Appendix B

An Addendum to the Research Grant

"POLYCHLORINATED BIPHENYL'S TRANSLOCATION AND ENVIRONMENT CONTROL"

Submitted to the Sport Fishery Research Foundation

MONS 013939

Introduction

Recently there has been a great deal of public concern over PCB contamination in the aquatic environment especially in the Great Lakes region (Illinois and Wisconsin). Interest arose due to the banning of fishing in various Wisconsin rivers and in portions of Lake Michigan because of high PCB concentrations noted in fish. In response, the Sport Fishery Research Foundation funded a project at Tulane University to investigate PCB translocation mechanisms in freshwater ecosystems, to determine PCB bioaccumulation fluctuations in fish and to explore possible PCB decontamination mechanisms. In the first year of this project several interesting observations have been noted regarding the contaminated aquatic ecosystem under study: (1) the drop in PCB concentration in a ten year period appears to be substantially faster than the half-life projected in laboratory studies; (2) aqueous translocation does not appear to be due to soluble PCB's; (3) the major sinks for PCB appear to be the colloidal portions of the sediment and benthos organisms; and (4) some of the benthos organisms appear to exhibit a detoxication mechanism for PCB's.

Upon the request of the Sport Fishery Research Foundation, this addendum is submitted to ask for funding for a second year and request a third year extension. In the second and third years, we propose to: (1) validate gas chromatography analysis by the use of mass spectroscopy to better confirm the results obtained in both field and laboratory; (2) investigate biodegradation; (3) develop bioaccumulation studies; (4) study the possible removal of both

MONS 013940

soluble and bound PCB by vascular aquatic plants; and (5) determine PCB half-life by obtaining permission to utilize industrial data and continuing the field monitoring program.

Validation of PCB Analysis

The PCB measurement will be periodically confirmed by GC-MS analysis in order to further validate field observations. In biodegradation studies, metabolites resulting from PCB degradation will be carefully monitored by frequent GC-MS analysis. Finally, all other laboratory investigations should be monitored periodically in order to substantiate the chromatograph technique.

Decontamination Studies

By obtaining further support, in-field decontamination techniques may be determined. Field investigations and recent unpublished findings[1,2], give strong evidence for microbial degradation of PCB. The proposed decontamination study will require three phases: (1) an initial microbial acclimitization study; (2) sonications experiments (causing the stable PCB's to be altered to a more degradable form); and (3) a final microcosm study for final varifications of decontamination technique.

A possible technique for PCB removal from contaminated environments is the utilizing and harvesting of vascular aquatic plants which have a high affinity to remove soluble PCB's or PCB's bonded to soils, sediments and colloidals. Since it has been noted that plants tend not to accumulate PCB's (as readily as sediments, soils, and biota), this investigation will study the efficiencies of specific vascular plants in removing harmful quantities of PCB's from soil and sediment sinks.

MONS 013941

Bioaccumulation Studies

The bioaccumulation studies and the destabilization of contaminated colloidal sediments (clays and humic acids) will involve two phases: (1) the determinations of PCB's affinity for various sediment constituents and (2) the determination of PCB bioaccumulation by fish from contaminated clays and humates.

By chance, it was noted that while colloidally bonded PCB's are not as toxic as soluble PCB, the bound PCB's affect the behavior of various fish. Therefore, in this proposed bioaccumulation study sublethal toxicity and more realistic values for PCB's bound to colloidal sediments can be ascertained.

The Determination of PCB's Half-Life

The first year of study has shown that even though PCB's are still above contaminated levels in fish tissue, there has been a dramatic drop in PCB concentrations in soils, sediment, water and fish tissue in the area of study. Additional funding support would enable us to obtain permission to use industrial data and to continue monitoring the Alabama site; to thereby determine a realistic PCB half-life for the southeastern portion of the United States.

Tentative Schedule and Budget

This project will require approximately 24 months to complete. The gearing-up phase will require two to three months (the planning stage and preliminary experiments). The experimental phase will be conducted after the gear-up phase and be completed in a year. A final refined experimental phase will be completed during the subsequent six months. After completion of the laboratory phases, the data will be analyzed and a final report will be prepared with a three month time frame.

MONS 013942

The cost of the proposed project is shown in Table I and the tentative research team is listed in Table II.

MONS 013943

References

1. Gunning, G.E., Unpublished Results, 1978.

2. Griffin, R.A., "Disposal and Removal of PCB's in Soil", Presented at the Fourth Annual [illegible] Symposium on Land Disposal of Hazardous Waste", San Antonio, Texas, March 6-8, 1978.

MONS 013944

TABLE I

RESEARCH BUDGET

		First Year	Second Year
1.)	Personnel	$ 15,600	$ 15,600
2.)	Travel		
	Surveys		800
3.)	Equipment		
	Maintenance	1,000	1,000
	Field Equipment	500	500
	Recorder	1,500	0
	Lab Equipment	1,000	1,000
4.)	Supplies		
	(chemical reagents, gases for GC and misc. supplies)	2,000	2,000
5.)	Other		
	Computer Time		300
	Xeroxing and report preparation		300
6.)	GC-MS Analysis	7,500	7,500
7.)	Total Cost Project	$ 31,100	$ 29,000

MONS 013945

TABLE II

GENERAL RESEARCH TEAM

SPORT FISHERY INSTITUTE

Mr. Richard Stroud

PRINCIPAL SUPERVISOR

R.S. Reimers, Ph.D.

Field Survey	Analysis	Microbial Degradation	Bioaccumulation	Plant Harvesting
J.E. Gunning, Ph.D.	R.S. Reimers, Ph.D.	A.C. Anderson, Ph.D.	A. Abdelghani, D.Sc.	A.J. Englande, Jr., Ph.D.
M. Wilke, Ph.D. Cand.	A. Abdelghani, D.Sc.	A. Abdelghani, D.Sc.	R.S. Reimers, Ph.D.	S. Tridech, D.Sc. Cand.
L.S. Gardner, M.S. Cand.	Research Assistant	Graduate Student	A.C. Anderson, Ph.D.	R.S. Reimers, Ph.D.
Graduate Student			Graduate Student	

MONS 013946