SUMMARY

The United Nations has set a target of reducing food waste by 50% by 2030, emphasizing the importance of advancements in food packaging methods to achieve this goal. Food packaging is critical for protecting food products from contamination and physical damage during the various stages of handling, storage, and transportation. While packaging technology has advanced significantly over time, the industry continues to innovate to improve safety, functionality, sustainability, and environmental impact.

Paper and plastic are the most common materials used in commercial food service packaging, with paper additives frequently used to increase moisture and grease resistance. Per- and polyfluoroalkyl substances (PFAS) are popular additives in paper-based products for this purpose. Although the global production and application of PFAS in paper-based packaging are lower than plastic additives like bisphenol A (BPA), concerns about their environmental persistence, mobility, and health implications have led to an increasing resistance to their use.

PFAS compounds can enter the food chain via contaminated food or food contact materials (FCMs), raising serious public health concerns. Analyzing the content of various FCMs and evaluating their migration under typical usage and storage conditions is critical to understanding and addressing this issue. Previous research has found PFAS compounds in food packaging materials, albeit at lower levels, indicating progress in regulation and manufacturing practices.

Given this backdrop, it is critical to assess PFAS contamination in various packaging materials used in different markets. This study used ultrasound-assisted extraction and Ultra High-Performance Liquid Chromatography-Tandem Mass Spectrometry (UHPLC-MS/MS) with isotopically labeled standards to detect and quantify PFAS in twelve food contact materials collected from retail vendors in Hungary.

The goals of this investigation were to identify the presence of PFAS compounds in the collected materials and quantify any detected PFAS. The study used a previously established and verified procedure for PFAS analysis.

The analysis involved PFAS extraction from the samples, followed by UHPLC-MS/MS analysis using electrospray ionization (ESI) in negative mode. Multiple reaction monitoring (MRM) was used to track two mass transitions for each analyte, with identification criteria that include signal-to-noise ratio, retention time consistency, and ionic ratio matching.

Despite methodological challenges, PFAS compounds such as HFPO-DA, PFHpA, and PFHxA were successfully identified in several samples. However, inadequate recovery in some samples emphasized the importance of method optimization and validation. Overall, the study adds to our understanding of PFAS contamination in FCMs and emphasizes the importance of ongoing efforts to ensure food packaging safety and sustainability while aligning with global food waste reduction goals.