Food Safety Threats & Thermo Scientific Solutions

A safe and contaminant-free food supply not only protects companies and brands, but guards public health and ensures healthy international trade and commerce. Thermo Scientific technologies address a broad range of food safety issues from foreign object contamination to microbiological and chemical detection. The following overview identifies some of the most pressing food safety threats and how our solutions address them. We enable our customers to make the world a cleaner, healthier and safer place by providing the tools to detect and analyze food contaminants that threaten public health.

Threat	Solution
Bacteria	**Bacteria**
Salmonella, E. coli, Listeria and Campylobacter are typically traced back to dairy or meat products, with the exception of Listeria, which is often found in soil and vegetation. If digested, these bacteria can cause serious infections, diseases, and even death in humans.	Our trusted Oxoid & Remel brand products offers a range of detection tools and tests, including chromogenic media for Salmonella and Listeria and our magnetic particle processor, which includes revolutionary patented technology and isolates bacteria from food samples or animal virus RNA from food and meat samples. In addition, our microplate photometers and microplate washers are used in the identification of harmful bacteria, including mad cow disease.
Chloramphenicol	**Chloramphenicol**
Chloramphenicol is sometimes used in the treatment of animals that produce food for human consumption. Significant levels of chloramphenicol have been discovered in seafood and honey in East Asia. The chemical can cause the potentially lethal aplastic anemia condition in humans.	The presence and concerns over high levels of chloramphenicol in food prompted us to develop new analytical methodologies to screen food samples for residue levels of chloramphenicol. Our triple quadrupole mass spectrometer coupled with the Thermo Scientific Accela™ liquid chromatograph can detect < 0.05 ppb of chloramphenicol.
Malachite Green and Leucomalachite Green	**Malachite Green and Leucomalachite Green**
Malachite Green (MG) is a fungicide used in aquaculture, particularly in Asian countries. During metabolism, MG reduces to Leucomalachite Green (LMG). Both chemicals have demonstrated putative carcinogenic activity and trace levels of MG and LMG residues have been found in fish products exported by China.	Our mass spectrometers allow the detection of both Malachite Green and Leucomalachite Green without post-column oxidation. A highly sensitive and selective method using our triple quadrupole mass spectrometer, yields detection limits of < 0.5 ug/kg in roasted eel and other fish products.
Melamine	**Melamine**
Melamine is an industrial chemical used in the manufacturing of plastics, flame retardants and other chemical products. It is not approved by the FDA for use in food or animal feed, but was identified in recent tainted pet foods. Ingestion of melamine may lead to reproductive damage, or bladder or kidney stones, which can lead to bladder cancer.	We paved the way for the detection of melamine and its three major by-products: cyanuric acid, ammeline and ammelide. The triple quadrupole mass spectrometer enables Highly Selective Reaction Monitoring (H-SRM) and was used in a published FDA method for determination of melamine residues. In food processing, the Thermo Scientific Spectra-Quad™ analyzer can detect and measure melamine in wheat gluten or wheat powder.
Mycotoxins	**Mycotoxins**
Mycotoxins are toxic metabolites produced by certain species of fungi and have been identified as sources of food-borne illnesses. Most mycotoxins are relatively stable compounds that are not destroyed during food processing or cooking. Consumption has been linked to several diseases, including aflatoxic hepatitis, enteric ergotism and vascular ergotism.	Our liquid chromatograph-mass spectrometry technique is widely used to detect mycotoxins in food. We also offer mycotoxin test kits for faster screening and results, and our microplate photometers offer a cheaper method of mycotoxin detection.
Nitrates & Nitrites	**Nitrates & Nitrites**
Sodium nitrate is added to foods like hot dogs, bacon and other meats to create a red color and fresh appearance. Natural nitrites found in vegetables and high levels of nitrates in drinking water can be potentially harmful to humans and animals.	We offer automated photometers that reliably analyze nitrates and nitrites from food samples that are in either water or homogeneous liquid forms.
Nitrofurans	**Nitrofurans**
Nitrofurans are a group of veterinary antibiotics banned in many countries because of human health concerns. The ban stimulated interest in developing analytical methods for detecting trace levels of these drug residues found in animal products such as seafood and honey.	The combination of our triple quadrupole mass spectrometer and liquid chromatography capabilities effectively detects trace levels of nitrofuran and metabolites (< 0.050 ug/kg) in seafood.

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Threat	Solution
Pesticides	**Pesticides**
Pesticides are useful in the mitigation, control, destruction or repellence of unwanted pests, but can be harmful if they enter the food chain. Certain pesticides may have short-term or long-term health effects if consumed by humans. Many countries have established limits for pesticide use and the testing of food products for pesticides is required to establish safety and compliance.	A combination of our gas chromatographs and mass spectrometers can identify and quantify pesticides in food. In addition, specific methods and spectral libraries have been developed for use with our mass spectrometers to analyze hundreds of pesticides.
Trace Elemental Analysis	**Trace Elemental Analysis**
Specific levels of potassium, sodium, iron, zinc, manganese, mercury or lead can be harmful to the human body. These elements can enter the human food chain through direct contamination of a product, through the environment in which a plant is grown or animals.	We offer equipment used in trace elemental analysis, including Atomic Absorption Spectrometers, Inductive Coupled Plasma Spectrometers and Inductively Coupled Plasma Mass Spectrometers to precisely detect, measure and analyze these elements.
Foreign Objects	**Foreign Objects**
Foreign objects, such as metal, glass and stone, can be introduced or found at any point during food processing and production. Solid contaminants can come from raw ingredients, processing, accidents or deliberate actions. A small stone, a piece of wire from a strainer or a shard of glass are all threats to food safety.	Our metal detectors and X-ray systems are the industry's leading online technology and trusted by some of the largest food and beverage companies. Our metal detectors incorporate a unique multi-coil design (patent-pending) for maximum sensitivity and contaminant detection, as well as the Thermo Scientific AuditCheck feature, which verifies system performance.
Product Inspection	**Product Inspection**
Food and beverage producers may suspect that certain product batches are contaminated and need quick, convenient X-ray inspection and metal detection services.	We offer offline product inspection services in the US and Europe at facilities outfitted with high-sensitivity X-ray and metal detection systems. Product inspection teams are often able to detect contaminants less than 1 mm in size, maximizing product recovery and minimizing product disposal costs.
Irradiated Food Testing	**Irradiated Food Testing**
Food irradiation, or the process of exposing food to ionizing radiation, can extend the shelf life of food by killing bacteria, delaying ripening or disinfesting insects. The concern with this practice is that food which appears healthy may actually be spoiled or infested with harmful bacteria.	We are a leader in the field of irradiated food testing using the thermoluminescent (TL) technique, widely applied in Germany, Japan and Korea. The TL technique is a confirmatory process unlike other processes, which are gross indicators.
Sterilization without Heating	**Sterilization without Heating**
Dimethyldicarbonate is often used as a cold sterilization agent for beverages and is harmful before it breaks down into methanol and CO_2. It is typically added immediately before a beverage is capped; therefore, quality checks must be done through the measurement of methanol.	Our photometric analyzers test for methanol at any phase in the juice process and our microplate photometers detect acetic acid, D-glucose, D-fructose, L-lactic acid, L-malic acid, primary amino nitrogen and yeast assimilation nitrogen in wine.
Quality Assurance and Traceability	**Quality Assurance and Traceability**
Manufacturers often need to provide evidence that quality assurance activities have been completed during a manufacturing process, especially in the event that a substandard product reaches the public.	Laboratory Information Management Systems (LIMS) allow QA/QC environments to trace the quality of products at any point in the manufacturing supply chain, from raw materials to packaged products. This service is essential in finding the source of substandard products or tracing other affected products.

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

Africa
+43 1 333 5034 127
Australia
+61 2 8844 9500
Austria
+43 1 333 50340
Belgium
+32 2 482 30 30
Canada
+1 800 530 8447
China
+86 10 8419 3588
Denmark
+45 70 23 62 60
Europe-Other
+43 1 333 5034 127
France
+33 1 60 92 48 00
Germany
+49 6103 408 1014
India
+91 22 6742 9434
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Latin America
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Middle East
+43 1 333 5034 127
Netherlands
+31 76 579 55 55
South Africa
+27 11 570 1840
Spain
+34 914 845 965
Sweden/Norway/ Finland
+46 8 556 468 00
Switzerland
+41 61 48784 00
UK
+44 1442 233555
USA
+1 800 532 4752

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