Environmental Forum on Emerging Contaminants Webinar
Wednesday, April 15, 2009
12:45 pm – 3:00 pm EST

I. Emerging Contaminants in the Drinking Water Cycle

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Abstract: In the past decade, the scientific community and general public have become increasingly aware of the potential for the presence of unregulated, and generally unmonitored contaminants, found at low concentrations (sub-µg/L) in surface, ground and drinking water. The most common pathway for the introduction of these chemicals is from an upstream direct discharge of wastewater effluent. In the US, there are more than two dozen communities that draw their drinking water from streams that consist of more than 50 % wastewater during low flow conditions. The US Geological Survey (USGS) and US Environmental Protection Agency (USEPA) have been working on a series of collaborative research projects to determine the identity of chemicals that are commonly present in wastewater effluent, the persistence of these chemicals in surface and ground waters, the removal of these chemicals during drinking water treatment, the formation of by-products during their chlorination and the presence of these chemicals in finished drinking water. In effluents collected at eleven wastewater treatment plants (WWTPs) across the US, 72 out of 110 monitored chemicals were detected at least once, documenting incomplete removal during wastewater treatment. Downstream of the WWTPs, the chemicals exhibited varying environmental persistence. To determine which wastewater chemicals persist through drinking water treatment, a follow-up study examined source and finished waters for nine drinking water treatment plants from across the United States known to be impacted by wastewater. All water samples were analyzed for 84 different emerging contaminants, including 24 pharmaceuticals. The sample collection was designed to account for residence time within the plant in order to match waters before and after treatment. The investigated utilities used varying source waters (surface or ground water), disinfectants (chlorine, chlorine dioxide, chloramine, ozone or UV), and produced different volumes of treated water per day (2.3 to 200 mgd). Thirty-five chemicals were detected at least once, with 28 chemicals detected in the source waters and 23 chemicals detected in the finished waters. The greatest number of chemicals detected in a single source water sample was 15; the greatest number detected in a single finished water was 11. In companion laboratory studies on the effects of chlorination, eight of the 14 chemicals investigated were oxidized by the disinfectant, two of which were at least partially chlorinated. Taken as a whole, these studies demonstrate that to understand the comprehensive environmental impact of emerging contaminants, their persistence, removal efficiencies during waste and drinking water treatment, as well as the potential for by-product formation, must be known.

Disclaimer: Although this work was reviewed and approved by the USEPA, it may not necessarily reflect official Agency policy.

Dr. Susan T. Glassmeyer is a Research Chemist in the USEPA's Office of Research and Development, National Exposure Research Laboratory, Microbiological and Chemical Exposure Assessment Research Division in Cincinnati, Ohio. She received a BS in Chemistry from Xavier University in Ohio, and an MSES and PhD in Environmental Science from Indiana University's School of Public and Environmental Affairs. Her research is focused in two areas: the assessment of pharmaceuticals and other emerging contaminants as indicators of human fecal contamination, and the analysis of microorganisms, including *Cryptosporidium parvum, Giardia lamblia*, and enterococci, by mass spectrometry.

II. Endocrine Disruptors and Pharmaceuticals: Implications for Water Sustainability

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Abstract: The availability of safe freshwater is diminishing at an alarming rate globally. Increasing human population is stressing water supplies and contributing to water pollution. Population density increases and climate changes including epic droughts in certain parts of the world have led to the utilization of non-conventional water resources. These resources include desalinated sea water and recycled water to meet potable water needs. The water quality in many parts of the world is changing. The burgeoning human population taxes not only water resources but also food supplies, leading to rising demands for irrigation water and consequently to greater potential for water contamination by pesticides, fertilizers, and naturally occurring constituents. The public perception of water is shifting, with growing public awareness of certain groups of contaminants due to media coverage and non-government organization (NGO) concerns. Modern analytical technology has permitted the discovery that minute concentrations of contaminants of distinctly human origin occur in the water cycle. Many of these so-called "contaminants of emerging concern" have been, and will continue to be, detected in potable water supplies. Without question, the propensity for the contamination of fresh water will rise as human population continues to grow. Water treatment technology also continues to evolve. Advanced water treatment processes can provide effective and efficient contaminant removal. This presentation will describe the history, current status, and future implications that the detection of endocrine disruptors and pharmaceuticals will have on water and energy sustainability, with a particular emphasis on water treatment technologies.

Dr. Shane Snyder is the Research and Development Project Manager for the Southern Nevada Water Authority (SNWA). SNWA serves the regional water needs for more than 2,000,000 permanent residents and more than 40,000,000 visitors annually. Dr. Snyder also serves as an Associate Adjunct Professor of Chemistry at the University of Nevada, Las Vegas. He holds a B.A. in Chemistry from Thiel College and a Ph.D. in Zoology and Environmental Toxicology from Michigan State University. Dr. Snyder's research has focused on the aqueous fate, transport, and treatment of emerging contaminants, such as endocrine disrupting compounds, pharmaceuticals, perchlorate, perfluorinated organics, and novel disinfection byproducts. He has published more than 60 manuscripts and book chapters on the detection and treatment of endocrine disruptors and pharmaceuticals in water. Dr. Snyder served two terms on EPA Advisory Committees for the Endocrine Disruptor Screening Program and has severed on two expert panels for EPA's Candidate Contaminant List III. He also is a member of the Research Advisory Council for the Water Reuse Foundation and is a member of the American Water Works Association's Water Science & Research Division Board of Trustees. Dr. Snyder is the Principal Investigator of several national projects that address the occurrence, fate, and relevance of endocrine disruptors and pharmaceuticals in US drinking water. In April of 2008, Dr. Snyder testified before the US Senate Committee on Environment and Public Works for a subcommittee hearing entitled "Pharmaceuticals in the Nation's Water: Assessing Potential Risks and Actions to Address the Issue."