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Since March 3, 2003, my colleagues and I have collected 37 tree bark samples and tree bores from various sites in Crystal Springs, Mississippi (see Figure 1). Using the bark samples, we will quantify the magnitude of passive gas phase PCB absorption from the atmosphere into the lipid tissues of bark. Bores will be used to measure the ages of the trees. Our tree bark and bore samples have been collected in trees from residential yards, former industrial sites (e. g. the former icehouse) and flood-plain areas.

Atmospheric gas phase PCB that are more lipophilic absorb into lipid tissues in tree bark. The less lipophilic PCB, normally those with lower molecular mass, remain in the atmospheric gas phase. In this way, trees act as passive air samplers for certain congeners and homologues of atmospheric PCB (Hermanson & Hites, 1990) and the amounts found in tree bark are indicators of the exposure of other organisms in the area to gas-phase atmospheric PCB, including people residing there. The PCB in bark indicate the maximum air concentrations occurring during the lifetime of the tree.

PCB are known to readily evaporate into air from ground surface sources and buried sources, usually at times of relatively high air temperatures (Hermanson & Hites, 1989). The concentrations of total PCB in air are predominantly in the gas phase (usually > 90% of total PCB) relative to atmospheric PCB associated with particles, or on “dust”. As a result, PCB travel easily through the air and can be absorbed or inhaled representing a pathway to the average adult human who inhales 20,000 liters of air daily.

Crystal Springs is the site of the Kuhlman Electric Corporation plant. Since the early 1950's and until some time in the 1970's, Kuhlman used Askarels as a dielectric fluid in new

transformers manufactured in the Crystal Springs plant. These Askarels contained roughly 40 percent PCB, in the form of Aroclor 1260, and about 60 percent chlorobenzene. Some soils on the Kuhlman property have been known to be contaminated with PCB since about 1967. PCB have been discovered in soils off plant property to the north, where plant drainage flows toward Lake Chatauqua. PCB have also been discovered in some residential soils in Crystal Springs and in blood lipids of several residents. Some PCB found in soils on the Kuhlman site and other soils in and around Crystal Springs have likely evaporated into air and moved into other environmental compartments, including trees.

In my supplementary report, to be prepared when PCB bark data are available, I will discuss the results of tree bark analysis in Crystal Springs.

In the past, I have collected tree bark from several sites for evaluation of absorption of atmospheric PCB. These include Bloomington, Indiana, site of 3 PCB sites on the NPL; Anniston, Alabama, the site of former PCB manufacturing and considerable environmental PCB contamination; Isle Royale National Park (Michigan), a background site known not to be a source of PCB, but known to be affected by atmospheric deposition. In Bloomington, we found that trees growing nearer to known PCB-contaminated sites had higher PCB content in bark than trees growing farther away (see Hermanson & Hites, 1991). In Anniston, we found that trees growing within 500 meters of the PCB plant site and 400 meters from a PCB landfill contained 1000 times more PCB in bark than trees about 5 miles distant from the plant. The distance-decay pattern in Anniston was stronger than any other experimental variable, including differing tree species and tree ages. Based on these findings from previous work, we know that tree bark is will indicate a historic high gas phase atmospheric PCB concentration during the lifetime of the tree. We will interpret our Crystal Springs data, when they are available, in a similar way.

References

Hermanson, M. H. and Hites, R. A. *Polychlorinated biphenyls in tree bark*. **Environmental Science & Technology** 1990, 24, 666-671.

Hermanson, M. H. and Hites, R. A. *Long-term measurements of atmospheric polychlorinated biphenyls in the vicinity of Superfund dumps*. **Environmental Science & Technology** 1989, 23, 1253-1258.



Figure 1: Tree boring (left) and bark sampling from a tree in Crystal Springs, MS, March 15, 2003.