The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.

Disclaimer: The information expressed in this deliverable reflects the authors’ views; the European Commission is not liable for the information contained therein.
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1  Description of Deliverable
An important goal of the FoodIntegrity project is to facilitate transfer of knowledge among the partner organisations and also outside the project consortium, in order to stimulate collaboration and overall scientific excellence in the European Union and worldwide and establish a European basis for permanent education in the field of food integrity. To support this objective, the Deliverable D11.4 was focused on knowledge transfer of the FoodIntegrity results through series of Open days, demonstration activities, and sessions at major international events.

2  Approach
Series of Open Days organised as satellite events of major international conferences were held with the aim to disseminate information on the project plans, activities, progress and outcomes to academia, scientists, industry and other all interested stakeholders. Some of these conferences also hosted FoodIntegrity supported sessions focused on topics Food authenticity/fraud/integrity. In addition, series of demonstration activities called “demo-corner” was incorporated into the program of FoodIntegrity conferences series.

The VSCHT team organised all these events, with great support of project partners who contributed to dissemination and demonstration activities.

3  Achievement of Deliverable
During 5 years of the FoodIntegrity project duration 3 Open Days, 3 demo-corner events and several FoodIntegrity sessions were organised.

3 Open Days organised as satellite events of international conferences:

- 1st Open Day at 7th International Symposium on Recent Advances in Food Analysis (RAFA 2015, www.rafa2015.eu), 3-6 November 2015 in Prague, Czech Republic
- 3rd Open Day at Summit on Global Food Integrity (ASSET 2018, https://www.qub.ac.uk/sites/ASSET2018Summit/) 28-31 May 2018 in Belfast, UK

Instead of 1 remaining Open Day, series of demo-corner activities was organised on occasion of the FoodIntegrity conferences in 2016, 2017 and 2018 and supporting demonstration of achieved project results.

3 Demo-corner activities organised at FoodIntegrity conferences:

- Assuring the integrity of the food chain: Fighting food fraud, 6-7 April 2016, in Prague, Czech Republic
- Assuring the integrity of the food chain: Turning science into solutions, 10-11 May 2017, in Parma, Italy
- Assuring the integrity of the food chain: Delivering real-world solutions, 14-15 November 2018, in Nantes, France
**FoodIntegrity sessions** at major international conferences:

- 2 sessions on Food authenticity & Fraud chaired by FoodIntegrity experts at the 7th International Symposium on Recent Advances in Food Analysis (RAFA 2015, [www.rafa2015.eu](http://www.rafa2015.eu)), held from the 3rd to the 6th November 2015 in Prague, Czech Republic.

- 2 sessions on Food authenticity & Fraud chaired by FoodIntegrity experts at the 8th International Symposium on Recent Advances in Food Analysis (RAFA 2017, [www.rafa2017.eu](http://www.rafa2017.eu)), held from the 7th to the 10th November 2017 in Prague, Czech Republic.

- 2 FoodIntegrity sessions on (i) Latest research and (ii) Tools and Solutions at Summit on Global Food Integrity, ASSET 2018 conference on 29-30 May 2018 ([https://www.qub.ac.uk/sites/ASSET2018Summit/](https://www.qub.ac.uk/sites/ASSET2018Summit/)).

Following chapters provide summary on individual activities.
3.1 1st FoodIntegrity Open Day

1st FoodIntegrity Open Day had been organised on 4-5 November 2015, as an associated event of the 7th International Symposium on Recent Advances in Food Analysis (RAFA 2015, www.rafa2015.eu), held from the 3rd to the 6th November 2015 in Prague, Czech Republic.

The aim of the 1st FoodIntegrity Open Day was to provide participants with a brief update on some of the progress on this multi-faceted project and let participants know how to get involved. Collection of posters on individual WP activities (see Annex I), leaflets, newsletters (see Deliverable D12.4 Compendium of e-Newsletters), slide shows (see Annex II), video (see YouTube at https://www.youtube.com/watch?v=rwxpFbSC5wE&list=PLAlfiul7voTJcHEUS60bQWhLttMUNOx2&index=5&t=0s) on the FoodIntegrity background and progress in activities of individual WPs has been presented to achieve this goal. Live tasting and live demonstrations showed the latest methods for authentication of olive oils, spirits and meat.

Through these complex activities participants have learned more on:

(i) FoodIntegrity Network and how to get involved
   Activity: On-site registration to the network by WP1 representatives

(ii) FoodIntegrity Knowledge (database): an information resource on food authenticity, description of the database and progress achieved so far
   Activity: On-site oral explanation of knowledge base functionalities by WP2 representatives

(iii) Survey of the Olive oil sector, description of the survey and its outcomes
   Sensory analysis of olive oils: Do you recognise adulterated product?
   Activity: Distribution of leaflets on Survey of the Olive oil sector, description of the survey and its outcomes and on-site tasting and demonstration of the relation between oils’ organoleptic properties and their quality and authenticity

(iv) Investigation of available and potential future rapid technologies for authentication of branded spirits and/or categories
   “Hands on” demonstration of authentication of spirit drinks
   Activity: On-site demonstration of tools for spirit drinks authentication (sensorial analysis, sensors, multispectral camera, miniature spectrophotometer configured for spirit measurement) by WP5 representatives

(v) How to reduce product misdescription in the seafood sector?
   Activity: On-site description of differences among wild and farmed salmon

(vi) Chinese consumer attitudes to food fraud, short description of the survey and its outcomes
   Activity: Projection of video on Consumer Survey in China, on examination of Chinese consumers’ attitudes and perceptions towards the safety and integrity of imported European foods

(vii) Industrial perspective of relevant food chains vulnerabilities vs Current analytical methods and technologies that can be applied
   Activity: Projection of slide show on WP10 case studies and posters

(viii) Non-destructive analysis of adulteration by MicroNIRs
   Activity: Demonstration of portable MicroNIRs devices for food authentication by WP10 representatives

(ix) Training and dissemination activities in progress
   Activity: Distribution of newsletters and leaflets on the FoodIntegrity and providing information on planned training activities
Series of live demonstrations provided clear evidence on applicability of approaches developed for authentication of various food commodities.

FoodIntegrity Open Day has been also accompanied by the training workshop on “Vibrational spectroscopy and chemometrics for monitoring of food and feed products and contaminants’ detection”. The aim of this workshop was to give an overview of the theoretical and practical issues for the right applications of spectroscopic techniques in food and feed quality control, detecting non-conformity and subsequently identifying targeted or untargeted adulterants and contaminants among others. More details can be found here (see also Annex III).

Finally, an intriguing RAFA 2015 Filmed Roundtable Discussion was hosted by New Food Journal on the topic of contaminants and novel approaches in food analysis, also covering aspects directly related to FoodIntegrity.

RAFA 2015 was attended by almost 800 participants who contributed also to very well attendance of the Open Day. Open Day was attracted by approximately 150 participants from various countries and different sectors as well as from national and European authorities and media. They actively engaged in discussions with the present FoodIntegrity scientists. The level of interaction was remarkably high and there was an intense exchange not only on the presented goals and results of the project, but also about future needs and possible collaborations.
Figure 1 Invitation to the FoodIntegrity Open Day at RAFA 2015
Figure 2 Photos taken during the Open Day at RAFA 2015 (examples)

- Invitation to attend FoodIntegrity OPEN DAYS
- Demonstration of the FoodIntegrity Knowledge base
- Sensory analysis of olive oils: Do you recognise adulterated product?
- Video on Chinese consumer attitudes to food fraud, short description of the survey and its outcomes
- "Hands on" demonstration of authentication of spirit drinks
- MicroNIR analysis of cheese adulteration
- Sensory tasting: Do you recognise wild and farmed salmon?
3.2 2nd FoodIntegrity Open Day

2nd FoodIntegrity Open Day had been organised on 8-9 November 2017, as an associated event of the 8th International Symposium on Recent Advances in Food Analysis (RAFA 2017, www.rafa2017.eu), held from the 7th to the 10th November 2017 in Prague, Czech Republic.

The aim of the 2nd FoodIntegrity Open Day was to provide participants with a brief update on some of the progress on this multi-faceted project and let participants know how to get involved. Collection of posters on individual WP activities (see Annex IV), newsletters (see Deliverable D12.4 Compendium of e-Newsletters), slide show (see Annex V), video (see YouTube at https://www.youtube.com/watch?v=rxwpFbSC5wE&list=PLAIfjuL7voTjcHEUS60bQWhLltMUN0Xg2&index=5&t=0s) on the FoodIntegrity background and progress in activities of individual WPs had been presented to achieve this goal. Live demonstrations showed the latest rapid methods for authentication of spirits.

Through these complex activities participants have learned more on:

(i) FoodIntegrity Network and how to get involved
   Activity: On-site registration to the network by WP1 representatives

(ii) FoodIntegrity Knowledge (data)base: an information resource on food authenticity, description of the database and demonstration its value
   Activity: On-site oral explanation of knowledge base functionalities by WP2 representatives

(iii) Investigation of rapid technologies for authentication of branded spirits and other food products
   Activity: On-site demonstration of instrumentation for food authentication (multispectral camera, miniature spectrophotometer configured for spirit measurement, mobile phone connected spectrometer) by WP5 representatives

(iv) Chinese consumer attitudes to food fraud, short description of the survey and its outcomes
   Activity: Projection of video on Consumer Survey in China, on examination of Chinese consumers’ attitudes and perceptions towards the safety and integrity of imported European foods

(v) Industrial perspective of relevant food chains vulnerabilities vs Current analytical methods and technologies that can be applied
   Activity: Demonstration of App & Infographics using mobile devices to bring together available data on industrially exploited analytical tools for detection of food fraud, and identify reliable indicators/markers by WP10 representatives

Open Day participants had also opportunity to register for participation in the FoodIntegrity training program and enjoy the quiz HOW MUCH DO YOU KNOW ABOUT FRAUD? awarded by the bottle of whisky sponsored by SWRI.

RAFA 2017 was attended by almost 750 participants who contributed also to very well attendance of the Open Day. Open Day was attracted by approximately 200 participants from various countries and different sectors as well as from European authorities and media. Interest of Open Day participants in the FoodIntegrity demonstration was high, they actively engaged in discussions with the present FoodIntegrity scientists, viewed posters, collected flyers.

Open Day was part of SMART LAB, providing information and demo’s on smart analyzers for on-site testing of food quality and safety, ‘where the future in food analysis is being made’, which also contributed to high interest in the FoodIntegrity exhibition. Within SMART LAB, other two EU funded (H2020) projects have been presented, FoodSmartphone (www.foodsmartphone.eu) and
PhasmaFood (www.phasmafood.eu), enabling further networking and communication on research activities.

FoodIntegrity Open Day had been also accompanied by the training workshop on “Vibrational spectroscopy and chemometrics for monitoring of food and feed products and contaminants’ detection”, organised by CRA-W on the 7th November 2017 and attended by 57 participants from 26 countries worldwide (for invitation see Annex VI). The aim of this workshop was to provide an overview of basics of spectroscopy and chemometric approaches in spectroscopy, applications of spectroscopic techniques in the food and feed quality control, detecting non-conformity and identifying targeted or untargeted adulterants and contaminants, validation and reporting of non-targeted “fingerprinting” approaches for food authentication.
INVITATION to
FoodIntegrity OPEN DAYS at RAFA
8–9 November, 2017 • Prague, Czech Republic
Clarion Congress hotel Prague, Tycho & Kepler hall, 10:30–16:00, exhibition hours 13:30–16:00

FoodIntegrity OPEN DAYS are organised as satellite event of the 8th International Symposium on Recent Advances in Food Analysis, www.rafa2017.eu

WHAT CAN YOU LEARN?

FoodIntegrity Knowledge base: An information resource on food authenticity description of the database and demonstration of its functionality
To bring together available information on available analytical tools and associated reference data for the detection of food fraud in a Knowledge Base, to facilitate access to the information for industry regulatory authorities and research organisations

On-site from 14:00 to 14:30
Industrial perspectives of relevant food chain vulnerabilities vs Current analytical methods and technologies that can be applied
App & Infographics using mobile devices to bring together available data on industrially exploited analytical tools for detection of food fraud and identify reliable indicators/markers

Chinese consumer attitudes to food fraud, short description of the survey and its outcomes
Visual examination of Chinese consumers’ attitudes and perspectives towards the safety and integrity of imported European foods

Investigation of available and potential future technologies for authentication of branded spirits and/or products
Hands on demonstration of food products authentication

Do you wish to participate in the FoodIntegrity events?
Do you wish to be trained in food authentication strategies?
Join us at the Open Day and learn more on opportunities we offer!

APPLY FOR PARTICIPATION IN THE FOODINTEGRITY TRAINING PROGRAM HERE!

QUIZ
Test your knowledge on the food integrity and win a bottle of whisky!

HOW TO GET INVOLVED?

Do you wish to receive information about news, progress and events related to the FoodIntegrity project?
You may register on-site for the project or on www.foodintegrity.eu/page Contact us

FoodIntegrity is a European five-year project which will draw from a well of experience consisting of 60 partners in the EU, China and Iceland to tackle issues surrounding the authenticity of food. The project will provide a focal point for the sharing and exploitation of European research aimed at protecting the integrity of food production in Europe.

The aim of the FoodIntegrity demonstration is to provide you with a brief update on some of the progress on this multifaceted project and let you know how you can get involved. We hope you find it useful.

You can join us and discuss with FoodIntegrity experts the latest developments and strategies in the field of food integrity, safety, quality, authenticity and traceability.

www.foodintegrity.eu
Figure 4 Photos taken during the Open Day at RAFA 2017 (examples)

Workshop on “Vibrational spectroscopy and chemometrics for monitoring of food and feed products and contaminants’ detection”

Registration to the FoodIntegrity Network

Demonstration of App & Infographics & Knowledge Base

“Hands on” demonstration of rapid technologies for authentication of branded spirits and other food products

Invitation to join the FoodIntegrity training program

Collection of the FoodIntegrity posters and flyers
3.3 3rd FoodIntegrity Open Day

The 3rd FoodIntegrity Open Day had been organised on the 30th May 2018, as an associated event of the Summit on Global Food Integrity, ASSET 2018 conference on 29-30 May 2018 (https://www.qub.ac.uk/sites/ASSET2018Summit/), held from the 28th to the 31st May 2018 in Belfast, UK.

The aim of the 3rd FoodIntegrity Open Day was to provide participants with a brief update on the latest progress on this multi-faceted project and let participants know how to get involved. Posters (see Annex IV), newsletters (see Deliverable D12.4 Compendium of e-Newsletters), slide show (see Annex V), videos on the FoodIntegrity background and progress in activities of individual WPs had been presented to achieve this goal. Live demonstrations showed the Apps and rapid methods for food authentication.

Through these complex activities participants have learned more on:

(i) FoodIntegrity Network and how to get involved
   Activity: On-site registration to the network by WP1 representatives (at https://secure.fera.defra.gov.uk/foodintegrity/registerAccount.cfm)

(ii) FoodIntegrity Knowledge (database): an information resource on food authenticity, description of the database and demonstration its value

(iii) Chinese consumer attitudes to food fraud, short description of the survey and its outcomes
   Activity: Projection of video on Consumer Survey in China, on examination of Chinese consumers’ attitudes and perceptions towards the safety and integrity of imported European Foods (at https://www.youtube.com/watch?v=rwxpFbSC5wE&list=PLAlfjuL7voTJcHEUS60bQWhLItMUN0Xg2&index=4)

(iv) Industrial perspective of relevant food chains vulnerabilities vs Current analytical methods and technologies that can be applied
   Activity: Demonstration of App & Infographics using mobile devices to bring together available data on industrially exploited analytical tools for detection of food fraud, and identify reliable indicators/markers by WP10 representatives (for presented infographics see FoodIntegrity website here https://secure.fera.defra.gov.uk/foodintegrity/index.cfm?sectionid=84, or FoodIntegrity YouTube channel at https://www.youtube.com/watch?v=bt_8P4cWTPE&t=11s&index=9&list=PLAlfjuL7voTJcHEUS60bQWhLItMUN0Xg2 and https://www.youtube.com/watch?v=u39Vf8UxTeU&t=54s&index=8&list=PLAlfjuL7voTJcHEUS60bQWhLItMUN0Xg2)

(v) Portable technologies for food authentication
   Activity: Demonstration of a portable NIRS (Scio) unit for food authentication by WP10 representatives

(vi) F.I.S.Hub App
   Activity: Demonstration and oral explanation of the F.I.S.Hub software enabling identification of fish species from its digitized picture using a user-friendly App for mobile phones and other portable devices by WP15 representatives

(vii) Improving supply chain integrity through data sharing
   Activity: Demonstration, video and oral explanation on how management solution Check X helping to prevent fraud in food supply chains with food fraud vulnerability works by WP16
representatives (at https://www.youtube.com/watch?v=_6NTnWq01n8&list=PLAIfjuL7voTjCHeUS6bQWhLlMUN0Xg2&index=9)

Open Day participants had also opportunity to enjoy the quiz HOW MUCH DO YOU KNOW ABOUT FRAUD? awarded by the bottle of whisky; winner was drawn during the FoodIntegrity session at ASSET 2018 on May 30.

ASSET 2018 was attended by almost 600 participants who contributed also to very well attendance of the Open Day. Open Day was attracted by approximately 200 participants from various countries and different sectors as well as from European authorities and media. Interest of Open Day participants in the FoodIntegrity demonstration was high, they actively engaged in discussions with the present FoodIntegrity scientists, learnt on tools developed by the FoodIntegrity, viewed posters, videos, and collected flyers distributed both in the ASSET 2018 delegates bags and at WP11 stand (leaflets on FoodIntegrity dissemination and communication activities, newsletters, flyer on the 5th FoodIntegrity conference).

FoodIntegrity Open Day had been also accompanied by the training “Workshop introducing Early Warning System to the industry and the food safety authorities” (see Annex VII), organised by FERA on the 30th May 2018 and attended by approx. 25 participants from EU countries. The workshop aimed to introduce Early Warning System to potential end-users from industry or safety authorities and engaged them in using the tool first hand to get insights regarding potential food fraud incidents. Organizers demonstrated the possibility of exploring future food fraud scenarios and identifying fraud type using a Bayesian network.
Figure 5 Invitation to the FoodIntegrity Open Day at ASSET 2018

Ensuring the Integrity of the European food chain

INVITATION to FoodIntegrity OPEN DAY at ASSET 2018

30 May, 2018 • Belfast, Northern Ireland, UK
Belfast Waterfront, Foyer, 9:00–17:00, exhibition hours during coffee and lunch breaks

WHAT CAN YOU LEARN?

- FoodIntegrity Knowledge base: An information resource on food authenticity, description of the database and demonstration of its functionality
  To bring together available information on suitable analytical tools and associated reference data for the detection of food fraud in a Knowledge Base, to facilitate access to this information for industry, regulatory authorities and research organisations

- Workshop Introducing Early Warning System to the industry and the food safety authorities (12:30 to 14:00, Hall 2B – you may enjoy your lunch during the workshop)

- Do you really know the fish you eat?
  Demonstration of the F.I.S.4DB software enabling identification of Bsh species from its digitized picture using a user-friendly App for mobile phones and other portable devices.

- Improving Supply Chain Integrity through Data Sharing
  Video on integrity management solution Check X helping to prevent fraud in food supply chains with food fraud vulnerability

- Do you wish to receive information about FoodIntegrity events and trainings?
  Join us at the Open Day and learn more on opportunities we offer!

QUIZ:
- Test your knowledge on the food integrity and win a bottle of whisky!

All oral explanations on-site from 13:00 to 14:00

BECOME INVOLVED AND SIGN-UP AS A STAKEHOLDER!

You may register on-site for the project COMMUNICATION or on www.foodintegrity.eu/page Contact us

Join us and discuss with FoodIntegrity experts the latest developments and strategies in the field of food integrity: safety, quality, authenticity and traceability!

FoodIntegrity is a European five-year project, which will draw from a well of experience consisting of 60 partners in the EU, China and Iceland to tackle issues surround the authenticity of food. The project will provide a focal point for the sharing and exploitation of European research aimed at protecting the integrity of food production in Europe.

The aim of the FoodIntegrity demonstration is to provide you with a brief update on some of the progress on this multifaceted project and let you know how you can get involved. We hope you find it useful.

www.foodintegrity.eu
Figure 6 Photos taken during the Open Day at ASSET 2018 (examples)

Look at the Open Day stands

Demonstration of Knowledge Base

Demonstration of App & Infographics

Demonstration of F.I.S.Hub App

“Hands on” demonstration of portable NIRS (Scio) unit for food authentication

FoodIntegrity session, invitation by Paul Brereton
3.4 FoodIntegrity “demo-corner” activities

Due to high interest of various stakeholders in the FoodIntegrity results, apart from Open Days, similar activities called “demo-corners” were organised on occasion of the FoodIntegrity conferences series from year 2016 at:

- 3rd FoodIntegrity conference - Assuring the integrity of the food chain: Fighting food fraud, 6-7 April 2016, in Prague, Czech Republic
- 4th FoodIntegrity conference - Assuring the integrity of the food chain: Turning science into solutions, 10-11 May 2017, in Parma, Italy
- 5th FoodIntegrity conference - Assuring the integrity of the food chain: Delivering real-world solutions, 14-15 November 2018, in Nantes, France

For description of demo-corner activities see D11.4 Completion of 5 planned international conferences.
3.5 FoodIntegrity sessions

FoodIntegrity sessions focused on Food Safety/Quality/Authenticity/Integrity dedicated to the project activities were also included into several conferences’ program to support widespread dissemination of the information on the project activities & achieved results.

FoodIntegrity sessions were organised at these major international conferences:

- 2 sessions on Food authenticity & Fraud chaired by FoodIntegrity experts at the 7th International Symposium on Recent Advances in Food Analysis (RAFA 2015, www.rafa2015.eu), held from the 3rd to the 6th November 2015 in Prague, Czech Republic
2 sessions on Food authenticity & Fraud chaired by FoodIntegrity experts at the 8th International Symposium on Recent Advances in Food Analysis (RAFA 2017, www.rafa2017.eu), held from the 7th to the 10th November 2017 in Prague, Czech Republic

**ORAL SESSIONS**

**WEDNESDAY, November 8, 2017**

| 9:00-10:30 | 2 sessions on Food authenticity & Fraud chaired by FoodIntegrity experts at the 8th International Symposium on Recent Advances in Food Analysis (RAFA 2017, www.rafa2017.eu), held from the 7th to the 10th November 2017 in Prague, Czech Republic |
| 9:00-9:30 | SESSION 1: Food authenticity & Fraud I  
Chair: Christopher Elliott & Vincenzo Bastian  
**L10** ANALYTICAL FOOD AUTHENTICATION – FROM RESEARCH TO ROUTINE  
Costen Francis-Hasek, Federal Institute for Risk Assessment (BfR) Berlin, Germany |
| 9:30-9:50 | **L11** ULTRA-HIGH PERFORMANCE LIQUID-CHROMATOGRAPHY COUPLED TO TANDEM MASS SPECTROMETRY FOR THE DETECTION OF ANIMAL BY-PRODUCTS IN FEED  
Marie-Caroline Leucarne, Wadiroc, Agricultural Research Centre (CRA-W), Gembloux, Belgium |
| 9:50-10:00 | **L12** THE DETECTION OF ECONOMICALLY MOTIVATED ADULTERATION IN THE HERB AND SPICE INDUSTRY  
Pamela Galvin-King, Queen’s University Belfast, Belfast, United Kingdom |
| 10:00-10:20 | **L13** FIGHTING THE FOOD FRAUDS BY MEANS OF LIPID ANALYSIS: PALM OIL ADDITION  
Emmanuele Sangiorgi, Laboratory of Veterinary Medicine, University of Brescia, Brescia, Italy |
| 10:20-10:30 | **L14** DISCRIMINATION OF PROCESSING GRADES OF OLIVE OIL AND OTHER VEGETABLE OILS BY MONOCHLOROPROPAENEDIOYL ESTERS AND GLYCERYL ESTERS COMPOSITIONS  
Jing Yan, RIVM Wageningen University & Research Wageningen, The Netherlands |
| 10:30-11:00 | Coffee Break / EXHIBITION |
| 11:00-12:30 | SESSION 4: Food authenticity & Fraud II  
Chair: Paul Brennan & Costen Francis-Hasek |
| 11:00-11:30 | **L15** TOP-DOWN FOOD FRAUD DETECTION AND PREVENTION – HOW TO AVOID THE GOLDEN “HAMMER”  
Petter Olsen, Norwegian University of Science and Technology, Norway |
| 11:30-11:40 | **L16** HIGH RESOLUTION MASS SPECTROMETRY BASED METABOLIC FINGERPRINTING OF RED AND BLUE BERRIES FOR DETECTION OF FRUIT-BASED PRODUCTS ADULTERATION  
Kornilis Hertveld, University of Chemistry and Technology, Prague, Czech Republic |
| 11:40-11:50 | **L17** COMBINATION OF NON-TARGETED AND TARGETED APPROACHES FOR THE DISCRIMINATION OF EXTRA VIRGIN OLIVE OILS FROM DIFFERENT PROTECTED DESIGNATIONS OF ORIGIN AND THE IDENTIFICATION OF POTENTIAL “ORIGIN MARKERS”  
Lucas Oliva Garcia, University of Granada, Granada, Spain |
| 11:50-12:00 | **L18** GC-MS AND HPTLC FINGERPRINT OF POLISH HONEYS WITH DIFFERENT BOTANICAL ORIGIN – AS A TOOL FOR THEIR AUTHENTICATION  
Ewa Malowiez, Opole University, Opole, Poland |

*Young Scientists’ presentation*
## 4 ANNEXES

| Annex I | 1<sup>st</sup> FoodIntegrity Open Day at RAFA 2015 - collection of displayed posters |
| Annex II | 1<sup>st</sup> FoodIntegrity Open Day at RAFA 2015 - presented slide shows |
| Annex III | 1<sup>st</sup> FoodIntegrity Open Day at RAFA 2015 - leaflet on the workshop on ‘Vibrational spectroscopy and chemometrics for monitoring of food and feed products and contaminants’ detection |
| Annex IV | 2<sup>nd</sup> FoodIntegrity Open Day at RAFA 2017 - collection of posters for dissemination activities |
| Annex V | 2<sup>nd</sup> FoodIntegrity Open Day at RAFA 2017 - slide show on WP10 successful case studies |
| Annex VI | 2<sup>nd</sup> FoodIntegrity Open Day at RAFA 2017 – leaflet on the workshop on “Vibrational spectroscopy and chemometrics for monitoring of food and feed products and contaminants’ detection” |
| Annex VII | 3<sup>rd</sup> FoodIntegrity Open Day at ASSET 2018 – invitation to the “Workshop introducing Early Warning System to the industry and the food safety authorities” |
| Annex VIII | Program of ASSET 2018 conference |
Annex I 1st FoodIntegrity Open Day at RAFA 2015 - collection of displayed posters
Ensuring the Integrity of the European food chain

FoodIntegrity Network
Elena Fesenko* and Paul Brereton, Fera Science Ltd

Introduction

Food Integrity the state of being whole, entire, or undiminished or in perfect condition. Providing assurance to consumers and other stakeholders about the safety, authenticity and quality of European food (integrity) is of prime importance in adding value to the European Agri-Food economy.

The Network

The FoodIntegrity Network is developed as part of the EU Food Integrity project. It is a platform for stakeholders and experts to exchange knowledge and expertise in food authenticity, safety and quality; and to rapidly share information and intelligence about suspected and actual incidents to protect consumers and food products from damaging effects of food mis-description.

The primary objective of the network is to form stakeholder/expert groups with shared interests in detection, methodology, intelligence, open innovation and knowledge transfer in relation to food authenticity, quality and safety.

Experts and Stakeholders

FoodIntegrity stakeholder is a person, group or organisation that has interest or concern in the food integrity area. They can affect or be affected by FoodIntegrity project outcomes, objectives or actions. FoodIntegrity stakeholders can be contacted for advice and/or contribution.

FoodIntegrity expert is a person with extensive knowledge or skills based on research, experience, or occupation in the area of food integrity. FoodIntegrity experts can be called in for advice and/or contribution, but they do not always have to agree on particulars of food integrity issues.

Register at www.foodintegrity.eu

Searchable database of experts is linked to the FoodIntegrity knowledge base

Scientific Opinions

Stable isotope techniques for verifying the declared geographical origin of food in legal cases
Federica Camin*, Markus Boner, Carsten Fauhl-Hassek & Andreas Rossmann

Isotopic ratio analysis of 2H/1H (or D/H), 13C/12C, 18O/16O, 15N/14N, 34S/32S, 87Sr/86Sr has successfully been used to verify geographical origin and guarantee authenticity in various cases in relation with legal or other control instruments. The authenticity verification is in some cases improved by other analytical parameters e.g. elemental analysis. The creation of a databank and the selection of adequate reference data is one of the most critical aspects for the application of the stable isotope technique in legal cases.
For more information contact Federica Camin federica.camin@fma.ch.it

Workshops

- Fat food products with high economical and sustainable use origin, authenticity and integrity, Lisbon, January 2016
For more information contact Cristina Mágues emmanson@fc-ul.pt
- Food integrity of spices, Berlin, May 2016
For more information contact Riedl Janet janet.riedl@bfr.bund.de

www.foodintegrity.eu

The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.
Ensuring the Integrity of the European food chain

WORK PACKAGE 10: Industrial Integration

M. Suman, BARILLA Italy; B. Perez & M.A. Pardo, AZTI Spain; P. Vermeulen & V. Baeten, CRA-W Belgium; M. Lees, EUROFINS France; A. Cannavan, FAO/IAEA Austria; F. Camin & L. Bontempo, FEM Italy; A. Charlton, FERA UK; R. Home & R. Mader & H. Stolz, FiBL Switzerland; S.A. Haughey & C.T. Elliott, QUB Northern Ireland; Y. Weesepoel & S. Van Ruth, RIKILT The Netherlands; E. Maestri & S. Sforza, SITEIA.UNIPR Italy; K.H. Laursen, UCPH Denmark.

Provide the European food industry with practical tools for avoiding safety and security risks, monitoring entire food sourcing chains, testing on the field both rapid/cost effective screening technologies and targeted/non-targeted confirmatory methods.

- Rapid screening high-throughput NIR technologies:
  - Quantification of common wheat in durum wheat
  - Quantification of impurities/contaminants in wheat
  - Assessment of portable instruments for fraud detection on samellina or flour
- Food Integrity Information Hub: Regional, National and EU key interlocutors in food organizations/associations and industries
- Recognition of DNA based methods for standardisation bodies
  - e.g. authentication of PDO Idiazabal cheese / tuna canned products
  - Tailor made methods for authentication of food ingredients (seafood, meat, juices etc…)
- Omics technologies in relation to e.g. honey, meat, oil and wine authenticity
- Leading global network of food authenticity experts
- Identification of biomarkers unique to adulterants
- Web based resources for food fraud alerts and management

WP10 Overall Objectives

- Monitor what happens from raw materials to finished products
- Contribute to assess state of the art in detecting food frauds, understanding consumer concerns
- Check the effectiveness of validated/harmonised methods, transnational databases & reference materials
- Focus on reducing methods complexity to render them more effective for stakeholders
- Explore the potentialities of high throughput non-targeted screening methods
- Test rapid&cost effective screening technologies

Challenges & Issues

- Emerging economies
- Demand for premium foods
- Rising prices and scarcity of raw ingredients
- Increased risk of adulteration of ingredients & food
- Demand of information from consumers
- Need to discriminate among food/raw materials origins (e.g. PDO, PGI,…) production methods (e.g. organic vs traditional), food processing, etc.

Tool boxes

- Methods & technologies validated from the industry side
- Guidelines to match between foods description and real products
- Guidelines to evaluate compliance with defined food/raw materials, standards & certifications
- Environmental & social implications

www.foodintegrity.eu

The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.
Non-destructive determination of chicken fillet adulteration by MicroNIRs

Yannick Weesepoel1, Eleftheria Tzoumeleka1, Chang Hsiung2, Rita Boerrigter-Eenling1, Chris Pederson2, Nada O’Brien2 and Saskia van Ruth1,3

Chicken fillet - Background
Local production and import of chicken fillets in Europe/The Netherlands is a multimillion euro industry. Consumers are entitled to informed choices and should not be deceived, e.g. by:
• Thawed chicken fillets sold as fresh.
• Addition of non-labelled moisture and accompanying moisture retaining agents.

MicroNIRs - Background
The MicroNIR® 1700 was explored as a fast tool for on-site non-destructive authentication (Fig. 1). The equipment is USB powered, weighs 60 grams (45 x 42 mm) and measures in the spectral range of 950 – 1650 nm (Fig. 2). Analysis results can be directly displayed on a tablet or laptop (Fig. 5). A food inspector can therefore identify suspect samples to transfer to his laboratory facilities for more elaborate investigation.

Results & Discussion
Due to the inhomogeneity of the samples, ‘classical’ principal component classification and regression methods show little correlation with the laboratory values. Therefore, machine learning algorithms were employed. In this case, support vector machine (SVM) classification and support vector regression (SVR) gave accurate results (Fig. 3 – 4 and Tab. 1 – 2). Low number of false negatives for classification and low deviations from the actual ISO values were found.

Conclusions
Chicken fillet can be authenticated on-site and non-destructively by portable MicroNIR spectroscopy.

Methods
- Five MicroNIR spectra per fillet (63 pc.), 950-1650 nm range, reflectance, 17.2 ms integration time, 100 scan count, rim applied.
- Chemometrics: Unscrambler X 10.3.
- Freeze/Thawing: 24h/24h.
- Up to 1% (w/w) brine or porcine gelatine solution added.
Untargeted detection of contaminants in agro-food products using vibrational spectroscopy and chemometrics: the example of detection of melamine levels in milk

Juan Antonio Fernández Pierna, Damien Vincke, Vincent Baeten, Clément Grelet, Frédéric Dehareng & Pierre Dardenne
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Introduction

In this study, a procedure is proposed for the characterisation of agro-food products using vibrational spectroscopy. New crises of adulteration with illegal ingredients other than known ones continue to occur from time to time. By relying only on targeted analysis methods, adulteration could get out of control and analysis. In contrast to targeted analysis, which uses information from known possible unusual ingredients, an untargeted approach registers all information within a certain correlation/similarity, including data from new products. Untargeted analysis will mean alerts can be given more rapidly and fraud detected more easily. Until now, untargeted analysis has been associated mainly with direct analysis techniques, such as mass spectrometric-based metabolomics or isotope-assisted methods. Only a few studies have linked untargeted analysis with vibrational spectroscopic methods.

In this study, vibrational spectroscopic techniques combined with new concepts in multivariate analysis is used for characterizing liquid UHT milk samples spiked with varying levels of melamine. Melamine has been illegally added to food/feed to artificially elevate the protein content values of products. Strict regulations have been enforced throughout the world and many papers have been published. In this work, a new tool, Local Window Principal Component Analysis (LWPCA) based on a moving window associated to the use of a local technique allowing, for each sample to be predicted, the selection of the most spectroscopically similar samples, is proposed as untargeted analysis of samples.

Workflow of LWPCA

1. Set up a “clean” set = reference set
2. For each unknown new spectrum, Select k closest spectra from the clean set based on correlation
3. Build a PCA model from the selected spectra for each window along the wavelength range
4. Compute the residuals limits of the PCA models
5. Apply the PCA models to project the unknown new spectrum
6. Compute the residuals of the projected spectrum
7. Check if these residuals are within the PCA residual limits

A case study

The case study selected is based on milk contaminated with melamine. Melamine (2,4,6-triamino-1,3,5-triazine) is a chemical compound rich in nitrogen, which is illegally added to food/feed to artificially elevate the protein content values of products.

A data set consisting of 300 samples of UHT liquid milk was used as ‘clean’ data set. Moreover, other 12 UHT liquid milk samples have been contaminated with melamine at different levels ranging from 0.01 % to 1 % (100 – 10000 ppm). All these samples have been measured using a Fourier transform mid-infrared (FT-MIR) spectrometer type FT6000 (Foss, Hillerød, Denmark).

Results

Original spectra
GH (Mahalanobis dist.)
LWPCA

0.025% = 250ppm
0.01% = 100ppm
0.01% = 100ppm

Conclusion

These results show that no clear conclusion can be obtained when looking directly at the spectra. GH values detect abnormalities at levels higher than 500 ppm. LWPCA allows detecting contamination at levels up to 100 ppm; however at those levels the detection of melamine in milk becomes unstable, which is an indication that the technique has probably reached its limit of detection.

In this work a local moving window PCA method has been proposed for the characterization of an important agronomical product and the detection of possible contaminants using vibrational spectroscopy. The application shown here shows the possibilities of this method for the detection of abnormal spectra in the samples. In the case presented here, liquid UHT samples have been contaminated with melamine, making it thus a targeted study. However the method should be used as a method for detection of abnormalities (real contamination or fraud) in the data and a previous step for further analyses. Moreover, as there is a local selection of the most spectroscopically similar samples, the spectral library can be multi-products, which can also drive to the development of unique predictions… but this is another story.

Acknowledgments

This work was partly performed in the framework of the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 613688 FOODINTEGRITY project.
WP11: Dissemination & Knowledge Transfer

WP leader: Jana Hajslova, University of Chemistry and Technology, Prague, Czech Republic
WP partners: All FoodIntegrity consortium partners

OBJECTIVES:
- The knowledge transfer of project results to all interested stakeholders through the website, e-Newsletter, publications and presentations at scientific and other events, some of which will be in collaboration with WP1 and WP10. In particular, the dissemination activities will feed back into the FoodIntegrity Network (WP1) and its forums to complete the “knowledge circle” and inform the widest possible International stakeholder audience.
- There will also be close links to the industrial Integration activities (WP10) with short and long-term training/mobility activities in advanced analytical technologies and other specific knowledge developed/generated within the project framework to the project consortium members and external end-users.
- Effective technology transfer and training to all interested end-users through various training tools and events (academia, scientists, official authorities, policy makers, consumers and other potential end-users).

ACTIVITIES:

General dissemination activities:
- The FoodIntegrity public web site: www.foodintegrity.eu
- Publications in peer reviewed journals and professional journals to present the results of the consortium
- Presentations at international conferences (lectures, posters) to present the results of the consortium
- Flyers, posters, brochures, booklets for distribution at adequate occasions, e.g. stakeholder events

Specific dissemination activities:
- A pro-active approach is applied to reach the target stakeholders of the project outcome with specific information. This is achieved via the following actions:
  - Database of stakeholders
    A stakeholder database was established and is continuously updated by WP1: Food Integrity Network with the active participation of all consortium members
    Registered stakeholders are informed by email on the progress of the project activities, including the e-newsletters.
  - Comprehensive involvement of stakeholders, policy makers, industry and consumers through the FoodIntegrity advisory board
  - Collaborations with other EU FP7 projects regarding food integrity (activity in cooperation with WP1, WP12)
  - e-Newsletters to make project results directly available to end users and stakeholders, dedicated to general public, official authorities, food and feed sectors and scientists
  - Innovation implementation / outreach strategies via the commercial enterprises involved in the project
  - Production of guidance documents for industry such as ‘Good practice recommendations for the industry’ (activity of WP10: Industrial Integration)

WHAT DOES KNOWLEDGE TRANSFER MEAN?
Knowledge Transfer is the process of transferring skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services.

WHO ARE FoodIntegrity TARGET STAKEHOLDERS & SECTORS FOR DISSEMINATION AND KNOWLEDGE TRANSFER?
Academia, scientists, official authorities, risk assessors and policy makers (e.g. EFSA, DG Sanco, national Food Safety Authorities), industry and potential end-users of developed analytical technologies (e.g. control laboratories, food analysis contract laboratories, food industry, SMEs), consumer organisations including China consumers, stakeholder organisations, trade organisations / associations, ILSI network, EU projects etc... and FoodIntegrity consortium

Training program:
- Various short-term and long-term training and education activities at different levels will take place within and following the FoodIntegrity project in order to establish a European basis for permanent education in the field of food integrity.
- Young scientist mobility both within the project consortium and involving members of the training network, with the aim both to help in capacity building of young researchers and assist in the transfer of knowledge within the project consortium
- e-learning interactive tool(s)/webinar(s) to support worldwide knowledge dissemination to the community not involved directly in the training network
- Workshops focused on advanced analytical methodologies, traceability and consumers’ issues related to the food integrity aspects, aiming at knowledge transfer to the community of professionals, associations, industry and other potential end-users
- Training network
  Development of TRAINING NETWORK -- 2 step training approach is planned:
  Phase I: Future trainers will be trained
  - To develop a training program for interested stakeholders
  - To provide training to all interested stakeholders via various training tools
  Phase II: Trained trainers will organize targeted training either at national level for scientists, academia, researchers, control labs etc. (via hands on, one-to-one, training course, ...) or for European industrial/ professional organisations
- Series of Open days / Information days
  Organised in connection with regular stakeholder events to tailor the presentations to the target audience and to reach a maximum number of participants
- International conferences for stakeholders and interested public
  Series of 5 Food Integrity conferences focused on Food Safety / Quality / Authenticity / Integrity issues is organised to support widespread dissemination of the information on the project activities & achieved results to general public, media, scientists, industry, official authorities etc.

The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.
Ensuring the Integrity of the European food chain

Work Package 2

The Food Integrity Knowledge Base – a web-tool mapping analytical solutions to food fraud issues

M. Lees *, Eurofins France ; M. Thomas *, FERA UK ; M. Suman, Barilla Italy ; C. Fauhl-Hasse & J. Riedl, BfR Germany ; V. Baeten & P. Vermeulen, CRA-W Belgium ; D. L.G. González, CSIC Spain ; A. Cannavan, FAO/IAEA Austria ; F. Camin & L. Bontempo, FEM Italy ; A. Rossmann, isolab GmbH Germany ; A. Maquet, JRC Geel Belgium ; S. van Ruth & Y. Weesepoel, RIKILT The Netherlands ; E. Maestri, SITEIA.PARMA Italy ; I. Goodall, SWRI UK ; G. Downey, TEAGASC Ireland ; A. Zalacain, UCLM Spain ; K.H. Laursen, UCPH Denmark ; J. Hajslova & M. Tomaniova, VSCHT Czech Republic

*Corresponding authors: MicheleLees@eurofins.com and Miles.Thomas@fera.co.uk

Today’s context
There is a need for a Knowledge Base on food authenticity issues:
- to support industry’s efforts to combat food fraud
- to help enforcement bodies target food fraud
- to promote European Research and Development in food authenticity and traceability

The FoodIntegrity Knowledge Base
is a Web-based TOOL, bringing together available information on:
- food authenticity issues and related food commodities
- suitable analytical tools and associated reference data
with the aim of facilitating access to this information for:
- industry
- regulatory authorities
- research organisations

The FoodIntegrity Knowledge Base will provide the following information:

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- industry
- regulatory authorities
- research organisations

The FoodIntegrity Knowledge Base will provide the following information:

Food Integrity Issue
Analytical Strategy

Food Product

Data entry screen

Results of database search
You can display the database results
You can display selected records
Or you can save the output to a PDF
You can refine search criteria
You can display selected records
Report selection to PDF

The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613668.
The FoodIntegrity Knowledge Base - Progress made in the inventory of food authentication methods - A review of EU-funded projects

M. Lees*, D. Salvat-Brunaud, A. Rebours, S. Barreteau, Eurofins Analytics France, Rue Pierre Adolphe Bobierre, 44300 Nantes, France
*Corresponding author: MicheleLees@eurofins.com

FOODINTEGRITY is a five-year project, comprising an inner core of 38 project participants from industry, academia, research institutes, and a global network of stakeholders. Its key focus is to provide Europe with a state-of-the-art and integrated capability for detecting fraud and assuring the integrity of the food chain. The work presented in this poster has been carried out as part of Work Package 2.

Introduction
The principle objective of Work Package 2 of the FoodIntegrity Project is to bring together, in a Knowledge Base, all available information on suitable analytical tools and associated reference data for the detection of food fraud. One of the first tasks in building this knowledge base has been the inventory of existing authentic reference data sets by examining past/current EU-funded projects, or nationally-funded projects related to food fraud. In the work carried out the concept of food fraud has been taken to include both ‘food authenticity’ and ‘food traceability’.

Research Methodology
EU R&D projects were identified from the CORDIS, EUREKA and COST websites. These were searched using the following keywords:

<table>
<thead>
<tr>
<th>Research criteria : Keywords related to Food Fraud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adulteration / adulterant</td>
</tr>
<tr>
<td>Counterfeit / Counterfeiting</td>
</tr>
<tr>
<td>Food authenticity / Food authenticity</td>
</tr>
<tr>
<td>Feed fraud / Food fraud</td>
</tr>
<tr>
<td>Food traceability / Food traceability</td>
</tr>
<tr>
<td>Food composition / Food safety</td>
</tr>
<tr>
<td>PDO (Protected Designation of Origin)</td>
</tr>
<tr>
<td>PGI (Protected Geographical Indication)</td>
</tr>
<tr>
<td>TSG (Traditional Specialities Guaranteed)</td>
</tr>
</tbody>
</table>

The search was completed using a set of product-related keywords based on the ingredient categories of the USP Food Fraud Database.

Results
From 1989 to 2014
95 projects selected: 83 authenticity and 15 traceability

Information collected for each project
- Framework Programme
- Start and end dates
- Title, acronym, summary
- Food or feed product(s)
- Analytical method(s) used or developed
- Total cost and EU contribution
- Coordinator and contact details
- Number and country of origin of participants (EU and non-EU)
- Contract type
- Link to Cords summary or project website if available

The information obtained was provided to WP3 as part of the Gap Analysis and will be used as a source of data for the FoodIntegrity Knowledge Base.

Food Fraud-related EU Projects classified...
.... according to Framework Programme
![Graph showing number of projects per Framework Programme]

Authenticity and traceability projects funded by the European Commission from FP2 to FP7

... according to food category

Number of authenticity projects funded by the European Commission from FP2 to FP7 according to the type of product (food, feed)

... according to analytical method involved

Number of authenticity projects funded by the European Commission from FP2 to FP7 according to the analytical method involved

www.foodintegrity.eu
Ensuring the Integrity of the European food chain

The Food Integrity Knowledge Base – a web-tool mapping analytical solutions to food fraud issues

M. Lees *, Eurofins France ; M. Thomas *, FERA UK ; M. Suman, Barilla Italy ; C. Faulh-Hassek & J. Riedl, BFR Germany ; V. Baeten & P. Vermeulen, CRA-W Belgium ; D. L.G. González, CSIC Spain ; A. Cannavan, FAO/IAEA Austria ; F. Camin & L. Bontempo, FEM Italy ; A. Rossmann, isolab GmbH Germany ; A. Maquet, JRC Geel Belgium ; S. van Ruth & Y. Weesepoel, RIKILT The Netherlands ; E. Maestri, SITEIA.PARMA Italy ; I. Goodall, SWRI UK ; G. Downey, TEAGASC Ireland ; A. Zalacain, UCLM Spain ; K.H. Laursen, UCPH Denmark ; J. Hajslova & M. Tomaniova, VSCHT Praha Czech Republic

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The FoodIntegrity Knowledge Base will provide the following information:

Data entry screen

Results of database search

The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.
Ensuring the Integrity of the European food chain

WP4-Olive Oil Integrity - Joining Quality and Authenticity

D. L. García-González & N. Tena*, CSIC, Spain; M. Lees, Eurofins, France; M. Thomas, FERA UK; A. Maquet, JRC-IRMM, Belgium; E. Maestri, SITEIA.UNIPR, Italy; S. van Ruth & Y. Weesperoepl, RIKILT, The Netherlands; F. Camin & L. Bontempo, FEM Italy; G. Downey, TEAGASC, Ireland; V. Baeten & J.A. Fernández-Pierna, CRA-W, Belgium; L. Mannina, UNIROMA1, Italy.

WP4 1st Objective: Worldwide Survey

Worldwide Survey on Olive Oil Actors

Do we really need to ask ........

To define better strategies
To give analytical solutions
To get and concentrate knowledge
To identify quality and authenticity issues
To identify gaps

Olive Oil Survey Is Still Open!

Go to www.foodintegrity.eu Click on “survey”

We need your Input!!!

The survey is available in English, Spanish, Italian and French

Traceability

In your opinion, what are the three main objectives for the implementation of an efficient traceability system for VOO?

Safety (20%), quality (29%) and geographical declaration (31%) are equally perceived as traceability objectives.

As a consumer, are you willing to pay more for a VOO with additional assurance regarding traceability?

www.foodintegrity.eu

The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.
WP4-Olive Oil Integrity- Joining Quality and Authenticity

D. L. García-González & N. Tena*, CSIC, Spain; M. Lees, Eurofins, France; M. Thomas, FERA UK; A. Maquet, JRC-IRMM, Belgium; E. Maestri, SITEIA.UNIPR, Italy; S. van Ruth & Y. Weesepoel, RIKILT, The Netherlands; F. Camin & L. Bontempo, FEM Italy; G. Downey, TEAGASC, Ireland; V. Baeten & J.A. Fernández-Pierna, CRA-W, Belgium; L. Mannina, UNIROMA1, Italy.

Why Olive Oil Integrity Is Important?

Food Integrity is: “the state of being whole, entire, or undiminished or in perfect condition”.

Breach of integrity is when there is a mismatch between the actual properties of an olive oil and the properties that it is claimed on the label or in the accompanying documentation.

Misdescription includes: quality flaws, authenticity issues, mislabeling, doubtful practices.

Objectives of WP4 “OLIVE OIL INTEGRITY”:

- To reorganize existing information and to identify problems and potential solutions.
- To reinforce rapid methods to solve current safety/quality demands (i.e., geographical provenance).
- To identify problems in the validation of qualitative methods proposed for acceptance by regulatory bodies.

World Wide Survey on Olive Oil Actors

- Producers, Farmers, Retailer, Importers/Exporters, Analysts, Consumers
- Regulatory bodies...

Geographical Provenance: The Physicochemical Backward Traceability

- Confronting the eventual relationships between product characteristics related to geographical provenance and the analytical features extracted from spectroscopic techniques (isotopic methods, FTIR, NMR, etc.).

Harmonizing Methods and Guidelines for Validating Qualitative Methods

- Current standards from different national and international bodies will be cross-tabulated and compared. Information from spectroscopic experience will be used to produce guidelines to support the validation of qualitative responses
Work Package 5: PROVIDING ASSURANCE IN THE SPIRIT DRINKS SECTOR


* Corresponding author: ian.goodall@swri.co.uk

The FoodIntegrity Spirit Drinks Work Package

Within the FoodIntegrity Project are three work packages focussing on three key European food and drink commodities. Work Package 5 deals exclusively with European spirit drinks and is led by the Scotch Whisky Research Institute. The three other partners in this Work Package are: D.D. Williamson, Ocean Optics and spiritsEUROPE.

Background to the Spirit Drinks Work Package

The spirit drinks sector is important for consumers, producers and the agricultural sector within the European Union. In 2011, European spirit drinks producers together produced 37.5 million hectolitres of spirit drinks valued at over €23 billion, approximately two-thirds of which is exported. The spirit drinks sector constantly strives to ensure a high level of consumer protection by the prevention of deceptive practices that impact negatively on consumer perception and health. By so doing, the sector aims to safeguard the reputation which European Union spirit drinks have achieved in the world market.

Laboratory Analysis

Analytical methods that can ensure the safety and authenticity of spirit drinks have been developed to meet sector requirements. These are principally laboratory based, requiring skilled operators to return results. Improving ease of use, speed, and the ability to differentiate between authentic and counterfeit products is a continuing aim of the spirit drinks sector.

In-field Screening

A particular requirement of the sector is to provide in-field technologies that will allow counterfeit samples to be quickly identified at point of sale or distribution (i.e. at customs), ideally without having to sample the liquid from the bottle. Such in-field screening will better target sources of counterfeit and potentially harmful products. The detection of undesirable contaminants such as methanol, provides a universal means of counterfeit detection across all spirit categories.

Communication, Information and Education

Considerable expertise in spirit drinks analysis resides within the spirit drinks sector. However, analysis for spirit authentication and safety by laboratories outside the spirit sector can often be compromised by a lack of knowledge. A lack of informed and skilled independent spirit analysis laboratories in certain markets can make effective enforcement of spirit quality and authenticity difficult. Improved communication between producers and enforcers, without compromising issues of company confidentiality, would advance the ability of the spirit sector to protect its interests as well as those of the consumer.

Provision of guidance on analytical methods and authentication protocols, training of analytical laboratories, and the certification of laboratories using proficiency schemes have all been employed to some extent by the sector.

Key Objectives

- Development of field devices to detect harmful/non-potable constituents in spirit drinks
- Further development of field devices to authenticate branded spirits and/or specific spirit categories
- Development of supporting laboratory based techniques
- Construction of recommended protocols for assessing safety/authenticity of spirit drink products
- Provision of guidance/training in appropriate spirit drinks analysis and compliance testing/certification of external laboratories

Networking

Underpinning the above objectives is the establishment of a network of key stakeholders in spirit drinks authentication and assurance, whether involved in analysis, regulation, brand management or enforcement. Interested parties, please contact the work package leader at ian.goodall@swri.co.uk.
Ensuring the Integrity of the European food chain

Work Package 5: ACTIVITIES IN PROGRESS


* Corresponding author: ian.goodall@swri.co.uk

The FoodIntegrity Spirit Drinks Work Package

There are four principal tasks within the Spirit Drinks Work Package of the FoodIntegrity project.

These are:
• Development of field device(s) to detect harmful/non-potable constituents in spirit drinks.
• Further development of field devices to authenticate branded spirits and/or specific spirit categories.
• Construction of recommended protocols for assessing safety/authenticity of spirit drink products.
• Provision of training in appropriate spirit drinks analysis and compliance testing/certification of external laboratories.

Work on In-field Detection of Harmful/Non-Potable Compounds

• A review of the technical literature has been undertaken on the use of markers to identify illicit alcohol in spirit drinks.
• Initial markers to target have been selected - high concentrations of methanol and common European denaturants, e.g. IPA (isopropyl alcohol), MEK (methyl ethyl ketone), ES-AK (ethyl sec-amyl ketone), MIPK (methyl isopropyl ketone) and denatonium benzoate.

• Given the range of potential denaturants, multi-analyte techniques such as GC-MS and LC-MS are being considered in portable/deployable forms.

Work on Further Development of Field Devices to Authenticate Spirit Brands and Categories

• Similar techniques are being tested with brand authentication as for the detection of markers for illicit alcohol – e.g. UV/Vis/NIR/Raman and more portable versions of traditional laboratory techniques (GC-MS and LC-MS).
• The Ocean Optics Spirit Sampler is being enhanced. This successfully uses UV/Vis spectroscopy to identify a large proportion of brand counterfeits.

Supporting Laboratory Analysis

• Results from in-field screening devices are typically supported by more authoritative laboratory based analysis.
• Work with equipment suppliers and academia has started looking at alternative laboratory techniques to identify new markers/techniques for authenticating products.
• Work is also being undertaken to improve standard analyses methodology.

Sharing Best Practice on Spirit Drinks Authentication

• Collation of analytical methods used to profile spirit drinks.
• Development of a website for sharing information on spirit drinks authenticity.
• Population of spirit drink analytical methods into Food Integrity Knowledge Base (Work Package 2).
• Work to be undertaken on appropriate tools for education and training of third party laboratories.

To access the spirit drinks section of the FoodIntegrity website, register at www.foodintegrity.eu and email ian.goodall@swri.co.uk to ensure correct permissions.
Chinese Consumer Attitudes to Food Fraud: Preliminary findings from a Quantitative Consumer Survey in China

Naughton, P.1 Kendall, H.1 Clark, B.1 Kuznesof, S.1 Dean, M.2 & Frewer, L.2

1 School of Agriculture, Food and Rural Development, Newcastle University, Newcastle Upon Tyne, UK.
2 School of Biological Sciences, Queens University Belfast, Belfast, UK.

Background

In recent years the food industry in China has been damaged by frequent food fraud scandals, which has increased Chinese consumers’ concerns about food safety and quality (Liu et al., 2013). Therefore, from the perspective of European food and drink manufacturers it is important to ensure that the expectations of Chinese consumers are being met in terms of the integrity of European food and drink products.

Study Aim

To investigate the perceptions and expectations of Chinese consumers towards the authenticity and tractability of selected products originating from Europe; and drink and GM modified food and drink.

Data Collection

Computer aided structured interviews with a random sample of 850 Chinese Consumers selected from three cities in China: Beijing, Changzhou Tier 2 City and Guangzhou Tier 2 City.

The administration of the questionnaire was carried out by Millward Brown in August 2015. This included translation, pilot testing and data collection.

Results

Table 1 Socio-demographic profile of different types of purchasers

<table>
<thead>
<tr>
<th>Socio-demographic profile</th>
<th>Total Sample</th>
<th>Non-purchasers</th>
<th>Formula only</th>
<th>Whisky only</th>
<th>Other only</th>
<th>Two or more purchases</th>
<th>Sig</th>
<th>p* (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>n = 850</td>
<td>n = 246</td>
<td>n = 186</td>
<td>n = 180</td>
<td>n = 60</td>
<td>n = 274</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>50</td>
<td>45.2</td>
<td>75</td>
<td>58.3</td>
<td>53.4</td>
<td>0.0005</td>
<td>30.71</td>
<td>(4)</td>
</tr>
<tr>
<td>Female</td>
<td>350</td>
<td>54.8</td>
<td>75</td>
<td>41.7</td>
<td>46.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (Years)</td>
<td>18-25</td>
<td>50</td>
<td>50.0</td>
<td>75</td>
<td>53.4</td>
<td>0.0001</td>
<td>38.34</td>
<td>(8)</td>
</tr>
<tr>
<td>26-35</td>
<td>350</td>
<td>50.0</td>
<td>50.0</td>
<td>75</td>
<td>53.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36-45</td>
<td>50</td>
<td>50.0</td>
<td>50.0</td>
<td>75</td>
<td>53.4</td>
<td>0.025</td>
<td>30.3152</td>
<td>(4)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary school</td>
<td>0.5</td>
<td>1.2</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>0.0005</td>
<td>30.3152</td>
<td>(4)</td>
</tr>
<tr>
<td>Junior high school</td>
<td>5.1</td>
<td>4.8</td>
<td>3.9</td>
<td>8.1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior high school</td>
<td>25.6</td>
<td>26.6</td>
<td>26.6</td>
<td>17.8</td>
<td>18.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical school</td>
<td>6.5</td>
<td>7.3</td>
<td>7.3</td>
<td>10.6</td>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-years college education</td>
<td>28.2</td>
<td>24.2</td>
<td>28.2</td>
<td>39</td>
<td>29.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-years college education</td>
<td>16.5</td>
<td>30.2</td>
<td>31.1</td>
<td>17.2</td>
<td>46.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate degree</td>
<td>3.9</td>
<td>2.4</td>
<td>1.3</td>
<td>6.6</td>
<td>3.2</td>
<td>0.038</td>
<td>21.9732</td>
<td>(12)</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 1000 RMB/week</td>
<td>15.2</td>
<td>19</td>
<td>16.5</td>
<td>11.7</td>
<td>20.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1001-1999 RMB/week</td>
<td>46</td>
<td>49.6</td>
<td>45.2</td>
<td>44.4</td>
<td>46.7</td>
<td>0.038</td>
<td>57.493 (8)</td>
<td>(4)</td>
</tr>
<tr>
<td>2000-2099 RMB/week</td>
<td>25.6</td>
<td>18.5</td>
<td>28.7</td>
<td>29.4</td>
<td>25.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3000-3999 RMB/week</td>
<td>3.2</td>
<td>13.9</td>
<td>0.6</td>
<td>14.4</td>
<td>8.3</td>
<td>0.0005</td>
<td>37.072</td>
<td>(4)</td>
</tr>
<tr>
<td>4000-4999 RMB/week</td>
<td>33.4</td>
<td>28.6</td>
<td>25.0</td>
<td>26.1</td>
<td>46.7</td>
<td>0.0005</td>
<td>57.493 (8)</td>
<td>(4)</td>
</tr>
<tr>
<td>5000-5999 RMB/week</td>
<td>33.3</td>
<td>37.7</td>
<td>34.0</td>
<td>30.0</td>
<td>33.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Chi-square tests show that type of purchaser is significantly related to gender, age, education, income and location. For example, it is apparent that non-purchasers are more likely to earn less than 15000 RMB whereas those who purchase two or more of these types of products are more likely to earn more than 20000 RMB.

Consumers’ perceptions to different food related hazards were measured on Likert scales ranging from 1 = strongly disagree to 5 = strongly agree (Table 2). The a-d superscripts indicate means which are significantly different (p < 0.05) using paired sample t-tests; means that are not significantly different are identified by the same letters. It is clear to see that consumers are most concerned about deteriorated and adulterated food and drink and least concerned about nutritionally imbalanced food and drink and GM modified food and drink.

Consumers’ perceptions regarding the importance of different types of authenticity cues (table 3) and the importance of knowing the origin of different types of food & drink products (table 4) were measured on Likert scales ranging from 1 = strongly disagree to 5 = strongly agree. Looking at Table 3 it is apparent that Chinese consumers regard a tamper proof seal and a cert of authenticity to be very important cues of authenticity, whereas information about where the product is produced and packaged is considered less important when making authenticity judgements. Table 4 shows that Chinese consumers are more concerned about the traceability of foods purchased for in home and family consumption than for imported food and drink products.

Chinese consumers were asked who should be responsible for ensuring consumers have safe and authentic food, who can be trusted to protect consumers from adulterated food and drinks and who can be trusted to provide transparent and accurate information. Looking at table 5, Chinese consumers believe that manufacturers and consumer organisations should be responsible, however, they are less inclined to trust food and drink manufacturers. While the government, medical doctors and consumer organisations are considered to provide accurate sources of information, manufactures and retailers are less trusted to do so.

Table 2 Mean ratings of Chinese consumers’ risk perceptions of food related hazards

<table>
<thead>
<tr>
<th>Risk Perception</th>
<th>Average (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adulterated food &amp; drink</td>
<td>4.29 (0.86)</td>
</tr>
<tr>
<td>Food &amp; drink containing additives</td>
<td>4.21 (0.87)</td>
</tr>
<tr>
<td>Genetically modified food &amp; drink</td>
<td>4.29 (0.87)</td>
</tr>
<tr>
<td>Inferior quality &amp; drink</td>
<td>4.21 (0.87)</td>
</tr>
<tr>
<td>Veterinary drugs</td>
<td>4.29 (0.87)</td>
</tr>
</tbody>
</table>

Table 3 The perceived importance of authenticity cues

<table>
<thead>
<tr>
<th>Authenticity cues</th>
<th>Average (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country of origin</td>
<td>4.08 (0.76)</td>
</tr>
<tr>
<td>Producers &amp; packagers in Europe</td>
<td>4.02 (0.85)</td>
</tr>
<tr>
<td>Food &amp; drinks consumers at home</td>
<td>4.04 (0.81)</td>
</tr>
<tr>
<td>Government</td>
<td>3.94 (0.87)</td>
</tr>
<tr>
<td>Doctors &amp; medical doctors</td>
<td>3.95 (0.85)</td>
</tr>
<tr>
<td>Retailers</td>
<td>3.95 (0.85)</td>
</tr>
<tr>
<td>Food &amp; drink manufacturers</td>
<td>4.02 (0.78)</td>
</tr>
<tr>
<td>Food &amp; drinks retailers</td>
<td>4.01 (0.76)</td>
</tr>
</tbody>
</table>

Table 4 The perceived importance of traceability for different purchase occasions

<table>
<thead>
<tr>
<th>Food Types</th>
<th>Average (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food &amp; drinks consumers at home</td>
<td>4.42 (0.61)</td>
</tr>
<tr>
<td>Government</td>
<td>4.36 (0.63)</td>
</tr>
<tr>
<td>Doctors &amp; medical doctors</td>
<td>4.32 (0.66)</td>
</tr>
<tr>
<td>Retailers</td>
<td>4.33 (0.63)</td>
</tr>
<tr>
<td>Food &amp; drink manufacturers</td>
<td>4.36 (0.64)</td>
</tr>
<tr>
<td>Food &amp; drinks retailers</td>
<td>4.32 (0.66)</td>
</tr>
</tbody>
</table>

Table 5 Organisations/individuals responsible & trusted to ensure consumers have safe & authentic food and have accurate information

<table>
<thead>
<tr>
<th>Organisation/Individual</th>
<th>Who Should be responsible</th>
<th>Who Can be trusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food &amp; Drink Retailers</td>
<td>4.16 (0.86)</td>
<td>3.68 (0.63)</td>
</tr>
<tr>
<td>Food &amp; drink manufacturers</td>
<td>4.16 (0.88)</td>
<td>3.71 (0.62)</td>
</tr>
<tr>
<td>Government organisations</td>
<td>4.04 (0.84)</td>
<td>4.04 (0.70)</td>
</tr>
<tr>
<td>Dentists/pediatricians</td>
<td>4.13 (0.81)</td>
<td>4.05 (0.82)</td>
</tr>
<tr>
<td>General practitioners</td>
<td>4.05 (0.82)</td>
<td>4.23 (0.78)</td>
</tr>
<tr>
<td>The WHO</td>
<td>4.10 (0.86)</td>
<td>3.89 (0.72)</td>
</tr>
<tr>
<td>The MFA</td>
<td>4.09 (0.80)</td>
<td>4.05 (0.82)</td>
</tr>
</tbody>
</table>

Note: Answers were measured on Likert scales ranging from 1 = strongly disagree to 5 = strongly agree. The a-d superscripts indicate means which are significantly different (p < 0.05) using paired sample t-tests.
Annex II 1st FoodIntegrity Open Day at RAFA 2015 - presented slide shows
Ensuring the Integrity of the European food chain

FoodIntegrity Knowledge Base: an information resource on food authenticity

Work Package 2

Members of WP2
Ensuring the Integrity of the European food chain

WP 2 Database Search Engine

This is a PowerPoint presentation of the search engine
Run only as a slideshow
Click mouse anywhere to begin viewing

Click where the yellow boxes indicate

Food Integrity Database Search Form

Select a Food Category (compulsory)
(Select food category)

And/Or a CN code (enter only the first four digits)

And/Or use a wildcard search for a keyword(s)
Multiple words can be used, separate with AND / OR / AND NOT in upper case
e.g. goat AND cheese, oil AND NOT rape

And/Or type of fraud: Select one or more

And/Or Issue: Select one or more

GET RESULTS
Select commodity – Eggs and egg products

And/or use a wildcard search for a keyword(s)
Multiple words can be used, separated with AND / OR / AND NOT in upper case

And/or type of fraud:
- Dilution
- Substitution
- Consistency/Weight
- Labeling
- Unapproved enhancement
- Dry market
- Counterfeiting

And/or you can do a wildcard search for any word or words used

GET RESULTS
Food Integrity Database Search Form

Select a Food Category (compulsory)
Eggs and egg products

And/or use a wildcard search for a keyword(s)
Multiple words can be used, separate with AND / OR / AND NOT in upper case

And/or a CN code (enter only the first four digits)

And/or type of fraud: Select one or more
- Dilution
- Concealment
- Substitution
- Masking
- Unauthorized enhancement
- Counterfeiting

And/or issue: Select one or more
- Product composition
- Geographical origin
- Botanical, chemical or physical properties
- Production system/process
- Product quality

Then click Search

GET RESULTS

Food Integrity Database Results

<table>
<thead>
<tr>
<th>No.</th>
<th>Entry No.</th>
<th>Food Category</th>
<th>Commodity Detail</th>
<th>CN Code</th>
<th>Description of issue and scope of analytical solution</th>
<th>Type(s) of fraud</th>
<th>Issue(s)</th>
<th>Analytical strategy</th>
<th>Level of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P17</td>
<td>Eggs and egg products</td>
<td>Egg products</td>
<td>4070019</td>
<td>Intentional addition of incubated eggs</td>
<td>Dilution, Substitution, Conspirement</td>
<td>Product composition, Product quality</td>
<td>Other type of technique</td>
<td>Routinely by industry</td>
</tr>
<tr>
<td>2</td>
<td>P18</td>
<td>Eggs and egg products</td>
<td>Fresh eggs</td>
<td>4070019</td>
<td>Partial or complete substitution with eggs without quality and food safety characteristics requested by law and by the contract (as “fresh eggs” or “category”)</td>
<td>Dilution, Substitution, Conspirement</td>
<td>Product composition, Quality</td>
<td>Other type of technique</td>
<td>Routinely out of lab</td>
</tr>
</tbody>
</table>

At this point you can display an individual record

Display selected entries
Export selection to PDF
Food Integrity Database Results #17

FOOD INTEGRITY ISSUE

Food category: Eggs and egg products (Fresh eggs)
CN Code: 4070019
Description: Intentional addition of incubated eggs
Type of fraud: Dilution, Substitution, Concealment, Grey Market
Issue: Product composition, Product quality
Importance: Rare
Location in supply chain: Food manufacturer

ANALYTICAL STRATEGY

Type: Marker-oriented, Screening method
Target: Analysis of chemical marker 3-OH-Butyric Acid
Chromatography: GC – Details of method
Status: Accepted as a routine method
ANALYTICAL STRATEGY

Method Use, Extent: Method transferred to other laboratories

Method Use, Level of use: Used routinely by industry

Complexity: Software available for automatic processing

Availability of Analytical Data: Proprietary

Expert contact: Dott.ssa Paola Salvador
Resp.Garanzia Qualità
Eurovo
Phone: +39 0547 654043
Mobile: +39 348 4423894

Food Integrity Database Results #17

Tick to select
Data Entry No.
Food Category
Commodity
Detail
CN Code
Description of issue and scope of analytical solution
Type(s) of fraud Issue(s)
Analytical strategy
Level of use

#17 Eggs and egg products
Egg products 4070019 Intentional addition of incubated eggs
Dilution, Substitution, Concealment, Grey market
Product composition, Product quality
Portable/out of lab
Used routinely by industry

#18 Eggs and egg products
Fresh eggs 4070019 Partial or complete substitution with eggs without quality and food safety characteristics requested by law and by the contract (as "fresh eggs" or A category)
Dilution, Substitution, Concealment
Product composition, Product quality
Other type of technique
Portable/out of lab
Used routinely by industry

Or you can select those entries of interest

Display selected entries
Export selection to PDF
## Food Integrity Database Results

<table>
<thead>
<tr>
<th>Entry No.</th>
<th>Food Category Commodity</th>
<th>CN Code</th>
<th>Description of issue and scope of analytical solution</th>
<th>Type(s) of fraud Issue(s)</th>
<th>Analytical strategy</th>
<th>Level of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>#17</td>
<td>Eggs and egg products</td>
<td>4070019</td>
<td>Intentional addition of incubated eggs</td>
<td>Dilution, Substitution, Grey market</td>
<td>Portable, Consignment, Product quality</td>
<td>Other type of technique</td>
</tr>
<tr>
<td>#18</td>
<td>Eggs and egg products</td>
<td>4070019</td>
<td>Partial or complete substitution with eggs without quality and food safety characteristics requested by law and by the contract as &quot;fresh eggs&quot; or A category</td>
<td>Dilution, Substitution, Concealment</td>
<td>Portable, Consignment, Product quality</td>
<td>Other type of technique</td>
</tr>
</tbody>
</table>

You can then display all the selected records

Or you can run the output to a PDF

If you choose this option your Output would have been run to a pdf file in the live version
Ensuring the Integrity of the European food chain

Rapid Methods in the Spirit Drinks Sector

Work being undertaken within FoodIntegrity Work Package 5

Dr. Ian Goodall
The Scotch Whisky Research Institute

The project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.

www.foodintegrity.eu

Spirit Drinks Authentication

Why authenticate?

• The spirit drinks sector is the most valuable European agri-food export sector.

• EU spirit drinks are premium global products – and are thus a natural target for counterfeiters, particularly in emerging markets.

Source: spiritsEUROPE
The project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.

www.foodintegrity.eu

Spirit Drinks Authentication

Some Impressive Facts and Figures

• €21.4bn generated through excise duty and VAT.

• €10bn in exports, representing a trade surplus close to €9bn.

• 1,000,000 jobs in production and sales.

Source: spiritsEUROPE

Spirit Drinks Authentication

Some Less Impressive Facts and Figures

• The incidence of counterfeit alcohol is a major problem around the world.

• In the UK, the level of counterfeit alcohol is reported to have increased by almost 400% between 2009 and 2012.

Source: spiritsEUROPE
The project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 613688.

www.foodintegrity.eu

Some Less Impressive Facts and Figures

- A quarter of the products sold in China are fakes.
- In Bulgaria, illicit spirits are believed to constitute more than 50% of domestic spirit consumption.
- Illicit alcohol production and counterfeit spirit drinks can also pose a serious risk to health.
- Recently over 45 people died and dozens more suffered serious illness in the Czech Republic, the Slovak Republic and Poland after drinking vodka or rum tainted with methanol.

Source: spiritsEUROPE
Spirit Drinks Authentication

Generic Counterfeit
- Trading on the premium quality associated with a category of spirit drink, e.g. Scotch Whisky, Cognac or Vodka.

Example of a Generic Counterfeit “Scotch Whisky”
- Canned in Austria, sold in Middle East
- Manufactured from “industrial alcohol” and flavouring
- 15 million cans sold over a period of a few years
Spirit Drinks Authentication

Brand Counterfeit

- Trading on the premium quality associated with a particular brand of spirit drink.

The Use of Rapid Methods in Spirit Drinks Authentication

- Rapid analysis methods for counterfeit detection at key points in the distribution chain are seeing increasing use in the sector as screening tools.

- Supplement documentary evidence and more traditional, time-consuming laboratory based methods.

- The focus of this presentation is rapid methods for liquid analysis but rapid analysis methods on dry goods are used to assess authenticity.
The Use of Rapid Methods in Spirit Drinks Authentication

- The packaging or appearance of the bottle can give rise to suspicion that the product is fake.

- Low fill levels
- Squint, creased or peeling labels
- Cloudy or unusual colour

The Use of Rapid Methods in Spirit Drinks Authentication

- Packaging collection and refilling is a common practice for brand counterfeits.
- Only true indicator of product authenticity is the liquid itself.
The Use of Rapid Methods in Spirit Drinks Authentication

• A number of rapid liquid analysis techniques already in use in the sector.

• Traditionally, these are used in surveys by brand owners to assess counterfeit issues in market.

• Advantages: quick, portable, easy to use.

The Use of Rapid Methods in Spirit Drinks Authentication

• One of the first pieces of portable equipment used in the spirit sector was the Authenticator

• Portable UV-Vis spectrometer

• Less sophisticated operation allowing untrained operators to use

• UV-Vis spectral profiles of suspect brand products can be compared to the genuine product

• Easy to rapidly screen 100s of samples
The Use of Rapid Methods in Spirit Drinks Authentication

Main - Profiles of 8 Whisky Blends (Multiple Samples, Multiple Authenticators)
Inset - Differentiation between 1 brand (showing range) and counterfeits

- Very good at identifying gross counterfeits
- Liked by industry, harder to create an “authentic” profile
- Less able to differentiate more sophisticated counterfeits or brand substitution
- Provides simple PASS/FAIL response
- Basic principle of analysis – differentiation from brand model based at set wavelengths, using simple sum of z-scores approach
The Use of Rapid Methods in Spirit Drinks Authentication

• Authenticator now developed into Spirit Sampler by Ocean Optics.

• Improvements in performance, operation and machine to machine reproducibility.

• Sum of z-scores still in use, but benefit of advanced techniques (e.g. neural nets) has been shown.

The Use of Rapid Methods in Spirit Drinks Authentication

• Dipstick type devices have also been used by the sector.

• Can be specific to certain trace level additions of ingredients (where the spirit drink definition permits).

• Portable conductivity, pH meters, alcohol strength meters can be used to identify non-compliant products,

  e.g. vodka made with non-deionized water.
The Use of Rapid Methods in Spirit Drinks Authentication

- Limited application of rapid methods to generic counterfeits.
- Neogen, ALERT® for Methanol – enzyme mediated colour change.

The Use of Rapid Methods in Spirit Drinks Authentication

- SWRI leading Spirit Drinks Work Package focussing on the safety, authenticity and quality of European Spirit Drinks.
- The aim is to target the current gaps in the protection of the spirit drink sector’s brands/categories from inferior and/or harmful counterfeits
- There is a desire for improved rapid, easy to use, portable analysis methods.
- Definitive, non-intrusive, wider scope.
The Use of Rapid Methods in Spirit Drinks Authentication

Detection of markers for illicit alcohol used in brand and generic counterfeits.

- Typically looking at denaturants (e.g. Methanol, IPA, MEK, Denatonium Benzoate) signifying abuse of excise exempted alcohol
  - Spectroscopic – portable/non-intrusive
  - Dipstick type devices – specificity/portability
  - Other techniques offer better coverage of range of markers, but lack portability/ease of operation but are still being considered

The Use of Rapid Methods in Spirit Drinks Authentication

Brand or Category Authentication.

- Similar requirements as to markers for illicit alcohol but consideration being given to:
  - Ability to distinguish more sophisticated counterfeits (e.g. brand substitution)
  - The extension of current techniques via the combination of complementary techniques e.g. UV/Vis/NIR/Raman

For example, simultaneous UV/VIS profile with alcohol strength measurement by Raman/NIR would provide additional benefit
The Use of Rapid Methods in Spirit Drinks Authentication

Research Approach:
- Three levels of solution
- Level 1: Portable (e.g. handheld/backpack)
  - Quick, relatively low cost, screening
- Level 2: Deployable (e.g. back of car)
  - More authoritative, e.g. LC/MS & GC/MS benefitting from miniaturisation
  - Often just as rapid.
  - Issues – expense and ease of use.
The Use of Rapid Methods in Spirit Drinks Authentication

Research Approach:
- Three levels of solution
- Level 3: Supplemental Lab Based
- Improvements in standard methods (e.g. maturation compounds) and exploration of new techniques

The Use of Rapid Methods in Spirit Drinks Authentication

- Keen to engage with researchers/analysts/enforcers/brand managers/technology providers to investigate requirements and solutions.

ian.goodall@swri.co.uk
The Use of Rapid Methods in Spirit Drinks Authentication

• To access the spirit drinks section of the FoodIntegrity website, register at www.foodintegrity.eu and email ian.goodall@swri.co.uk to ensure correct permissions.

www.foodintegrity.eu

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