Rolf Halden

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Bio

Associate Professor
School of Sustainable Engineering and the Built Environment
Ira A. Fulton School of Engineering

Rolf Halden, Ph.D., P.E., is Associate Professor in the School of Sustainable Engineering and the Built Environment at Arizona State University, Senior Sustainability Scientist in the Global Institute of Sustainability at ASU, Assistant Director of the Biodesign Institute's Center for Environmental Biotechnology, and Adjunct Associate Professor of Environmental Health Sciences at the Johns Hopkins Bloomberg School of Public Health. Rolf received a Master's in Biology (Diploma, 1992) from the Technical University of Braunschweig, Germany, and a Master's (1994) and Ph.D. (1997) in Civil Engineering from the University of Minnesota. Prior to joining academia, Rolf was project engineer at the Lawrence Livermore National Laboratory, where he directed the construction and operation of physical and biological groundwater treatment systems. He has served on the Maryland State Water Quality Advisory Committee, the Food and Drug Administration's Nonprescription Drugs Advisory Committee, and a National Research Council committee of the National

Academies.

Expertise

Public Health, Water Quality, Environmental Proteomics, Bioremediation, Biological Treatment Processes, Environmental Chemistry, Exposure Assessment, Sustainability, Pollution Prevention, Green Chemistry, Green Engineering

Education

1998, Postdoctoral Training in Environmental Science, University of California, Lawrence Livermore National Laboratory, Livermore, CA
1997, Ph.D. in Civil (Environmental) Engineering, University of Minnesota, Minneapolis
1994, M.S. in Civil (Environmental) Engineering, University of Minnesota, Minneapolis
1992, M.S. (Diploma) in Biology, Technical University of Braunschweig

Awards

2011 Leroy E. Burney Lecturer, Johns Hopkins School of Public Health

2010 - Senior Sustainability Scientist, Global Institute of Sustainability, ASU

2010 Nominee and Finalist, 'Award for Research Excellence,' Arizona BioIndustry Association's BIOFEST 2010

2010 Biodesign Impact Accelerator Program, Selected Startup Company, ASU

2007 Faculty Research Initiative Award, Johns Hopkins University

2005 Faculty Research Initiative Award, Johns Hopkins University

2002 Faculty Innovation Award, Johns Hopkins University

2000 Two Recognition Awards, Lawrence Livermore National Laboratory

1998 American Permanent Residency National Interest Waiver, LLNL

1997 American Society for Microbiology, Travel Grant

1996 Dissertation Fellowship, Outstanding Ph.D. Student, University of Minnesota

[VISIT THE HALDEN LAB]:

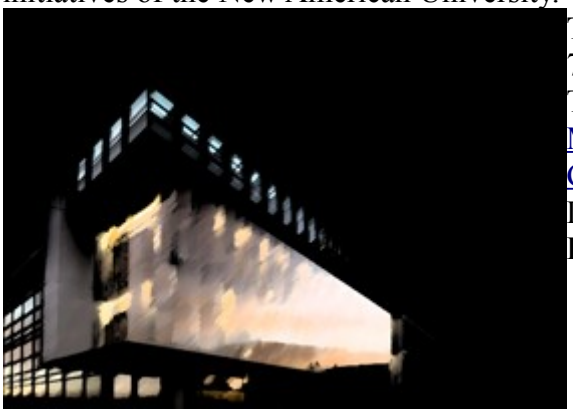
Rolf Halden, PhD, PE
Assistant Director, Center for Environmental Biotechnology
Associate Professor of Engineering, Department of Civil, Environmental, and Sustainable Engineering

Welcome to the Halden laboratory.
Among the greatest challenges to human society are access to safe drinking water, clean air, healthy food, and renewable energy sources protecting from adverse climate change.

We conduct use-inspired research to meet these major global challenges. With our work, we seek to avoid or minimize:

- Environmental pollution,
- Human exposure to toxic chemicals and
- Depletion of natural resources including drinking water and fossil fuels.

To meet our objectives, we harness the power of sustainable chemistry, microbiological systems and renewable bioenergy sources.
Our research group is housed in ASU's Biodesign Institute, a state-of-the-art facility and the first platinum LEED certified building in the state of Arizona. The Biodesign Institute is one of the key initiatives of the New American University.



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Rolf Halden, PhD, MS

Associate Professor

The Biodesign Institute, Swette Center for Environmental Biotechnology

Associate Professor

Ira A. Fulton School of Engineering, Civil, Environmental, and Sustainable Engineering

Bio

Associate Professor
School of Sustainable Engineering and the Built Environment
Ira A. Fulton School of Engineering

Rolf Halden, Ph.D., P.E., is Associate Professor in the School of Sustainable Engineering and the Built Environment at Arizona State University, and Adjunct Associate Professor of Environmental Health Sciences at the Johns Hopkins Bloomberg School of Public Health. His research labs are housed in the Center for Environmental Biotechnology at the ASU's Biodesign Institute. Rolf received a Master's in Biology (Diploma, 1992) from the Technical University of Braunschweig, Germany, and a Master's (1994) and Ph.D. (1997) in Civil Engineering from the University of Minnesota. Prior to joining academia, Rolf was project engineer at the Lawrence Livermore National Laboratory, where he directed the construction and operation of physical and biological

groundwater treatment systems. He has served on the Maryland State Water Quality Advisory Committee, the Food and Drug Administration's Nonprescription Drugs Advisory Committee, and a National Research Council committee of the National Academies.

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1997, Ph.D. in Civil (Environmental) Engineering, University of Minnesota, Minneapolis
1994, M.S. in Civil (Environmental) Engineering, University of Minnesota, Minneapolis
1992, M.S. (Diploma) in Biology, Technical University of Braunschweig

Dr. Halden's research explores the connection between anthropogenic activities, environmental quality and human health. His research relies heavily on the use of mass spectrometric tools (e.g., LC-MS/MS, MALDI-TOF) for applications in environmental proteomics, bioremediation and public health engineering. Ongoing projects focus on:

Bioremediation of Environmental Contaminants

We are conducting research and also are supporting full-scale field deployments of bioremediation strategies for the removal of toxic pollutants from impacted soil and groundwater environments. This work includes the development of novel diagnostic devices for groundwater monitoring and remedial design.

Pharmaceuticals and Personal Care Products (PPCPs) in the Environment

We are determining the fate of PPCPs in the environment, beginning with a characterization of sources such as wastewater treatment plants and ending with the characterization of the human body burden and biomarkers of exposure.

Environmental Proteomics

We are developing and applying proteomics techniques for the detection and characterization of microorganisms providing ecological services or posing public health threats. Instrumentation utilized includes liquid chromatography coupled to robotic spotters for matrix-assisted laser desorption/ionization (LC-MALDI) analysis, and electro spray ionization (ESI) tandem mass spectrometry (MS/MS). Our laboratory features triple quadrupole and time-of-flight (TOF/TOF) mass analyzers.

Health Effects of Human Exposure to Toxic Pollutants

We are studying the extent of human exposure to toxic pollutants and their associated health effects by examining biological specimens from adults and children.

Renewable Energy from Biological Systems

We are developing diagnostic assays for monitoring photosynthetic biomass production and biomass conversion to hydrocarbons and electricity.

2010 Publications

Hartmann. E. M., D. R. Colquhoun and R. U. Halden.* 2010. Identification of Putative Biomarkers for Toluene-Degrading Burkholderia and Pseudomonads using Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry and Peptide Mass Fingerprinting. *Biosciene, Biotechnology, Biochemistry* (In Press).

Chao, T.-C., Hansmeier, N. and R. U. Halden.* 2010. Towards proteome standards: The use of absolute quantitation in high-throughput biomarker discovery. *J. Proteomics.* (In Press).

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10.1016/j.watres.2009.12.032

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Deo, R. P. and R. U. Halden.* 2010. Effect of sample filtration on the quality of monitoring data reported for organic compounds during wastewater treatment. *J. Environ. Monit.* 12:478-483. doi:10.1039/b919076g.

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Zhang, Y., N. Jiao, D. R. Colquhoun, R. U. Halden, and F. Cheng. 2009. Protein Modifications Relate to Phage Resistance in a Marine Roseobacter. Aquatic Microbial Ecology. 55(2):203-207.

Chalew, T. and R. U. Halden.* 2009. Environmental Exposure of Aquatic and Terrestrial Biota to Triclosan and Triclocarban. J. Am. Water Res. Assoc. 45(1):3-13.

Colquhoun, D. R., L. R. Goldman, R. N. Cole, M. Gucek, M. Mansharamani, F. R. Witter, B. J. Apelberg, and R. U. Halden.* 2009. Global Screening of Human Cord Blood Proteomes for Biomarkers of Toxic Exposure. Environmental Health Perspectives 117(5):832-838. [Online]

2008 Publications

Heidler, J. and R. U. Halden. 2008. Meta-analysis of Mass Balances for Monitoring Chemical Fate during Wastewater Treatment. Environ. Sci. Technol. 42(17):6324-6332. HTML or PDF.

Rittmann, B. E., R. Krajmalnik-Brown, and R. U. Halden. 2008. Pre-genomic, genomic and post-genomic study of microbial communities involved in bioenergy. Nature Reviews. Microbiology 6(8):604-612.

Apelberg B. J., Goldman L. R., Halden, R. U., Witter, F. R., Herbstman, J. B., and Needham, L. L. 2008. Perfluoroalkane acids: Apelberg et al. respond. Environ. Health Perspect. 116(6):A238-9.

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Panny, L. L. Needham and L. R. Goldman. 2008. Birth Delivery Mode Modifies the Associations between Prenatal PCB and PBDE and Neonatal Thyroid Hormone Levels. Environ. Health Perspect. EHP-in-Press. doi:10.1289/ehp.11379.

Miller, T. R., J. Heidler, S. N. Chillrud, A. DeLaquil, J. C. Ritchie, J. N. Mihalic, R. Bopp, and R. U. Halden. 2008. Fate of Triclosan and Evidence for Reductive Dechlorination of Triclocarban in Estuarine Sediment. Environ. Sci. Technol. 42:4570-4576. HTML or PDF.

Young, T.A., J. Heidler, C. R. Matos-Perez, A. Sapkota, T. Toler, K. E. Gibson, K. J. Schwab and R. U. Halden. 2008. Ab Initio and In Situ Comparison of Organic Wastewater Compounds as Indicators of Sewage-derived Microbes in Surface Waters. Environ. Sci. Technol. 42(9); 3335-3340.

Kim, S. R., R. U. Halden, and T. J. Buckley. 2008. Polycyclic Aromatic Hydrocarbons in Human Milk of Nonsmoking U.S. Women. Environ. Sci. Technol. 42(7); 2663-2667.

2007 Publications

Herbstman J. B., Sjodin A., Apelberg B. J., Witter F. R., Patterson D. G., Halden, R. U., Jones, R. S., Park, A., Zhang, Y., Heidler, J., Needham, L. L., and Goldman, L. R. 2007. Determinants of Prenatal Exposure to Polychlorinated Biphenyls (PCBs) and Polybrominated Diphenyl Ethers (PBDEs) in an Urban Population. Environ. Health Perspect. 115(12):1794-800.

Apelberg, B. J., F. R. Witter, J. B. Herbstman, A. M. Calafat, R. U. Halden, L. L. Needham, and L. R. Goldman. 2007. Cord Serum Concentrations of Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoate (PFOA) in Relation to Weight and Size at Birth. Environ. Health Perspect. 115(11):1670-1676.

Halden, R. U. (Contributing Author). 2007. Plans and Practices for Groundwater Protection at the Los Alamos National Laboratory, Final Report, Committee for the Technical Assessment of Environmental Programs at the Los Alamos National Laboratory. ISBN-10: 0-309-10619-2. 104 Pages. Nuclear and Radiation Studies Board, Division of Earth and Life Studies. National Research Council of The National Academies, The National Academies Press, Washington, D.C.

Apelberg, B. J., Goldman, L. R., Calafat, A. M., Herbstman, J. B., Kuklenyik, Z., Heidler, J., Needham, L. N., Halden, R. U., and F. R. Witter. 2007. Determinants of Fetal Exposure to Polyfluoroalkyl Compounds in Baltimore, Maryland. Environ. Sci. Technol. 41(11): 3891-3897.

Kim, S. R., Halden, R. U., and T. J. Buckley. 2007. Volatile Organic Compounds in Human Milk: Methods and Measurements. Environ. Sci. Technol. 41(5):1662-1667

Miller, T. R., M. P. Franklin, and R. U. Halden. 2007. Bacterial Community Analysis of Shallow Groundwater Undergoing Sequential Anaerobic and Aerobic Chloroethene Biotransformation. FEMS Microbiol. Ecol. 60(2):299-311.

Heidler, J., and R. U. Halden. 2007. Mass Balance Assessment of Triclosan Removal During Conventional Sewage Treatment. Chemosphere 66(2):362-369.

Sapkota, A., J. Heidler, and R. U. Halden. 2007. Detection of Triclocarban and Two Co-Contaminating Chlorocarbanilides in U.S. Aquatic Environments Using Isotope Dilution Liquid Chromatography Tandem Mass Spectrometry. Environ. Res. 103(1):21-29.

Rolf U. Halden

Associate Professor - Adjunct

Certified Professional Engineer

Academic Degrees

- PhD
- MS

Departmental Affiliation

- Name:
  Environmental Health Sciences
  Affiliation Type:
  Primary
  Division:
  Division of Environmental Health Engineering

Center and Institute Affiliations

- Information Projects Johns Hopkins Center for Water and Health

Departmental Address

The Biodesign Institute at ASU, 1001 S. McAllister Ave, P.O. Box 875701 Tempe, AZ 85287

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Research and Professional Experience

What chemical and microbiological contaminants are present in our drinking water? How did they get in there? How do we keep them out? Who gets exposed to these contaminants, and at what level? What are the human health outcomes of these exposures, if any? And finally, how can we change societal behavior for a healthier and more sustainable future?

These are key questions guiding the day-to-day research activities in my laboratories in the Center for Water and Health at the Johns Hopkins Bloomberg School of Public Health and in the Center for Environmental Biotechnology at Arizona State University's Biodesign Institute.

Finding answers to these questions is exciting but not always easy. An eclectic ensemble of research tools assists us in our inquiry. Water-soluble contaminants are spied upon using liquid chromatography/mass spectrometry (LC/MS); non-polar compounds are tracked by gas chromatography/mass spectrometry (GC/MS). Microbial contaminants can be cultivated, enumerated, and DNA-fingerprinted, or enzymatically digested in order to detect identity-revealing peptides by matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALDI-TOF MS) and electrospray ionization tandem mass spectrometry (ESI-MS/MS).

Human exposure is evaluated via analysis of contaminants and biomarkers in urine, blood, and breast milk by LC-MS/MS. Proteomic techniques including difference gel electrophoresis (DIGE) can reveal early biological responses in umbilical cord blood serum in response to chemical insults. Links between environmental contamination and adverse human health effects are investigated using database searching and the geographic information system (GIS).

Mass balance calculations help us to keep track of the overall contaminant mass as point sources release their toxic load into rivers and streams, and as contaminants in wastewater treatment plants face the ultimate question: persistence, sorption, volatilization, biotransformation, or mineralization?

Previously and currently funded activities include: • a community-based translational cancer research project concentrating on human fetal exposure to carcinogens in drinking water; • a nationwide study on the fate of pharmaceuticals and personal care products (PPCPs) in the environment; • the JHU National Biosolids Repository funded by a JHU Faculty Research Initiative Award; • pilot projects concentrating on the development and application of exposure assessment tools for the detection of toxins in water, sediment, biosolids, food, urine, blood and human milk; • an EPA STAR project concentrating on monitoring techniques for emerging microbial contaminants in drinking water; • studies on the bioremediation of chemical mixtures funded by the National Institute of Environmental Health Sciences.

As part of the latter project, we are developing novel diagnostic devices (i.e., the In Situ Microcosm Array or ISMA) designed to reveal the best environmental cleanup strategy for a given contaminated site, and to aid in the discovery of microorganisms, biochemical processes and natural products of potential commercial value.

Honors and Awards

2011 Leroy E. Burney Lecturer, Johns Hopkins School of Public Health

2010 Senior Sustainability Scientist, Global Institute of Sustainability, ASU (2010 - present)

2010 Award for Research Excellence, Arizona BioIndustry Association's BIOFEST 2010, Nominee and Finalist

2010 Biodesign Impact Accelerator Program, Selected Startup Company, ASU

2010 Faculty Honoree, School of Sustainable Eng. and the Built Env., ASU

2007 Faculty Research Initiative Award, Johns Hopkins Bloomberg School of Public Health

2006 Technical Assessment of Environmental Programs at Los Alamos National Lab, NRC Committee Member, The National Academies

2005 Congress on Emerging Contaminants, RNRF, Washington, DC, Invited Delegate

2005 Faculty Research Initiative Award, Johns Hopkins Bloomberg School of Public Health

2003-05 Maryland State Water Quality Advisory Committee (SWQAC), Member

2003-04 Faculty Senate, Johns Hopkins Bloomberg School of Public Health

2002 Faculty Innovation Award, Johns Hopkins Bloomberg School of Public Health

1996 Vice-President, Environmental Engineering Society, University of Minnesota

1996 Dissertation Fellowship, Outstanding Civil Eng. Student, U of MN

Selected Publications

2011 Publications

Pycke, B. F., T. M. Benn, P. Westerhoff, and R. U. Halden*. 2011. Strategies for Quantifying C60 Fullerenes in Environmental and Biological Samples and Implications for Toxicological Studies in Environmental Health and Ecotoxicology. *Trends in Analytical Chemistry* 30(1):44-57. doi:10.1016/j.trac.2010.08.005

2010 Publications

Chao, T.-C., G. Song, N. Hansmeier, P. Westerhoff, P. Herckes, R. U. Halden.* Characterization and LC-MS/MS based quantification of hydroxylated fullerenes. *Analytical Chemistry* (In Press).

Wells, E. M.,* B. J. J. M. Jarrett, Y. H. Li, K. L. Caldwell, J. R. Hibbeln, B. J. Apelberg, J. Herbstman, R. U. Halden, F. R. Witter and L. R. Goldman. Body burdens and Descriptors of Mercury, Lead, Selenium and Copper Among Newborns at an Urban Hospital. *Environ. Res.* (In Press).

Wells, E. M.,* Navas-Acien, A., Herbstman, J. B., Apelberg, B. J., Silbergeld, E.K., Caldwell, K. L., Jones, R. L., Halden, R. U., Witter, F. R., and L. R. Goldman. Low level lead exposure and elevated blood pressure during pregnancy. *Environ. Health Perspect.* (In Press).

Neta, G.,* L. R. Goldman, D. Barr, A. Sjödin, N. Fedarko, B. J. Apelberg, F. R. Witter, R. U. Halden. 2010. Fetal exposure to chlordane and permethrin mixtures in relation to inflammatory cytokines and birth outcomes. *Environmental Science & Technology (*In Press).

Benn, T. M.*, B. F. Pycke, P. Herckes, P. Westerhoff, and R. U. Halden. Evaluation of Extraction Methods for the Quantification of Aqueous Fullerenes in Urine. (In Press at *Anal. Bioanalyt. Chem.*).

W. P. Ela,* D. L. Sedlak, M. A. Barlaz, H. F. Henry, D. D. G. Muir, D. L. Swackhamer, E. J. Weber, R. G. Arnold, L. Ferguson, J. A. Field, E. T. Furlong, J. P. Giesy, R. U. Halden, T. Henry, R. A. Hites, K. C. Hornbuckle, P. H. Howard, R. G. Luthy, A. K. Meyer, A. E. Sáez, F. S. vom Saal, C. D. Vulpe, and M. R. Wiesner. 2010. Towards Identifying the Next Generation of Superfund and Hazardous Waste Site Contaminants. *Environ. Health Perspect.* Published online 01 Oct 2010 | doi:10.1289/ehp.1002497. (In Press)

Higgins, C. P.,* Z. J. Paesani, T. E. A. Chalew, R. U. Halden, L. Hundal. 2010. Persistence of Triclocarban and Triclosan in Soils after Land Application of Biosolids and Bioaccumulation in *Eisenia foetida*. *Environ. Toxicol. Chem.* (In Press).

Miller, T. R., A. L. Delcher, S. L. Salzberg, E. Saunders, J. C. Detter, and R. U. Halden.* 2010. The Genome Sequence of the Dioxin Mineralizing Bacterium *Sphingomonas wittichii* RW1. *J. Bacteriology* 192(22):6101-6102 (In Press).

Deo, R. P. and R. U. Halden.* 2010. *In Silico* Screening for Unmonitored, Potentially Problematic High Production Volume (HPV) Chemicals Prone to Accumulate in Biosolids. *Journal of Environmental Monitoring* 12(10):1840-8145. DOI:10.1039/c001559h

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McClellan K. and R. U. Halden.* 2010. Pharmaceuticals and Personal Care Products in Archived U.S. Biosolids from the 2001 EPA National Sewage Sludge Survey. *Water Res.* 44(2):658-668. doi: 10.1016/j.watres.2009.12.032

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Colquhoun, D. R., L. R. Goldman, R. N. Cole, M. Gucek, M. Mansharamani, F. R. Witter, B. J. Apelberg, and R. U. Halden RU. 2008. Global Screening of Human Cord Blood Proteomes for Biomarkers of Toxic Exposure and Effect. In Press at: Environ. Health. Perspect. doi:10.1289/ehp.11816. [Published Online 2 December 2008]

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Myth of a Germ-Free World: A Closer Look at Antimicrobial Products

ScienceDaily (**Nov. 9, 2010**) — Killing microorganisms has become a national obsession. A pair of antimicrobial compounds known as triclosan and triclocarban are lately the weapons of choice in our war of attrition against the microbial world. Both chemicals are found in an array of personal care products like antimicrobial soaps, and triclosan also is formulated into everyday items ranging from plastics and toys to articles of clothing.

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But are these antimicrobial chemicals, as commonly used by people across the nation, really safe for human health and the environment? More pointedly, do they even work? According to associate professor Rolf Halden, of the Biodesign Institute at Arizona State University, the answer to these questions is an emphatic "No."

A biologist and engineer, Halden is interested in chemicals produced in high volume for consumer use. "I follow the pathways of these substances and try to figure out what they do to the environment, what they do to us and how we can better manage them."

The antimicrobial triclosan was patented in 1964, and began its use in clinical settings, where it was found to be a potent bacterial killer, useful before surgical procedures. Since then, industry's drive to convince consumers of the need for antimicrobials has been aggressive and highly effective. Antimicrobials made their first appearance in commercial hand soaps in the 1980s and by 2001, 76 percent of liquid hand soaps contained the chemical.

Antimicrobials have become a billion dollar a year industry and these chemicals now pervade the environment and our bodies. Levels of triclosan in humans have increased by an average of 50 percent since 2004, according to newly updated data from the Centers for Disease Control and Prevention (CDC).Triclosan and triclocarban are present in 60 percent of all rivers and streams nationwide and analysis of lake sediments have shown a steady increase in triclosan since the 1960s. Antimicrobial chemicals appear in household dust where they may act as allergens, and alarmingly, 97 percent of all U.S. women show detectable levels of triclosan in their breast milk. Such unnecessary exposures carry risks which, at present, are ill-defined.

Halden and his team conducted a series of experiments aimed at tracking the environmental course of the active ingredients in personal care products. The disturbing results of their research indicate that triclosan and triclocarban first aggregate in wastewater sludge and are transferred to soils and natural water environments, where they were observed to persist for months or years.

The chemistry behind these compounds, which contain benzene ring structures that have been chlorinated, make them notoriously difficult to break down. Further, they are averse to water or hydrophobic, tending to stick to particles, which decreases their availability for breakdown processes and facilitates long-range transport in water and air. A recent study demonstrated the accumulation of triclosan in dolphins from contaminated coastal waters.

Earlier, the EPA had been provided with industry-funded studies of wastewater treatment plant effluent, seemingly indicating elimination of triclosan and triclocarban during the treatment process. But Halden speculated that these chemicals might in fact persist in the solid byproduct left over after treatment -- the sewage sludge. The group's suspicions were confirmed through an initial testing of a large wastewater treatment plant serving 1.3 million people, located in the Mid Atlantic region of the U.S.

In the first study of its kind, conducted by the team in 2006, it was determined that three quarters of the mass of triclocarban entering the wastewater treatment facility was simply moved from the water into the sludge. Similar tests confirmed the accumulation of triclosan in sludge with 50 percent efficiency.

"We make 13 billion pounds of dry sludge per year," Halden notes. "That is equal to a railroad train filled with sludge stretching 750 miles from Phoenix to San Francisco." One half of this sludge winds up on agricultural fields. The potential for these chemicals to migrate into food or leach into groundwater, has not received adequate consideration. It is likely that antimicrobials are capable of moving up the food chain, through a process known as biomagnification.

Both triclosan and triclocarban have been linked to endocrine disruption, with potential adverse impacts on sexual and neurological development. Further, the accumulation of these antimicrobials in the environment is exerting selective pressure on microorganisms exposed to them, thereby increasing the likelihood that a super-bug, resistant to the very antimicrobials developed to kill them, will emerge -- with potentially dire consequences for human health.

On the positive side, Halden's team identified specific microorganisms adapted to not only tolerate but also break down pervasive antimicrobials. The research is part of a wider effort aimed at alerting the public and regulatory agencies, including the EPA and FDA, of the dangers of these chemicals as well as developing effective remediation strategies.

As Halden explains, "these microbes have the dual advantage of being resistant to destruction by antimicrobials and being able to break down these chemicals. You could put them to use for

example by adding them to high-strength industrial wastewater before it gets combined with the domestic sewage."

In the group's recent studies, appearing in *Water Research* and the *Journal of Hazardous Materials*, levels of triclosan and triclocarban were measured, to determine the degree to which these chemicals, along with other antimicrobials, become concentrated in sludge, and what happens to them thereafter. Triclosan and triclocarban account for two-thirds of the mass of all the antimicrobials in sludge, Halden found, based on a survey of 72 chemicals entering the wastewater treatment stream. Further, massive bioaccumulation of antimicrobial chemicals has been observed in various species. Earthworms exposed to triclosan, for example, showed accumulation of the chemical by a factor of 2700 percent.

Halden notes the impact these persistent chemicals can have on other life forms in the environment that are not their intended target. The thresholds for killing microbes are much higher than those for other, more fragile life forms, like algae, crustaceans and fish. "This explains why residual concentrations of antimicrobials found in aquatic environments are still sufficiently harmful to wipe out the small and sensitive crustaceans, which are critical to the aquatic life cycle and food web," Halden says.

For certain, chemicals like triclosan and triclocarban have their place in public health, particularly in clinical settings, among people who are trained in their proper use. However, in 2005, the FDA put together an expert panel to review all the available information on these chemicals. Halden was among the voting members of this committee, which concluded that regular use of antimicrobial products by the general public was no more effective than traditional methods of proper hygiene -- simply washing thoroughly with regular soap and water.

Society, Halden insists, is participating in a grand experiment in which we are all guinea pigs. While effective regulation of these chemicals is badly needed, Halden says that the inertia of regulatory agencies is a formidable obstacle. In the meantime, the best hope is for consumers to avoid triclosan and triclocarban containing products.

"The culture of fear leads people to make impulsive decisions and buy a lot of antimicrobial products that are not really needed," Halden says. "It's a profitable market to be in, but not one that is ultimately sustainable or a good idea."

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The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Arizona State University**. The original article was written by Richard Harth, science writer, Biodesign Institute at ASU.

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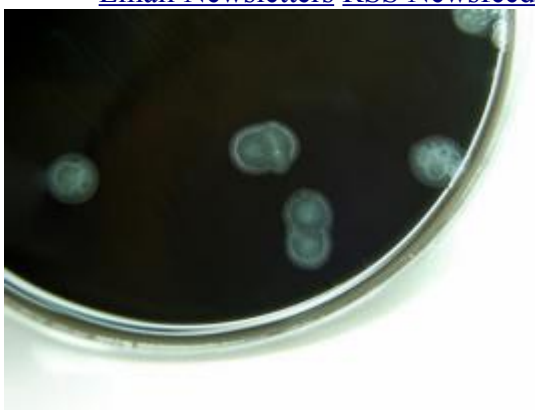

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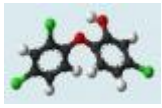

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3 Minute Interview: Rolf Halden

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By: Sara Michael **08/21/08** 3:00 AM
Examiner Staff Writer
Rolf Halden, an adjunct associate professor at the Johns Hopkins Bloomberg School of Public Health and associate professor at Arizona State University, has done extensive research into contaminants in drinking water.

He spoke with The Examiner about pharmaceuticals and personal care products, such as cosmetics and vitamins, in the environment.

What do we know about the low levels of pharmaceuticals found in water?

We are now beginning to appreciate the presence of pharmaceuticals and residues of personal care products in the environment.
In the past 10 years, great strides have been made.

We are becoming cognizant now that these products enter the environment and in some instances don't degrade.

What is lacking is a more complete understanding of the ramifications of these detections.

We already know some pharmaceuticals and personal care products have hormonal functions and these are the chemicals that have great concern.

It's difficult to pinpoint. It's not easy to determine which chemical is responsible. But the science is fairly young. There is much to be learned.

So we haven't had the right tests to detect pharmaceuticals?

We just became aware of the presence of the chemicals, because we developed the analytical tools to detect these amounts.

What are the health effects of the contamination?

You have to take a look at whether people drink this water and if it's treated to remove chemicals.
In a lot of instances, we have effective treatments of these chemicals.
What seems more important is the effect of the knowledge that people drink water that is recycled.
The truth is there is no virgin water.

Everything is recycled. The water has been many places. That is a reality.

As the planet becomes more populated, we have to appreciate that water is a limited resource.

The message should be not to scare people but to make them consider how they use water and stop thinking about it as wastewater.

Read more at the Washington Examiner: http://washingtonexaminer.com/local/3-minute-interview-rolf-halden#ixzz1KUNQstXQ

Sunday, 24 April 2011

Smoking Mothers And Newborn Health Risks Rolf Halden

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