Preventing miscarriages of justice

APHA AGM & Port Health Training Day - 14 November 2024

Selvarani Elahi, Deputy Government Chemist

Contents

The Government Chemist

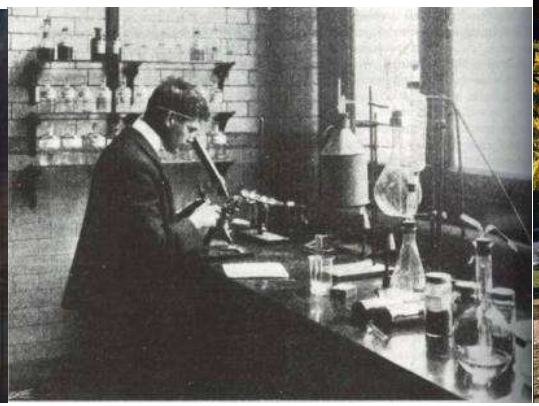
George Phillips 1842-1874

Julian Braybrook

Government Chemist

Selvarani Elahi

Deputy Government Chemist



1875 – Sale of Food and Drugs Act

Sale of Food and Drugs Act 1875

Food Safety Act 1990

The duties of the Government Chemist as referee analyst are defined in or under:

Food Safety Act 1990	Rheoliadau Deunyddiau ac Eitemau mewn Cysylltiad â Bwyd (Cymru) 2012
Food Safety (Sampling and Qualifications) Regulations 2013	Materials and Articles in Contact with Food (Northern Ireland) Regulations 2012
Food Safety (Sampling and Qualifications) (Scotland) Regulations 2013	Agriculture Act 1970
Food (Northern Ireland) Order 1989	The Animal Feed (Hygiene, Sampling etc. and Enforcement) (England) Regulations 2015
Food Safety (Northern Ireland) Order 1991	The Animal Feed (Hygiene, Sampling etc. and Enforcement) (Wales) Regulations 2016
Food Safety (Sampling and Qualifications) Regulations (Northern Ireland) 2013	Rheoliadau Bwyd Anifeiliaid (Hylendid, Samplu etc. a Gorfodi) (Cymru) 2016
Food Safety (Sampling and Qualifications) Regulations (Wales) 2013	The Animal Feed (Hygiene, Sampling etc. and Enforcement) Regulations (Northern Ireland) 2016
Rheoliadau Diogelwch Bwyd (Samplu a Chymwysterau) (Cymru) 2013	

www.gov.uk/government/organisations/government-chemist

Government Chemist

Legislation review with developments in food and feed law

March 2024

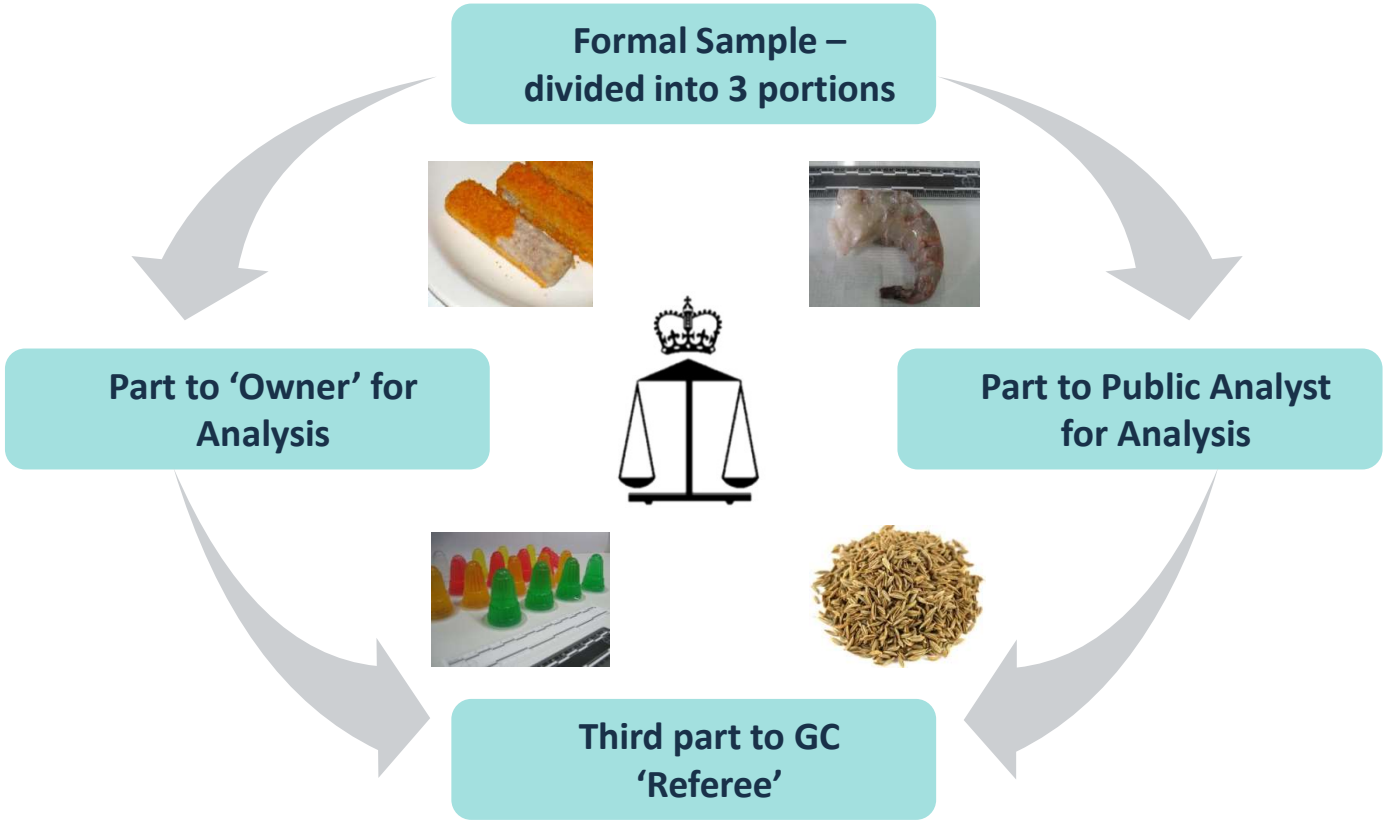
Two Roles

1. As an **independent referee analyst** resolving disputes that occur in relation to certain legislation, and

2. As an **advisor to the public sector and the wider analytical community**, where there are measurement science implications of existing and proposed legislation, standards and policy.

Government Chemist Referee Function

Referee Samples



- Sample taken
- Analysis (Public Analyst)
- Grounds for dispute
- Refer to Government Chemist
- The Courts …

Regulated ---------- Government Chemist ---------- Regulator

Why does referee analysis take so long?

1. **Decision to accept (is there a dispute?)**
2. **Fee / funding**
3. **Schedule work**
4. **Check legislation**
5. **Identify appropriate methodology**
6. **Method trialled**
7. **Experimental design:**
   - Minimum replicates 3 x 3 days
   - CRM's, RM's, spikes
   - Witnessed
8. **More than one technique**
9. **Transcriptions checked**
10. **Results reviewed**
    - Interpretation
    - Statistical analysis
11. **More analysis?**
12. **Certificate**
    - Reviewed and independently checked
    - Fit for purpose?
    - Issued to all parties

NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

LGC

GMO's in rice products from China

- **China (Restriction on First Placing on the Market) (England) Regulations 2008**
  - Implement in England Commission Implementing Decision 2011/884/EU
- **Define specified rice products**
- **Permit the placing on the market such products only if they are compliant with assimilated EU law**
- **Non-compliant if a genetically modified element is detectable**
  - Target CaMV 35S, t-NOS and Cry 1Ab/Ac
- **Specified methods of analysis supported by EURL guidance**
  - GMO rice: testing on behalf of the importer sometimes fails to follow appropriate guidance

NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

LGC

Typical analysis plan for a rice product

1. 10 retail packs (250g each) received, each with 3 bundles of noodles
2. Packs randomly divided into 3
3. For each sub-sample all packs opened and bundles mixed.
   - Air dry if necessary
4. 2 bundles randomly selected (~160g) and homogenised
5. 2 x 100mg taken from each sub-sample
6. DNA extracted on different days
7. Subjected to PCR
8. QC to include BT11 maize, MON 810 maize, LL rice (LL 62), and wild type rice

Summary outcome of GMO cases

Product	PA result	GC result	Outcome
Instant rice meal	Cry1Ab/Ac detected	GMO ND*	Compliant
Rice noodles	Cry1Ab/Ac detected	Cry1Ab/Ac detected	Non-compliant
Rice noodles	Cry1Ab/Ac detected	GMO ND*	Compliant
Rice cakes	Cry1Ab/Ac detected	GMO ND*	Compliant
Short grain rice	**CaMV 35S detected**	**T-NOS detected**	**Non-compliant**
Vermicelli	Cry1Ab/Ac detected	Cry1Ab/Ac detected	Non-compliant
Round grain rice	t-NOS and CaMV 35S detected	t-NOS and Ca MV 35S detected	Non-compliant
Rice balls	Cry1Ab/Ac detected	Cry1Ab/Ac detected	Non-compliant
Rice cakes	CaMV 35S detected	GMO ND*	Compliant

*ND = CaMV 35S, t-NOS or Cry1Ab/Ac not detected

NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

LGC

GC Guidance Published

Guidance

Detection of genetically modified rice at the UK border - advice

Advice note prepared by Dr Michael Walker on behalf of the Government Chemist, regarding the detection of genetically modified rice at the UK border

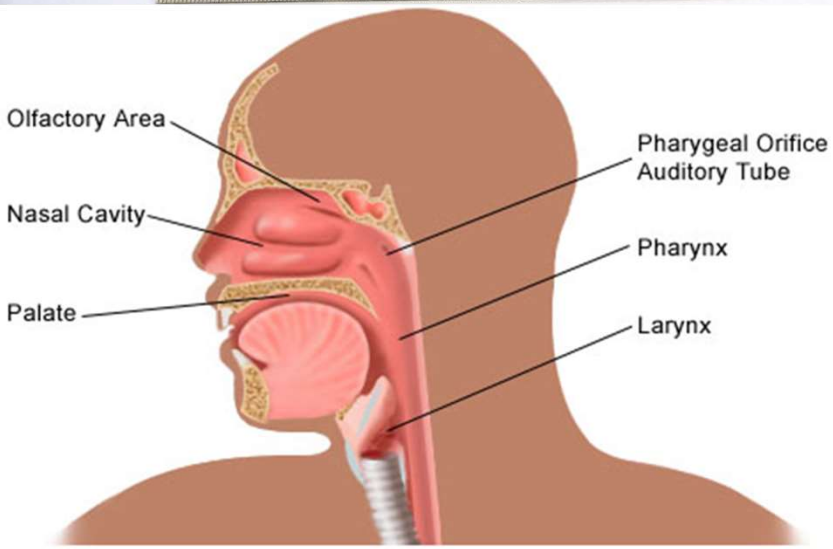
From: Government Chemist

Published 10 July 2020

www.gov.uk/government/publications/detection-of-genetically-modified-rice-at-the-uk-border-advice

Jelly mini-cups – Choking hazard

- UK 2003
  - 8 month old boy died
- Japan 1994 - 2008
  - 22 deaths linked to jelly mini-cups containing konjac between 2002- 2008
  - 32 cases of choking accidents between 1994-2008
- USA 1995 – 2008
  - Six children died from choking on mini-cup jelly
- Korea 2001 – 2007
  - Five Korean children choked on mini-cup jelly, 3 died



Legal definition

- **Part E of Annex II of Regulation 1333/2008**

  "The substances listed under numbers E 400, E 401, E 402, E 403, E 404, E 406, E 407, 407a, E 410, E 412, E 413, E 414, E 415, E 417, E 418, E 425 and E 440 may not be used in jelly mini-cups, defined, for the purpose of this Regulation, as jelly confectionery of a firm consistence, contained in semi rigid mini-cups or mini-capsules, intended to be ingested in a single bite by exerting pressure on the mini-cups or mini-capsule to project the confectionery into the mouth; E 410, E 412, E 415 E 417 may not be used to produce dehydrated foods intended to rehydrate on ingestion. E425 may not be used in jelly confectionery."

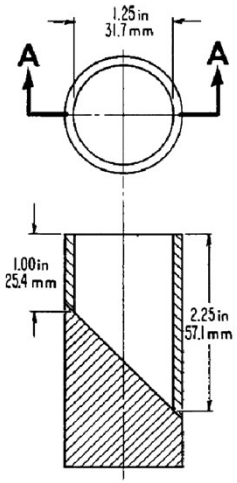
- **Legal uncertainty: Firm consistency, Semi-rigid, Single bite, Pressure**
- **What dimensions and forces could contribute to the risk of choking?**
- **Size, solubility, compression, accessibility and penetration of the jelly mini-cup**
- **Young children at most risk**
- **Fatal accidents involving toy and childcare products**
  - **Standards**
  - **Legislation**
  - **Risk based anthropometric data**

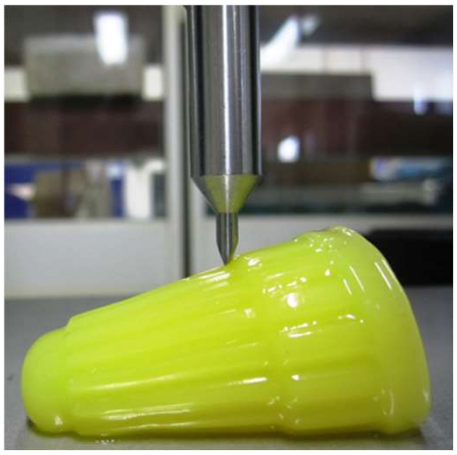
NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

LGC

GC Experiments

1. Size
2. Solubility
3. Compression
4. Accessibility
5. Penetration





Example opinion

- The jelly confectionery in the referee sample exhibits considerable variation from item to item.
- Some items clearly do not fall within the regulatory definition of a ‘jelly mini-cup’ because they have very little structural strength.
- For others it is at least questionable if they satisfy the definition owing to the ease with which they can be broken up.
- However, the majority of items (60 % of those examined) conform to the Regulation (EC) No 1333/2008 definition of jelly mini-cup and by their labelling contain additives, agar (E406) and locust bean gum E410, the use of which is prohibited in jelly mini-cups.
- Hence the products do not comply with Regulation (EC) No 1333/2008 implemented in England by the Food Additives, Flavourings, Enzymes and Extraction Solvents (England) Regulations 2013.

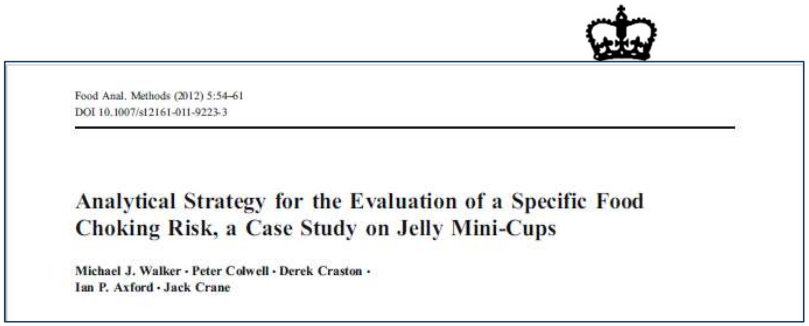
NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

LGC

GC Guidance

- **Publication**

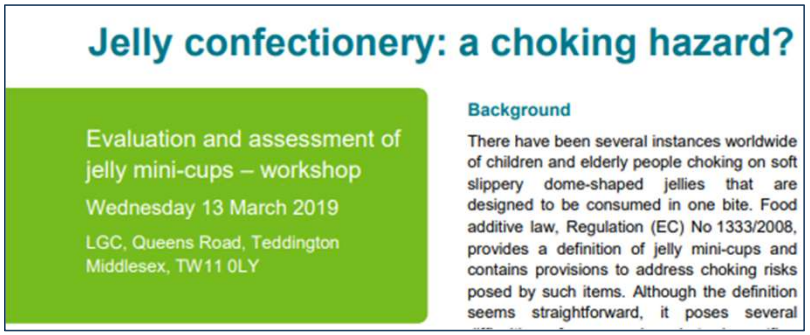
  Analytical Strategy for the Evaluation of a Specific Food Choking Risk, a Case Study on Jelly Mini-Cups. DOI http://dx.doi.org/10.1007/s12161-011-9223-3


Food Anal. Methods (2012) 5:54–61
DOI 10.1007/s12161-011-9223-3

Analytical Strategy for the Evaluation of a Specific Food Choking Risk, a Case Study on Jelly Mini-Cups

Michael J. Walker · Peter Colwell · Derek Craston · Ian P. Axford · Jack Crane

- **Training Workshop**
  - Regulators & FBOs
  - Jelly confectionery laboratory checklist: https://assets.publishing.service.gov.uk/media/5efcd71ed3bf7f768e27c64f/Jelly_confectionery_checklist.pdf



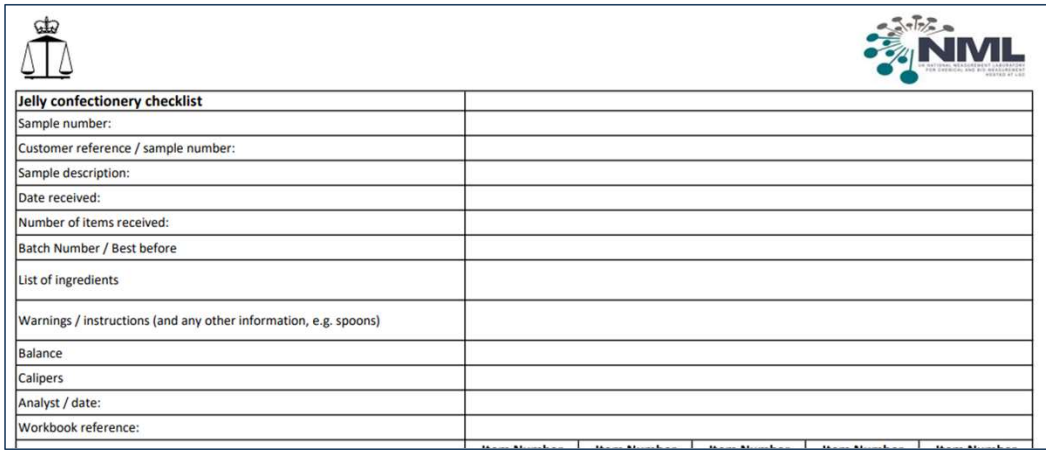
- **GC Website**


News story

Update: assessment and evaluation of jelly mini-cups.

An update on the work of the Government Chemist assessing the conformity of jelly mini-cup confectionary products.

From: Government Chemist
Published 16 August 2023

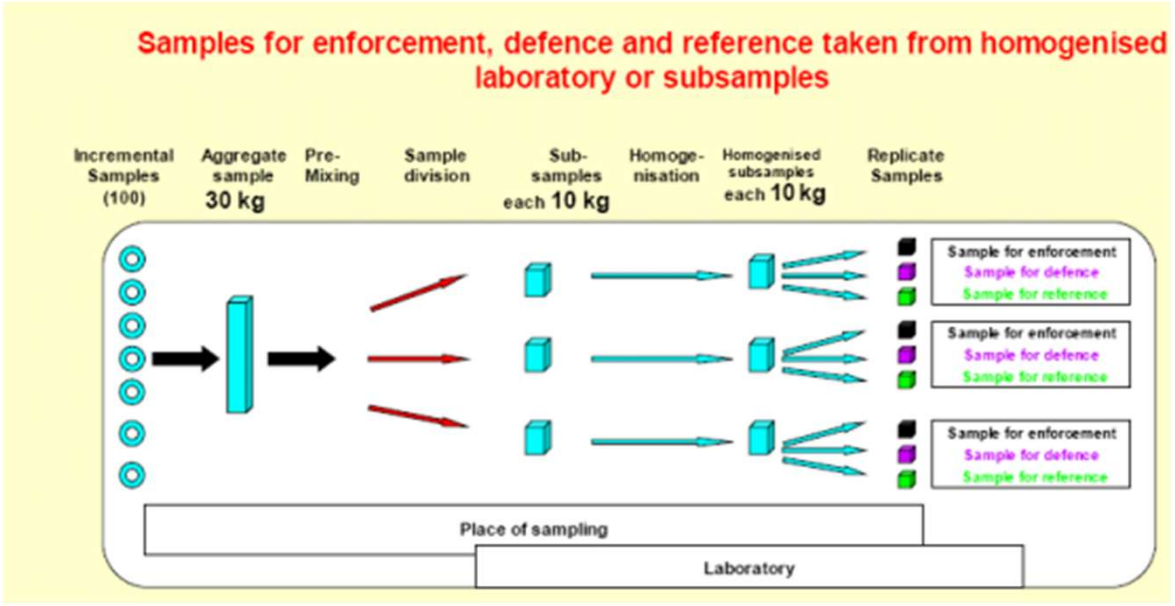


Jelly confectionery checklist	
Sample number:	
Customer reference / sample number:	
Sample description:	
Date received:	
Number of items received:	
Batch Number / Best before	
List of ingredients	
Warnings / instructions (and any other information, e.g. spoons)	
Balance	
Calipers	
Analyst / date:	
Workbook reference:	

Why cases get referred to the GC - Scientific

1. **Difficult cases**
   - Complex analysis
   - Results close to legislative limit
   - Legislation difficult to interpret
2. **Inadequate**
   - Method of analysis chosen
   - Application of a method
   - Interpretation if results.
3. **Nature springs a surprise e.g. almond or mahaleb in spices**
4. **Poor reporting practice (allergens…)**
5. **Inadequate bioinformatics – squid (but also plant allergens …)**
6. **Incorrect analysis performed by FBO, e.g. rice from China**
7. **Inadequate planning for sampling - allergens**

8. Incorrect sampling / Inadequate application method e.g. Mycotoxins

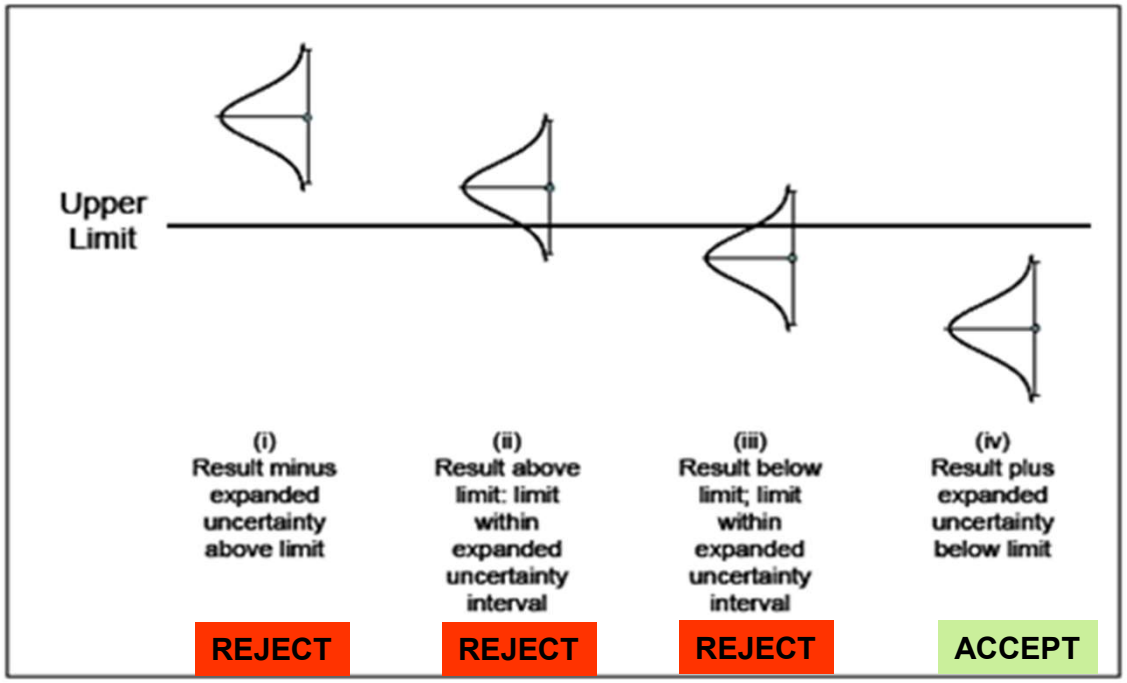


Walker, Colwell, Cowen, Ellison, Gray, Elahi et al., 2017, Aflatoxins in Groundnuts – Assessment of the Effectiveness of EU Sampling and UK Enforcement Sample Preparation Procedures, J Assoc Public Analysts, 45, 1 – 22

Why cases get referred to the GC - Scientific

9. Inadequate interpretation, e.g. Mycotoxins

REJECT



ACCEPT

Why cases don't make it to the GC

1. **There is no evidence of a technical dispute**
2. **Incorrect analysis requested by FBO – not accepted by GC**
3. **FBO portion not analysed**
4. **FBO portion lost or disposed of**
5. **Loss of chain of custody of sample:**
   - Poor labelling
   - No labelling
   - No paperwork with sample to indicate that it is a formal sample.
   - Insufficient communication between parties.
6. **Government Chemist can advise**

https://www.gov.uk/government/organisations/government-chemist

Government Chemist Advisory Function

GC Advisory Function

- **1872 – GC gave evidence to the Select Committee on the Adulteration of Food Act**
- **1894 – 1909:**
  - **Increased requests for committee work**
  - **Reflected increased concern of effect of chemicals on environment**
- **1901 – GC (Sir Thorpe) contributed to technical reports, e.g.:**
  - **Lead from pottery**
  - **Phosphorous from matches**
- **Government Chemist today:**
  - **Acts as advisor to Government & wider stakeholders**
  - **National & international expert committees**

- Association of Public Analysts (APA) Training Committee
- Authenticity Methods Working Group (AMWG)
- Authenticity Steering Group (ASG)
- British Standards Institute Committee AW/275 - Food analysis - Horizontal methods
- British Standards Institute Committee AW/9 – Microbiology
- British Standards Institute Committee AW/10 - Animal feeding stuffs
- British Standards Institute Committee AW/34 – Food Authenticity
- British Standards Institute Committee AW/307 – Oilseeds, animal and vegetable fats and oils and their by-products
- CEN TC 460 - Food Authenticity Technical Committee, Plenary & Working Groups
- Codex Committee on Methods of Sampling and Analysis (CCMAS)
- European Network of GMO Laboratories (ENGL): Plenary meetings
- European Network of Food Allergen Detection Laboratories (ENFADL
- Food Law Group
- Food Standards and Labelling Focus Group
- Hazardous Substances Advisory Committee (HSAC)
- Institute of Food Science and Technology (IFST) Science Committee
- Nanomaterials Environment and Health Industry Group (NEHIG)
- Nanomaterials Environment and Health Government Group (NEHGG)
- NNEdPro Strategic Advisory Committee
- Royal Society of Chemistry's (RSC) Analytical Methods Committee (AMC) Food and Feed Authenticity Expert Working Group
- Royal Society of Chemistry's (RSC) Food Group
- Trade Scheme Certification Body Impartiality Committee
- UK Chemicals Stakeholder Forum (UKCSF)
- NNEdPro Strategic Collaborative Partners Network
- CEN Food Authenticity Chair's Advisory Group (honey authenticity)
- Defra UK Food Security Report 2024 Expert Elicitation Group

Advice

- **Reactive advice**
  - Enquiries to Government Chemist mailbox or directly
- **Proactive publication of guidance:**
- **Advisory projects**
  - Honey authenticity
  - Weight of Evidence Toolkit
  - CBD

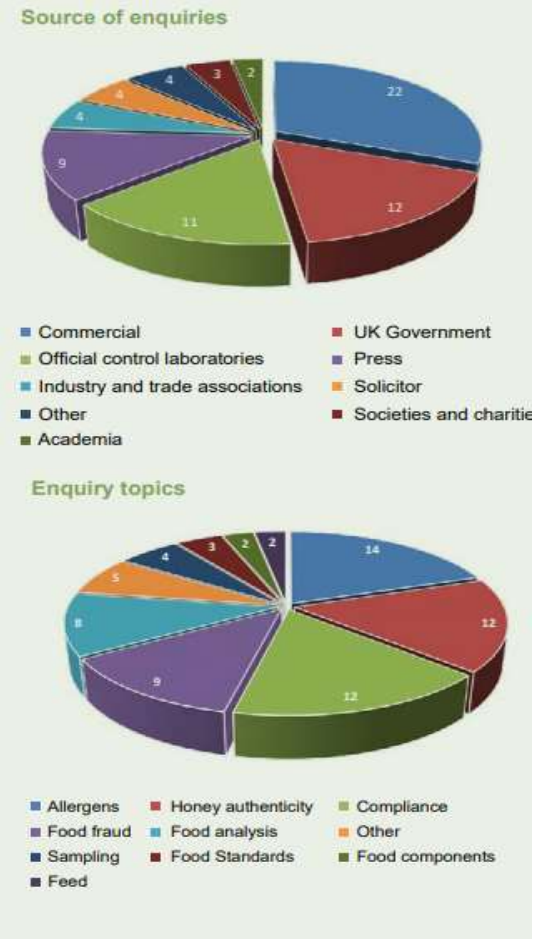
News story

A Weight of Evidence Toolkit for Food Authenticity Investigations

A Toolkit to Support Weight of Evidence Approaches for Food Authenticity Investigations published by Defra.

From: Government Chemist

Published 7 February 2024



Protocol for the Collection of Honey Reference Samples for the Construction of Authenticity Databases

October 2023

Department for Environment Food & Rural Affairs

Department for Science, Innovation & Technology

CBD in food and consumer products

- Cannabidiol (CBD) is a non-psychoactive cannabinoid present in the cannabis plant
- CBD containing food supplements and some cosmetics have become popula on high street & online
- CBD is not a controlled drug but during manufacturing, other cannabinoids and products, some of which are psycho-active, may co-extract
- CBD edible products now regulated as novel foods in the UK
- Accurate methods needed

International Intercomparison

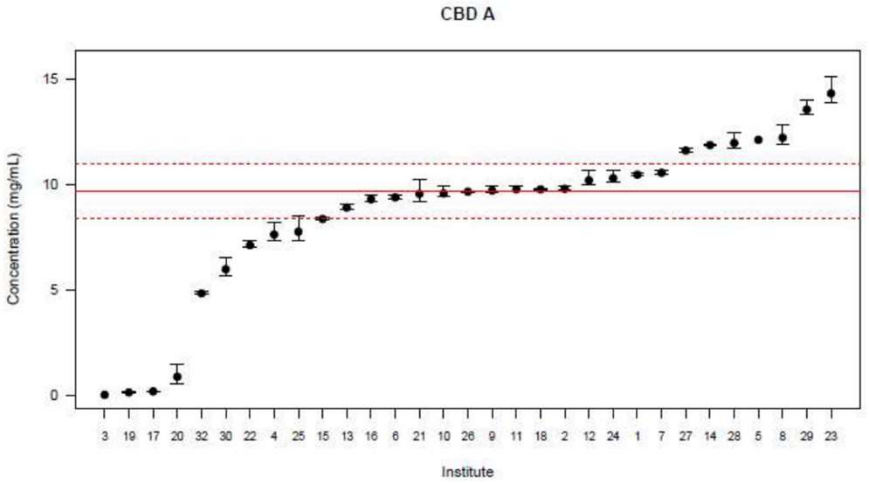


Figure 4. Calculated concentrations of CBD in LGC-RT/20/A by all participating laboratories. Error bars represent the standard uncertainty of the laboratories' replicate results.

Government Chemist contribution recognised as ACMD publishes advice on CBD products. Cannabidiol (CBD) is a non-psychoactive cannabinoid present in the cannabis plant (Cannabis sativa L) along with many other cannabinoids that may either exhibit psychoactive or non-psychoactive properties. 21 Jan 2022

PAOL CAPABILITY

Research and analysis

Government response to the ACMD's advice on consumer CBD products (accessible version)

Updated 24 October 2023

CB3: Methods for controlled cannabinoids

NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

LGC

Current GC Capability Building Project

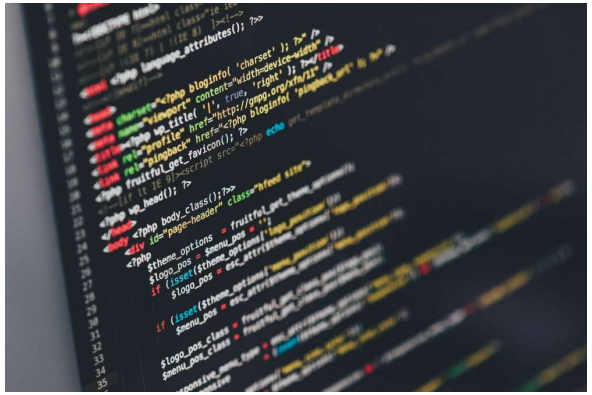
1. Comparative quantitative review of the sustainability of novel food production methods
2. Analysis of alternative proteins
3. CBD and controlled cannabinoids for novel foods and animal feed supplements
4. Enhancing capability for detection and quantitation of GMOs and gene edited (“precision bred”) products
5. NGS and supportive technologies to underpin food authenticity and safety
6. Measurement methods for microplastics in food
7. Trace measurement of allergens in non-dairy milk substitutes
8. Transportable Mass Spectrometry for food fraud
9. Novel contaminants from recycled and novel food packaging materials
10. Supporting Nutrition Security for One Health

NML UK NATIONAL MEASUREMENT LABORATORY FOR CHEMICAL AND BIO-MEASUREMENT HOSTED AT LGC

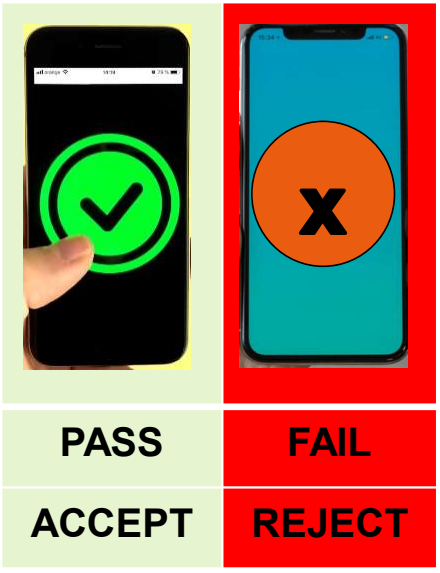
LGC

Point of Contact Testing

What do we want?



Minutes



PASS	FAIL
ACCEPT	REJECT

Point of Contact Testing

- **POC**
  - **Plethora of instruments/technologies**
  - **Bespoke applications & requirements - precludes universal adoption**
- **POC R&D projects**
  - Assessment of Point of Contact Testing Technologies to Verify Food Authenticity - FA0178: https://randd.defra.gov.uk/ProjectDetails?ProjectId=20202
  - Point of Contact (PoC) DNA testing using Loop Mediated Isothermal - FA0189: https://randd.defra.gov.uk/ProjectDetails?ProjectId=20782
  - Guidance for Point of Contact Technologies: https://webarchive.nationalarchives.gov.uk/ukgwa/20240802180348/https:/www.food.gov.uk/research/innovative-regulator/guidance-for-point-of-contact-technologies
  - Review of methods for the analysis of culinary herbs and spices for authenticity: https://webarchive.nationalarchives.gov.uk/ukgwa/20240803015825/https:/www.food.gov.uk/research/research-projects/review-of-methods-for-the-analysis-of-culinary-herbs-and-spices-for-authenticity
  - **GC Capability Building Projects**
- **"What unique role can the POC devices provide which is not already covered by well-established laboratory instrumentation?"**
- **Conclusions**
  - **One size does not fit all**
  - **Robust validation to demonstrate fitness for purpose**
  - **Fitness for purpose: AMWG, FSAI report, FAN resources etc.**

MinION™ (Oxford Nanopore Technologies)

MiSeq™ System (Illumina, Inc.)

Ion GeneStudio™ S5 (Thermo Fisher Scientific)

Point of Contact Testing

Uptake low due to a number of barriers:

- Expense - instrument cost, maintenance and servicing, test costs
- Analytical capabilities (e.g. specificity and analytical sensitivity)
- Availability of instrument / training / expertise
- Ease of use of the instrument
- Size, weight and portability
- Time to result
- Quantitative capability
- Food types
- Complexity of sample preparation, sample size and representativeness
- Results format and interpretation

Appropriate reference materials & databases

Recommendations to promote uptake of POC:

- Appropriate and accessible reference materials and curated/open-access databases
- Further involvement of regulatory authorities
  - guidance on sampling and results generation/interpretation
- Harmonised terminology
- Establishment of well-defined and independent method validation
- Evaluation of key performance characteristics
- Provision of Working Instructions, protocols and SOPs with context specific application to food sampling scenarios
- Increased availability of POC instrumentation, reduced size and improved sample testing time
- Training

Resources and Contacts

1. **Government Chemist website:** www.gov.uk/government/organisations/government-chemist
2. **Training Resources:** https://www.gov.uk/government/collections/knowledge-resources
3. **Submit a referee sample:** https://www.gov.uk/guidance/submit-a-referee-sample-to-the-government-chemist
4. **Submit a second expert opinion sample:** https://www.gov.uk/guidance/submit-a-supplementary-expert-opinion-sample
5. **Contact:** Kirstin.Gray@lgcgroup.com and **GC Enquiries:** Governmentchemist@lgcgroup.com
6. **The Food Authenticity Network**: https://www.foodauthenticity.global


achieving
question
feel
put
meeting
team
like
try
next
side
Put
list
look
exercise
easy
paper
similar
flip
help
responses
success
part
activity
chart
successful
targets
including
compare
working
Statement
personal
done
members
Success
Email
wall
everyone
different
know
answer
member
achieved
Ask
ask
criteria
task
achieve
progress
team's