Northeastern

Department of Civil and Environmental Engineering

Nitrosamines: Why it has Emerged as a New Disinfection By-product of Concern for Drinking Water Systems

Paul Westerhoff
School of Sustainable Engineering and The Built Environment
Arizona State University

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Abstract

Drinking water systems have managed the formation of disinfection by-products (DBPs) such as trihalomethanes (THM) or haloacetic acids (HAA) which form from the reaction of free chlorine disinfectants with natural organic matter, to meet regulated THM and HAA maximum contaminant levels of 80 and 60 ug/L. One strategy widely employed has been the transition from free chlorine to monochloramine, which forms fewer regulated DBPs. However, these chloramines can react with organic nitrogen in water to form low (ng/L) levels of nitrosamines – of most interest is nitrodimethylamine (NDMA). While debate exists, several states and countries have health goals for NDMA in the low ng/L range. This presentation will present research from our group over the past decade that has helped define the problem of nitrogenous DBPs in general, and nitrosamines specifically. The presentation will cover our current understanding of organic nitrogen precursors for NDMA, and control strategies for minimizing NDMA formation. In addition to those interested in drinking water, the presentation should be of interest to those involved in wastewater treatment because many of the higher yielding NDMA precursors are in wastewater effluent – and associated with trace organics including pharmaceuticals or personal care products.

Bio

Dr. Paul Westerhoff is the Associate Dean for Research in the Ira A. Fulton Schools of Engineering and Professor in School of Sustainable Engineering and The Built Environment, and member of the Civil, Environmental and Sustainable Engineering faculty, at Arizona State University (ASU). He obtained a Ph.D. from the University of Colorado at Boulder, a MS from University of Massachusetts and BS from Lehigh University. Westerhoff joined ASU in August 1995 and was promoted to full professor as a University Exemplar in 2007. He served as Department Chair in Civil and Environmental Engineering, and was the founding Director for the School of Sustainable Engineering and the Built Environment. Westerhoff has a strong publication and research record, has garnered wide recognition for his work related to treatment and occurrence of emerging contaminants in water, and has been active in multidisciplinary research. He has lead research funded by AWWARF, USEPA, NSF, DOD and local organizations investigating the fate of nanomaterials in water, use of nanomaterial-based technologies for water and reuse treatment, reactions and fate of oxo-anions (bromate, nitrate, arsenate) during water treatment, characterization, treatment and oxidation of natural organic matter in watersheds, formation of disinfection by-products, removal of taste and odor micropollutants. He has over 150 peer reviewed journal article publications and has been involved in over 250 conference presentations. He belongs to ASCE, AWWA, AEESP, ACS, IOA, IWA, AWPCA, and IHSS and serves on numerous voluntary committees for these organizations. He currently is a member of the USEPA Science Advisory Board – environmental engineering committee, Vice Chair of the WateReuse Foundation Research Advisory Board, external advisory board member of the EPA-NSF Center for Environmental Impacts of Nanotechnology. Westerhoff has received several research awards including the 2013 AEESP/Arcadis Frontier in Research Award, 2005 ASCE Walter L. Huber Research Award and the 2006 WEF Paul L. Busch Award.

Paul Westerhoff, PhD, PE

Professor, School of Sustainable Engr and the Built Environment

Civil, Environmental and Sustainable Engineering Program

Associate Dean of Research, Ira A. Fulton Schools of Engineering ARIZONA STATE UNIVERSITY

Education

- **PhD, Civil, Arch, and Envr Engr, *UNIVERSITY OF COLORADO-BOULDER***
- **MS, Civil & Envr Engineering, *UMASS - AMHERST***
- **BS, Civil Engineering, *LEHIGH UNIVERSITY***

Research Interests

- **Emerging contaminants**
- **Fate of nanomaterials**
- **Nanomaterial-based treatment**
- **Natural organic matter & oxoanions in water treament**
- **Disinfection by-products**

Selected Service and Awards

- **Founding Director, School of Sustainable Engr & the Built Environment**
- **Former Chair, Dept. Civil & Envr Engr.**
- **USEPA Science Advisory Board**
- **AEESP/Arcadis Frontier in Research Award 2013**
- **School of Engineering Top 5% Teachers**