

PERMOTOX: Detection of PMT Chemicals in Environmental Samples via SPE and HPLC Analysis

Persistent, Mobile and Toxic (PMT) chemicals are a category of molecules whose properties pose a particular hazard within water ways both here in Ireland and indeed around the world. These chemicals mainly originate from the agricultural and pharmaceutical industries, and many can pass through wastewater treatment plants unimpeded endangering the environment.

The term **Persistence** describes the molecule stability, and the stability allows PMT chemicals to stay in the environment for an extended period of time without degrading. Thus, it can start to accumulate over time. Equally, **Mobility** describes the ability to traverse distances from where they were released which make them pervasive in water ways, this property also makes PMT chemicals difficult to remove during waste-water treatment and to analyse in water samples. **Toxic** describes how PMT chemicals are harmful to the environment and to humans. This has been seen at even in low doses. Chemicals that have a combination of these three traits are labelled as PMT chemicals and pose a threat if they continue to be released.

The mobility of PMT chemicals make them difficult to be analysed in laboratories due to limitations in available analysis equipment and as such are in an “analytical and monitoring gap”. Current methods of analysis need to be optimised or developed for PMT chemicals to be more commonly monitored.

Within this work caffeine (an anthropogenic marker commonly found in municipal wastewater and surface waters), was utilized as an analogue to pharmaceutical chemicals, due to its structure and mobility. Hence, it was used as a starting point for analysis of water samples.

1L samples from various Irish surface waters were taken to be analysed. The water was filtered, and 100 mL of sample was run through hydrophilic-lipophilic balance (HLB) Solid-phase extraction (SPE) cartridges in triplicate to preconcentrate the solution, which was then analysed in HPLC. The concentration of caffeine was found in a number of samples ranging from 1.6 – 63.7 ppb.

From the analysis, it can be noted that the highest concentration of caffeine in surface waters sampled (63.7 ppb) was found in River Liffey within the capital city and the second highest concentration (38.7 ppb) was found upstream on the same river. Highlighting widespread presence and the usefulness of caffeine as an analogue.

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