

# Food Analytical Services

Protect consumers, your products and your brands



The Food and Environment Research Agency's (Fera) scientific expertise, combined with a detailed knowledge of current and emerging regulations, has enabled us to remain at the forefront of test development and analysis in the areas of food authenticity, genetic modification, contaminants and residues.

Effective knowledge management systems allow us to easily keep our food analytical services up to date. Our customers can be sure the services we offer are aligned with current legislation, the EU-wide rapid alert system for food and feed (RASFF) and other factors influencing testing regimes.

In the pages that follow it is only possible to give an overview of the extensive ongoing testing programme run at Fera.

However, this is not a static programme and we are continually working with clients to develop new tests for food contaminants. In addition we have accredited analytical capabilities to test foodstuffs for the presence and quantity of other non-contaminant substances, for example artificial sweeteners and preservatives.

If your analytical requirements do not appear to be covered, please contact us.

## Environmental Contaminants

Dioxins (PCDD/Fs), polycyclic-aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and poly-brominated diphenyl ethers (PBDEs) are organic environmental contaminants that occur in many marine and animal based foods at very low concentrations. Fera has developed an extensive suite of highly sensitive tests capable of detecting these toxic chemicals in what are considered to be the major sources of human exposure; meat, poultry, fish, milk, eggs and their products.

Similar EU restrictions apply to the levels of trace elements in foodstuffs and Fera specialises in detecting these in both ingredients and processed foods. Here again, Fera has developed advanced techniques for example using ICP-MS (Inductively Coupled Plasma-Mass Spectrometry) that allows us to test for up to 60 elements in one analytical run.

Description	Target LOQ	Units	Determination Step	Application
<b>Organic contaminants</b>				
PAHs extraction & analysis	0.02-0.2	µg/kg	GC-MS	Foodstuffs including fish and fish products, meat and meat products, milk and milk products, eggs, fats and oils
PCDD/Fs & non <i>ortho</i> -PCB analysis	0.01	ng/kg	High resolution GC-MS	
<i>ortho</i> -PCB analysis	0.01	µg/kg	GC-MS	Animal feeds
PBDEs analysis	0.01	µg/kg	GC-MS	
Perfluorinated alkyl compounds (e.g. PFOS)	1-5	µg/kg	LC-MS/MS	
<b>Trace elements</b>				
Multi Element Customer Selection	0.01-0.7	mg/kg	ICP-MS	Foodstuffs including fish and fish products, meat and meat products, milk and milk products, eggs, fats and oils
Iodine	0.01-0.7	mg/kg	ICP-MS	
Inorganic arsenic	0.01-0.7	mg/kg	ICP-MS	Animal feeds

## Food Contaminants

Fera provides a full suite of analytical tests that address food contaminants restricted under EU food safety legislation. We specialise in testing for and identifying the levels of mycotoxins, contaminants migrating from food contact materials, contaminants resulting from food processing and illegal use of food additives.

Description	Target LOQ	Units	Determination Step	Application
<b>Mycotoxins</b>				
Aflatoxins B + G	0.2	µg/kg	HPLC	Foodstuffs and animal feedstuffs including: cereals, nuts, milk, dried fruit, rice
Aflatoxins M1(+M2)	0.01	µg/kg	HPLC	
DON	50	µg/kg	HPLC	
Fumonisin	40	µg/kg	HPLC	
Ochratoxin A	0.2	µg/kg	HPLC	
Patulin	5	µg/kg	HPLC	
Trichothecenes	50	µg/kg	GC-MS	
ZON	10	µg/kg	HPLC	
<b>Food contaminants</b>				
Acrylamide	30	µg/kg	GC-MS	Fried, baked and roast foods
3-MCPD	10	µg/kg	GC-MS	Soy sauces, HVP flavouring products and raw materials
DCP	5	µg/kg	GC-MS	
Furan	2-5	µg/kg	GC-MS	Canned and bottled food
Ethyl carbamate	10	µg/kg	GC-MS	Fermented foods
HMF	1	mg/kg	HPLC-UV	Honey and sweeteners
Total phenols	1	mg/kg	UV-VIS	Fish
Nitrate/nitrite	10/5	mg/kg	Ion Chromatography UV	Vegetables, meat, baby food
Methyl imidazole & THI	1	mg/kg	LC-MS	Sweeteners
<b>Food packaging</b>				
Plasticizers (phthalate esters)	0.02-0.05	mg/kg	LC-MS/MS or GC-MS	Foodstuffs, food simulants, and food contact materials and articles
Plasticizers (ESBO)	5	mg/kg	LC-MS/MS	
Residual solvents from printing inks	0.01	mg/kg	GC-MS	
Primary aromatic amines	0.01	mg/kg	LC-MS/MS	
BADGE and its hydroxy and chlorinated derivatives, BFDGE	0.1	mg/kg	LC-FI	
Bisphenol A	0.05	mg/kg	LC-FI	
Photoinitiators	0.01-0.05	mg/kg	LC-MS/MS or GC-MS	
Diisopropylnaphthalenes	0.02	mg/kg	LC-FI	
Styrene	0.01	mg/kg	GC-MS	
Vinyl chloride	0.005	mg/kg	GC-MS	
<b>Illegal use of dyes</b>				
Sudan I - IV, Orange G, Black B	10	µg/kg	LC-MS/MS	Spices, seasonings, flavourings, sauces, pastes, batters, and derivatives of these products, including: curry powders, pastes, oils and oleoresins
Sudan Red 7B, G, B	10	µg/kg	LC-MS/MS	
Para Red	50	µg/kg	LC-MS/MS	
Rhodamine B	10	µg/kg	LC-MS/MS	
Butter Yellow	10	µg/kg	LC-MS/MS	
Orange II	10	µg/kg	LC-MS/MS	
Toluidine Red	10	µg/kg	LC-MS/MS	
Fast Garnet	10	µg/kg	LC-MS/MS	
Metanil Yellow	50	µg/kg	LC-MS/MS	
Auramine	10	µg/kg	LC-MS/MS	
Orange Oil SS	100	µg/kg	LC-MS/MS	
Bixin	100	µg/kg	LC-MS/MS	

## GM and Food Authenticity

Fera uses the most effective and accurate chemical and molecular testing methods to confirm authenticity and provenance of foods, as well as offering up to date advice and guidance on food authentication issues. Using powerful tools such as stable isotope ratio mass spectrometry, DNA and protein analysis, Fera helps companies throughout the food supply chain to protect product integrity and monitor compliance with labelling requirements such as those arising through use of alternative or genetically modified ingredients.

Description	Determination Step	Application
<b>Genetically Modified Organisms</b>	Qualitative and quantitative PCR-based tests with a detection limit of 0.1%	Multi-element profiling, event specific tests
<b>Food authenticity and traceability</b>		
Basmati rice	Microsatellite analysis	Identifying presence of 7% non-Basmati grain in a sample
Meat speciation	DNA amplification of cytochrome B sequences	Detection of turkey, chicken, duck, pheasant, quail, pork, beef, lamb, deer, horse and donkey matrices in cooked meats, pâté and pies
Fish identification	Iso-electric focusing	Identification of species from round fish, flat fish, salmon and shellfish families
Meat binding agents	Protein mass spectrometry	Presence and identification of species of blood based binding agents, e.g. presence of pork protein in fish and chicken
Detection of specific proteins	Protein mass spectrometry	Allergens
Geographical origin	Stable isotope ratio mass spectrometry (IRMS) and trace element analysis using ICP-MS	Verification of food provenance, e.g. PDO, PGI labels
Corn-fed chicken	$\delta^{13}\text{C}$ IRMS	Verification of labelling requirements
Verification of natural origin of food additives	GC-C- $\delta^{13}\text{C}$ IRMS	For example flavours, preservatives
Alcohol characterisation	$\delta^{13}\text{C}$ stable isotope ratio mass spectrometry	Source of neutral alcohol
Generic food verification systems	$^1\text{H}$ NMR	Product integrity, QA
Product adulteration	Specific natural isotope fractionation NMR (SNIF-NMR)	Detecting addition of ethylene glycol to wine Detection of added sugars to syrups

## Veterinary Medicine Residues

Fera's veterinary medicine residue analysis service is designed to determine low level residues in complex matrices such as animal tissues, dairy products and, where raw materials are not available, processed foods and ready meals. Our laboratory services ranges from rapid screening, through to full quantification and confirmation using the most up to date measurement technology such as optical biosensors and mass spectrometry. Commodity suites of analyses are available for red meat, poultry, seafood, dairy products, eggs, farmed fish and honey.

Description	Target LOQ*	Units	Determination Step	Application
Antimicrobial screen (Delvotest® or Premi®test)	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	Antimicrobial inhibition	Poultry & game, seafood, fish, red meat, honey, eggs, milk
Avermectins	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-FI, LC-MS/MS	Poultry & game, seafood, fish, red meat, milk
β-agonists	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	ELISA, LC-MS/MS	Poultry & game, red meat, milk
Benzimidazoles & levamisole	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-FI/UV, LC-MS/MS	Poultry & game, seafood, fish, red meat, eggs, milk
Chloramphenicol	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	ELISA, biosensor, LC-MS/MS	Poultry & game, seafood, fish, red meat, honey, eggs, milk, cheese
Florfenicol	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-UV	Fish
Fluoroquinolones	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-FI, LC-MS/MS	Poultry & game, seafood, fish, red meat, honey, eggs, milk
Ionophores	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-UV, LC-MS/MS	Poultry & game, red meat, eggs
Lasalocid	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-FI, LC-MS/MS	Poultry & game, red meat, eggs
Macrolides and dapsone	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-MS/MS	Honey
Malachite green	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-UV, LC-MS/MS	Seafood, fish
Nicarbazine	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-UV, LC-MS/MS	Poultry & game, red meat, eggs
Nitrofurans	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-MS/MS	Poultry & game, seafood, fish, honey, eggs, milk
Nitroimidazoles	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-UV, LC-MS/MS	Poultry & game, seafood, fish, red meat, honey, eggs, milk
Quinolones	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	HPLC-FI, LC-MS/MS	Poultry & game, seafood, fish, honey
Streptomycin	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	Biosensor	Poultry & game, seafood, fish, honey, milk
Sulphonamides	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	TLC, LC-MS/MS	Poultry & game, seafood, fish, red meat, honey, eggs, milk, cheese
Tetracyclines	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	LC-UV, LC-MS/MS	Poultry & game, seafood, fish, red meat, honey, eggs, milk, cheese
Trenbolone	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	ELISA	Poultry & game, fish, red meat
Zeranol	<sup>1</sup> / <sub>2</sub> -1 MRL or less	µg/kg	ELISA	Poultry & game, red meat

\* The GC-MS multi-residue (GC-MS MR) screen analysis is capable of detecting in excess of 120 pesticides and metabolites.

\*\* The LC-MS/MS multi-residue (LC-MS/MS MR) screen analysis is capable of detecting in excess of 65 pesticides and metabolites.

For customers requiring a rapid turn round of results we offer an Express Service, with results being provided within 24 hours. Currently this service applies to the multi-residue GC-MS and LC-MS/MS methods.

Fera also provides a service for single or small groups of pesticides amenable to either multi-residue method.

## Pesticide Residues

Fera has been carrying out residue testing for over 30 years, providing services across the food supply chain. Our experience is such that we know what to look for in any given foodstuff so can help you identify an appropriate testing regimen for your products – from multi-residue screening through to targeted analysis for specific residues.

Fera continues to be at the forefront of method advancement and has a well established reputation for developing a range of innovative tests to detect residues including new pesticide/matrix combinations, e.g. the growth regulator trinexapac-ethyl used on cereal crops, and detection of pesticides and veterinary drugs using Lateral Flow Device (LFD) technology.

Description	Target LOQ	Units	Determination Step	Application
<b>Pesticides</b>				
GC-MS MR*	10	µg/kg	GC-MS	Foodstuffs including: fruit, vegetables, animal products, cereals, processed foods, beverages
LC-MS/MS MR**	10	µg/kg	LC-MS/MS	
Chloromequat & Mepiquat	10	µg/kg	LC-MS/MS	
ETU & PTU	10	µg/kg	LC-MS/MS	
Abamectin	10	µg/kg	LC-FI	
Dithiocarbamates	50	µg/kg	GC-FPD, MS	
Glyphosate	100	µg/kg	GC-MS	
Inorganic bromide	10	µg/kg	GC-ECD	
Maleic hydrazide	100	µg/kg	LC-UV	
Methyl bromide	10	µg/kg	GC-ECD	
OCs (high fat samples)	10	µg/kg	GC-MS/MS	
Phosphine	1	µg/kg	GC-NPD	
Trinexapac-ethyl	10	µg/kg	LC-MS/MS	
2,4-D	10	µg/kg	GC-MS	

\* The GC-MS multi-residue (GC-MS MR) screen analysis is capable of detecting in excess of 120 pesticides and metabolites.

\*\* The LC-MS/MS multi-residue (LC-MS/MS MR) screen analysis is capable of detecting in excess of 65 pesticides and metabolites.

For customers requiring a rapid turn round of results we offer an Express Service, with results being provided within 24 hours. Currently this service applies to the multi-residue GC-MS and LC-MS/MS methods.

Fera also provides a service for single or small groups of pesticides amenable to either multi-residue method.

## Online Decision Support Systems

Fera has over 35 years' experience and understanding of contaminants analysis and safety in the food supply chain. This knowledge has been combined with data from other authoritative sources to produce a suite of online decision support tools for food supply chain professionals. The common theme linking our decision support tools is information management.

Each of our tools combines relevant sources of information and allows you to search for the information you want, but will supplement your core search results with other linked information that may be of value.

Decision Support Tool	Application	Website Address
<b>FC24 food contaminants online</b>	EU-wide information on food contaminants, rapid alerts and residues, including metals, nitrates, veterinary drugs, pesticides, dioxins	<a href="http://www.thefera.org/fc24">www.thefera.org/fc24</a>
<b>LIAISON</b>	Comprehensive information on pesticide approvals, label information, UK/EU and CODEX pesticide MRLs	<a href="http://www.thefera.org/liason">www.thefera.org/liason</a>
<b>RAPPORT</b>	Interactive design tool for developing bespoke residue testing/pesticide protocol programmes	<a href="http://www.thefera.org/rapport">www.thefera.org/rapport</a>
<b>HOMOLOGA</b>	Comprehensive database of global pesticide approvals and MRLs, including active, marketing company, harvest interval, expiry date, approved crops, maximum dose	<a href="http://www.thefera.org/homologa">www.thefera.org/homologa</a>
<b>MYTOXIPEDIA</b>	Details current legislative limits and regulations on mycotoxins	<a href="http://www.thefera.org/mytoxipedia">www.thefera.org/mytoxipedia</a>

## Service you can trust

Fera's analytical services are carried out in modern laboratories by highly trained scientific staff, using state-of-the-art analytical equipment. Naturally, our services are fully confidential.

We are accredited to the internationally recognised ISO9001 quality standard and over 90 of our analytical methods are accredited to ISO17025.

For many years Fera has participated in European Proficiency Testing Schemes, where our consistently high ranking places our analytical capabilities firmly among the very best laboratories in Europe.

Our services go beyond simply issuing you with a test result. We can help you interpret your results and provide advice on meeting European food safety regulations.

- Fera has over 160 years of history working in Plant Health.
- Fera are the Global Proficiency Testing Provider for food microbiology, chemistry, water and environment analysis laboratories in over 95 countries operating the FAPAS, FEPAS, GeMMA and Leap Schemes.
- Risk Assessment staff at Fera work with worldwide clients to determine risk analysis across a wide range of food and drink process areas.
- Food and drink research at Fera links seamlessly with your testing requirements.
- The NMR-Nuclear Magnetic Resonance expertise at Fera can identify process issues ahead of any internal sensory analysis and can be an essential tool for quality control.

## Contact details

This leaflet provides an overview of Fera's food analytical testing capability. For full terms and conditions relating to the tests outlined above or for help with finding a solution to a specific food analysis issue please contact [foodanalysis@fera.gsi.uk](mailto:foodanalysis@fera.gsi.uk), or call **+44 (0) 1904 462 450**.

