 40

Measurements of PCB (Aroclor 1254) in Lake Superior Diluent Water During a Brook Trout Chronic Exposure

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Concommitant with the need to investigate the chronic effects and bioconcentration factor of PCBs with fish is the need to measure the concentration of PCBs in the water. Brook trout are being exposed to Aroclor® 1254 at NWQL at nominal concentrations ranging from 0.01 µg/l to 1.0 µg/l. Water samples were taken daily from each tank and weekly composites were made using formalin to minimize microbial activity. Reagent blanks and recovery experiments using water from the control tanks spiked with 0.01 µg/l, 0.10µg/l, and 1.0 µg/l Aroclor® 1254 were conducted each week. In addition, estimates of PCBs in the Lake Superior water used in the exposure were made by perchlorinating the PCBs to decachlorobiphenyls.

Water samples (4 liters from each tank and 20 liters from Lake Superior water supply) were passed through glass columns packed with polyurethane foam after the extraction systems were exhaustively extracted with solvent to remove impurities which could interfere in the analysis. The PCBs were removed from the columns with acetone (50 ml) and hexane (225 ml). The extracts were dried over anhydrous Na_2SO_4 and concentrated to 5 ml in a Kuderna-Danish evaporative concentrater. The concentrates were transferred to one gram Florisil columns (prewashed with hexane) and the PCBs were eluted with 75 ml of hexane. The eluant was collected in a Kuderna-Danish concentrator and reduced to about 5 ml for GLC analysis.

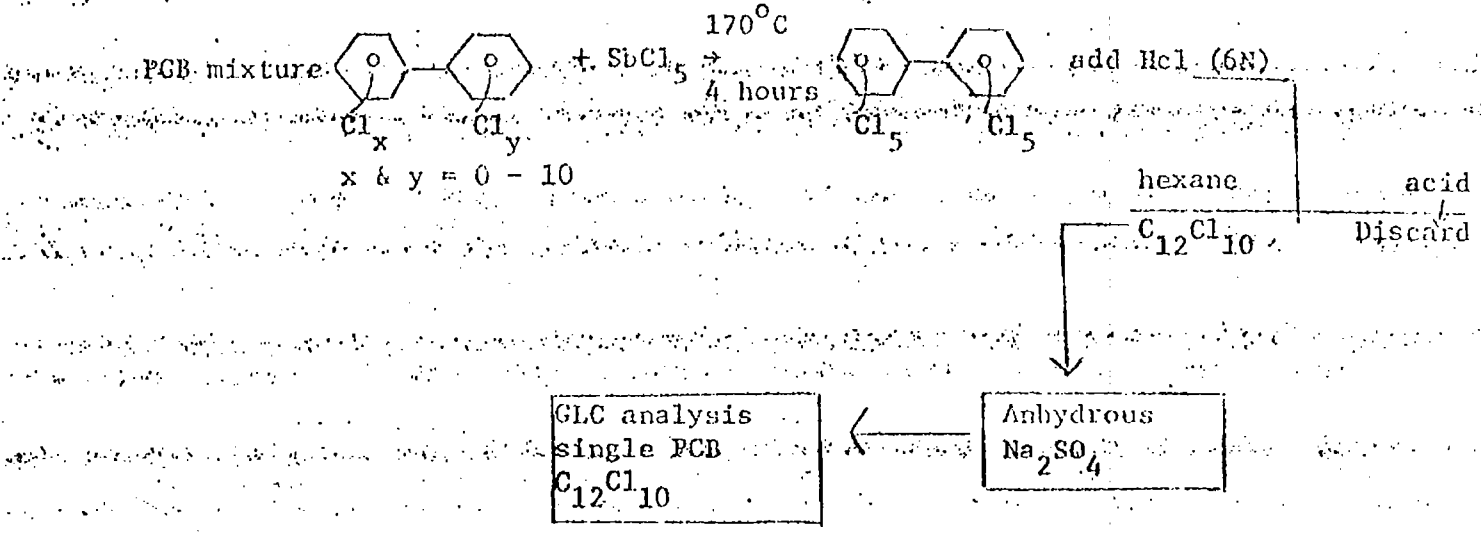
The results of the recovery experiments are presented in Table 1.

The data show that the mean recovery of PCBs from spiked Lake Superior water was greater than 60 percent over the range from 0.01 µg/l to 1.0 µg/l. The data also demonstrate that the standard deviation of the analyses using the four liter water samples increased from ± 14 percent at the 1 µg/l concentration to ± 59 percent at the 0.01 µg/l concentration.

Table 1. Recovery of Aroclor® 1254 Added to Water From NWQL Control Tanks

Quantity of PCBs added per liter	Number of recovery experiments	Recovery of PCBs (percent) Mean	Standard Deviation
1.00	59	62	± 14
0.10	58	62	± 21
0.01	57	79	± 59

The extracts of the 20 liter water samples were analyzed for PCBs by perchlorinating the samples with $SbCl_5$. Briefly, the analytical scheme is as follows:



The increased sensitivity of this method is due to the conversion of all PCBs to a single compound and the greater sensitivity of the more highly chlorinated $C_{12}Cl_{10}$ to electron capture.

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The GLC response is linear up to 0.2 ng $C_{12}Cl_{10}$ and the detection limit is about 0.005 to 0.01 ng $C_{12}Cl_{10}$. It is commonly observed that commercially available $SbCl_5$ produces a blank in this analysis, and both the $SbCl_5$ and reagent blanks generally limit the determinable limit in these analyses.

The experiment to measure the PCBs in Lake Superior water consisted of two perchlorination blanks, three reagent blanks which includes the extraction through the perchlorination steps, three replicate samples of Lake Superior water, and three replicate samples from the control tanks in the PCB bioassay system. The results of these analyses are summarized in Table 2. Since the perchlorination blanks were essentially the same as the overall reagent blank, the major source of PCBs is assumed to be the perchlorination step and all blanks were grouped together. The Lake Superior water samples contained approximately 0.8 ng/l PCBs as Aroclor 1254. However, the variability of the measurements (more than 50 percent) at this concentration does not permit precise estimates to be made. The estimated concentration of PCBs in the control tanks was approximately 3 ng/l.

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Table 2. PCBs in Lake Superior Water and Control Bioassay Tanks

Sample Origin	Number	Volume (liters)	Total ng $C_{12}Cl_{10}$ Mean ± S. E.	Estimated PCB concentration (ng/l as Aroclor 1254)
Reagent blanks	5	--	44 ± 12	--
Lake Superior	3	20.3 ± 0.02	62 ± 6	0.8 ± 0.4
Brook trout control tanks	3	21.1 ± 0.05	132 ± 11	3.2 ± 0.5

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