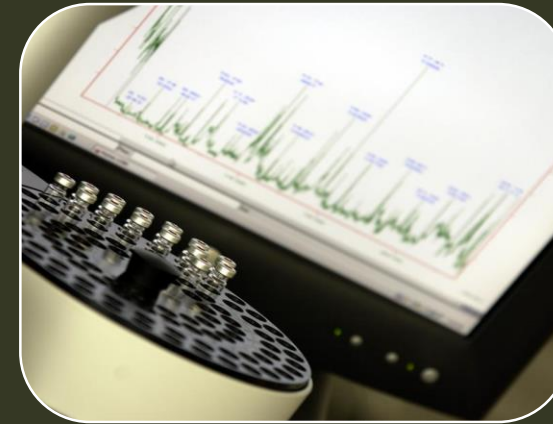


Food integrity scientific opinions



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To provide Europe with a state of the art and **integrated** capability for detecting fraud and **assuring** the integrity of the food chain

To provide a **sustainable** body of expertise that can inform high level stakeholder platforms on food fraud / authenticity issues and priorities

To **bridge** previous research activities, assess capability gaps, commission research and inform EU future research needs

ADDING VALUE TO THE EUROPEAN AGRI-FOOD ECONOMY BY PROVIDING FOOD SAFETY, AUTHENTICITY AND QUALITY ASSURANCE

WP1 The FoodIntegrity Network – Opinions

<http://www.foodintegrity.eu>

<https://doi.org/10.1016/j.foodcont.2019.05.021>

<https://doi.org/10.1016/j.tifs.2019.02.019>

<https://doi.org/10.1016/j.tifs.2019.07.035>

Topic No:	Topic Title:
1	Application of SIMRS for determining geographical origin in legal cases.
2	Role of analytical testing for food fraud risk mitigation – how much is enough?
3	What are the scientific challenges in moving from targeted to non-targeted methods for food fraud testing and how can they be addressed?
4	Multivariate Statistics: considerations and confidences in food authenticity.
5	Database development, use and curation.
6	Use of NMR applications to tackle future food fraud issues.

Definition

FOOD AUTHENTICITY

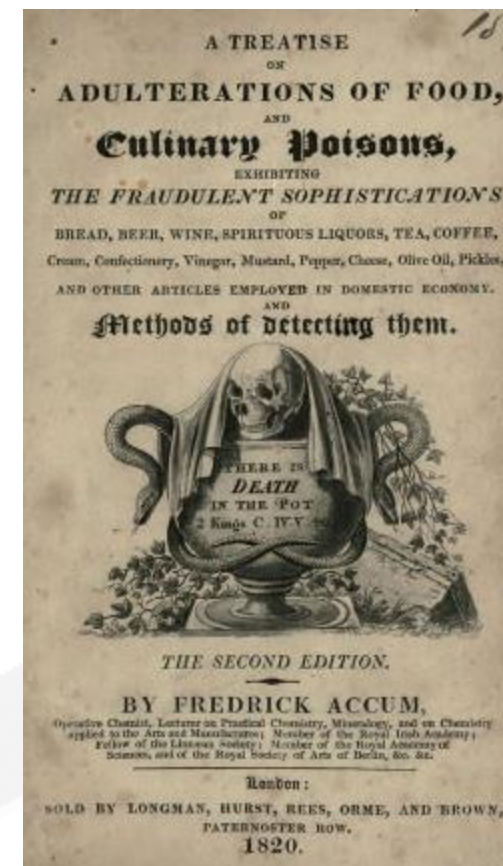
“FOOD AUTHENTICITY IS ABOUT ENSURING THAT FOOD OFFERED FOR SALE OR SOLD IS OF THE **NATURE, SUBSTANCE AND QUALITY** EXPECTED BY THE PURCHASER (SECTION 14 FOOD SAFETY ACT 1990).” *

FOOD FRAUD

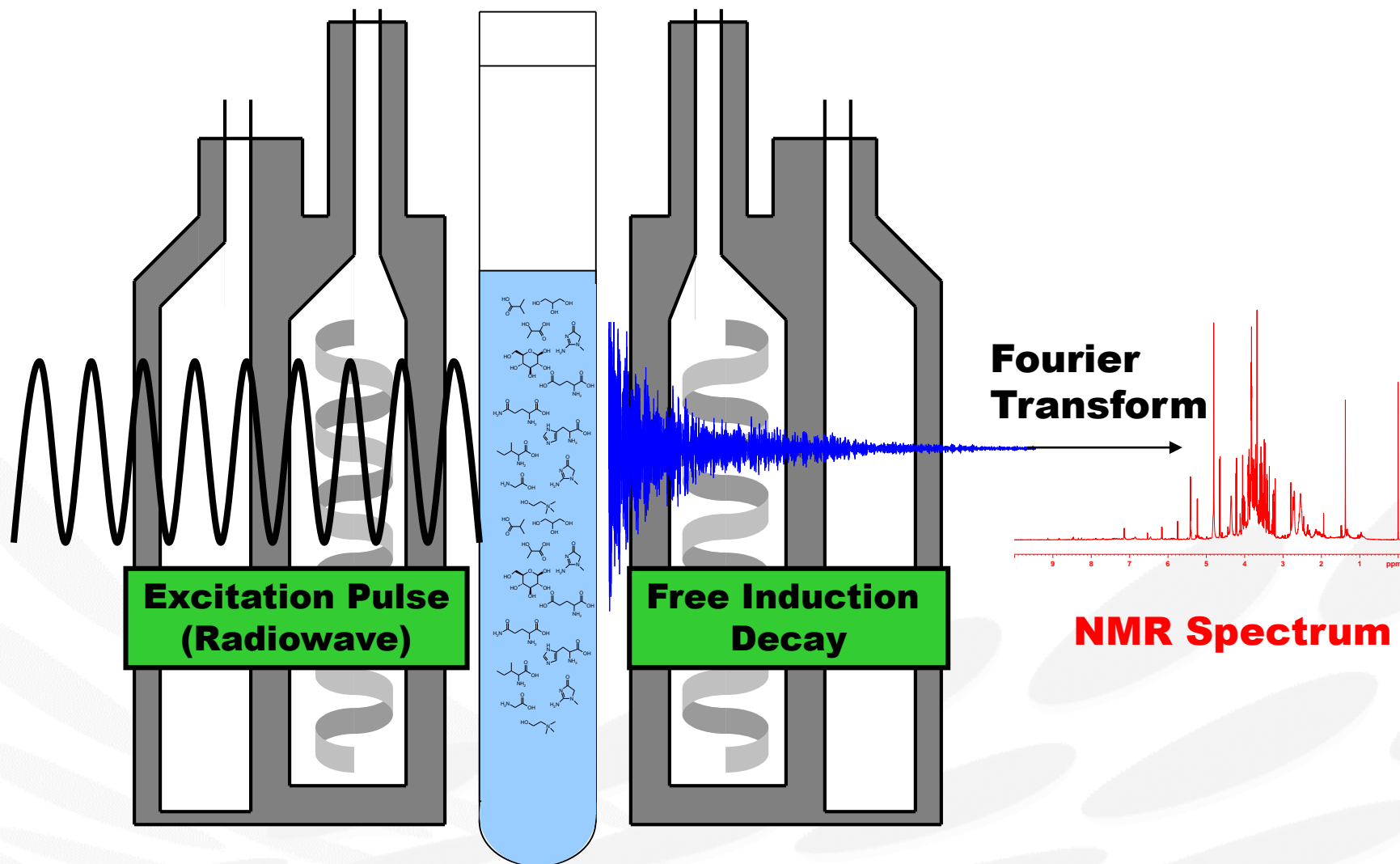
“DISHONEST ACT OR OMISSION, RELATING TO THE PRODUCTION OR SUPPLY OF FOOD, WHICH IS INTENDED FOR PERSONAL GAIN OR TO CAUSE LOSS TO ANOTHER PARTY” **

*Elliott Review into the Integrity and Assurance of Food Supply Networks – Final Report

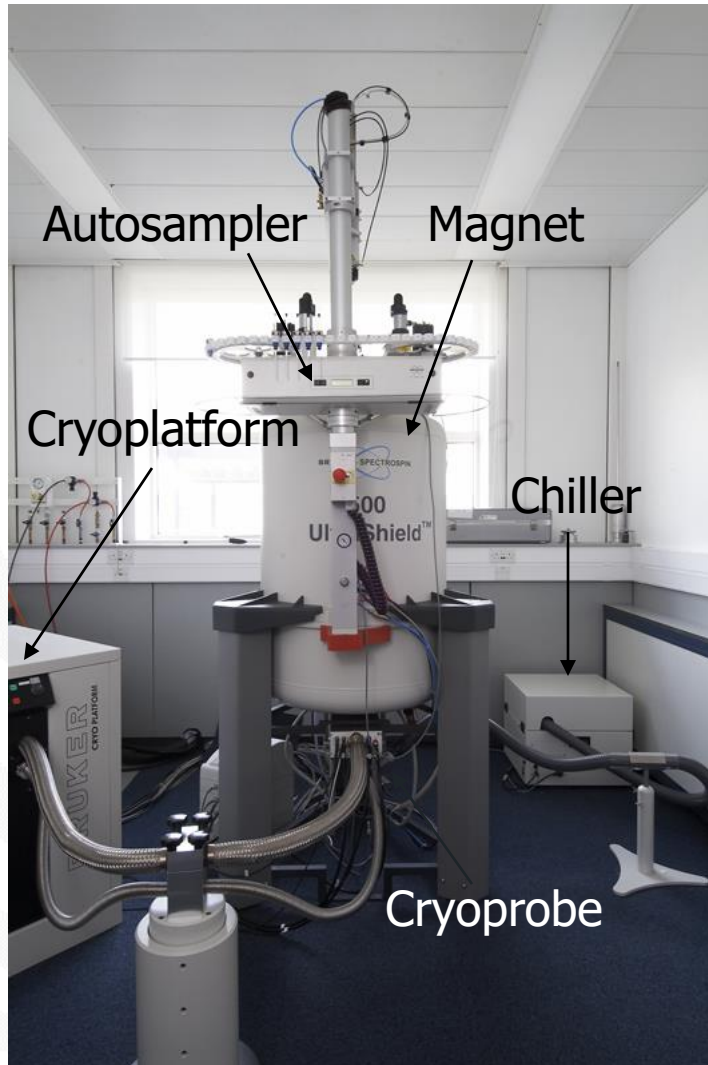
**PAS 96:2017 Guide to protecting and defending food and drink from deliberate attack



Nuclear Magnetic Resonance spectroscopy



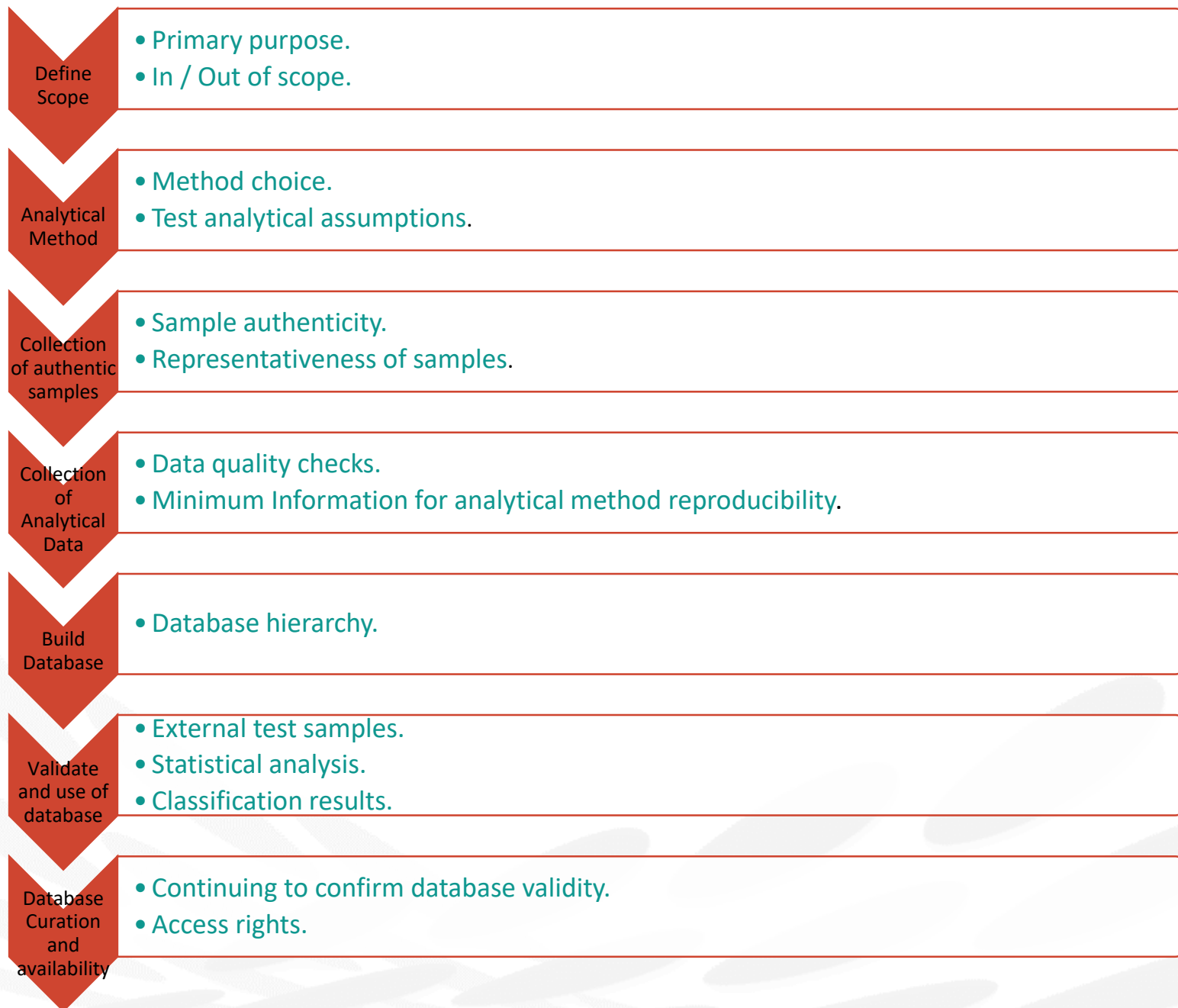
Nuclear Magnetic Resonance spectroscopy



- High throughput
- Unbiased
- Unique “virtual” separation
- Repeatable & Reproducible
- Identification of unknowns
 - Multinuclear chemical shifts
 - *J*-couplings
 - Peak intensities
 - NOE
 - Diffusion rate

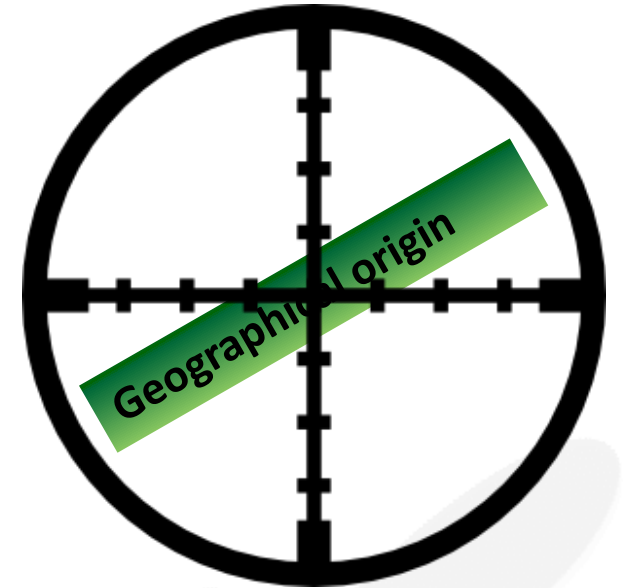
Definition – Food Authenticity Database

“ORGANISED COLLECTION OF **DATA**, ANALYSED WITH ESTABLISHED PROTOCOLS ACQUIRED FROM A REPRESENTATIVE NUMBER OF AUTHENTIC SAMPLES, WITH THE **PURPOSE OF DEFINING THE NATURAL VARIABILITY** OF SOME PARTICULAR, DEFINED, PROPERTIES OF A FOODSTUFF”



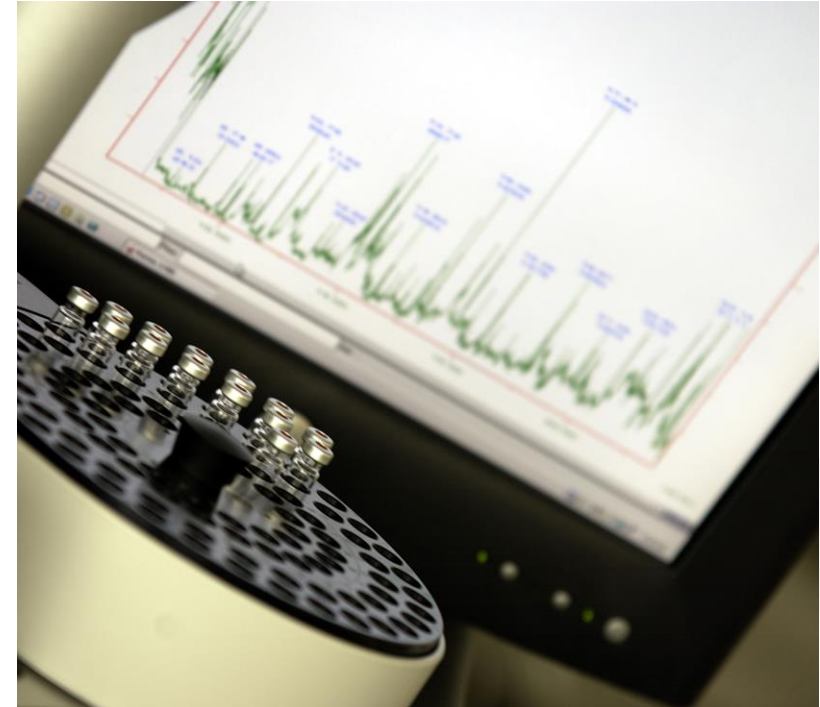
Scope of food authenticity database

- Purpose.
- Confirmation / forensic assessment.
- Scope defines sampling.
- Broad can lead to excessive sampling requirements.
- Sample metadata.



Method of Analysis

- Appropriate for scope.
- Targeted methods:
 - Accredited.
 - Proficiency testing.
 - Robust.
- Non-targeted methods:
 - Long term stability.
 - Transferability.
- Trial study.



Authentic Reference Material

- **Authentic.**
- “Authentically not authentic”.
- Representative.
- Metadata, collect and record what is appropriate.



Data Acquisition

- Minimum reporting information.
- Machine / method Repeatability.
- Randomly ordered analysis.
- Reference material.
- Time dependencies / sample storage.
- Precision.



Database Building

- Online / offline.
- Storage medium for underlying database.
- Volume of data.
- Archiving.
- Speed of entry and retrieval.
- Statistical analysis within database or external.



Validation and Application

- Univariate / multivariate.
- Multi / single class modelling.
- Externally blinded validation.
- 'Outliers' – rationalise or reduce scope.
- Reported classification rates.



Maintenance / Curation

- Librarian.
- Ensure validity over time.
- Protocols for usage and expansion of scope.
- Access rights to the data.



Conclusions

- NMR spectroscopy is a ideal tool for creating food authenticity databases
- Defined critical steps, starting with scope.
- Rationalised method of analysis.
- Relevant, authentic samples.
- Appropriate storage of data.
- Validation of the ability of the database to protect against food fraud.
- Once created, the database should be curated to ensure it remains valid.

Acknowledgements



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