

Food safety and labeling issues for testing laboratories

Tips to enable analytical excellence



BROUGHT TO YOU BY INDEPENDENT SCIENCE PUBLISHER

SelectScience®

IN PARTNERSHIP WITH

ThermoFisher
SCIENTIFIC



Introduction

The challenges for performing food analysis in testing laboratories has never been greater. There are an increasing number of compounds to detect, analyze and quantify to ensure that foods and beverages meet regulatory compliance and safety standards, and that labeling information is clearly and accurately communicated to consumers. This presents a requirement for reliable and accurate, high-throughput workflows, allowing food testing laboratories to maintain stringent analytical quality control standards whilst reducing costs per sample. The potential damage to a laboratory and a brand's reputation for failing to adhere to regulatory guidelines can be great.

This eBook will outline various ways that laboratories can meet the demands listed above using technologies such as gas chromatography (GC), liquid chromatography (LC), ion chromatography (IC), inductively coupled plasma (ICP) and mass spectrometry (MS), along with consumables and chromatography software, to support food and beverage safety testing for a range of chemical residues and contaminants. These can also be used in identification and chemical composition analysis for essential

Contents

Chapter 1: Safety testing

- Pesticide residues
- Mycotoxins
- Environmental contaminants
- Trace metals and toxic contaminants
- Food contact materials
- Veterinary drug residues
- Additional resources

Chapter 2: Essential labeling and authenticity testing

- Labeling
- Authentication
- Featured products
- Video resources

labeling and authenticity testing. It will also highlight that Thermo Fisher Scientific is the partner to help testing laboratories with their current and future testing needs.



Chapter 1

Food safety testing

Food safety testing is essential, and getting it right is crucial to meet regulatory compliance for products and for consumer safety. Yet the global food supply chain is complex and increases the list of compounds that laboratories test for. Laboratories are expected to conduct simultaneous analysis for a vast number of compounds within a wide variety of food matrices.

The challenge for these laboratories is to balance the right type and level of high-quality testing required while reducing costs, increasing throughput, offering a faster turnaround of high-quality reportable results, and enacting rapid responses to unexpected food safety incidences, such as dioxins in meat, fish and dairy, fipronil in eggs and ethylene oxide in seeds and other food commodities. This is a fine line to walk, and one that could place brand reputation on the line if not performed correctly.

Pesticide residues



Pesticides have a great impact on the environment, biodiversity, and human health. The increase in the global food trade and the application of

pesticides to food continues to place the spotlight on pesticide residues testing.

More than ever, food manufacturers and government authorities are testing to ensure that imported food products comply with permitted maximum residue levels (MRLs). Competing demands for speed and breadth of testing continue to drive investment across the public and private sector.

Thermo Fisher Scientific can support comprehensive multi-residue workflows for ion chromatography (IC), liquid chromatography (LC) and gas chromatography-(GC) amenable pesticides using [mass spectrometry with integrated software solutions](#) to streamline the path to multi-residue testing.

Learn more about pesticides residues in this infographic



Thermo Fisher Scientific analytical equipment and workflows can be applied to any number of food products, including those with the most difficult matrices. [In this](#)

The workflows for multi-residue testing are designed to minimize food product recalls, thus protecting the testing laboratory's brand and reputation. NOW Foods are a dietary supplements manufacturer conducting in-house testing, and are an example of a high-throughput laboratory which has found [huge benefits when testing both raw and finished dietary supplements using GC-MS/MS technology.](#)

[application note, the pesticide residues in black tea are analyzed](#) using triple quadrupole gas chromatography–mass spectrometry (GC-MS), and [in this application note, to analyze ultra-trace pesticides in baby food.](#) As an alternative, for example when screening for pesticides, [GC-MS can offer the ability to conduct untargeted full-scans.](#) Dual channel liquid chromatography can improve productivity by increasing throughput, as

Other chromatography instruments can also be coupled to mass spectrometers. [This method utilized IC MS/MS for multi-residue analysis.](#) For LC-amenable solutions, Thermo Fisher provide their [Pesticide Explorer™ Solution](#) – supporting applications [such as this fast analysis of multi-class pesticide panel in wine.](#) High-resolution accurate-mass (HRAM) MS is also sufficiently quick to allow analysis of [large multi-residue assays, as shown in this method.](#)

However, not all pesticide residues can be detected using these methods. Cationic polar pesticide residues can be more challenging to detect. [This application note explores ion chromatography and tandem mass spectroscopy](#) for the detection of cationic polar pesticides in cereals.

[this application note demonstrates.](#)

Many foods and beverages require sample preparation to perform authentication and characterization. [QuEChERS provides a quick, easy, robust, and reliable way to confidently extract target analytes.](#)

You can learn more about sample preparation and tools to help [in this roundtable discussion.](#)

READY-TO-GO METHODS

For established methods in pesticide analysis, go to appslab.thermofisher.com for a range of ready-to-go analytical methods, covering multiple instrument combinations.

THE BENEFITS OF AUTOMATED, ONLINE CLEAN-UP

To set up analyses and increase productivity, good sample preparation and the ability to automate is paramount.

With regards to pesticides analysis, “Undoubtedly, the QuEChERS approach is faster, more cost effective, more environmentally friendly and more generic than previous methods, which used higher volumes of solvent and more tedious clean-up procedures.” However, matrix co-extractives can still remain in samples, causing “ionization suppression and faster contamination of the LC-MS/MS detection system”. To overcome this, [this method demonstrates the feasibility of automation of the solid-phase extraction \(SPE\) step](#) using a robotic autosampler and miniaturized SPE cartridges.

Automated clean-up can also be used to support GC-MS/MS analysis. This method tested the suitability of [QuEChERS and automated μSPE clean-up for the analysis of pesticide residues](#) in rice and wheat. Automated μSPE clean-up on matrix-matched standards supported calibration, and improved accuracy and precision.

Mycotoxins



Mycotoxin-producing fungi grow on numerous crops and foodstuffs such as cereals, nuts, and coffee beans.

Humid temperatures and sufficient water supply are crucial for their survival. A rise in global temperatures could mean countries in cool or temperate climates would be at higher risk for mycotoxin contamination in food and animal feed supply chains. The changing conditions could also increase the potential for new strains and emerging combinations of mycotoxins, leading to greater risk of cumulative toxicity¹.

Mycotoxins can pose a significant health threat to both humans and livestock, including acute poisoning and long-term effects such as cancer and compromised immune systems. Chronic problems in livestock include a higher incidence of disease, poor reproductive performance, and suboptimal milk production². Molds that produce mycotoxins penetrate deep into foodstuffs and are not just superficial. It is important to implement preventative measures and appropriate testing regimens both pre- and post-harvest to ensure food safety and security.

However, concerns go beyond the big six mycotoxin classes of aflatoxins, ochratoxin A (OTA), deoxynivalenol (DON), zearalenone (ZEN), T-2, and fumonisins (FUM). Often undetected, emerging and multiclass mycotoxins also present a risk.

When it comes to protecting human health, the food chain, and your brand, analytical testing workflows will ensure product safety. The life-threatening effects of mycotoxins make accurate detection a priority. Liquid chromatography and mass spectrometry (LC-MS) workflows enable the analysis of multiple toxins in a single run, with increased confidence and faster turnaround in reportable results, helping you meet your testing demands. Established techniques [to test for mycotoxins include tandem quadrupole mass spectrometry](#) and [HRAM](#).

Further, recognized monitoring strategies (such as increasing specificity through

immunoaffinity SPE before HPLC analysis) can provide rapid results for commonly analyzed aflatoxins at levels well below regulatory tolerances (EU³) to ensure [high-throughput and confidence in the analyses](#). For further support on column choice, this method uses mycotoxins as a model suite of aromatic compounds to demonstrate why and how orthogonal chemistries can help us [determine the best column choice when running a sample in a complicated matrix](#).

Learn more about mycotoxins in this infographic



Environmental contaminants



Environmental contaminants are chemicals present in a range of sources within the environment (such as the air, or water sources) that can be

harmful to human health if ingested at high concentrations. These contaminants can find their way into or onto food, and analysis of foodstuffs is required to assess their presence and levels to adhere to health regulations.

One prominent category of contaminants is dioxins. According to the WHO, “Dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer.”⁴ Dioxins are part of a group of persistent organic pollutants (POPs)

that are regulated by the EU⁵, the FDA⁶ and Japan⁷. As such, measuring their levels in food products is an essential part of safety testing.

Polybrominated diphenyl ethers (PBDEs) degrade to dioxins and are just one of the compounds that can be detected in foods as part of [contaminant screening using triple quadrupole GC-MS/MS](#).

The gold-standard routine quantitative analysis of dioxins and persistent organic pollutants (POPs) is performed using the [Thermo Scientific™ DFS™ Magnetic Sector GC-HRMS System, which is the only GC-MS specifically designed for dioxin and POPs analysis](#), which enables compliance with all official dioxin or polychlorinated biphenyls (PCB) methods (for the US, EU, and Japan). This method demonstrates how the DualData XL Acquisition configuration of the Thermo Scientific DFS Magnetic Sector GC-HRMS [can be used to increase sample throughput for dioxin/furan analyses](#).

The Thermo Scientific™ TSQ™ 9000 triple quadrupole GC-MS/MS system can also be used for the analysis of environmental contaminants. In this method, the TSQ 9000 triple quadrupole GC-MS/MS system coupled with Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) software [for the routine and regulatory compliant analysis of contaminants in food and feed samples](#). Triple quadrupole GC-MS/MS can also be used in the analysis of [low levels of polychlorinated dibenzo-p-dioxins \(PCDDs\), polychlorinated dibenzofurans \(PCDFs\), and dioxin-like polychlorinated biphenyls \(dl-PCBs\)](#).

Short-chained chlorinated paraffins (SCCPs) are emerging contaminants that, once released, will remain in the environment for long periods of time with the potential to bioaccumulate in living organisms. [This method utilizes the Thermo Scientific™ Exactive™ GC Orbitrap™ mass spectrometer coupled to a Thermo Scientific™ TRACE™ 1310 Gas Chromatograph](#) for analysis of SCCPs.

For more methods on sample preparation and GC-MS for dioxins and POPs, [Thermo Fisher also offer a range of workflow solutions](#).

Trace metals and toxic contaminants



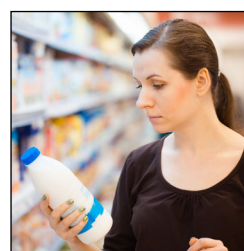
Analysis for toxic contaminants such as heavy metals, as well as an analysis of the nutritional elements in the complex matrices can present

challenges. Inductively coupled plasma mass spectrometry (ICP-MS) can detect ions of elements at levels of milligrams to nanograms per liter and for more challenging analyses, the iCAP™ TQ ICP-MS uses triple quadrupole MS to ensure the most robust analyses. Coupled with the innovative Thermo Scientific™ Qtegra™ Intelligent Scientific Data Solution™ (ISDS) Software platform to simplify method development, the best analyses can be performed confidently and easily.

To identify trace metals and other toxic contaminants is essential in a range of different foods and food products – and this is especially important in food products for vulnerable groups, [such as medical food or baby foods](#). Strong-anion-exchange chromatography can also be combined with ICP-MS to enable efficient identification and quantification of toxic compounds in [food containing elements like arsenic](#) or mercury.

[Thermo Fisher's trace elemental and speciation analysis learning center](#) can support with methods and advice for a range of different trace element identification and analysis. This includes [methods that compare IC and HPLC systems for speciation](#) and that demonstrate the [use of a hyphenated IC-ICP-MS method](#).

Food contact materials



Food comes into contact with a range of materials – packaging, cookware, and other materials during travel and storage. While these containers and packaging might

seem simple, they are often made of many different materials, each with different properties and components. This includes intentionally added substances and non-intentionally added substances (NIAS), as

well as unknowns coming from an increasing percentage of recycled packaging. The complexity of these materials and the need for analysis is set to increase as the demand for food increases and more packaging is made from recycled or mixed materials.

There are a number of regulations within the USA through the Food and Drug Administration, packaging and food contact substances (FCS) code of Federal Legislation (CFR)⁸, within the EU⁹ and within individual countries such as the German BfR, Canada, Australia and Japan, that govern the permitted levels of migration of chemicals into products. Such levels of chemicals and composition of the compounds must be determined analytically using gas chromatography–mass spectrometry (GC-MS). Migration is the process of compounds leaching from the food contact material itself, into the food or beverage.

[Find out more here.](#)

Read more on navigating the forensics of food contact materials in this infographic



SelectScience 23
The Fastest Way to Expert Opinion™

ThermoFisher
SCIENTIFIC

Navigating the forensics of food contact materials
to ensure packaging integrity and safety assurance

To preserve quality and reduce food wastage during transport, food products are often packaged in materials such as plastics, aluminum cans, or glass, particularly those that are transported overseas as part of global food supply chains.

However, these seemingly simple containers are often constructed from a variety of materials, with increasing reliance on recycled content.

Food contact materials (FCMs) are not just limited to packaging, items such as cookware and tableware are also included. Substances can migrate from these FCMs via blooming and can accumulate to reach concentrations of toxicological concern if left unchecked!

High-quality instrumentation can be used to analyse and screen for chemicals migrating from food contact materials. This paper shows the value of [GC-Orbitrap™ mass spectrometry for non-targeted screening of chemicals migrating from paper-based food packaging](#). This paper demonstrates the use of gas chromatography and liquid chromatography – [Orbitrap mass spectrometry to screen for chemicals migrating from plastic food contact materials](#).

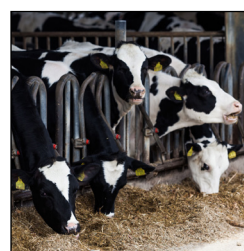
THE POWER OF ANALYTE LIBRARIES

Laboratories will need to analyse for food contaminants within packaging. These may include per- and polyfluoroalkyl substances (PFAS) that can be present in packing materials and foods themselves. Analyses can be challenging, especially when screening for analytes that are unknown. Mass spectral fragmentation libraries can play a crucial role in supporting the identification of unknown analytes. This method describes a process for [screening and identifying unexpected and unwanted compounds in foods, utilizing software libraries](#) and for [characterizing unknowns in food packaging](#).

Thermo Fisher has created and curated a range of different mass spectral fragmentation libraries that can help with the determination of known analytes and elucidate unknowns. These can be helpful across a range of applications relating to food and beverages, as well as numerous other compound classes. To learn more about how the mass spectral fragmentation library, mzCloud™, assists with confident identification for small molecule unknowns using mzLogic, see below:

- www.thermofisher.com/mzCloud
- www.thermofisher.com/mzlogic

Veterinary drug residues



Laboratories need to analyze components that may accumulate in the food chain. This includes the drugs that are used for animal welfare and typically involves

both the identification and quantification of veterinary drug residues. It is necessary to screen food products for veterinary drug residues at the maximum residue limits (MRL) set by global regulatory agencies.

Thermo Fisher has transformed [complex assays into simple workflows with their end-to-end VetDrugs Explorer Collection](#). This brings solutions to users that combine different components, including sample preparation procedures, equipment, and software. With the combined benefit of all these different tools, users can search for the optimal workflows on integrated libraries.

This has the potential to streamline analysis in laboratories. By [using triple quadrupole information from libraries to create selective reaction monitoring](#), users can develop their own methods more quickly.

Automated, online workflows can also be facilitated, reducing errors and solvent wastage. In this example, researchers used a fully automated approach to [online clean-up of QuEChERS extracts of animal tissues for LC-amenable veterinary drugs](#).

Veterinary drugs do not need to be screened for in isolation – it is possible to

combine the analysis of veterinary drugs with other chemical classes, and also to [include multiple analytes in one analysis, as demonstrated in this method](#).

The potential of multiple analyte analysis is further explored [in this roundtable discussion](#).

ADDITIONAL RESOURCES

Although this eBook focuses on analytical laboratory testing, there are many additional factors to consider when analyzing food for safety. **Thermo Fisher can provide support in other areas of food testing such as PCR testing and food weighing and inspection equipment.**

References

- Paterson, R.R.M & Lima, N (2010). How will climate change affect mycotoxins in food? *Food Research International*, Volume 43, Issue 7, August 2010, Pages 1902-1914
- World Health Organization. Who.int (2018). *Mycotoxins*. <https://www.who.int/news-room/fact-sheets/detail/mycotoxins> (accessed August 5 2022).
- COMMISSION REGULATION (EC) No 1881/2006 of December 19 2006: setting maximum levels for certain contaminants in foodstuffs, ANNEX section 2: mycotoxins (M5).
- World Health Organization. Who.int (2016). *Dioxins and their effects on human health*. <https://www.who.int/news-room/fact-sheets/detail/dioxins-and-their-effects-on-human-health#:~:text=Dioxins%20are%20highly%20toxic%20and,expected%20to%20affect%20human%20health> (accessed June 9 2022).
- COMMISSION REGULATION (EC) No 850/2004 of April 29 2004: on persistent organic pollutants and amending Directive 79/117/EEC.
- US Food and Drug Administration. Fda.gov (February 7, 2002). *FDA Strategy for Monitoring, Method Development, and Reducing Human Exposure to Dioxins*. <https://www.fda.gov/food/chemical-contaminants-food/fda-strategy-monitoring-method-development-and-reducing-human-exposure-dioxins> (accessed June 9 2022).
- The Government of Japan. www.env.go.jp (2012). *Dioxins*. <https://www.env.go.jp/en/chemi/dioxins/brochure2012.pdf> (accessed June 9 2022).
- US Food and Drug Administration. Fda.gov (April 16, 2021). *Inventory of Food Contact Substances Listed in 21 CFR*. <https://www.fda.gov/food/packaging-food-contact-substances-fcs/inventory-food-contact-substances-listed-21-cfr> (accessed June 25 2022).
- European Commission. Food.ec.europa.eu. *Food Contact Materials*. https://food.ec.europa.eu/safety/chemical-safety/food-contact-materials_en (accessed June 25 2022).



Chapter 2

Essential labeling and authenticity testing

Accurate labeling is essential for regulatory compliance and consumer safety. To ensure that labels are accurate, laboratories need to analyze huge numbers of products and screen for many compounds, testing not just for the components, but also for authenticity and origin.

Labeling



Accurate labeling of vitamins included in food and verification of the levels present is essential. Ensuring this can be done efficiently and with high reproducibility is a key aim. This includes analysis of the components in food supplements or medical foods. This paper establishes a rapid and quantitative analytical method for the [simultaneous detection of seven vitamins in infant formula](#). In this method, researchers used solid phase extraction rather than liquid-liquid extraction pre-treatment, making time and cost savings.

In a further demonstration of possible efficiencies, this study shows simultaneous analysis. Using the Thermo Scientific™ Vanquish™ Flex Duo UHPLC system

for Dual LC, researchers share a method for [simultaneous determination of water- and fat-soluble vitamins in tablets and energy drinks](#).

Authentication



Carbohydrate and sugar analysis can be another complex area for evaluation in laboratories, as labels often require a breakdown of the types of carbohydrates present. [With the right equipment and processes, this can be incorporated efficiently into your workflow](#). Whatever your workflow, [Thermo Fisher Scientific can support you to find the right solution for complex carbohydrate analysis](#).

Adulteration of carbohydrates can also be a challenge. With cheaper sugars or carbohydrate sources introduced as an alternative – laboratories need to be able to identify the source of sugars in samples as well as the type. Honey, for example, can often be adulterated so specific [methods are required to analyze the product to ensure that the labeling is as accurate as possible](#).

Authentication and characterization of

The Eurofins Nutrition Lab in Nantes, France, is an example of a laboratory with a high throughput of samples, and a focus on carbohydrate analysis which found success with support from Thermo Fisher. The Eurofins team were seeking to increase the capacity of their equipment, improve turnaround times and maximize the sensitivity of their testing – without placing additional burden on their technicians.

ingredients goes beyond carbohydrate sources. Some ingredients can vary widely in their composition depending on their origin and quality – for example olive oil. Laboratories need the ability to not only screen for the presence of the ingredient, but to also measure and detect small changes in the chemical components of the ingredient that verifies its origins and quality. This can apply to ingredients and flavorings, such as herbs and spices. Unintentional adulteration of drinks with flavor-changing compounds can also be analyzed – for example wine with smoke-taint was analyzed using SPME-GC-MS/MS in this method, and taste and odor compounds in drinking water using single quadrupole GC-MS in this method.

SUPPORT FOR AUTHENTICATION IN A RANGE OF FOODS AND BEVERAGES:

Beer: HPLC determination of biogenic amines in beer

Wine: Determination of biogenic amines in wine by ion chromatography-single quadrupole mass spectroscopy

Fruit juices: Authenticity of fruit juices and purees by LC-MS/MS

Software can support verification when used alongside mass spectrometry, as shown in this workflow for food characterization and this method for meat authentication and adulteration testing.

Automation can also help to support analyses of foodstuffs for the authentication of their components and ingredients, through simplifying sample extraction and clean-up in complex food matrices. This can support the identification and quantification of components and contaminants in consumables such as wine and edible oils, supporting authentication or other quality control.

ISOTOPE MEASUREMENTS TO CONFIRM ORIGIN AND AUTHENTICATE LABELING

Certain regions are renowned for their production of particular foods or beverages, and thus the value of their exports is heavily tied to their origin. Motivated by economic gains, exporters can fraudulently mislabel lower quality products from other regions in order to increase profits. Isotope fingerprints provide unique chemical signatures that can be analyzed by isotope ratio mass

spectrometry (IRMS) to confirm their origin, as well as provide an additional technique for authenticating other labeling claims.

Geographical	Botanical:	Synthetic:
i) <u>Coffee</u>	v) <u>Sugar</u>	vi) <u>Menthol</u>
ii) <u>Tequila</u>		vii) <u>Organic food</u>
iii) <u>Beef</u>		
iv) <u>Rice</u>		



Featured products

These reviews are from an earlier Triple Quadrupole GC-MS system, the TSQ™ 9000 Triple Quadrupole GC-MS/MS System. The TSQ™ 9610 Triple Quadrupole GC-MS has the same great qualities as the 9000, with updated features and efficiency.

TSQ™ 9610 Triple Quadrupole GC-MS by Thermo Fisher Scientific

“Quality results on time every time even at low levels”

Ease of use: ★★★★★ After sales service: ★★★★★ Value for money: ★★★★★

Rating: ★★★★★

Application Area: Genotoxic impurities, Nitrosamines, Unknown peak identification

“Truly unstoppable performance with the Thermo Scientific TSQ 9000 triple quadrupole GC-MS/MS system. Delivers high sensitivity for more routine analysis. Minimize maintenance intervals with routine-grade robustness. Operate with technology, flexible method development, and powerful reporting tools designed for optimal productivity. Quality results on time, every time with easy-to-use routine workflows.”

Kiran Kumar Kurella, Caponex Labs PVT LTD



“Results are highly reproducible and easy to interpret using NIST library.”

Ease of use: ★★★★★ After sales service: ★★★★★ Value for money: ★★★★★

Rating: ★★★★★

Application Area: Analysis of volatile components in ginger, garlic, plant extract, fatty acid and ester derivatives

“Thermo Scientific TSQ 9000 Triple Quadrupole GC-MS/MS System is easy to use and the results are highly reproducible. I have been using it since September 2018. Results are easy to interpret using NIST library. It is easy to operate the Thermo Fisher GC-MS/MS system and easy to understand the mechanism in the system. I recommend it to everyone.”

Raj Kumar, Panjab University, Chandigarh

Thermo Scientific™ Orbitrap Exploris™ 240 mass spectrometer by Thermo Fisher Scientific

“A breakthrough technology.”

Ease of use: ★★★★★ After sales service: ★★★★★ Value for money: ★★★★★

Rating: ★★★★★

Application Area: Metabolomics

“The Exploris 240 is so easy to use. You have predefined workflows that cover most of the applications. Is flexible, and also, it has an accurate mass performance of top-of-the-range Orbitraps. There is no other technology equivalent in its price range.”

Daniel Ettlin, UNICAM



“The best MS/MS proteomics system.”

Ease of use: ★★★★★ After sales service: ★★★★★ Value for money: ★★★★★

Rating: ★★★★★

Application Area: Proteomics

“The Thermo Orbitrap system has an excellent performance for proteomics applications, the high resolution is perfect for doing denovo sequencing.”

Oscar Villa Hernandez, GSK-Darier



Vanquish Core Binary HPLC System by Thermo Fisher Scientific



“Easy to use, reliable separation device that is priced competitively.”

Ease of use: ★★★★★

After sales service: ★★★★★

Value for money: ★★★★★

Rating: ★★★★★

Application Area: Chromatography Separation & Purification

“The Vanquish Core Binary HPLC System by Thermo Fisher Scientific is an easy to use, easy to maintain and priced moderately by the manufacturer for the lab user. It is a reliable, convenient, repeatable-result separation instrument.”

Farid Ahmed, GEM Tox Consultants & Labs, Inc.

iCAP TO ICP-MS by Thermo Fisher Scientific

“Great results, it really changed my work for the better.”

Ease of use: ★★★★★ After sales service: ★★★★★ Value for money: ★★★★★

Rating: ★★★★★

Application Area: Elemental analysis

“This triple quadrupole made my analyses the best experience I’ve ever had, compared to other mass spectrometers. The software is very easy to use, very intuitive, and the price is very competitive compared to models from other companies.”



“The best ICP-MS with triple quadrupole for food control and safety.”

Ease of use: ★★★★★ After sales service: ★★★★★

Value for money: ★★★★★

Rating: ★★★★★

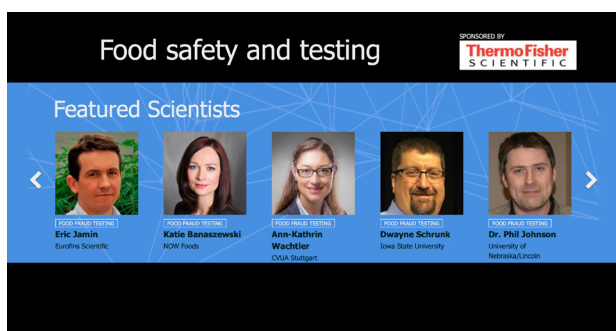
Application Area: Food analysis

“The only chance to use triple quadrupole for very affordable price. This is important for food safety and quality laboratories. Great results for P, S, As, Se as well as for other elements in combination with ICP-MS sensitivity.”

Sergiy Romanov, Intertech Corporation

Video resources

You can find more information on the topics covered in this eBook in a variety of video-based resources relating to Thermo Fisher's Food and Safety Testing program.



[The Scientists' Channel Food and Safety Testing channel »](#)



[Emerging trends and future directions in food testing webinars »](#)



[Tackling the residual testing challenges of pesticides in the global food supply chain »](#)



[Consumer and brand protection from mycotoxins: Detecting known, emerging and masked mycotoxins now, and into the future »](#)

Certain images and/or photos in this eBook are the copyrighted property of 123RF.com, its contributors or its licensed partners and are being used with permission under the relevant license. These images and/or photos may not be copied or downloaded without permission from 123RF.com.