

Policy Position Statement

Pharmaceuticals and other trace organic micro-pollutants in water

Purpose

This Policy Position Statement presents a view on the occurrence of pharmaceuticals and other trace organic micro-pollutants in natural waters, wastewater, and drinking water. The term “organic micro-pollutants” is intended to include any organic compounds that may be found at microgram per litre concentrations or lower in water, such as pesticides, pharmaceutical residues, hormones, flame-retardants, plasticizers, perfluorinated compounds, and others. The aim is to place the potential environmental and public health significance of these compounds into context and to also recognise the costs inherent in removing these compounds from water and the need for solutions that are sustainable in a broad sense.

CIWEM’s Position on organic micro-pollutants in water:

1. There is no convincing case, based on the currently available information, that organic micro-pollutants at the concentrations that are measured in drinking water presently constitute any acute, or even chronic, consequences to human health. The current concentrations of organic micro-pollutants in tap water should therefore be regarded as “safe” unless/until new information proves otherwise.
2. There is currently a large amount of information from studies conducted around the world regarding the concentrations of a wide range of organic micro-pollutants in natural waters, wastewater, and drinking water. Water utilities should consider proactive monitoring for any new chemicals that may be discharged into water in some form. This monitoring should, wherever possible, include metabolites and degradation by-products of these micro-pollutants, which in some cases may have more significant consequences than the parent compounds.
3. There is currently a relatively large amount of information from studies conducted around the world regarding the toxicological effects and epidemiological consequences of a range of organic micro-pollutants at the concentrations found in natural waters, wastewater, and drinking water. Further studies are needed to address confounding factors such as mixture effects and other routes of exposure besides ingestion (e.g. dermal exposure, inhalation, food sources) before appropriate conclusions regarding the true environmental and human health consequences of exposure to these organic micro-pollutants via water, on both short- and long-term bases, can be reached.
4. Further research is needed to develop new energy-efficient, cost-effective treatment technologies and/or to optimise existing treatment practices to remove organic micro-pollutants from water and wastewater in a more effective and sustainable manner.

5. Other ways to minimise the concentrations of organic micro-pollutants, besides the implementation of new water and wastewater treatment processes, should also be investigated and implemented if appropriate. Examples may include improving the protection of drinking water source waters from organic pollution, or regulatory application of the “polluter pays” principle when particular consumer products are identified as being significant sources of organic pollution.

CIWEM is the leading independent Chartered professional body for water and environmental professionals, promoting excellence within the sector.

Context

There has been considerable media coverage reporting the presence of a range of organic micro-pollutants in natural waters, wastewater, and even tap water. Some of the most high-profile media coverage has been given to pharmaceutical residues in water for example, residues from birth control pills, antibiotics, or analgesics. Some of these organic compounds have always been “naturally” present to some degree in water (e.g. human or animal hormones), whereas other organic micro-pollutants would not normally be found in the natural environment but rather result from man-made products (e.g. pesticides, pharmaceutical residues, flame-retardants, perfluorinated compounds, plasticizers). Alarm has been raised, even though the environmental and human health significance of many organic micro-pollutants is still unproven.

Much of the increased interest in these organic micro-pollutants in recent times results from advances in the analytical chemistry methods for quantifying the very low concentrations of these compounds in water. Therefore, it is not necessarily the case that all of these organic micro-pollutants are newly occurring in water, but rather that it is only recently that the ability has been developed to reliably measure them at the very low concentrations at which they occur in water.

Toxicology studies have shown that aquatic organisms (e.g. fish) in natural waters that receive wastewater effluents that contain organic micro-pollutants can exhibit reproductive and other physiological effects that are directly attributable to organic micro-pollutants. It has not yet been conclusively proven that these organic micro-pollutants have either acute (immediate) or chronic (long-term) health consequences for humans. This is partly due to the inherent complexity of conducting epidemiological studies where there are a number of confounding factors (e.g. the effect of exposure to a mixture of micro-pollutants, other routes of exposure) and which require very long study periods in order to produce conclusive results.

There are regulatory standards for some, but not all, organic micro-pollutants in water and wastewater. Some of these standards are specific values that are related to toxicological findings, often with safety factors applied, e.g. the current EU standard for benzene in water is 1 microgram per litre. Limits also exist on certain groups of micro-pollutants, e.g. the current UK limit for pesticides in water is 0.1 micrograms per litre.

Ozone and granular activated carbon are effective water treatment processes for removing some organic micro-pollutants (e.g. pesticides, endocrine-disrupting compounds). Advanced

processes, such as ultraviolet advanced oxidation and membrane filtration, have also been proven to be effective against many compounds, however these can be expensive to implement and operate, both in terms of cost and carbon footprint, and may therefore be difficult to justify for the sole purpose of removing micro-pollutants.

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Note: CIWEM Policy Position Statements (PPS) represents the Institution's views on issues at a particular point in time. It is accepted that situations change as research provides new evidence. It should be understood, therefore, that CIWEM PPS's are under constant review, that previously held views may alter and lead to revised PPS's. PPSs are produced as a consensus report and do not represent the view of individual members of CIWEM.