The overall goal of the Analytical Core is to facilitate high-quality, high-impact research products in support of the University of Iowa Superfund Research Program (ISRP) such as data, methods, and peer-reviewed publications. The Analytical Core (AC) provides both routine and non-routine analytical services including expert staff, analytical methods, equipment, and instrumentation to enable research discoveries and fulfill the mission of the ISRP. Its Aims are:

Aim 1. Maintain analytical quality assurance standards and protocols.
Aim 2. Facilitate high-throughput analysis in complex biotic and abiotic matrices.
Aim 3. Provide prioritized training and access to AC facilities.
Aim 5. Maintain analytical infrastructure.

2021 Progress

In 2021, the Analytical Core developed and implemented 12 priority analysis plans for use of Analytical Core facilities and personnel including a rigorous quality assurance plan for each project to assure accuracy, precision, representativeness, reproducibility, and comparability. Routine analyses included the entire suite of 209 PCBs, 72 commercially available and more than 50 ISRP-synthesized OH-PCBs. The Analytical Core contributed to 17 publications, including six published peer-reviewed research papers, 4 peer-reviewed papers in review, and seven peer-reviewed papers in preparation. In 2021, the Analytical Core supported studies from Project 1, Project 2, Project 3, Project 4, Project 5, and the Synthesis Core.

Table 1. Active Priority Analysis Plans that the Analytical Core is supporting as of November 15, 2021.
The Analytical Core collaborates closely with the Synthesis Core (SC) and the Data Management and Analysis Core (DMAC). This is enabled through weekly meetings organized by Dr. Rachel Marek, co-Investigator of the Analytical Core. Dr. Marek held 30 such meetings in 2020 (as of November 15, 2021). All were held by zoom. Typical attendance is 20-25 people. In 2021, DMAC investigators attended every meeting and frequently led the discussion for the hourly meeting. The agendas are released prior to every meeting and updated as minutes. The agendas are archived in a shared directory accessible to every researcher named on a Priority Analysis Plan, as well as the PIs.

Recent Publications:

2022

Jessica M Ewald, Jerald L Schnoor, Timothy E Mattes, Combined read- and assembly-based metagenomics to reconstruct a Dehalococcoides mccartyi genome from PCB-contaminated sediments and evaluate functional differences among organohalide-respiring consortia in the presence of different halogenated contaminants. [2], FEMS Microbiology Ecology, fia067, Published:06 June 2022 [Project 5, Analytical Core]


2021

Duo Zhang, Panithi Saktrakulkla, Rachel F. Marek, Hans-Joachim Lehmler, Kai Wang, Peter S. Thorne, Keri C. Hornbuckle, and Michael W. Duffel, PCB Sulfates in Serum from Mothers and Children in Urban and Rural U.S. Communities (link is external) [4], Environ. Sci. Technol. 2022, Volume 88, November 2021, 103757, PMCID: PMC8595862 [Analytical Core, Synthesis Core, Previous Cycle Project 3]
Christian M. Bako, Timothy E. Mattes, Rachel F. Marek, Keri C. Hornbuckle, Jerald L. Schnoor, Biodegradation of PCB Congeners by Paraburkholderia xenovorans LB400 in Presence and Absence of Sediment During Lab Bioreactor Experiments [5], Environmental Pollution, Volume 271, 15 February 2021, 116364 [Project 5, Analytical Core]

Bannavti, Moala K; Jahnke, Jacob C; Marek, Rachel F; Just, Craig L; Hornbuckle, Keri C, Room-to-Room Variability of Airborne Polychlorinated Biphenyls in Schools and the Application of Air Sampling for Targeted Source Evaluation [6], Environ. Sci. Technol. 2021, 55, 14, 9460-9468, Publication Date: May 25, 2021, [Project 4, Analytical Core]


Datasets

2022

Christian M. Bako, Andres Martinez, Jessica M Ewald, Rachel F Marek, Keri C Hornbuckle, Timothy E Mattes and Jerald L Schnoor, Dataset describing polychlorinated biphenyl (PCB) congener accumulation on polyurethane foam (PUF) and solid-phase microextraction (SPME) passive samplers in sediment slurry bioreactors bioaugmented with Paraburkholderia xenovorans LB400 [8], University of Iowa; 2022; DOI: 10.25820/data.006160 [Project 5, Project 4, Analytical Core]

Xueshi Li, Marco M Heft, Rachel F Marek, Keri C Hornbuckle, Kai Wang, and Hans-Joachim Lehmler, Dataset for assessment of polychlorinated biphenyls and their hydroxylated metabolites in postmortem human brain samples: age and brain region differences [9], University of Iowa; 05/31/2022;DOI: 10.25820/data.006169 [Synthesis Core, Analytical Core, Data Management and Analysis Core]

Duo Zhang, Panithi Saktrakulkla, Rachel F Marek, Hans-Joachim Lehmler, Kai Wang, Peter S. Thorne, Keri C Hornbuckle, and Michael W Duffel, Dataset for PCB Sulfates in Human Serum from Mothers and Children in Urban and Rural U.S. Communities [10], Iowa Research Online, University of Iowa; 05/02/2022; DOI: 10.25820/data.006162 [Analytical Core, Synthesis Core, Previous Cycle Project 3]

2021

Moala K Bannavti; Jacob C Jahnke; Rachel F Marek; Keri C Hornbuckle, Dataset for Room-to-Room Variability of Airborne PCBs in Schools and the Application of Air Sampling for Targeted Source Evaluation [11], University of Iowa; 2021 DOI https://doi.org/10.25820/data.006136 [12] [Project 4, Analytical Core]

Panithi Saktrakulkla, Xueshi Li, Andres Martinez, Hans-Joachim Lehmler, and Keri C Hornbuckle, Dataset for hydroxylated polychlorinated biphenyls are emerging legacy pollutants in contaminated sediments [13], Iowa Research Online,University of Iowa; 07/30/2021; DOI: 10.25820/data.006146 [Analytical Core, Synthesis Core]
Core Leader: Keri C. Hornbuckle, PhD

Dr. Hornbuckle is the ISRP Director and Donald Bentley Professor of Engineering in the Department of Civil and Environmental Engineering. She is responsible for all aspects of the Analytical Core activities, including handling and extraction of samples and analysis by capillary gas chromatography (GC), liquid chromatography (HPLC), mass spectrometry, and various other analytical methods. Dr. Hornbuckle oversaw the development of automated air sample analysis Standard Operating Methods and methods for more specialized applications. She will consult directly with Project Leaders to refine analysis to maximize sensitivity and selectivity for PCBs and metabolites in various matrices.

Co-Investigator: Rachel Marek, PhD

Dr. Marek is an Assistant Research Scientist and has over ten years experience in the analytical chemistry of PCBs. She has published journal articles concerning PCBs and hydroxylated PCBs in human blood serum, contaminated sediments, and air. Rachel will work with project leaders and coordinate work associated with method development and application regarding PCB breakdown products. Together with Hornbuckle, she oversees all the analytical work and training for environmental samples including extraction, cleanup, and analysis by capillary gas chromatography (GC), liquid chromatography (HPLC), mass spectrometry, and various other analytical methods and the quality control and assurance metrics that go with them.

Co-Investigator: Hans-Joachim Lehmler, PhD

Dr. Lehmler is a chemist with experience in the synthesis and analysis of PCBs in animal tissues with a special emphasis on the analysis of chiral PCB congeners. He is a professor in the UI Department for Occupational and Environmental Health. In addition to being a member of the Analytical Core of the ISRP, he will also serve as the Leader of the Synthesis Core. This will facilitate the interaction between the Analytical and Synthesis Cores.

Attach files:  AC Sample Priority Analysis Plan [14]

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[12] https://doi.org/10.25820/data.006136
[13] https://iro.uiowa.edu/esploro/outputs/dataset/Dataset-for-hydroxylated-polychlorinated-biphenyls-are
/9984084300302771