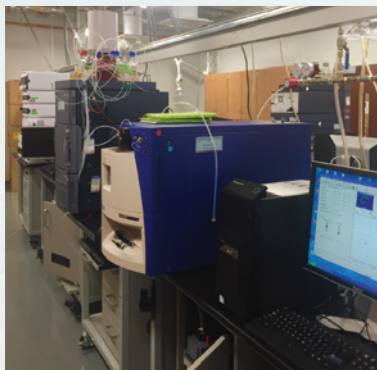


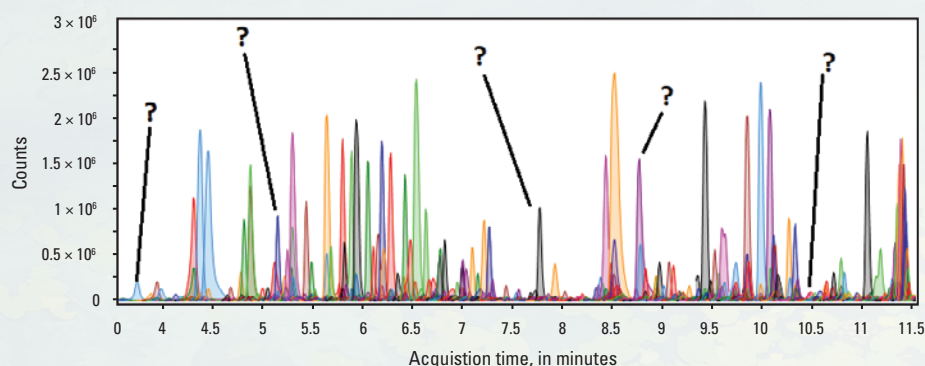
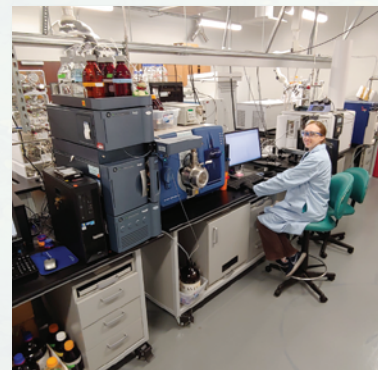
Kansas Water Science Center
Organic Geochemistry Research Laboratory

Detecting Algal Toxins and Organic Contaminants of Concern in the Environment

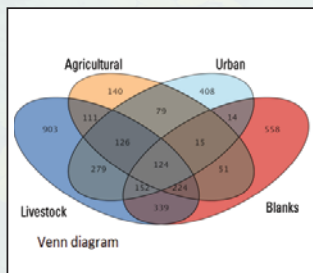
The U.S. Geological Survey (USGS) Kansas Water Science Center Organic Geochemistry Research Laboratory (OGRL) was established in 1987. The OGRL is a multidisciplinary program that contributes knowledge about the distribution, fate, transport, and effects of new and understudied organic compounds that may affect human health and (or) ecosystems. The OGRL consists of two units: Algal and Other Environmental Toxins Unit and Environmental Organic Chemistry Unit. The OGRL does independent and collaborative research, develops robust analytical methods, and provides fee-for-service analytical laboratory analyses.



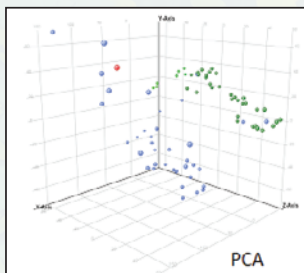
Since 1987, the Organic Geochemistry Research Laboratory has analyzed more than 99,000 samples from all 50 States to help examine the distribution of potentially harmful contaminants in the environment.



The chromatogram in the upper plot is a portion of thousands of compounds present in an environmental sample. The large amount of data generated can be analyzed to identify unknown compounds or perform statistical analysis to determine trends.



The Venn diagram shows compounds found in a sample set organized into groups. This allows the discovery of compounds that are found in one group or are shared between one or more groups.



The principal component analysis (PCA) shows a statistical grouping of samples. The samples can be color coded by characteristics of the sample.

The Organic Geochemistry Research Laboratory uses nontarget mass spectrometry to analyze unknown compounds in environmental samples.

The OGRL receives funding from the USGS Ecosystems Mission Area - Environmental Health Program (<https://www.usgs.gov/ecosystems/environmental-health-program>) to further research and support projects within the Toxins and Harmful Algal Blooms Science Team and the Core Technology Team. Other funding sources include the USGS Water Mission Area (<https://www.usgs.gov/water-resources/programs>) for glyphosate analysis as part of the National Water Quality Network, and collaborations with other Water Science Centers. Funding also is received from other Federal (National Aeronautics and Space Administration, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers), State, and local agencies.

Algal and Other Environmental Toxins Unit Research

Research from the Algal and Other Environmental Toxins Unit includes the following:

- Advancement of targeted and nontargeted analytical methods to support cyanotoxin and algal toxin research across the freshwater-to-marine interface from ground to atmosphere.
- Identification of toxin metabolites and chemical biomarkers of exposure.
- Improvement of understanding of mechanisms controlling toxin production and fate.
- Providing support for suspected intoxication events.



Algal and Environmental Toxins Research Chemist and Unit Lead analyzing toxin samples.

Environmental Organic Chemistry Unit Research

Research from the Environmental Organic Chemistry Unit includes the following:

- Assessment of nontarget compounds using high resolution mass spectrometry.
- Investigation of the extraction of complex solid matrices (that is, algae, insects, plasma, plants, and so forth).
- Analytical methods development for the following:
 - Microplastics,
 - Pesticide adjuvants and surfactants,
 - Pharmaceuticals, and
 - Tire leachate: 6PPD-quinone.



Environmental Organic Chemistry Unit Principal Investigator Chemist and Unit Lead processing solid samples.

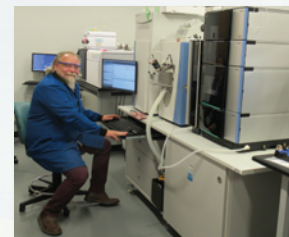


Environmental Organic Chemistry Unit Chemist filtering samples in the field.

Algal and Environmental Toxins Unit Analytical Capabilities

The Algal and Environmental Toxins Unit has the capability to detect toxins that could be harmful to human health and the environment.

- Enzyme-linked immunosorbent assay (ELISA) techniques in low and high salinity waters for the following toxins: anatoxin-a, cylindrospermopsin, microcystin, and saxitoxin.
- Liquid chromatography/high resolution mass spectrometry for the following:
 - Total and dissolved freshwater toxins (includes 13 analytes),
 - Total and dissolved marine toxins (includes 9 analytes),
 - Total and dissolved freshwater and marine toxins (includes 21 analytes), and
 - Nontarget screening.



Algal and Environmental Toxins Unit Chemist processing samples for toxin analysis.



Organic Geochemistry Research Laboratory Manager performing quality control checks.

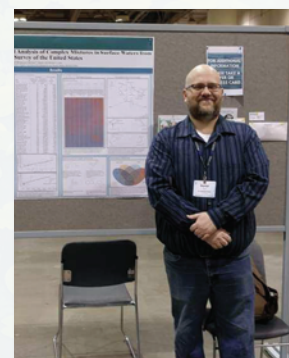
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dc_ks@usgs.gov

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Environmental Organic Chemistry Unit Analytical Capabilities

Using state-of-the-art instrumentation and techniques, the Environmental Organic Chemistry Unit analyzes samples from various matrices to determine the occurrence of organic contaminants in the environment.

- Sample preparation, including filtering, accelerated solvent extractions, bioassay extractions, and solid-phase extractions.
- Liquid chromatography/tandem mass spectrometry methods in water and solids (soil, sediment, and biosolids) for the following:
 - Artificial sweeteners (includes 5 analytes);
 - Atrazine;
 - Glyphosate, aminomethylphosphonic acid (AMPA), and glufosinate;
 - Four class antibiotic method (includes 33 analytes);
 - Hormones: androgens, conjugates, and estrogens (includes 32 analytes);
 - Hormones: progestins (includes 11 analytes);
 - Hormones: phytoestrogens (includes 6 analytes); and
 - Mycotoxins (includes 8 analytes).



Environmental Organic Chemistry Unit Principal Investigator Chemist presenting a poster at a scientific conference.

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