Defra's independent Authenticity Methods Working Group (AMWG)

Response to Elliott review on 'integrity and assurance of food supply networks' – recommendation 4

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Executive summary

The Technical Sub Group (TSG) of the Authenticity Methods Working Group (AMWG) has considered Recommendation 4 of the Elliott Review relating to: 1) the standards of analysis; (2) the way in which sampling is conducted (e.g. general surveillance or risk-based sampling); and (3) the availability of laboratory services themselves (including centres of excellence).

In this report the AMWG TSG sets out the existing national framework already in place for food authenticity testing which it believes is robust as demonstrated by the successful testing of large volumes of food during the horsemeat crisis in 2013.

The Report defines standardisation in the context of 'fit for purpose' methods, and documents the quality principles and guidance needed for sampling and analysis to be achieved by all laboratories involved in food testing. It highlights the need to raise awareness of the level of expertise that needs to be provided by analytical services. It also reiterates the need for enabling methodology and the updating of existing methods as well as the development of new technologies to tackle the challenges posed by food fraud.

The Report recognises that there is scope for better collaboration, data sharing and harmonisation between all those with an interest in food authenticity including industry and enforcers nationally and internationally. It explores where those challenges may lie and how they could be addressed in putting forward key, proposed actions.

The Report makes recommendations to enhance existing food authenticity testing, set against current budgetary constraints, with the aim of better collaboration between laboratories and other stakeholders. The objective is to enable better and more effective intelligence sharing of known risks as well as helping to identify emerging risks in the field of food authenticity to inform testing priorities. With this in mind, the report acknowledges that composition of the authenticity Expert Groups (e.g. ASG, AMWG) have dynamic memberships which are under continuous review and will change periodically. This ensures appropriate expertise is available to advise on the current issues at hand.

The Report also summarises the analytical community's views on a proposed network of laboratories ('centres of excellence') and the need for coordination to ensure consistent approaches to analysis, raised awareness, increasing access to information and better transfer of technology into use.

The AMWG TSG is mindful that it needs to maintain a 'watching brief' to ensure methods and approaches remain relevant as the food authenticity landscape develops. The ultimate goal is to have continued access to resilient, sustainable food analytical laboratories to check food authenticity now and for the future.

Background

1. In response to the horsemeat incident in 2013, the Government commissioned Professor Chris Elliott to carry out an independent review ('Elliott Review') of the 'Integrity and assurance of food supply networks'. The report was published in September 2014 and contained a series of recommendations[1].

2. As part of the Government response to this Review, The Authenticity Methods Working Group (AMWG) was asked to respond to recommendation 4 on laboratory services carrying out food authenticity testing: Specifically (1) the standards of analysis; (2) the way in which sampling is conducted (e.g. general surveillance or risk-based sampling); and (3) the availability of laboratory services themselves.

3. A Technical Sub Group (TSG) of the AMWG was tasked with advising AMWG on the response. It met on 4 occasions between June and November 2014. The Group assessed a wide range of evidence, drawing on the views of experts to formulate their advice. Membership of the Group is at **Annex 1**.

4. This report is the formal response of AMWG to Recommendation 4 of the Elliott Review. It considers the three areas identified in the Review as relating to laboratory services. Case studies and published evidence are used to demonstrate where these recommendations already are being met. Proposals are made for specific actions to address the recommendations around standardised approaches for food authenticity testing and a virtual network of laboratories of 'Centres of Excellence'.

5. In making recommendations the TSG and AMWG have been mindful of budgetary constraints and the need to implement all the actions proposed within an acceptable timescale.

Elliott review recommendation 4

6. Recommendation 4 focuses on three areas relating to laboratories carrying out chemical analysis and food authenticity testing: (1) the standards of analysis; (2) the way in which sampling is conducted (e.g. general surveillance or risk-based sampling); and (3) the availability of laboratory services themselves. Specifically:

'Those involved with audit, inspection and enforcement must have access to resilient, sustainable laboratory services that use standardised, validated approaches. The Government should:

[1] https://www.gov.uk/government/news/consumer-confidence-to-be-strengthened-through-new-food-crime-unit

Facilitate work to standardise the approaches used by the laboratory community testing for food authenticity;

Work with interested parties to develop 'Centres of Excellence', creating a framework for standardising authenticity testing;

Facilitate the development of guidance on surveillance programmes to inform national sampling programmes;

Foster partnership working across those public sector organisations currently undertaking food surveillance and testing including regular comparison and rationalisation of food surveillance;

Work in partnership with Public Health England and local authorities with their own laboratories to consider appropriate options for an integrated shared scientific service around food standards; and

Ensure this project is subject to appropriate public scrutiny'.

Response to Elliott review recommendation on standardised approaches: performance of analytical laboratories

7. In the narrative preceding recommendation 4, the Elliott Review[2] highlights the need for auditors, inspectors and enforcers to have "access to resilient, sustainable laboratory services that use standardised, tested approaches." It also states that method development and testing to assure food integrity needs to be carried out according to 'recognised standards and agreed performance criteria'; and that detection methods need to be adapted to tackle emerging food fraud. The report also recognises "There are key roles for the Joint Research Centre of the European Commission, the technical sub-groups of Defra's Food Authenticity Steering Group, in developing these standardised approaches and they are encouraged to continue with this work."

8. For the purposes of this report, the Technical Sub Group has interpreted the phrase, "standardise the approaches … testing for food authenticity" as meaning methods that are **'fit for purpose'** and that are validated and not that all laboratories should use EU / national mandated methods (see Box 1 and paragraphs 18 and 19).

[2] https://www.gov.uk/government/publications/elliott-review-into-the-integrity-and-assurance-of-food-supply-networks-final-report

BOX 1: DEFINITION OF 'FIT FOR PURPOSE'

CAC/GL 72-2009, Codex Guidelines on Analytical Terminology defines **'fitness for purpose'** as:

the degree to which data produced by a measurement process enables a user to make technically and administratively correct decisions for a stated purpose.

9. The enforcement of food and feed legislation is covered by Regulation (EU) 882/2004. This Regulation stipulates the basic principles on how the enforcement of food/feed legislation (including that for food authenticity) is carried out within the EU and in particular highlights the need for Member States to designate official control laboratories and the need for suitably qualified analysts.

10. The Food Standards Agency (FSA) is the UK competent authority for food/feed enforcement under 882/2004 and therefore is responsible for designating official control laboratories. A full list is given on the FSA website[3].

11. Within the UK a suitably qualified analyst is defined in the Food Safety Act 1990 as being either an appointed Public Analyst or an instructed Food Examiner. Parallel national legislation also exists for feed where the qualified analyst is known as an Agricultural Analyst. Public Analysts and Agricultural Analysts are often one and the same. A Public Analyst has to be a qualified Food Analyst where the qualifications required to be a Food Analyst and/or Food Examiner are laid down within the Sampling and Qualifications Regulations 2013. Each local authority has to have at least one appointed Public Analyst although the analysts themselves can undertake this function for multiple local authorities. When official control samples are taken within the UK all samples have to be sent to the appointed analyst. It is the decision of the analyst as to methodology to be used and whether they can:

    - undertake the analysis themselves;
    - pass on the sample to another appointed analyst;
    - send the sample to a 3rd party laboratory (often not an Official Control Laboratory) where analysis is carried out under the analyst's direction.

It is the responsibility of the appointed analyst to sign the analytical certificate and, if necessary, defend the result of the analysis in a court of law[4].

[3] http://www.food.gov.uk/enforcement/monitoring/foodlabs/foodcontrollabs

[4] https://www.food.gov.uk/enforcement/enforcework/food-law

12. There are established standards and agreed criteria for analytical performance, most of which are enshrined in law, international standards, etc. These are already followed by Public Analysts and the wider analytical community. For example, most reputable UK contract analytical laboratories:

    - have ISO17025/2005 accreditation[5] ;
    - whenever possible, use methods for which they have UKAS accreditation. (see **Annex 5**) In order to maintain this accreditation they participate in proficiency test schemes (e.g. Food Analysis Performance Assessment Scheme (FAPAS));
    - operate in accordance with UKAS principles for those methods for which they do not have UKAS accreditation;
    - work according to Eurachem/CITAC Guide 'Traceability in Chemical Measurement'[6] ;
    - work according to EURCHEM Guide 'The Fitness for Purpose of Analytical Methods[7].
    - The UKAS website[8] contains an online searchable database which contains scopes of accreditation for all laboratories accredited to ISO/IEC 17025:2005 by UKAS.

13. Further detail on the current approach to laboratory inter-comparability (e.g. hierarchy of methods, statutory methods, ISO methods, reference laboratory methods, etc.) is outlined at **Annex 6**.

14. Laboratories designated as Official Control Laboratories (e.g. Public Analysts) are assessed by competent authorities in accordance with Article 12 of Regulation 882/2004[9]. The preamble to the Regulation states "Laboratories involved in the analysis of official samples should work in accordance with internationally approved procedures or criteria based performance standards and **use methods of analysis that have as far as possible been validated**".

15. Regulation 882/2004 lists appropriate performance criteria by which the analyst responsible can establish method performance. Many laboratories offering food

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[5] ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories

[6] Traceability in Chemical Measurement, A guide to achieving comparable results in chemical measurement, Eurachem/CITAC, 2003

[7] The Fitness for Purpose of Analytical Methods, EURCHEM Guide 1998, ISBN: 0-948926-12-0; https://www.eurachem.org/index.php/publications/guides/mv

[8] www.ukas.org

[9] Regulation (EC) No 882/2004 of European Parliament and of the Council of 29 April 2004 on Official Controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules, 30.4.2004, OJ L 165/1-141, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:165:0001:0141:EN:PDF

testing have ISO 17025 accreditation, with methods verified by UKAS. Alternatively, as in the case of many food industry quality control laboratories, they have external independent validation from LabCred or the Campden Laboratory Accreditation Scheme (CLAS). Both types of laboratory do not necessarily use standardised procedures and there are good reasons not to do so. Rather, they are **obligated to use methods that are fit for purpose and must be able to demonstrate that they are fit for purpose**. Also, it is recognised that there will be occasions when methods developed are not accredited in good time but this does not mean they are not valid as a 'fit for purpose' method.

16. A key issue, and one not identified by the Elliott review, is the existence of analytical laboratories that hold no appropriate accreditation and accordingly can offer much cheaper tests that may not be necessarily 'fit for purpose'. The onus is on industry to demonstrate due diligence and to use appropriately accredited laboratories for the specific issue at hand. Some suggested criteria, for a purchasing organisation to be mindful of, when employing the services of a laboratory / analytical service(s) are summarised in Box 2 below. There are synergies between the criteria in Box 2 and those developed by the Valid Analytical Measurement Programme as outlined in Box 3.

BOX 2: SOME EXAMPLES OF CRITERIA FOR A 'FIT FOR PURPOSE' ANALYTICAL LABORATORY

1. Accreditation to ISO 17025 by a suitable body for the performance of tests;

2. Suitably qualified and knowledgeable staff who keep up to date in their areas of work;

3. Sufficient staff to undertake the work required;

4. Suitable equipment to undertake the work required;

5. Suitable premises to undertake the work required;

6. An appropriate track record in providing such services to industry; and,

7. If necessary, consult their local Regulatory Services or their local Public Analyst regarding the bona fides of an organisation they wish to employ.

17. Industry has legal responsibilities, under both domestic and EU law, to ensure that food is accurately described and labelled and does not mislead the consumer. To the extent that industry utilises laboratory testing to help it discharge those responsibilities, industry will have to ensure that that testing is fit for purpose and able to withstand legal scrutiny in the case of challenge. Also, as part of their own due diligence or as required by retailers or other industry standards (BRC, IFS etc.), industry normally goes to contract laboratories for authenticity testing services. They often use accredited laboratories which have either been specified by their

client or selected from UKAS (United Kingdom Accreditation Service) laboratories lists, (http://www.ukas.org/testing/singlesearch.asp).

Response to recommendation on standardised approaches: fitness for purpose of methods

18. The term 'standardisation' of analytical methods has a particular meaning to professional analysts. Historically, attempts have been made to specify mandatory standard methods and some remain to this day in EU legislation. Examples are the method published in 1977 for the determination of erucic acid in food and the methods for analysis of cosmetic products last revised in 1976. Significantly better analytical technology now is available but cannot be used except unofficially because of the existence of standard methods.

19. In place of standardised methods, the international analytical community has developed the approach of "**fitness for purpose**", i.e. where the method performance is properly defined and understood and where results are anchored to reference materials in a proper metrological framework. The "Fitness for Purpose" approach is further outlined in the Eurachem Guide[10] which highlights a UK initiative[11] identifying six principles of analytical practice which are considered to constitute best practice (Box 3). These six principles are relevant to laboratories working in isolation or producing results which need to be compared with those from other laboratories (see Case Study 1). **Annex 6** has details of the current structure accepted by professional laboratories and accreditation bodies.

BOX 3: SIX PRINCIPLES OF ANALYTICAL BEST PRACTICE TO ACHIEVE 'FIT FOR PURPOSE' ANALYTICAL APPROACHES [10, 11]

1. "Analytical measurements should be made to satisfy an agreed requirement" (to a defined objective).

2. "Analytical measurements should be made using methods and equipment which have been tested to ensure they are fit for purpose".

[10] B. Magnusson and U. Ornemark (eds.) Eurachem Guide: The Fitness for Purpose of Analytical Methods – A Laboratory Guide to Method Validation and Related Topics, (2nd ed. 2014). ISBN 978-91-87461-59-0. Available from www.eurachem.org

[11] The manager's guide to VAM, UK Department of Trade and Industry, Valid Analytical Measurement Programme. Published as VAM Principles. M, Sargent. Anal. Proc., 1995,32, 201-2.

3. “Staff making analytical measurements should be both qualified and competent to undertake the task” (and demonstrate that they can perform the analysis properly).

4. “There should be a regular independent assessment of the technical performance of a laboratory”.

5. “Analytical measurements made in one location should be consistent with those made elsewhere”.

6. “Organisations making analytical measurements should have well defined quality control and quality assurance procedures”.

CASE STUDY 1: HORSE MEAT SURVEILLANCE

During the 2013 horsemeat incident the Food Standards Agency commissioned LGC to produce reference materials to enable comparison of approaches between laboratories. These reference materials provided participating laboratories involved in the enforcement surveillance with a reliable mechanism to quality assure their results.

Defra also commissioned research (FA0134 [1], FA0135 [2]) to ensure fitness for purpose of the survey methods. This research showed that, utilising and building upon pre-existing knowledge, standardised approaches could be adapted during a food emergency to (i) verify limits of detection of different methods, and (ii) facilitate quantitation of horse DNA based on international guidance and best measurement practice, in line with the recent EU Commission Recommendation involving establishment of a threshold value for testing for deliberate adulteration [3]. This research emphasised the importance of agreement and provision of harmonised guidance on testing across laboratories, added value to the state-of the-art methods, and provided additional confidence in the interpretation of results.

[1] Defra project FA0134

http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18740

Related paper: Eloise Busby and Malcolm Burns (2014) “Method Verification of the LOD Associated with PCR Approaches for the Detection of Horse Meat” Journal of the Association of Public Analysts 2014 (42): 001-017. http://www.apajournal.org.uk/2014_0001-0017.pdf

[2] Defra project FA0135

http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18741

[3] Commission Recommendation of 27 March 2014 “on a second coordinated control plan with a view to establishing the prevalence of fraudulent practices in the marketing of certain foods” (2014/180/EU)

20. Whilst some standards exist covering food composition, at present there are no international standardisation committees (e.g. ISO, CEN[12], etc.) dedicated specifically to food authenticity/fraud. This is because the area is diverse and encompasses a multitude of analytical techniques (e.g. molecular biology, immunoassay, stable isotope ratio analysis, microscopy, etc.) that would make the formation of a dedicated committee difficult at a practical level. The nearest standardisation committee is ISO/TC34/SC16 Horizontal Methods for Molecular Biomarker Analysis[13] which has a working group (WG5) dedicated to 'Varietal Identification'. To date ISO/TC34/SC16 has been focussed on the analysis of GMOs and WG5 has been relatively inactive.

21. There are a few food authenticity/fraud orientated methods that have been submitted to ISO/TC34/SC16 for consideration as ISO standards so WG5 might become more active in the future. The methods submitted include:

- Varietal identification of Basmati Rice using multiplexed SSR analysis (India)
- A new work item proposal for multiplex PCR for species identification of meat and meat products (Iran)
- A new work item proposal for PCR analysis of buffalo meat in meat products.

22. At the last meeting of ISO/TC34/SC16, held in September 2014, a proposal was made to create a new Working Group tasked with the standardisation of meat speciation methods. The proposal is currently being voted upon. The UK is represented on ISO/TC34/SC16 by FSA (UK lead) and Fera. Meetings are held every 18 months. The FSA-supported Molecular Biology and Protein Analysis e-Network (MPAN) acts as an unofficial mirror-group for UK input in ISO/TC34/SC16 and various other CEN/ISO standardisation committees.

23. In December 2002 the European Network of GMO Laboratories (ENGL[14]) was inaugurated and acted as a general discussion forum on issues relating to GMO analysis within the EU. The ENGL is still very active and has a legal mandate in EU legislation[15]. The UK is represented at ENGL by a number of recognised experts, including LGC and Fera. The active participation of the experts in working groups and advisory committees has resulted in UK input into the publication of a number of official EC and ENGL guidance documents. These include guidance for both estimation of measurement uncertainty and verification of analytical methods for

[12] CEN – European Committee for Standardisation
[13] ISO/TC34/SC16 (http://www.iso.org/iso/standards_development/technical_committees/other_bodies/iso_technical_committee.htm?commid=560239)
[14] ENGL (http://gmo-crl.jrc.ec.europa.eu/ENGL/ENGL.html)
[15] Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed (http://ec.europa.eu/food/food/animalnutrition/labelling/Reg_1829_2003_en.pdf)

GMO testing[16,17]. These published guidance documents are aimed at providing a forum for harmonisation of analytical methodology for GMO analysis at the EU level.

24. Since its inception in 1994, the Government's[18] Food Authenticity Programme has focused on the development of **enabling methodology** for detecting mislabelling and other types of food fraud. The rationale for this approach is that official control laboratories and other competent laboratories determining the authenticity of foods only use validated methods. They do not have the resources and/or expertise to develop new methods. The food authenticity programme has been instrumental (see Case Study 2) in leading the way in developing analytical technologies for use as food forensics tools and facilitating their uptake in to practical use for food law enforcement.

[16] "Guidance document on measurement uncertainty for GMO testing laboratories" S. Trapmann, M. Burns, H. Broll. R. McArthur, R. Wood, J. Zel (2007) European Commission – Directorate General, Joint Research Centre. EUR Report 22756 EN/2, ISBN 978-92-79-11228-7

[17] JRC Scientific and Technical Reports (2011) "Verification of analytical methods for GMO testing when implementing interlaboratory validated methods" Guidance document from the European Network of GMO laboratories (ENGL) Prepared by the ENGL working group on "Method Verification". ISBN 978-92-79-19925-7 doi: 10.2788/88038 http://gmo-crl.jrc.ec.europa.eu/doc/ENGL%20MV%20WG%20Report%20July%202011.pdf

[18] Government in this context means: Ministry of Agriculture, Fisheries and Food (MAFF), Food Standards Agency (FSA), and Department for Environment, Food and Rural Affairs (Defra)

CASE STUDY 2: ENABLING DNA-BASED METHODS TO SUPPORT ENFORCEMENT

In the 1990's there was a need to identify the species of plant or animal from which particular foods had been prepared. It was recognised that the only solution was to use methods based on molecular biology but at that time such methods were outside the expertise of public analysts because they had been trained as analytical chemists. MAFF, and the FSA, invested in the development of suitable methods and trained public analysts in the use of these methods. As more and more DNA-based analytical methods were developed under the Food Authenticity programme it was realised that each method used five different molecular biology techniques. This plethora of techniques was a barrier to their adoption by public analysts. To combat this, the FSA funded a project on a simplified method for identifying fish species using a new technology platform (the Agilent microfluidic Bioanalyser). The results from this project were so encouraging that the Food Authenticity programme focussed effort to convert all the DNA-based methods onto this simple, easy-to-use system and provided funding to enable all the public analyst laboratories to purchase the necessary equipment. These actions ensured that molecular biology methods became established as routine tools for testing the authenticity of food products.

In many instances of food fraud there is a need for quantitative results. However, most DNA-based methods are only suited to qualitative or, at best, semi-quantitative use. As improved methods of quantitative PCR have been developed funding has been provided for projects that evaluated their suitability for use in food authenticity applications. For example, following the recent horsemeat incident a method was developed that could detect horsemeat at the 0.1% level in mixtures of other meat. However, the methodology used in this particular case may not be as reliable when used with more complex meat products. For this reason Defra now is funding a project that will evaluate two newer quantitative methods that should be much less sensitive to food matrix effects than existing methodology. The overall and continuing objective is to ensure that public analysts have access to molecular biology methods that are fit for purpose.

25. Since its inception, the Food Authenticity Programme has been at the forefront of identifying emerging authenticity issues and funding the development of cutting edge methods to detect food fraud (see Case Study 2). The majority of these methods are based on novel, innovative science and not existing analytical approaches. The programme has commissioned over 150 projects to date, covering a wide range of techniques (e.g. stable isotope ratio analysis, proteomics, genomics, metabolomics) across a host of food and beverage matrices and production methods (**Annex 2**). Over 30 of the methods developed have been converted to standard operating procedures and these have been made available for use by analytical laboratories (**Annex 3**). Details of the projects are available in final reports published on the Defra R&D website[19] and in over 50 scientific papers in peer-reviewed journals.

[19] http://randd.defra.gov.uk/

26. The strategic direction of research of the Food Authenticity Programme and the quality of the science to develop 'fit for purpose' methods to detect emerging food fraud is supported by two expert advisory groups. These are:

- The **Authenticity Steering Group (ASG)** identifies emerging issues in food authenticity and gaps in science and testing methodology and ensures that the priorities of the food authenticity research programme managed by Defra meet the needs of all interested parties. The ASG sets priorities for the Government's food authenticity programme based on horizon scanning, market intelligence and assessment of the science capability and evidence base.

- The **Authenticity Methods Working Group (AMWG)** provides a challenge function to ensure that the food authenticity research is based on sound science and that the methodology being developed is robust, practical, and defensible in terms of its scientific principles. It advises on the transfer of new methodology to testing laboratories and on generic analytical issues of methodology such as quantitation, limits of detection, etc. It also considers emerging technologies and innovation in science and technology; and how these can be used analytically to address evolving technical requirements to support food authenticity testing, and new regulatory requirements such as the European 'Food Information to Consumers' Regulation.

27. The composition of the AMWG has been selected on the basis of technical expertise to ensure that new methods that are developed and transferred to reflect best analytical practice and that outputs are fit for purpose to support food law enforcement. Contractors developing new methods funded by the Authenticity programme are required to follow AMWG recommendations on assay validation[20] and to produce Standard Operating Procedures (SOPs) in accordance with formal guidance from Defra[21]. In addition, contractors are required to present their project results to the AMWG where they are subject to critical appraisal and require endorsement prior to publication. Contractors are also encouraged to publish methods in peer reviewed journals/papers to ensure the robustness of outcomes from the Programme.

28. AMWG also oversees good measurement science for new authenticity methods/approaches coming into general use (see Case Study 3).

[20] GUIDELINES FOR Defra CONTRACTORS INVOLVED IN THE DEVELOPMENT AND VALIDATION OF FOOD AUTHENTICITY ASSAYS, July 2013

[21] GUIDELINES FOR THE PREPARATION OF STANDARD OPERATING PROCEDURES, revised July 2014

CASE STUDY 3: MODERN DAY CHALLENGES AND KEEPING PACE WITH THE SCIENCE

In late 2013/ early 2014, the Food Standards Agency conducted a pilot study on the use of stable isotope ratio analysis to determine conformance with country of origin labelling on a variety of foods. A number of commercial and public test laboratories in the UK and Europe, all of whom are used by the food industry already, were commissioned to undertake the analysis which required them to use their own reference databases. Analysis of the results by FSA, Defra and independent experts showed that they were consistent with all the products tested being from the UK. This study showed that stable isotope analysis can be utilised in assessing country of origin of products. However, the results highlighted a number of issues concerned with differences in the methodology and practices used by the laboratories. The AMWG has played a key role in ensuring the approaches used were fit for purpose for their intended use as a tool to support origin testing (along with traceability information) and identifying that the testing could be made more robust for future studies.

The AMWG has asked the co-ordinator of the EU Food Integrity project (see Case Study 6) to obtain participants advice on best practice for using stable isotope ratio analysis for determining geographical origin. The response, which will be reported in 2015, will provide end users with an independent assessment of the use and application of the technique in control/enforcement situations.

29. In June 2013 AMWG set up a Technical Sub Group (TSG) to undertake detailed review of new technical developments in analytical science and to consider how these might be used to solve particular (existing or emerging) problems in food authentication. This group was instrumental in developing the science to resolve issues around achieving fit for purpose quantitative meat speciation in processed meat products. Other issues reviewed by the Sub-Group include:

    - applications of digital PCR in food authenticity
    - spectral imaging applications for authenticating Durum wheat and Basmati rice
    - applications of benchtop NMR instruments
    - uses of Next Generation Sequencing in a commercial analytical laboratory.

30. The TSG also reviews and analytically quality assures food authenticity research specifications before these are put to tender. Issues considered include

    - Food matrices to be sampled

- Adulterants to be detected
- Need to determine limit of detection
- Need to determine measurement precision
- Robustness of methodology
- Requirement for availability of databases and/or reference materials

31. This approach provides a clear mechanism for ensuring that methods are fit for purpose and is in line with the recommendations on assay fitness for purpose as set out in the Elliott Review. The AMWG continuously reviews all projects from conception to endorsement of methods for publication.

32. The Food Authenticity programme proactively works with both UK Official Control Laboratories and those overseas as part of its work to validate methods via ring trials with other laboratories. Examples include methods to determine water in chicken, detect whether chicken has been previously frozen, and to detect blood clotting agents which were developed collaboratively with several UK and Member States Official Control Laboratories[22].

33. The Food Authenticity programme has a long history of engaging at an EU and international level to develop standardised approaches and data sharing. Examples include:

(i) Work led via FERA under the Framework 7 Programme on 'Trace' which developed approaches to trace food origin (Case Study 4).

(ii) The 'Labelfish' project which will standardise the detection of genetic traceability methods used by several Member States (Case Study 5).

(iii) The EU Food Integrity project which will provide an international focal point for harmonisation and exploitation of research and technology for assuring food integrity. It will facilitate data sharing, harmonisation of databases, and establish an international network of experts and platforms for developing coherent approaches to food authenticity (Case Study 6).

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http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=17708&FromSearch=Y&Publisher=1&SearchText=FA0105&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=18043&FromSearch=Y&Publisher=1&SearchText=FA0114&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=17848&FromSearch=Y&Publisher=1&SearchText=FA0107&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

CASE STUDY 4: DEVELOPING A COMMON STRATEGY FOR GENETIC TRACEABILITY METHODS

"TRACE" (tracing the origin of food) was one of the world's largest research projects on food authenticity and traceability. It ran from 2005-2009 and focused on provenance, correctly anticipating the increasing importance of this attribute to consumers. This €20M Framework 6 project (co-funded by the Food Authenticity programme) enhanced our understanding of the relationship between stable isotopic markers in food and those in its local environment, and, as a result, demonstrated isoscape technology in the food sector for the first time. TRACE provided the Programme with access and valuable insight into how analytical methodology could be used to authenticate, geographical, species and production origin claims.

CASE STUDY 5: DEVELOPING A COMMON STRATEGY FOR GENETIC TRACEABILITY METHODS

"LABELFISH – the "Atlantic Network on Genetic Control of Fish and Seafood Labelling and Traceability" is a project co-funded by the Food Authenticity programme. This project focussed on analysis of fish traceability in several EU countries (including UK) and reviewed current technologies being used. The objective was to standardise detection of genetic traceability methods to allow harmonisation of methodologies at the EU level. It also established a network of laboratories (public and private). (http://www.labelfish.eu/)

CASE STUDY 6: EU FOOD INTEGRITY PROJECT

Funded by the EU's Seventh Framework Programme and co-funded by Defra, the *€12M Food Integrity project* comprises 38 international partners from industry, academia and government institutes. As well as carrying out research on new methods and systems for authenticating food and ingredients, the project will work with stakeholders to better understand consumer behaviour, develop horizon scanning tools and systems for data sharing. An international network of expertise on food authenticity will be established. It will identify gaps and commission €3M worth of research requirements within the project to address emerging issues (as recommended in the Elliott Review).

- Produce robust scientific opinion on food authenticity methodology
- Develop a knowledge base on analytical methodology for food authentication, detailing method, application, validation status etc.
- Develop a network of the analytical community involved in detecting food fraud
- Develop an early warning system to anticipate food fraud events
- Identify the gaps in current analytical methodology capability and commission and deliver new research to address those gaps.
- Develop stakeholder platforms to discuss key issues and ensure implementation of research outcomes
- Undertake technology transfer of research outputs to the user community

34. The identification of new fraudulent practices has to be intelligence led, which is reflected in the membership of the ASG (regulators, enforcers, Public Analysts, industry and consumer representatives).

35. The ASG periodically carries out horizon scanning reviews[23] to inform where new detection methods and capability needs to be developed. For example, it recently initiated economics-focussed research to develop a conceptual model to evaluate the link between commodity prices, substitution and the likelihood of food fraud[24].

36. More broadly, Defra is engaged with a new 5 year EU Food Integrity project (project FA0151) which will work with Member States to build up a framework to enable assessment of probability of fraud in food chains (Case Study 6) and implement outputs in a user-friendly tool (Food Fraud early warning system: FRAME-Fraud).[25]

37. Following the horsemeat incident, the FSA has established a Food Crime Unit. This Unit works closely with the Food Authenticity Programme to provide two-way intelligence on economically motivated fraud and enforcement activity which is integral to prioritising method development for food fraud detection. ASG also informs annual priorities for food authenticity surveillance carried out under the FSA's coordinating sampling programme by Local Authorities.

38. The new Food Crime unit will access and exchange intelligence and priorities at local, regional and national levels with a range of enforcement partners including the National Fraud Intelligence Bureau and the National Trading Standards Board. Networks are also being established internationally across the EU and in other countries. FSA and Defra also use existing communication forums such as the Emerging Risks Consultative Forum and the Defra-led Food Chain Emergency Liaison Group to exchange intelligence and advice. Priority areas for further investigation identified by the Food Crime Unit include company identity theft, livestock theft and illegal slaughter, mislabelling, deliberate meat and fish substitution, counterfeit and illicit alcohol, and sale and supply of food destined for animal feed.

[23] FOOD AUTHENTICITY: CURRENT STATUS AND FUTURE NEEDS, December 2011

[24] http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=3&ved=0CC0QFjAC&url=http%3A%2F%2Fsciencesearch.defra.gov.uk%2FDocument.aspx%3FDocument%3D11247_FA0104-FoodFraudDeskStudy-FinalReport-1may12.pdf&ei=AGccVLywGYXaaOK0gNAH&usg=AFQjCNGVwOOqwjOIXc3f8ot3qzik6bJ_jw&bvm=bv.75774317,bs.1,d.d2s

[25] (http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=19315)

Summary of Comments on Fitness for Purpose of Methods

39. AMWG Technical Sub Group (TSG) has noted that the Elliott Review recognises the work already done, and progress made, by the UK's Food Authenticity Programme (and AMWG) in establishing a framework for standardising authenticity testing.

40. In response to the Elliott recommendation that work be facilitated to standardise laboratory food authenticity testing, the TSG points to the large volume of work produced already as described in the document on the Food Authenticity Analytical Toolbox (see **Annex 7**).

41. Successful methods have been validated across laboratories in line with good measurement practice and subjected to peer review. This includes collaborative trial work ('method performance studies') funded by the FSA's 'E01 methods of analysis research and collaborative trial programmes'[26] outside of the national authenticity programme. Verifying authenticity in a way which cannot be circumvented by fraudsters and standardising methods can be technically challenging and costly.

42. The TSG was established before the Elliott Review was published but the detailed technical oversight that it provides fully meets the recommendations of Elliott on standards of analysis. For example, following the horsemeat incident the FSA set a 1% threshold level for contamination of raw meat with undeclared ingredients. FSA also asked suppliers to provide an explanation if the undeclared ingredient was above 0.1%. Although this 1% / 0.1% level is not enshrined in law the AMWG has taken the view that future food authenticity methods will need to be able to be used quantitatively where feasible. Therefore, key deliverables from projects will include determination of measurement uncertainty and limits of detection for measurands in particular food matrices. Recent published work to assess fit for purpose of quantitative horse meat testing at the 1% level (Case Study 1) has been adopted by the EU Commission as a bench-mark for best measurement practice for the second round of EU Official Controls for horse meat testing[27,28] . This illustrates the

[26] http://www.food.gov.uk/sites/default/files/multimedia/pdfs/evidenceplan2011.pdf
[27] http://www.apajournal.org.uk/2014_0001-0017.pdf

[28]Commission Recommendation of 27 March 2014 "on a second coordinated control plan with a view to establishing the prevalence of fraudulent practices in the marketing of certain foods" (2014/180/EU)

synergies and areas of harmonisation between the UK and the EU in terms of best measurement practice.

RECOMMENDATIONS ON FITNESS FOR PURPOSE OF METHODS

M1. It is clear that those members of the UK analytical community who are operating in accordance with the quality principles set out in paragraphs 12-15 are using methods that are fit for purpose. Defra should continue to support the development of new enabling methodology and the AMWG and TSG should continue to ensure that any new methodology is fit for purpose before being transferred effectively to the analytical community.

M2. ASG and AMWG will raise awareness of all parts of the food supply chain of the need to ensure that they use analytical laboratories with the right expertise. If a laboratory is not ISO17025 accredited, industry should use laboratories that participate in reputable, accredited schemes such as CLAS, LabCred.

M3. The AMWG should continue to regularly review and update existing authenticity methods and identify gaps in testing methodology and align with the EU activity to harmonise methods.

M4. Up until now, knowledge transfer events have been directed to support uptake of technology by Official Control Laboratories. It is recommended that, in future, these events are publicised much more widely to encourage attendance by the wider analytical community and involve industry.

M5. The Food Authenticity Programme continues to engage with EU and other international research programmes to align global authenticity research priorities and develop networks to facilitate method harmonisation and data sharing.

Response to recommendations on the way in which sampling is conducted

43. The aim of a sampling strategy is to help ensure food is safe, compositionally correct, does not contain contaminants, only contains permitted additives, is correctly described, bears required markings and is truthfully labelled. Controls put in place for sampling must be proportionate, risk-based and consistent with good practice, with each case being judged on the circumstances and evidence.

44. The TSG recognises that there are established sampling policies in place either under statutory Food Law Codes of Practice or under the FSA's national co-ordinated food sampling programme. These are summarised at **Annex 8**.

45. The reliability of analytical results can only be as good as the sample submitted. Some sampling guidelines exist within legislation e.g. Regulation 1881/2006 setting maximum levels for certain contaminants in foods and Regulation 152/2009 laying down methods of sampling and analysis for the official control of feed. There are no technical guidelines available for small scale samples taken from the general food chain.

46. A key issue which the Elliott Review does not address is that analytical laboratories have little or no control on how representative a sample is of the bulk food (or feed) it purports to represent. Sampling uncertainty is currently not normally controlled or quantified for the majority of sampling operations but is known to often be greater than analytical uncertainty (CCMAS, CX/MAS 10/31/06)[29] .

RECOMMENDATIONS ON SAMPLING

S1. It is clear that more effort is needed to ensure sampling is representative and appropriate to ensure that reliable analysis can be carried out. We recommend that the Government's authenticity programme:

- Produces food authenticity-specific sampling guidance focussing on the strengths and weaknesses of each approach and demonstration that sampling has been correctly undertaken.
- Prepares short 'Explanatory Notes' on authenticity sampling of specific commodities for use by industry and enforcers. The AMWG should explore with, for example, the Royal Society of Chemistry's Analytical Methods Committee (RSC-AMC), options for preparing these notes.

S2. The AMWG should keep a watching brief on developments on sampling approaches undertaken by others, including:

- Internationally (e.g. Codex)
- Within the EU
- By other Agencies (e.g. FSA initiative with Public Analysts)
- By other professional bodies (e.g. Royal Society of Chemistry).

[29] ftp://ftp.fao.org/codex/meetings/CCMAS/ccmas31/ma31_06e.pdf

Response to recommendations on the availability of laboratory services

47. The TSG notes that Elliott Review recommendations on overall laboratory capacity/availability are being taken forward by the Department of Health with Public Health England and are outside the scope of this report. The following paragraphs consider effective and efficient use of laboratory capabilities in the context of the Elliott recommendation on 'Centres of Excellence'.

48. The Elliott review states that, "To future proof regulation of food authenticity there should be a virtual network of laboratory 'Centres of Excellence' co-ordinated by the Food Authenticity Steering Group (advised by its Analytical Methods and Technical Working Groups)". Figure 1 (at **Annex 9a**) sets out the structure of a network of 'Centres of Excellence' covering the key areas of testing".

49. TSG notes that there already are several established laboratories in the UK each with specific or overlapping technical expertise in food authenticity testing which are food commodity and/or technology specific. These include LGC, Fera, Campden BRI, Leatherhead Food Research, Official Control Laboratories, university, commercial, private and industry laboratories which span the technologies listed in the Elliott Review.

50. Over the past 20 years many of these laboratories have worked closely with the Food Authenticity Programme, ASG and AMWG to develop fit for purpose methods to detect food fraud. Examples of success include: (i) collaboration with LGC to conduct research and provide best measurement practice advice on horsemeat detection methodology as part of the response to the horse meat incident (Case Study 1); (ii) work led by Campden BRI, in collaboration with Public Analysts to develop reliable transferable DNA methods across laboratories (Agilent 'lab on a chip' analyser); (iii) development of immuno-assay methods to detect offal species (Nottingham Trent University).

51. The TSG supports proposals to consult on, and set up, a coordinated virtual network of 'Centres of Excellence' in the area of food authenticity and notes that Defra has sent a letter to potential participants to solicit 'expressions of interest' (**Annex 9**).

52. This letter makes it clear that a network of these existing Centres of Excellence could work together to provide a mechanism to disseminate and communicate information on methods, Standard Operating Procedures and best measurement practice, and to support knowledge transfer activity under the direction of the Authenticity Steering Group (ASG). This network would be complimentary to the ASG and act primarily as a 'hub' for networking, sharing skills and knowledge management/transfer, with an oversight and advisory role to be provided by a network co-ordinator.

53. The breadth of food authenticity issues and food commodities means that the analytical 'toolbox' needed must be wide ranging (e.g. chemical, physical, DNA-based techniques, etc.) and requires specific technical expertise that cannot be easily brought together in one central place in a cost-/resource-efficient way.

54. The TSG supports the Elliott recommendation to establish a virtual network of laboratory 'Centres of Excellence' for routine, emerging, and/or emergency food integrity and authenticity issues. This will allow quick, easy access to laboratory services/experts across a diverse breadth of techniques as needed.

55. An informal network already exists through the Authenticity Programme and most analysts/laboratories are already aware of each other. Official Control Laboratories have traditionally networked through their membership of the Association of Public Analysts. The latter provides a mechanism for information, dissemination and advice. Putting a virtual network of known centres of excellence on a more formal footing provides an efficient and effective approach to future-proof tools for food fraud detection while recognising the constraints on funding for supporting method development.

56. Raising awareness of the competent laboratories and methods that are available via the network would help industry and enforcers access expertise to provide the reassurance and confidence that testing is reliable and fit for purpose. The network would also facilitate intelligence-led data-sharing, and capacity building by promoting working in partnership to develop and validate methods, SOPs and sharing best measurement practice.

57. The TSG notes that there was an overwhelming positive response to Defra's interested parties' letter on the creation of a virtual network on authenticity. It is extremely encouraged by the breadth of interest including from laboratories less familiar with the programme. This demonstrates the clear need for such a network and that laboratories widely welcome the opportunity for better knowledge exchange interaction through a virtual authenticity network. It encourages Defra to fully consider the evidence provided in the responses in establishing the network to help build capacity and enhance the quality of authenticity testing services throughout the UK.

58. The TSG believes that the role of coordinator is key to supporting the virtual network particularly in ensuring efficient information flow, access and dissemination of information and in helping facilitate the use of 'fit for purpose' methodological approaches. It is encouraged that a number of respondents put themselves forward for this role. TSG notes that while a number of organisations could act as a coordinator it believes careful consideration should be given to the criteria for selection as this role is a crucial one in ensuring the network operates at its full potential. Emphasis should be placed on existing knowledge in the area. Equally important will be the ability to demonstrate impartiality while having the capability and expertise to support the network and bring together the various disciplines

involved in food authenticity testing. Another key role will be raising awareness of and disseminating information on best practice for fit for purpose food authenticity testing.

RECOMMENDATIONS ON CENTRES OF EXCELLENCE

CE1. The TSG recommends that Defra map out the current UK capability amongst the main providers of food authenticity testing in terms of:

- Key areas of testing
- Vertical commodity expertise
- Horizontal methodology expertise

Once this information is compiled Defra should consider organising a meeting of the relevant experts to work out the most effective structure to capture this expertise.

CE2. The Centre of Excellence network should act as a key mechanism for raising awareness of competent laboratories and methods that are available and strengthening networks; and provide a ‘one stop shop’ for raising awareness of, and disseminating information about food authenticity testing.

CE3. The role of Coordinator will be key to the operation of the network. Defra should establish a clear description of its terms of reference and role.

Annexes

Annex 1 - Membership of AMWG TSG

Annex 2 - Projects funded under the Food Authenticity Programme

Annex 3 - List of ‘Standard Operating Procedures’ (SOPs) produced under the Food Authenticity Programme

Annex 4 - Government’s Food Authenticity Programme (ASG, AMWG, TSG)

Annex 5 - Laboratory Accreditation

Annex 6 - Current Approach to Laboratory Inter-comparability, Hierarchy of Methods, and Traceability and Inter-comparability of Measurement

Annex 7 - Food Authenticity Toolkit

Annex 8 - Existing Sampling Policy and Further Sampling Initiatives

Annex 9 - Expressions of Interest Letter on ‘Centres of Excellence’ (10 Sept. 2014)

Annex 9a - A virtual network of ‘Centres of Excellence’ for food authenticity testing

Annex 1- Members of AMWG TSG involved in the production of this report

Dr Sandy Primrose (Chair, Independent Authenticity Programme Advisor)

Dr Malcolm Burns (LGC*)

Dr Nigel Payne (Public Analyst)

Dr Gordon Wiseman (Premier Analytical Services)

Dr Hez Hird (Fera)

Dr Stephen Garrett (Campden BRI)

Prof. Paul Fraser (Royal Holloway)

Dr Andrew Damant (Food Standards Agency)

Ms Pendi Najran (Defra)

Dr Lucy Foster (Defra)

* -LGC also represents statutory and referee advisory roles as underpinned by UK legislation.

Annex 2 - Projects funded under the food authenticity programme

1997 – 2005

Project number	Project name	Contractor / Institute
Q01001	Improved methodology for the identification of non-cocoa fats in chocolate	P.Brereton/CSL
Q01002	Detection of meat species in fresh and processed food: Prodn & use of mabs reactive with insoluble muscle protein desmin	E.Billiett/Uni Nottingham Trent
Q01003	Differentiation of species of meat in particular cooked products by DNA methods	J.Sawyer/LGC
Q01004	Species identification of raw and heat processed fish from computer data bases of electrophoretic protein profiles	I.Mackie/Rowett Research Institute
Q01005	Speciation of processed meat and fish products based on the actin multigene family	R.Bardsley/Uni Nottingham
Q01006	Identification of species in processed/composite fish/ seafood products using DNA-based techniques	S.Pryde/Rowett Research Institue
Q01007	The development of a rapid and cost efficient assay for non- permitted cellulases in fruit juice	C.Slade/BBSRC - IFR

Q01008	Detection of offal in cooked meats by protein cleavage & visualisation of tissue specific peptides by electrophoresis	P.Reece/CSL
Q01009	Evaluation of dielectric spectroscopy in the measurement of added water in meat products	A.Knight/LFI
Q01010	Quantitation of meat species in meat & meat products using TaqMan PCR	H.Brown/CCFRA
Q01011	Optimn & validn of DNA assay for detect of select non-muscle tissues in meat prods using tissue specific DNA modificatio	D.McDowell/LGC
Q01012	The development of rapid & novel Nuclear Magnetic Resonance (NMR) techniques for measuring water in meat	P.Brereton/CSL
Q01013	Varietal identification of potatoes by DNA profiling	R.Cooke/NIAB
Q01014	The development of methods that can detect protein standardisation of cows` drinking milk	P.Brereton/CSL
Q01015	Develop methods to detect hazelnut oil in olive oil by analysis of volatiles and polar components	M.Gordon/Uni Reading-School of Food Biosciences
Q01016	Fluorescent molecular beacons for quanatitive detection of species-specific	R.Bardsley/Uni Nottingham

	markers in DNA isolated from food mixtures	
Q01017	Detection of hazelnut oil addition to olive oil	C.Crews/CSL
Q01018	Develop & validate methods to determine the origin of milk butter & cheese	P.Brereton/CSL
Q01019	Apply gc-Pyrolysis-IRMS to determine the authenticity of veg. oils, wine, fruit juices and flavours	P.Brereton/CSL
Q01020	Exploit the genetic variability in natural yeast populations to determine the authenticity of certain wines	L.Smith/NIAB
Q01021	Within species discrimination of meat cuts evaluate a novel approach using DNA phage display & protein technologies	C.Martin/Rowett Research Institue
Q01022	Determine nonmuscle components of meat by identifying tissue specific DNA modifications	D.McDowell/LGC
Q01023	The immunological determination of meat content in cooked meat products	P.Farnell/LGC
Q01024	Nitrogen factors for turkey meat	R.Lawrie/RSC
Q01025	Development of a method for the detection of adulteration of basmati rice	N.Blackhall/Uni Nottingham

Q01026	Further development and validation of assays for fruit authentication (ext. to AN0672 & AN0691)	A.Knight/LFI
Q01027	Adulteration of olive oil with hazlenut oil: to enable detection of hazelnut oil in virgin & refined olive oils	L.Webster/FRS - The Marine Laboratory
Q01028	Determination of the authenticity of virgin olive oil by DNA fingerprinting of yeast associated with olive drupes	L.Smith/NIAB
Q01029	Detection of Beet Adulteration in Honey and Fruit Juices	P.Martin/QP Services
Q01030	Development of a method to differentiate Basmati Rice from Non-Basmati Rice based on gas sensor technology	S.Taylor/Uni Greenwich
Q01031	Development and validation of methodology for the confirmation of the origin of wild and farmed salmon and other fish	M.Lees/Eurofins Scientific
Q01032	Numbers and types of starter bacteria in fermented milks in relation to claims concerning probiotic properties	Reference: UNNLSUT001
Q01033	Real time analysis of PCR - based DNA methods for the limit of detection,sensitivity and specificity.	H.Hird/CSL

Q01034	Compilation of local regulation in the EU on chapitalisation of wines	K.Williams/Eurofins Scientific
Q01035	Improved Quantitative PCR for Food authentication	A.Knight/LFI
Q01036	Combined Competitive PCR / Multicolour fluorescence for accurate quantification of markers in DNA from Foods	R.Bardsley/Uni Nottingham
Q01037	Study of the nitrogen factor for whole cod fillet fish ingredient and for minced cod fish ingredient as defined in the code of practice on the declaration of fish content in fish products 1998.	J.Grant/RSC
Q01038	The development of isotopic analysis and DNA polymorphic markers to determine the geographical and cultivar origin of premium long grain rice	H.Hird/CSL
Q01039	Evaluation of a suite of methods to distinguish cheese analogues from genuine cheese	P.Farnell/LGC
Q01040	Development of methods that can detect protein standardisation of cows drinking milk	LI.Lumley/GC
Q01041	Methods for the detection of rectified grape and apple juice in fruit juices	P.Farnell/LGC
Q01042	An assessment of	N.Blackhall/Uni

	microsatellite markers for Basmati rice varieties	Nottingham
Q01043	Real-time analysis of PCR-based DNA methods for limit of detection, sensitivity and specificity	B.Popping/Eurofins Analytik GmbH
Q01044	Analysis of desmin antibodies reactive with major meat species for meat content determination; production of beef-specific antibodies	E.Billett/Uni Nottingham Trent
Q01045	Identification of species origin of milk and milk products using ELISA and PCR	J.Williams/Uni College Chester
Q01046	Authentication of Milk and Milk Products using Surface Enhanced Laser Desorption/Ionisation	B.Daniel/Uni London - KCL
Q01047	Verification of "Organic Meat production" by detection of permitted and not-permitted uses of veterinary medicines.	CSL
Q01048	Determination of authenticity of provenance of high quality tea products through the use of DNA fingerprint profiles	D O'Sullivan/ NIAB
Q01049	The identification of meat species in vegetarian foods by QRT-PCR	G.Wiseman/RHM Technology
Q01050	The detection of added meat products in processed vegetarian foods	P.Brereton/CSL

Q01051	Development of an assay for the quantitative determination of the white fish content of commercial products.	H.Hird/CSL
Q01052	DNA extraction and the distribution target sequences in animal tissues; implications for quantitative analysis of meat in meat products	S.Garrett/ CCFRA
Q01053	Quantitative and qualitative detection of DNA targets in meats of known provenance	G.Saunders/ VLA
Q01054	The influence of offal content on the validity and accuracy of species quantification by real time PCR.	LGC
Q01055	Quantitation of meat in fresh and processed foods: an evaluation of the use of antibodies to the insoluble muscle protein desmin	E.Billett/Uni Nottingham Trent
Q01056	Development of genomic markers to improve quantitation of meat species in meat products	S.Garrett/ CCFRA
Q01057	The identification of compounds in fruit juices that could be used as quantitative markers for the determination of fruit juice content in soft and alcoholic drinks	A.Lea/RSSL
Q01058	Detection of the adulteration of olive oil by hazelnut oil	M.Gordon/Uni Reading

Q01059	Development and assessment of methods for the detection of adulteration of olive oil with hazelnut oil	P.Brereton/CSL
Q01060	Development of Molecular Markers Suitable for the Detection of Olive Oil Adulteration with Hazelnut Oil	S.Garrett/ CCFRA
Q01061	Development of an assay for the quantitative determination of the white fish content of commercial products.	G.Hold/Rowett Research Institue
Q01062	Gas chromatography coupled to stable isotope ratio mass spectrometry (GC-IRMS) to check food and beverage authenticity - suitable reference materials to ensure measurement inter-comparability	P.Brereton/CSL
Q01063	Establishing of a data bank for analytical parameters for wines from Third Countries	P.Brereton/CSL
Q01064	Development and validation of methods for the determination of non-muscle tissues in meat products	N.Harris/LGC
Q01066/79	The development of methods to verify the compulsory origin labelling of beef	IFR
Q01067	The development and testing of a Data Bank of PDO cheeses.	P.Brereton/CSL

Q01068	Development of simple, rapid immunoassays and DNA based confirmatory tests for marine fish speciation	C.Nicoletti/BBSRC - IFR
Q01069	Application of a chip-based capillary electrophoresis system to enable simple PCR detection of fish species	S.Garrett/ CCFRA
Q01070	Optimisation of real time polymerase chain reaction methods for accuracy and precision - CSL	H.Hird/CSL
Q01071	Optimisation and validation of the quantitative microsatellite assay for premium rice varieties	H.Hird/CSL
Q01072	Rapid and accurate quantitative analyses of mixtures of rice varieties	N.Blackhall/Uni Nottingham
Q01073	Improved authentication of Jams and Yoghurts using PCR	A.Knight/LFI
Q01074	Development and validation of methods to distinguish 'non-battery' from 'battery' eggs.	D.Lewis/CSL
Q01075	Applications of methods to authenticate speciality vinegars	C.Crews/CSL
Q01076	Verifying the authenticity of organically grown crops using stable nitrogen isotope analysis.	S.Kelly/IFR

Q01077	A review of literature on novel chemical and biochemical markers that have the potential for identifying contamination or adulteration of speciality oil and of spreadable fats	P.Brereton/CSL
Q01078	A market survey of fruit products to assess the range available and the labelling information presented on the pack.	T.Lobstein/Food Commission Uk Ltd
Q01079	The development of methods to verify the compulsory origin labelling of beef	J.Kingsmill/ BBSRC - IFR
Q01080	The development of methods to detect the fraudulent use of rectified juice concentrates	A.Charlton/CSL
Q01081	Application of an isotopic method to authenticate claims that poultry have been 'corn-fed'	P.Reece/CSL
Q01082	Identification of Biomarkers for MRM: A prelude to the development of a robust surveillance method	I.Lumley/LGC
Q01083	Development of methods for the identification of duck, pheasant, venison, horse and wild boar in meat products.	H.Hird/CSL
Q01085	The quantitative determination of common wheat in durum pasta using	G.Wiseman/RHM Technology

	real-time PCR - method validation	
Q01086	The development of methods to determine the geographical origin of poultry	S.Kelly/IFR
Q01084/87/88/89/90	Final optimisation and evaluation of DNA based methods for the authentication and quantification of meat species	VLA, RHM, Eurofins, CCFRA,CSL
Q01091	Traceability of origin and authenticity of olive oil by combined genomic and metabolmic approaches	D O'Sullivan/ NIAB
Q01092	Production and use of monoclonal anti-albumin antibodies to monitor the presence of bovine and porcine blood proteins in processed meat products.	E.Billett/NTU
Q01093	HPLC-MS of species specific fibrinogen peptide as a qualitative method for fibrin based meat binders	P.Reece/CSL
Q01094	Validation of a qualitative and quantitative method to determine non-cocoa butter vegetable fats in chocolate	C.Crews/CSL
Q01095	Validation of a DNA-based method for the determination of hazelnut oil in olive oil	J.Dooley/ CCFRA

2005 - 2014

Q01096	Development of a protocol to detect non-muscle tissues in meat	N.Harris/LGC
Q01097	TRACE - Tracing food commodities in Europe	P.Brereton/CSL
Q01098	TRACE - Tracing the origin of food	S.Kelly/IFR
Q01099	Extending the lab-on-a-chip PCR-RFLP database for a wider range of commercial fish species	S.Garrett/ CCFRA
Q01100	Development of Assays for the quantification of white fish in commercial products using real-time PCR	H.Hird/CSL
Q01101	Evaluation of simple microscopy protocols for identifying Mechanically Recovered Meat	K.Groves/LFR
Q01102	Metabolomic approach to identification of robust markers for the detection of MRM/MSM in meat products	P.Bramley/RHU
Q01103	The Effect of Superchilling on the HADH assay for Chicken and Turkey	P.Lawrance/ LGC
Q01104	A proteomic approach to the determination of meat species within a mixed meat product.	P.Bramley/RHU
Q01105	Proteomic detection and quantification of offal	E.Billett/NTU

Q01106	Transfer of the real-time PCR method to detect and quantify common wheat adulteration of pasta to the LabChip capillary electrophoresis system	G.Wiseman/ Premier Foods
Q01107	The adaptation and validation of real-time PCR methods, for exotic species identification, for analysis on a capillary electrophoresis chip system	H.Hird/CSL
Q01108	Adaptating and Validating DNA Methods for Basmati and Other Fragrant Rices for the LabChip system	R.Ogden/ Bangor
Q01109	Adaptation of DNA analysis techniques for the identification of illegally imported bushmeat for use on the Agilent 2100 bioanalyser	R.Ogden/Tepnel
Q01110	An evaluation of lectin chip array technology to identify the species of origin of milk used in the production of mozzerralla cheese.	J.Topping/LFR
Q01111	Evaluation of DNA based methods for fruit juice authenticity using lab-on-a-chip capillary electrophoresis endpoint detection	S.Garrett/ CCFRA
Q01114	Evaluation of DNA based methods for fruit juice authenticity using lab-on-a-chip capillary electrophoresis endpoint detection	A.Knight/LFR

Q01115	A protein based method for the detection of gelatine in plant based foods and beverages	P.Bramley/RHU
Q01117	Measurement of animal based ingredients in composite imported foods to determine whether health checks are necessary	H.Brown/ CCFRA
Q01118	Development of a method to detect gelatine in vegetarian products	P.Reece/CSL
Q01120	Measurement of animal based ingredients (milk, egg and crustaceans) in composite imported foods	J.Topping/ LFR
Q01121	TRACE –Tracing Food Commodities in Europe	P.Brereton/CSL
Q01122	Improve the existing method to determine cocoa solids in chocolate by optimising the measurement of theobromine, and determining the theobromine content in a suitable range of commercial cocoa nibs used in chocolate marketed in the UK. Write SOPs for the improved determination of cocoa solids in chocolate.	A.Richards/ Durham PA
Q01123	Confirming the Origin of British Beef using Multi-Isotope and Multi-Element Analysis	S.Kelly/IFR
Q01124	Assessing the origin of wine using existing compostional	A.Charlton/CSL

	information	
Q01126	TRACE –Tracing Food Commodities in Europe	S.Kelly/IFR
Q01127	Identification of an internal isotopic reference for palm to allow detection of palm sugar adulteration with cane sugar	S.Kelly/IFR
Q01128	Determination of Potato Varieties using a DNA Lab on a Chip Format	D.Lee/NIAB
Q01129	The development and validation of DNA marker methods for the verification of meat from wild boar.	H.Hird/CSL
Q01130 FA0101	Verifiction of meat from traditional cattle and pig breeds using SNP DNA markers	R.Ogden/Tepnel
Q01131	Extend an existing method using light microscopy to determine whether material recovered off beef and lamb bones meets the definition of MSM	K.Groves/LFR
Q01132 (FA0105)	Validation of a proteomics method to detect undeclared proteins in chicken products used to retain water.	A.Charlton/Fera York University
FA0401	Knowledge transfer of method to identify mechanically separated meat	K.Groves/LFR
FA0402	Knowledge transfer of	M.Burns/LGC

	advanced PCR methods	
FA0101	Verification of meat from traditional cattle and pig breeds using SNP DNA markers	R Ogden/ Tepnel
FA0102	Evaluation of the dissemination of DNA authenticity methods	LGC
FA0103	Public analyst training course for using DNA sequencing	LGC
FA0104	Desk study to provide an overview of food fraud.	FERA
FA0105	Validation of a proteomics method to detect undeclared proteins in chicken products used to retain water	FERA
FA0106	Transfer of an offal detection assay to an ELISA platform	Nottingham Trent University
FA0107	Validation of method to detect blood-based binding agents	FERA
FA0108	Contract for Independent Programme Advisor	
FA0109	Authentic Food- CORE organic II ERA-NET	FERA
FA0110	Basmati rice collaborative trial	FERA
FA0111	----- no project ------	
FA0112	Extension of the method to verify meat from traditional	Ogden

	cattle and pig breeds using SNP DNA markers	
FA0113	---- no project -----	
FA0114	Inter-laboratory validation of a method for detecting previously-frozen poultry	LGC
FA0115	Determination of nitrogen factors for Pangasius and Alaska Pollack	RSC
FA0116	LABELFISH EU Atlantic area programme	Salford
FA0117	Evaluation of methodologies to verify vegetable oil species in mixtures of vegetable oils	Queen's Belfast
FA0118	Geographic traceability tools for commercial fish and fish products	R Ogden
FA0119	---- no project -------	
FA0120	----- no project -------	
FA0121	Determination of a nitrogen factor for chicken breast	RSC
FA0122	Validation of Western blot methods to monitor the presence of added bovine and porcine blood proteins in meat products.	Nottingham Trent University
FA0123	----- no project ------	
FA0124	Validation of the method for determining blood-based binding agents	FERA

FA0125	Development of breed specific assays for beef and pork authentication	Trace Forensics
FA0126	Supplementary validation of a method to determine the species origin of gelatine in commercially available foods	FERA
FA0127	A reassessment of pork N factors	RSC
FA0128	E-learning project	CBRI
FA0129	Development of isoscapes to verify labelling claims relating to the provenance of chicken and pork	FERA
FA0130	Development of analytical methods to verify labelling claims relating to egg production	FERA
FA0131	Indication of food origin using a metagenomic approach	FERA
FA0132	----- no project ------	
FA0133	----- no project ------	
FA0134	Method verification of the LOD associated with the Defra/FSA study protocol for detection of horse DNA in food samples	LGC
FA0135	Real-time PCR approach for quantitation of horse DNA and study into relevance of expression units (DNA/DNA	LGC

	and w/w tissue)	
FA0136	Spectral imaging	LGC
FA0137	Contamination in meat plants	LGC
FA0138	Development of a proteomics method for meat speciation in heavily processed foodstuffs	FERA
FA0139	An evidence based review of the state of knowledge on methods for distinguishing mechanically separated meat (MSM) from desinewed meat (DSM)	Leatherhead
FA0141	Metagenomics for origin of oysters	FERA
FA0144	Knowledge transfer event for DNA extraction	LGC
FA0145	Dissemination of a microscopy method for identifying mechanically separated meat	Leatherhead
FA0146	Method validation of the real-time PCR approach for the quantitation of horse DNA	LGC
FA0147	----- no project ------	
FA0150	----- no project ------	
FA0151	Food Authenticity Conference	FERA
FA0152	BRITISH BEEF ORIGIN PROJECT 2 – improvement	FERA

	of the British beef Isotope Landscape Map (Isocape)	
FA0153	Contract for Independent Programme Advisor	
FA0154	Provision of Evidence and Knowledge Evaluation on Whisky Method of Analysis	FERA
FA0155	EU Food Integrity Project	FERA
FA0157	Evaluation of quantitative molecular biology methods	***
FA0158	Development and validation of the proposed methodology to verify vegetable oil species in mixtures of oil	Queen's Belfast

Annex 3 - List of 'standard operating procedures' (sops) produced under the food authenticity programme

SOP related to project*	Title	Author and Organisation
-	Guidelines for preparing SOPs	Dr Sandy Primrose
Q01055	Standard Operating Procedure for the extraction of desmin from meat samples	Cheryl Wells (NTU)
Q01055	Standard Operating Procedure for the analysis of desmin enriched meat extracts	Cheryl Wells (NTU)
Q01066	Standard Operating Procedure For Determination Of The Geographical Origin Of Uncooked Beef Meat	Simon Kelly (IFR)
Q01086	Standard Operating Procedure for the determination of corn-fed status of chicken meat using the 13C/12C isotope ratio of the protein fraction of the meat	Paul Reece (Fera)
Q01095	Standard Operating Procedure for the use of a DNA-based approach for the detection of unrefined hazelnut oil in virgin olive oil.	John Dooley (Campden BRI)
Q01092	Standard Operating Procedure for the extraction of processed meat products prior to the analysis of added serum	Cheryl Wells (NTU)
Q01092	Standard Operating Procedure for immunoblot analysis of bovine or porcine serum in extracts of processed meat products	Cheryl Wells (NTU)
Q01093	Standard Operating Procedure For The Detection Of Bovine And Porcine Fibrinopeptides In Raw And Cooked Meats	Paul Reece (Fera)

Q01099	Standard Operating Procedure for the discrimination of salmon species in canned products by PCR-RFLP analysis using the agilent 2100 bioanalyser	Steve Garrett (Campden BRI)
Q01099	Standard Operating Procedure for the discrimination of tuna species in canned products by PCR-RFLP analysis on the agilent 2100 bioanalyser	Steve Garrett(Campden BRI)
Q01099	Standard Operating procedure for discrimination of king & queen scallop species by PCR-RFLP analysis using the agilent 2100 bioanalyser	Steve Garrett (Campden BRI)
Q01101	Standard Operating Protocol (SOP) for A Microscopy Protocol for Identifying Mechanically Separated Meat (MSM) for pork, chicken and turkey	Kathy Groves (LFR)
Q01106	Standard Operating Procedure for Detection and quantification of T. aestivum addition in T. durum pastas and semolinas by PCR followed by analysis using the Agilent 2100 Bioanalyzer capillary electrophoresis system.	Gordon Wiseman (Premier Foods)
Q01107	Standard Operating Procedure for analysis of DNA from meat using a capillary electropheresis chip system and CTAB extraction	Hez Hird (Fera)
Q01107	Standard Operating Procedure for analysis of DNA from meat using a capillary electropheresis chip system and Tepnel Bead extraction	Hez Hird (Fera)
Q01108	Standard Operating Procedure For The Quantitative Analysis Of Adulteration Of Basmati Rice With The Varieties Sherbati, Mugad Sugandha, PAK 386 Or Superfine Using The Agilent 2100 Bionalyser (SOP1-RM201)	Katherine Steele (Food DNA Services)

Q01108	Standard Operating Procedure For The Quantitative Analysis Of Adulteration Of Basmati Rice With The Varieties Sherbati, Mugad Sugandha, PAK 386 Or Superfine Using The Agilent 2100 Bionalyzer (SOP2-INDEL B8)	Katherine Steele (Food DNA Services)
Q01108	Standard Operating Procedure For The Detection Of Non-Permitted Rice Varieties By INDEL-PCRAnalysis Using The Agilent 2100 Bionalyser (SOP3)	Katherine Steele (Food DNA Services)
Q01108	Standard Operating Procedure For The Adulteration of Basmati Rice with Sherbati, Mugad Sugandha, Pak 386, or Superfine (Beckman quantitative SSR)	Katherine Steele (Food DNA Services)
Q01108	Standard Operating Procedure for The Identification of Selected Basmati Rice Varieties (Beckman qualitative SSR)	Katherine Steele (Food DNA Services)
Q01109	Standard Operating Procedure For The Genetic Identification Of Common African Wildmeat Species Using The Agilent 2100 Bioanalyzer	Rob Ogden (Food DNA Services)
Q01114	Standard Operating Procedure for determining grapefruit juice in orange juice	Angus Knight (LFR)
Q01114	Standard Operating Procedure for determining mandarin juice in orange juice	Angus Knight (LFR)
Q01118	Standard Operating Procedure for the detection of gelatine in vegetarian meals	Helen Grundy (Fera)
Q01069	Standard Operating Procedure for identification of fish species by PCR-RFLP analysis using the Agilent 2100 Bioanalyser	Steve Garrett (Campden BRI)

Q01123	SOP for the determination of the ‘global’ deuterium/hydrogen (2H/1H) and oxygen-18/oxygen-16 (18O/16O) ratio of bulk materials.	Simon Kelly (IFR)
Q01123	SOP for the determination of the ‘global’ or ‘average’ carbon-13/carbon-12 (13C/12C) and nitrogen-15/nitrogen-14 (15N/14N) ratio of bulk materials.	Simon Kelly (IFR)
Q01123	SOP for the determination of the ‘global’ or ‘average’ sulphur-34/sulphur-32 (34S/32S) ratio of bulk materials	Simon Kelly (IFR)
Q01123	SOP for Strontium-87 isotope analysis of organic material	Simon Kelly (IFR)
Q01123	Trace Element Analysis of Organic Material	Simon Kelly (IFR)
Q01131	SOP for a Microscopy Protocol for Identifying Mechanically Separated Meat (MSM) for beef and lamb.	Kathy Groves (LFR)
Q01130	SOP for the Genetic Identification of Traditional Breeds of Pig using DNA SNP markers	Rob Ogden (Gen-Probe)
Q01130	SOP for the Genetic Identification of Traditional Breeds of Cattle using DNA SNP markers	Rob Ogden (Gen-Probe)
Q01105	SOP for the Extraction of Meat Products (Raw and Processed) and the Analysis of Added Offal.	Ellen Billett (NTU)
	The development and validation of DNA marker methods for the verification of meat from wild boar.	Hez Hird (FERA)

Q01132	Standard operating procedure for the micro-method for the determination of hydroxyproline in gelatine extracts	Helen Grundy (FERA)
Q01132	Standard operating procedure for the isolation of gelatine from chicken fillet preparations	Helen Grundy (FERA)
Q01132	Standard operating procedure for the LC/MS/MS of tryptic digests of chicken exudate extracts to determine the species origin of gelatine	Helen Grundy (FERA)
Q01132	Standard operating procedure for the tryptic digestion of gelatine	Helen Grundy (FERA)
Q01122	The determination of theobromine and caffeine in cocoa and chocolate products by high performance liquid chromatography	
FA0137	Environmental Monitoring for Meat Processing Plants	LGC
FA0114	Method for the detection of previously frozen poultrymeat by determination of HADH activity	LGC
	Draft SOPs (unpublished)	
FA0117	Standard operating procedure for development of a two-step methodology to determine vegetable oil species in vegetable oil mixtures	Tassos Kaodis (University of Belfast)
FA0125	Standard Operating Procedure for the genetic identifications of traditional cow breeds using DNA SNP markers	Rob Ogden (RZSS)
FA0125	Standard Operating Procedure for the genetic identifications of traditional pig breeds using	Rob Ogden (RZSS)

	DNA SNP markers	
FA0125	Standard Operating Procedure for the genetic identifications of cod, hake and sole populations using DNA SNP markers	Rob Ogden (RZSS)
FA0106	Standard operating procedure for the extraction of a heart marker protein in raw and processed meat products and its subsequent detection and quantification by an ELISA	Ellen Billet (NTU)

Annex 4 - Food authenticity programme – expert groups terms of reference

The Authenticity Steering Group (ASG)

The ASG has a diverse membership that reflects all those with an interest in food authenticity. The members include senior officials from Defra and the FSA and representatives from:

- The Consumer Association (Which magazine)
- The Food and Drink Federation
- The British Retail Consortium
- Association of Port Health Authorities
- Trading Standards
- Association of Public Analysts
- A commercial food testing laboratory
- LGC (in its role as Government Chemist)

The identification of new fraudulent practices has to be intelligence led and this is reflected in the membership of the ASG to maximise the sharing of information.

ASG Terms of Reference (July 2013)

1. To identify trends and global drivers likely to impact on food labelling, standards and the potential for food fraud, deceptive and misleading activities.

2. To identify overarching authenticity research and survey needs that will assist in reducing fraudulent, deceptive or misleading practices to protect consumers and enhance the competitiveness, resilience and sustainability of the food supply chain.

3. To advise on the priorities for commissioning authenticity research which contribute to developing robust methods and methodologies to detect food mis-description and adulteration with a focus on areas of highest risk.

4. To advise on authenticity surveys, that targets areas of highest risk.

5. To assist in identifying effective knowledge transfer activities between local authorities; official control laboratories (public analysts and food examiners) and other stakeholders, including the food and drink industry as appropriate.

6. To assist in identifying where research outputs may be of value to Defra's work on development of authenticity technologies.

7. To cooperate with the Food Standards Agency, other organisations, delivery bodies and trade associations with an interest.

The Authenticity Methods Working Group (AMWG)

In addition to officials from Defra and FSA, the members of the AMWG include:

- An expert in sampling protocols and assay validation
- A public analyst
- The Deputy Government Chemist
- An expert in analytical molecular biology
- An expert in stable isotope analysis
- A professional analytical chemist
- The manager of a commercial analytical laboratory
- The independent authenticity programme advisor
- Representatives from the Food and Drink Federation and the British Retail Consortium

AMWG terms of reference

The Food Authenticity Methods Working Group will act to evaluate research developed within the food authenticity research programme. This programme focuses on the development of methods to support the authentication of food description and enforcement of food legislation. The working party will play a role in ensuring the methods developed are robust and will provide advice on the wider application of the methods, for example, in the carrying out of surveys.

The terms of reference for the Working Group are to:

1. assess methods of analysis to be used to detect adulteration and mis-description of food, and comment on their applicability to specific issues and advise generally on the uncertainty and interpretation of results

2. advise where further development work is required to improve or validate existing methods for determining food authenticity

3. promote information and technology transfer by encouraging enforcement authorities and industry to apply existing and new techniques, as appropriate,

4. consider food authenticity surveillance exercises performed by Defra and the Agency and advise on any future action needed

The AMWG Technical Sub-Group (TSG) (July 2013)

The AMWG established the Technical Sub-Group to undertake detailed technical analysis of food authenticity issues. The remit of the TSG is to:

- Review all new developments in analytical chemistry, physics or biology for suitability for application to unsolved or developing problems in food authenticity.
- Review all new developments in analytical chemistry, physics or biology for suitability for the possibility of improving existing methods for food authenticity determination, especially where existing methods will not be suitable for determining undeclared ingredients below 0.1% as specified by the FSA.
- Review project specifications prior to 'calls for tender' to ensure that successful projects deliver methods that are fit for purpose.
- Review manufacturer's claims about equipment or reagents that are promoted as being suitable for determining food authenticity.

The Technical Sub-Group has a core group of members that includes:

- An expert in sampling protocols and assay validation (from the FSA)
- A Public Analyst
- Experts in analytical molecular biology (from LGC, Fera and CCFRA)
- A professional analytical chemist
- The manager of a commercial analytical laboratory
- The independent authenticity programme advisor

This core group is supplemented with other relevant professionals on a case-by-case basis.

TSG terms of reference:

1. To review all the quantitative molecular biology methods currently available and assess:
    - Their suitability for determining the amount of one meat species in another;
    - Their suitability for use with complex food products
    - The likelihood that they could detect target species at the 1% level

- What work needs to be done to validate each method

2. To make recommendations to AMWG on what new quantitative methods should be supported and on knowledge transfer of methods

Annex 5 - Laboratory accreditation

A laboratory involved in food testing should hold accreditation for ISO 1702530. In the United Kingdom, the sole organisation permitted to provide this accreditation is the United Kingdom Accreditation Service (UKAS).

The first edition (1999) of this International Standard was produced as the result of extensive experience in the implementation of ISO/IEC Guide 25 and EN 45001, both of which were regarded as too proscriptive and therefore restrictive to best practice and good innovation. It contained all of the requirements that testing and calibration laboratories have to meet if they wish to demonstrate that they operate a management system, are technically competent, and are able to generate technically valid results. The principles within the standard have been further developed and are in active use in laboratories.

Accreditation is awarded following extensive audit of a laboratory's facilities, staff and operating procedures by UKAS and requires a high level of compliance with traceability measures. In addition, it requires staff of sufficient training and experience at all levels within the laboratory, a high standard of analytical quality control, validation of methods, traceability of measurement31, document and procedural control. In particular, it requires that methods in use are fit for purpose[32.]

Flexible Scope (utilising what are known as Generic Protocols) is a tool available to laboratories to enable rapid development of method to an ISO 17025 accredited standard when required for one-off samples or emerging risks. In some areas of food testing e.g. GMO analysis, flexible scope of accreditation to ISO 17025 is actively encouraged and recommended as setting the benchmark for demonstrable evidence for fitness for purpose. If a laboratory has proven experience in a field of analysis, it may use its UKAS accredited Flexible Scope to respond to demand for analysis outside its normal accredited scope of work.

Mutual recognition within Europe is the responsibility of European Cooperation for Accreditation (EA)33. EA is formally appointed as the body responsible for European accreditation infrastructure under Regulation 765/200834. The EA Multilateral Agreement (EA MLA) is a signed agreement between the EA Full Members whereby the signatories recognise and accept the equivalence of the accreditation systems operated by the signing members, and also the reliability of the conformity assessment results provided by conformity assessment bodies accredited by the signing members.

[30] ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories
[31] Traceability in Chemical Measurement, A guide to achieving comparable results in chemical measurement, Eurachem / CITAC, 2003
[32] The Fitness for Purpose of Analytical Methods, EURCHEM Guide 1998, ISBN: 0-948926-12-0
[33] http://www.european-accreditation.org/
[34] Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products

Mutual international recognition of laboratory results obtained in accredited facilities currently underpins much international trade. To this end, a system of mutual recognition of audited accreditation systems is in place under the auspices of the International Laboratory Accreditation Cooperation (ILAP)35. The system that exists is therefore a mature, multi-layered approach that is truly international and far reaching in approach, scale and scope and is bounded by International Trade Agreements.

[35] https://www.ilac.org/

Annex 6 - The current approach to laboratory intercomparability

The Hierarchy of Methods

Article 11 of Regulation 882/2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules states:

Methods of sampling and analysis

1. Sampling and analysis methods used in the context of official controls shall comply with relevant Community rules or,

(a) if no such rules exist, with internationally recognised rules or protocols, for example those that the European Committee for standardisation (CEN) has accepted or those agreed in national legislation; or,

(b) in the absence of the above, with other methods fit for the intended purpose or developed in accordance with scientific protocols.

2. Where paragraph 1 does not apply, validation of methods of analysis may take place within a single laboratory according to an internationally accepted protocol.

3. Wherever possible, methods of analysis shall be characterised by the appropriate criteria set out in Annex III.

4. The following implementing measures may be taken in accordance with the procedure referred to in Article 62(3):

(a) methods of sampling and analysis, including the confirmatory or reference methods to be used in the event of a dispute;

(b) performance criteria, analysis parameters, measurement uncertainty and procedures for the validation of the methods referred to in (a); and (c) rules on the interpretation of results.

Methods typically fall into the following categories:

Statutory methods

Those methods written into Regulation. Some are Official Methods which must be used (rare), some are Recommended (or Reference) Methods which are not mandatory, and any alternate method that is used must be of equivalent or better performance.

International Standards Organisation (ISO) methods

Methods published by the ISO and accepted internationally. Often used in support of analysis undertaken in the context of Codex Alimentarius standards for international trade.

Reference Laboratory Methods

Published and Circulated by European Reference Laboratories (EURL) or National Reference Laboratories (NRL) appointed under the provisions of Regulation 882/2004.

Governmental and Professional Association Methods

For example, methods published by the Association of Official Analytical Chemists (AOAC). These methods are generally of a good quality and have performance data associated with them, often derived from a collaborative trial36. They are methods within the control of analytical chemists and are amenable to amendment when required.

Journal Methods

Published academic papers. Often used to support the development of new methods, but usually require more validation work than methods above.

Equipment Manufacturers' Methods

Specific to a particular piece of equipment, but often related to journal Methods.

In-house Methods

Methods developed for particular problems where no previous method exists.

Traceability and Intercomparability of Measurement

Certified Reference Materials (CRM)

Certified Reference Materials[37] are the "gold standard" of chemical analysis. They consist of well-characterised and stable materials to which a laboratory can anchor their own method and which allows calibration, comparability and traceability of results.

Certified Calibration Materials

Prepared and certified according to ISO Guide 34[38,] these materials anchor the "front end" of instrumental analysis by making a traceable, with a known concentration of the analyte available to all purchasing laboratories.

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[36] International Union of Pure and Applied Chemists (IUPAC), see development work: http://www.iupac.org/nc/home/projects/project-db/project-details.html?tx_wfqbe_pi1%5Bproject_nr%5D=2005-024-2-600

[37] ISO Guide 32 Calibration in analytical chemistry and use of certified reference materials

Performance Assessment Schemes

Schemes such as the Fera's Food Analysis Performance Assessment Scheme and the LGC's Standards Proficiency Testing circulate well characterised[39] samples to participating laboratories. Results are then compared, allowing laboratories to monitor performance relative to other laboratories.

Primary Calibrations

Equipment is subject to calibration, that calibration being traceable to international standards. This includes, but is not limited to, glassware volume, temperature, distance, pressure, energy output, time and all items which are critical to good measurement.

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[38] ISO Guide 34 General requirements for the competence of reference material producers

[39] The International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories (IUPAC Technical Report) http://www.iupac.org/publications/pac/2006/pdf/7801x0145.pdf

Annex 7 - Food Authenticity Toolkit

Part 1: Methods

METHOD	APPLICATIONS	COMMENTS
Protein mass spectrometry	1 Identification of gelatine source in injection powders 2 Quantification of fibrin-based meat binding agents 3 Identification of offal 4 Identification of species origin of casein in cheese 5 Identification of meat species from muscle proteins	SOPs are available for gelatine, fibrin and offal. Gelatine speciation needs access to proprietary database. Offal method is used as confirmatory test in conjunction with Western blotting All protein mass spectrometry methods can be made quantitative. In theory this method can be used with highly processed samples but results obtained will be very sample dependent. Sensitivity of the method depends on the instrument used.
Western blotting	Identification and quantification of heart, lung, kidney and liver in meat products	Protein mass spectrometry used as confirmatory test for offal detection. An SOP is available.
Lab-on-a-chip capillary electrophoresis (Agilent Bioanalyser)	1 Meat and fish speciation including bushmeat and canned fish 2 Adulteration of Basmati rice 3 Detection of bread wheat in Durum wheat Identification of fruit sources in fruit juice 4 Genetically-modified	SOPs are available for all methods. The method can be used semi-quantitatively as a screening tool before using qPCR. Ideally, need good quality DNA. Quality of results is dependent on amplicon size. Method can fail to work if DNA heavily degraded by, for example, sample processing prior to DNA extraction. The smaller the amplicon the better the chance of getting good results.

	organisms	For speciation, the DNA amplicon can be sequenced to confirm identity.
Real-time PCR (qualitative)	1 Detection of meat species 2 Detection of animal DNA in vegetarian foods	SOPs available for detection of both nuclear and mitochondrial DNA targets.
Real-time PCR (quantitative)	1 Quantification of GMOs 2 Quantification of bread wheat in Durum wheat 3 Quantification of horsemeat in other meats (raw minced meat)	Results are dependent on having good quality DNA. Small amplicons (<100bp) are appropriate for use with degraded target DNA in processed food. Horsemeat method could be used with meats other than horsemeat. Accurate quantification within raw minced meat is dependent on recognizing when there are problems with any of the steps in the analytical procedure.
Gel analysis of simple sequence length polymorphisms (SSLPs)	1 Identification of potato varieties 2 Detection of mandarin juice	Detection of mandarin juice in orange juice is done by heteroduplex analysis.
Multi-SNP analysis	Identification of breed of cattle or pig	Identification of large numbers of SNPs using arrays.
DNA barcoding	Fish and meat speciation by DNA sequencing	Method can be primary method of speciation or used as confirmatory test (see Agilent Bioanalyser).
Digital PCR	Quantification of horsemeat in meat products	Being evaluated
Metagenomics		Being evaluated
Enzyme assay	Determining if meat sold as fresh has previously been frozen	Determination of mitochondrial HADH.

Stable isotope ratio analysis (SIRA)	1 Differentiating wild versus farmed salmon and whitefish 2 Determining if product is from stated origin 3 Determining if sugar is from cane or beet. 4 Detecting extension of fruit juice with added sugar and water 5 Identifying corn-fed chicken	Determining source of sugar can be used to detect added sugar in some products. For determining if a product is from the origin stated it is necessary to have access to a relevant database and/or samples of known provenance. The method has been used to distinguish beef from different countries and particularly good for identifying beef from Southern hemisphere. It also has been used to distinguish rice from Europe, America and Indian sub-continent and to distinguish European and non-European poultry.
Near infrared spectroscopy + fatty acid methyl ester (FAME) analysis	Identification of vegetable oils in an oil mixture	Method not fully evaluated but looks promising. Method can be used quantitatively.
Microscopy	1 Identification and differentiation of DSM and MSM 2 Detection of tetracycline feeding to chickens	SOPs available.
ELISA	1 Detection of added blood proteins 2 Detection of cellulose and cellobiose	Detection of addition of porcine and bovine blood proteins to enhance the apparent meat content of processed meat products. Cellulase used illegally to enhance sugar content of fruit juice. Cellobiose is the breakdown product of cellulase action on cellulose.
Chemical analysis	1 Detection of gelatine in vegetarian products 2 Addition of unrefined hazelnut oil to extra virgin olive oil	

	3 Authentication of balsamic vinegar 4 Measurement of non-cocoa butter fats and milk and vegetable fats in chocolate	3 Concentration of 2-acetoxyfurfural is indicator of ageing of vinegar. 4 Adopted as CEN methods.

Part 2: Applications

APPLICATION	METHODS	COMMENTS
MEAT AND MEAT PRODUCTS		
Meat ,poultry and game speciation	1 Agilent Bioanalyser 2 Real-time PCR 3 Protein mass spectrometry 4 Barcode of Life (sequencing)	Identifying the species present either singly or in a mixture is easiest using the Agilent Bioanalyser provided that the RFLP pattern of all the species present is known. Where species are present whose RFLP pattern is not known it would be best to use DNA sequencing (Barcode of Life). Although barcoding has not been evaluated for identifying meat species in food there is no reason why it should not be successful. Quantifying the amount of an undeclared meat species present in a food sample is very difficult except with unprocessed lean meat mixtures. Protein mass spectrometry has been used to identify common meat species by analysis of muscle proteins and can be used as a confirmatory test.
Detection of bushmeat	Agilent Bioanalyser	Barcode of Life would be better method if no prior knowledge of species.
Detection of MSM and DSM in meat products	Microscopy	
Detecting and	1 Western blotting	Western blotting used for initial screening and

quantifying offal in meat products	2 Protein mass spectrometry	quantification and protein mass spectrometry used for confirmation. Currently used to detect heart, lung, liver and kidney. Method needs extension to other possible offals, e.g. pancreas.
Detection of added blood proteins to meat products	ELISA	Blood proteins added to increase apparent meat content as determined by measurement of nitrogen factors.
Detection of cold gelling agents (fibrinogen + thrombin)	Protein mass spectrometry	Cold gelling agents used to bind meat fragments into larger steaks, etc.
Detecting use of tetracycline in chicken feed	Microscopy	Tetracycline feeding detected by fluorescence of chicken bones.
Detection of use of injection powders to increase weight of chicken breasts	Measurement of hydroxyproline in chicken 'drip' by chemical analysis	
Identification of species of gelatine used to make injection powders	Protein mass spectrometry	
Determination if meat or chicken previously frozen	Enzymatic assay (HADH)	
Identification of breed of beef or pork	Analysis of ~96 SNPs	May be commercially available.
Determination of country of origin of beef, lamb and chicken	Stable isotope analysis	Works best for distinguishing British and Irish beef from beef sourced from Southern hemisphere but can sometimes differentiate beef and lamb from different parts of the UK. Can differentiate chicken produced in Europe from those produced elsewhere, e.g. Asia.
Determining if chicken corn-fed	Stable isotope ratio analysis	

FISH AND FISH PRODUCTS		
Species identification of fish and shellfish	1 Agilent Bioanalyser 2 Barcode of Life (sequencing)	Agilent Bioanalyser easiest for common species in human food chain but Barcode of Life will identify most species, particularly those that would be missed by Agilent Bioanalyser. There is a lack of information available for authentication of other seafood (e.g. cephalopods, molluscs and other invertebrates).
Determination if fish wild or farmed	Stable isotope ratio analysis	Has been used with salmon, sea bass and sea bream.
Determination of fishing ground where fish caught	Analysis of large number of SNPs	Method still being evaluated but complicated because fishing grounds recognized by EU do not match fish ecological niches.
RICE AND PASTA		
Quantification of common wheat in Durum wheat	Quantitative PCR	Quantification can be done using the Agilent Bioanalyser but with significantly greater precision and accuracy with a real-time PCR instrument.
Detection of Basmati adulteration	1 SSLP analysis 2 Agilent Bioanalyser 3 Stable isotope ratio analysis	Best method, which gives quantification, is use of SSLP analysis but Agilent Bioanalyser easier to use. Stable isotope analysis can differentiate rice from US, Europe and Indian sub-continent.
FRUIT JUICE/ FRUIT PRODUCTS		
Determination of fruit used to make juice	Agilent Bioanalyser	Could use Barcode of Life which will detect unexpected species.
Determination of fruit in yoghurt and jam	Agilent Bioanalyser	Could use Barcode of Life which will detect unexpected species.

Detection of added sugar and water to fruit juice	1 Stable isotope analysis 2 Enzymatic analysis	Stable isotope ratio analysis can distinguish beet and cane sugar as well as natural sugar from C3 and C4 fruit. Enzymatic analysis can determine illegal use of cellulase to increase sugar content.
VEGETABLE OILS & FATS		
Identification of vegetable oils in an oil mixture	NIR spectroscopy + FAME analysis	Method still to undergo inter-laboratory validation. Method currently being extended to wider range of oils.
Addition of unrefined hazelnut oil to extra virgin olive oil	HPLC analysis	
Measurement of non-cocoa butter fats and milk and vegetable fats in chocolate	Chemical analysis	Adopted as CEN method.
MISCELLANEOUS FOODS		
Identification of potato variety	SSLP analysis	Used to identify substitution of premium potatoes, e.g. King Edwards, with cheaper varieties.
Identification of tea variety	SSLP analysis	Identification of Darjeeling tea.
Determination of ageing of balsamic vinegar	Measurement of 2-acetoxyfurfural	
Identification of meat ingredients in vegetarian products	Real-time PCR	Use of a male bovine Y DNA sequence to detect the addition of male meat in the presence of milk products. Could also use protein mass spectrometry to identify meat species present.

Identification of gelatine in vegetarian products	Measurement of hydroxyproline	Protein mass spectrometry can be used to identify species of gelatine origin.

Annex 8 - Existing sampling policy and further sampling initiatives

Local authorities are required under the statutory Food Law Code of Practice (separate parallel Codes of Practice exist for each of the four UK countries) to develop an annual risk-based sampling programme for their area and provide the resources necessary to carry out the work. Local Authorities must follow the statutory Food Law Code of Practice, and each must have their own food law Enforcement Policy, which sets out their approach to dealing with non-compliance.

Controls must be proportionate, risk-based and consistent with good practice, and local authorities will also have to judge each case based on the circumstances and evidence. The aim of a sampling strategy is to help ensure food is safe, compositionally correct, does not contain contaminants, only contains permitted additives, is correctly described, bears required markings and is truthfully labelled.

All samples for analysis, taken under section 29 of the Food Safety Act 1990 in accordance with the Food Safety (Sampling and Qualifications) (England) Regulations 2013 and with the requirements of Codes of Practice, should be submitted to the appointed Public Analyst at a laboratory accredited for the purposes of analysis, and which appears on the list of official food control laboratories[40].

In addition to the sampling of food and feed undertaken by UK Local Authorities the FSA also funds a national co-ordinated food sampling programme. The FSA has been working with UK local authorities since 2003 to support Enforcement Authority risk-based sampling and surveillance of food sold in the UK, whether it is imported or produced in the EU or UK. The work aims to inform policy makers and to provide better information to assist in future sampling programmes as well as determining levels of compliance around areas of concern within the UK food chain. Sampling priorities for the programme – including food authenticity - are developed in consultation with a wide range of organisations (including DEFRA, Department of Health, Public Health England, the Association of Public Analysts and Local Authorities). The programme adds value to local authorities that already carry out effective, routine sampling as part of their sampling policy. The funding available provided by this programme covers the costs of sample collection and analysis, and represents additional work over and above local authorities' existing work programme. Any non-compliance highlighted by the sampling results is followed up by the relevant local authority and appropriate enforcement action taken. Expenditure was increased in FY 13/14 due to the horsemeat incident.

[40] List of Official Feed and Food Control Laboratories in the UK (http://www.food.gov.uk/enforcement/monitoring/foodlabs/foodcontrollabs#.U-Op1rFnAig)

While guidance suggests that a risk-based approach should be applied, there is little advice available on the appropriate method of risk assessment. To help improve both the understanding of risk-based sampling and to generate a consistency of approach across all 434 UK Local Authorities the FSA has recently funded a 2-year research project to develop risk-based sampling guidance for enforcement officers[41].

Whilst the development of risk-based sampling strategies help UK Local Authorities (and food businesses) target what 'to' sample the process does not provide much useful information as to 'how' the sample should be taken and the number of items/units that need to be taken in order to obtain a representative sample. These issues relate to food/feed sampling per-se and are not specific to the food authenticity/fraud area. There are numerous sampling guidelines available (for example[42,43,44,45,46,47,48,49,50,51,52]) where many have been devised according to the specific need involved and to varying degrees of statistical validity ranging from simple pragmatic (or best practice) sampling strategies to statistical sampling strategies such as sampling by attributes and sampling by variables.

From recent discussions between FSA and some PAs it is clear that there is a need for an improved knowledge of sampling and sampling statistics in order to provide better advice to UK Local Authorities when Sampling Policy and Sampling Programmes are being developed. Mechanisms and procedures are well laid down in legislation for formal sampling but this is not necessarily the case for other types of sampling a UK Local Authority or food body might wish to undertake. In response to this need FSA is currently assisting a PA to develop a sampling and sampling statistics training course for Public Analysts as part of the APA training programme.

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[41] FSA Project - Development of Risk-Based Sampling Guidance for Enforcement Officers (http://food.gov.uk/science/research/choiceandstandardsresearch/enf-research/fs222001/#.U-OkLbFnAig)

[42] Codex CAC/GL50-2004 General Guidelines on Sampling (http://www.codexalimentarius.org/standards/list-of-standards/en/?no_cache=1)

[43] ISO 24333:2009 Cereals and cereal products – Sampling (http://www.iso.org/iso/catalogue_detail.htm?csnumber=42165)

[44] ISO 542:1990 Oilseeds – Sampling (http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=4619)

[45] DD CEN/TS 15568:2006 Foodstuffs. Methods of analysis for the detection of genetically modified organisms and derived products. Sampling strategies (http://shop.bsigroup.com/ProductDetail/?pid=000000000030158620)

[46] COMMISSION RECOMMENDATION of 4 October 2004 on technical guidance for sampling and detection of genetically modified organisms and material produced from genetically modified organisms as or in products in the context of Regulation (EC) No 1830/2003 (http://www.biosafety.be/PDF/787_2004_EN.pdf)

[47] Guidance Document on the Sampling of Cereals for Mycotoxins (http://ec.europa.eu/food/food/chemicalsafety/contaminants/guidance-sampling-final.pdf)

[48] COMMISSION REGULATION (EC) No 1882/2006 of 19 December 2006 laying down methods of sampling and analysis for the official control of the levels of nitrates in certain foodstuffs (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1882&from=EN)

[49] COMMISSION REGULATION (EC) No 401/2006 of 23 February 2006 laying down the methods of sampling and analysis for the official control of the levels of mycotoxins in foodstuffs (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R0401&from=EN)

[50] COMMISSION REGULATION (EU) No 178/2010 of 2 March 2010 amending Regulation (EC) No 401/2006 as regards groundnuts (peanuts), other oilseeds, tree nuts, apricot kernels, liquorice and vegetable oil (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0178&from=EN)

[51] COMMISSION REGULATION (EC) No 333/2007 of 28 March 2007 laying down the methods of sampling and analysis for the official control of the levels of lead, cadmium, mercury, inorganic tin, 3-MCPD and benzo(a)pyrene in foodstuffs (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R0333&from=EN)

[52] COMMISSION REGULATION (EC) No 1883/2006 of 19 December 2006 laying down methods of sampling and analysis for the official control of levels of dioxins and dioxin-like PCBs in certain foodstuffs (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1883&from=EN)

From an international Codex standpoint, TSG is aware that the 35th CCMAS (2014) has considered a discussion paper on sampling[53]. The paper considers, amongst other issues, sampling procedures, estimating sampling uncertainty. At this stage, it is unclear if or how the document will be taken forward within Codex. That said, the main UK author intends to ask RSC-AMC sampling uncertainty Sub-Committee to develop 3-4 Technical Briefs from the paper to be issued through usual AMC channels. It is expected that the issue of sampling uncertainty will have to be addressed during the development of the Codex principles document[54].

[53]IAM Discussion Paper on Sampling in Codex Standards (ftp://ftp.fao.org/codex/meetings/ccmas/ccmas35/ma35_07e.pdf)
[54]PROPOSED DRAFT PRINCIPLES FOR THE USE OF SAMPLING AND TESTING IN INTERNATIONAL FOOD TRADE: EXPLANATORY NOTES (ftp://ftp.fao.org/codex/meetings/ccmas/ccmas35/ma35_04e.pdf)

Annex 9 - Expressions of Interest Letter on 'Centres of Excellence' (10 Sept. 2014):

Department
for Environment
Food & Rural Affairs

10 September
2014

Dear Interested Party (see attached list at the end),

Virtual network of laboratories of "Centres of Excellence" for food authenticity testing - Expression of interest

I am writing to you as an organisation with an interest in food authenticity to seek your views on the creation of and participation in a virtual network of 'Centres of Excellence' in the area of food authenticity.

The Elliott Review

Professor Chris Elliott published his final report on the 'Review into the Integrity and Assurance of Food Supply Networks'[55] on 4 September 2014. Part of recommendation 4 of Professor Elliott's report is about the capability of laboratory services. It highlights the need for a resilient, sustainable laboratory service in the area of food authenticity which uses standardised, tested approaches. It recommends a coherent and coordinated approach covering the range of techniques used in authenticity testing. Recognising that no one organisation will be equipped with all the necessary expertise in all areas it proposes the creation of 'Centres of Excellence' to cover the different disciplines and techniques involved, and which would be brought together as a virtual network.

Centres of Excellence

[55] https://www.gov.uk/government/news/consumer-confidence-to-be-strengthened-through-new-food-crime-unit

The Government has accepted the recommendations in the Elliott report. Defra and the Food Standards Agency (FSA) are considering what role a network of 'Centres of Excellence' can play in helping fulfil the Government's goals of preventing food fraud and ensuring a resilient network of food analytical laboratories.

It is envisaged that a network of Centres of Excellence could work together under the auspices of the Authenticity Steering Group (ASG)[56]. The ASG would continue to provide the overall strategic direction for the Food Authenticity research programme. The network of Centres of Excellence would bring together the UK laboratories with expertise in this area, in particular to ensure dissemination of information on methods, Standard Operating Procedures and best measurement practice, and to support knowledge transfer activity.

It is envisaged that participation in the network would be on a voluntary basis. Membership will need to reflect the emerging needs and capabilities for authenticity testing and would be sufficiently flexible to allow organisations to join or leave the network as circumstances change. The network would cover the range of key analytical techniques and approaches used for authenticating foods, e.g. genomics, proteomics, stable isotope ratio analysis, spectroscopy, immunoassay. This network would make the most efficient and effective use of each laboratory's individual capabilities. In addition bodies representing enforcement authorities, public analysts and others such as the Royal Society of Chemistry's Analytical Methods Committee could also have a role in contributing to the network.

Expressions of interest

As a first step in establishing a network **we are seeking expressions of interest from organisations which see themselves being one of the Centres of Excellence; and views on how the network should operate.**

Coordination Role

It is envisaged that for the network to operate effectively, it would need to be coordinated in order to bring the participating centres together and promote dissemination of information. Our initial view is that this coordination role would probably work best outside Government and might be performed by one of the Centres of Excellence or by a separate organisation. Annex A attached to this letter contains further background on the network and what might be involved.

The role would involve leading on dissemination of information about the technical and practical approaches to food authenticity testing across the disciplines. The ASG and its sub groups would continue to govern the programme's strategic direction and method development. The coordinator might also be expected to provide an oversight and advice role on the practicalities around testing methods, working with the Authenticity Steering Group, to ensure the UK's capabilities in food authenticity are maintained and further

[56] The Food Authenticity Steering Group (ASG) provides strategic direction on the Government's Food Authenticity Programme identifying emerging issues in food authenticity and gaps in testing methodology.

developed. We envisage a web portal to ensure dissemination of methods to enforcers and industry and which could act as a conduit for advice between testing organisations on standardisation and best practice. We expect there will be a limited amount of funding available to support an organisation's set up costs in the role in 2015.

Candidates for the role will need to have sufficient capability and expertise to coordinate and support a virtual network and bring together the various disciplines involved in authenticity testing. **Ideally it will therefore already be recognised as an authority in the field of authenticity with capabilities already covering a range of disciplines used in authenticity testing.** We plan to conduct a limited tender exercise for this role by the end of the year based on responses to this letter. Organisations invited to tender will be those who have demonstrated that they have the capability, knowledge and expertise in the food authenticity area.

Questions

The paragraphs above set out our initial thinking, but this is still at an early stage and Defra and FSA would welcome your views. We would particularly welcome your views on the following:

3. **Do you support the creation of a network of Centres of Excellence for food authenticity testing? Please explain your reasoning?**

4. **Would your organisation be interested in participating as a "Centre of Excellence" and if so please state why you would be suitable (in terms of expertise, capability, experience) and for which disciplines?**

5. **Do agree there is a need for a coordinating role? Please explain your reasoning.**

6. **Would your organisation be interested and have the capability to take on a leading coordinating role for the virtual network of Centres of Excellence? Please supply brief details of your suitability as a coordinator**

7. **How do you see this coordination role working in order to ensure a successful network of Centres which delivers a standardised approach to methods and testing?**

8. **We would be interested in any further views around alternative options to a virtual network and improving coordination of food authenticity testing.**

Next steps

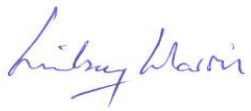
Responses to this exercise will help further inform our thinking and we will consider any expressions of interest to be a 'Centre of Excellence' and part of a virtual network. We will be in touch further to clarify and validate areas of expertise and roles later in the autumn.

We will conduct a limited tender exercise for the coordinating role later this autumn based on the responses received to this letter. Respondents will be contracted directly.

I would be grateful if you could send your responses, by email, to Dr Michelle McQuillan, by **31 October 2014**. Email: michelle.mcquillan@defra.gsi.gov.uk Tel: 0207 238 4352.

If you wish to discuss any aspects of this letter further then please contact either Michelle or me.

Yours sincerely,



Lindsay Harris

Deputy Director, Food Security and Food Standards

Interested Parties

- Defra Programme Advisor
- ABP Beef
- BRC
- BHA
- BMPA
- BSDA
- Campden BRI
- Eurofins
- FDF
- Fera
- Food Forensics
- Genon Labs

- Institute of Food Research
- Laboratory of the Government Chemist
- Leatherhead Food RA
- Longhand Data
- Minerva Scientific
- Nottingham Trent University
- Queens University Belfast
- Premier Foods
- Royal Holloway University of London
- Royal Zoological Society of Scotland
- Salford University
- Trace Network
- University of East Anglia
- Waitrose
- Which
- Mark Woolfe
- David Hammond

Government

- All UK Public Analysts Laboratories
- Local Authorities
- CIEH
- Innovate UK
- FSA HQ and Scotland Wales and Northern Ireland
- DH
- PHE

Annex 9a - A virtual network of 'Centres of Excellence' for food authenticity testing

Background Note

The final report of the Elliott Review into the Integrity and Assurance of Food Supply Networks[57], published on 4 September 2014, sets out several recommendations about the need for continued access to resilient, sustainable laboratory services that use standardised, validated approaches.

Recommendation 4 concerns:

Facilitating work to standardise the approaches used by the laboratory community testing for food authenticity and

Working with interested parties to develop Centres of Excellence and creating a framework for standardising authenticity testing.

Authenticity Steering Group (ASG)

The strategic direction and outputs from the Government's current Food Authenticity Programme are governed by two independent expert groups. The Authenticity Steering Group (ASG) is composed of representatives from the food industry, consumers, port health, trading standards, the analytical community, and led jointly by Defra and the FSA. This group sets the research priorities for the Government's food authenticity programme based on horizon scanning, market intelligence and assessment of the science capability and evidence base. The Authenticity Methods Working Group (AMWG) is composed principally of expert analytical scientists, but also includes technical representatives from the food industry, enforcement bodies, FSA and Defra. AMWG steers and challenges research and method development from conception and reviews the technical output from projects to ensure methods developed are fit for purpose prior to publication. It also advises on generic analytical methodology issues.

Standardisation of approach in food authenticity testing

The Elliott review recognises the role for the Food Authenticity Steering Group (ASG) and others in developing standardised methodological approaches and encourages them to continue with this work. The Technical Subgroup (TSG) of the Food Authenticity programme's Authenticity Methods Working Group is looking at this in more detail and

[57] https://www.gov.uk/government/news/consumer-confidence-to-be-strengthened-through-new-food-crime-unit

aims to report its recommendations to the ASG before the end of the year. The issues it is looking at include:

Fit for purpose robust methods, measurement uncertainty, performance criteria and good measurement practice;

Updating and reviewing existing methods and guidance.

- Maximising ways to disseminate agreed approaches to enforcers and industry.

- Guidance on standardising food authenticity sampling for enforcers and industry which can impact on the reliability of analysis.

- Capability and expertise.

Virtual laboratory Network – Centres of Excellence

Food authenticity testing is currently carried out across a range of laboratories and organisations with very different fields of expertise. Professor Elliott points out that "no single institution in the UK could field the complete range of such techniques with the required expertise." The review recommends that to future proof regulation of food authenticity there should be a virtual network of laboratory "Centres of Excellence" co-ordinated by the Food Authenticity Steering Group, (and advised by its Analytical Methods and Technical Sub Groups). This would ensure the UK can make the most effective and efficient use of each laboratory's individual capabilities. It also would facilitate adaptation to the changing needs of regulators and fast track development of new scientific approaches to particular problems. Proactive co-operation between 'Centres of Excellence' will demonstrate the UK's potential as a world leader in food authenticity methodologies and testing.

Figure 1 of the Elliott Review (attached at end) provides a possible structure for an "Authenticity Assurance Network" and illustrates how a virtual network of "Centres of Excellence" might fit into the overall assurance network. The 'Centres of Excellence' virtual network would need to cover the key methodologies used in food authenticity testing. It would also need to involve key bodies from both the private and public sector with an interest in food authenticity including academia, enforcement laboratories and professional bodies such as the Royal Society of Chemistry's Analytical Methods Committee.

Several key technologies exist in the 'authenticity toolbox' which exploit properties of elements, chemicals/metabolites and biological molecules to verify foods in terms of provenance, production, quality and composition. It is likely that "Centres of Excellence" would cover the 'analytical tool box', that is currently available for verification of authenticity:

- Genomics, including all forms of PCR

- Mass spectrometry
- Spectroscopy and other physical methods
- Microscopy
- Immunoassay including ELISA, Western Blotting
- Proteomics
- Metabolomics
- Chemical analysis including stable isotope ratio and trace element analysis
- Other emerging techniques as deemed appropriate.

An informal network of laboratories carrying out authenticity testing already exists but a more formalised virtual coordinated network of laboratories would provide the breadth of knowledge and research capability needed for food authenticity testing, surveillance, enforcement and incident response. It is envisaged that the virtual network would report through the ASG and AMWG.

The virtual network would be flexible but based around a central core of nominated experts within the 'Centres of Excellence'. Membership would be a reflection of the current and emerging issues in the areas of food authenticity testing. It would be demand driven and work to an agreed standardised framework developed by AMWG. It is also envisaged that the network would provide a challenge function to ensure labs are operating within a standardised framework and to maintain capability.

Coordination of the Network of Centres of Excellence.

It is envisaged that in order for the network to work to its strengths one organisation or body could coordinate the network, reporting to ASG. The coordinator could also act as a knowledge hub aiding dissemination of information, standard operating procedures and knowledge transfer. Creation of a web portal or platform to promote discussion of issues and ensure efficient dissemination could also be a role for the coordinator.

We expect to provide a limited amount of start-up funding to support this coordination role but the role in itself will have some reputational benefits for an organisation undertaking it. The role would start from April 2015 and we envisage this would be piloted for an initial period of 2 years.

Next steps

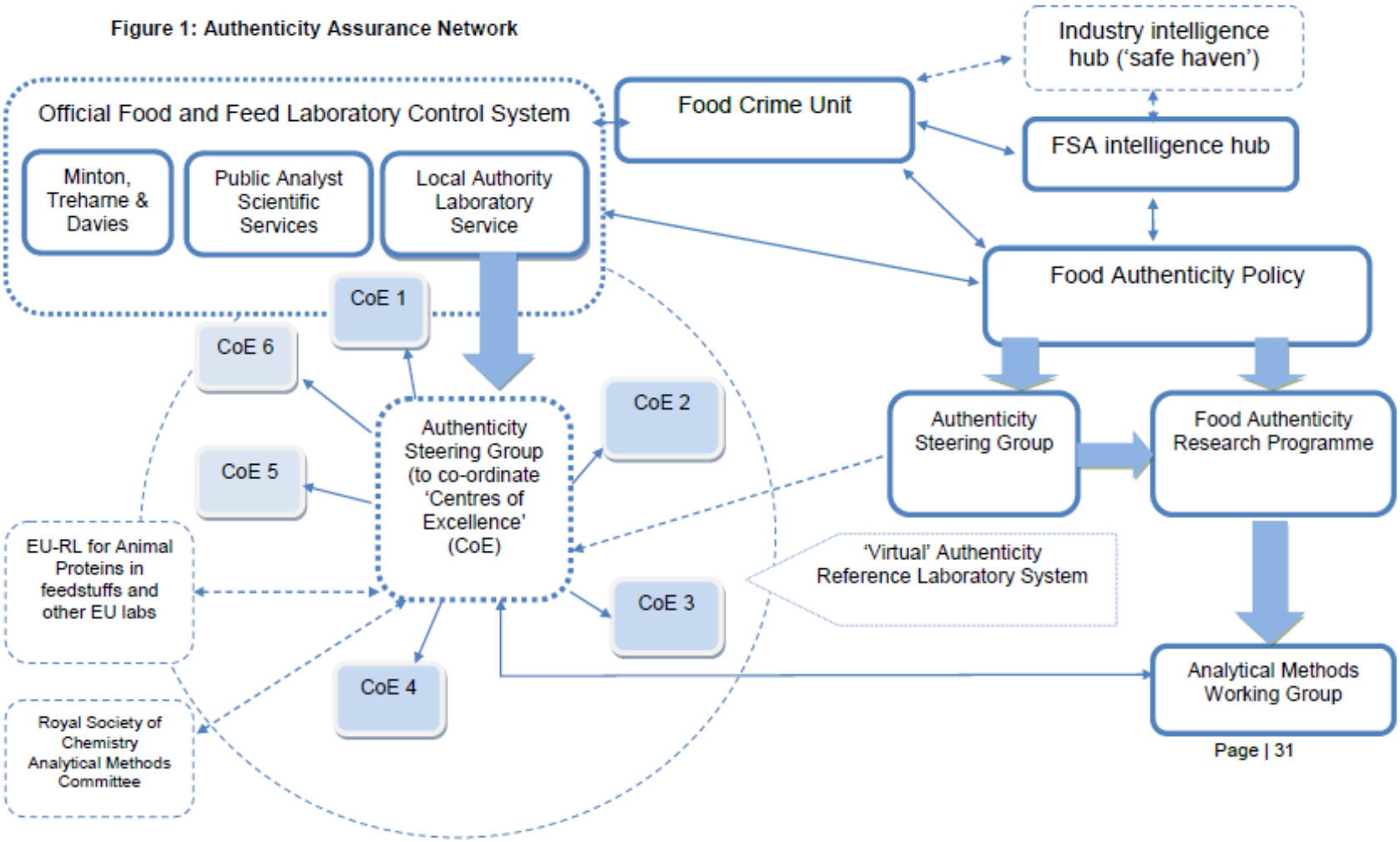
Responses and expressions of interest are requested by 31 October 2014.

Defra and FSA will review the responses and expressions of interest to participate as a ‘Centre of Excellence’. We will contact with those who wish to participate to clarify details of next steps by end of October 2014.

Defra, in partnership with FSA, will consider carrying out a Limited Tender exercise (based on responses to the expression of interest) for the coordination role for the virtual network of laboratories and ‘Centres of Excellence’ in the autumn.

Defra will use the information provided in response to our letter to inform its thinking around the development of the network. It will also assist the TSG led work on testing standardisation aspects in response to Elliott’s Recommendation 4. This work will report formally by the end of 2014.

Figure 1: Authenticity Assurance Network



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