

Measurement of the time-weighted average concentration of selected pharmaceuticals in drinking water using the Chemcatcher® passive sampler

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The presence of pharmaceutical compounds and their metabolites in natural waters is now becoming of increasing environmental concern. A wide range of these analytes at ng/L-µg/L concentrations has been detected in low volume spot samples of surface and waste water. This has been made possible primarily due to advances in instrumental analytical methods such as liquid chromatography/mass spectrometry-mass spectrometry (LC/MS-MS) techniques that can simultaneously detect and quantify numerous pharmaceutical residues at trace concentrations. There have recently been several reports where passive sampling devices (e.g. using the POCIS) have been used to both identify the presence of drugs and attempt to measure their time-weighted average (TWA) concentrations in natural waters. One problem is the lack of reliable uptake rate data for these analytes with polar samplers, and that performance reference compounds are difficult to use effectively.

We used the Chemcatcher® passive sampler fitted with a 47 mm Empore™ SDB-XC disk as the receiving phase and a polyethersulfone (PES) diffusion limiting membrane to measure the TWA concentration of eight pharmaceutical compounds. These compounds were selected as they covered a range of physico-chemical properties and have previously been reported to be present in environmental waters. The samplers were deployed at various surface water sites in the UK that were used as an intake source for drinking water purification plants. In addition, devices were also deployed in the finished drinking water. The passive samplers were deployed with the sampling face down in a stainless steel tank, with a series of upward facing jets fed from a header tank into which the water source was fed from a tap. This rig was also used for calibration purposes, and uptake rates were measured over a deployment period of 30 days. Constant concentrations of target analytes were achieved in the calibration tank by injecting a stock methanolic solution, using an HPLC pump, into a constant inflow of water regulated by a needle valve and flow meter. Since PRCs are not available for these compounds, the calibration parameters are applicable only to the conditions used in this study.