NEWEA Position Paper

Comprehensive National Response to Microconstituents

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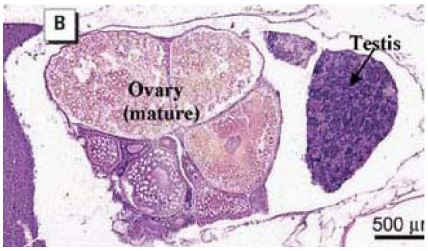
by the New England Water Environment Association

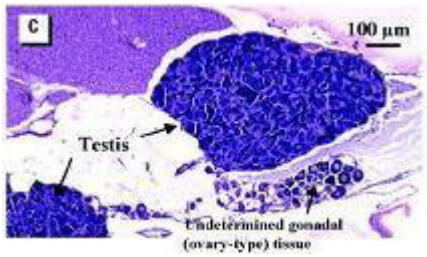
Modern science has produced a wide variety of chemical compounds that have improved the quality and longevity of our lives. The Water Environment Federation (WEF) estimates that there are more than 100,000 chemicals currently in use by society and industry, with up to 1,000 new chemicals being introduced yearly. Some of these compounds migrate into the terrestrial and aquatic environments through a variety of sources, such as wastewater effluent, treated sewage sludge, landfill leachate, combined sewer overflows, and animal feed lot drainage. It is important to note that contributions to the environment from some of these sources remain poorly characterized in both quantity and quality, and there are other avenues of migration that have yet to be identified.

WEF defines microconstituents as natural and manmade substances, including elements and inorganic and organic chemicals, detected within water and the environment for which continued assessment of the potential impact on human health and the environment is a prudent course of action. Most microconstituents are not new to the environment: the difference is that there are now analytical test procedures that can measure microconstituents in minute concentrations (fractional parts per billion, ppb; or parts per trillion, ppt). Research has revealed low levels of microconstituents in surface water, drinking water, domestic and industrial wastewater, biosolids, soils, and air. The rapid-development of new compounds and their incorporation into consumer products potentially adds even more complexity to the issue. In addition, it is likely that some microconstituents have potentially harmful effects in the ecosystems and to human health.

In 1999 – 2000, a U.S. Geological Survey study conducted by Kolpin et al. found concentrations of 95 organic wastewater contaminants in 139 streams in 30 states. The contaminants were found in 80% of the streams sampled, with many streams containing multiple contaminants. Contaminants found included non-prescription drugs, prescription drugs, fire retardants, antibiotics, hormones, and fragrances. For most of these contaminants, water quality standards, drinking water standards, maximum contaminant levels, or other standards do not exist. Exposure to these contaminants has been suspected to cause health effects in organisms, including likely fish feminization and other impacts. Research published in 2009 by Hinck et al. into the prevalence of intersex fish in nine rivers in the U.S. found that intersex characteristics, defined as the existence of both female and male characteristics, could be identified in 3% of all fish that were sampled throughout the rivers. The sampling showed that 18% of the male largemouth bass and 33% of the male smallmouth bass were intersex.



Intersex fish with one ovary and one testis. (Nash et. al.,2004)



Intersex fish with two testes and smaller juvenile (ovarytype) tissue.
(Nash et. al., 2004)

However, the presence of microconstituents does not necessarily equate to risk. Risk is determined by applying the parameters of toxicology, including presence and concentration (presence), fate—how it gets to a potentially-impacted organism (exposure) and impact on the organism given the exposure (impact). Research shows that microconstituents are present in the environment in low concentrations, and organisms in the environment are impacted by exposure to them, although the extent to which is not yet clear. There is a limited amount of research regarding the impacts to organisms by the kinds of exposures that have been found or are expected.

Based on this evidence, NEWEA advocates further research to enhance our understanding of this evolving and complex issue. Potential future regulatory requirements addressing microconstituents must be driven by sound scientific principles. Because there is so much that is unknown and the potential costs involved in evaluating the presence, fate, and impacts of tens of thousands of microconstituents, it is imperative that future research be appropriately prioritized.

Some of the unknowns regarding microconstituents include: what is the relative abundance and concentration of microconstituents in the environment; how they are transported and what is their fate in the environment; and, at what concentration levels do they pose a risk to humans and other organisms? Other questions are: what are the possible synergistic effects of exposure to microconstituents in combination; what are the acute, chronic, and reproductive effects of microconstituents; what are the costs associated with controlling microconstituents at their source versus treating microconstituents after they have entered wastewater treatment facilities or the environment; and how can we eliminate or reduce these sources while still maintaining our quality of life and the products we all need and use?

NEWEA firmly supports actions to prevent microconstituents from entering into our water resources and the environment. Source control and reduction measures are key issues that must be implemented to avoid the further discharge of these pollutants into our water and wastewater infrastructure and subsequently the aquatic environment. Specific activities include pharmacy take-back programs for prescription drugs, collection and recycling programs, and public education.

NEWEA strongly encourages that the following efforts be undertaken:

1. **Prevention**: Industry, agriculture, and the water and wastewater community should be active proponents of controlling microconstituents at their point of generation, where practical, in order to reduce potential risks. Pollution prevention strategies should be applied, such as recycling or proper disposal of pharmaceuticals and household chemicals.
2. **Product Evaluation and Control**: The U.S. Environmental Protection Agency and the Food and Drug Administration should work together to identify and address gaps in the existing regulatory framework for evaluating new substances prior to their production and use to ensure that they do not present significant threats to public health and the environment after they are dispersed in the environment.
3. **Research**: Federal agencies and academia should engage in cooperative efforts with organizations to accelerate research needed to assess potential risks to human health and the environment posed by microconstituents. Research efforts focused on source control, treatability, presence, transport, fate, and effects of microconstituents are all critical to understanding this complex issue. Screening level risk assessments based on preliminary information should be developed and used to determine priorities for further research and possible safeguards.
4. **Monitoring**: Local, state, and federal agencies should engage in cooperative monitoring efforts to better understand the presence and fate of microconstituents. In addition, federal agencies and academia should support further improvements in the accuracy and cost-efficiency of microconstituent detection and quantification.
5. **Public Outreach**: Federal, state, and local agencies, working with manufacturers and water and wastewater professionals, should educate the public about their role in reducing the release of microconstituents to the environment. Such programs should promote understanding of the proper methods for recycling or disposal of products and the consequences of improper use.

To address the water resource challenges that microconstituents will bring, NEWEA calls on the U.S. Congress to ensure that water resources are a central element of any federal legislation that establishes a framework for a comprehensive national response to microconstituents. The New England region is already in a daily struggle to meet the demands placed on our water infrastructure, and dealing with microconstituents will only put more pressure on the people and the systems that provide safe, clean water. We call upon our nation's leaders to provide the necessary support and leadership to ensure that the nation's water resource professionals have the tools and resources necessary to research and assess the extent of risks posed by microconstituents and to mitigate any significant risks that are found.

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