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Bioaccumulative and mobile substances: equivalent concerns in water resources



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Hale, S. E., Arp, H. P. H., Schliebner, I., and Neumann, M. (2020) Persistent, mobile and toxic (PMT) and very persistent and very mobile (vPvM) substances pose an equivalent level of concern to persistent, bioaccumulative and toxic (PBT) and very persistent and very bioaccumulative (vPvB) substances under REACH. *Environmental Sciences Europe* 32:155. DOI: 10.1186/s12302-020-00440-4

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When emitted into the environment, chemicals pose a threat to water resources depending on their bioaccumulation potential, persistence and mobility in aquatic environments. A study now compares the ‘level of concern’ for substances that are persistent, mobile and toxic (PMT or, if very persistent and very mobile, vPvM) to those that are bioaccumulative rather than mobile (PBT or vPvB); currently the latter are under particular scrutiny from EU chemicals regulation. While previously PMT/vPvM chemicals were not regulated in the EU, a recent strategy document¹ has now focused on establishing substance criteria for PMT which may pose an equivalent risk.

Several EU directives seek to protect human and environmental health from water contamination — assessing, preventing and mitigating water contamination via the [Drinking Water Directive](#); protecting groundwater with the [Groundwater Directive](#) and surface waters with the [Environmental Quality Standards Directive](#)²; and ensuring the quality of European water bodies as a whole via the [Water Framework Directive](#). Regarding the risks posed by chemicals, [REACH \(Registration, Evaluation, Authorisation and Restriction of Chemicals\) regulation](#) was introduced in 2007 to encourage industry to identify the intrinsic hazards of the chemicals they use, and substitute the most dangerous chemicals — ‘substances of very high concern’, or SVHCs — with alternatives. PMT is now to be regulated under [Classification Label Packaging](#) (CLP) and REACH by the end of 2021 and 2022 respectively.

In 2019, two SVHCs were identified under [REACH regulation](#) due to their PMT and vPvM properties — perfluorobutane sulfonic acid (PFBS) and HFPO-DA (commonly referred to as Gen-X). These substances were considered to have an ‘equivalent level of concern’ to persistent, bioaccumulative and toxic (PBT/vPvB) substances, through Article 57 (f), which are [paid specific attention](#) and recommended for substitution by REACH. However, there are signs that PMT/vPvM substances are equivalent on a far wider scale to PBT/vPvBs in terms of risk; they are able to break through artificial barriers at water-treatment facilities, and are unaffected by waste-water



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Bioaccumulative and mobile substances: equivalent concerns in water resources (continued)

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clarification, chlorination and filtration processes. Additionally, current analytical data are not widely available for the most mobile substances, causing many to go unnoticed and undetected in the water cycle.

This study builds on the regulatory decision for PFBS and HFPO-DA, using these and one other case (1,4-dioxane, recently proposed to be a [class 1B carcinogen](#)) to evaluate the serious effects of PMT/vPvM substances for human health, the environment and other circumstances. The researchers aimed to provide a scientific basis for the generalised conclusion that PMT and vPvM substances should be considered at posing the same risk level as PBT and vPvB substances.

The researchers developed 16 assessment categories:

- **health effects** (four categories): possible serious effect, quality of life, irreversibility of health impacts, and delay of health effects;
- **environmental effects** (nine categories): irreversible exposure and effect, intergenerational exposure and effect, unknown/uncertain spatial scale, disparity between point of release and point of effect, unknown/uncertain temporal scale, uncertain/difficult to predict long-term fate and toxic effects, harmful to aquatic environment, and potential to reach pristine areas;
- **other effects** (three categories): societal costs, effect on resources, requiring emissions control.

They applied these categories to the case studies of PFBS, HFPO-DA and 1,4 dioxane, and then compared their results to those for PBT/vPvB substances.

The assessment supports the assumption that PMT/vPvM substances cause an equivalent level of concern as PBT/vPvB substances, and as such should be regulated as SVHCs in REACH. In all 16 categories, the PMT/vPvM substances exhibited comparable effects to PBT/vPvB substances. While exposure pathways were different for humans and the environment, the effects and impacts were similar — PMT/vPvM substances accumulated in semi-closed drinking water cycles, where wastewater can re-enter areas where drinking water is abstracted, as well as accumulating in pristine aquatic environments, while PBT/vPvB substances accumulated in the human body and food chain.

For both types of chemicals, it remains challenging to determine longer-term and longer-range transport patterns and risks of exposure, suggest the researchers. They are now pleased to see that EU regulatory efforts are to be focused on establishing clear PMT/vPvM substance criteria under REACH. They suggest that this will allow the distinct and unambiguous identification of SVHCs in order to protect human and environmental health.

1. For more information see: the EC's strategy document, [Chemicals Strategy for Sustainability Towards a Toxic-Free Environment](#) (2020).

2. Directive 2008/105/EC on environmental quality standards in the field of water policy: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L010>