Emerging contaminants threaten the uses of reclaimed water and the health of Arizona ecosystems. Laboratory analysis techniques for emerging contaminants in water are still under development. Arizona needs trained technicians and standard protocols to address this issue.

**PROJECT TEAM**

**Investigators**
Jon Chorover (UA) - Lead
Catherine Propper (NAU)
Paul Westerhoff (ASU)

**Research Assistants**
Marisa Masles (ASU)
Mary Kay Amistadi (UA)

**External Partners**
Patricia Adler (ADHS)
Matthew Rosenow (ADHS)
Victor Wadell (ADHS)

**PROJECT FUNDING CYCLE**
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**PROJECT GOALS**
The goal of this project was to develop consistent state-of-the-art analytical methods at the Arizona Department of Health Services (ADHS) State Laboratory and university laboratories for measuring a range of emerging contaminants of concern that might be found in source water, drinking water, and wastewater.

**BACKGROUND/RESEARCH METHODS**
Emerging contaminants in water, both organic chemicals and trace metals, are of critical concern because of potential adverse impacts to human health and to the ecosystem, especially in aquatic habitats where fish and amphibians may be affected. Because these contaminants are often present in sewage and may not be completely removed by sewage treatment processes, they are of special concern in Arizona where the treated wastewater often supports riparian communities, is reused for irrigation and other purposes, or is recharged to offset groundwater pumping. The concern about these contaminants will only magnify as reclaimed water plays an even greater role in Arizona’s future water budget.

New analytical techniques are needed to measure these contaminants in water at the very low levels (parts per trillion) required for environmental occurrence, fate, and transport studies. This project funded a collaboration of the three state universities with the ADHS State Laboratory to develop analytical methodologies for selected emerging contaminants.

**KEY SCIENCE FINDINGS**
Under this study, laboratory techniques were collaboratively developed, validated, and documented for detecting organic chemicals and trace metal/element species at the part per trillion level. Techniques for concentration, separation, extraction, and measurement were developed for trace metal/element spe-
cies of chromium, selenium, antimony, bromine, and arsenic using high-performance liquid chromatography (HPLC) with inductively coupled plasma mass spectrometry (ICP-MS). Similar work was done for 32 organic chemicals categorized as pharmaceuticals and personal care products (PCPs) and endocrine disrupting chemicals (EDCs) using liquid chromatography tandem mass spectrometry (LCMS/MS).

KEY OUTCOMES

The partnering of the universities and ADHS will have lasting statewide impact through the development of capacity in Arizona to perform these difficult but critically important analyses and in establishing consistent techniques necessary for meaningful comparison of results. Under the project, technicians were trained to perform the analyses, and the work sets the stage for future collaboration in analytical method development. Importantly, the AWI grant seeded new funding from the National Science Foundation’s Major Research Instrumentation Program, which is allowing the University of Arizona to purchase significant instrumentation for advanced chemical analysis.

CONCLUSIONS and RECOMMENDATIONS

The investigators identified additional work that could be undertaken to improve separations and detection limits for some of the metals. If available, further funding would improve the capability of the ADHS Laboratory to perform organic chemical separations, which are being done by more labor intensive means compared to the automated equipment that was used at Arizona State University.

In summary, the analytical capabilities and techniques funded under this grant are already being applied to environmental monitoring studies. These and future studies, in turn, will be used to maximize the safety of reclaimed water reuse.

FIND OUT MORE

Project Final Reports and other information available at www.azwaterinstitute.org

ARIZONA WATER INSTITUTE
845 N. PARK AVENUE  SUITE 532
TUCSON, AZ  85719
520-626-5627