Chemical Pollutants in Water Emerge

High profile contaminants make for murky regulatory waters.

Chemical Processing, April 2010

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Recent advances in contaminant identification methodologies, sampling instrumentation, and analytical chemistry have caused an explosion of knowledge about the presence of previously undetected organic micropollutants. While it doesn't follow that the mere presence of chemical contaminants results in harm, public health experts, regulators, and others aren't sitting idly by.

Given the necessity of water to all life forms, emerging data about the presence of previously undetected substances has garnered the attention of consumers, regulators, elected officials, and the media. Following are examples of water and wastewater organic micropollutants that have emerged as high profile contaminants, and the technical challenges regulators and others face in defining, managing, and communicating potential risk posed by these substances.

Endocrine Disrupting Compounds

A heightened concern about potential effects of exposure to endocrine disrupting compounds (EDC) was reflected in Congress' 1996 enactment of the Food Quality Protection Act and amendments to the Safe Drinking Water Act. Both laws include provisions requiring the U.S. Environmental Protection Agency (EPA) to identify, characterize, and regulate EDCs, as appropriate. After much work, in April 2009 EPA published the final list of the first group of chemicals to be screened under the Endocrine Disruptor Screening Program. EPA began issuing testing orders in October 2009 to obtain data on whether endocrine effects exist.

Pharmaceuticals/Personal Care Products

There's heightened concern about the presence in wastewater and drinking water of pharmaceuticals and chemicals commonly found in personal care products (PCP). Pharmaceuticals (including those for veterinary use) are prescribed to address and/or prevent illness or infection and are intentionally designed to interfere with a biological system. PCPs are typically synthetic organic compounds derived for use by individuals in soaps, lotions, beauty aids, sunscreens, fragrances, and related PCPs and aren't typically designed to interact with biological systems.

Engineered Nanomaterials

Consumer applications of nanoscale materials have recently received much attention. An inventory of consumer products maintained by the Project on Emerging Nanotechnologies (PEN) at the Woodrow Wilson International Center for Scholars, Washington, D.C., identifies more than 1,000 nano-enabled products in commerce today, marketed in more than 21 countries. While the PEN inventory is only one and an admittedly imprecise measure of rapid deployment

of nanotechnology in consumer products, it's frequently cited as a fairly reliable gauge of nano commercialization.

Releases from these products into the environment may occur during product manufacture. Nanoparticles embedded in products may be released when the products are used as intended. The intended use of certain products may result in nanoparticles either becoming a contaminant in a water body or part of the influent being treated at a publicly owned treatment works. Nanoparticles also may be released into the environment when fabrics that contain embedded nanoparticles as a fiber finish are laundered or as certain antifouling paint and coatings for use on vessels and/or off-shore structures weather and degrade over time. Nanoparticles also may be released into the environment when products containing them are discarded and degrade, and potentially contribute to groundwater or surface water pollution.

Technical Challenges

While debate continues over whether there's evidence of a link between exposure to these micropollutants and adverse health effects, there's consensus that much more can be learned about the presence of these compounds in water, and the effectiveness of conventional drinking water and wastewater processes to remove them. Other issues arise from application of conventional pollutant treatment methodologies and tools to address newer, more exotic pollutants found in very low concentrations. Current sampling methodologies may not be able to identify and/or characterize in all cases the presence of organic micropollutants in complex water matrices.

It's also important to recognize these new challenges are in addition to existing, more "routine" challenges facing wastewater treatment operators. As the population grows, municipalities must process more water with fewer resources and with an aging infrastructure.

How these substances are managed, and how well and accurately they are profiled by regulators, the media, and other stakeholders may influence how other micropollutants are managed for years to come. All stakeholders must be scrupulously mindful of what's known, and what should be fairly and impartially communicated, and seek to contribute meaningfully to helping resolve the complex science challenges that deserve open and transparent reporting and deliberation.

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