Atmospheric Sources of PCB Congeners

The overall goal of Project 4 is to better understand the relationship between the observed concentrations in air and sources of airborne PCBs in ambient and indoor environments. Building on our understanding of PCBs and their breakdown products, our state-of-the-art analytical tools, environmental sampling expertise, and together with our knowledge in environmental modeling, we propose to:

- Determine sources of airborne Aroclor and non-Aroclor congeners in Chicago air through a large air-sampling network that has collected 2593 samples since 2006. Dr. Scott Spak explains the process and the results in a youtube video (click on image).
- Complete a collaboration with Environment and Climate Change Canada (ECCC) to examine the global applicability of a method for determining the sampling rates and effective volumes of passive samplers for collecting airborne PCBs.
- Characterize release of airborne PCBs in the Indiana Harbor and Ship Canal (IHSC) in East Chicago, Indiana. In 2017, we simultaneously deployed passive air and water samplers in the IHSC. Air and water samples were retrieved ~ every 35 days. Project 4 also assisted with determining the amount of PCBs emanating from New Bedford Harbor, MA.
- Identify the sources of PCB congeners in indoor air. In 2017, we reported results from the largest study yet of airborne PCBs in schools. We measured airborne PCBs in six schools, using paired air samplers located inside and outside. We found indoor concentrations to exceed outdoor concentrations for both PCB congeners and OH-PCBs. This study was the first report of OH-PCBs in any indoor environment, and only the second report in air. We confirmed that inhalation exposure to PCBs to be as large as the estimated exposure from diet, a finding that overturns a long-held perception about the routes of PCB exposure by children.
- Determine the physical and chemical properties of PCB breakdown products. Project 4 requires the chemical properties of PCB breakdown compounds to predict their fate. This aim includes laboratory studies to determine the potential and rate that these compounds can be emitted.

As a result of the work described here, Project #4 will promote more scientifically sound and effective action to reduce human exposure to these potentially harmful compounds.

Project Leader: Keri C. Hornbuckle, PhD
& Environmental Engineering at the University of Iowa. Dr. Hornbuckle's research concerns the fate and transport of pollutants in the environment. She is particularly interested in persistent organic pollutants including PCBs and other legacy industrial pollutants, perfluorinated compounds related to the production of surface protectants, fragrances and other persistent chemicals in household products, and pollutants related to large-scale agriculture.

- **Dr. Andres Martinez**, Research Scientist and Adjunct Professor in the College of Engineering, has nearly 10 years of scientific research experience, during which he has developed expertise in the areas of field sampling, development of analytical method and analysis of hydrophobic organic compounds in complex environmental matrices, environmental modeling, and data analysis. Distribution, transport, and fate of polychlorinated biphenyls (PCBs) in air, water and sediment/soil have been his main areas of interest.

- **Dr. Scott Spak**, Assistant Professor in Urban and Regional Planning and Civil and Environmental Engineering, has more than 10 years of experience studying air pollution and climate in the Great Lakes region, including criteria air pollutants, air toxics, exposure and health impacts assessment using chemical transport and emissions modeling and chemical data assimilation of in situ and satellite observations.

- **Dr. Kai Wang** is a Professor of Biostatistics in the College of Public Health at the University of Iowa.

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