

## Emerging environmental contaminants: Challenges facing our next generation and potential engineering solutions

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### Abstract

While our current generation continues to make efforts to remediate and minimize traditional pollutants in the environment, other “emerging” environmental contaminants are now warranting attention. These include perfluorinated compounds, nanomaterials, pharmaceuticals, illicit drugs, antibacterials, hormones, flame retardants, disinfection by-products (DBPs), artificial sweeteners, benzotriazoles, 1,4-dioxane, and algal toxins, as well as emerging contaminants on the horizon: prions and ionic liquids. Wastewater effluents are a major source for many of these emerging contaminants, due to their use in products we use in our households, from pharmaceuticals, detergents, fabric coatings, foam cushions, lotions, sunscreens, cosmetics, hair products, foods and beverages, and food packaging. After use, these chemicals are released in wastewater, and because many are incompletely removed in wastewater treatment, they enter our rivers and drinking water supplies. Surface run-off and agricultural run-off can also be important sources of their entry into the environment. Moreover, many of these contaminants can transform in the environment, from such processes as microbial degradation, photolysis, and hydrolysis, and they can also react with disinfectants in drinking water or wastewater treatment to form disinfection by-products. Issues surrounding these emerging contaminants, include widespread occurrence, bioaccumulation, persistence, and toxicity. Climate change can also serve to exasperate their effects by concentrating them in rivers during times of drought and by causing resuspension of some (like nanomaterials) during floods. This review will discuss these issues surrounding emerging contaminants and also propose some engineering solutions for the future.