The latest tools and strategies for fighting food fraud

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To be discussed

- What is food fraud?
- The need for a common language
- Latest developments
- Useful sources of information and links

What is food fraud?

- No global or agreed definition
- "Illegal intentional deception for economic gain using food" Spink et al 2017
- Other descriptions sub categories
  - Food crime, food adulteration, economically motivated food adulteration, substitution, addition, counterfeit etc.

Consumer attitudes to food fraud

- In many parts of the world = food safety risk
- In Europe = impact on product or consumer perceived attribute


PLOS ONE

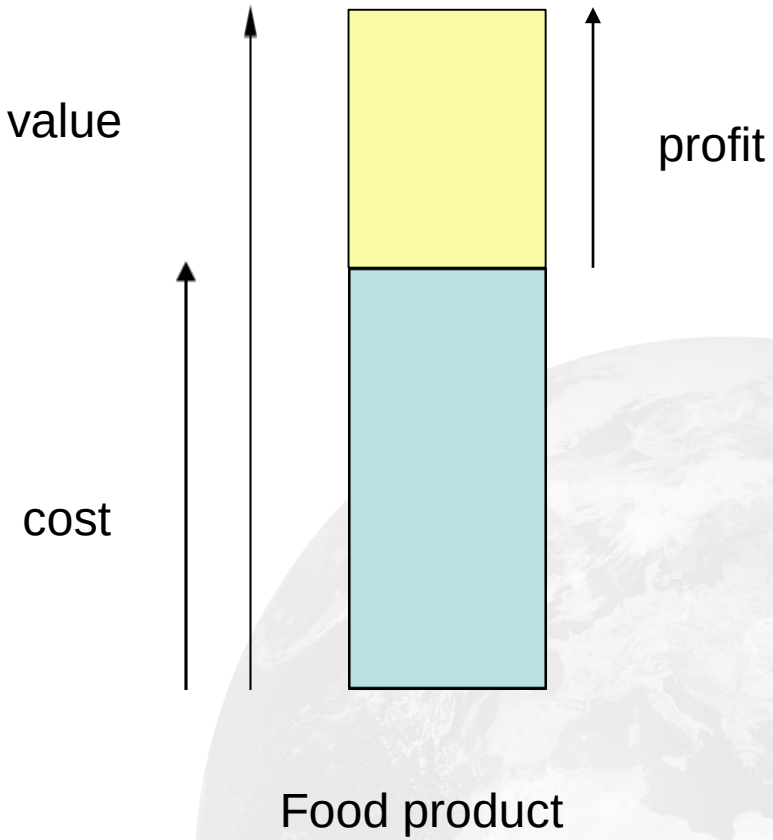
RESEARCH ARTICLE

Food fraud and the perceived integrity of European food imports into China

H. Kendall[1©], P. Naughton[2©], S. Kuznesof[1‡*], M. Raley[1], M. Dean[3], B. Clark[1], H. Stolz[4], R. Home[4], M. Y. Chan[5], Q. Zhong[6], P. Brereton[3], L. J. Frewer[1‡]

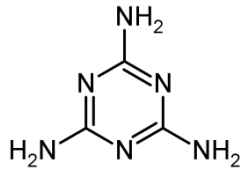
Why does food fraud occur?

- Opportunity
- Cost differential
- Motivation
- Likelihood of detection
- Reward/penalty

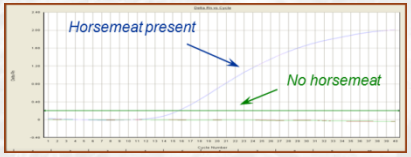


High profile food fraud incidents

- 2008 Melamine in Chinese milk products
  - 54,000 babies hospitalised, 6 deaths
  - High volume low price
  - Long term fraud due to deficient analytical methods



- 2012 Czech Republic methanol in spirits
  - 42 deaths in Eastern Europe
  - Short term "crude" fraud- easy to detect but high profits
- 2013 Horsemeat in Europe
  - No food safety issues, relatively easy to detect
  - High volume low price,
  - Long term fraud(?) due to lack of intelligence/surveillance?



JRC tool Medisys (https://medisys.newsbrief.eu)

Recent food fraud cases

Portuguese authorities have seized more than 4000 litres of olive oil labelled as "organic" that did not fulfil the requirements of the mentioned classification. Agroportal: 16/08/19

Twenty-two percent of the tested imported honey samples in controls carried out by the Canadian Food Inspection Agency turned out to be diluted with exogenous sugars such as sugar cane and rice syrup. CBC: 25/07/19

Some 1,400 tons of chicken meat infested with Salmonella and originating from Brazil was stopped at the UK border and shipped back to Brazil were it was later sold as processed meat. Le Monde: 05/07/2019

A New Zealand winery provided misleading information about geographical origin and vintage of tens of thousands of bottles of wine. The fraud is related to 2011, 2012, and 2013 Waipara and Marlborough Sauvignon Blanc vintages. NZ Herald: 05/07/19

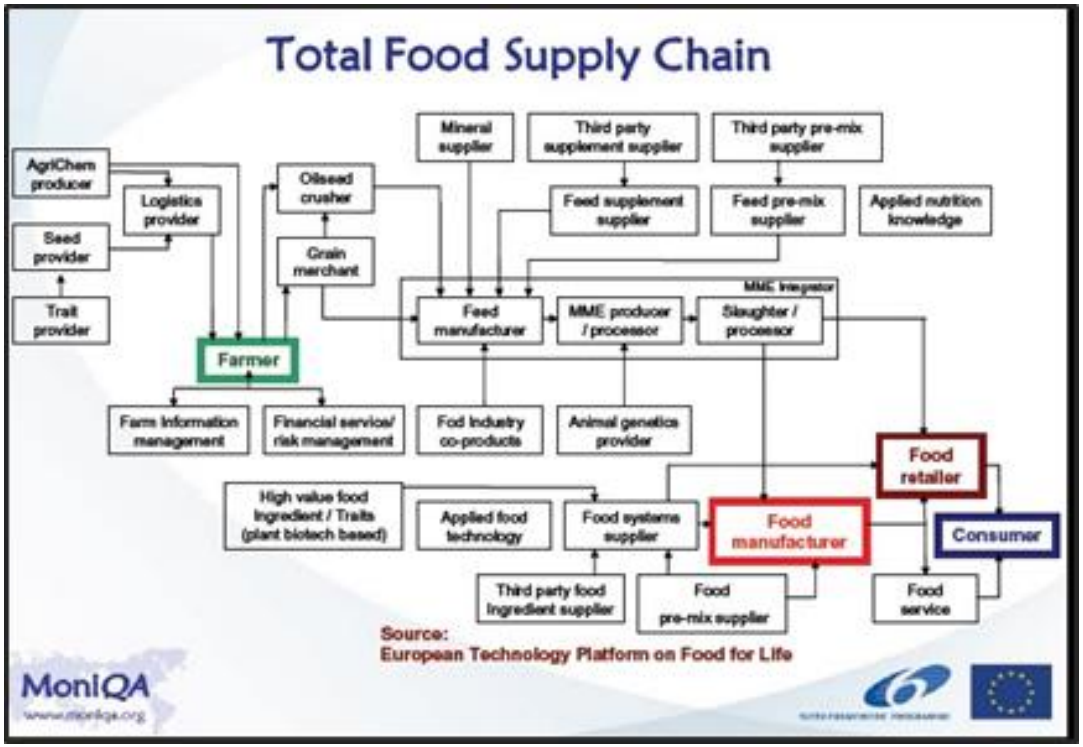
Assuring Food Integrity

Verification procedures

+

Supply Chain Management, Risk management procedures

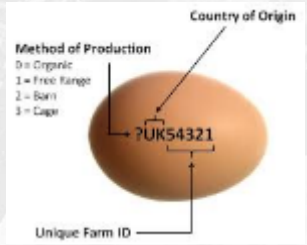
Industry – cause and victim ?



- Most fraud B to B
- No protection
- Insufficient penalties
- Cut corners or go out of business?

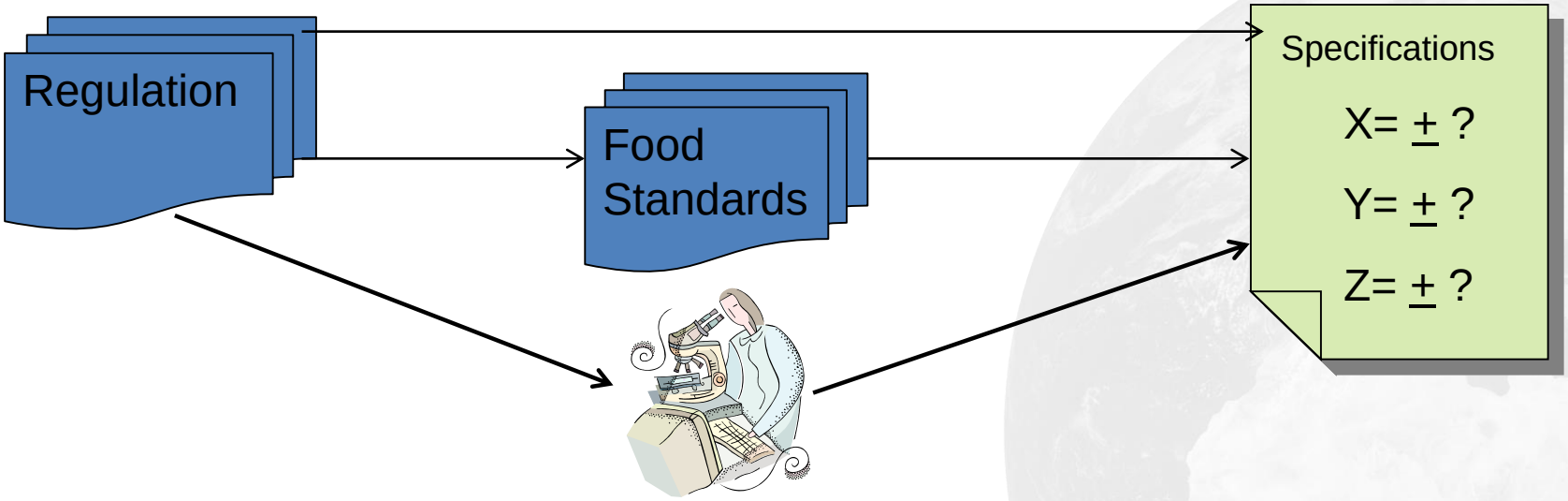
"Food" Traceability the need for verification

- Most systems track and trace units of food packaging (packaging, pallets, cargoes)
- A few do track and trace the item itself
  - eg whole eggs, livestock
  - Problems can arise at processing/post slaughter stages
- Need verification match between contents and identifier- how to do?



Verification and specifications

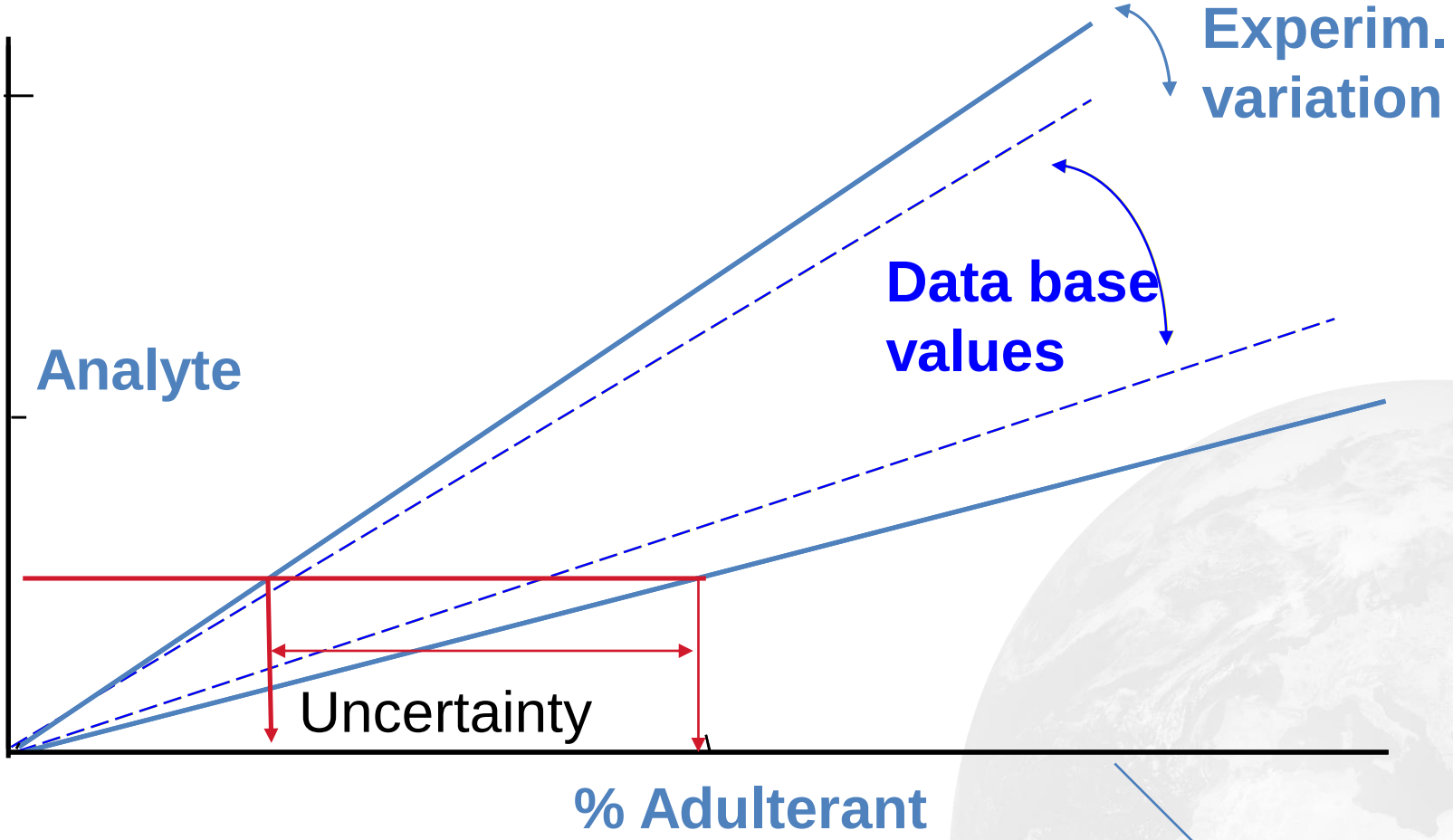
- In order to verify using analytical methodology we need a specification or to interpret regulation/std into a specification e.g.
  - Legislation relevant to Horsemeat mislabelling converted into analytical specifications



Regulatory specifications

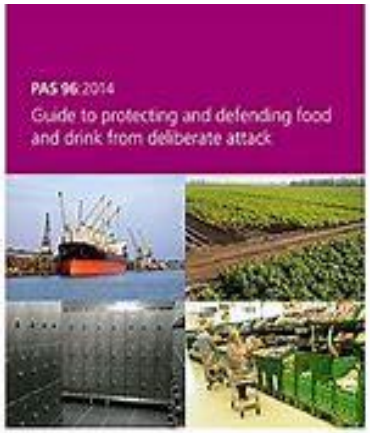
- Most regulated areas tend to have quantitative specifications for compliance…but not all :
  - Food contaminants (safety) e.g. mycotoxins
  - Alcoholic drinks (tax revenue) e.g. alcohol content
  - Food commodities (trade) e.g. Sugar, olive oil, wine
- Food authenticity
  - Geographical origin, species/variety, free range, matured for 3 years ?

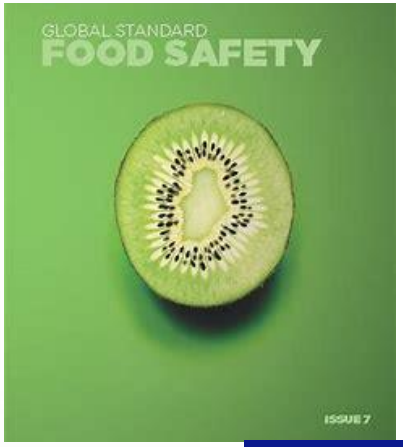
Uncertainty, degree of confidence

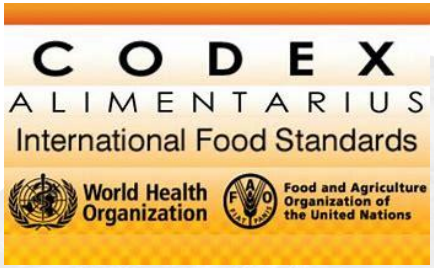


New analytical approaches for verifying the origin of food, Edited by P Brereton, UK, ISBN-13: 978 0 85709 274 8

Food Integrity relevant Guides/Standards





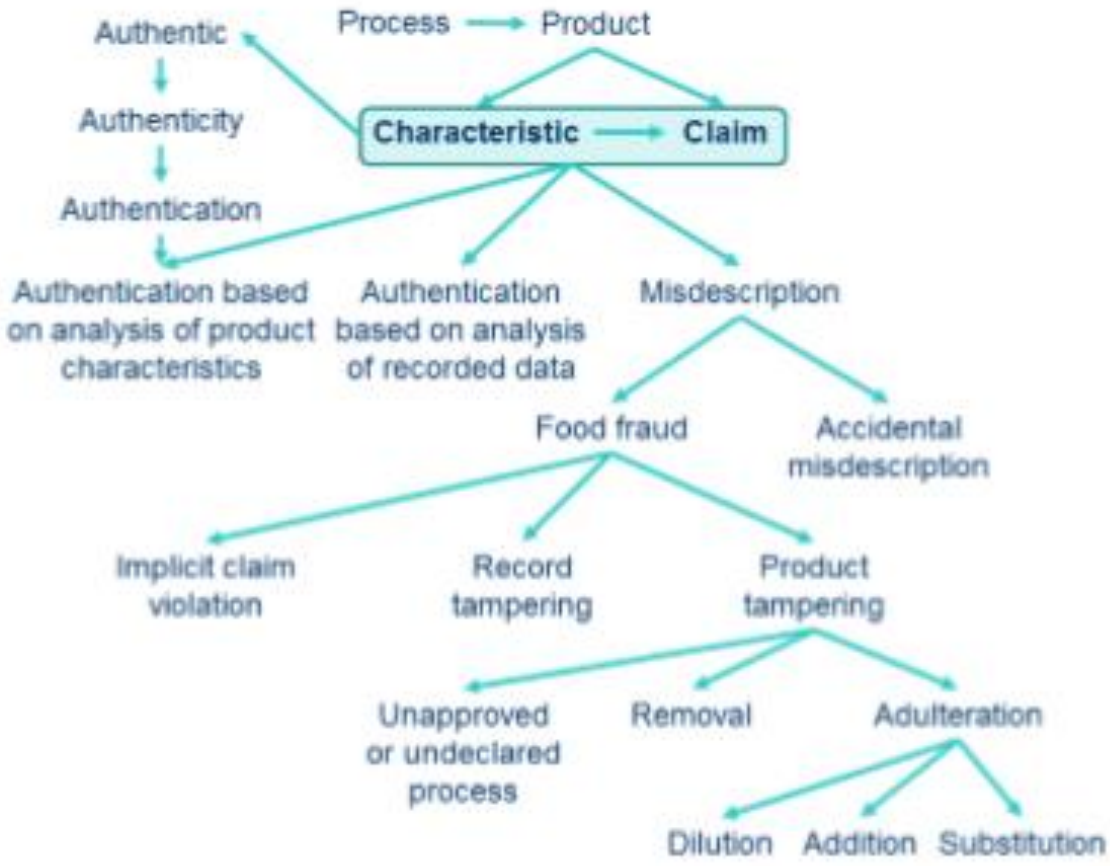


ILSI Europe

Relevant international standards and guides

- NGOs
  - Codex
  - ISO TC 34
  - CEN WS/86 - Authenticity in the feed and food chain – General principles and basic requirements
  - CEN TC460 to focus on methods of analysis
  - AOAC
- Industry
  - GFSI
  - BRC7
  - ILSI

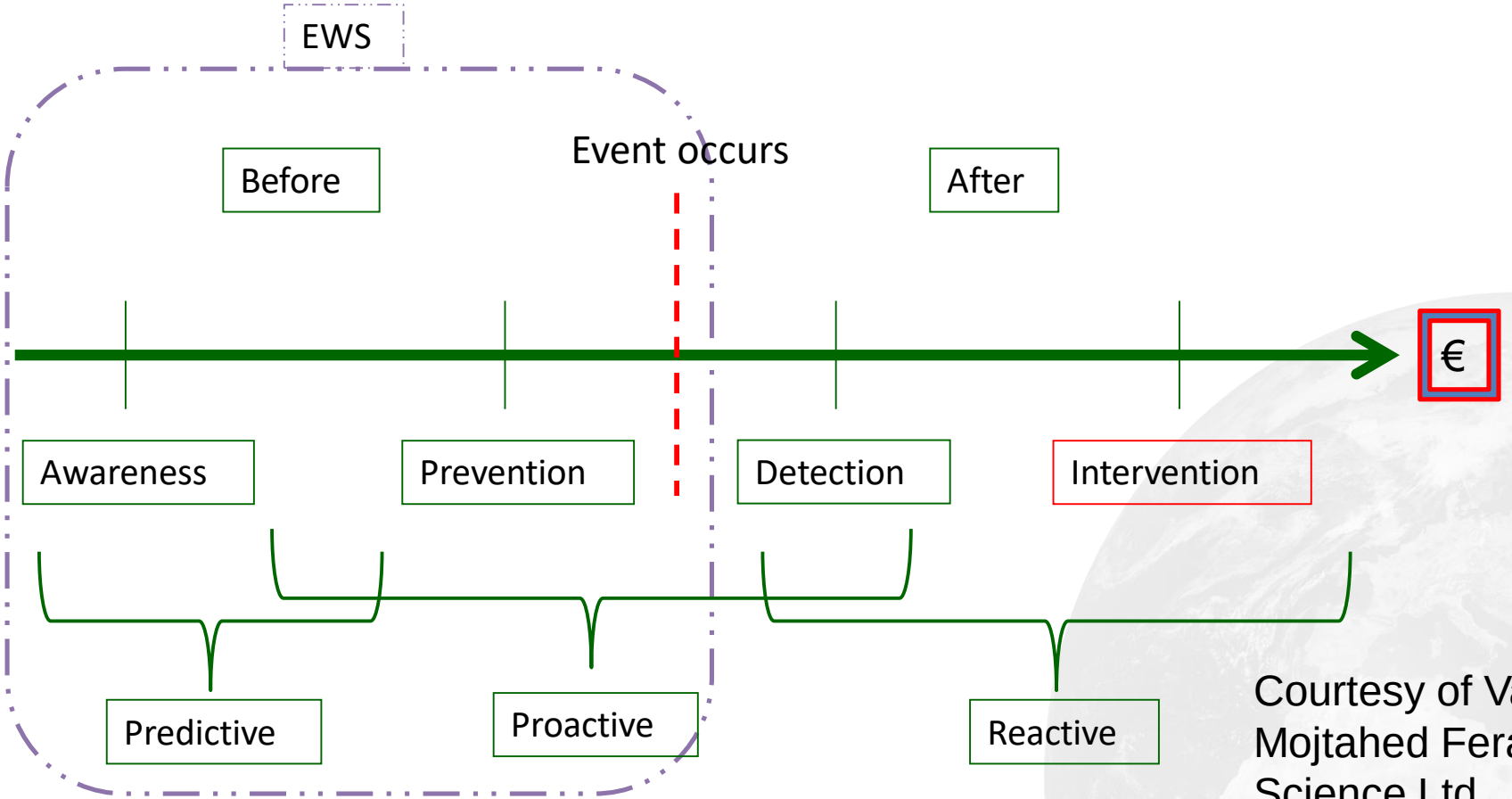
CEN WS/86 General principles and basic requirements



Latest Developments

- Methods of Analysis
- "Traceability systems"
- Collaborations and data sharing

Food fraud incident



Courtesy of Vahid Mojtahed Fera Science Ltd

Anticipating and identifying an "event"

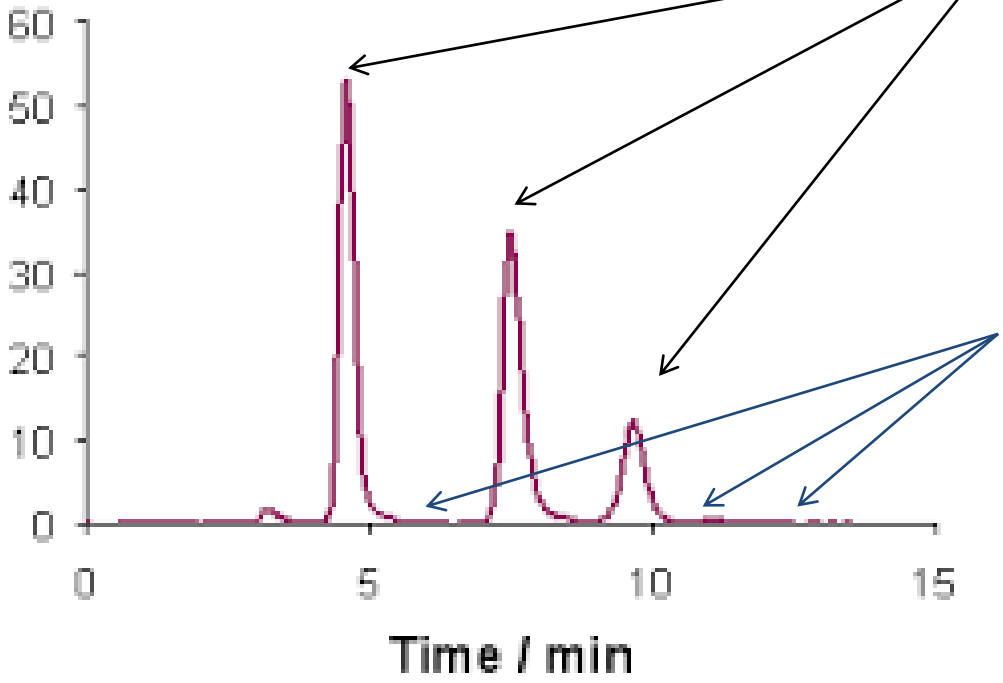





Methods of analysis- needs

- Rapid, on-site, efficient, user friendly, cost effective
- Reliable, recognised, validated
- Fit within food fraud mitigation strategy ***and process?***

Analytical approaches to risk



Target analyte(s)

Inefficient, limited, can be expensive,

Confidence in risk mitigation strategy…, risk communication

BUT what about other/emerging risks?

Measure change not analyte

- (Bio)chemists historically "profile" the target analyte (chemical/biological entity)
- New strategy is to profile normality and measure change in profile

"Measuring change" - techniques

Non-targeted

Increasing specificity

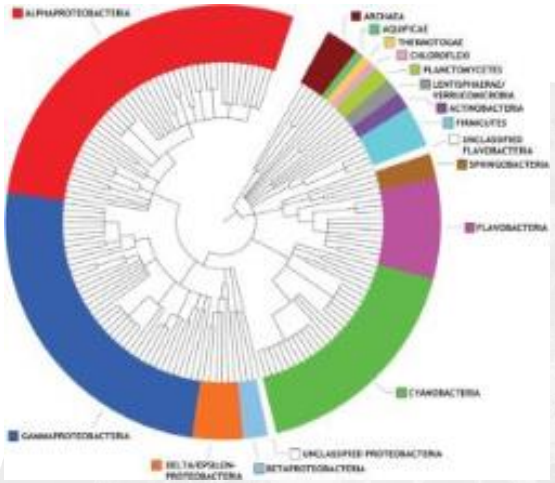
FT-IR spectroscopy

NMR spectroscopy

Mass spectrometry

Increasing coverage

Targeted



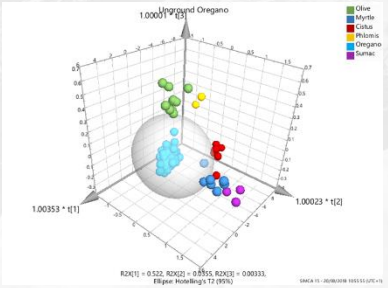
Lab of the future?

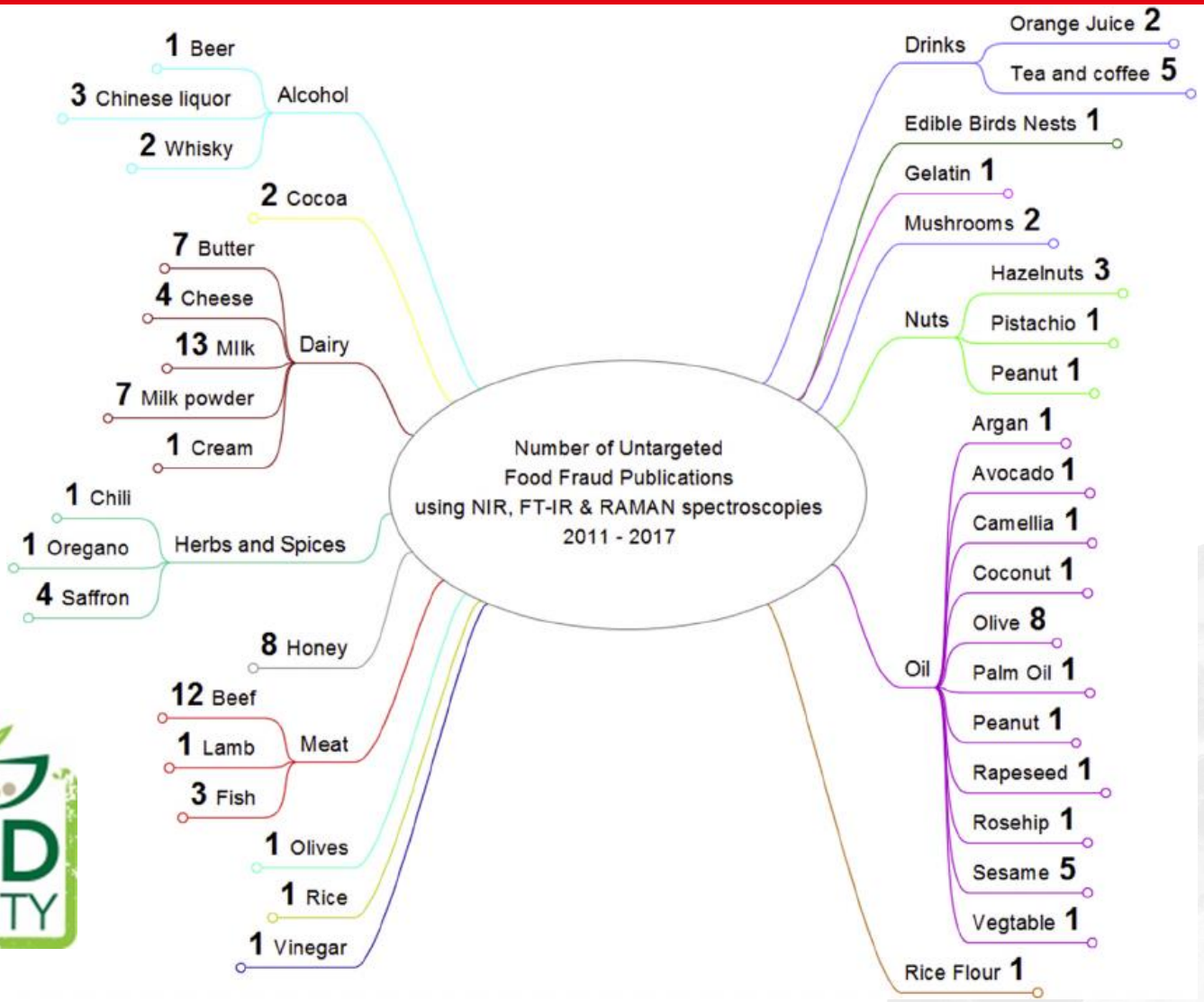
- Linked into meta data
- Linked to on-site/in-field "sentinels"
- Measuring trends
- Flagging up risks/anomalies in "real time"

https: //www.eurekalert.org/pub_releases/2015-10/dnnl-nis102615.php

Non- targeted analysis

- scientific opinions
- 2 workshops/sessions
- Guide to validation
- Applications in herbs/spices
- industry in-situ demonstration of monitoring quality & authenticity in the pig sector





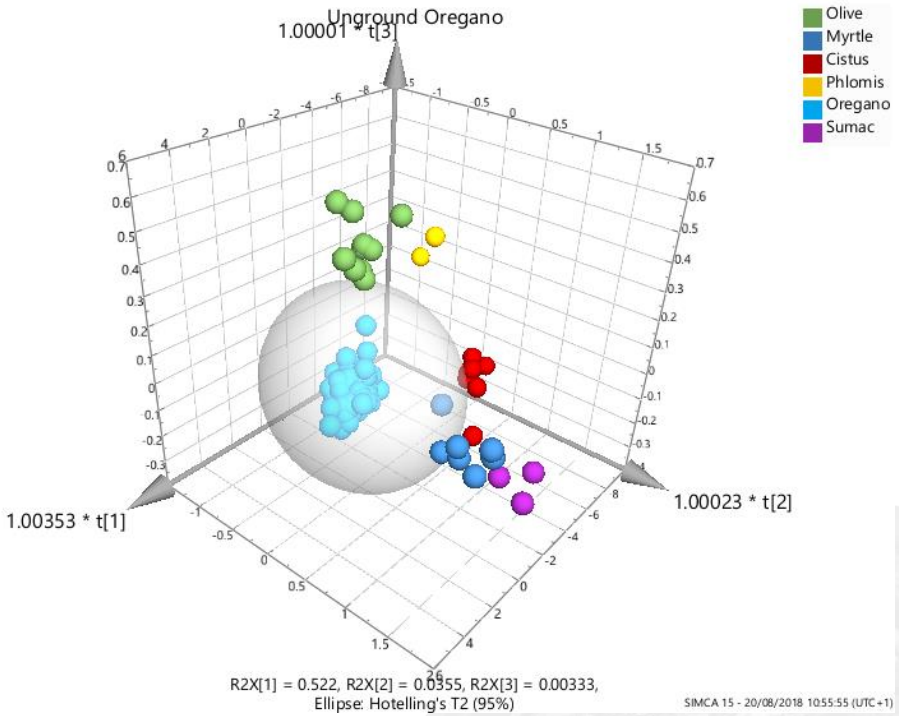
FOOD INTEGRITY

Terry F.McGrath[a]Simon A.Haughey[a]JennyPatterson[a]CarstenFauhl-Hassek[b]JamesDonarski[c]MartinAlewijn[d]Saskia van Ruth[d]Christopher T.Elliott[a]

Trends in Food Science & Technology
Volume 76, June 2018, Pages 38-55

Oregano

	Cut off	Correctly identified Oregano	Correctly Identified Adulterated
M2	0.87	94.1%	92.6%
M3	0.88	91.5%	93.8%
M14	0.8	89.0%	88.9%
M17	0.85	92.4%	93.8%



Food Chemistry 210 (2016) 551–557

Contents lists available at ScienceDirect

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

A comprehensive strategy to detect the fraudulent adulteration of herbs: The oregano approach

Connor Black, Simon A. Haughey*, Olivier P. Chevallier, Pamela Galvin-King, Christopher T. Elliott

Institute for Global Food Security, Advanced ASSET Centre, School of Biological Sciences, Queen's University Belfast, Northern Ireland, United Kingdom

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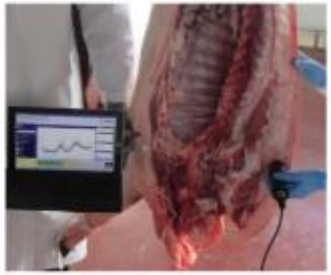
Monitoring quality and authenticity in-situ



On-site analysis of individual pork carcasses for the predictions of quality parameters in Iberian ham

Ana Garrido Varo, Lola Pérez Marín, (Universidad de Cordoba, Spain), Tom Fearn (UCL)

FoodIntegrity Scientific Opinions

Contents lists available at ScienceDirect

Trends in Food Science & Technology

Trends in Food Science & Technology 76 (2018) 38–55

Review

Stable
origin

Federica
Simon D

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Trends in Food Science & Technology

journal homepage: www.elsevier.com/locate/tifs

Trends in Food Science & Technology 80 (2018) 223–241

What are
methods f
Spectrosc

Terry F. McC
James Donar

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journal homepage: www.elsevier.com/locate/tifs

Review

The scientific challenges in moving from targeted to non-targeted mass spectrometric methods for food fraud analysis: A proposed validation workflow to bring about a harmonized approach

Daniele Cavanna[a,b], Laura Righetti[b], Chris Elliott[c], Michele Suman[a,*]

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[b] Department of Food and Drug, University of Parma, Parco Area delle Scienze 95/A, 43124, Parma, Italy
[c] Faculty of Medicine, Health & Life Sciences, Queen's University Belfast, BT9 6NG, Belfast, Ireland

In press/review

SO's on:

- Food testing
- Databases
- NMR
- NGS
- SIRA
- Chemometrics
- NTA NIRetc
- NTA MS

"Validating" non-targeted analysis

- Guideline for validating qualitative methods D4.4 (Diego L. García-González et al)
- White Paper D18.5 (Marco Arlorio et al)

Quick guides for industry

FoodIntegrity InfoGraphics (English)

FoodIntegrity InfoGraphics (French)

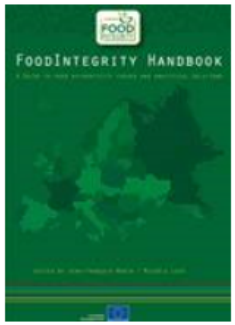
FoodIntegrity InfoGraphics (German)

FoodIntegrity InfoGraphics (Italian)

FoodIntegrity InfoGraphics (Spanish)

https://secure.fera.defra.gov.uk/foodintegrity/index.cfm?sectionid=84

FI Handbook on Food Authenticity Issues and Related Analytical Techniques



Food Fraud has been around a long time but following several highly mediatised incidents such as the milk and infant formula contaminated with melamine in 2008 and the horsemeat scandal in 2013, all authenticity issues have become big news. Regulators and customers now require food operators to keep abreast of any potential risks and to regularly assess their raw material and ingredient supply chains for vulnerability to food fraud. It is hoped that this FoodIntegrity Handbook will be a useful companion to help the food industry achieve this aim.

The Handbook has been written for food business operators and is primarily aimed at quality control managers working in food production and to those actors involved in the food supply chain. It may also be useful to young scientists, students and researchers with little prior knowledge of the area.
Written by nearly 50 experts in food authenticity, it is the result of European collaboration through the EU-funded FoodIntegrity project.

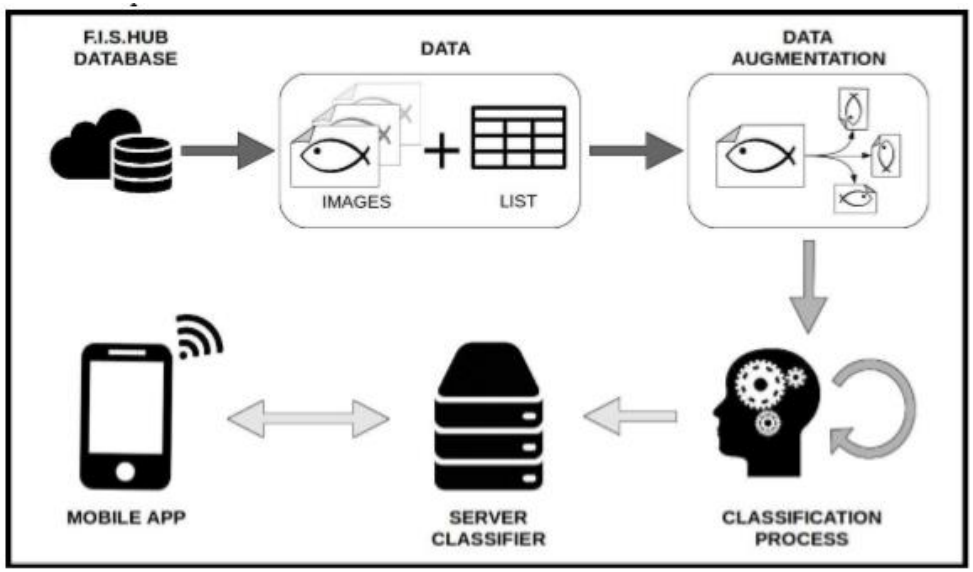
The book's editors, Jean François Morin and Michèle Lees, are respectively the current and former Directors of Collaborative Research at Eurofins Analytics France, an analytical laboratory renowned for its pioneering research into Food Authenticity.

ISBN print version 978-2-9566303-0-2 ; ISBN electronic version 978-2-9566303-1-9 ;
https://doi.org/10.32741/fihb

DOWNLOAD ENTIRE HANDBOOK

https://secure.fera.defra.gov.uk/foodintegrity/secure/downloadFile.cfm?id=659

Alternative technologies for rapid methods
Mobile phone App for fish id



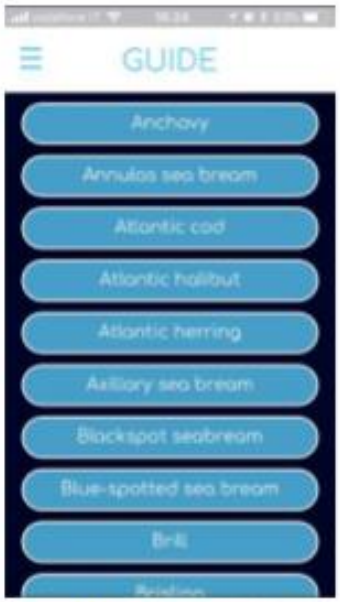


Figure 11: list of available species

Figure 12: Species details

D21.3 (Pier Luigi Acutis)

Data sharing and transparency

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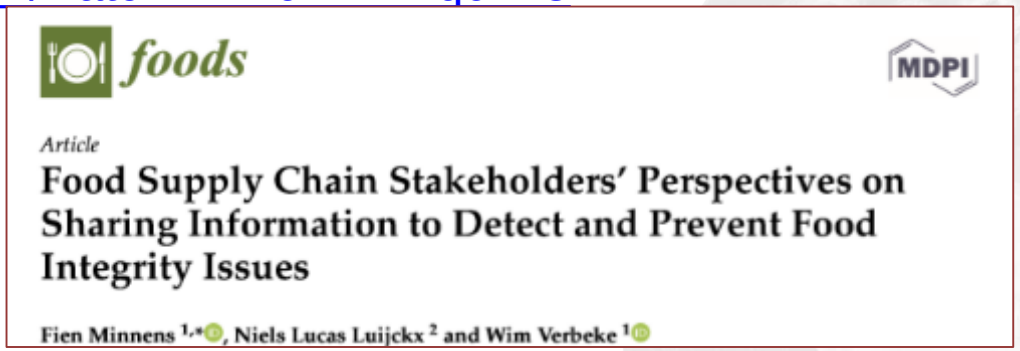
Check Organic
global. supply chain. integrity.

Blockchain

https://www.youtube.com/watch?v=_6NTnWq01n8



foods

MDPI

Article

Food Supply Chain Stakeholders' Perspectives on Sharing Information to Detect and Prevent Food Integrity Issues

Fien Minnens [1,*], Niels Lucas Luijckx [2] and Wim Verbeke [1]

Foods 2019, 8, 225; doi:10.3390/foods8060225 www.mdpi.com/journal/foods

Useful resources for identifying emerging food and feed risks

DG SANTE
FOOD FRAUD NETWORK

RASFF

EREN efsa European Food Safety Authority

FOOD INDUSTRY INTELLIGENCE NETWORK

https://www.foodfraudadvisors.com

The Food Authenticity Network
www.foodauthenticity.uk

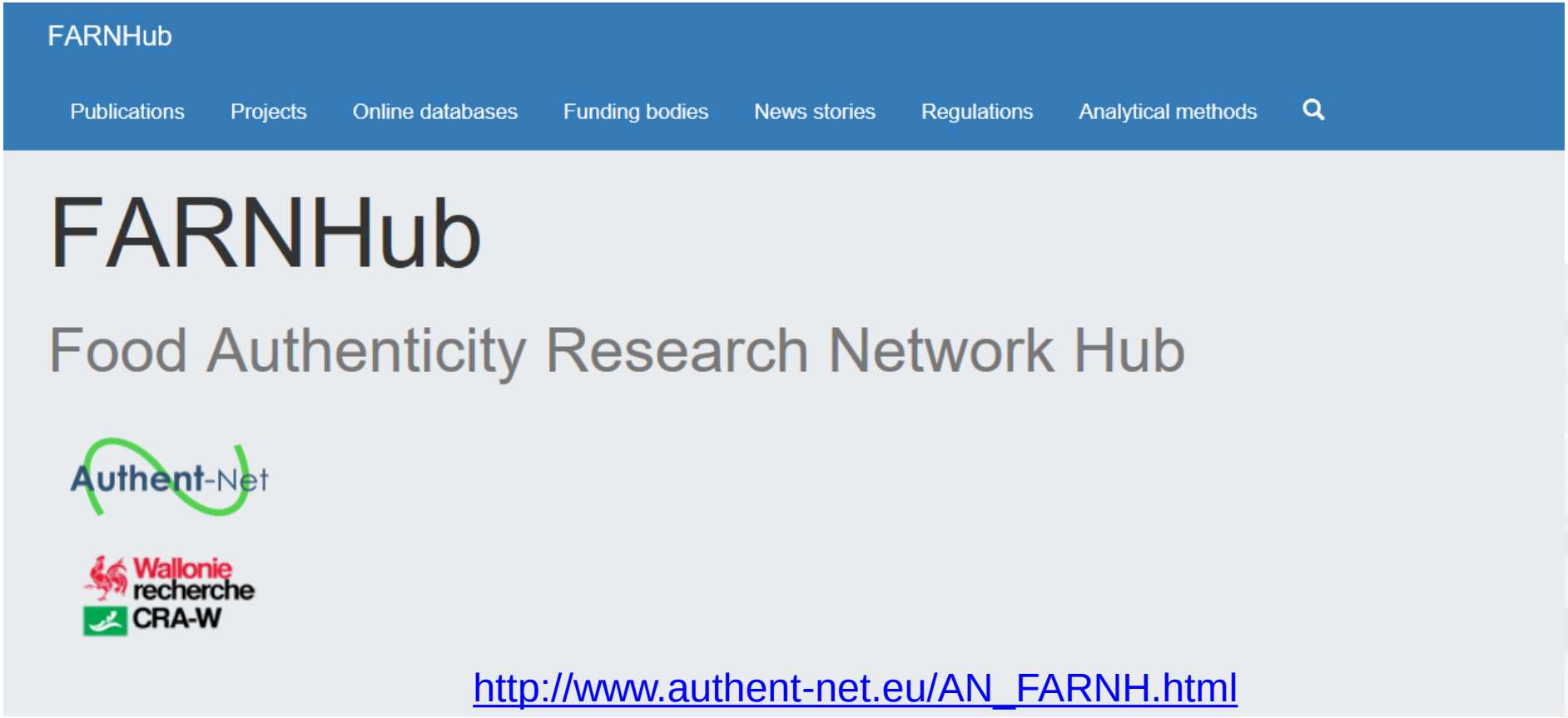
DECERNIS
A FOODCHAIN ID COMPANY

HorizonScan
Food Safety at Your Fingertips

http://fera.co.uk/knowledgeSolutions/horizonscan.cfm

http://hisz.rsoe.hu/alertmap/index2.php

FARNHub one stop shop for end-users



FoodIntegrity How to Get Information

Join FoodIntegrity **network**

Visit FoodIntegrity **website**

www.foodintegrity.eu

E-mail FoodIntegrity

foodintegrity@fera.gsi.gov.uk

YouTube

Visit our website: https://www.foodintegrity2018-nantes.eu/

https://www.youtube.com/watch?v=4IXqPx8t6Ng

https://secure.fera.defra.gov.uk/foodintegrity/secure/downloadFile.cfm?id=653

Summary

- Food Fraud is a global trans-national problem. It impacts on the local agri-food economy, consumer heath and trust
- A common set of terms, definitions and standards are needed
- Industry requires a level playing field where fraud is rigorously prosecuted together with clear standards and pragmatic methods and tools for prevention and prediction
- Control authorities need robust validated methods
- New data sharing and forecasting methods will help stakeholders target resources.
- Multi actor, interdisciplinary transnational approaches are needed to keep up with the fraudsters and protect the integrity of the food supply

Acknowledgements

FOOD INTEGRITY

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THANK YOU

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