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EMERGING CONTAMINANTS IN U.S. WATERS

(110–171)

HEARING

BEFORE THE

SUBCOMMITTEE ON
WATER RESOURCES AND ENVIRONMENT

OF THE

COMMITTEE ON
TRANSPORTATION AND
INFRASTRUCTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

SEPTEMBER 18, 2008

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September 15, 2008

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Water Resources and Environment

FROM: Subcommittee on Water Resources and Environment Staff

SUBJECT: Hearing on Emerging Contaminants in U.S. Waters

PURPOSE OF HEARING

On Thursday, September 18, 2008, at 2:00 p.m., in Room 2167 of the Rayburn House Office Building, the Subcommittee on Water Resources and Environment will hear testimony from representatives from the United States Environmental Protection Agency (EPA), the United States Geological Survey (USGS), the State of Maine, the National Association of Clean Water Agencies, and academic researchers on emerging contaminants in U.S. waters.

BACKGROUND

This memorandum provides a summary of both unregulated contaminants and those of growing concern in surface waters, and the effects or potential effects on human health and aquatic ecosystems. The memorandum also discusses the Clean Water Act's framework for addressing contaminants in surface waters.

Emerging Contaminants

No single or commonly-accepted definition of emerging contaminants exists. Various agencies[1] and states have different, but related, usages. Emerging contaminants can be characterized

[1] Federal definitions of emerging contaminants vary. USGS characterizes emerging contaminants as "any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and (or) human health effects." (http://toxics.usgs.gov/regional/emc/index.html (accessed 12 September, 2008)). In a draft report, EPA recently characterized emerging contaminants as "chemicals and other substances that have no regulatory standard, have been

as both unregulated contaminants and those of growing concern in surface waters that negatively affect or have the potential to negatively affect human health and/or aquatic ecosystems.

The range of emerging contaminants includes:

- Toxic chemicals, including persistent organic pollutants[2];
- Pharmaceuticals and personal care products;
- Veterinary medicines;[3]
- Endocrine-disrupting chemicals;[4] and
- Nanomaterials.

Emerging Contaminants in Surface Waters

USGS has the responsibility for water-quality monitoring of the nation's waters. Through its National Water Quality Assessment (NWQA) and Toxic Substances Hydrology (Toxics) Programs it is a national leader in identifying emerging contaminants in the nation's surface, ground, and drinking waters. USGS program and research activities in the area of emerging contaminants include: analytical methods development, occurrence in the environment, sources and source pathways, transport and fate, and ecological effects. The FY 2008 enacted budgets for the NWQA and Toxics Programs were, respectively, $63.9 million and $13.5 million. The President's proposed FY 2009 budget requests approximately $54.1 million and $10.7 million for these programs, respectively.

In 2002, USGS researchers released the first nationwide study of the occurrence of pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams.[5] Since 2002, USGS has published more than 160 reports that document and demonstrate the existence of these substances in U.S. waters, the sources of these substances, the assimilation of some of these by organisms,[6] and adverse ecological health effects.[7]

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recently "discovered" in natural streams (often because of improved analytical chemistry detection levels), and potentially cause deleterious effects in aquatic life at environmentally relevant concentrations. They are pollutants not currently included in routine monitoring programs and may be candidates for future regulation depending on their (eco)toxicity, potential health effects, public perception, and frequency of occurrence in environmental media." (EPA Draft White Paper. "Aquatic Life Criteria for Contaminants of Emerging Concern." (June 3, 2008))

[2] Persistent organic pollutants are organic chemical compounds that are resistant to environmental degradation through chemical, biological, or photolytic processes. These compounds will persist in the environment and can bioaccumulate in animal tissue – resulting in a biomagnification up the food chain. These substances are often toxic and can therefore negatively impact human and environmental health.

[3] These substances can include antimicrobials, antibiotics, anti-fungals, growth promoters, and hormones.

[4] These substances include synthetic estrogrens, androgrens, and naturally-occurring estrogens. They have the potential to act as hormones, resulting in changes to the endocrine system and biological changes.

[5] Kolpin, D.W., et al., 2002. "Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance." *Environmental Science and Technology.* 36: 1202-1211.

[6] *Amongst the most recent of these is:* Kinney, C.A., et al., 2008. "Bioaccumulation of pharmaceuticals and other anthropogenic waste indicators in earthworms from agricultural soil amended with biosolid or swine manure." *Environmental Science and Technology.* 42: 1863-1870.

[7] *Amongst the most recent of these is:* Vajda, A.M., et al., 2008. "Reproductive Disruption in Fish Downstream of an Estrogenic Wastewater Effluent." *Environmental Science and Technology.* (published on-line March 25, 2008: http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/2008/42/i09/abs/es0720661.html (accessed 12 September, 2008)).

The 2002 USGS study involved monitoring for 95 emerging contaminants that are potentially associated with human, industrial, and agricultural waste, including antibiotics, other prescription drugs, steroids, reproductive hormones, personal care products, products of oil use and combustion, insecticides, fire retardants, solvents, and plasticizers, among others. Samples were taken from 139 streams across a wide range of settings in 30 states. Stream sites were chosen on the basis of their being downstream from urban centers and livestock production, and therefore susceptible to contamination. The results of this study are therefore not representative of all streams across the United States.

The study identified one or more emerging contaminants in 80% of the sampled streams. Eighty-six percent of the emerging contaminants were detected at least once. A median of seven emerging contaminants were found in those streams in which the study authors identified a targeted emerging contaminant, with one stream containing 38 of the targeted emerging contaminants. For interpretive purposes, the authors grouped the 95 emerging contaminants into 15 categories, based on their uses or origins. At least six of those categories – steroids, nonprescription drugs, insect repellant, detergent constituents, disinfectants, and plasticizers – showed up in over 60 percent of the streams tested. Three categories – steroids, detergent constituents, and plasticizers – made up almost 80% of the total measured concentration of contaminants.

Measured concentrations of individual compounds were generally low. However, total concentrations of all targeted emerging contaminants were considerably higher. For those substances that have drinking-water guidelines or aquatic-life criteria associated with them, levels were not, for the most part, exceeded. However, the authors noted that "many of the 95 OWCs do not have such guidelines or criteria determined…"[8] Thirty-three of the 95 target emerging contaminants are known, or are suspected, to exhibit at least weak hormonal influence, with the potential to disrupt normal endocrine function. All of these endocrine disruptors were detected in at least one of the stream samples during the study. The study authors note that "measures of concentrations of reproductive hormones may have greater implications for health of aquatic organisms than measured concentrations of nonprescription drugs."[9]

The 2002 USGS study authors conclude that the implications of this research are that many such compounds survive wastewater treatment and biodegradation.

Aquatic and Environmental Health Impacts

For many emerging contaminants, the toxicological effects, or potential toxicological effects, of emerging contaminants are not clearly understood. The 2002 USGS study researchers noted that "[f]or many OWCs, acute effects to aquatic biota appear limited because of the low concentrations occurring in the environment."[10] They go on to note, however, that "chronic effects from low-level environmental exposure to select OWCs appear to be of much greater concern."[11] The 2002 USGS report cites a number of studies in which long-term, chronic impacts to aquatic and environmental health have been demonstrated, as a result of exposure to emerging contaminants.

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[8] Kolpin, D.W., et al., 2002. p. 1208.
[9] Kolpin, D.W., et al., 2002. p. 1209.
[10] Kolpin, D.W., et al., 2002. p. 1208.
[11] Kolpin, D.W., et al., 2002. p. 1208.

Recent USGS research has identified toxicological and endocrine impacts on aquatic and environmental health. This USGS research has included studies of developing anti-microbial and anti-biotic resistance at beaches and coastal areas,[12] mercury and PCB (polychlorinated biphenyl) contamination of fish in the southeastern U.S.,[13] endocrine disrupting chemicals from wastewater effluent on fish resulting in altered (cancerous, reduced sized, intersex) reproductive organs,[14] and the bioaccumulation of pharmaceuticals and other wastewater effluent contaminants in earthworms from agricultural soil partially comprised with biosolids.[15]

Human Health Impacts

At levels currently identified in surface water the potential effects of many emerging contaminants on human health is not clearly understood. This includes both acute and chronic effects. As demonstrated above, however, research is developing that shows acute and chronic impacts on other species.

Water contaminants can enter the body through a number of pathways, including ingestion, surface contact, and inhalation of vaporized water. Pregnant women, infants and children, and individuals with suppressed immune systems are understood to be more at risk for negative health consequences from toxic contaminants.

The USGS 2002 study also notes that there is little understanding of the potentially toxic interactive effects of complex mixtures of emerging contaminants in the environment. A 2002 State University of New York-Albany (SUNY-Albany) study highlights the human health effects of chemical mixtures.[16] This research notes that an estimated 80,000 chemicals are currently in use. This is a three-fold increase from 1941 to 1995. Of these 80,000, nearly 10% are understood to be carcinogens. The SUNY-Albany researchers state that many of these compounds have not been adequately tested for human toxicity. Compounding this is even less of an understanding of the human health impacts of chemical mixtures.

Similarly, a number of compounds included among the targeted emerging contaminants in the 2002 USGS study are noted to degrade into other constituents over time. As a result, the 2002 USGS study authors call for increased research into the health effects of the individual emerging contaminants, mixtures of these compounds, and degradates of particular compounds.

In 2008, USGS has released a national reconnaissance study that demonstrates the presence of emerging contaminants in untreated drinking water sources across the United States.[17] Sixty-three of the 100 targeted emerging contaminants were detected in at least one water sample (taken from 74 untreated drinking water locations.) This is consistent with the findings of recent Associated

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[12] Fogarty, L.R., et al., 2003. "Abundance and Characteristics of the Recreational Water Quality Indicator Bacteria *Escherichia coli* and Enterococci in Gull Faeces." *Journal of Applied Microbiology.* 94: 865-78.
[13] Hinck, J.E., et al., 2008. "Chemical Contaminants, Health Indicators, and Reproductive Biomarker Responses in Fish from Rivers in the Southeastern United States." *Science of the Total Environment.* 390: 538-57.
[14] Hinck, J.E., et al., 2008; Vajda, A.M., et al., 2008.
[15] Kinney, C.A., et al., 2008. "Bioaccumulation of Pharmaceuticals and other Anthropogenic Waste Indicators in Earthworms from Agricultural Soil Amended with Biosolid or Swine Manure." *Environmental Science and Technology.* 42: 1863-70.
[16] Carpenter, D.O., et al., 2002. "Understanding the Human Health Effects of Chemical Mixtures." *Environmental Health Perspectives Supplements.* 110: 25-42.
[17] Focazio, M.J., et al., 2008. "A National Reconnaissance for Pharmaceuticals and Other Organic Wastewater Contaminants in the United States – II) Untreated Drinking Water Sources." *Science of the Total Environment.* 402: 201-16.

Press (AP) investigative reports that found that pharmaceuticals are in the drinking water supplies of at least 46 million Americans.[18] In these reports, the AP writers noted that some pharmaceuticals resist drinking water and wastewater treatment processes, and that wastewater treatment facilities are not currently configured to remove these substances. These media accounts do report that levels of contaminants are showing up in drinking water supplies or source water at very low levels. However, concern exists in the research community about the human health consequences of long-term, low-level exposure to these contaminants.[19]

Clean Water Framework for Addressing Surface Water Pollutants

Introduction: The Clean Water Act is the federal government's primary statutory tool for protecting the quality of surface waters. The 1972 CWA identifies two national goals: the discharge of pollutants into navigable waters be eliminated by 1985; and, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983 (also known as "swimmable and fishable waters"). While progress towards these goals has been achieved, neither goal has yet been met.

Protection of surface waters, through the CWA, occurs through two mechanisms: technology standards and water quality standards. Technology standards, through the use of effluent guidelines, were intended to result in the complete elimination of the discharge of pollutants into surface waters by 1985, through a process of increasingly strict technology standards over time. Water quality standards are intended as a backstop that would entail a strengthening of effluent guidelines until a water body is delisted as impaired.

Effluent Limitation Guidelines: Effluent limitation guidelines are national standards that are developed by EPA on an industry-by-industry, pollutant-by-pollutant basis. Effluent limitation guidelines are intended to represent the greatest pollutant reductions from a given industry that are economically achievable and technically feasible. Effluent limitation guidelines are not determined by toxicity, or based on any health standard or criteria. This effluent guideline approach was envisioned by the 1972 CWA to be an interim step, with the eventual goal of an elimination of all pollutant discharges.

Since 1972, EPA has established effluent limitation guidelines for 56 industry sectors. EPA has not finalized any new effluent guidelines since 2003.

If a sector has no effluent limitation guideline associated with it, it is up to the permit writer to establish site-specific technology based limits to control the discharge. Under Section 304(b) of the CWA, EPA must identify and generate effluent limitation guidelines for those industry sectors that generate more than trivial amounts of toxic or "nonconventional" pollutants.

Pursuant to Section 307(a) of the CWA, EPA has identified a class of toxic pollutants known as "priority pollutants." EPA must develop effluent limitation guidelines for these substances.

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[18] Donn, J., et al., 2008. "AP Probe Finds Drugs in Drinking Water." *USA Today.* 9 March 2008; Mendoza, M. 2008. "AP Enterprise: Recent Tests Detect Pharmaceuticals in Drinking Water of 46 Million Americans." *Los Angeles Times.* 12 September, 2008.

[19] Rapid Public Health Policy Response Project. 2008. *Pharmaceuticals are in the Drinking Water: What Does it Mean?* George Washington University School of Public Health and Health Services.

Currently, 126 specific toxic substances are listed on the priority pollutant list (this list was generated from 65 pollutants and classes of pollutants.)

Water Quality Standards: In those instances where a technology-based permit (or secondary treatment limits for treatment works) is not sufficiently stringent to meet state-established water quality standards for the water where the discharge is located, the Clean Water Act requires the implementation of more stringent, water-quality based effluent (discharge) limits to ensure that water quality standards for the waterbody are met.

Following implementation of the technology-based controls (developed as part of traditional effluent guidelines), if a water body is still impaired, the Clean Water Act requires the development of water-quality based discharge limits for those chemicals or pollutants that are causing the impairment of the waterbody. However, unlike the technology based effluent limits, water-quality based limits do not require a cost-benefit analysis, but are focused on establishing specific discharge limits for pollutants that are known to cause water quality impairments to receiving waters.

Accordingly, the framework of the Clean Water Act provides a process for the identification of specific waterbodies where the technology-based limits fail to achieve water quality standards for identified pollutants, as well as a mechanism for imposing further discharge limits on those identified pollutants that, if properly, implemented, should result in the waterbody meeting state-established water quality standards.

WITNESSES

Panel I

Honorable Carolyn McCarthy
Congresswoman
4th District of New York

Panel II

Honorable Benjamin Grumbles
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United States Environmental Protection Agency
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Dr. Matthew Larsen
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Commissioner, Department of Environmental Protection
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Mr. Keith Linn
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The National Association of Clean Water Agencies

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HEARING ON EMERGING CONTAMINANTS IN U.S. WATERS

Thursday, September 18, 2008,

HOUSE OF REPRESENTATIVES,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
SUBCOMMITTEE ON WATER RESOURCES AND ENVIRONMENT,
Washington, DC.

The Subcommittee met, pursuant to call, at 2:00 p.m., in Room 2167, Rayburn House Office Building, the Honorable Eddie Bernice Johnson [Chairwoman of the Subcommittee] presiding.

Ms. JOHNSON. I would like to call the Subcommittee to order. This afternoon, we will be holding a hearing on emerging contaminants in U.S. waters, and we will try to move expeditiously for those who are operating under time constraints.

Today's hearing looks at the extensive range of emerging contaminants that are present in our surface waters. Many of these substances are either unregulated or under-regulated and include toxic chemicals, pesticides, pharmaceuticals, and nano-materials.

As many of you know, I spent my early years as a nurse—and we have a nurse facing us out there—and it is from that experience that I have been very mindful of threats, especially unnecessary threats, to human health.

However, I am concerned with the growing body of evidence on the presence of toxic chemicals and their byproducts in the Nation's waters and question just how safe our waters actually are, especially to human health over the long term.

While the Clean Water Act was successful in controlling some substances, it is clear that today's contaminants of concern are not the pollutants of yesteryear. For example, there are currently 80,000 chemicals in use. This is a three-fold increase from 1941 to 1995. Eight thousand of these are known to be carcinogenics.

One would hope that all of these 8,000 cancer-causing poisons are somehow addressed under Federal and State authorities, including the Clean Water Act. Shockingly, this is not the case. It seems that less than 300 chemicals have permit limits. Today's hearing provides us the opportunity to ask why this is the case.

It is not as if emerging contaminants are new issues of concern for either the Congress or the EPA. In 1996, through the Food Quality Protection and Safe Drinking Water Acts, the Congress instructed EPA to develop a screening program to determine if certain chemicals and compounds disrupt hormones in humans. In the 12 years since this mandate was put forward, the Agency has not begun to test any chemicals under this program, despite the poten-

tial for these chemicals and compounds to cause great harms to individuals, especially to children and pregnant women

Testimony from the U.S. Geological Survey will demonstrate that these endocrine disrupting chemicals, and many other toxic substances, are in our surface waters. Not only have they been demonstrated to harm aquatic life, they have the grave potential to harm humans.

I look forward to hearing from our witnesses today about how these chemicals, these emerging contaminants, are getting into our waters.

Our former Defense Secretary, Don Rumsfeld, famously stated: "There are known knowns. There are known unknowns. But there are also unknown unknowns."

While perhaps it is a clever quip, we certainly saw how a reliance on such platitudes rendered our situation in Iraq during his tenure. We would certainly hope that our Nation's Environmental Protection Agency is not taking the same approach with regards to unregulated toxic chemicals.

Frankly, when it comes to the health of the very young, to pregnant woman, and to the elderly, there is no excuse for not knowing.

I look forward to the testimony from our witnesses today on this very important hearing. I now yield to the Subcommittee's Ranking Member, Mr. Boozman.

Mr. BOOZMAN. Thank you, Madam Chair. First of all, I want to congratulate you and Dr. Ehlers and the staff for the passage yesterday of the Great Lakes Legacy Act. That is something that I think that the Subcommittee can be very, very proud of, and we appreciate your leadership.

Today, the Subcommittee begins to explore a new and important topic: micro pollutants in U.S. waters, sometimes referred to as contaminants of emerging concern.

With the advent of better detection equipment, we are discovering a number of chemicals in our water that previously we have not considered. These substances may be naturally occurring or they may be manmade. Of those that are manmade, many are associated with human, industrial, and agricultural waste, including antibiotics, other prescription drugs, steroids, reproductive hormones, personal care products, products of oil use and combustion, pesticides, fire retardants, solvents, and the list goes on and on.

These chemicals have been found in surface water downstream of urban center and livestock production areas. Many of these compounds seem to survive wastewater treatment. Some of these substances have also been found in the untreated drinking water sources for several U.S. cities. Where they are found, the concentrations of these chemicals so far has been relatively low and being compared to finding a drop of pollution in an Olympic-size swimming pool. Such low concentrations may not have any adverse human health effects, but we do not know how long these concentrations will remain low.

We know that current drinking water and wastewater treatment processes are not designed to remove many of these substances, including pharmaceuticals. We know that at high concentrations, many of these contaminants have an adverse effect on the environ-

ment and on human health. We know very little about the chronic effect of low doses over extended periods of time.

While there is a lot we do not know about the potential effects these substances might be having, we do know for certain that proper use of pharmaceuticals and industrial chemicals have enriched the quality of our lives and our Nation's economy. These are benefits that we certainly want to preserve. It would appear to me that there is a lot we do not know about the presence of these substances and to what degree they are actually a threat to human health and the environment. We certainly need to know a lot more before we decide on any regulatory course of action.

I hope to learn more from the hearing today from this panel of expert witnesses. Hopefully, they can help us understand what is already known and what we still need to know about contaminants of emerging concerns in U.S. waters.

I yield back, Madam Chair.

Ms. JOHNSON. Thank you very much.

We will ask all Members to file their statements and they will be a part of the permanent record. We will go directly to our witnesses, since we are starting late.

I am pleased to have a distinguished Member of the House testifying on our first panel, Congresswoman Carolyn McCarthy, from the State of New York.

Your full statement will be placed into the record, and if you can keep your comments to five minutes, we would appreciate it. And consistent with the Subcommittee practice, Members will not receive questions following the testimony, but, if we have some, we will contact you later. You may proceed.

TESTIMONY OF THE HONORABLE CAROLYN MCCARTHY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Ms. MCCARTHY. Thank you, Chairwoman Eddie Bernice Johnson, and I want to thank Ranking Member John Boozman and Members of the Committee for holding this hearing and inviting me to testify.

I commend the Chairwoman for all your hard work to keep our Nation's waters clean; not just by holding this hearing, but also moving the Water Resources Development Act and Beach Protection Act, important legislation to ensure that our beaches are safe for swimming, which the House took up before we entered the summer beach season.

I appreciate the opportunity to testify before you specifically about pharmaceuticals in our Nation's waters.

As you know, when the House took up H.R. 2357, the Beach Protection Act of 2007, I offered and withdrew an amendment to the bill. We engaged in a colloquy about pharmaceutical products in our Nation's waters. I asked that hearings be held, and we agreed to work together on legislation to address this issue. That brings us here today, and I commend the Committee for acknowledging that we must begin to understand this important issue so that our constituents can feel confident when they are drinking clean, safe water.

An Associated Press study from March brought to light the fact that pharmaceuticals have been found in the drinking water supply of at least 41 million Americans. Last week, the AP did a follow-up study that found that even more Americans were affected by the contaminated water, approximately 46 million.

In my State of New York, health officials found heart medicine, infection fighters, estrogen, mood stabilizers, and a tranquilizer in the upstate water supply. Six pharmaceuticals were found in the drinking water right here in Washington, D.C. We don't know how the pharmaceuticals enter the water supply, but it is likely that some medications that are not fully absorbed by the body may have passed into the water through human waste. In some other cases, unused pills may have simply been flushed down in the toilet. Additionally, some agricultural products and medications may have run off into the groundwater supplies.

In addition to antibiotics and steroids, EPA has identified over 100 individual pharmaceutical and personal care products in environmental samples and in drinking water. Wastewater treatment plants appear to be unable to completely remove pharmaceutical products from the water. The presence of the pharmaceuticals in our Nation's waters raise serious questions about the effects on humans and on wildlife.

I, along with my colleagues Representative Tammy Baldwin of Wisconsin and Allyson Schwartz of Pennsylvania, have introduced legislation that would require the EPA to conduct a study on the presence and source of pharmaceuticals and personal care products in our Nation's water.

Pharmaceuticals and personal care products include prescription and over-the-counter therapeutic drugs, veterinarian drugs, fragrances, lotions, and cosmetics, as well as products used to enhance growth of health of livestock.

H.R. 6820, the Water Assessment and Treatment Evaluation Research Study Act of 2008, or the WATER Study Act, includes a three-part report to be carried out by EPA working with other relevant Federal agencies. An initial report, due in one year after the bill is passed, calls for an analysis of what pharmaceuticals and personal care products are in the water, where they come from, and how we can regularly monitor for them.

An interim report due in three years looks at the effects the products have on human and animal health, as well as methods to remove the products from our drinking water supply. A final report asks for an analysis of the long-term effects on human exposure to pharmaceutical products in our waters and the levels at which the products in our waters become harmful.

The report is broken into three pieces because many interested groups explained the difficulty in completing a report from all the elements too soon, but some items we can know pretty quickly and can begin to respond to them in a better matter. Furthermore, initial results will prompt responses from the scientific community, which can also help form the basis of the items to be studied in the future reports.

The final report asks for an update on all the findings from the initial and the second reports. The report will be used as part of

the Government's efforts to better understand the effects pharmaceuticals in our waters have on human health and aquatic wildlife.

I want to stress that my legislation is not intended to make any presumptions or accusations, or even say that a problem does exist. We are just looking for more information so we can make better informed choices and eventually move towards more sensible policies. Hopefully, the study will give us more information about the presence, source, and effects of the products that are in the water so we can begin efforts to ensure that the water is safe.

We need to find out how these contaminants got in the water, what the risks are, and what steps we need to take to solve the problem. We need to know how are the pharmaceuticals entering the water supply? How much is in the water? What else is in the water that we do not know about yet? What are the effects on human health and plant life? What is the best way to dispose of pharmaceuticals? And how should we great water that has been contaminated with these products?

How is existing Federal legislation, such as the Clean Water Act and Safe Drinking Water, sufficient to address the new products that we are finding?

It is vital that Congress take up and champion the cause of keeping our coastal recreation and drinking water safe. This is a public health issue and we must act before the presence of pharmaceutical products reaches a crisis level. This study is a first and very important step in the process of addressing this issue. We need to accurately assess the risks of these contaminants in the water because some experts have suggested that the problem will only increase. We have seen a 12 percent rise over the last five years alone.

I know that my bill, H.R. 6820, has been referred to the Energy and Commerce Committee because it focuses so much on addressing safe drinking water in specific, but I do recognize that this Committee handles the Clean Water Act, so it is important that we look at all of our Nation's waters as well, including source water, to see where the problem begins. We can't fully address safe drinking water without looking at the whole entire water system.

I look forward to working with all of you, including the EPA, the water treatment companies, the drug companies, agricultural interests, and others to combat this issue. Before dropping the bill, we reached out to many different parties and will continue to talk. I know that we can come to an agreement on this issue, including efforts to educate people about safe disposal of medication.

Just on a side, as all of us, you know, we go to the doctor, we get a prescription drug and we find, after a day or two, that we can't take that drug—maybe we have a reaction to it—and you have 40 pills. I asked the doctor, what can I do with the pills. He didn't know. So they are still sitting in my medicine cabinet because I don't want to dispose of them any more because I am afraid they will get into our water system.

Madam Chairwoman, I again commend the Committee for holding this very important hearing, would be happy to answer any questions, and look forward to working with you and the Committee as we go forward. Thank you very much.

Ms. JOHNSON. Thank you very much. We will not have questions for you. Thank you very much for coming.

Our second panel of witnesses consists of EPA's Assistant Administrator of Water, Mr. Benjamin Grumbles; Dr. Matthew Larsen of USGS. Dr. Larsen is the Assistant Director for Water at the USGS and is accompanied today by Mr. Herb Buxton, the Program Coordinator of the Toxics Program at USGS; Mr. David Littell from the State of Maine's Department of Environmental Protection. I am going to ask him to start testimony first because he has to leave.

Following him will be Mr. Keith Linn, Environmental Specialist of the Northeast Ohio Environmental Sewer District, and Mr. Linn will be testifying on behalf of the National Association of Clean Water Agencies. We will then hear from Dr. Tee Guidotti, Chair of the Department of Environmental and Occupational Health at the George Washington University. Our final witness on the second panel is Mr. Peter deFur, Research Associate Professor from the Center of Environmental Studies at the Virginia Commonwealth University.

Your full statements will be placed in the record, and we ask that you try to limit your testimony to five minutes as a courtesy of the other witnesses. Again, we will proceed with Mr. Littell.

TESTIMONY OF DAVID LITTELL, COMMISSIONER, MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, CHAIR, CROSS MEDIA COMMITTEE, ENVIRONMENTAL COUNCIL OF THE STATES, AUGUSTA, MAINE; THE HONORABLE BENJAMIN GRUMBLES, ASSISTANT ADMINISTRATOR FOR WATER, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.; MATTHEW LARSEN, ASSOCIATE DIRECTOR FOR WATER, UNITED STATES GEOLOGICAL SURVEY, RESTON, VIRGINIA, ACCOMPANIED BY HERB BUXTON, PROGRAM COORDINATOR, TOXICS PROGRAM, UNITED STATES GEOLOGICAL SURVEY, WEST TRENTON, NEW JERSEY; KEITH LINN, ENVIRONMENTAL SPECIALIST, NORTHEAST OHIO REGIONAL SEWER DISTRICT, CLEVELAND, OHIO, TESTIFYING ON BEHALF OF THE NATIONAL ASSOCIATION OF CLEAN WATER AGENCIES; TEE L. GUIDOTTI, CHAIR, DEPARTMENT OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH, SCHOOL OF PUBLIC HEALTH AND HEALTH SERVICES, THE GEORGE WASHINGTON UNIVERSITY, WASHINGTON, D.C.; AND PETER DEFUR, RESEARCH ASSOCIATE PROFESSOR, CENTER FOR ENVIRONMENTAL STUDIES, VIRGINIA COMMONWEALTH UNIVERSITY, RICHMOND, VIRGINIA

Mr. LITTELL. Good afternoon, Chairwoman Johnson, Ranking Member Boozman, Members of the Committee. Thank you for accommodating my schedule. I am David Littell, Commissioner of the Maine Department of Environmental Protection. Thank you for inviting me here to testify on Maine's experience with emerging contaminants.

As a representative of the States, I hope to leave you today considering three issues. One is that the States simply do not have sufficient information nor resources to fully understand the human or environmental impacts of emerging contaminants in the waste streams, our waters, or our ecosystems. Two, there are certain characteristics of some substances that suggest a need for caution.

Those substances are particularly carcinogens, reproductive and developmental toxics, endocrine disruptors, persistent and very persistent substances and biocumulative and very bioaccumulative substances. Third, the States have established, in some cases, common sense and very practical innovative approaches to dealing with some of these issues outside the regular regulatory construct, and we will commend some of those approaches to the Federal level as well.

Maine's scientific and regulatory community has been looking at what we are calling emerging contaminants for well over a decade now. In 1995, Dr. Beverly Paigen, a scientist at Maine's internationally renowned Jackson Laboratory, discussed endocrine-disrupting chemicals in a technical paper prepared for the Maine Environmental Priorities Project.

In that paper she noted concerns regarding biological, human, and wildlife impacts, including increased incidents of certain cancers, particularly reproductive impacts including human reproductive impacts, and congenital abnormalities, among other factors. As a result of that paper, Maine joined with USGS and the EPA to conduct limited sampling in Maine that supplemented the national sampling to determine to what extent some of these emerging contaminants of concern were in our waters.

In 2002, Maine submitted samples to U.S. EPA Region I for wastewater effluents and associated receiving water discharges in eight locations in Maine. These were scanned for only six emerging contaminants. In the majority of these samples, detectable amounts of certain contaminants were found in the majority of the samples, particularly, bisphenol-A was detected, triclocarban, which is an antibacterial agent in soaps, and detectable amounts of an emulsifier used in detergents and pesticides were found. In addition, in the majority of samples, one or more estrogen-like compounds were detected.

In 2005, Maine also dedicated a portion of our limited funding to study the presence of estrogenic compounds in the effluent of three publicly owned treatment plants on the Penobscot River. In each of these discharges from our public sewer treatment plants, effluent was determined to be estrogenic when it was discharged to the Penobscot River.

What is the significance of these limited efforts today? Well, the significance is, although the data is sparse, we have clearly determined that wastewater discharges in receiving water bodies have levels of some emerging contaminants which could impact at a biological level aquatic life. That is a significant concern.

Furthermore, we do not know what the cumulative effect is of multiple contaminants such as endocrine disruptors which are discharged to water bodies.

In addition, impacted populations can be difficult to predict, and let me use a particular example from Maine to illustrate that. Maine has been studying the impact of mercury in our ecosystems since at least 1980, significantly. The conventional wisdom until very recently was that mercury issues were primarily aquatic ecosystem issues, the belief being that mercury was deposited in rainwater, as well as snow, into our aquatic ecosystems and worked its

way up the food chain, ultimately ending up at the top end predator species—eagles, loons, and, of course, humans.

Very recently, the BioDiversity Institute in Maine conducted extensive samples of 23 different bird species—ocean species, coastal wetland species, upland species, and inland wetland species. What they found is that certain species that have no direct contact with the aquatic ecosystem had mercury levels that were much higher than were expected. So we now know that we have a terrestrial ecosystem problem with mercury, where we don't entirely understand the mechanism of fate and transport and how the mercury is getting into the birds, but we clearly have an issue that until very recently we didn't realize we had in our terrestrial ecosystem.

In addition, persistence, fate, and transport can be hard to predict, and by way of example of that I would offer the DDT example. Maine banned DDT four decades ago, and the United States followed in 1972. Despite that, we still have three river systems in Northern Maine that are under fishing advisories for DDT, and, of course, the situation is more significant nationally.

In short, there is a lot that we don't know when gaging the significance of the release of many of these potential emerging contaminants into our ecosystems.

What we do know is that there is an ongoing need for additional research needs to determine the environmental and human health impacts of these contaminants when they are released into the environment, also, to determine the human health toxicology and the eco-toxicology of these contaminants. Along the way, we have observed, as Ranking Member Boozman said in his opening statement, that wastewater treatment plants do not do a good job of treating for many of these contaminants. They are not designed to do so and, in many cases, they simply do not do so.

However, there are other alternatives besides the traditional Clean Water Act approaches to controlling some of these contaminants. At the State level, we and other States have pioneered product stewardship initiatives, and particularly in the area of pharmaceuticals, in 2003, Maine was the first State to pass legislation authorizing a mail-in rebate program for unused pharmaceuticals.

Since then, many entities have worked on the details of working that out because, as you might imagine, with pharmaceuticals they are a little bit different, some of them are controlled substances, so the drug enforcement authorities had particular concerns with how the program was designed and my own agency had concern because some of them qualified as hazardous waste, so they had to be dealt with a little bit differently than some other product stewardship initiatives.

Nonetheless, we have successfully ironed out all the details and, in 2007, the U.S. EPA awarded a $150,000 grant to the University of Maine's Center for Aging, which launched a statewide mail-in rebate program. We expect that rebate program to remove 3,000 pounds of unused pharmaceuticals from our waste streams in Maine. Those 3,000 pounds of pharmaceuticals will not go into our water of the United States or water of the State of Maine, which is our groundwater.

Maine's experience can be replicated and expanded nationally. In May of 2008, the international pharmaceutical company Roche pub-

licized financial incentives to ensure that unused and outdated products are returned by retailers and others in the supply chain. Roche participates in pharmaceutical take-back programs in the EU and encourages those types of programs in the United States, but more could be done to work on those types of programs.

While the overall structure of the Clean Water Act does not inhibit our work in this area and it is possible to use the traditional water quality criteria for individual toxics under the Clean Water Act, it is probably more effective to institute product stewardship initiatives to prevent these contaminants from entering the waste stream in the first place.

In addition, I would respectfully submit that revisions to the Toxic Substance and Control Act would help ensure that the toxicity of the human health toxicity, as well as ecological toxicity, is better defined for existing chemicals that are in commerce and new chemicals before they are introduced in commerce.

With that, I am happy to answer any questions the Committee might have, and, again, thank you for asking us to testify today.

Ms. JOHNSON. Thank you very much. We will ask the Committee Members to submit questions to you later, since it is just about time for you to walk out.

Mr. LITTELL. Thank you, Congresswoman.

Ms. JOHNSON. Thank you.

We will now go back to our regular order and ask Mr. Grumbles to start his testimony.

Mr. GRUMBLES. Thank you, Madam Chair and Congressman Boozman. It is always an honor to appear before the Committee. I just want to say, if this does end up being one of the last times to appear before the Committee, what an honor it has been to work with you all. You identify the right issues, the key concerns, and that is what today is all about. EPA is concerned about pharmaceuticals and personal care products in water, but we are also concerned that utilities and communities not divert their resources and efforts away from higher priorities and risks.

Therefore, EPA has developed a comprehensive four-pronged approach to deal with this emerging concern of different types of contaminants that are not currently regulated, particularly pharmaceuticals and various personal care products. The first prong, one of the most fundamental, is to strengthen the science. We all know, and I am sure that this panel will understand that there is a lot for us to learn. We need to help close the gap between what we know what we don't know and what we need to know.

The Agency is carrying out extensive studies and surveys at a national level and at a regional level to help close gaps in that first prong. I just want to mention a few of them. One of them is that we are conducting a study at nine sewage treatment plants to better understand what is going into the plant for treatment and what is coming out of the discharge. We have also conducted a pilot study on fish tissue looking for the presence of pharmaceuticals and other personal care products in fish tissue in five effluent-dominated streams across the U.S.

Madam Chair, we are also conducting a national survey of sewage sludge from 74 randomly-selected wastewater treatment plants to determine whether contaminants occur in biosolids and, if so, at

what concentrations. We have also carried out and will continue to issue grants to various organizations and work with research foundations and universities, including the University of Florida and Duke University. We are working with them and providing funding to help get answers to questions involving different types of contaminants of emerging concern.

Madam Chair, we are also conducting something that is extremely important to the Agency, and that is to build upon the fish tissue studies that we have currently conducted. That is why we are expanding the scope of our surveys under the National Rivers and Streams Assessment to monitor for fish tissue and water samples at 154 developed and urban sites so that we can have a statistically representative estimate of the occurrence of pharmaceuticals and personal care products in fish tissue.

We are also working, Madam Chair, with the National Research Council of the National Academy of Sciences. A critical question all of us are asking is to what extent does this present a risk to human health. So EPA will be working with the National Academy of Sciences and convening a workshop in December to help us all answer some of those fundamental questions about potential risks to human health.

I would just reiterate to the Members and to the public that, so far, we do not have much evidence or information that there is a risk to human health. But I also would underscore that U.S. EPA is very concerned about potential impacts, impacts that we, USGS, and others have seen on aquatic life.

Madam Chair, the second prong, in addition to strengthening the science, is to improve the public understanding and risk communication. We have established a Web site to provide information on the work that we are doing and to help utilities, health professionals, and the general public better understand and to put into proper context the nature of this risk, and we will continue to reach out to all our stakeholders and partners at the State level, at the local level, and in the private sector to underscore the importance of this issue and to improve upon risk communication.

The third prong that we are focused on at U.S. EPA at a national level is identifying partnership and stewardship opportunities. We know that, as we wait for more information to come in for a verdict to be rendered from the scientific jury, we know that actions should be taken now. One of the key steps is to do more in terms of product stewardship. I am calling upon the pharmaceutical industry to do more to focus more on product stewardship. I think all of us can do more in the spirit of pollution prevention.

The EPA, the Office of National Drug Control Policy, and the Department of Health and Human Services has issued guidelines to help the public better understand that the toilet should not be treated as a trash can. We also recognize that there are lists of certain pharmaceuticals that may currently be labeled to be flushed down the toilet. We are working with various agencies to revise that list, but pollution prevention and stewardship are key.

One of the most important things all of us can be doing, including this Committee, is to get out the word to the public that take-back programs and voluntary collection campaigns can be critically

important and a good way to protect the waterways as we gather more scientific information.

Mr. Chairman, the fourth prong, a critically important one, is using regulatory tools. We know, at EPA, that regulations are needed, in addition to stewardship and partnership programs. I want to mention very quickly that there are several extremely important regulatory efforts underway that could lead to potential regulations under the Clean Water Act.

One of them is under our effluent guidelines program, which involves conducting a comprehensive survey, gathering information on disposal practices for the health services industry—hospitals, nursing homes, veterinary clinics. EPA is watching the health services industry. We are going to work with them. We want all of them to work together to move the ball forward for more effective and appropriate disposal of unused pharmaceuticals and personal care products.

We are also working to revise aquatic life criteria—a technical term under the Clean Water Act—which is also critically important. It means developing assessment methodologies so that we can do a more advanced job of translating endocrine disruption, gender-bending effects on aquatic life, and translate that into the standards program under the Clean Water Act. A third area is the Contaminant Candidate Listing process under the Safe Drinking Water Act. We are looking very closely at potential pharmaceuticals and personal care products being added to the lists of potential contaminants that would, in the future, be subject to maximum contaminant levels.

The bottom line, Mr. Chairman, is that the U.S. EPA is taking this matter very seriously. We are using a four-pronged approach. We know that we need to work with USGS and other Federal partners. We need to work with all of the governmental and non-governmental organizations to move forward and address these emerging contaminants in the most responsible and effective way possible, and I look forward to answering any questions the colleagues of the Committee may have. Thank you.

Mr. TAYLOR. [Presiding] Thank you very much, Dr. Grumbles.

We are now joined by Dr. Matthew Larsen of the USGS. Dr. Larsen is the Associate Director for Water at USGS. He is accompanied today by Mr. Herb Buxton, the Program Coordinator of the Toxics Program at USGS. Dr. Larsen is recognized for five minutes.

Mr. LARSEN. Thank you, Congressman Taylor and Congressman Boozman and Members of the Subcommittee for the opportunity to provide the views of the U.S. Geological Survey Department of Interior on emerging contaminants in the environment.

The observed presence of emerging contaminants in the environment has prompted public interest regarding potential adverse ecological effects and potential contamination of drinking water. Public awareness of the ways we handle and dispose of chemicals has increased. Industries are pursuing improved waste treatment technologies and management practices that are effective at removing these trace organic chemicals from surface and groundwater and waste products.

The USGS studies a wide range of chemicals referred to as emerging contaminants. These chemicals include human and vet-

erinary pharmaceuticals, detergents, fragrances, fire retardants, disinfectants, plastics, and insect repellents. The chemicals of greatest interest include those that enter the environment via human and animal waste.

Many of these chemicals are a new focus for environmental research because they are used in relatively small quantities and were therefore not expected to be of significant environmental concern. They have been detected increasingly in the environment at very low levels. Despite these low levels, investigation is needed to determine if there are potential adverse environmental and human health effects.

Although detection is an important component of the environmental assessment, ecological and human health assessments of the levels and mixtures observed in the environment are also essential. Research and monitoring by the USGS and others have demonstrated that many trace organic chemicals associated with human and animal waste have been entering the environment for as long as we have used them. The manner in which we handle and dispose of our waste can concentrate these chemicals in some environmental settings to levels that may be an ecological health concern.

In 1998, the USGS initiated research on emerging contaminants. By 2002, a USGS study had documented the presence of these chemicals in the Nation's streams and largely defined this issue in the United States. Since 2002, the USGS has published more than 160 reports—some of which I have here—that document the occurrence, concentration, and mixtures of these chemicals in various environmental settings, including stream and well water, stream sediments, and soil amended with manure and biosolids. These reports also demonstrate the comparative contributions from various sources, including wastewater treatment plants, livestock production and animal feedstock waste, aquaculture, septic systems, combined sewer overflows, and industrial discharges.

The USGS continues to conduct research on emerging contaminants in the environment. Our research priorities include assessing chemical loads from various sources, including industrial facilities, as well as the occurrence of emerging contaminants in waters that are the source of drinking water. Other research priorities include ecological effects such as fish endocrine disruption in streams enriched with wastewaters and the comparative performance of various water and waste treatment processes to remove emerging contaminants.

The USGS conducts this research with a number of partner Federal agencies, including the EPA, Centers for Disease Control and Prevention, Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration. The USGS, EPA, and FDA cochair the Federal Interagency Work Group on Pharmaceuticals in the Environment and the USGS participates in the Endocrine Disruption Work Group, both under the auspices of the Committee on Environment and Natural Resources of the National Science and Technology Council. These work groups have further increased coordination of Federal research.

Thousands of potential emerging contaminants are used in our homes and places of work to improve our health and quality of life.

USGS focuses research on those chemicals that are likely to be of environmental concern. Investigations of adverse health effects must consider the actual levels and mixtures of chemicals that organisms are exposed to in the environment. The results of USGS studies of environmental occurrence are used by many scientists to guide human and ecological health effect studies to assure that actual environmental conditions are being tested.

Thank you, Mr. Chair and the Subcommittee, for the opportunity to present this testimony.

Mr. TAYLOR. Thank you, Doctor.

Our next speaker will be Mr. Keith Linn, Environmental Specialist with the Northeast Ohio Environmental Sewer District. Mr. Linn will be testifying on behalf of the National Association of Clean Water Agencies.

Mr. Linn, you are recognized for five minutes.

Mr. LINN. Congressman Taylor, Ranking Member Boozman, and Members of the Subcommittee, thank you for the opportunity to provide testimony on the emerging contaminants making their way into the Nation's waters. My name is Keith Linn, and I am an environmental specialist for the Northeast Ohio Regional Sewer District in Cleveland, Ohio. I am testifying on behalf of NACWA, which represents the interests of municipal wastewater agencies nationwide.

The purpose of this testimony is to provide the Subcommittee with a sense of the state of science on emerging contaminants and the major data gaps that still exist, to explain the increasing public and media attention this issue is receiving, and to explain that sound science, not fear, must be applied to this issue about which we still have so much to understand.

These compounds are often described as emerging contaminants, despite the fact that many have been in the environment for a long time, ever since society began producing and using them. However, human use of the products containing them is expanding, meaning that more of these products are ending up in the environment.

While households and individuals represent a huge non-regulated source of these products, other significant sources include manufacturing, retailers, hospitals, veterinary operations, landfills, and meat processors, just to name a few. However, no one has been able to confidently rank the relative contribution from each of these categories or their relative risks to human health in the environment.

Increasingly sophisticated technology is revealing the presence of chemical compounds at lower and lower trace levels, down to nanograms per liter concentrations. A person would have to drink two Olympic-size swimming pools of untreated water from Cleveland's Cuyahoga River daily to ingest as much as a single therapeutic dose of an antibiotic detected in the river. Stated another way, these concentrations are so small that they are roughly equivalent to one second in the last 10,000 years, that is, a single second in the time from the earth's last ice age until now.

Yet, presence alone is fostering awareness of and anxiety about emerging contaminants. The Associated Press released several stories earlier this year that focused on trace amounts of pharmaceuticals and other compounds in the drinking water of 24 cities.

The question is whether trace concentrations of these emerging contaminants in the Nation's waters have a negative environmental or human health impact, and what the respective roles should be for manufacturers, retailers, users, and wastewater and drinking water utilities.

However, identifying which emerging contaminants are of the greatest concern is exceedingly difficult, as many of these compounds are designed to have effects at low concentrations. Additionally, there is little or no data on the ecological toxicity of most of these compounds, and performing chemical analyses on all of them would be prohibitively expensive. We need to recognize that we can never have enough data to prove the absolute safety of contaminants, as it is impossible to prove a negative.

Nonetheless, when people read or hear reports of possible effects in fish, they often become concerned about similar effects occurring in humans. This issue could be significant for wastewater utilities if regulations and subsequent technology standards arise out of a public perception that a problem exists.

The Northeast Ohio Regional Sewer District is actively involved nationally through membership on the NACWA Emerging Contaminants Work Group and on the Water Environment Research Foundation's Trace Organics Issue Area Team. Locally, the Sewer District has spearheaded the creation of a multi-agency used medication work group. This local work group has developed an outreach campaign to educate the public on proper medication disposal methods and it seeks to establish a regular and legal medication collection initiative.

NACWA has been involved in efforts to remove from commerce potentially harmful products that add little or no practical value, such as soaps and detergents containing triclosan. NACWA has also participated in discussions with EPA on permethrin-impregnated clothing and copper and silver biocides that may create problems for aquatic life. The Association has established a partnership with the Product Stewardship Institute to develop a comprehensive approach for managing the disposal of unused pharmaceuticals and personal care products, and many of NACWA's member agencies have established pharmaceutical take-back programs to keep these compounds out of the environment altogether.

However, product stewardship initiatives such as drug take-back programs face numerous barriers, including Federal narcotics laws and guidelines that continue to advise certain prescription drugs be flushed into the sewer system. At the same time, EPA and other regulatory agencies may ultimately require utilities to remove these same drugs from their wastewater effluent. Clearly, preventing illicit drug use must be of a priority, but NACWA feels strongly that there are better ways of managing prescription drugs without resorting to disposal in the sewer system.

In addition, NACWA strongly encourages Congress to address other emerging contaminants in a cooperative manner with the regulated community. Before regulation of any contaminants can be contemplated, EPA must first answer whether, and at what levels, these compounds can reasonably be expected to result in effects on human health or the environment. Substantially greater funding for the appropriate research is needed before broad national

regulatory strategies are implemented. In the meantime, opportunities exist for collaboration and innovation, including research, community collections, take-back programs, and aggressive public education campaigns.

Thank you for your time and the opportunity to testify before the Committee. I would be happy to answer any questions you may submit.

Ms. JOHNSON. [Presiding] Thank you very much.

Mr. Guidotti.

Mr. GUIDOTTI. Thank you very much. Chairwoman Johnson and honorable Members, I am Tee Guidotti. I have retired as chair, but I remain Professor in Environmental and Occupational Health at the George Washington University School of Public Health and Health Services. I am here today representing only myself, however.

Advanced testing technology has quantified the amounts, but neither the levels nor the range of contaminants should be a surprise to us; we have known that these substances are in water. It shouldn't be any surprise, either, that these substances are present, that they exist wherever there is an upstream source. At present, these levels are probably not enough to affect human health, but, if levels rise for any of a number of reasons, this possibility cannot be ruled out for the future.

Why would they rise? Well, for one thing, the population is aging. More and more people are taking medications. For another, there are changing patterns of prescriptions. So the burden of pharmaceuticals is likely to not only increase, but to change in terms of its pattern. And the population of various communities are increasing, so that upstream loading of the waterways is likely to increase.

I see two issues, two broad issues. One are trace organics, particularly pharmaceutical agents, which are widely dispersed. And I would include, by the way, silver and copper nanoparticles, because I think that this is an emerging issue that we are going to see much more of in personal care products and in hygienic products. The other problem is emerging contaminants of a more restricted nature.

For the pharmaceuticals and similar trace organics, I think that we need a comprehensive program on a national level. I think that we need a commitment and comprehensive programs to enforce watershed protection and upstream source protection; and this may involve land use planning, because this is not the only issue that affects watershed integrity and upstream protection. We clearly need take-back programs and we need coordination with DEA. A great deal has already been said about this, I won't repeat it. We need a well designed evaluation and monitoring program to determine national trends for the loading of trace organics in source water.

We don't need individual utilities to invest valuable funds that could better be used to treat the source and to create mitigation technologies as their infrastructure needs are met, rather than to conduct monitoring programs in each individual city and drinking water system. Personally, I think that would be a waste of re-

sources. We know that we need to know the general trend; we don't need every single utility to do it for themselves.

We need a research program that is robust and cost-effective looking at multivalent water treatment technologies that break down and remove a broad spectrum of contaminants, because many of these contaminants are, at present, best removed through singular and rather expensive technologies that only work for a limited range of chemicals. And we need the deployment of technologies to remove contaminants, which I personally think is best done as a program of continuous improvement as infrastructure needs are taken care of, rather than a crash program, which would be much more expensive and which would change priorities from other more pressing issues with respect to water quality.

That is one set of problems. Another set of problems are emerging contaminants of a more restricted nature, and this includes quite a long list. It is in my written remarks, I won't repeat the list right here. But these point source emerging contaminants need to be handled differently. Generally speaking, they are local problems. We need systematic research and tracking where they are most likely to occur, and the solution for these issues is more likely to be local and targeted, rather than a minimal to a national strategy.

Finally, the last thing I would like to say is that we need to be aware that the recognition of other very heterogeneous sets of water pollutants raises another issue which should be considered, and that is the issue of simultaneous compliance. As we have seen with the lead issue, where compliance with the disinfection byproduct rule inadvertently pushed many utilities into water chemistry secondary effects, which forced them out of compliance with the lead and copper rule, we need to have a more integrated approach. We need to have a research that looks at the compatibility of various regulations in water quality. The best way to do this, I think, is to adopt new regulatory models if there are multi-contaminant and multiple risks.

We need to think through the integration of the Clean Water Act and the Safe Drinking Water Act, rather than having the current fragmentary system, which is quite different with each State. We need to conduct research from the utilities point of view and on local water chemistry to better embed public health research in the regulatory frameworks and monitoring, and acknowledge the role of education and communication for the informed public.

I just want to say one thing very quickly in closing, and that is that there is an aura of uncertainty and, if you will, anxiety about water that I think, to a large extent, is exaggerated, and we are beginning to see this in opposition to disinfection in drinking water, which is a catastrophic potential move if that movement ever gained force. People are becoming cynical about their water. I think we need steps and I think we need risk communication strategies to reassure them, educate them properly, and to alleviate these concerns.

Thank you.

Ms. JOHNSON. Thank you very much.

Mr. deFur.

Mr. DEFUR. Thank you very much. Good afternoon, Chairwoman Johnson and Members of the Committee. I appreciate the opportunity to present testimony on emerging contaminants in the surface waters of the United States and present some of my perspectives on how the Clean Water Act may be improved.

I am Peter deFur. I am an Environmental Scientist and a Research Associate Professor at Virginia Commonwealth University, although my comments are my own and do not represent the position of VCU or any other organization with which I am affiliated.

Your timing with this hearing is absolutely impeccable. It was only two days ago that the Food and Drug Administration held a public hearing on one of the emerging contaminants, bisphenol-A, or BPA, expressing some of the great controversy over the scientific evaluation and whether uncertainty means that you proceed with caution or you proceed full steam ahead.

But to go back to two historical examples over this issue, it was 1991 when researchers demonstrated that compounds could come out of plasticware, they could leach out and cause biological effects in an experimental situation and beyond the laboratory. Where were those compounds going if they were coming out of the plasticware when the plasticware was being washed?

The next piece of historical information that is important is when scientists in Britain discovered that fish were having hormonal problems and they realized that male fish had female characteristics. Putting those fish in cage downstream from the effluent of sewage treatment plants, male fish were becoming feminized through something that was coming from those. As a result, we had investigations, many of them conducted by U.S. researchers, including USGS, to identify what is coming out of our effluents, not just from sewage treatment plants, but from other facilities, and it turned out a number of those were hormonally-active agents and we began to look at what else is in those.

You have already heard from USGS about the great variety of compounds that are present not only in our Nation's waters, but in some of the discharges that we can identify. Those compounds are not just pharmaceutical agents. They are not just from personal care products. They are from everything that comes out of the house. They are from things that wash off our lawn. They are from things that we use in commerce and things we use everyday.

Some of them include caffeine, and it includes the breakdown product of nicotine, that is, cotinine. These are commonly found in the waters of the United States. One of the more recent publications by USGS in 139 rivers and water bodies found that both of these were fairly common. Also, the plasticizing agents.

It is also evidence from research that has been conducted since that time, much of it since 1991, 1992, that there are a number of chemicals that are very active at very low concentrations. Some of these chemicals do act like hormones, and hormones act at the level of just a few molecules. That is how we function; that is how all animals on the face of this earth function. They depend upon internal chemical signals.

Much of the information that we have is very incomplete. We don't have good toxicological information on 80,000 chemicals in commerce. But we do have information on a number of those toxic

chemicals that are reported on the USGS list. The information comes not only from the peer reviewed scientific literature, but also from EPA reports on toxic chemicals and from the Agency for Toxic Substances and Disease Registry.

These investigations suffer from one of the major problems that you have already heard about that is in the Clean Water Act. We know about individual chemicals, and we know because we started them on animals in model systems under controlled situations in the laboratory, one chemical at a time, starting with fairly high concentrations. We don't know much about how low concentrations over long periods of time affect animals in the wild or humans. We have very little information about that.

The Clean Water Act has only criteria for less than 200 chemicals. If we are going to go through tens of thousands, we are going to be here for millennia before we have enough criteria to be able to manage this problem properly.

One of the things that we need to do in the Clean Water Act is provide for a comprehensive evaluation of effluents on some regular basis that identifies every chemical that comes out of there, so that at least we have a complete picture of what is in the effluent, regardless of whether or not there is a water quality criterion or a standard.

The second one is we need to have the ability to regulate mixtures. EPA and the State regulatory agencies need to do something more than individual chemicals, chemical-by-chemical regulation. They have to be able to do this. If we wait five years, until all of our studies are done, we will still be sitting here worrying about mixtures, and the chemicals that we have spent five years studying will no longer be a problem—somebody will have reduced them—and we will be looking at another group of chemicals about which we know nothing.

We have to do something to develop pollution control measures at the top of the pipe, not just product stewardship, but the ability for dischargers to identify the source and control those sources. Pollution prevention is not only more effective, it is cheaper.

I would be happy to answer any questions now or at a later time. Thank you very much.

Ms. JOHNSON. Thank you very much.

Let me thank the entire panel for very interesting testimony.

I am going to defer to Mr. Hall for questions.

Mr. HALL. Thank you, Madam Chair, for your holding this hearing and for allowing me to go first.

I just wanted to start by asking Mr. Grumbles does EPA routinely and systematically monitor for pollutants present in surface waters? Specifically, does EPA routinely monitor for toxic chemicals that do not have permit guidelines? And why or why not, depending on the answer.

Mr. GRUMBLES. Thank you, Congressman. EPA does not routinely monitor for contaminants that don't have criteria or effluent guidelines for them. What we do is encourage our State partners and utilities to monitor not only for those contaminants which are regulated, but also we want to encourage monitoring and pollution prevention both through the pretreatment program and through other regulatory programs. But we are very careful not to impose

enforceable regulatory requirements for contaminants that don't have assessment methods or established criteria under the Act.

Mr. HALL. Thank you. I understand. Does EPA routinely or systematically monitor for toxic chemicals that don't have permit guidelines that may be present in wastewater or effluent discharges? Would that be the same answer?

Mr. GRUMBLES. It is the same answer with the added point that, under the Clean Water Act, we have a duty which we take very seriously to continuously, on a yearly basis or twice a year basis look at effluent guideline requirements to make possible requirements or new water quality criterion standards.

I just think it is important to emphasize we started a national survey specifically on pharmaceuticals and personal care products not only for the effluent, but also for biosolids. We think that is going to help us, just like Congresswoman McCarthy's bill, focus in specific directions future potential regulatory action.

Mr. HALL. Thank you.

I want to ask Mr. Linn, do wastewater treatment facilities discharge unregulated toxic chemicals? In other words, do wastewater treatment facilities discharge toxics that do not have permit limits and do these facilities monitor for those toxics?

Mr. LINN. Wastewater treatment plants will discharge anything that is in sewage that is not adequately removed by the plant. Anything that society uses and puts down the drain is going to reach wastewater treatment plants, and, as we heard earlier today, there are 80,000 chemicals in use out there.

There are certainly quite a few chemicals out there that we do not monitor for. To do so would be very expensive and prohibitively expensive, and in many cases a lot of these things that we are talking about here, the emerging contaminants, are occurring at levels that we are just now starting to see with cutting-edge analytical technology, and there is a lot of uncertainty associated—even when these expensive analyses are performed, there is a lot of uncertainty associated with the accuracy of the data that is produced.

Mr. HALL. I understand that. I believe it was Mr. Littell's testimony in which he said or one of the panelists said that we are now seeing, in the long-lived substances that we are talking about, that we are seeing all of the medications or chemicals or toxics that we have produced going back to when they were first put into use and started being put in the ecosystem.

So it has gone from being unmeasurable or unnoticed to being measurable and noticed. I assume that that means you would agree that if we keep on doing what we are doing now, that that level will continue to rise and, therefore, whatever degree of risk there currently is, there will be a greater degree of risk if we don't take any action, which is why everybody is talking about the different actions we can take.

USGS demonstrated that surface waters contain a host of unregulated contaminants, including carcinogens and endocrine disruptors. So the question I would just ask, maybe starting with Dr. deFur and going down the line, is are our surface waters or our aquifers safe for our infants, for pregnant women? Do we know that they will not negatively impact human health over the long term?

I have heard medical professionals in my district, as this topic has come to the fore, saying, hmm, I wonder about the increase in autism or the increase in Alzheimer's. There are some things that are happening we can't explain and people are blaming it on thimerosal or whatever. But it raises the question, whether it is silver or whether it is caffeine or acetaminophen or some combination of antibacterials or the synergist effect of all those things.

So just a quick reaction not that.

Mr. DEFUR. Sure, I would be happy to answer that. No, I think they are uniformly not safe because we have several thousand water bodies that are under EPA regulatory controls for one or more chemicals either in the water or in the fish that live in there, so very sensibly, in some cases, they regulate fish tissue concentrations of things like flame retardants, polychlorinated biphenols, DDTs, mercury. So if you look at the water in the fish, we have thousands of water bodies that have some regulatory warning or concern over the levels of those compounds.

Mr. HALL. Madam Chairman, my time has expired, so if you would like to—I yield back if you want to let the rest of the panelists answer or answer in writing. Either would be fine. Thank you.

Ms. JOHNSON. Thank you very much.

Mr. Boozman.

Mr. BOOZMAN. Thank you, Madam Chair. We do appreciate your being here, Mr. Grumbles, and have appreciated your testimony through the years. You have done a tremendous job. You mentioned that you were concerned that we needed to explore this, but you had some concern about resources being moved off things that you felt like were not necessarily important, but more in a situation we needed to deal with now. Can you name one or two of those things that you are concerned with that we are dealing with that we are not doing as good a job?

Mr. GRUMBLES. Raw sewage, various mixtures of sewage; wastewaters that have pathogens in them. We know that there is an acute risk not only to aquatic life, but to human health. Beach water quality toxics that are on our national priority list for toxic pollutants that are persistent and bio-cumulative.

This Country has made tremendous progress over the last three and a half decades cleaning up the waters, to make them cleaner and healthier. We still have a long way to go, and the key to success in the future and sustainable clean water program, as you and your colleagues know, is not just to focus on what you are currently doing, but to keep an eye on the science and the growing need to deal with emerging areas of concern, and that certainly includes pharmaceuticals and personal care products, even though they are occurring at truly tiny trace amounts.

The question about mixtures, as was pointed out, the question about potential impacts, long-term impacts on human health are all very legitimate valid questions. The U.S. EPA's position is that this is very good. This is great for the Committee, in a responsible way, to be drawing attention to this growing concern. We are getting so much data. Our microscopes are getting so much stronger.

We can detect chemicals and pharmaceuticals to a greater extent than ever before, but we need to be careful and communicate the risk and also make sure that there is a risk-based approach to the

priorities. That is why I am just saying that we know aging infrastructure systems, pathogens and persistent toxics are already being regulated need to continue to focus on those.

Mr. BOOZMAN. Good. Very good. And if that stuff is getting through, then this other stuff is getting through with that. You know, if we have raw sewage, then all of this stuff is getting through.

Mr. GRUMBLES. That is right. That is right.

Mr. BOOZMAN. Very good.

Mr. Linn, can you tell us a little bit about the challenges of removing this stuff, what it would take with present technology, the energy that it would take? If we could do it, are we running into a situation where, if we did do it, that you would almost create other environmental problems or not?

Mr. LINN. You are talking about moving——

Mr. BOOZMAN. The expense. The whole bit.

Mr. LINN.—it out of wastewater treatment plants.

Mr. BOOZMAN. If we could snap our fingers today and fix this, what are the challenges that we face with doing that right now?

Mr. LINN. Well, a lot of these things are already removed, at least to some extent, by wastewater treatment——

Mr. BOOZMAN. Well, the stuff that is showing up in the water now.

Mr. LINN. Some of the stuff that is showing up——

Mr. BOOZMAN. The hormones and things like that.

Mr. LINN. Some of the stuff that is showing up in the water is removed to a large extent by wastewater treatment plants now. Every chemical is different, and that is one of the problems; you can't install a single technology at a wastewater treatment plant and remove all of any of this stuff.

Again, the conventional treatment right now removes through a variety of processes, depending upon the characteristics of the specific chemical you are talking about, anywhere from a large amount of it to virtually none of it. So there is not an answer to a type of technology that you can just put at a wastewater treatment plant that is going to eliminate all of this stuff, it just doesn't exist now, and it is unlikely to exist in the future.

Mr. BOOZMAN. This is for the panel. What are some of the compounds that are we most concerned about that? You mentioned a molecule or two of hormones being a problem. Certainly, that, in a very small amount, could be a problem. What are we seeing that is elevated where—I don't guess this stuff ever goes away, does it? I mean, does it or does it not? I mean, once it is in the water to begin with——

Mr. LINN. If I may answer that. Again, it depends on what particular type of chemical you are talking about. Some of the chemicals break down in the environment. That isn't always a good thing. Sometimes they break down into something else that is potentially harmful, but sometimes they break down completely and they are gone. Other types of chemicals are very persistent and they last for long periods of time. So you get the whole range of potential results.

Mr. BOOZMAN. What are the top two or three that we are concerned about?

Mr. LARSEN. If I could ask Mr. Buxton to respond.

Mr. BOOZMAN. Mr. Buxton?

Mr. BUXTON. Sure. I think the way we think about priorities with respect to chemicals is the way they may affect organisms in the environment. The endocrine disruption process that was mentioned earlier is probably the most important process now because, as was acknowledged before, it happens with chemicals that occur at extremely low concentrations, and the chemicals fall in several classes that have this hormonal activity.

Some are the biogenic hormones that come from our bodies and animals' bodies; some are the synthetic hormones that we make and take as part of birth control—pills, ovulation inhibitors, those types; others are industrial chemicals that, by their molecular form, tend to mimic these hormones. So what we find when we study these effects in the environment, specifically the effects on fish that live right near where they may be introduced to a stream, is that we have to look at what we look at the relative estrogenicity, how much each of these chemicals act like estrogen, and then, in a way, add it up to see what the total effect may be of this mixture of chemicals.

So I would say those are the chemicals that are most important, and it is quite a range of different chemicals.

Mr. BOOZMAN. Let me just close. You mentioned, Dr. deFur, the small quantities, you are saying, of the hormones and the importance of controlling the dischargers. The challenge, though, is that the dischargers in that case, I would argue that that is not people that have extra pills. The dischargers are us that are sitting here now. So that is a very difficult situation to deal with.

Mr. DEFUR. Well, you have got a group of chemicals that are so widespread as to be almost ubiquitous and that essentially have passed through the human organism on their way to the water supply that may not be quite so amenable to a take-back program. But even those there may be excess supply that can be taken out of circulation, so to speak, by appropriate disposal mechanisms.

I think that the hormone disruptors are the issues of greatest concern. Drop down a couple orders of magnitude and risk, there may be other effects, for example. One of the things that we are concerned about with the silver nanoparticles is that they really mess up water treatment systems, so they may have secondary effects that render our sewage treatment less effective. They may also have environmental impacts on the microorganisms that live in the aquatic environment. So that is an issue.

And maybe, maybe in this same order of magnitude there are issues with the chemical called NDMA, which I won't go into the technical side, but which has all of the unwanted characteristics of MTBE, which, as you will recall, made such a mess of groundwater.

So these are not all on the same level, by any means, and the entire class of problems represented by these emerging contaminants is a couple of orders of magnitude less risk than some of the more conventional problems that Mr. Grumbles articulated so effectively a few minutes ago.

It is a question of putting things into perspective and being sure that the investment to control this does not take funds away from issues of a higher, short, and long-term priority.

Ms. JOHNSON. Thank you very much.

Mr. Taylor.

Mr. TAYLOR. Thank you, Madam Chair.

I do want to thank our panel. I would, though, at this moment have to tell you that all of you gentlemen have been very long on generalities and very short on specifics. It is my understanding that, at the moment, the FDA is four and five years behind just on checking food products from coming overseas, on checking on drugs coming from overseas. I guess my thought to you, as someone who has to explain to 700,000 Mississippians why we are $10 trillions in debt, that unless you can identify a more specific problem and a more specific solution, I don't think anything comes of this hearing.

Raw sewage is already outlawed; you cannot dump that into the waters of the United States of America. We already have standards for biological oxygen demand. We have standards for fecal chloroform. We have standards for suspended solids in the water. We have standards for how much mercury can be in the water.

I would think a more practical approach to what some of you have been saying would be a public awareness campaign. If you have isolated a specific drug that people are flushing down their commodes that is causing a problem and can give them a better alternative to disposing of that drug, then I think that would be worth funding.

So I am going to give the panel an opportunity to be a bit more specific than you have been so far in this hearing.

Mr. GRUMBLES. Congressman, I would just like to say I completely endorse your statement about public education and awareness and responsible use of taxpayer funds. There is no doubt, from an EPA standpoint, as we worked very hard and closely with FDA and with other agencies involved in the regulation of the pharmaceutical industry, product stewardship, and the Drug Enforcement Administration on take-back programs, that pollution prevention is key. It is the low hanging fruit as we continue to do more science and research, and it doesn't involve sacrifice.

One thing that I think is very important from an EPA standpoint is to continue to look for cost-effective treatment technologies at the sewage treatment plant. As Congressman Boozman mentioned, a lot of this isn't simply unused pills being flushed or somehow getting into the sewers; it is also average daily excretion. So what can we do? I will tell you one thing we are doing is we are reviewing over 400 studies on current or promising technologies at the sewage treatment plant that can both detect and reduce the presence of these contaminants of emerging concern.

I think it is important to go carefully and responsibly. It is also important, however, not to brush this off and say, well, the science hasn't proven that there is some direct and immediate threat to human health; and I think you are saying the same thing.

Mr. TAYLOR. Mr. Grumbles, I do appreciate that. So out of this panel, I have got to believe there is one thing that the panel can identify is saying we have strong reason to believe that this is a

problem. Fill in the "this." And we have strong reason to believe that that can be solved by doing what? Because I really haven't heard that today.

Mr. GRUMBLES. I will say something. I know Matt Larsen may want to say something too.

I will tell you what is a problem. A problem is when you have intersex fish. That is not acceptable. Particularly as we look more and find more, that is not acceptable. Now, what do we do about that? One thing we can do is to continue to gather more information so we know the potential causes. I know that it is important to look at the wastewater treatment plants; it is important to look at concentrated animal feeding operations; and to look at potential regulatory changes.

But a key right now is to get out much more information on proper disposal of unused pharmaceuticals and take-back programs. We need to do a lot more across the Country to work on community-based and community-driven efforts, and work with the aging population to make it easier for them to understand and properly dispose of unused pharmaceuticals and personal care products.

Mr. LARSEN. If I could add some specifics that might help in your appreciation for the problem and also how the drinking water treatment plants are responding.

A recent study published last year by the USGS analyzed at one conventional drinking water treatment plant 113 organic compounds that included the list of types of chemicals we are talking about here today. Forty-five of these compounds were detected in samples of source water, the water coming into the plant, and 34 were detected in samples of settled sludge and filter backwash.

The performance of the plant, in general, granular-activated carbon filtration accounted for 53 percent of the removal of these compounds from the aqueous phase, disinfection accounted for 32 percent, and clarification accounted for 15 percent of the removal.

The effectiveness of the treatment varied widely within and among classes of compounds, and the detection of 21 of the compounds in one or more samples of finished water—the water that we would be drinking at our tap—was documented and 3 to 13 compounds in every finished water sample indicates substantial, but incomplete, degradation or removal of organic compounds through conventional drinking water treatment processes used at this plant.

Unidentified SPEAKER. I have four specific suggestions.

Mr. TAYLOR. It would have to be with the approval of the Chairwoman at this point.

Ms. JOHNSON. We have multiple votes, so I am going to try to wrap up before we leave, and just ask Members—you can ask that one question, but I was going to ask Members if they will submit their questions so that we can submit them to the witnesses.

I am going to call on one more, Mr. Brown.

Did you have another?

Mr. TAYLOR. No.

Ms. JOHNSON. Okay, Mr. Brown.

Mr. BROWN. Madam Chair, thank you. I know a vote has been called for, so we have limited time, but I was just going to follow up on Congressman Taylor's recommendation.

Back in my early career, I was actually on city council, and wastewater treatment was a big issue for us. I know that about all I could get out of the guy that did the treatment is he puts these bugs in and I guess before we had primary treatment and had to go to secondary treatment because our local DEHAC was in South Carolina. So I guess if I could find a conclusion similar to what Congressman Taylor was talking about, if we could get some assurance that there is enough testing going on to be able to determine what is out there so we must have some criteria or some limits to what can pass and what cannot pass.

How can we establish some criteria to be sure that if there is something in either the wastewater that is going out that needs to be diluted or whether, when we get our drinking water coming in, before it actually goes into the pipes, that there is some assurance that these items will be extracted?

Mr. GRUMBLES. Congressman, I am just going to say quickly that EPA appreciates congressional support for efforts to do more to update and improve upon the aquatic life criteria and the scientific methods for factoring in a better way to evaluate gender-bender type of effects on fish. We are working with the Science Advisory Board on that.

The other key area for us that can help establish criteria or standards in future directions in research and regulation and pollution prevention is working through the National Academy of Sciences on a road map for identifying potential human health risks. I think that has got to be a very important factor to justify the expense, the investments, and make sure we don't divert attention away from higher priorities.

Mr. BROWN. Thank you, Madam Chair. I know our time is limited.

Ms. JOHNSON. Thank you very much.

Congresswoman Napolitano wants to ask a question and asks for a written response.

Mrs. NAPOLITANO. Yes. Thank you, Madam Chair.

Very quickly, one of the things that I have not heard is whether or not EPA or USGS or anybody has the appropriate funding to be able to do all of the required analysis of everything that we are talking about, because, without the money, you can say you are going to do it, but if you can't stretch the money far enough, it is not going to get done.

Unfortunately, I have seen that in my area. We continue to try to identify in the sanitation district those pollutants in the effluent and everything else. So I would like an answer in writing as to whether or not the funding is adequate and whether or not you would be able to move forward more expeditiously with additional funding that will cover the work you have to do.

Ms. JOHNSON. Thank you very much.

I am going to ask Congresswoman Norton if she can take the chair and ask questions.

Let me once again thank the panel. This is probably one of the most interesting hearings we have had and probably with the most

questions. While Ms. Norton is coming, let me ask Dr. Guidotti, didn't you say you were retired? Do you have any volunteer time?

Mr. GUIDOTTI. I am retiring, yes.

Ms. JOHNSON. Oh. Let us know when you are retired.

Mr. GUIDOTTI. All right.

Ms. NORTON. [Presiding] A dubious advantage of not being able to vote except in the Committee of the whole, so I get to ask my questions. I will assume that that can be counted as a tradeoff. I am not sure that it rises quite to the level that taxpaying Americans, however, would regard.

I do have a question. I think this is an important hearing for us to have. In this region, we have seen what Mr. Grumbles calls intersex fish, among other deformities in the fish population. Recently, and only recently, frankly, did pharmaceuticals emerge; and if they have emerged here, they must be emerging everywhere in the United States.

In this region, we have experienced lead in the water because we saw that, while there was regulation, there was manipulation of the regulations, and that was here in the District of Columbia. In the Nation, we are experiencing what can only be called an economic collapse of an entire section of the economy because nobody regulated in time. So I think we have got to begin to ask very hard questions that are proactive and preventative, especially when the handwriting is so clearly on the wall and everyplace else.

The Chesapeake Bay, of course, is one of the great, marvelous wonders of America, but it cannot possibly be unique. So my question really has to do with how much we need to know before it occurs to us that something has to be done.

Now, scientific certainty is impossible, and you will always get, as we should, conflicting views even from respectable scientists, and today, with, I think it fair to say, 90 percent of respectable scientists saying that there is some manmade warming going, you still have a debate going on on that. The planet may burn up before that one gets decided.

But this one is very, very—this has a two-pronged problem—the pharmaceuticals, the intersex fish, the crab population that is drastically diminished in this region. The two-prong problem is a health problem—that is first and foremost—and, in areas like this, an economic problem that could get to be very severe if we wait for I don't know.

So I think it is fair to ask, in light of what we have already seen, whether that is enough to warrant at least some regulation, the beginning, at least, of some regulation. And I would like to know what, if any, regulation can be said to be relevant to what we are seeing clearly among changes in fish.

Yes, Mr. Grumbles.

Mr. GRUMBLES. You know, I don't disagree with your statement. EPA is not waiting for a final verdict from the scientific community before we take action.

Ms. NORTON. On what? Finish the sentence.

Mr. GRUMBLES. Yes, exactly. On several fronts. On the regulatory front, we know, in this litigious society—we also know, in our approach to things, it has to be based on sound science before you take specific regulatory actions. You have to be able to defend

the record. What we are doing is we are pursing, on a regulatory front, we are going to be finalizing a concentrated animal feeding operations rule. We had to go back, based on a court decision, and revise it, and we are going to be issuing that rule in the next month, and it is focused on zero discharge from those large feed lots.

Now, when it comes to regulatory actions specifically focused on pharmaceuticals or personal care products, Congresswoman, we are pursuing a survey to gather information from the health services industry—this is one of my highest priorities—that will help inform us as a potential regulation under the Clean Water Act for new effluent guidelines specifically for hospitals, nursing care facilities, veterinary clinics. That, we need to gather more information on, but we are very interested in and EPA is watching how the very large and important player in this, the health services industry, is disposing of pharmaceuticals and personal care products.

We also, on the drinking water front, as you are very familiar with based on your rule and efforts in the lead and copper rule, we have a contaminant candidate listing process where the Agency, in a very formal way, identifies potential contaminants that aren't currently regulated to decide whether or not to regulate those. We are in the process of reviewing, gathering public comments specifically on pharmaceuticals and personal care products. It is an area that merits a lot of attention from us.

But I would just underscore what the other panelists have said, Congresswoman, so far, there is a lot of meaningful action that we can take that doesn't fall into the regulatory category, that will really make a difference, that the taxpayers will feel is a good use of their money and also can reduce the risks from these emerging contaminants, and by that we mean product stewardship, working with the pharmaceutical industry, working with communities on take-back programs.

Those are real and meaningful actions that we can take, and I know personally, in my position, I have seen, over the last year, a tremendous amount of increased effort and attention by communities and citizens groups and State and local governments, as well as EPA, on greater awareness about proper disposal of these personal care products.

Ms. NORTON. Have you advised the States and localities—there is such consciousness today, aroused consciousness that consumer information would be a beginning, an important beginning. Has EPA advised States and localities—particularly since the Federal Government, it seems to me, has the capacity to do or access to the needed research—on how they should advise consumers, for example, to dispose of—there are all manner of chemicals, but let's begin with pharmaceuticals, which are so common? I don't know what to do. I don't know what to do, by the way.

Mr. GRUMBLES. I have written to every single State commissioner asking them, first of all, what they are doing on this emerging area of concern about pharmaceuticals and what types of research needs they have——

Ms. NORTON. I guess that sounds like—I think they might be asking you.

Mr. GRUMBLES. Yes. Well, we have met and we are working with the State water and drinking water agencies on research priorities and ways to improve risk communication.

Ms. NORTON. Isn't there something we can be telling the average consumer about disposal?

Mr. GRUMBLES. Yes.

Ms. NORTON. Pharmaceuticals are precious way now to save people from going to the hospital, it is not simply something for our elderly. Pharmaceuticals are so widely used that if there was general information so that every State and locality didn't have to find out for themselves as to ten steps, six steps—you name it—that everyone can take, we might be able to begin——

Mr. GRUMBLES. That is an excellent point. In January of last year, the Administrator, the Secretary of Health and Human Services, and the Director of the White House Office of National Drug Control Policy issued national guidelines for the consumer. It was a first step, Congresswoman. It was a first step to encourage the proper disposal of unused pharmaceuticals, urging that the rule is: a toilet isn't a trash can; if you are going to use a trash can, here is one way to dispose of it for security reasons and also environmental protection. We need to do a lot more work on that front. We can't do it alone, and the State commissioners, the local utilities, the pharmaceutical industry, product stewardship initiatives——

Ms. NORTON. Mr. Grumbles, I recognize, because when I talk about these kinds of matters, I know I am not entirely in your jurisdiction, but the point I would like to make here is that is just what I would like not to happen. There is a reason why the EPA is a Federal responsibility. The waters, for example, from the District of Columbia go into the entire region; so does the Anacostia, the Chesapeake Bay, the Anacostia, the Potomac. There are no borders there. So that if what we encourage without some national guidance is exactly what the interstate clause is meant to avoid, some kind of pot marketed notion of how to dispose of things, then we will have conflict among the States, conflict among the localities.

I am looking for some urgent national guidance, and I may not be talking to the officials here who are in a position always to do that, but I would hate to see us ask the States what they are doing, then have them feel panicked about making sure they are doing something without recognizing that one State could be doing something to protect itself which could be exactly what endangered a neighboring State or locality or waterway.

Mr. GRUMBLES. I could not agree with you more. In terms of updating the guidance that we issued in January of last year and working on additional fronts, the RCRA program on reverse distribution systems is very much a priority for us, working on some national parameters with our State and local partners and drawing greater attention to this whole subject, embracing pollution prevention and product stewardship as we gather more information on the scientific front about the risks and the potential health effects.

Ms. NORTON. Well, I want to thank the entire panel. My only regret, given my deep interest in this subject, is that I couldn't be here for the entire time. I simply want to leave you all with the notion that I don't think there is another thing that anybody could

want to learn about the need to begin measured and careful, but certainly to be in some regulation when fish start changing sexes—and we are not talking about a few abnormalities—and when whole or parts of the economy of regions are threatened. I hope that we have learned, certainly from the present economic crisis, that at some point not only will it be necessary to do something at some point, sometimes it is impossible to do something.

So I urge, particularly for what is happening when it comes to abnormalities in fish, to take that as much of a warning sign as you need. We may not know as much about pharmaceuticals and the rest of it, but the decline in certain species of fish is now widespread and well known, and the abnormalities in fish, it seems to me, are more than indicators and deserve some thoughtful regulation, if you will forgive me, yesterday.

I want to thank all of you for coming, on behalf of the Chair, to this very important hearing.

[Whereupon, at 4:39 p.m., the Subcommittee was adjourned.]

OPENING STATEMENT OF
THE HONORABLE RUSS CARNAHAN (MO-3)
HOUSE TRANSPORTATION AND INFRASTRUCTURE
WATER RESOURCES AND ENVIRONMENT SUBCOMMITTEE

Hearing on
Emerging Contaminants in U.S. Waters
September 18, 2008

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Thank you, Chairwoman Johnson and Ranking Member Boozman, for holding this hearing on "emerging contaminants" in our nation's waters.

I share the concern of my colleagues and those within the public health and scientific communities about the growing presence of "emerging contaminants" in both surface waters and ground water and believe we must work to find out where these contaminants are coming from and what can be done to reduce their harm on our health?

The Clean Water Act has made great progress toward meeting the goal of swimmable and fishable waters. However, a recent investigative report done by the Associated Press that found that pharmaceuticals are in the drinking water supplies of at least forty-six million Americans raises concern maybe we need to do more to reach the goal of swimmable and fishable waters. Specifically, as we are seeing evidence that these "emerging contaminants" may be impacting our health it is clear we need to invest more in research to gain a better sense of their effect.

In closing, I want to thank our witnesses for joining us today and I look forward to hearing their testimony.

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STATEMENT OF
THE HONORABLE JERRY F. COSTELLO
SUBCOMMITTEE ON WATER RESOURCES AND ENVIRONMENT
HEARING ON EMERGING CONTAMINANTS IN US WATERS
SEPTEMBER 18, 2008

Thank you, Madame Chairwoman, for holding this hearing on emerging contaminants in US waters.

The protection and the improvement of water quality are among the greatest responsibilities of this Subcommittee. The Clean Water Act (CWA) was enacted to preserve our waters, resulting in significant investment in wastewater infrastructure and emphasizing truly clean water. It is widely viewed as the Nation's most successful environmental law.

The US Geological Survey (USGS) is a national leader in identifying emerging contaminants in the nation's surface, ground, and drinking waters. The 2002 USGS found that many contaminants survive wastewater treatment and biodegradation. Further, more research is needed to explain the effects current levels and increased levels of contaminants in surface water have on human health .

The CWA is a framework to provide the protection of surface waters through technology standards and water quality standards. I am interested in hearing from our witnesses if they believe the CWA can meet emerging contaminants and the threats they pose or if changes need to be made.

I am pleased that we are having a hearing on this to look at significant policy issues affecting our nation's ability to maintain and ensure clean water. I welcome the witnesses here today, and look forward to their testimony.

STATEMENT OF
THE HONORABLE EDDIE BERNICE JOHNSON
WATER RESOURCES SUBCOMMITTEE HEARING ON
EMERGING CONTAMINANTS IN U.S. WATERS
SEPTEMBER 18, 2008

Today's hearing looks at the extensive range of emerging contaminants that are present in our surface waters. Many of these substances are either unregulated or under-regulated, and include toxic chemicals, pesticides, pharmaceuticals, and nano-materials.

As many of you know, I spent my early professional years as a nurse. It's from this experience that I have been very mindful of threats – especially unnecessary threats – to human health.

However, I am concerned with the growing body of evidence on the presence of toxic chemicals and their by-products in the nation's waters, and question just how safe our waters actually are – especially to human health over the long term.

While the Clean Water Act was successful in controlling some substances, it is clear that today's contaminants of concern are not the pollutants of yesteryear.

For example, there are currently 80,000 chemicals in use. This is a three-fold increase from 1941 to 1995. 8,000 of these are known to be carcinogens.

One would hope that all of these 8,000 cancer-causing poisons are somehow addressed under federal and state authorities, including the Clean Water Act. Shockingly, this is not the case. It seems that less than 300 chemicals have permit limits.

Today's hearing provides us with the opportunity to ask why this is the case.

It's not as if emerging contaminants are new issues of concern for either the Congress or EPA. In 1996, through the Food Quality Protection and the Safe Drinking Water Acts, the Congress instructed EPA to develop a screening program to determine if certain chemicals and compounds disrupt hormones in humans. In the 12 years since this mandate was put forward, the Agency has not begun to test any chemicals under this program, despite the potential for these chemicals and compounds to cause great harms to individuals – especially to children and pregnant women.

Testimony from the U.S. Geological Survey will demonstrate that these endocrine disrupting chemicals – and many other toxic substances – are in our surface waters. Not only have they been demonstrated to harm aquatic life, they have the grave potential to harm humans.

I look forward to hearing from our witnesses today about how these chemicals, these emerging contaminants, are getting into our waters.

Our former Defense Secretary, Don Rumsfeld, famously stated:

> *There are known knowns…There are known unknowns…But there are also unknown unknowns.*

While perhaps a clever quip, we certainly saw how a reliance on such platitudes rendered our situation in Iraq during his tenure. We would certainly hope that our nation's Environmental Protection Agency is not taking the same approach with regards to unregulated toxic chemicals.

Frankly, when it comes to the health of the very young, to pregnant women, and to the elderly, there is no excuse for not knowing.

I look forward to the testimony from our witnesses today on this very important hearing. I now yield to the Subcommittee's Ranking Member, Mr. Boozman.

Testimony by Rep. Carolyn McCarthy
Water Resources Subcommittee
September 18, 2008

- Thank you Chairwoman Eddie Bernice Johnson and members of the Committee for holding this hearing and inviting me to testify.

- I commend the Chairwoman you for all your hard work to keep our nation's waters clean, not just by holding this hearing but also moving the Water Resources Development Act and Beach Protection Act—important legislation to ensure that our beaches are safe for swimming which the House took up before we entered the summer beach season.

- I appreciate the opportunity to testify before you specifically about pharmaceuticals in our nation's waters.

- As you know, when the House took up H.R. 2537, the Beach Protection Act of 2007, I offered and withdrew an amendment to the bill. We engaged in a colloquy about pharmaceuticals in our nation's waters, I asked that hearings be held, and we agreed to work together on legislation to address this issue.

- That brings us here today and I commend the Committee for acknowledging that we must begin to better understand this important issue so that our constituents can feel confidant that they are drinking clean, safe water.

- An Associated Press study from March brought to light the fact that pharmaceuticals have been found in the drinking water supply of at least 41 million Americans.

- Last week, the AP did a follow-up study that found that even more Americans were affected by the contaminated water—approximately 46 million people.

- In my state of New York, health officials found heart medicine, infection fighters, estrogen, mood stabilizer and a tranquilizer in the upstate water supply.

- Six pharmaceuticals were found in the drinking water right here in Washington, D.C.

- We don't know how the pharmaceuticals enter the water supply.

- But it is likely that some medications that are not fully absorbed by the body, may have passed into the water through human waste.

- In some other cases, unused pills may have simply been flushed down the toilet.

- Additionally, some agricultural products and medications may have run off into groundwater supplies.

- In addition to antibiotics and steroids, EPA has identified over 100 individual pharmaceuticals and personal care products in environmental samples and drinking water.

- Wastewater treatment plants appear to be unable to completely remove pharmaceuticals from the water.

- The presence of the pharmaceuticals in our nation's waters raises serious questions about the effects on human health and wildlife.

- I, along with my colleagues Representative Tammy Baldwin of Wisconsin and Allyson Schwartz of Pennsylvania, have introduced legislation that would require EPA to conduct a study on the presence and source of pharmaceuticals and personal care products, in our nation's drinking water.

- Pharmaceuticals and personal care products include prescription and over-the-counter therapeutic drugs, veterinary drugs, fragrances, lotions, and cosmetics, as well as products used to enhance growth or health of livestock.

- H.R. 6820, the Water Assessment and Treatment Evaluation Research Study Act of 2008, or WATER Study Act, includes a three-part report

to be carried out by EPA working with other relevant Federal agencies.

- An initial report, due in one year after the bill is passed, calls for an analysis of what pharmaceuticals and personal care products are in the water, where they came from, and how we can regularly monitor for them.

- An interim report due in 3 years looks at the effects the products have on human and animal health, as well as methods to remove the products from our drinking water supply.

- A final report asks for an analysis of the long term effects of human exposure to pharmaceuticals in our waters and the levels at which the products in our water become harmful.

- The report is broken into three pieces because many interested groups explained the difficult in completing a report with all of the elements too soon but some items we can know pretty quickly and can begin to respond to initial findings.

- Furthermore, initial results will prompt responses from the scientific community which can also help form the basis of the items to be studied in the future reports.

- The final report asks for an update on all of the findings from in the initial and second reports.

- The report will be used as part of the government's efforts to better understand the effects of pharmaceuticals in our waters have on human health aquatic wildlife.

- I want to stress that my legislation is not intended to make any presumptions or accusations or even say that a problem does exist.

- We are just looking for more information so that we can make better informed choices and eventually move forward on more sensible policies.

- Hopefully, the study will give us more information about the presence, source, and effects of pharmaceuticals in our waters so that we can begin efforts to ensure that the water is safe.

- We need to find out how these contaminants got in the water, what the risks are and what steps we need to take to solve the problem.

- We need to know; how are the pharmaceuticals entering the water supply?

- How much is in the water?

- What else is in the water that we do not yet know about?

- What are the effects on human health and aquatic and plant life?

- What is the best way to dispose of pharmaceuticals?

- And how should we treat water that has been contaminated with pharmaceuticals and other personal care products?

- How is existing Federal legislation such as the Clean Water Act and Safe Drinking Water Act sufficient to address the new products we are finding in out waters?

- It is vital that Congress take up and champion the cause of keeping our coastal recreation and drinking water safe.

- This is a public health issue and we must act before the presence of pharmaceuticals reaches crisis levels.

- This study is a first and very important step in the process of addressing this issue.

- We need to accurately assess the risks of these contaminants in the water because some experts have suggested that the problem will only

increase as prescriptions are on the rise—up 12 percent over the last five years.

- I know that my bill, H.R. 6820, has been referred to the Energy and Commerce Committee because it focuses so much on addressing safe drinking water in specific but I do recognize that this Committee handles the Clean Water Act and it so important that we look at all of our nation's waters as well, including source water, to see where the problem begins.

- We can't fully address safe drinking water without looking at the entire water cycle.

- I look forward to working with all interested parties, including the EPA, the water treatment companies, the drug companies, agricultural interests, and others to combat this issue.

- Before dropping the bill, we reached out to many different parties and will continue to talk. I know that we can come to agreement on this issue, including efforts to educate people about safe disposal of medications.

- Madam Chairwoman, I again commend the Committee for holding this very important hearing, would be happy to answer any questions, and look forward to hearing the testimony of the other witnesses, the real experts.

- Thank you.

Harry E. Mitchell

Statement of Rep. Harry Mitchell
House Transportation and Infrastructure Committee
Subcommittee on Water Resources and Environment
9/18/08

--Thank you Madam Chairwoman.

--As you know, the Environmental Protection Agency ("EPA") has identified a list of "priority pollutants." One of those pollutants is trichloroethylene ("TCE"), a suspected cancer-causing agent.

--This is certainly a priority pollutant to some of the residents of Scottsdale, who earlier this were exposed to drinking water with four times the permissible concentration of TCE, before a three-day tap water ban was implemented.

--As my colleagues may recall, in February, when Assistant Administrator for the Office of Solid Waste and Energy Susan Parker Bodine testified before this subcommittee, and I asked her about the water problem in Scottsdale, she said it was "a situation that we haven't encountered before."

--That is why I believe it is so important for the EPA to stay ahead of these contaminant related issues.

--So, I want to thank you, Madam Chairwoman, for holding this hearing today.

--I look forward to hearing from our witnesses.

--At this time, I yield back.

STATEMENT OF
THE HONORABLE JAMES L. OBERSTAR, CHAIRMAN
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
SUBCOMMITTEE ON WATER RESOURCES AND ENVIRONMENT
HEARING ON "EMERGING CONTAMINANTS IN U.S. WATERS"
SEPTEMBER 18, 2008

Thank you , Madam Chairwoman, for holding this hearing on a topic of growing concern within the scientific and public health communities – the increased awareness of "emerging contaminants" in our nation's waters.

These chemical compounds, which can include pharmaceuticals, persistent organic pollutants, pesticides and herbicides, flame retardants, and other industrial by-products, are showing up more and more frequently in the nation's surface waters and ground water.

The question boils down to: where are these chemicals coming from; what is the likely impact to human and ecological health; and what should and can be done to protect us from harm?

This issue garnered significant national attention this past summer in a series of *Associated Press* news articles on pharmaceuticals and "personal care products" in our nation's drinking water supply.

Much of the nation's drinking water supply comes from our surface and ground waters, so it is appropriate that this Committee expands the focus to what chemicals compounds and other pollutants are found in surface and ground waters that feed our nation's drinking water supply, and how these pollutants are addressed (or not addressed) through the Clean Water Act.

In many ways, the Clean Water Act has been successful in improving the overall quality of the nation's waters. For example, in 1972, only one-third of the nation's waters were entirely safe for fishing and swimming. However, after over 35 years of Clean Water Act authority, today two-thirds of the nation's assessed waters meet the fishable and swimmable standard.

In just over three decades, we have doubled the number of waters meeting water quality standards, but we are only half-way in meeting the goals of the Clean Water Act – that all waters meet fishable and swimmable standards.

What concerns me is that we seem to have reached a plateau in improving water quality. The statistic that two-thirds of the nation's assessed waters meet fishable and swimmable standards has remained relatively unchanged for over a decade.

We need to start asking why.

Is it simply a question of funding needed wastewater improvements and upgrades, as some would suggest? Or is it something more? Has modern technology finally surpassed the regulatory capabilities of the Clean Water Act, to where the Act can no longer address emerging threats to the nation's waters, and in turn, to the nation's overall ecological and human health?

The focus of today's hearing explores one of the water quality challenges that require further attention.

Recent Federal studies have revealed the growing presence of "emerging contaminants" in our nation's waters, including the presence of pharmaceuticals, industrial chemicals, pesticides, and other chemical compounds.

Unfortunately, the vast array of treatment technologies available today may be ill-suited (or incapable) of removing these chemical pollutants from the nation's waters, exposing the natural environment to a potential low-dose toxic soup.

Recent news reports have demonstrated the potential effects of these chemical mixtures on the natural environment, including intersex fish in the Chesapeake Bay, deformed alligators in Florida lakes, greater incidence of fish tumors and declining fish populations, including native lake trout, in the Great Lakes.

What is less apparent is the potential impact of these chemical mixtures on human health.

Human exposure to waterborne pollutants can come in many forms, such as direct exposure through recreational contact or consuming potentially-contaminated fish. Yet, the most common "pathway" of exposure comes from the water directly out of the tap, either directly from drinking the water or through inhaling pollutants in steam during a bath or shower.

Ironically, even individuals who believe that bottled water is a safer alternative may be unaware that a 10-minute shower contributes to a greater dosage of chemical compounds than drinking a half-gallon of tap water.

The anecdotal evidence on human health impacts is growing, including studies on decreased fertility rates, increased incidence of breast, ovarian, prostate, and uterine cancers, and statistically-significant reports on low-male birth rates.

Yet, what is striking is **how much we do not know** about the potential short term and long-term effects of exposure to these chemical compounds. However, because the potential human health implications are so great, it is clear that more attention needs to be placed on this issue.

I am pleased we are holding this important hearing to learn more about the challenges that remain in reaching our goal of fishable and swimmable waters.

I look forward to a continuing dialogue on whether a "next generation" of the Clean Water Act is necessary to meet the water quality challenges of the upcoming century.

I welcome our witnesses here today, and look forward to their testimony.

VCU

Testimony of

Peter L. deFur, Ph.D
Research Associate Professor
Center for Environmental Studies
Virginia Commonwealth University
Richmond, Virginia

On

EMERGING CONTAMINANTS UNDER THE CLEAN WATER ACT

BEFORE THE

SUBCOMMITTEE ON WATER RESOURCES AND THE ENVIRONMENT

OF THE

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

September 18, 2008

Good Afternoon Chairwoman Johnson and members of the Subcommittee. I appreciate the opportunity to present testimony on the important problem of emerging contaminants in the surface waters of the United States, and to present my perspective on how the Clean Water Act might better handle this type of problem. My comments also address some aspects of avoiding such future problems before they become as serious as the ones we presently face.

I am an environmental scientist with over 35 years of experience in dealing with environmental programs as a researcher, consultant and university instructor. Much of my work has been related to the Clean Water Act concerning water quality issues, wetlands, the Chesapeake Bay Program, contaminated sediments, etc. I have also served on the National Academy of Sciences Board on Environmental Studies and Toxicology and on three Environmental Protection Agency advisory committees on endocrine disrupting chemicals (EDCs).

The problem of emerging contaminants is one that has become apparent in the past 15 to 20 years as scientists and water resource managers have examined water quality issues more closely. The US Geological Survey defines the topic of emerging contaminants on the web site: (http://toxics.usgs.gov/regional/emc/)

"Emerging contaminants" can be broadly defined as any synthetic or naturally occurring chemical or any microorganism that is not commonly monitored in the environment but has the potential to enter the environment and cause known or suspected adverse ecological and(or) human health effects. In some cases, release of emerging chemical or microbial contaminants to the environment has likely occurred for a long time, but may not have been recognized until new detection methods were developed. In other cases, synthesis of new chemicals or changes in use and disposal of existing chemicals can create new sources of emerging contaminants.

The history of this story provides some important context and scientific evidence that affects what action Congress takes on this issue. In 1991, Dr. Anna Soto and her colleagues reported that plasticizers leaching out of labware were stimulating breast cancer cells to grow in lab culture. Her work demonstrated conclusively that plastics leach chemicals that are biologically active and able to stimulate disease under lab conditions.

Soon after Soto published her work on estrogenic properties of plasticizers and other chemicals, Colborn and Clement (1992) published a summary of work on humans, fish, birds and other animals affected by such chemicals and at very low concentrations in the environment. This publication began a substantial effort into understanding Endocrine Disrupting Chemicals. That effort resulted in research initiatives around the world, numerous scientific publications and Congressional action. In 1996, Congress directed EPA to develop a program to screen and test about 80,000 chemicals in commerce to protect against endocrine disruption (Safe Drinking Water Act and Food Quality Protection Act). Scientists and

managers were now coming to understand that low levels of chemicals can alter the way animals function without killing them- the chemicals can change their physiological functions and leave them alive and not functionally normal.

Government agencies and scientific organizations published a number of research summaries on the state of the scientific knowledge of endocrine disruptors in every type of animal. We all concluded that animals from worms to human were susceptible to this problem and some were already experiencing impacts. One result of this effort was that federal agencies and independent scientists began to look more closely for the sort of problems and conditions that many of us predicted would be found. More evidence soon came from these investigations.

The research group of Dr. John Sumpter in England (Harries et al., 1997) first reported that the effluent from sewage treatment plants was causing male fish to develop female characteristics in a number of English rivers. After this work was repeated in the US, scientists looked more closely at chemicals in effluents, waters, sediments and fish. Since then, numerous researchers around the US and the world have found biologically active chemicals in streams and effluents. Male fish were affected by water borne contaminants that caused them to develop female characteristics. Scientists then turned their attention to determining the cause or causes of sex changes in aquatic animals.

One of my colleagues, Dr. Rob Hale, from the Virginia Institute of Marine Sciences of William and Mary, a sister University in Virginia, found that flame retardants were accumulating in rivers and fish (Hale et al., 2001). The flame retardants are just one class of chemicals now found throughout waters, sediments and fish. These chemicals were on the list of the possible causes of endocrine disruption.

One of the efforts to identify biologically active chemicals in water was undertaken by USGS. Staff completed surveys of US streams to assess the extent and nature of chemicals that come from human sources and are found in our rivers, lakes and streams. In a survey of 139 streams, Kolpin's group (Barnes et al., 2002) identified chemicals that come from farms, homes, leach from plastic bottles and can linings, drugs, industrial chemicals, legacy contaminants, some of which have been banned, and the by-product of nicotine and chemicals derived from human waste that are never broken down before discharged from the sewage treatment plants. I include below a figure taken from one of the USGS reports (Barnes, et al., 2002), showing the percentage of the 139 water samples that had each of the most commonly found chemicals. The numbers are startling in terms of the extent to which our nations streams have these by-products of human activities (http://toxics.usgs.gov/regional/emc/streams.html).

Kolpin et al. 2002 found phthalates, phenolics, pesticides, metals, pharmaceuticals, legacy chemicals and more. Legacy chemicals that are present

and pose health threats include the banned pesticide DDT, Kepone, chlordane, dieldrin and industrial chemical polychlorinated bi-phenyls (PCBs) that were supposed to be removed from the market 30 years ago and contaminate our waters, the rivers sediments and the fish in our rivers, bays and estuaries. This one chemical still contaminates thousands of waters throughout the US.

The legacy chemicals are now a part of the problem we face from past activities, some, such as PCB's, widespread in the environment. The significance of the legacy problems is that living systems are already exposed to a combination of chemicals that can combine to affect normal functions.

I recognize that while the mere presence of so many human-derived chemicals is of concern to many people, still others want to know what, if any harm comes from these chemicals. Are these chemicals contaminating the waters, sediments and animals, causing harmful effects, or are these chemicals just there?

There is some scientific information on the issue of what effects these chemicals may have on living systems, both humans and ecological resources. I do not present here an exhaustive review of the biological activity of all the chemicals reported by Kolpin and colleagues, or other scientists working on emerging chemicals. Rather, I want to point out that there is information on the effects, derived from federal agency reports and the peer reviewed published research. The Agency for Toxic Substances and Disease Registry (ATSDR) has toxicological profiles for some of the more common chemicals or groups of chemicals, including the flame retardants, PBDEs, phthalates, bisphenol-A, creosote constituents (PAH's), most pesticides and most metals. These reports and summaries provide some toxicological information, but on a limited number of animals, rarely on people, and only within a certain range of concentrations. Equally as important, there is little, if any information on how these chemicals act in the mixtures and combinations that occur in the real world.

The limitations we face right now with regulating and understanding emerging chemicals are based in the approach to research and regulation of chemical discharges into waters under the Clean Water Act. Research is largely conducted on single chemicals on model systems under controlled conditions and fairly high exposure levels. Little, if any work is done on mixtures and at lower levels over long periods looking for harm other than death. Regulations are similarly focused on individual chemicals, and notably those that are specifically listed in the Clean Water Act.

The Clean Water Act does not list all 80,000 chemicals in commerce and there is no toxicological information on most of those chemicals. Combinations or mixtures of chemicals are not listed at all in the Clean Water Act and neither EPA nor state agencies that administer the permit program in most cases do not address mixtures, only individual chemicals. The chemicals that Kolpin et al. list

are not regulated as a group and many are not regulated at all under the Clean Water Act. And is it practical to regulate 80,000 chemicals one at a time?

These chemical mixtures do, however, occur in waters and in fish, as well as in human tissues. The Centers for Disease Control and Prevention (CDC) conducts a regular survey of chemicals in the US population and reports finding a number of these compounds. In addition, fish tissue surveys report finding PCBs, phthalates, PBDE's, DDT, other organic toxic chemicals and various toxic metals in numerous water bodies around the country, some in the Potomac River.

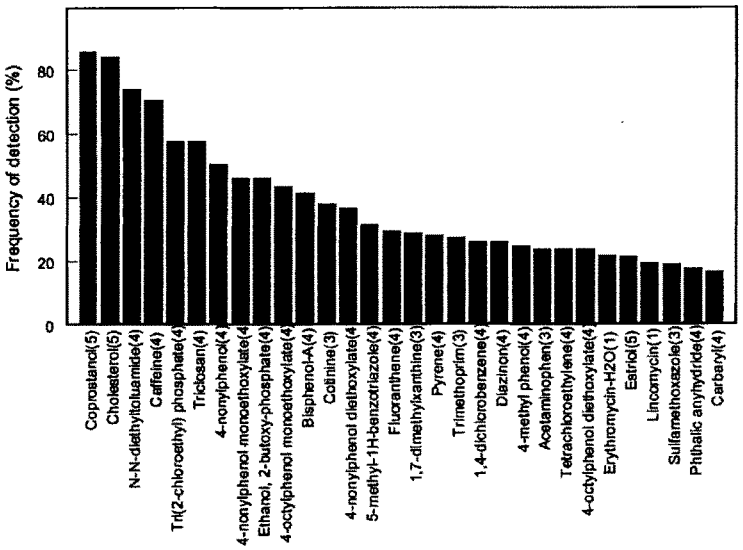
A new approach is needed under the Clean Water Act to address two of these problems: the occurrence of mixtures and the presence of chemicals that are not specifically listed. EPA and state agencies have to be able to control chemicals for which there are not yet water quality criteria or standards.

At present, agencies can set limits on the discharge of specific chemicals, and place limits in the discharge permits. The problem is that the regulatory permit limits are based not on pro-active, but on reactive monitoring. Agencies tend to depend on both knowledge of chemical toxicity and that a facility process can produce a specific chemical. If a state agency or EPA does not have specific data on both toxicology and probability of discharge, then regulation is not likely.

The Clean Water Act could require monitoring and reporting of all chemicals in discharges, regardless of the identity and chemical nature. The Clean Water Act could be more clear about requiring toxicological testing of the type that revealed problems with fish, known as caged fish studies. Congress could also make revolving loans once again available to upgrade POTW's to permit state-of-the-art processes and equipment to remove many of these chemicals.

The most cost effective approach to dealing with the presence of so many emerging contaminants is to not discharge them in the first place. The burden of proof can and should be shifted to assume that chemicals not already present will not be benign, and that increases in the concentrations of chemicals already found there are acceptable.

To summarize, the problem of emerging contaminants arose over the past two decades as the scientific community discovered new and important information about environmental toxicology. We now face the situation with hundreds or thousands of chemicals in our daily lives, our food supply, our waters, and we are not sure how these are affecting us. Under the Clean Water Act, some new approaches can offer improvements in how EPA regulates this vast array of chemicals. Pollution prevention remains as the most cost effective way to deal with this issue.



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TESTIMONY OF

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ASSISTANT ADMINISTRATOR FOR WATER

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BEFORE THE

WATER RESOURCES AND ENVIRONMENT

SUBCOMMITTEE OF THE

TRANSPORTATION AND INFRASTRUCTURE COMMITTEE

UNITED STATES HOUSE OF REPRESENTATIVES

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Good afternoon Madam Chairwoman and members of the Committee. I am Benjamin H. Grumbles, Assistant Administrator for Water at the United States Environmental Protection Agency (EPA). I appreciate the opportunity to describe EPA's comprehensive, four-pronged approach to pharmaceuticals and other contaminants of emerging concern in water and actions to evaluate the potential risks to human health and aquatic life posed by trace amounts of these contaminants in water, and to identify measures to minimize their occurrence. The Agency is committed to strengthening the science in evaluating the risks associated with such contaminants, improving public understanding and risk communication, identifying and increasing partnership and stewardship opportunities, and using appropriate regulatory tools.

EPA is concerned about contaminants of emerging concern in our water. EPA has been actively working with federal agencies and state and local government partners to better understand the implications of emerging contaminants such as pharmaceuticals and personal care products and endocrine disrupting chemicals detected in drinking water, wastewater, surface water and ground water. We continue to evaluate their occurrence, routes and levels of exposure, and potential effects on public health and aquatic life.

Over the last several years, EPA has increased its work in a number of areas to better understand contaminants of emerging concern, including pharmaceuticals and personal care products. We are focused on learning more about the occurrence of contaminants of emerging concern in water. In addition, we are working to better understand what treatment technologies may remove them from wastewater and drinking water. We are developing analytical methods to improve detection and quantitation capabilities. We are conducting national studies and field surveys to help direct our course of action. We are also partnering with government agencies, stakeholders, and the private sector, and increasing public awareness about product stewardship and pollution prevention.

We know collaborating with our partners will be critical so we can all make the best use of our existing resources and protect human health and the environment. Using technology and implementing regulations on a watershed basis, we place a strong emphasis on sound science, transparency, public information, and partnerships.

EPA's Four-Pronged Approach to Contaminants of Emerging Concern

EPA is responding to contaminants of emerging concern with a four-pronged approach aimed at strengthening science, improving public understanding, identifying partnership and stewardship opportunities, and preparing to take regulatory action when appropriate.

Strengthening the Science

Sound science and reliable information must be the foundation for any Agency decision. There is critical work to be done in the area of research and assessment before we can make any decisions as to whether regulatory actions are needed. EPA and other federal agencies are working on projects to evaluate exposure and potential effects on humans and aquatic life. This is key because, while we know that pharmaceuticals have health effects at the therapeutic dose, but we do not know if there are effects associated with long-term exposure at much lower concentrations of the same chemicals. Effects may be more likely in aquatic life because they are continually exposed.

Several EPA offices, including my Office and the Office of Research and Development, are working together to better understand potential issues related to exposure pathways and health effects of contaminants of emerging concern. For example, a key area of research is assessing the sources of contaminants of emerging concern in water. Important to this effort is having available and reliable analytical methods so we can detect and quantify these contaminants with confidence. In December 2007, the Agency released newly developed, cutting-edge methods for the analysis of approximately 100

pharmaceuticals, personal care products, steroids, and hormones in raw sewage, treated wastewater, and biosolids which are some of the most complex samples to test. In addition to these new methods, EPA has validated a new pesticide detection method in a single laboratory, but other labs have not yet confirmed this result, and revised the existing flame retardants (polybrominated diphenyl ethers or PBDEs) method to more accurately detect these contaminants in wastewater samples. The availability of the methods responds to requests for guidance in this area and supports studies being conducted by the Agency. We will continue to consider and evaluate additional methods.

EPA, other federal agencies, and academic and private sector researchers are studying the occurrence of contaminants of emerging concern in wastewater, surface water, ground water and drinking water, as well as in fish and other aquatic life. EPA's Office of Water is taking several actions, including:

- A study at nine publicly owned wastewater treatment facilities (POTWs) to better understand what is going into the plant for treatment and what is coming out in the discharge. We expect to have a preliminary report by December 2008.
- A pilot study to investigate whether pharmaceuticals and other personal care products may occur in fish from five effluent-dominated streams across the US. The study results are undergoing quality assurance review.
- A Targeted National Sewage Sludge Survey of biosolids from 74 randomly selected wastewater treatment plants to determine whether contaminants occur in biosolids, and if so, at what concentration. We expect to complete this study later this fall.

- Grants to University of Florida and Duke University funded by EPA to assess occurrence of contaminants of emerging concern in wastewater and biosolids. Researchers are studying the occurrence, fate and transport, and treatability of contaminants of emerging concern like triclocarban (an antiseptic widely used in soaps and other products) and steroids and hormones in biosolids and wastewater. Duke University is in the process of evaluating the results of its study at four POTWs. The University of Florida grant to evaluate biosolids was recently extended until 2010 to conduct additional work.

In addition to these studies, we recently announced a number of new efforts that the Office of Water is undertaking:

- Building on the fish tissue pilot study, the National Rivers and Streams Assessment will monitor fish tissue and water samples at 154 developed/urban sites to develop statistically representative estimate of the occurrence of pharmaceuticals and personal care products is in fish tissue and waterways in developed/urban areas across the country. The results should be publicly available in 2011.
- EPA is working to better understand and evaluate the potential risk to humans of low concentrations of contaminants of emerging concern in drinking water. EPA has commissioned the National Research Council of the National Academy of Sciences to convene a panel of experts to provide their individual ideas and opinions on this subject. The panel will meet in December 2008.

EPA's research agenda also includes a broad range of work to better understand contaminants of emerging concern in water in the following areas: sources, fate and transport, exposure pathways (human and ecological), human health and ecological assessment and risk management. Research supported by EPA's Office of Research and Development is increasing our understanding of possible exposure routes and effects contaminants of emerging concern may have on humans and aquatic life.

Another important research area is treatment and removal of pharmaceuticals from wastewater and drinking water. While EPA is active in this area, research foundations representing drinking water and wastewater utilities are key players in evaluating the removal efficiency of different types of treatment. Research is finding that higher-level treatment strategies are more effective at removing certain types of contaminants of emerging concern, including pharmaceuticals.

Improving Public Understanding

One of the most difficult tasks faced by public health and environmental officials is how to communicate risks in the face of uncertainty. Useful information should be shared with the public in a timely way as it is generated. It is important to communicate with the public so that they can help shape effective public policy in this area and make informed choices. We recently created a new publicly accessible web page (www.epa.gov/waterscience/ppcp/) to provide information on the work that we are doing on contaminants of emerging concern in water, in particular, pharmaceuticals and

personal care products. In addition, EPA has a website that details all of the research the Agency is conducting or funding on pharmaceuticals (www.epa.gov/ppcp/).

We will continue to work with all of our stakeholders to communicate available data on both occurrence and health effects for contaminants of emerging concern, and any associated uncertainty with those data. It is essential for us to share information and understand stakeholder concerns so that we can work together as effectively as possible in communicating with the public.

Identifying Partnership and Stewardship Opportunities

To be successful, we must work with other federal, state, and local agencies and industry to assess the occurrence and effects of contaminants of emerging concern, analyze their risks, and take appropriate actions to reduce those risks.

For example, EPA worked with the White House Office of National Drug Control Policy last year to develop federal guidelines that recommend appropriate disposal methods for unused medication. While most pharmaceuticals from human sources are entering water through natural biological functions, it is also important the public understand the toilet is not a trash can for most unused medications.

EPA has also been working to develop and promote good stewardship efforts such as take-back programs that would allow consumers to properly dispose of unwanted or

unused pharmaceuticals. Take-back programs and events are collection methods that reduce the quantity of unused pharmaceuticals entering the environment and reduce the amount of drugs available for diversion, theft, or accidental poisoning. EPA recognizes that these programs must be consistent with the Controlled Substances Act and regulations for managing medications that are also classified as controlled substances. The Agency will work with DEA to ensure that pilot take-back programs supported by EPA are conducted safely and in compliance with federal and state laws and regulations.

Along these lines, EPA recently funded a grant to the Area Resources for Community and Human Services in St. Louis. Last year, the Aging Initiative in EPA's Office of Children's Health Protection and Environmental Education provided a grant to this community partnership, which is piloting an efficient regional model to responsibly dispose of unwanted, non-controlled medications using a regional grocery store chain as the collection point. The grantee is evaluating this pilot take-back program for its potential broader applicability.

In addition, EPA's regional offices have sponsored or provided grants to local communities to support several activities related to the prudent disposal of unused medications, including the successful April 2008 "Great Lakes Earth Day Challenge," which collected nearly 4.5 million pills for safe disposal.

As part of EPA's broader strategy to strengthen and expand technical partnerships and information sharing at all levels, we asked the states to share information with us on take-

back programs, and current or planned monitoring programs for pharmaceuticals and personal care products in wastewater, surface water, ground water or drinking water. We are also working to obtain toxicology data from available sources, including other federal agencies and exploring ways to improve the understanding of potential effects of exposure to contaminants of emerging concern in water.

This type of information can be very useful to EPA to identify potential contaminants for unregulated contaminant monitoring, revising effluent guidelines, and determining which contaminants are the highest priorities for development of new or revised water quality criteria. We will compile the information we receive with the goal of sharing best practices and encouraging broad adoption of effective programs across the country.

EPA is also coordinating research efforts with other federal agencies as part of the Pharmaceuticals in the Environment workgroup and the Endocrine Disruptors in the Environment workgroup, under the auspices of the White House's National Science and Technology Council Committee on Environment and Natural Resources Toxics and Risk Subcommittee. The goals of these workgroups are to identify current federal efforts, avoid duplication of effort, leverage existing resources, and better prioritize Federal efforts. EPA co-chairs both of these workgroups.

EPA is also participating in a World Health Organization (WHO) task force investigating pharmaceuticals and personal care products in drinking water. WHO plans to address a variety of issues such as environmental occurrence and sources of pharmaceuticals and

personal care products in finished drinking water and source water; approaches to assess health risks to vulnerable populations; environmental chemistry of pharmaceuticals and personal care products in natural waters; and advances in treatment methods (including treatment effectiveness) and analytical methods.

My office recently hosted a series of four stakeholder meetings with wastewater and drinking water utilities, state environmental and public health departments, key members of the environmental community, and several agricultural organizations. These meetings helped us better understand what our stakeholders are doing to assess and appropriately respond to pharmaceuticals and personal care products (PPCPs) in our waterways, and identify or build upon opportunities to collaborate. Input from our stakeholders was extremely useful and helped to inform our recently announced new initiatives.

Using Regulatory Tools

We recognize stewardship activities alone may not always be sufficient to manage issues associated with contaminants of emerging concern in water. We are also gathering information that will help us assess whether regulatory action is warranted.

For example, under the Clean Water Act, EPA establishes technology-based national regulations, termed "effluent guidelines," to limit pollutant discharges from categories of industrial facilities to waters of the United States. As part of the effluent guidelines planning process, the Agency is studying the disposal of unused pharmaceuticals by

certain health care institutions to determine current disposal methods and to identify alternative disposal practices that could reduce or avoid direct or indirect discharge of PPCPs to waterways. EPA initiated this effort in 2007 and issued an Interim Report on Unused Pharmaceuticals in the Health Care Industry in August 2008. To complete the Health Care Industry study, EPA intends to conduct an "Information Collection Request" (ICR) in accordance with the provisions of the Paperwork Reduction Act. The ICR will collect additional information on 1) the factors driving current disposal practices, 2) information on the amount and identities of unused pharmaceuticals currently disposed of via the drain or flushing, and 3) the alternatives to drain-disposal. This important collection effort will cover hospitals, long-term care facilities, hospices and veterinary hospitals and is currently undergoing public comment. The comment period closes November 10, 2008.

EPA is also evaluating whether the potential impact of contaminants of emerging concern, including pharmaceuticals and personal care products that exhibit endocrine disrupting activity or other toxic properties, may require the Agency to consider additional or modified procedures for determining appropriate protective levels for aquatic life. In June, EPA presented a paper to the EPA Science Advisory Board detailing the technical issues and recommendations that may serve as a basis for modifying EPA's existing methodology for establishing aquatic life criteria, in response to contaminants of emerging concern.

Additionally, under the Safe Drinking Water Act, the Agency assesses contaminants for potential drinking water regulation. On February 21, 2008, the Agency released the draft Contaminant Candidate List (CCL 3) for public review and comment. As part of the process to develop the list, the Agency evaluated an extensive list of pollutants, including microbial pathogens, pesticides, chemicals used in industrial products and consumer products and contaminants of emerging concern, such as pharmaceuticals, to identify those that have the potential to occur in drinking water provided by public water systems. The public comment process concluded on May 21, 2008. The Agency is evaluating the comments to inform its decision on which contaminants to include on the final list.

Conclusion

Madam Chairwoman, this committee and EPA share a long-standing commitment to keep our water clean and healthy. We know sound science and information must continue to drive our decisions. EPA will continue in evaluating effects, occurrence, and risk reduction strategies so we can make sound decisions to protect public health and aquatic life. By engaging the full range of public and private partners and by using appropriate regulatory and incentive-based tools, we will ensure continued progress in meeting the goals of the Clean Water Act.

Thank you for this opportunity to describe EPA's important work on contaminants of emerging concern. I would be happy to answer any questions you may have.

Testimony of Tee L. Guidotti
To the
House Committee on Transportation and Infrastructure
Subcommittee on Water Resources and Environment

18 September 2008

Chairwoman Johnson and Members of the Subcommittee, I am Tee L. Guidotti, a physician and professor in environmental and occupational health at the George Washington University School of Public Health and Health Services. I am here today representing only myself but I have served as a consultant in public health and risk management to water and public health agencies, most notably the District of Columbia Water and Sewer Authority.

My testimony today is in three parts:

1. An overview of trace organic contaminants, especially pharmaceutical agents.
2. An overview of emerging contaminants of concern of a more local nature
3. General policy considerations, especially the problem of simultaneous compliance

My written testimony summarizes my oral remarks and includes a PowerPoint presentation and a briefing paper. All are available in full to the Subcommittee.

Trace Organic Contaminants

The emergence of novel contaminants in source water is not a surprise. In the environmental health community, we have known for many years that trace organic and other contaminants were present in low concentrations in surface water that was the source for intake into the drinking water system. Advanced testing technology have quantified the amounts but neither the levels nor the range of contaminants should be a surprise.

People take drugs and excrete them into wastewater. When have unwanted drugs they discard them, often down the toilet. Not surprisingly, then, pharmaceutical agents are present in the water downstream, which has become someone else's drinking water source. Yet another source is pharmaceutical use in agriculture. We have become aware of the presence of these contaminants because we have gone looking for them and because measurement technology is now sophisticated enough to find them at very low concentrations.

Currently, these contaminants are present in very low concentrations, parts per billion (one drop of water in an Olympic-size swimming pool) or trillion (one drop of water in a thousand pools). These levels are probably not enough to affect human health but if levels rise for whatever reason this possibility cannot be ruled out. For species that live in the aquatic environment and that may bioaccumulate some of these agents, however, there is a real possibility of environmental impacts and ecosystem effects. This is

especially true for agents that exert hormone-like effects (so-called "endocrine disruptors").

Technologies to treat these agents vary in their effectiveness. Many technologies seem to reduce many organics a little, but some are only removed appreciably by singular and expensive technologies, such as ultraviolet treatment.

Trace organics (especially pharmaceutical agents) are widely dispersed, passed along from town to town downriver, and reflect broader patterns of consumption of medication. It is hardly surprising that the list of cities which have identified these agents in their source water is growing. Where ever there are concentrations of people, these agents are going to be downstream and will enter source water for the next community down the line.

This problem therefore requires a national effort to achieve a solution before a serious health hazard emerges. I suggest that such an effort would consist of at least the following:

1. A national commitment to and comprehensive programs of watershed protection and upstream source protection. This will involve land use planning to ensure compatible uses in watershed areas.
2. "Take-back programs" that allow pharmaceuticals to be returned to the point of purchase of convenient, safe disposal sites and that discourage disposal down the toilet or into trash destined for a landfill.
3. Well-designed evaluation programs to determine national trends for the increase or decrease of levels in source water. (Operational monitoring for each and every utility is probably not cost-effective and are unlikely to change the timetable for technological upgrading.)
4. Research programs to develop robust but cost-effective water treatment technologies that are "multivalent", that is, that breakdown or remove a broad spectrum of contaminants.
5. Deployment of technologies to remove contaminants on the intake side is probably best done as a program of continuous and monitored improvement rather than as a crash program. There are many possible unintended consequences and the risk or threat does not seem to justify a disruptive effort that might divert resources away from upgrading basic water treatment and source protection. It is better to get it right than to get it done quickly.

Other Emerging Contaminants

Emerging contaminants are chemicals that are not regulated nationally as water contaminants and have not traditionally been recognized as water pollutants. Most emerging contaminants other than pharmaceutical agents and nanoparticles appear to come from what are called "point sources", release sources that are geographically restricted. The emerging contaminants of greatest interest at the moment are often related to Superfund NPL sites or local industrial sources.

These include the following:

- Silver nanoparticles (which are bactericidal -- they are an even greater problem in wastewater and may soon be as ubiquitous as trace organics)
- N-nitrosodimethylamine (which has characteristics like MTBE, which caused huge problems and may also become widespread as a disinfection byproduct)
- Perfluorinated compounds (including C8)
- Perchlorate (which can also occur naturally)
- 1,4-Dioxane (not to be confused with dioxin)
- 1,2,3-trichloropropane (called TCP, which is a bigger threat to groundwater)
- PBDE and PBBs (out-of-production fire retardants, not to be confused with PCBs)

These other, point-source emerging contaminants need to be handled in different ways specific to the local situation, to include:

1. Systematic research and tracking where they are known or most likely to occur.
2. Further toxicological investigation to support risk assessment, in order to determine the level of risk they present.
3. Targeted development of remediation technology, which of necessity is likely to be site-specific.

Simultaneous Compliance

The recognition of another, very heterogeneous set of water pollutants raises another issue which should be considered before additional regulation is proposed to deal with these issues.

Water utilities (and all regulated entities, really) are required to comply with many different regulations. What happens when they are incompatible?

An example of this occurred in 2001 when the newly promulgated Disinfection Byproduct Rule was proposed. Water utilities switched their disinfection regimes to chloramine in order to comply with the regulation, which was an entirely reasonable thing to do. In some places, most notably Washington DC, the resulting change in water chemistry had an effect on the internal surface of lead service lines (water pipes delivering drinking water from the main to the house), which still supply many homes, and lead-containing fixtures and solder which still exist in many homes. The result was exceedances under the Lead and Copper Rule. EPA is well aware of this problem and has convened meetings to address it.

One social consequence of this problem is that we are seeing the emergence in some quarters of an activist movement to ban chloramine, based on misunderstanding an the absence of science. We are also seeing the emergence of a nihilistic attitude against disinfection altogether in favor of only filtering water, which is even worse. This is a very bad idea which could usher in new epidemics of waterborne disease, especially diarrhea.

The health consequences would be catastrophic if this latter opinion carried the day but my reading of this movement is that it is best read as a troubling signal of unease and confusion.

We must deliberate and use the best science available to us and sponsor additional studies if we do not have the science we need. We need to be careful that as the water contaminant issue becomes more complex, the regulatory framework does not create unintended consequences. The regulatory framework needs to address water as a complex system, not by individual contaminants alone.

The best way to do this is, in my opinion:

1. Adopt new regulatory models, such as multi-contaminant, multiple risk models.
2. Connect regulation of source water and drinking water by reconciling the Cleat Water Act and the Safe Drinking Water Act.
3. Conduct research on implementation and outcomes at the level of utilities and the factors that make water chemistry so different from one community to another.
4. Imbed public health research and practice, including active involvement of the CDC, in the development of regulatory frameworks.
5. Acknowledge the role of education and communication for an informed public that can actively participate in ensuring that water, our most valuable resource, is clean, safe and protected.
6. Provide a clear message to the public as to why disinfection is critical to health

Conclusion

In closing, the emergence of novel contaminants in source water is not a surprise and the demonstration that there are emerging contaminants in other watersheds is to be expected. Pharmaceuticals and some other emerging contaminants are widespread and require a federal commitment for research and development for robust treatment options. Others are local issues and solutions will have to be addressed to local conditions. Whatever is done, regulations and mitigation efforts should be carefully weighed so as not to introduce unexpected consequences, as we have seen with disinfection byproduct control measures.

Thank you for the opportunity to present this testimony.

Emerging Contaminants in US Waters

THE GEORGE WASHINGTON UNIVERSITY

Briefing for
House Committee on Transportation and Infrastructure
Subcommittee on
Water Resources and Environment

Tee L. Guidotti

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Background

- We've known this was coming for years.
- Ecosystem and human health effects
- Incomplete health data
  - Typical of an emerging issue
  - Health outcome data will be hard to obtain
- Distrust of water safety
  - Substantially aggravated by lead issue
  - Beginnings of a public movement against disinfection – very dangerous

Pharmaceutical Agents

- Pharmaceuticals are designed to have a biological impact, but at relatively high concentrations
- Lack tests for many effects
  - EPA has tried for endocrine disruptors – controversy
  - Significance in dispute
- Pharmaceutical residues may be transformed
  - Biotransformation in surface water
  - Reactions with free chlorine
- Chemical mixtures may have unpredictable effects.
  - Theoretical concern

This is not exactly a surprise.

Health Risk - Plausible

- Ecotoxicity more likely than human toxicity
- Most likely effects are endocrine disruption
  - Hormones and cell signaling
  - Can have effects at much lower levels than other chemicals: dosage issues and relevance of indicators
- Pharmaceuticals are present in very low concentrations: ppb, ppt
  - Too low for most toxic effects
  - Allergic reactions if levels rise?
- Antibiotic-resistance?
  - Most likely where local accumulation
  - Documented for antibiotics in feed

Perception of Risk

- Perception, rather than data, drives public reactions.
- Addressing perceptions
  - We have known about this problem for years.
  - Attention in part due to much improved measurement technology and surveys.
  - Health effects not so easy to rule out
- Need a comprehensive message on water quality.
  - Enormously complicated by the lead issue.
  - Strategic risk communication effort

Is it a threat to me and my family?

Recommendations for Pharmaceutical Contaminants

- Continued research required
  - Are levels rising, is distribution changing.
  - Improved means of water treatment
  - Need to evaluate trends across country in a systematic way
- Operational monitoring is probably not necessary at this time.
  - Very expensive
  - Little useful information
  - Technology is the bottleneck, not recognition.
- Systemic approach needed:
  - Risk assessment to address uncertainty
  - Risk management to control effluent
  - Risk communication and risk perception

Management of Risk - National

- Coordinated approach to human health effects and contaminant mixtures (FDA, EPA, CDC, USGS)
- Integration of pharmaceuticals into the CDC's Environmental Health Tracking Program
- Interagency collaboration at the local, state and national level in conducting assessments
- Control agricultural practices that release antibiotics and steroids into source water.
- Change TSCA and integrate screening with FDA
  - Require pharmaceutical companies to assess the environmental impact of new pharmaceuticals.
  - Model should be REACH. This won't happen.

Management of Risk - Local

- Pharmaceutical Take Back Programs
  - Collaboration with pharmacists
  - Proper disposal of medications
  - Public education
  - Removing barriers to take back programs.
- Invest in drinking and wastewater treatment upgrades and infrastructure.
- This is really a national issue, not a local one.
- Watershed protection and upstream management.

Other Emerging Contaminants

- Unregulated on a national level
- Point source for most, esp. NPL sites and industrial facilities
- Much uncertainty in toxicology but levels tend to be very low
- Technology for removal varies, can be expensive
- Bottled water as an alternative may be poor risk-risk calculation, except where locally high levels.
- Disinfection byproducts constitute some emerging contaminants, e.g. NDMA

Emerging Contaminants (Unregulated)

- Silver nanoparticles
  - Used in bactericidal products, use will increase
  - Highly toxic to bacteria
  - Bigger problem is effect on sewage treatment facilities
- N-nitrosodimethylamine (NDMA)
  - Antioxidant and amination product; food; air pollution
  - Found around rocket fuel production sites to 3000 ppt
  - Miscible in water; similarities to MTBE
  - Easily broken down by photolysis
  - Probable human carcinogen (a nitrosamine)
  - California has set standard of 3 ng/L (ppt)
  - US EPA Regions 3 and 6 use 0.42 ppt alert

Emerging Contaminants (Unregulated)

- Perfluorinated compounds (inc. C8)
  - Nonstick coatings, stain-resistant fabric treatment
  - Locally high contamination where industrially used
  - Bioaccumulate, immunotoxicity among reptiles
  - So far human health risk not apparent
- Perchlorate
  - Rocket fuel, explosives; also occurs in food
  - Highly soluble in water; concentrated brines sink
  - Very controversial
  - EPA DWEL 24.5 ppm (thought protective)
- 1,4-Dioxane (not to be confused with dioxin)
  - Solvent, widespread use
  - Probable human carcinogen (IARC)
  - US EPA Regions 3 and 6 screening level 6.1 ppb

Emerging Contaminants (Unregulated)

- 1,2,3-Trichloropropane (TCP)
  - Solvent and feedstock
  - Low solubility in water, local groundwater hazard
  - Human carcinogen (California)
  - CA standard for water 5 ppt
- PBDE and PBB (not to be confused with PCBs)
  - Fire retardants , no current production
  - Bioaccumulate, bioconcentrate
  - Occurs in sediment, slow release to surface water
  - Thyroid toxicity, risk level unclear
  - IARC: possible human carcinogens
  - Strict regulation in Europe (DK, A)

Simultaneous Compliance

- We are reaching a point where some regulatory requirements may conflict and interfere with one another.
- This what happened with the current push to control disinfection byproducts (DBP).
- Complying utilities risk inadvertently violating Lead and Copper Rule (LCR) unless further treatment of water.
- Similar unanticipated consequence emerging with NDMA and chloramination
- This is contributing to an unjustified perception that chloramine is unsafe.

Simultaneous Compliance: A Case

- Disinfection Byproduct Rule
  - Controlling DBP is a priority because they are suspected of causing cancer in humans and reproductive outcomes (although the evidence for the latter suggests not).
  - EPA promulgated the DBP Rule
  - The ensuing change in water chemistry caused lead levels to rise in home water taps.
  - This caused a violation of the Lead and Copper Rule (LCR). Observed first in Washington, DC.
  - Source of lead is fixtures in the home and lead service lines, not source water contamination.
  - Passivation (with orthophosphate) ameliorated problem.

Simultaneous Compliance: Issues

- This is not simply a problem of coordination.
- Need further research to anticipate these unintended consequences
- Research needs to be programmed with input from utilities caught in the middle.
- Emergence of a nascent anti-chloramine movement is a potential challenge.
  - Currently scattered opposition to chloramines, occasionally any disinfection agent
  - Disinfection is essential for public health.
  - Complaints include unconfirmed symptoms such as itching: need to be addressed
  - Position may be ill-founded but difficult to address without accessible research and risk communication.

Rapid Public Health Policy Response Project

April 2008

School of Public Health and Health Services

Pharmaceuticals are in the Drinking Water: What Does It Mean?

THE GEORGE WASHINGTON UNIVERSITY MEDICAL CENTER WASHINGTON DC

URL: *www.gwumc.edu/sphhs/about/rapidresponse/index.cfm.*

GW SPHHS Rapid Public Health Policy Response Project is supported in part through the Public Health and Policy Group of Pfizer Inc

About this Paper

In cities across America, trace concentrations of pharmaceuticals — hormones and antibiotics, psychiatric and cardiac medications, and painkillers and blood thinners, among them — are moving into surface water, and from there into the drinking water. Neither the steps in place to treat wastewater before it is discharged into waterways, or drinking water before it gets to the tap, are adequate to eliminate them entirely. There may be no immediate health effects at the tiny concentrations in which these drugs have been detected, but scientists worry about the consequences of long-term, low-level exposure.

The federal government does not currently regulate the level of pharmaceuticals in the drinking water and utilities are not required to monitor it. As science accumulates about the scope of this issue, it may be appropriate to consider new strategies for identifying drugs in the water supply, assessing health risks, expanding water treatment options, and setting upper-level standards for contaminants of concern.

For more information about pharmaceuticals in the drinking water, contact:

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About the Rapid Public Health Policy Response Project

The Rapid Public Health Policy Response Project of the School of Public Health and Health Services at The George Washington University presents data and other background information on breaking public health stories. The goal is to educate the public, policymakers, legislators, health care providers, the media and others in order to promote informed decisionmaking.

Karyn Feiden, an independent consultant who writes about public health and health care, provides editorial support for this project. Financial support comes from the Public Health and Policy Group of Pfizer, Inc.

April, 2008

Traces of many pharmaceuticals are entering the drinking water of numerous American cities. That conclusion is based on a decade of scientific research and advances in methods to detect minute concentrations of chemicals in the water. The issue gained renewed attention in early March, when the Associated Press publicized the results of its five-month investigation: "A vast array of pharmaceuticals — including antibiotics, anti-convulsants, mood stabilizers and sex hormones — have been found in the drinking water supplies of at least 41 million Americans," reported the news service.[1]

The findings raise important questions about the environmental and human effects of low concentrations of water-borne chemicals, and about the adequacy of systems in place to treat both wastewater and drinking water. At current levels, pharmaceutical residues are unlikely to pose an immediate risk to human health, but the long-term consequences of individual chemicals, and combinations of chemicals, are unknown, especially as concentrations rise. Recent findings, said Tee L. Guidotti, MD, MPH, chair of the Department of Environmental and Occupational Health in GW's School of Public Health and Health Services, "are a wake-up call, but not an alarm."

How should public agencies and local water authorities respond?

From Wastewater to Drinking Water

Pharmaceuticals enter the water supply through human, agricultural, and veterinary practices. When we ingest drugs, our bodies absorb some of them, excreting the rest through bodily wastes. Unused pharmaceuticals may also be flushed down the toilet, poured down the drain, or allowed to leach from landfills. In urban areas, pharmaceuticals in household wastewater travel through a sewer system to a treatment plant, and then are discharged into surface water (lakes, rivers, and streams). In rural areas, they are processed through septic systems and may enter groundwater (the water that permeates soil and rock, and accumulates in underground aquifers). Surface water and groundwater are the interconnected sources for most drinking water.

Contaminants that evade wastewater treatment: Conventional wastewater treatment was not designed to break down pharmaceuticals, and it is not efficient at doing so. But in the past, we did not even know those contaminants were present. Breakthroughs in chemistry and refinements in measurement technology in recent years have allowed environmental scientists to detect chemicals at increasingly lower concentrations. The levels being detected today are measured in the parts per billion (equivalent to one drop of water in an Olympic-sized swimming pool, or a single blade of grass in a football field) or parts per trillion (that drop of water in one thousand pools, that blade of grass in one thousand football fields).

In 1999 and 2000, the United States Geological Survey (USGS) conducted the first "national reconnaissance" of organic wastewater contaminants, with an eye towards

determining their concentration in the nation's streams.[2] USGS chose to look for 95 compounds, including:

- Human and veterinary antibiotics (e.g., doxycycline, tetracycline and sulfa drugs)
- Prescription drugs (e.g., analgesics, antidepressants, and drugs designed to lower cholesterol, reduce hypertension, and prevent blood clots)
- Steroids and reproductive hormones
- Caffeine
- Chemicals commonly found in plastics, insecticides, fragrances, fire retardants and solvents

The USGS found what it was looking for. Eighty percent of the water samples researchers took from 139 streams in 30 states contained at least one of the 95 contaminants under study. Most contained a lot more — researchers found an average of seven contaminants in each water sample.

The study was not a definitive finding on the nature or extent of the problem. The target compounds were only a subset of the organics likely to be in wastewater and the USGS deliberately chose many sites downstream of urban and agricultural areas, where contamination is more likely. Nonetheless, with its finding of contamination "in a wide variety of hydrogeologic, climatic, and land-use settings across the United States," USGS concluded that the wastewater treatment steps intended to return clean water to the nation's waterways do not effectively control pharmaceuticals.[2]

Numerous studies in the United States and Europe have had similar results, suggesting a global problem. An October 2005 report estimated that 100 different pharmaceuticals had already been identified in surface water.[3] For example:

- USGS researchers found "a complex mixture of pharmaceuticals, wastewater chemicals, pesticides and trace metals" in the watershed region of Boulder Creek, Colorado.[4]
- Acetaminophen, caffeine, codeine, antibiotics, and warfarin were among the compounds detected in the outflow of a high school septic system in western Montana. That research also indicated that an antibiotic, a mood-stabilizing drug used to treat bipolar disorder, and nicotine had penetrated local aquifers.[5]
- After reviewing the pharmaceutical load in proximity to seven wastewater treatment plans along the Ebro river basin in Spain, researchers concluded, "wastewater treatment plants are hot spots of aquatic contamination concerning pharmaceuticals of human consumption."[6] Likewise, surface and groundwater in Germany contained trace pharmaceuticals, including a cholesterol regulator, painkillers and drugs to prevent seizures.[7]

"The bottom line is that wastewater treatment somewhat reduces, but does not entirely eliminate trace pharmaceutical compounds in wastewater," said Tee L. Guidotti

Reaching the tap: Eventually, some of those compounds make their way into household drinking water. The Associated Press study, which was based on a review of scientific literature and government databases, extensive interviews, and surveys of major water providers in the nation's 50 largest cities and elsewhere, concluded that municipal water in at least 24 major metropolitan areas contain pharmaceutical residue.[1]

The scope of the emerging issue is undoubtedly far greater since many water utilities do not routinely test municipal drinking water for pharmaceuticals,[1] either because they can not afford to do so, or because they are reluctant to venture into an area where research is limited and the federal government has not provided guidelines. Moreover, utilities that do test may not share their results with the public (there are no federal requirements mandating disclosure, although the U.S. Environmental Protection Agency [EPA] says it "encourages" utilities to do so).[7]

Drinking water treatment varies by location, but typically combines coagulation and sedimentation techniques, which allow contaminants to clump together and settle out, and is usually disinfected with chlorine or chloramine. There is often a filtration step in the process before water is considered suitable for consumption. None of these conventional methods removes significant amounts of organic contaminants. More costly technologies, especially ozone and granular activated carbon filtration, do significantly reduce the load, although traces of pharmaceutical remain even after their use.[8]

The Health Risks of Pharmaceutical Residue

The literature on the human health risks of trace pharmaceuticals is thin, but some researchers have suggested that they are too dilute to be of concern. "To date, no evidence has been found of human health effects from PPCPs [pharmaceuticals and personal care products] in the environment," states the EPA on its Web site.[9]

In one model, researchers first estimated "no effect concentrations" of 26 active pharmaceutical ingredients (APIs) — the concentration at which these ingredients would be expected to have no effect, even on sensitive populations. Based on comparisons to concentration levels that have been measured and reported in the published literature, they concluded: "No appreciable human health risk exists from the presence of trace concentrations of these APIs in surface water and drinking water."[10] (This study excluded hormonal residue, and in a separate presentation, one of the authors acknowledged a potential effect of hormones in the drinking water.[11])

Other researchers are less sanguine. Commenting on the "no effect" study, a scientist from the EPA's National Exposure Research Laboratory wrote, "There is still a scarcity of human health assessments for environmental exposure to pharmaceuticals, so it is premature to draw firm conclusions at this time and to extrapolate this limited assessment to pharmaceuticals beyond the 26 investigated."[12] That investigator noted that while some 3,000 pharmaceutical ingredients are in use today, environmental studies have looked at only about 150 of them.

The sparse research on an emerging problem reflects, in part, the fact that environmental toxicology has traditionally focused on the effects of acute exposure, rather than on low-level,

chronic exposure. A number of issues suggest the need for more knowledge about the potential health effects of highly dilute pharmaceuticals:

- In contrast to conventional pollutants, pharmaceuticals are deliberately designed to interact with the body at low concentrations in order to have a biological impact. They can also interact with cell receptors other than those targeted for therapeutic purposes.[9]
- A limited body of research demonstrates the plausibility of biological effects — of particular concern is a study that hints at an impact on the basic mechanisms of cell signaling[13] and another that suggests an additive effect when a mixture of pharmaceuticals is present.[14]
- Because pharmaceuticals are present at such low concentrations, tests capable of detecting any subtle biological effects need to be developed. The EPA has singled out neurobehavioral effects and the inhibition of efflux pumps (which transport molecules from cells and play a role in eliminating toxins from the body) as potential outcomes that should be measured. Subtle effects that accumulate may become significant.[9]
- Pharmaceutical residues may be transformed, possibly with toxic effects, through biodegradation and other interactive processes that occur in surface water, or as a consequence of reactions associated with drinking-water treatment.[15]
- Hormones and other chemicals that act by signaling and stimulating cell changes can have effects at much lower levels than other chemicals. Endocrine disruptors, which interfere with normal hormone function in animals and humans, are a special concern.[12]
- While current concentrations of pharmaceuticals are far below levels known to trigger allergies, vulnerable people could have allergic reactions if levels rise.
- The possibility that antibiotics released into the environment could promote local pockets of antibiotic-resistant bacteria, while largely speculative at this point, can not be ruled out. One study, for example, detected higher levels of antibiotic-resistant bacterial strains downstream from a swine-feeding facility, compared with upstream levels.[16]

An impact on the ecosystem is already apparent. "Exposure risks for aquatic organisms are much larger than those for humans," says the EPA, noting that these organisms are exposed continually, over many generations, to the higher concentrations of pharmaceuticals that linger in surface water.[9] Published studies have identified endocrine disruptions, reproductive effects, and renal deterioration in fish, among other damage.[4,12,17]

Meeting the Challenge

More information on the health risks of trace pharmaceuticals is clearly necessary. Until that occurs, the urgency of the need to lessen the flow of pharmaceuticals from treated wastewater

into drinking water is likely to remain controversial. The most appropriate strategies for action are likewise uncertain.

As emerging contaminants, pharmaceuticals in drinking water remain basically unregulated. There is likewise no federal requirement that utilities test water for the presence of drugs.[1] As the U.S. Geological Survey states, "Few of the detected compounds exceeded water-quality standards; however, many do not have water-quality standards."[18] According to an Associated Press report, the EPA reviewed 287 pharmaceuticals as potential candidates for regulation, and nominated only one — nitroglycerin, not because of its relevance to water contamination, but because of its potential use in explosives.[19]

Unless national standards are developed, monitoring mandates imposed, and adequate resources made available to ensure compliance, the decision to track the problem and invest in technologies to address it, will continue to be made at state and local levels. However, the incentive to act locally is complicated by the fact that investments in water treatment may not directly benefit the entity that makes those investments since contaminated wastewater often flows into neighboring communities.

D.C. water: Washington, DC illustrates the complexity of the issue, and the costs that are involved. The District's drinking water comes from upstream sources in the Potomac, with trace concentrations of pharmaceuticals supplied by upstream communities. The Washington Aqueduct, a branch of the U.S. Army Corps of Engineers, collects that water and supplies it to the DC Water and Sewer Authority (WASA) to distribute.* The Aqueduct is currently investing substantial resources to determine what treatments would be most effective in removing emerging pathogens, including pharmaceuticals.[20]

WASA also runs the Blue Plains sewage treatment facility, the world's largest advanced wastewater treatment plant. It has budgeted more than one billion dollars for future upgrades, including anaerobic digesters and advanced chemical treatment that would be expected to reduce the downstream discharge of pharmaceuticals and other organic contaminants into the Chesapeake Bay.[21] That means Washington has to pay huge sums to treat its water twice, once as it enters the system at the tap and again as it departs in wastewater.

Action steps: Federal standards would lead to greater uniformity in how localities manage their pharmaceutical load. Other possible action steps.

- More attention to research. The Association of Metropolitan Water Agencies (AMWA), among others, has urged the EPA and the Food and Drug Administration (FDA) to study the short-term and long-term effects of trace pharmaceuticals on human health and the environment. The AMWA has also called on the EPA to make research into treatment technologies a high priority.[22]

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- More public education to encourage consumers and health care providers to dispose of medications properly. A partnership has been formed among the U.S. Fish and Wildlife Services, the American Pharmacists Association, and the Pharmaceutical Research and Manufacturers of America to publicize appropriate disposal measures.[23] "Take-back" programs, already instituted at some pharmacies, allow customers to return unused and out-of-date pharmaceuticals for safe disposal.
- Changes in the way the FDA requires pharmaceutical companies to assess the environmental impact of their drugs, as recommended by the Environmental Working Group, an advocacy organization.[24]
- Altering agricultural practices that release antibiotics and steroids into the water supply, as recommended by the AMWA. The association has also asked that the agricultural industry abandon its efforts to seek liability exemptions from federal hazardous waste laws.[22]
- An emphasis on controlling the discharge of contaminated water at the source, rather than treatment at the point of use. This would be safer for the environment, while reducing the burden on downstream drinking water treatment plants.[25]
- A close look at regulatory approaches in the European Union, where there have been more aggressive efforts to control contamination in waterways.[26]
- Greater public investment in drinking and wastewater infrastructure. Rather than taking a contaminant-by-contaminant approach, upgrading technology offers an opportunity to address water quality issues, and ecological stressors, systematically.[27]

Amidst uncertainty a few facts are clear. Trace pharmaceuticals survive the steps in place to treat both wastewater, before it is discharged back into the environment, and drinking water, before it reaches the tap. While the threat to human health and the ecosystem are not well-established, Christian Zwiener, a German researcher from the University of Karlsruhe, offers this perspective.

"Irrespective of any risks, the precautionary principle should apply and micropollutants from wastewater should not be present in drinking water. There is also a question of public acceptance of, and confidence in, good drinking water quality."[5]

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STATEMENT OF
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BEFORE THE
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
SUBCOMMITTEE ON WATER RESOURCES AND ENVIRONMENT

September 18, 2008

Madam Chairwoman and Members of the Subcommittee, thank you for the opportunity to provide the views of the U.S. Geological Survey, Department of the Interior, on emerging contaminants in the environment. The observed presence of emerging contaminants in the environment has prompted public interest regarding potential adverse ecological effects and potential contamination of drinking water. The interest has already increased public awareness of the ways we handle and dispose of chemicals we use every day to improve our health and quality of life and has resulted in interest by industries in improved waste treatment technologies and best management practices that are most effective at removing these trace organic chemicals from surface and ground waters and solid and liquid wastes.

The USGS studies a wide range of chemicals often referred to as emerging contaminants. These chemicals of emerging environmental concern include many chemicals used in our homes, businesses, and industries, such as human and veterinary pharmaceuticals, detergents, fragrances, fire retardants, disinfectants, plastics, and insect repellants. The chemicals currently of greatest interest include those that enter the environment via human and animal wastes. Many of these chemicals are a new focus for environmental research, because they are used in relatively small quantities and, therefore, were not expected to be of significant environmental concern. In recent years, they have been detected increasingly in the environment at very low levels (less than one part per billion). Despite these extremely low levels, investigation is warranted to determine if there are any potential adverse environmental and human health effects. The fact that we are looking for these chemicals or even detecting them in the environment alone does not

indicate that they are an environmental health concern. Although detection is an important component of the environmental assessment, ecological and human health assessments of the levels and mixtures observed in the environment are also essential.

To date, research and monitoring by the USGS and others have demonstrated that:

(1) the manner in which we handle and dispose of our wastes can concentrate these chemicals in some environmental settings to levels that may be an ecological health concern, and
(2) many of these trace organic chemicals associated with human and animal wastes have been entering the environment for as long as we have used them.

In 1998, the USGS broadened its water-quality science programs by initiating research on pharmaceuticals and other human- and animal-waste related chemicals. We were spurred by the findings of European colleagues, who, looking for a pesticide, detected a heart medication in the North Sea (Buser et al., 1998). The realization that chemical-use and waste-handling practices had resulted in detectable concentrations of a drug in such a large water body suggested the need for further research. By 2002, a USGS study (Kolpin et al., 2002; Barnes et al., 2002; and Buxton and Kolpin, 2002) had documented the presence of pharmaceuticals and other waste-associated chemicals in the Nation's streams and largely defined this issue in the United States.

Since 2002, the USGS has published more than 160 reports that:

- Document the occurrence, concentration, and mixtures of these chemicals in various environmental compartments, including stream water, well water, stream sediment, and soil amended with manure and biosolids (the solid byproduct of wastewater treatment plants);
- Demonstrate the comparative contributions from various sources, including wastewater treatment plants, livestock production and animal feedlot wastes,

aquaculture, onsite septic systems, combined sewer overflows, and other industrial discharges; and

- Demonstrate that some of these chemicals are assimilated by organisms (Kinney et al., 2008) or cause adverse ecological health effects (Vajda et al., 2008).

The bibliography of USGS reports that support these findings on emerging contaminants is available on the Internet at: *http://toxics.usgs.gov/bib/bib-Emerging.html*.

A recent example of USGS research is described in a series of reports on the levels and mixtures of human- and animal-waste related chemicals that are found in wastewaters, biosolids, and manures, and the soils to which they are applied for fertilization, as well as the earthworms found in those soils (Kinney et al., 2006a, 2006b, and 2008).

USGS investigations at a drinking water treatment facility in New Jersey described the changes in concentrations of emerging contaminants from the source water through multiple stages of the treatment process (Stackelberg et al., 2004, 2007). Additional investigations like this one will inform decisions on improving existing and developing new treatment works that are more efficient at removing these chemicals from source waters (the sources of drinking water).

Two USGS papers, published recently in the peer-reviewed journal *Science of the Total Environment,* summarize the occurrence of these chemicals in ground water (Barnes et al., 2008) and in raw (untreated) sources (streams and wells) of drinking water (Focazio et al., 2008). The paper surveying source waters includes results from 74 sites near drinking water intakes in 25 states and Puerto Rico. All data from these reports are available to the public in an accompanying data report.

The ecological effects of some emerging contaminants found in the environment have been documented in scientific literature For example, it was not a surprise when antibiotics, which are designed to act as antibacterials, were found to have adverse effects on soil microorganisms at concentrations found in the environment (Thiele-Bruhn and Beck, 2005). Some toxicological tests have found no effects on some species tested. In

one study, three freshwater invertebrates were exposed to an anticonvulsant drug commonly found in the environment. Only one of the three species demonstrated an adverse effect (Oetken et al., 2005). Furthermore, evidence suggests that chemical mixtures can act collectively to cause adverse effects, even when each component is below its individual effect level (Brian et al., 2007). These are examples of an increasing body of scientific knowledge on potential adverse health effects. Significant uncertainty remains regarding the effects of long-term exposure to levels found in environmental settings.

Endocrine disruption is one adverse health effect of concern because it may occur as a result of exposure to very low levels of hormonally active chemicals. One form of endocrine disruption observed in environmental settings affects fish reproductive systems, where fish have been found to be "feminized" by exposure to a range of chemicals that act similarly to the natural hormone estrogen. Some ways in which feminization is observed in fish include: (1) a higher percentage of females in some fish populations than commonly expected,, (2) changes in behavioral characteristics, such as nesting behavior, or (3) the presence of male fish with female characteristics, such as the presence of female egg cells in testes or of a female egg protein in their blood. A recent study (Kidd et al., 2007) demonstrated that the addition of ethinylestradiol (one of the active ingredients in birth control pills) at observed environmental concentrations to an experimental lake in Canada caused feminization and near extinction of fathead minnows in the lake.

A wide range of hormonally active chemicals can contribute to endocrine disruption, including actual biogenic hormones, synthetic hormones (pharmaceuticals, such as ethinylestradiol), and other chemicals that mimic or block hormone function (including certain pesticides, detergents, metals, and other industrial chemicals). These chemicals have been found together in waters affected by human and animal wastes and can occur together in various environmental settings. This reinforces why these chemicals must be studied together and not as separate classes of contaminants.

The effects of long-term exposure to the low levels of emerging contaminants found in the environment on human health are not well understood and warrant continued study. The USGS has collected information on the occurrence, concentrations, and mixtures of these waste-related chemicals in source waters used for drinking water and, to a much more limited extent, in finished (treated) drinking water. However, whether or not there are adverse human health effects from cumulative lifetime exposures to the low concentrations and complex mixtures of emerging contaminants found in the environment remains a research priority, particularly the effects on sensitive subpopulations such as children, women of child-bearing years, the elderly, and people with suppressed immune systems.

In the past decade, the USGS has developed the capability to analyze for approximately 200 emerging contaminants at levels less than one part per billion in environmental samples. These chemicals include pharmaceuticals, personal care products, detergent byproducts, detergents, hormones, fragrances, fire retardants, disinfectants, plastics, and insect repellants. The vast majority of these chemicals are synthetic and indicate human sources. Some are naturally occurring, and the levels at which they are detected can help distinguish between human and natural sources. We have collected and analyzed samples from approximately 1,500 sites across the Nation. About a quarter of these sites were sampled in nationally-designed targeted surveys implemented by the USGS to assess the occurrence of emerging contaminants across a wide range of environmental settings. The majority of the 1,500 sites were sampled as parts of studies conducted by the USGS in cooperation with State and local governments. These cooperative studies were designed to provide information for local resource managers on conditions in their area, and the findings are available to the public.

California provides an example of an extensive State program. The USGS California Water Science Center, in collaboration with the California Water Boards, has designed and implemented the Groundwater Ambient Monitoring and Assessment (GAMA) Project to assess the quality of California's ground water. The Priority Basin Program, a part of GAMA, will sample approximately 2,500 wells in about 120 ground-water basins

in California over an 8-year period (2004-2012). From May 2004 through December 2007, we have sampled about 1,400 wells for a very large suite of emerging contaminants. About 1,000 wells are being evaluated for the presence of emerging contaminants.

The USGS is continuing to conduct research on emerging contaminants in the environment. Our research priorities will continue to include assessing:

- Chemical loads of various sources including wastewater treatment plants, Animal Feeding Operations, landfills, and other industrial facilities,
- Ecological effects, including fish endocrine disruption in streams enriched with wastewaters,
- The occurrence of emerging contaminants in waters that are the source of drinking water and, to a limited degree, in treated drinking water, and
- The comparative performance of varying water and waste treatment processes to remove emerging contaminants,

The USGS conducts this research with a number of partner Federal agencies, including the U.S. Environmental Protection Agency (USEPA), Centers for Disease Control and Prevention, Fish and Wildlife Service, and National Oceanic and Atmospheric Administration. The USGS, USEPA, and FDA co-chair the Federal Interagency Work Group on Pharmaceuticals in the Environment, and the USGS participates in the Endocrine Disruption Work Group, both under the auspices of the Committee on Environment and Natural Resources of the National Science and Technology Council. These Work Groups have further increased coordination of Federal research.

Thousands of potential emerging contaminants are used in our homes and places of work to improve our health and quality of life, The USGS is focusing environmental research on chemicals that are more likely to be of environmental concern, to increase the efficiency of research within the existing limited resources available. Similarly, investigations of adverse health effects must consider the actual levels and mixtures of chemicals that organisms are exposed to in the environment. Results of USGS studies of environmental occurrence are used by many scientists to guide both human and

ecological health-effects studies to assure that actual environmental conditions are being tested.

We welcome the opportunity to provide any further information or assistance to the Subcommittee. Thank you, Madam Chairwoman, for the opportunity to present this testimony, and I will be pleased to answer questions you and other Members might have.

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United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

NOV - 7 2008

BY SPECIAL MESSENGER

The Honorable James L. Oberstar
Chairman, Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Enclosed is the transcript for the hearing before the Subcommittee on Water Resources and Environment of the Committee on Transportation and Infrastructure held on September 18, 2008, regarding "Emerging Contaminants in United States Waters."

The transcript has been reviewed and corrected by the Department's witness, Dr. Matthew C. Larsen, Associate Director for Water, U. S. Geological Survey (USGS).

Further, as requested we are providing a written response to the question asked by Representative Napolitano on page 64 of the transcript. Rep. Napolitano asks whether the agencies represented at the hearing have the appropriate funding to be able to do all of the required analysis discussed during the hearing.

The USGS's Toxics program, which provides reliable scientific information and tools that explain the occurrence, behavior, and effects of toxic substances in the Nation's hydrologic environments, requested $10,704,000 for fiscal year 2009. The program includes three major components, Investigations of Subsurface, Point-source Contamination; Investigations of Watershed-scale and Regional-scale Contamination; and Technical Support. Toxics program activities over the next 5 years will be guided by the Toxic Substances Hydrology Program Five-Year Plan, 2007–11, which has been compiled with broad input from stakeholders and from other USGS programs.

The FY 2009 budget request proposed a reduction in the National Water-Quality Assessment Program (NAWQA). At the FY 2009 proposed funding level, NAWQA ground-water quality monitoring activities affecting 28 States (encompassing 14 study units and 10 principal aquifers) will be discontinued. Monitoring of ground-water quality to determine current conditions and trends, as well as data collection for topical studies, would continue if data analysis and reporting on prior year work is completed. The USGS will focus resources on targeted sampling sites and delivering products resulting

from prior year investments. Long-term stream monitoring would continue at all 113 sites and ecological sampling would continue at all 58 stream sites. The proposed level would allow the program to continue national synthesis of selected topics; regional and national assessments of status and trends in streams and ground water; studies of source-water quality associated with large community water systems; and a number of topical studies.

Thank you for the opportunity to review the transcript.

Sincerely,

Christopher P. Salotti
Acting Legislative Counsel
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Enclosure

NACWA
A Clear Commitment to America's Waters

Testimony

of

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Emerging Contaminants in U.S. Waters

House Transportation & Infrastructure
Subcommittee on Water Resources and Environment
September 18, 2008

Background

Chairwoman Johnson, Ranking Member Boozman, and Members of the subcommittee:

Thank you for the opportunity to provide testimony before you regarding the pharmaceuticals and personal care products (PPCPs), and other emerging contaminants that are making their way into the nation's rivers, streams, lakes, and estuaries. My name is Keith Linn and I am an Environmental Specialist for the Northeast Ohio Regional Sewer District in Cleveland, Ohio. I am testifying on behalf of the National Association of Clean Water Agencies (NACWA), which represents the interests of municipal wastewater treatment agencies nationwide. NACWA members are dedicated environmental stewards who work to carry out the goals of the Clean Water Act and who treat and reclaim more than 18 billion gallons of wastewater each day.

My public agency is a large district serving the wastewater collection and treatment needs of just over 1,100,000 people. We are a founding member of NACWA and have been a key player in one of the Clean Water Act's greatest success stories – the transformation of the 1960s' notoriously "burning" Cuyahoga River into today's ecologically healthy home for literally dozens of fish species.

The purpose of this testimony is to provide the subcommittee with a sense of the state of science on emerging contaminants and the major data gaps that still exist; to explain the increasing public and media attention this issue is receiving; and to explain that sound science, not fear or an excessive application of the precautionary principle, must be applied to this emerging concern about which we still have so much to understand. NACWA wants to ensure that any approach to address emerging contaminants is firmly rooted in sound science and not dictated by undue public anxiety.

How Do Emerging Contaminants End Up in Our Waters?

These compounds are often described as "emerging contaminants" despite the fact that many have been in the environment for a long time – ever since society began producing and using them. Trace amounts of PPCPs were first reported at detectable levels in U.S. waters by the Environmental Protection Agency (EPA) in 1975. Since then, these compounds have been found in surface water, groundwater, almost all influent and effluent, biosolids, and treated drinking water. Currently, human use of the products containing emerging contaminants is expanding and escalating.

This increasing use no doubt means that more of these products are ending up in the environment, both in waterways and in soils and sediments. While households and individuals represent a huge non-regulated source of these products, other potentially significant sources include manufacturing facilities, businesses, retailers, hospitals and the medical industry, veterinary operations, landfills, septic tank haulers, and meat processors just to name a few. However, no one has been able to confidently rank the relative contribution from each of these categories of sources or their potential risks to human health and the environment.

Advances in Technology Increase Detection Rates, May Cause Unfounded Concern

Increasingly sophisticated chemical detection and monitoring technology is revealing the presence of chemical compounds at lower and lower trace levels, down to nanograms per liter, or millions of times lower than a therapeutic dose of pharmaceuticals. A person would have to drink as much as two Olympic-size swimming pools of untreated water from Cleveland's Cuyahoga River daily to ingest as much as a single therapeutic dose of an antibiotic detected in the river. Stated another way, these concentrations are so small that they are roughly equivalent to one second in the last 10,000 years; that is, a single second in the time from the Earth's last Ice Age until now. Yet, while corresponding information on impacts at these extremely low environmental levels is lacking, presence alone is fostering *awareness* of, and anxiety about, emerging contaminants.

The Associated Press (AP) released several stories earlier this year that ran in newspapers and were discussed on television news programs, focusing on the presence of trace amounts of various pharmaceuticals and other compounds in the drinking water of 24 cities. Measurable amounts of medications for pain, depression, and colds; birth control pills; caffeine; hair product ingredients; cleaning supplies; and pesticides have all been detected in samples collected from U.S. waterways. Some of these products contain endocrine-disrupting compounds and other contaminants that some researchers fear may impact aquatic life or pose a risk to human health. The question remains whether trace concentrations of these or other emerging contaminants in the nation's waters have a negative environmental or human health impact, and what the respective roles should be for the suite of interests along the chain of commerce, from manufacturers, retailers, medical facilities, and users to the nation's publicly owned treatment works (POTWs) and drinking water utilities.

In order to provide a frame of reference for what the presence of these compounds means, scientists have been looking at both occurrence data and human health information. However, identifying which emerging contaminants are of the greatest concern is exceedingly difficult, as many of these compounds are designed to

have effects at low concentrations. Additionally, there is little or no data on the ecological toxicity of most of these chemicals, and performing chemical analyses on all of them would be prohibitively expensive. We need to recognize that we can never have enough data to prove the safety of chemicals at these concentrations; it is impossible to prove a negative. Being tasked with proving their absolute safety is analogous to being tasked with proving that life does not exist anywhere else in the Universe; we may be able to prove someday that life does exist other than on Earth but, even after massive expenditures on research, we'd never be able to absolutely prove that it doesn't.

Endocrine-disrupting compounds (EDCs) are the "poster children" of the emerging contaminant issue. Sometimes referred to as "hormonally-active agents," these compounds have been linked as early as the 1960s, through wildlife exposure to subsequently-banned pesticides such as DDT, to adverse biological and ecological effects. Concern has become more widespread throughout the 1990s and into this decade, as scientists have begun to look at the presence of intersex fish and higher numbers of females in some fish populations, an observation that has garnered significant media attention. Researchers are still working to define the scope of the problem, and there are several data gaps that need to be addressed.

Critically, the information that EPA has on how chronic exposure to some of these compounds affects native fish is based on data extrapolated from studies of mammals. Also, effects observed in fish and other aquatic organisms attributed to EDCs can have other causes, such as changes in temperature. They may further simply represent natural variation in a population. This is not to say that all of the effects we are talking about here today are not linked with EDCs. They may be. The key point, however, is that all likely causes of these effects on aquatic ecosystems must be addressed before we conclude that EDCs are primarily responsible. Furthermore, while some research suggests impacts to aquatic life, no effects on human health from exposure to environmental levels of these compounds have yet been demonstrated.

Nonetheless, when people read or hear reports of possible effects in fish or other aquatic life, they often become concerned about similar effects occurring in humans. Even if presumptions of potential impacts are not supported by solid scientific evidence, this issue could be significant for POTWs if regulations and subsequent technology standards arise out of a public perception that a problem exists.

Next Steps in Addressing Emerging Contaminants

It is critical to point out that "emerging contaminants" refers to a much broader category of constituents than just pharmaceuticals, although these have tended to garner the most notoriety from the press and attention from the public. Given that many of these compounds find their way into the nation's waters via wastewater treatment plant effluent, NACWA and its member agencies have taken a proactive approach and are working to ensure that EPA provides careful oversight and review of a number of other contaminants.

The Northeast Ohio Regional Sewer District has had a longstanding interest in this issue and is actively involved nationally through membership on the NACWA Emerging Contaminants Workgroup and on the Water Environment Research Foundation (WERF) Trace Organics Issue Area Team. Locally, the Sewer District has spearheaded the creation of a multi-agency "used medication" workgroup. This local workgroup has developed an outreach campaign to educate the public on proper medication disposal methods, and it seeks to establish a regular and legal medication collection initiative.

NACWA has been involved in coalition efforts to remove from the stream of commerce potentially harmful contaminants that add little or no practical value, such as soaps and detergents that use triclosan, a substance found most commonly in hand-soaps, that could harm the delicate balance of the biological wastewater treatment process. NACWA has also been a participant in discussions with EPA on permethrin-impregnated clothing and copper and silver biocodes that may create problems for aquatic life. The Association has worked to establish a national strategy to address the complex issue of PPCPs that make their way into the aquatic environment and has formed a partnership with the Product Stewardship Institute on a national dialogue to develop a comprehensive approach for managing the disposal of unused PPCPs. Many of NACWA's member agencies have established pharmaceutical take-back programs to keep these compounds out of the environment, altogether resulting in the collection of significant quantities of unused medications.

However, product stewardship initiatives such as drug take-back programs face numerous barriers, not the least of which are federal narcotics laws under the jurisdiction of DEA and the Resource Conservation and Recovery Act (RCRA), the primary law for regulating solid waste. While DEA does not oppose pharmaceutical take-back programs and community collections, the agency works to ensure that the opportunities for diversion of narcotics and other controlled substances are limited. This creates a complex system for tracking drugs and impedes the development of community take-back initiatives. NACWA hopes that DEA will

consider changes to broaden disposal options and help to remove some emerging contaminants from the wastewater stream.

Federal guidelines also continue to advise that certain prescription drugs be flushed into the sewer system. Unfortunately, at the same time, EPA and other regulatory agencies at the federal and state levels are conducting efforts that may ultimately require POTWs to install additional equipment or take other action to remove these same drugs from their wastewater effluent. Clearly, preventing illicit drug use must be a national priority, but NACWA feels strongly that there are better ways of managing prescription drugs without resorting to disposal in the sewer system. Instead, sustainable approaches such as ongoing collection of unused drugs need to be explored.

In addition, NACWA strongly encourages Congress to address other emerging contaminants in a cooperative manner with the regulated community. Before regulation of any contaminants can be reasonably contemplated, EPA must first answer whether, and at what levels, the presence of trace amounts of these compounds in our waters can be reasonably expected to result in short-term or long-term effects on human health or the environment. Although millions of dollars are already being spent to look at impacts and fund support projects being conducted by EPA, the Water Environment Research Foundation, and the U.S. Geological Survey, substantially greater funding for the appropriate research is needed before broad national strategies for addressing the problem are implemented.

In the meantime, opportunities exist for collaboration and innovation, including innovative research, community collections, take-back programs, and aggressive public education campaigns. NACWA will continue to work with its member utilities and other organizations that are doing environmental research to take the results and develop options for communicating these strategies to the public. As we look to a future with new mixtures of chemicals and the increasing use of nanotechnology, we must make sure that we fully understand their impacts, while not standing in the way of innovation and progress, and while not saddling communities where resources are already scarce with potentially unwarranted additional burdens.

Thank you for your time and the opportunity to testify before the committee. I would be happy to answer any questions you may have.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

Testimony of David P. Littell
Commissioner, Maine Department of Environmental Protection
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September 18, 2008

Subcommittee on Water and the Environment
House Committee on Transportation and Infrastructure

Thank you Chairwoman Johnson and ranking member Boozman for holding this hearing and for the opportunity to speak on Maine's experience with emerging contaminants.

I would like to leave you considering the following:

- States do not now have sufficient information or resources to fully understand the human and environmental impacts of emerging contaminants in the waste stream and our waters.
- Carcinogen, reproductive or developmental toxicants, endocrine disruptors; persistent, bioaccumulative; very persistent and very bioaccumulative characteristics in certain substances suggest the need for caution.
- Removing toxic contaminants from different waste streams is the most effective pollution prevention strategy in many cases.

Maine's Experience: A Timeline

Maine's scientific and regulatory community has been looking at what we are now calling "emerging contaminants" for well over a decade. Unfortunately we have not had the resources for a comprehensive evaluation, and for that reason, what we don't know may be as illuminating as what we do know.

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In 1995, Dr. Beverly Paigen, a scientist at Maine's internationally renowned Jackson Lab, discussed endocrine-disrupting chemicals in a technical paper prepared for the Maine Environmental Priorities Project. Dr. Paigen wrote of concerns regarding biological impacts to humans and wildlife, including: increased incidence of testicular, prostrate, breast and ovarian cancer; decreased human sperm count; increases in congenital abnormalities of the male reproductive tract; and increases in endometriosis.

In the middle 1990s, drinking water from several private Maine wells was sampled for pollutants by DEP. The active substance in DEET insect repellant (diethyl tolumide) as well as a common pain reliever (ibuprofen), were detected in this well water sampled at several small town locations in Maine.[1]

At the end of the decade, the US Geologic Survey analyzed stream samples nation-wide for 95 compounds.[2] To follow up, EPA's Region I provided analytical support to those New England states interested in gathering data on local waters.
In 2002, Maine submitted samples from wastewater treatment effluent and the associated receiving waters in eight locations. The data from this small study, which screened for only 6 emerging contaminants, showed that a compound found in polycarbonate plastics and epoxy resins (bisphenol-A), an agent that kills bacteria and is found in soaps and cleaning agents (triclocarban), and an emulsifier used in detergents and pesticides (nonylphenol) were present in detectable amounts in a majority of both the effluent and receiving water samples. Detectable quantities of one or more of three estrogen-like compounds were also found in three wastewater effluents and in one receiving water sample.

In recent years in order to move beyond a chemical-by-chemical monitoring framework, we have undertaken a number of studies to evaluate overall environmental or human health impacts. All indications point to cumulative impact assessment of toxics being the most effective way to determine how we manage for the increasing array of compounds detected in our environment.[3]

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[1] Orrs Island in Harpswell (pop.5,239) and Oquossoc in Rangeley (pop.1,052)
[2] USGS Water-Quality Data for Pharmaceuticals, Hormones, and other Organic Wastewater contaminants in US Streams, 1999-2002
[3] Maine Surface Water Ambient Toxics Monitoring Program (SWAT) reports 2000-2007.

In 2005, Maine dedicated limited funding to study the presence of estrogenic compounds in effluent from three public treatment plants on the Penobscot River, a major river once renowned for its Atlantic salmon fishery. Effluent was found to be estrogenic.[4]

We have also funded several other studies to see whether fish populations are showing cumulative environmental effects from a range of emerging contaminants. To date, these screening level studies have not indicated endocrine-disruption or other effects. We will continue to invest state resources to develop additional capacity to continue monitoring using nationally and internationally recognized methodologies.[5]

In sum, we have dedicated resources to a number of initiatives to understand the degree to which certain chemicals are present in our waters and the impacts they may be having. Our knowledge of both, at present, is limited.

What is the Significance of Our Efforts to Date?

At the outset, it is important to note that while our data is sparse, it does show detectable levels of certain "emerging contaminants." That is a concern because, for example, most estrogens are known to exert effects at very low concentrations, in the parts per trillion range. Referencing this, it is significant that a USGS survey of more than 100 U.S. streams revealed that certain compounds in this category are present in the aquatic environment at sufficient concentration to exert biological effects on aquatic organisms.

Furthermore, we also do not know what the cumulative impacts from multiple chemical exposures may be. NIEHS (National Institute of Environmental Health Sciences) notes in their 2007 fact sheet that:
"Although limited scientific information is available on the potential adverse human health effects, concern arises because endocrine disrupting chemicals, while present in the environment at very low levels, have been shown to have adverse effects in wildlife species, as well as in laboratory animals at low levels.
The difficulty of assessing public health effects is increased by the fact that people are typically exposed to multiple endocrine disruptors simultaneously.[6] "

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[4] Maine Surface Water Ambient Toxics Monitoring Program (SWAT) FINAL REPORT 2006-2007 Monitoring estrogen active compounds in wastewater effluent and determination of novel biological effects in zebrafish (Danio rerio). Principal Investigator Greg Mayer, UM http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

[5] Maine Surface Water Ambient Toxics Monitoring Program 2000-2007. http://www.maine.gov/dep/blwq/docmonitoring/swat/index.htm

[6] Example of a possible multiple exposure: The estrogen components of birth control pills are endocrine disruptors. Bisphenol A is also an endocrine disruptor and found in some plastic bottles and metal food cans. New information on

In addition, impacted populations can be difficult to predict. Let me use Maine's experience with mercury to illustrate my point.

Maine has been studying mercury since at least 1980. For years the conventional wisdom was that the primary health impacts from mercury derived from wildlife and people eating fish contaminated by mercury deposited from the air by rain or snow. In 2007 Maine's BioDiversity Research Institute surveyed the eggs of 23 species of Maine birds for contaminants. In addition to mercury, they detected flame retardants, industrial repellants, banned transformer coolants and banned pesticides in the eggs of all 23 bird species. Some of the bird species (red-winged blackbird, tree swallow) surveyed do not even eat fish.

In addition, fate and transport can be hard to predict. A 1991-2001 USGS pesticide survey of streams and ground water found organochlorine pesticides such as DDT in 94% of fish tissue samples and 24% of bed sediments in streams in non-agricultural areas with no development. DDT was banned in the U.S. in 1972 and in Maine in 1968, yet as of 2006, DDT was one of the constituents underlying 88% of the fish advisories issued in the U.S. including three rivers in northern Maine.

In short, there is a lot that we don't know when gauging the significance of our efforts to date.

What We Do Know

Fundamentally, there is an ongoing need for additional resources to conduct more comprehensive testing. But along the way we have observed that wastewater treatment plants are probably not the preferable primary tool to use to control the introduction of emerging contaminants into the environment. They are not designed to do so, and they clearly don't. Instead, we need to look to product stewardship initiatives such as take back programs.

In 2003, Maine was the first state in the nation to pass legislation authorizing a mail-in program for unused pharmaceuticals. Since then, many entities have worked through the details of such a program, addressing the concerns of drug enforcement officials as well as factoring in existing designations of many of these pharmaceuticals as hazardous waste under federal law.

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bisphenol A was reported on September 3, 2008 by the National Toxicology Program concluding that "current human exposure to the endocrine disruptor bisphenol A…is of 'some concern' for effects on development of the prostrate gland and brain and for behavioral effects in fetuses', infants and children…"

In 2007, with a $150,000 grant from the US EPA, the University of Maine's Center on Aging launched a statewide mail-in program for seniors that distributed 7,000 postage paid mailers to pharmacies around the state. The program expects to remove about 3,000 lbs of unused prescription medications from the waste stream.

Maine's experience can be replicated and expanded nationally. In May 2008, the international pharmaceutical company Roche[7] (which has multiple U.S. locations) noted that they have established financial incentives to ensure that unused or outdated products are returned by retailers and others in the supply chain. Their policies require that any returned or waste pharmaceutical product be incinerated rather than disposed of in landfills. Roche participates in pharmaceutical take-back programmes *in the EU and* supports the use of existing local take-back programmes in the U.S. as well as the implementation of a farther reaching program on the national level.

While the overall structure of the Clean Water Act does not inhibit our work on emerging contaminants there are other statutes that can better deal with this issue. Using the existing framework of setting water quality criteria for individual toxics is certainly possible, it is probably more effective to reduce or prevent substances of high concern[8] from entering the waste stream. Revisions to the Toxics Substance and Control Act (TSCA) to require a more thorough review of human and environmental toxicity of existing and new substances may be more effective than relying on the Clean Water Act.

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[7] Global Roche Position approved by the Corporate Sustainability Committee April 25, 2008. Hoffmann-LaRoche Inc. (Roche), based in N.J. is the U.S. prescription drug unit of the Roche Group

[8] Carcinogens, reproductive or developmental toxicants, endocrine disruptors; persistent, bioaccumulative and toxic; very persistent and very bioaccumulative

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