

Evidence Proforma
Food Authenticity Centres of Expertise

Institute of Food Research (IFR)

What is your organisations particular area(s) of expertise in food authenticity testing?

The Institute of Food Research (IFR) has a long history of research and development of analytical methods for food authenticity testing dating back to the early 1990s. IFR-Extra, a wholly owned subsidiary of the Institute of Food Research, specialises in providing bespoke research services to the food sector, and is the first point of contact for industrial collaborative and contract research. IFR-Extra administrates and staffs our ongoing industrial food authenticity testing contracts that cover mainly applied research, but can also accommodate surveillance using newly developed methods.

Our particular areas of expertise are the techniques of modern analytical chemistry, as follows:

- Molecular Spectroscopy (IR, NMR)
- Proteomics and organic mass spectrometry
- Chromatography (GC-MS, LC-MS)
- Statistics & software development
- Inorganic Mass Spectrometry (IRMS, ICP-MS)

The first four of these resources are located within the Analytical Science Unit at IFR. The inorganic MS is sited in the Analytical Facility at the University of East Anglia (Science Faculty). We have a close working relationship with UEA, and an established mechanism is in place via IFR-Extra for routinely accessing these facilities.

Please highlight your organisations key skills and capabilities in this area and provide a justification as to why you feel it should be regarded as a Centre of Expertise? In particular you should focus on highlighting your key analytical skills and capabilities and any accreditation and how you ensure fitness for purpose testing. (250 words max)

IFR's Analytical Sciences Unit houses the platform technologies and core resources (as listed above) that underpin the whole of the institute's science remit. As such, we are well-equipped with a wide range of cutting-edge instrumentation, which is well-maintained and staffed by a permanent complement of expert personnel. These resources are also available on a commercial basis, and in IFR-Extra we have an efficient means of arranging and administrating industrial contracts for carrying out analytical services using these facilities, such as authenticity testing. IFR Extra's management systems are accredited to ISO9001:2008.

Our wide range of technologies makes us well-placed to carry out exploratory studies, employing multiple platforms to cross-check outcomes and provide

internally cross-validated approaches (e.g NMR vs GC-FID for fatty acid composition; IR vs NMR for generic compositional profiling; SITE vs molecular spectroscopy for geographical origin).

The stable isotope and trace element facilities at UEA have been successfully used to develop and publish methods that link the production and geographical origin of foods to the environmental record stored within both plant and animal based foods. This research draws on expertise available in the internationally renowned School of Environmental sciences at UEA and their knowledge of theoretical and experimental isotope fractionation, groundwater dynamics, ocean circulation and soil chemistry to link foods to their production environment. The UEA facility participates in FIT-PTS and ring trials organised by the IAEA for stable isotope testing and QUASIMEME (Community of Practice for Marine Environmental Measurements) for trace element measurements in order to obtain data that are fit for purpose. The UEA facility is currently undergoing preparation for ISO17025 accreditation for both IRMS and ICP-MS measurements.

Briefly highlight your experience in method validation, data interpretation and evaluation and the reporting of analytical results? (150 words max)

IFR's Analytical Science Unit has decades of experience with authenticity method development, ranging through feasibility studies, novel methods development, calibration transfer across instrumentation, and multi-site ring trials for validation. The outcomes of these studies are regularly reported in the scientific literature (~100 papers, ~3000 citations) and trade press. IFR-Extra has undertaken numerous confidential contracts and consultancies, producing customised reports as required by clients. In particular, IFR staff have been leading advocates in the correct use of chemometric methods for classification of authenticity test samples measured using multivariate methods, which is still a major and current issue for authenticity enforcement work. Relevant publications are:

1. "Establishment of guidelines for the application of chemometric methods to food authenticity problems" Report to MAFF (ANO663), 1998, - Marianne Defernez & E. Katherine Kemsley.
2. "The use and misuse of chemometrics for treating classification problems" in Trends in Analytical Chemistry, vol. 16, no. 4, pages 216-221, 1997 - Marianne Defernez & E. Katherine Kemsley.
3. "Avoiding overfitting in the analysis of high-dimensional data with artificial neural networks (ANNs)" in The Analyst, vol 124, pages 1675 – 1681, 1999, - Marianne Defernez & E. Katherine Kemsley.

Please provide brief details where possible, of your experience in dealing with complex technical authenticity challenges and evidence of your ability to provide solutions. (150 words max)

A recent example of our authentication work that is now in the public domain is the development of a new, fast NMR-based approach to meat speciation using triglyceride profiling. The patented method employs a new variant of NMR spectroscopy operating at low magnetic fields and requiring relative low-cost instrumentation, and a fast, simple, sample preparation step. The challenges involved in developing this approach included optimizing the speed of the sample preparation, and careful data treatment to make the most of low-field NMR spectra which are quite different in nature to the more familiar high-field counterparts. The entire test take no longer than 15 minutes from incoming sample to analytical result, and has proved 100% accurate at verifying the authenticity of beef fat in trials at multiple sites, including commercial premises. This service is now offered commercially through IFR-Extra. A separate list of all other relevant peer-reviewed scientific publications covering spectroscopic and organic and inorganic mass spectrometric authenticity methods can be provided on request.

Are you willing to provide advice on your areas of expertise and assist others through partnership working and sharing of information? Outline briefly your experience in collaborative working and how you could contribute to enhancing the UKs standing in the field of authenticity testing. (150 words max)

Yes, we are willing to share generic expertise. As a publicly funded institution, IFR is committed to disseminating its work through a wide range of routes, including the academic literature, trade press, traditional and electronic media. A caveat to this is that IFR-Extra by default provides confidential contract services to industry, so we would never disclose outcomes of industrially-funded authenticity testing projects without the full knowledge and agreement of the clients.

With regards to our experience of collaboration, IFR has been an active participant in a number of notable multi-partner EU projects with a food provenance focus (EU-FAIM; EU-TRACE; EU-TYPIC; and MoniQA). A variety of national funding bodies (including MAFF, Defra, FSA and BBSRC) have also supported a succession of food authenticity projects addressing a range of product areas and issues in collaboration with industry partners. UEA has also had a succession of government funded authenticity projects and was involved in the EU trace project. UEA has hosted overseas researchers funded by the IAEA through the British Council to train in the application of stable isotope and trace element analysis in food authentication.

Please prove a brief statement of your capabilities to be included on the virtual food authenticity network portal (50 words max)

The Institute of Food Research (IFR) is a publicly-funded research institute that focuses on the underlying science of food and health, tackling challenges that include food safety and security. IFR Extra Ltd is a wholly-owned subsidiary of IFR that provides short-term and applied research projects and consultancies to the food sector. We can offer resources and expertise, on a commercial basis, for food authenticity methods development and testing using the following technology

platforms: Molecular Spectroscopy (IR, NMR); Proteomics and organic mass spectrometry; Chromatography (GC-MS, LC-MS); Statistics & software development. We also have a close working relationship with the Stable Isotope Facility at the University of East Anglia and an established mechanism in place for routine access to stable isotope and trace element testing facilities.