Towards Comprehensive Surveillance: Analysis of Per- and Polyfluoroalkyl Substances in Aqueous Samples by LC-MS/MS using performance-based EPA Method 1633

Ehab Abdelraheem, Sima Kumar, Mamy Rakotondravelo, and Wayne Jiang*
PFAS Analytical Laboratory, Center for PFAS Research, Michigan State University,
Lansing, MI 48910

Abstract

In the pursuit of comprehensive surveillance of per- and polyfluoroalkyl substances (PFAS) in aqueous samples, this study presents the application of EPA Method 1633 Draft 4 using a performance-based approach. With the increasing demand for accurate detection and quantification of PFAS in various matrices (portable water, non-portable water, biosolids, soil and solids, etc.), a robust method was developed employing LC-MS/MS in the multiple reaction monitoring mode. Utilizing a Thermo Scientific Vanquish UHPLC system and TSQ Altis Triple-Stage Quadrupole Mass Spectrometer, the analysis was conducted with specialized equipment, including a PFAS Upgrade Kit. The method incorporated isotope dilution or extracted and non-extracted internal standard quantification and relied on precise separation of target PFAS analytes through specific columns. Operated in a negative ionization mode, the meticulous design allowed for efficient separation from interfering compounds and minimum matrix interferences. This research successfully meets requirements for establishing the Initial Demonstration of Capability and offers a significant advancement in the analytical methodology for PFAS detection, especially in aqueous samples at desired detection limits. The developed technique provides enhanced sensitivity, accuracy, and a foundation for further exploration in the environmental monitoring of these pervasive compounds.