thermoscientific

TRUST

your foods are all they should be.

Food adulteration and authenticity testing brochure

ThermoFisher SCIENTIFIC

Trust your foods are all they should be

Determining the integrity of your food and beverage products

Complexities in the food and beverage supply chain create significant and, at times, relatively easy opportunities for economically motivated fraudulent activities. These opportunities for fraud may occur anywhere in the production process, from the manufacturing site to the consumer, and often go undetected.

In recent years, ensuring the authenticity of food and beverages has become an increasing global problem. Is the product pure? Does it contain any contaminants? Has it been adulterated?

Thermo Fisher Scientific offers advanced instrumentation and solutions that can help determine the known and unknown contaminants of food and beverage products and detect adulteration. From edible oils, juices, alcoholic beverages, milk, meat, fish, honey, and spices, food and beverage products have a fingerprint, a unique chemical and/or signature that allows its components to be identified. We help manufacturers, as well as contract and government laboratories the world over, meet their needs with the widest portfolio of solutions on earth.

With the help of our instrumentation, solutions, and application expertise, uniform quality and integrity can be confirmed in the various phases of the food production chain.

From in-field screening and routine testing to high-end detection, labs know what is riding on each and every determination they make. It is more than simply the quality of their food or beverage product. It is also the reputation of their brand.

Unique answers on origin and authenticity using isotope fingerprints

Tracking wine adulteration using isotope fingerprints (AB30147)

Tracking wine adulteration using oxygen isotope fingerprints (AB30461)

Isotope Analysis of Water, Fruit Juice and Wine Using the Thermo Scientific Gas Bench II IRMS (AN30048)

Detecting purity and adulteration of tequila with isotope fingerprints (AB30477)

Tracing the geographical origin of coffee using isotope fingerprints (AN30418)

Testing sugar package label claims using carbon isotope fingerprints (AB30424)

Isotope analysis for the investigation of authenticity and origin of food and beverage products

Thermo Scientific™ EA IsoLink™ IRMS System

By using a combination of temperature ramped gas chromatography and very low helium consumption per sample, the automated, high-throughput, and cost-effective EA IsoLink IRMS System provides precise data on CHNSO, that allows you to determine if the label states the truthful origin and if food or beverages were adulterated. No matter if you need robustness for routine analysis or flexibility for research applications, the EA IsoLink IRMS System is the solution of choice for bulk analysis.

Thermo Scientific™ GC IsoLink II™ IRMS System

The GC IsoLink II Interface for GC-IRMS builds a seamless solution combining separation capabilities of GC with superior detection power of IRMS. Besides providing analysts with a wealth of information on origin of compounds, metabolic pathways, synthesis, and diagenetic pathways, it can be hyphenated with any GC/GCMS technique to reveal unknown compounds.

Authenticity Control of Honey Using the Thermo Scientific LC IsoLink LC-IRMS (AN30024)

Detection of honey adulteration using isotope fingerprints (AB30177)

Detection of Squalene and Squalane Origin with Flash Elemental Analyzer and Delta V Isotope Ratio Mass Spectrometer (AN30276)

EA-IRMS: Detecting Organic Grown Vegetables (AB30399)

Product Authentication and Adulteration Determination Using a Novel Spectro-Electro Array Platform **(AN1064)**

Evaluation of Herb and Fruit Juice Adulteration and Authenticity by Coulometric Array Detection and Pattern Recognition Analysis **(PN70534)**

From the Ocean to the Table – An Integrated Mass Spectrometry Approach to Identify the Fish on Your Plate **(PO30334)**

Separate your results from the status quo

Thermo Scientific™ Vanquish™ UHPLC platform

Experience uncompromised UHPLC with no trade-offs in performance, robustness, and ease of use. With multiple detector options that can adapt to meet your analytical needs, the Vanquish UHPLC platform is one of the most advanced HPLC systems. The Vanquish platform gives you outstanding retention time stability, extended sample capacity, and simplified operation to help your food authenticity analysis become easier but also more productive than ever before.

Thermo Scientific LC-MS systems

From repeated unknown screening to untargeted and targeted quantitation, address your most stringent analytical requirements for food authenticity with our start-to-end workflows comprising an outstanding suite of LC-MS systems. The high-resolution, accurate-mass Thermo Scientific™ Q Exactive™ Focus Hybrid Quadrupole-Orbitrap™ mass spectrometer allows for efficient screening, identification, confirmation, and quantitation of untargeted and targeted compounds for total confidence in authenticity. Thermo Scientific™ TSQ™ triple quadrupole MS systems offer superior data quality with robust, sensitive, reproducible, and reliable targeted quantitation methods that enable supreme confidence for every molecule type, in every matrix.

Gradient HPLC Method for Analysis of Beer Polyphenols, Proanthocyanidins, and Bitter Acids Using a Novel Spectro-Electro Array Platform (AN1065)

Determination of Olive Oil Adulteration by Principal Component Analysis with HPLC–Charged Aerosol Detector Data (PN70689)

Determination of Dicyandiamide in Milk Powder (AN1095)

Analysis of Melamine and Cyanuric Acid in Food Matrices by LC-MS/MS (AN424)

Chemical Profiling and Differential Analysis of Whiskies Using Orbitrap GC-MS **(AN10492)**

GC-IRMS: $\delta^{13}C$ in Fatty Acid Methyl Esters (FAME) **(AN30052)**

Determination of Fatty Acid Methyl Esters in Olive Oil **(AN10058)**

A whole new level of usability

Thermo Scientific GC and GC-MS systems

GC systems

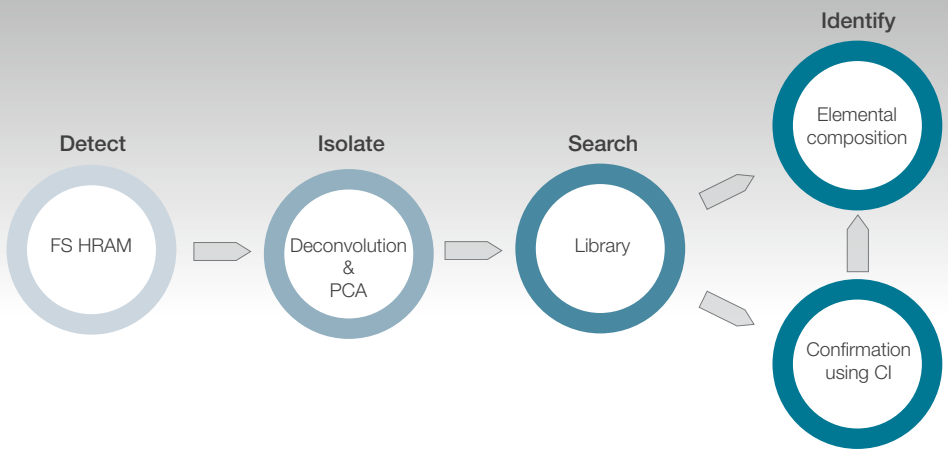
Complete solutions for the analyses of beverages and food including contaminants, flavors, and FAMEs. Advanced sampling capabilities, the unique Instant Connect injectors and detectors, and no-vent MS column replacement provide maximum flexibility and increased productivity by eliminating maintenance downtime.

Single and Triple Quadrupole GC-MS systems

Thermo Scientific™ ISQ™ Series Quadrupole GC-MS Systems are ideal for high-throughput laboratories that want to achieve uninterrupted productivity. The Thermo Scientific™ TSQ™ Triple Quadrupole GC-MS/MS Systems are the gold standard for the sensitive and specific quantitation of target compounds.

Orbitap GC-MS systems

The Thermo Scientific™ Q Exactive™ and Exactive™ GC Orbitrap™ GC-MS Systems represent the first-ever combination of capillary gas chromatography and high-resolution, accurate-mass (HRAM) Orbitrap mass spectrometry. This formidable combination provides screening, identification, and quantitation data, giving the highest confidence in results for authenticity testing.



Determination of Organic Acids in Fruit Juices and Wines by High-Pressure IC (AN1068)

Determination of Carbohydrates in Fruit Juice Using Capillary High-Performance Anion-Exchange Chromatography (AN127)

Carbohydrate in Coffee: AOAC Method 995.13 vs a New Fast Ion Chromatography Method (AN280)

A Fast Method for Sugar Analysis of Instant Coffee Samples (AU202)

Nothing compares to a Thermo Scientific™ Dionex™ IC system to successfully analyze compounds for food adulteration

Thermo Scientific™ Dionex™ Integrion™ HPIC™ system

Analyze for carbohydrates, anions, cations and organic acids with the Dionex Integrion HPIC ion chromatograph. Its high-pressure capabilities enable faster analysis without compromising data quality. Use the system's automated eluent generation (EG) to eliminate error-prone manual eluent preparation and achieve better method reproducibility.

Thermo Scientific™ Dionex™ ICS-6000 HPIC™ System

For more demanding applications, the Dionex ICS-6000⁺ system is the instrument of choice. It is a highly versatile, flexible system with a modular design and configurations to meet your toughest challenges. Take advantage of the speed and resolution that high-pressure systems with 4 µm columns have to offer.

HPAE-PAD Determination of Carbohydrates in Honey to Evaluate Samples for Quality and Adulteration (AN1159)

Determination of Organic Acids in Fruit Juices and Wines by High-Pressure IC (AN1068)

We create breakthrough technologies to enable food scientists to work smarter and faster

Solutions for every laboratory

Thermo Scientific™ iCAP™ TQ ICP-MS

Harness the power of Triple Quadropole (TQ) technology for uncomplicated analysis with incredible accuracy. Even the most challenging matrices are no obstacle for the iCAP TQ ICP-MS, ensuring reliable elemental analysis to support your food and beverage authenticity and adulteration analysis challenges. Ideal for pushing the boundaries of your research, or meeting future legislation requirements, the iCAP TQ ICP-MS instrument is the solution to future-proofing your lab.

Thermo Scientific™ iCAP™ RQ ICP-MS

Choose this robust, high-productivity system to simultaneously measure toxic and essential elements, while a suite of integrated software features enable regulatory compliance. Couple with a metal-free IC system to easily and accurately speciate critical elements such as arsenic and chromium.

Thermo Scientific™ Element 2™/XR™ HR-ICP-MS

High Resolution ICP-MS is the gold standard for trace elemental determinations and is capable of precise and accurate isotope ratio determinations that may be used in provenance studies.

The International Organisation of Vine and Wine (OIV) has a Type II inductively coupled plasma (ICP) ICP-MS method for simultaneous determination of 15 metals, boron, and bromine in wine. The metals include aluminum, cadmium, cobalt, copper, strontium, iron, lithium, magnesium, manganese, nickel, lead, rubidium, sodium, vanadium, and zinc.

Quality columns you can rely on for quality results

Thermo Scientific™ Hypersil GOLD™ HPLC columns

Hypersil GOLD HPLC columns are available in 12 different chemistries to optimize separations and maximize productivity. The extensive range of Hypersil GOLD columns offers chromatographers outstanding peak shape for reversed phase, ion exchange, HILIC, or normal phase chromatography. With all 12 phases available with 1.9 µm particle size, Hypersil GOLD columns offer chromatographers flexibility in choosing the correct column, whether using conventional or ultra-high pressure LC systems.

Thermo Scientific™ Accucore™ HPLC columns

Accucore HPLC columns provide a unique chromatography solution to enhance laboratory workflow and efficiency. Available in a wide range of stationary phase selectivities and compatible with almost any instrument, these columns provide an excellent return on investment.

Thermo Scientific™ Accucore™ XL HPLC columns

Using 4 µm solid core particles, Accucore XL HPLC columns allow users to enjoy performance far beyond that of columns packed with 5 µm, 4 µm, or even 3 µm fully porous particles.

Thermo Scientific™ gas chromatography columns

Columns that represent a leap forward in performance, delivering low bleed and superior inertness. Select from our comprehensive portfolio of Thermo Scientific™ GC columns that meet all of your analytical needs and achieve reliable, reproducible results for your gas chromatography (GC) and gas chromatography-mass spectrometry (GC-MS) applications.

Take your lab informatics to another level

Informatics and chromatography software

Whether you are performing routine product analysis, looking for potential contaminates, or carrying out authenticity studies, the Thermo Scientific informatics and chromatography software solutions help you manage your entire laboratory process.

Thermo Scientific™ SampleManager™ provides comprehensive data and operations management and lab execution in a single solution. When it is integrated with Thermo Scientific™ Chromeleon™ CDS software, you can benefit from a complete software platform that simplifies analysis and unlocks the value of your data.

Chromeleon 7.2 Chromatography Data System (CDS) software

Streamline your entire chromatography workflow, giving you better results faster. Its advanced processing tools ensure quick, consistent results. Chromeleon is also the first CDS to unify workflows for chromatography and routine quantitative MS analysis. Chromeleon eWorkflows™ contain everything you need to perform a run, including the sequence, instrument and processing methods, and final reports, simplifying the management and execution of routine analysis.

Thermo Scientific™ TraceFinder™ software

Offer increased flexibility and an array of capabilities in performing targeted screening and routine quantitation with either high-resolution, accurate-mass (HRAM) and/or triple stage quadrupole (TSQ) mass spectrometers with TraceFinder software. Not only does TraceFinder software provide method development tools for all molecule types, it also generates new methods from existing data.

Thermo Scientific™ Compound Discoverer™ software

Compound Discoverer software empowers researchers to strategically collect, organize, store and report data for both targeted and untargeted high resolution analyses. The software is ideal for characterization and profiling due to its ability to assemble data collected from multiple samples into one unified report.

Thermo Scientific™ AppsLab Library of Analytical Applications

An online repository for methods created and tested by Thermo Fisher Scientific application chemists. These applications can be downloaded through one-click eWorkflows directly into Chromeleon CDS and are ready to run.

Analysis software solutions for your analysis workflows, including identification, quantification, and confirmation

Go to AppsLab Library

Bringing your Authenticity Analysis to the Field

Rapidly detect illegal additives, residues, and food fraud

Thermo Scientific™ FoodDefender RM Handheld Raman Analyzer is a powerful Raman spectrometer that not only directly and non-destructively identifies unknown compounds for residues, but also combines surface-enhanced technology for the detection of trace level illegal additives allowing on-site food safety, public security, market surveillance and food authenticity monitoring. The entire testing process takes only a few minutes making it an ideal choice for on-site rapid testing and screening.

Gain clarity for your food and beverage identification and verification needs

Fast and accurate identification results:
Handheld instrument able to obtain accurate and reliable results within only seconds of sample scanning
Mixture identification:
Patented algorithm provides reliable analyses for mixtures
Lower limit of detection:
The limit of detection can be as low as ng/g with the nano surface-enhanced technology
Updated Raman spectrum library:
Libraries for pesticide residues, veterinary drug residues in food, raw materials and illegal additives in health products
Designed for field use:
Enhanced user interface make this Raman ideal for rapid, accurate identification of unknown chemicals directly in the field
Worry-free maintenance:
Ensure the same accurate results are obtained by novice or expert without the requirements of pre-heating, maintenance, calibration or tune.

Thermo Scientific™ Antaris™ II FT-NIR analyzer

The Antaris II Fourier Transform Near-Infrared (FT-NIR) analyzer sets the standard for process and quality control analytics through its intuitive operation and unique combination of performance, power, and support. This analyzer is designed for use at production lines and on factory floors, loading docks, or warehouses, while retaining the performance and flexibility necessary for method development work.

Thermo Scientific™ Nicolet™ iS™5 FTIR spectrometer

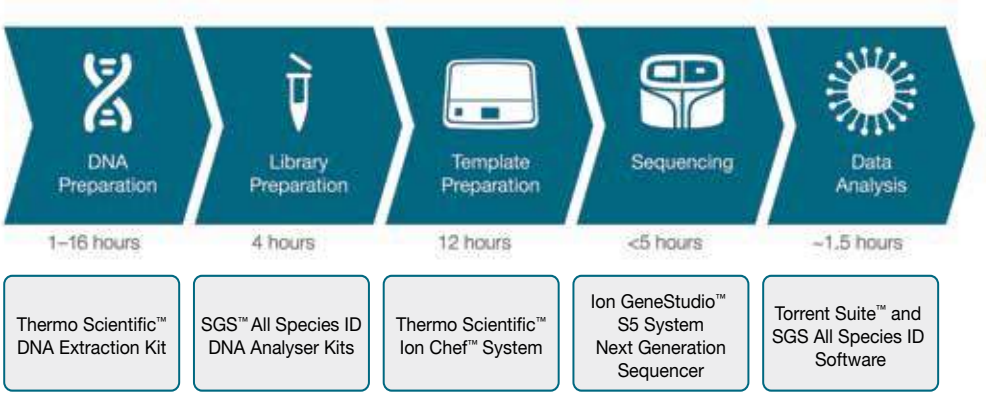
This portable spectrometer provides the ideal performance for product assurance and authenticity testing of a wide variety of food types. Whether you choose the Mid-IR or Near-IR version, this spectrometer delivers maximum confidence and reliability by implementing the same field-proven FT-IR technology found on other Thermo Scientific Nicolet FTIR models. The lightweight design and small footprint enable you to bring your Nicolet iS5 spectrometer to where you need answers most: from your busy laboratory to the production floor.

FTIR and NIR have been applied to widely used authentication of virgin olive oils, floral origin of honeys, milk and cheese authentication, vinegar, herbs, cocoa, and wine authentication, as well as detection of adulteration of meat, milk, and animal feed.

Next Generation Sequencing for species identification

The first complete NGS workflow for meat, fish and plant species screening and identification

The Thermo Scientific™ Next Generation Sequencing (NGS) Food Authenticity Workflow utilises Ion Torrent™ Next Generation Sequencing technology to enable an untargeted screening approach making it possible to identify the species contained in a food sample by comparison with an extensive DNA database of meat, plant and fish species.



- Simple: ready-to-use kits include all necessary reagents for DNA labeling and amplification, and provide results with any sample type, including complex and processed samples.
- Rapid: allows preparation of NGS library from extracted DNA within 4 hours.
- Flexible: utilises a unique labelling system in which the DNA of each food sample is individually identified with an exclusive barcoded DNA sequence, enabling analysis of multiple samples together for meat, fish and plant species.
- Supported: our experienced technical team is ready to assist you.

The fully supported, end-to-end workflow enables screening and identification of meat, plant, and fish species in under 24 hours making it a powerful tool for determining the authenticity of food raw materials, ingredients, animal feed and even highly complex and processed food products.

Initiate testing you couldn’t before

SGS All Species ID DNA Analyser Kits and SGS All Species ID Software

The ready-to-use SGS All Species ID DNA Analyser Kits allow the unique labelling and amplification of meat, fish or plant DNA in a sample by PCR in preparation for NGS, and automated data analysis by the SGS All Species ID Software. Test results are presented as a list of any meat, plant and fish species present in the sample.

Each SGS All Species ID DNA Analyzer Kit enables you to prepare up to 48 samples at once for simultaneous sample analysis when processed with the Ion Chef™ Food Protection Instrument, Ion GeneStudio™ Food Protection System S5 Food Protection System and SGS All Species ID Software

Ion Chef Food Protection Instrument

Offering automated template preparation and reproducible chip loading ahead of NGS the Ion Chef Food Protection Instrument provides significant time and labor savings whilst minimizing user variability.

The Ion Chef Food Protection Instrument features a cartridge-based reagent system combined with sample and reagent-tracking capability and an intuitive user interface to streamline your sequencing workflow.

Ion Genestudio S5 Food Protection System

The Ion GeneStudio S5 Food Protection System leverages the speed of semiconductor sequencing for the production of high quality sequencing data in just few hours enabling you to go from DNA library to data in as little as 21 hours with only 45 minutes hands-on time when paired with the Ion Chef Food Protection Instrument.





Species identification using targeted DNA detection

* Kits have been developed in collaboration with Imegen, Instituto de Medicina Genomica, Valencia Spain.

** Mitochondrial DNA (mtDNA) is a multi-copy DNA target, as mammalian cells contain several copies of mtDNA per cell. The Applied Biosystems ID Kits and Applied Biosystems Quant Multi-Meat Set detect mitochondrial DNA, giving the assay a very high sensitivity and making the assay applicable to be used with processed food.

*** Quantification assay is based on two absolute quantifications: the total amount of species DNA (using Applied Biosystems species ID Kit and RapidFinder™ Quant Multi-Meat Set), and the total amount of animal present in one sample using the Applied Biosystems Quant Multi-Meat Set.

Reliable detection and quantification of species DNA in meat and feed samples

Identification of specific meat or fish species present in food samples is an essential step for verification of origin and traceability of raw materials, as well as for quality control of handling and cleaning processes in production lines.
We offer a broad portfolio of high sensitivity, real-time PCR based meat species and fish detection and quantification testing solutions.

- Rapid: Same day results
- Full workflow solution: DNA extraction options for low and high sample input
- High sensitivity: Detection of mitochondrial DNA
- Quantitative: Quantification based on DNA standards, species DNA/total animal DNA result (%)

Meat and Fish Species Identification (ID) Kits

The Applied Biosystems™ Meat Species ID Kits* detect mitochondrial DNA** in food and feed samples. All reagents for 48 reactions are provided.

Quant Multi-Meat Set

The Applied Biosystems™ Quant Multi-Meat Set* detects mitochondrial DNA** in food samples and includes standards for quantification (species and animal)***. All reagents for 48 reactions are provided.

- Easy to use: Real-time PCR, no electrophoresis
- Reliable: Internal Positive Control (IPC) allows ruling out inhibition of PCR
- High sensitivity: Limit of detection in fresh meat of 0.01% (ID Kits) and 0.05% (w/w) (Multi-Meat Set)

Simple PCR workflows for species ID

Simplify handling with semi-automated sample preparation

Thermo Scientific™ KingFisher™ Flex purification Instrument

Highly versatile, automated magnetic-particle processing for DNA/RNA, protein or cell purification from virtually any meat or feed source. Using revolutionary magnetic particle separation technology, this system provides excellent reproducibility and quality. Prepare high purity DNA extracts for meat species identification and quantification in 96-well runs.

A choice of real-time PCR platforms for your rapid species detection and quantification

The Applied Biosystems™ QuantStudio™ 5 Real-Time PCR Food Safety System is a 96-well platform designed for users who need superior performance, maximum dye versatility, and security options in a cloud-enabled, real-time PCR system that is affordable and easy to use.

The Applied Biosystems™ 7500 Fast Real-Time PCR Food Safety instrument is a versatile, 96-well platform ideal for batch processing several hundred samples a day. This open system can be used to run assays to detect targets including authenticity markers and other targets important in food safety and quality testing.

Find out more at **thermofisher.com/FoodIntegrity**

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