

# *2<sup>nd</sup> International Conference on Pharmaceuticals and Endocrine Disrupting Chemicals in Water*

October 9-11, 2001, Hyatt on Nicollet Mall, Minneapolis, Minnesota



Cosponsored by:  
U.S. Geological Survey  
Technical University of Berlin  
Minnesota Department of Health  
Pan American Health Organization

- Occurrence of Pharmaceutical Compounds in Ground and Surface Waters
- Occurrence and Fate of Endocrine Disrupting Chemicals in Water
- Analysis of Pharmaceuticals and Endocrine Disrupting Chemicals
- Distribution and Effects on Wildlife
- Treatment Technologies for Pharmaceuticals and Endocrine Disrupting Chemicals

Conference Supporter



### **Pharmaceuticals in Rivers and on Tap**

Concerns over pharmaceuticals showing up in rivers downstream from sewage plants have government agencies scrambling now that several public water systems have tested positive for drugs. Tap water in Wheeling, West Virginia and the Ohio River tested positive for three common antibiotics according to USA Today. Attend this conference to examine what some of the leading scientists in the field are doing to understand the extent and concentrations of numerous drug compounds in the United States, Canada, and Germany. Learn new analytical technologies and what the Food and Drug Administration (FDA) requires about the environmental fate of new prescription medications.

### **Drug Resistant Bacteria**

One of the dominating concerns is the creation of "Superbugs". New strains of bacteria which are resistant to antibiotics are common near major cities and in rural areas and have been found in all 15 rivers from one study, including the Mississippi, the Ohio and the Colorado.

### **Endocrine Disrupting Chemicals (EDC) and Wildlife**

Disturbing evidence will be presented about effects on wildlife such as sexual differentiation reversal in male fish after exposure to natural and synthetic hormones and certain other EDC. EDC can be natural hormones, pharmaceuticals such as birth control pills, estrogen replacement products and other steroids, and hundreds of organochlorine compounds found in pesticides and industrial chemicals like PCBs. EDC appear to be persistent in the environment and bioaccumulate, and exposures are widespread throughout the entire globe. Correlative evidence does exist for organochlorines, cadmium, tributyltin, alkylphenols, and estrogen. Compounds in the complex mixtures from pulp and paper mill and municipal effluents have been shown to be EDC. Actually paper mill effluent has recently been determined to produce the male hormone Androstenedione and masculinized fish. Based on recognition of the potential scope of the problem, the possibility of serious effects on the health of populations, and the persistence of some EDC in the environment, research on EDC was identified as one of the six high-priority topics in the EPA Office of Research and Development Strategic Plan

### **Treatment Technologies for Pharmaceuticals and EDC**

Examine the state-of-the-art technologies for treating water containing drug compounds and EDC. You won't want to miss the exciting end to the technical sessions - Session V Treatment Technologies for Pharmaceuticals and EDC.

### **Full Proceedings Provided**

Each attendee will receive a full proceedings of the conference with author's manuscripts on CD-ROM.

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### **Sponsored by National Ground Water Association**



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## **Tuesday, October 9, 2001**

11:00 a.m. – 5:00 p.m.

### **Registration**

## **Session I Occurrence of Pharmaceuticals in Water**

**Moderator, Herb Buxton, U.S. Geological Survey, Toxic Substances Hydrology Program**

- |                       |   |
|-----------------------|---|
| 1:00 p.m. - 1:30 p.m. | <b>Keynote Address</b><br><b>Pharmaceuticals as New Emerging Environmental Contaminants: A Survey</b> Thomas Ternes, ESWE-Institut fuer Wasserforschung und Wassertechnologie Wiesbaden, Germany  |
| 1:30 p.m. - 1:55 p.m. | <b>A National Reconnaissance for Pharmaceuticals and Other Emerging Contaminants in Streams of the United States</b> Dana W. Kolpin, Edward T. Furlong, Michael T. Meyer, E. Michael Thurman, Steven D. Zaugg, and Larry B. Barber, U.S. Geological Survey                            |
| 1:55 p.m. - 2:20 p.m. | <b>Occurrence and Fate of Pharmaceutical Residues in the Aquatic System of Berlin as an Example for Urban Ecosystems</b> - Thomas Heberer, K. Reddersen<br>Institute of Food Chemistry, Technical University of Berlin  |
| 2:20 p.m. - 2:45 p.m. | <b>Pharmaceutical Residues in Ambient Water: Initial Surveillance in New Mexico, USA</b><br>Dennis McQuillan, Jennifer Parker, New Mexico Environment Department, David Mills, PhD, Ken Sherrell, Timothy H. Chapman, New Mexico Department of Health, Scientific Laboratory Division |
| 2:45 p.m. - 3:00 p.m. | <b>Refreshment Break</b>  |
| 3:00 p.m. - 3:25 p.m. | <b>Factors Affecting the Concentrations of Pharmaceuticals Released to the Aquatic Environment</b><br>David L. Sedlak and Karen E. Pinkston, Department of Civil and Environmental Engineering, University of California, Berkeley, CA.   |
| 3:25 p.m. - 3:50 p.m. | <b>Assessment of Potential Antibiotic Contaminants in Water and Preliminary</b>   |

**Occurrence Analysis** -Ching-Hua Huang, Jay E. Renew and Kristen L. Smeby, School of Civil and Environmental Engineering, Georgia Institute of Technology, Karen Pinkston and David L. Sedlak  
Department of Civil and Environmental Engineering,  
University of California, Berkeley, CA

3:50 p.m. - 4:15 p.m.

**Reconnaissance of Industrial and Household Use Chemicals and Pharmaceuticals in Selected Surface and Ground Water Resources in Minnesota, October 2000** - Kathy E. Lee, Steve D. Zaugg, and Jeffery D. Cahill, and Edward T. Furlong<sup>1</sup> U.S. Geological Survey

4:15 p.m. - 4:40 p.m.

**Pharmaceuticals in the Environment: an Industry Perspective** - James P. Hagan, Ph.D., P.E.,  
GlaxoSmithKline Pharmaceuticals and Health Care

4:40 p.m. - 5:05 p.m.

**Presence of Pharmaceuticals in Wastewater and Ground Water in Hawaii and Studies of Their Fate in Soil Following Irrigation with Reclaimed Water** -  
Roger Babcock, Jr. and Chittaranjan Ray  
Department of Civil Engineering, University of Hawaii at Manoa

5:05 p.m. - 6:30 p.m.

**Ice Breaker Reception** - refreshments provided  
(cash bar)

## **Wednesday, October 10, 2001**

**Moderator, James P. Hagan, Ph.D., P.E.,**  
**GlaxoSmithKline Pharmaceuticals and Health Care**

8:05 a.m. - 8:30 a.m.

**Occurrence and Behavior of Iodinated X-ray Contrast Media in Surface and Ground Water** - Anke Putschew, Sabine Wischnack and Martin Jekel - Technical  
University of Berlin, Department of Water Quality  
Berlin, Germany

8:30 a.m. - 8:55 a.m.

**Comparison of Pharmaceuticals in Surface Water and Bed Sediments** - Jeffery D. Cahill, Imma Ferrer, Edward T. Furlong, U.S. Geological Survey, National Water Quality Laboratory, Denver, CO

8:55 a.m. - 9:20 a.m.

**Presence of Pharmaceuticals in Treated Wastewater Effluent and Surface Water Supply Systems, Metropolitan Atlanta, Georgia, July–September 1999**  
Deborah M. Moll, Ph.D.<sup>1</sup>; Elizabeth A. Frick<sup>2</sup>;  
Alden K. Henderson, Ph.D., M.P.H.<sup>1</sup>; Edward T. Furlong, Ph.D.<sup>3</sup>; Michael T. Meyer, Ph.D.<sup>4</sup>

<sup>1</sup>Centers for Disease Control and Prevention, National Center for Environmental Health, Atlanta, GA;  
<sup>2</sup>U.S. Geological Survey, Atlanta, GA; <sup>3</sup>U.S. Geological Survey, Denver Federal Center, Denver, CO;  
<sup>4</sup>U.S. Geological Survey, Ocala, FL

9:20 a.m. - 9:45 a.m.

**Occurrence of Bacteriostatic Sulfonamide Drugs in Surface Waters and Their Behaviour in Bank Filtration** - Claudia Hartig and Martin Jekel  
Technical University Berlin, Department of Water Quality Control

9:45 a.m. - 10:00 a.m.

**Refreshment Break**

**Session II Analysis of Pharmaceuticals and Endocrine Disrupting Chemicals**  
Moderator Ira Adelman Ph.D. Department of Fisheries and Wildlife, University of Minnesota

10:00 a.m. - 10:25 a.m.

**Comparison of Solid Phase Microextraction, Solid Phase Extraction and Liquid Liquid Extraction coupled to GC/MS for Trace Analysis of Endocrine Disruptors in Wastewater**  
Pamela Wild, Monika Moeder, UFZ, Centre for Environmental Research Leipzig-Halle GmbH, Leipzig, Germany

10:25 a.m. - 10:50 a.m.

**On-Line Solid-Phase Extraction and Fluorescence Detection of Selected Endocrine Disrupting Chemicals in Water by High-Performance Liquid Chromatography** - Guang-Guo Ying, Rai Kookana and Zuliang Chen  
CSIRO Land and Water, Adelaide Laboratory, Australia

10:50 a.m. - 11:15 a.m.

**Analysis of Selected Antibiotics from Water Associated With Fish Hatcheries**  
E.M. Thurman<sup>1</sup>, M.E. Lindsey<sup>1</sup> and Hans-Christian Lutzhoft<sup>2</sup>, <sup>1</sup>U.S. Geological Survey and <sup>2</sup>Danish Royal School of Pharmacy, Copenhagen, Denmark

11:15 a.m. - 11:40 a.m.

**In-Situ Solid-Phase Extraction and Analysis of Ultra-Trace Synthetic Musks in Municipal Sewage Effluent Using Gas Chromatography-Mass Spectrometry, Full-scan Mode** - L. I. Osemwengie, U.S. Environmental Protection Agency, National Environmental Research Laboratory, Environmental Sciences Division  
S. Steinberg, Environmental Chemistry Department.  
University of Nevada Las Vegas

11:40 a.m. - 1:00 p.m.

**Lunch Provided**

### **Session III Endocrine Disrupting Chemicals: Occurrence and Fate**

**Moderator, Greg Sayles, US EPA National Risk Management Research Laboratory**

- 1:00 p.m. - 1:25 p.m.                      **Occurrence and Screening of Treatment Alternatives for PPCPs and EDCs in Waters of Southeastern Louisiana** - Glen R. Boyd, Ph.D., P.E., Civil and Environmental Engineering Department  
Deborah A. Grimm, Ph.D., Coordinated Instrumentation Facility, Tulane University
- 1:25 p.m. - 1:50 p.m.                      **Occurrence, Distribution, And Fate of 4-Nonylphenol in Kansas Domestic Wastewater Treatment Plants**  
Dr. K. Xia, H. L. Keller, A. J. Wagner, and Dr. A. Bhandari, Kansas State University
- 1:50 p.m. - 2:15 p.m.                      **Presence of Wastewater Tracers and Endocrine Disrupting Chemicals in Treated Wastewater Effluent and in Municipal Drinking Water, Metropolitan Atlanta, 1999**  
Alden K. Henderson Ph.D., MPH and; Deborah M. Moll, Ph.D., Centers for Disease Control and Prevention,  
Elizabeth A. Frick and Steven D. Zaugg, Ph.D. United States Geological Survey
- 2:15 p.m. - 2:40 p.m.                      **Processes Affecting the Fate of Nonylphenol During Wastewater Treatment** - Andrea Porter and Dr. Nancy Hayden, University of Vermont
- 2:40 p.m. - 3:05 p.m.                      **Monitoring of Pesticide Residues in Surface and Underground Water by Capillary Gas Chromatography Using C18 Column** -  
J.K. Dubey, Dr.Y.S. Parmar University of Horticulture & Forestry, Nauni, Solan, India
- 3:05 p.m. - 3:20 p.m.                      **Refreshment Break**
- 3:20 p.m. - 3:45 p.m.                      **Fate of the Endogenous Hormones 17 $\beta$ -Estradiol and Testosterone in Composted Manure** - Heldur Hakk, Patricia Millner, and Gerald Larsen, USDA-ARS
- 3:45 p.m. - 4:10 p.m.                      **Sorption, Mobility and Fate of 17 $\beta$ -Estradiol, Testosterone and Flame Retardant [Tetrabromobisphenol A] (TBBPA) in Loam Soil and Sand** -  
G. Larsen, F. Casey, B. Magelky, C. Pfaff and H. Hakk  
USDS - ARS

4:10 p.m. - 4:35 p.m. **Occurrence of Antibiotics, Pesticides, and Pesticide Degradates in Agricultural Runoff, Stillwater River Basin, southwest Ohio** -Gary L. Rowe and Michael T. Meyer, U.S. Geological Survey, Kammy D. Johnson, and Carol H. Rubin, Centers for Disease Control and Prevention

4:35 p.m. - 5:00 p.m. **Occurrence and Fate of Pharmaceuticals During Bank Filtration - Results from German and US Investigations** -Thomas Heberer<sup>1</sup>, Ingrid M. Verstraeten<sup>2</sup>, Michael T. Meyer<sup>2</sup>, A. Mechlinski<sup>1</sup> and K. Reddersen<sup>1</sup> <sup>1</sup> Institute of Food Chemistry, Technical University of Berlin, <sup>2</sup> U.S. Geological Survey

5:00 p.m. - 6:30 p.m. Reception refreshments provided (cash bar)

**Thursday, October 11, 2001**

**Session IV Distribution and Effects on Wildlife**  
Moderator, Chris Metcalfe, Trent University

8:30 a.m. - 9:00 a.m. **Analysis for Environmental Estrogens Using cDNA Microarrays** - Leroy C. Folmar, US EPA National Health and Environmental Effects Research Laboratory

**Altered Serum Sex Steroids and Vitellogenin Induction in Walleye Collected Near a Major Metropolitan Sewage Treatment Plant** - Leroy C. Folmar, US EPA National Health and Environmental Effects Research Laboratory

9:00 a.m. - 9:25 a.m. **Drugs in Canadian Surface Waters: Distribution and Effects on Fish** - Chris Metcalfe, Tom Moon, Vance Trudeau and John Struger, Environmental and Resource Studies, Trent University

9:25 a.m. - 9:50 a.m. **Effects of Environmental Estrogens on Reproductive Health of Male Walleye and Carp Near a Major Metropolitan Sewage Treatment Plant** - James T. Levitt, Heiko L. Schoenfuss, Ira R. Adelman, University of Minnesota, Department of Fisheries, Wildlife, and Conservation Biology

9:50 a.m. - 10:15 a.m. **Data from an Estrogen Receptor-based Biosensor Correlates with Evidence of Frog Malformation and Demonstrates a Differential Response of hER-a & b to Beneficial and Harmful Estrogenic Compounds** - <sup>1</sup>Judith L. Erb, <sup>2</sup>Eric A.E. Garber, <sup>1</sup>James G. Downward IV, <sup>1</sup>Eric M. Priuska, <sup>3</sup>James L. Wittliff, and <sup>4</sup>Joe Magner <sup>1</sup>IA Inc., <sup>2</sup>USDA-ARS Biosciences

Research Laboratory, , <sup>3</sup>Univ. of Louisville, KY, <sup>4</sup> Minnesota Pollution Control Agency

10:15 a.m. - 10:30 a.m.

**Refreshment Break**

10:30 a.m. - 10:55 a.m.

**Mineral Deficiency, Estrogenic Activity, and Occurrence of Malformed Frogs in Minnesota**

Eric A.E. Garber <sup>a</sup>, Judith L. Erb <sup>b</sup>, Amy M. McGarvey <sup>a</sup>, Gerald L. Larsen <sup>a</sup>, Joseph Magner <sup>c</sup>

<sup>a</sup>USDA-ARS, Biosciences Research Laboratory,

<sup>b</sup>ThreeFold Sensors,

<sup>c</sup>Minnesota Pollution Control Agency

10:55 a.m. - 11:20 a.m.

**Effects of Water-Borne 17 $\beta$ -Estradiol on Reproductive Fitness in Two Species of Fish -**

Heiko L. Schoenfuss, Dalma Martinovic, and Peter W. Sorensen, University of Minnesota, Department of Fisheries, Wildlife, and Conservation Biology

11:20 a.m. - 11:45 a.m.

**Questions and Answers**

**Panel Discussion and Open Microphone**

Panelists: Leroy Folmar, US EPA, Chis Metcalfe, Trent University, Dana Kolpin, USGS, James Hagan, GlaxoSmithKline, Thomas Heberer, Technical University of Berlin, Thomas Ternes, Institut fuer Wasserforschung und Wassertechnologie, Wiesbaden, Germany

11:45 a.m. - 1:00 p.m.

Lunch (on your own)

**Session V Treatment Technologies for Pharmaceuticals and EDC**

**Moderator, Thomas Heberer, Technical University of Berlin**

1:00 p.m. - 1:25 p.m.

**Removal of Pharmaceutical Residues and Other Persistent Organics from Municipal Sewage and Surface Waters Applying Membrane Filtration**

T. Heberer<sup>1</sup>, D. Feldmann<sup>2</sup>, K. Reddersen<sup>1</sup>, H. Altmann<sup>3</sup>, T. Zimmermann<sup>4,1</sup> Institute of Food Chemistry, Technical University of Berlin, <sup>2</sup>Central Institute of Bundeswehr Medical Service, <sup>3</sup>Bundeswehr Scientific Institute for Protection, Technologies – NBC – protection, <sup>4</sup>Federal Ministry of Defence – Medical Service –

1:25 p.m. - 1:50 p.m.

**Natural Attenuation of Pharmaceuticals**

Traugott Scheytt<sup>a</sup>, Petra Mersamann<sup>a</sup> and Thomas Heberer<sup>b</sup> <sup>a</sup>Technical University Berlin, Institute for Applied Geosciences, <sup>b</sup>Technical University Berlin, Institute for Food Chemistry,

1:50 p.m. - 2:15 p.m.

**Role of Subsurface Wetland Treatment in Fate of Endocrine Disrupters in Wastewater**

David M. Quanrud<sup>\*2</sup>, Karen D. Turney<sup>\*\*</sup>,  
Otakuye Conroy<sup>\*\*</sup>, Martin M. Karpiscak<sup>\*\*\*</sup>,  
Kevin E. Lansey<sup>\*</sup>, and Robert G. Arnold<sup>\*\*</sup>

<sup>\*</sup>Department of Civil Engineering and Engineering Mechanics, The University of Arizona, (UA)

<sup>\*\*</sup>Department of Chemical and Environmental Engineering, UA, <sup>\*\*\*</sup>Office of Arid Lands Studies, UA

2:15 p.m. - 2:40 p.m.

**Removal of Pharmaceuticals During Conventional Wastewater Treatment, Advanced Membrane Treatment and Soil-Aquifer Treatment - Jörg E. Drewes<sup>1</sup>, Thomas Heberer<sup>2</sup> and Kirsten Reddersen<sup>2</sup>**

<sup>1</sup>National Center for Sustainable Water Supply, Arizona State University, <sup>2</sup>Institute for Food Chemistry, Technical University of Berlin

2:40 p.m. - 3:05 p.m.

**Refreshment Break**

3:05 p.m. - 3:30 p.m.

**Removal of Endocrine Disrupting Compounds Using Drinking Water Treatment Processes**

John L. Cicmanec, DVM, MS, U.S. EPA

3:30 p.m. - 4:05 p.m.

**Routes of Groundwater Contamination with Pharmaceuticals and the Removal Drug Residues During Water Treatment Processes - Thomas Ternes<sup>1</sup>, Martin Meisenheimer<sup>1</sup>, Helfried Welsch<sup>1</sup>, R.-D. Wilken<sup>1</sup>, Harald Rückert<sup>2</sup>, Georg Berthold<sup>2</sup>. 1:**

ESWE-Institut fuer Wasserforschung und Wassertechnologie, 2: Hessische Landesanstalt fuer Umwelt, Wiesbaden, Germany,

4:05 p.m.

Drawing is held for \$100 gift certificates  
Conference Adjourns

**General Information**

**Fees**

NGWA member	\$350
Nonmember	\$500
Full-time Student (I. D. required)	\$100
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## 2<sup>nd</sup> International Conference on Pharmaceuticals and Endocrine Disrupting Chemicals in Ground Water (#5013)

October 9—11, 2001 ♦ Hyatt Regency Minneapolis ♦ Minneapolis, Minnesota

NGWA Member	\$ 350
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