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Abstract

Target Analysis and Suspect Screening of Per- and Polyfluoroalkyl Substances in Tap Water Samples throughout Chinese Cities †

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1. Introduction: Per- and polyfluoroalkyl substances (PFASs) are a group of anthropogenic chemicals ubiquitously found in various water bodies around the world. The consumption of drinking water is an important pathway of human exposure to PFASs. The aim of this study was to investigate the contamination of legacy and novel PFASs in tap water samples throughout China.

2. Materials and Methods: Tap water samples were collected from 18 cities of China in 2022. Solid phase extraction was applied for the sample pretreatment. A target analysis of water extracts was carried out using a UPLC-QQQ-MS/MS, and a nontarget analysis of water extracts was implemented through a HPLC-QTOF-MS/MS.

3. Results: Overall, the recoveries of all the target PFAS analytes ranged between 80% and 110%. LODs were between 0.01 and 0.05 ng/mL, while LOQs were between 0.05 and 0.20 ng/mL. ∑PFASs in tap water were in the range of 90.2 to 473.1 ng/L (median: 193.3 ng/L). Moreover, $\sum_{10}$legacy PFASs ranged between 30.1 and 131.5 ng/L (median: 64.0 ng/L). Previous studies related to Chinese tap water showed that $\sum_{10}$legacy PFASs ranged from 1.4 to 175 ng/L (median: 13.5 ng/L) in 2017 and $\sum_{17}$PFAA ranged from 4.49 to 174.93 ng/L (median: 22.12 ng/L) in 2019. Furthermore, 51 emerging PFASs, representing 11 distinct classes, were identified. Particularly, H-PFCAs, Cl-PFCAs, UPFCAs, FTAs, Et-PFSAs, Ke-PFSAs, and UPFAs were discovered in Chinese tap water for the first time. None of PFAS levels in the tap water samples of China exceeded the regulatory limits for PFOS (40 ng/L) and PFOA (80 ng/L) issued nationally.

4. Conclusions: In China, the PFAS levels of tap water were higher than those overseas. ∑PFASs in tap water ranged between 90.2 and 473.1 ng/L, with a median of 193.3 ng/L. Legacy PFASs in tap water were no longer dominated by long-chain PFASs, whereas short-chain and novel PFASs alternatives were extensively determined.

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