Development of an air sampling method for quantifying 12 legacy and emerging PFAS with the OSHA Versatile Sampler (OVS) tube and analysis by HPLC-MS/MS_Dataset

Introductory Information

Per- and polyfluoroalkyl substances (PFAS), recognized for their advantageous physical and chemical properties, are extensively utilized in various industrial applications. However, PFAS exposures have been associated with a range of adverse health effects, including developmental issues, immune system suppression, and hormonal disruptions. The International Agency for Research on Cancer (IARC) has classified perfluorooctanoic acid (PFOA) as carcinogenic to humans and perfluorooctane sulfonate (PFOS) as possibly carcinogenic due to evidence of tumor development in animal studies. Despite these health concerns, occupational environments frequently expose workers to PFAS through inhalation, dermal contact, or ingestion based on the substance state and application. Air monitoring has detected significant levels of PFAS in diverse workplace settings; however, the absence of standardized protocols for airborne PFAS presents challenges in understanding and controlling exposure risks. The Occupational Safety and Health Administration (OSHA) Versatile Sampler (OVS) tube has demonstrated efficacy in capturing and analyzing airborne PFOA. Our objective was to adapt this method for broader PFAS detection, employing a novel air generation technique to simulate environmental capture conditions. For the first time, we established a robust scientific approach for air sampling of a group of 12 PFAS from different classes, which will aid in assessing potentially harmful airborne PFAS levels. Method validation tests followed the National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods (NMAM) evaluation criterion.

General Description of the Air Sampling Method

We broadened the utility of the OVS tube to encompass a wider array of PFAS, including perfluorocarboxylic acids (PFCAs), perfluorosulfonic acids (PFSAs), GenX (HFPO-DA), and DONA-Na. Our evaluation introduced a novel two-step spiking process: non-volatile PFSAs and DONA-Na were statically spiked onto the OVS tube media, while semi-volatile PFCAs and HFPO-DA were administered through a vapor generation technique. We assessed the OVS tube efficiency in capturing four concentrations of a 12-PFAS mixture, corresponding to 0.01–2.0 times the German Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (MAK Commission) provisional occupational exposure limit (OEL) of 5.0 μg/m³, under an active airflow rate of 1.0 ± 0.1 L/min over an 8-h period to accumulate a total air volume of 480 L. Quantification was performed using high-performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS), with validation of air concentrations from 0.05 to 10 μg/m³.

List of Publications Based on the Dataset

Abdelraheem, W.H., Roberts, J.L., Streicher, R.P., Kurtz, K.S., and Robbins, Z.G., Development of an air sampling method for quantifying 12 legacy and emerging PFAS with the OSHA Versatile Sampler (OVS) tube and analysis by HPLC-MS/MS. *Talanta* 300(2026)129205.

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