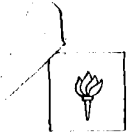


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PCBs



NEW YORK UNIVERSITY MEDICAL CENTER

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November 8, 1979

ANTHONY J. LANZA RESEARCH LABORATORIES AT UNIVERSITY VALLEY
LONG MEADOW ROAD, STERLING FOREST, TUXEDO, N.Y.
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Dr. Clayton F. Callis, Director
Environmental Operations and
Technical Planning
Monsanto Industrial Chemicals Co.
800 N. Lindbergh Blvd., B2SA
St. Louis MO 63166

Dear Dr. Callis:

This is a brief report on our progress in our studies of "Microbial Degradation of PCBs by Aquatic Fungi and Anaerobic Bacteria". Our goal for Year 1 is to isolate and cultivate fungi and anaerobic bacteria capable of growth in PCBs (Aroclor 1254 and 1016) from at least six different aquatic environments, and to investigate their ability to degrade the PCBs. To this end, the work is progressing well.

1. We have a Ph.D. candidate, Ramzi Sansur, who will be doing the fungal work. I am enclosing a portion of his thesis proposal for your interest, so that you may see what some of our study with the fungi will encompass.
2. We have a research assistant to help us with our field sampling and laboratory analyses.
3. We are still looking for a suitable graduate student to help with the anaerobic bacteria work. Until such a person is found, I am looking after the bacterial work as well as the entire program.
4. To meet our first year's objective, we have selected three major areas across the United States from which to obtain our samples for fungi and anaerobic bacteria; PCB-free and PCB-contaminated sites from each of these areas will be examined and are listed below:
 - a. Western U.S. as represented by the Columbia River system and the Duwamish River in Washington State.
 - b. Mid-western U.S. as represented by the Hudson Bay-Mississippi River system.

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c. Eastern U.S. as represented by the Hudson River system in New York State.

Fungi and mixed cultures of anaerobic bacteria have been obtained from areas (a) and (c). We have sediment and water samples from four different sites along the Columbia River and one from the Duwamish River. For area (c) we have three samples from the Hudson River and three from lakes and ponds here in Sterling Forest. Still needed are "clean" samples free from PCBs from the upper Mississippi River basin, Hudson Bay region and "PCB-contaminated" samples from the lower Mississippi River.

From the samples in areas (a) and (c) we have obtained, at least, 12 different fungi in pure culture and numerous cultures of mixed anaerobic bacteria. As the bacterial cultures are mixed, it is difficult to determine if they are different or not, as taxonomy is not a high priority item in this work at this time. The respective cultures are being maintained on a basal salts medium plus biphenyl and are waiting to be tested against the Aroclors.

Work is continuing on the one fungus (*Fusarium* sp.) and the culture of mixed anaerobic bacteria from the Hudson River, which we had in our laboratory at the inception of the present program. Although we are awaiting the results of ongoing experiments for proof of PCB degradation in the form of ^{14}C -radiolabelled metabolites from the "breakdown" of ^{14}C -labelled 1254, a vast amount of circumstantial evidence for microbial "breakdown" of Aroclor 1254 is being accumulated and is listed below:

1. Bacterial and fungal growth in 5-10 ppm 1254 in acetone as the sole source of carbon.
2. Decrease in the total PCB concentration in treatments versus controls (30-70% decrease within 60 days).
3. Changes in peak ratios of gas chromatograms of 1254 after microbial growth.
4. The presence of early eluting peaks resembling peaks found in Aroclor 1016 and 1221 in gas chromatograms of Aroclor 1254 after microbial activity. A peak tentatively identified as biphenyl was observed in treatment samples analyzed by flame-ionization gas chromatography. These results indicate PCB isomer transformation by dechlorination. I am attaching copies of a few annotated tracings.
5. The appearance of "metabolite" spots in thin layer chromatograms of Aroclor 1254 subjected to microbial

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activity; no such spots were observed for the controls. Similar experiments using ^{14}C -labelled 1254 gave no radioactive metabolite spots. However, the level of ^{14}C -1254 used in earlier radiolabelled experiments may be too low: (0.1 μCi of ^{14}C -1254 = 1 μg of ^{14}C -1254 added to 99 μg of cold 1254 in 20 ml of culture medium), and the resultant metabolites may not have acquired sufficient activity to be detected by autoradiography and/or by liquid scintillation counting. This situation is being corrected by increasing the amount of ^{14}C -1254 used (2.5 $\mu\text{Ci}/26 \mu\text{g}$ ^{14}C -1254 in 25 ml of culture medium, no cold 1254). These experiments are awaiting analysis. We expect the delivery soon of a Waters' gradient HPLC; this instrument should greatly aid in our studies of PCB degradation and detection of possible metabolites.

We are investigating the possibility of obtaining or having synthesized a ^{36}Cl -labelled 1254 or some other PCB, so that we may better investigate the dechlorination of Aroclor 1254 by our aquatic organisms.

Any help, suggestions, or questions you may have regarding our work would be appreciated.

Sincerely,



C. C. Lee, Ph.D.
Research Assistant Professor

CCL:emc
CC: Dr. Merrill Eisenbud
Enclosure

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