How toxic are unregulated wastewater pollutants?

Spanish and Dutch researchers have evaluated the environmental impact of chemical pollutants in wastewater in Spain. The results suggest that the most problematic pollutants may be derived from newer pharmaceutical and personal care products, such as everyday painkillers and soaps, not yet regulated.

Water pollution is the main environmental concern for EU citizens, according to an EC Eurobarometer survey of 2005. Concerns about the health effects of chemicals used in everyday products are also high across all Member States. The main instrument of regulatory control for water in Europe is the Water Framework Directive (WFD). The WFD regulates 33 ‘priority’ substances (either persistent or highly toxic or both) as markers of the ecological health of surface waters. These tend to come from industrial rather than domestic sources, and include heavy metals and pesticides, among others.

Many pollutants enter the environment via urban wastewater systems. The study analysed sewage at a Spanish wastewater treatment works for 98 different pollutants, including 23 ‘priority’ substances and 57 others deriving from common pharmaceutical and ‘personal care’ products (PPCPs).

The researchers calculated a ‘characterisation factor’ for each chemical in the sewage. This accounted for environmental fate, exposure and toxicity. Exact details of this type are available for very few of the chemicals, so the study compared results using two separate models. Both gave broadly similar outcomes, with some differences in details. Separate assessments of ecotoxicity and human toxicity were made for discharge entering freshwater, marine or terrestrial ecosystems. These data were used to rank the pollutants in terms of potential toxicological impact.

Standard wastewater treatment (primary sorting and secondary settling) considerably reduced the chemical content, and hence ecotoxicity, of the effluent. 15 of the 98 chemicals were found to be especially ecotoxic as they were highly concentrated in wastewater and/or had a high characterisation factor. PPCPs do not need to be persistent to cause toxic effects as they enter the environment in a steady stream. Additionally, 10 of these 15 chemicals were non-regulated PPCPs. This suggests that they contribute a greater part of the ecotoxicity than the priority substances assessed, which are regulated under the WFD. These pollutants derive from everyday painkillers, soaps, anti-depressants and perfumes.

The authors point out that this study is not a full risk assessment or life cycle analysis of the environmental fate of wastewater pollutants. Little data exists to define characterisation factors for most of the substances, and there are potentially many more pollutants not covered by this study. Combinations of pollutants may also change their individual toxicities.

Emerging pollutants may pose a threat to ecological wellbeing. In most cases, their toxicity and biological effects are unknown and hence they are difficult to regulate. A much more thorough assessment of chemicals used in PPCPs is required to improve estimates of characterisation factors. Such information could extend the regulations intended to protect the health of surface waters.


Contact: ivanmuno@ual.es

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Additional information: The EC’s LIFE programme plays an important role in supporting European water policy. Information on successful LIFE projects that contribute to the treatment of pollutants in wastewater can be found in the Wastewater section of the LIFE website: http://ec.europa.eu/environment/life/themes/water/lists/waste.htm.