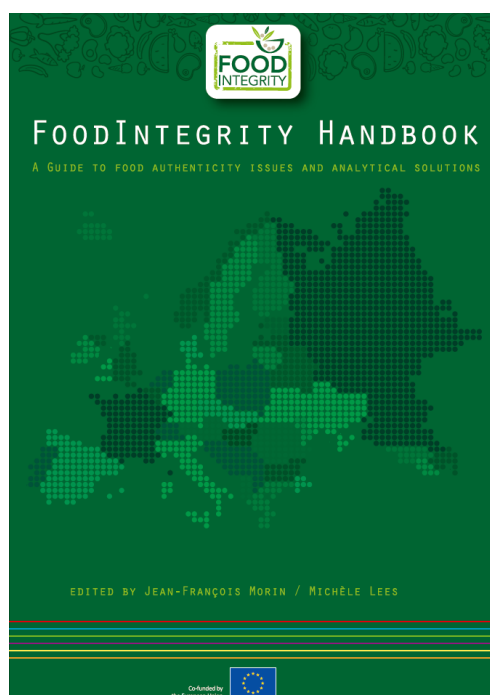# FOODINTEGRITY HANDBOOK

A GUIDE TO FOOD AUTHENTICITY ISSUES AND ANALYTICAL SOLUTIONS

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The FoodIntegrity Knowledge Base

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A whole Work Package of the FoodIntegrity project has been dedicated to the design and creation of a comprehensive **Knowledge Base** linking each food product, its potential integrity issues and appropriate solutions for detection.

For use by industry and regulatory authorities, this tool will make it possible to identify, easily and rapidly, potential food fraud threats to a given food product or ingredient and the existing solutions. The Knowledge Base contains a wealth of information including the type of the fraudulent practice, the analytical methods available, their use and performance criteria, and the availability of reference data with links to literature or standards and open-access databases.

Currently hosted under the umbrella of the FoodIntegrity website [1], a transfer to a European organisation is ongoing in order to ensure its sustainable use in the future.

Gathering information on food fraud detection

Analytical information in the field of food fraud can be found in a wide range of databases or sources. For instance, new techniques are often described in the scientific literature and can be accessed thanks to tools such as Pubmed, ScienceDirect or Scopus.

The FoodIntegrity Knowledge Base offers several specific features to users. First each of the recorded methods is **linked to a food commodity and to a food fraud issue**. It is of utmost importance for users in the food industry who want to have a quick answer to the threats they face in their daily activity and to inspectors monitoring food production to ensure they apply the most appropriate analytical method. The definition of the different types of fraud used in the FoodIntegrity Knowledge base is based on the work done by the GFSI Food Fraud Think Tank [2], a global multi-stakeholder group founded in 2012 to work on recommendations on effective systems to protect consumers from harm due to food fraud.

Entries of the FoodIntegrity Knowledge base include **comprehensive and standardised metadata** for each description of the analytical methods. This provides different kinds of information including for instance the type of food commodity, the analytical target (analyte, molecular marker or physical parameter), or the experimental protocol, giving a wide and summarised outlook of the method. In the case where statistical treatment is applied to the data, its summarised description is included, for instance the name of the multivariate analysis used (PLS-DA, SIMCA, etc.). Standardisation status has been foreseen: users can know if the methods are standardised, if reference material is available or if they are recommended in compendial approaches from non-

standardisation organisations such as the International Organisation of Vine and Wine (OIV) in the wine industry or professional associations such as the International Federation of Fruit Juice Producers (IFU) for juices. Indications if the method has been transferred to several laboratories and is available in routine analysis have been added: this allows users, especially from industry, to assess how easily they will be able to access the method. The Knowledge Base contains a field where the code of the Combined Nomenclature, the systematic list of commodities in use in the EU for classifying goods [3], is stored. This field allows better categorisation for statistics and, acting as a primary key, make future interaction possible with other resources or tools. For easier comparison between methods, information is recorded in a standardised way. When information cannot be stored in the Knowledge Base, links to other sources are provided.

Datasets containing for instance raw data from analytical devices are also attached to some of the entries. Nowadays different analytical approaches are used for food authenticity testing. The majority require a comparison to reliable authentic data to judge the compliance of a food sample. It is of enormous benefit to any organisation carrying out food fraud testing, or embarking on the development of new analytical methodology, to get access to this kind of information. The use of reference data is even more crucial where fingerprinting or profiling approaches are used.

Thanks to public funding from the European Commission and to the work of the FoodIntegrity partners, access to this resource will be **free of charge** for all users. Access to knowledge will be possible for any stakeholder, whether a food manufacturing SME, a researcher in the field of authenticity or a civil servant working in a food safety organisation.

Finally the Knowledge Base will act as a **European focal point** on analytical methods in the field of food fraud standing above the vast array of information that exists in a number of private and public analytical data bases. It will be open to users from any country. The fact that such data sets exist at a single point of reference will benefit most organisations.

Expected use for all food stakeholders

The FoodIntegrity Knowledge Base will be accessed through a reference portal on the web. Different types of users will find an interest in this resource according to their specific needs.

Users from the **food industry** will be able to identify an analytical solution when they are facing an adulteration issue in their premises. All possible solutions will be presented allowing the selection of the most suitable method based on criteria such as compliance with a standard, transfer to laboratories in routine, complexity of the method, etc. A second possible use of this Knowledge Base is during the preparation of food fraud mitigation plans. Since the recommendation via the GFSI Benchmarking Requirements Version 7.1 published in 2017 [4], cascaded to Global Food Safety Certification Programmes such as IFS (International Featured Standards) or BRC (British Retail Consortium), food companies are required to carry out a Food Fraud Vulnerability Assessment, then put in place a Food Fraud Control Plan consisting of a set of mitigating measures including a monitoring and testing strategy. The Knowledge base will help these companies in identifying the right analytical methods to mitigate risks identified in their vulnerability assessment.

For **food safety authorities**, the expected use of this Knowledge Base is first to enrich early warning tools such as the RASSF portal [5] or incident databases. Along with the case, the analytical solution to detect the fraudulent practice will be provided.

For **standardisation organisations**, the Knowledge Base will help to determine gaps in the coverage of food fraud detection by standards. Furthermore future candidates for standardisation or methods which need extended validation will also be identified.

The Knowledge Base will also be useful for **food testing laboratories**, whether academic or private. Thanks to the description and to the links to scientific papers containing the full description of the protocol, analytical methods can be easily implemented in routine practice. The service portfolio of these companies will expand, allowing a better monitoring of fraud risk in industry. Furthermore it will enable proficiency tests to be organised among more and more laboratories, facilitating dissemination and recognition of these methods throughout the European Union. For research laboratories, access to authentic and standardised datasets of analytical methods which can be reused will promote the development of new and improved analytical methods.

Ultimately the Knowledge Base will be used by all stakeholders as a knowledge reference in the field of food fraud. It will help to disseminate the idea that food fraud is not inevitable and that tools exist to tackle it.

Figure 1: Example of a method recorded in the FoodIntegrity Knowledge Base

Acknowledgments

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