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Trusted Answers

Measuring **PFAS Exposure** to Maintain Safe Food

Present and future trends for manufacturers, suppliers, and testing labs

European Union (EU) scientific committees are reviewing a proposal with wide-reaching implications for many industries that use PFAS for their non-stick, water-resistant, and heat-resistant properties – including the food and beverage industry. If implemented, the plans outlined in the proposal would result in the most extensive chemical ban in European history.

While there is no guarantee such a ban will be implemented, it is an indicator of the concern this class of chemicals is creating in exposure management assessment. If enforced, it would mean a dramatic increase in testing for food companies to ensure PFAS is below prescribed limits.

PFAS can enter food through the use of water in crop and ingredient production or via bioaccumulation in livestock, including their feed, silage, and grass grown on sludge fertilized fields. The impact on the supply chain of raw materials, ingredients, as well as on processing and packaging is so large it is difficult to quantify. Consider the effect on consumer confidence as more litigation and media interest increase visibility of the potential (but not fully understood) impact. Management of the problem is critical, and to manage it effectively, we must measure the impacts and the sources of concerns.

PFAS testing today

Currently, we see that PFAS testing in food is driven by concerns around the increasing amount of food contamination sources and the health risks associated with PFAS exposure. Specifically, sources include food packaging and contact materials, cosmetics, carpets, soil, and water. Fortunately, regulatory bodies are acting by establishing maximum allowable levels or issuing recalls. Major retailers and food manufacturers are also carrying out initiatives to reduce PFAS in food, ingredients, and their packaging. However, since PFAS is ubiquitous, we are seeing other challenges—preventing sources of sample contamination, devising robust and accurate methods to analyze complex and varying food and beverages, sourcing standards, and addressing the ever-changing regulatory landscape.

For some time, Agilent has been developing solutions to meet regulations, guidelines, and methods and standards for food and food products including egg, seafood, fish, meat, offal, produce, food for infants and young children, milk, feed, and dairy. Because PFAS was found in these foodstuffs, they are listed as matrices to test - so we provide validated methods for these matrices with the target PFAS compounds to meet enforced regulator limits. We are also committed to supporting the labs of food manufacturers and raw ingredient suppliers who want to test their products to protect brand equity. Agilent collaborates with these food labs to help develop or simplify their whole workflow for PFAS in specific food matrices. We have a powerful but simple sample prep method that removes unwanted interferences in complex and diverse matrices. If we can improve the data quality while simplifying the process, the cost of testing is reduced and the impact on future food prices is limited. Ultimately, we are a key partner in delivering safe, affordable food, and PFAS is the latest, but not the only contaminant of concern we help the industry assess and manage.

Advancing technology

We have made tremendous advances in the complete workflow for analyzing PFAS in food, addressing some of the challenges that customers face, the major of which is sample preparation: how to remove fats, oils, sugars, and pigments in food that may interfere with the analysis. Through collaboration and investment in research and development, we have a simplified sample prep using Quick, Easy, Cheap, Effective, Rugged, and Safe (QuEChERS) extraction followed by a novel "pass through" cleanup specifically designed for PFAS. The result is a faster, simpler process with demonstrated recovery of PFAS from samples higher than traditional sample prep methods.

Considering the omnipresence of PFAS, how do we remove PFAS background in the system to increase the sensitivity of the method? We found a solution in substituting key parts of the liquid chromatograph and accessories (such as tubing, filters, bottle caps, vials, and vial caps), eliminating potential contamination sources without sacrificing sensitivity. To keep up with evolving regulations, we developed a curated PFAS MRM database to quickly add new PFAS targets to the method. There are PFAS that are volatile and non-volatile, requiring the use of both LC/MS and GC/MS, especially with food packaging.

The performance of our workflows and instruments exceeds today's regulatory guidelines but achieving tomorrow's needs is our goal: identifying PFAS that are not in the target lists. For this, we suggest a nontargeted approach using high resolution mass spec and the Fluoromatch software.

Beyond these specific challenges, all laboratories seek productivity and sustainability without increasing operational costs. Agilent is committed to maximizing efficiency, developing intelligence on instruments to prevent unplanned downtime, and monitoring performance to eliminate repeated analysis to ensure laboratories get data right first time.

Regulations today

The European Commission set maximum limits for four PFAS compounds (PFOA, PFOS, PFNA, and PFHxS) in egg, seafood, fish meat, meat, and edible offal in EU Regulation 2023/915. The levels vary by food matrix and PFAS compound but are in µg/kg (ppb) levels. China has a GB standard for PFOA and PFOS in animal-derived food.

The United States, on the other hand, does not have federal regulations on PFAS in food. However, the US FDA can issue recalls on imported and local food and food products if they deem that the PFAS levels are likely a health concern. For example, food products such as bread, rice and ham were recalled from the market because they were made with PFAS-contaminated water. On the state level, Maine has an action level for PFAS in milk, beef, and fish tissue. The US FDA and USDA released methods FDA C-010.03 and USDA CLG-PFAS, respectively, to analyze PFAS in several food matrices.

While mandated regulations dictate specific testing, most food manufacturers will want to assess risk beyond these limits, so flexibility and future proofing any investment is recommended.

What's next?

We foresee more and more PFAS compounds being added to regulatory lists. Some of these compounds could be volatile and would be best analyzed in the gas phase. For example, the US FDA specifically called for the voluntary phase out of 6:2 FTOH in food packaging. This fluorotelomer alcohol is challenging to analyze with conventional LC/MS approach but is straightforward through GC/MS. As a result, multiple data sets per sample will become more common as the target compounds expand. This means informatics will play a larger part in the assessment. Automation would also be important throughout the entire workflow, from sample prep to data analysis and reporting. We are working to automate the sample preparation for as many typical food types as is practicable and are committed to developing intelligent tools to improve data interrogation and reporting to streamline the complex data sets and support our users in their quest to protect their business and their consumers.

To learn more about addressing the challenges and solutions of PFAS testing in food or to contact an Agilent representative, please visit **agilent.com/food/safety-testing**

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