Regaining trust

David Psomiadis explores food authentication methods of analysis, highlighting their standardisation challenges and role in food fraud prevention management.

FOOD FRAUD poses a significant threat to the food industry. In today's complex global supply chains, the issue of brand reputation and protection has been in focus more than ever.

Food fraud should not be viewed solely as a quality assurance problem for individual companies, but as a global influencing factor for the entire food industry, shaping decisions, values, brand reputations and corporate strategies. Food fraud incidents have industry-wide impacts with potential to alter consumer behaviour towards all brands. In this environment, the food industry should look for innovative ways to communicate the principles of integrity to the consumer, and analytical authentication solutions have a definite role in this space. Verifying food authenticity offers an opportunity to prevent consumer distrust of food product claims.

According to the CWA 17369:2019, food fraud is the act of intentionally causing a mismatch between food product claims and characteristics. CWA17369 has a useful diagram of the interconnections between different items and terms (**Figure 1**).

The central focus of this structure is not food fraud, but product characteristics and claims. These features underpin the framework, and food fraud is identified as a consequent property of this system, in a similar way to authenticity and authentication.

Another fundamental set of terms relates to authenticity; in **Figure 1**, the route of authenticity and authentication is the only alternative to food fraud.

In food authentication, we must first identify the product characteristics that are at food fraud risk. A critical and usually difficult point to address is defining an appropriate, available analytical method that satisfies the following questions: 'Is there really a suitable method and, if so, which is it?', 'Is it official, accredited, globally recognised and properly applied?' and 'Is the detection limit adequate to identify adulteration?'

When we talk about a testing programme, it is of utmost importance to accurately define where, when, how often, and for how long the analytical testing scheme should be carried out. Finally, you must ask yourself: 'What should be done after testing?', 'How should we deal with an identified adulteration in a product?' and 'Can the analytical result provide further information to assist with ascertaining how it happened?'

The testing programme can only be truly effective when it utilises a wide spectrum of state-of-the-art analytical methods. Accreditation is mandatory to ensure harmonisation, credibility and integrity, as well as international recognition of the findings. Food authenticity testing does not always end with a specific qualitative or quantitative result; novel fingerprinting or screening methods are more like forensic investigations entailing studies that must point to a result – a conclusion based on evidence from the analysis, that can support or reject a hypothesis.

In recent years, new versions of food certification standards, following the guidelines of the Global Food Safety Initiative (GFSI), have included a comprehensive requirement for food fraud risk assessment in the food industry. Companies are required to deliver a risk mitigation plan, taking measures against the risk of food fraud in their supplies. In this approach, analytical testing is a key feature that leaves little space for assumptions and decreases the risk of food fraud incidents significantly.

Food authenticity testing initially dealt with basic issues using the available technology. Today, however, we are equipped with a range of techniques, including both targeted and non-targeted analyses of food products. The need for low detection limits, as well as detection of sophisticated practices of adulteration, drives us to develop compound- and subject-specific methods that can provide strong evidence for or against a claim in complex samples. This reflects the complexity of most supply chains, since most products consist of hundreds of major or minor ingredients, where only some or just one carries a premium claim and could be adulterated.

Food authentication methods are usually grouped into targeted and non-targeted. Novel versions of traditional analytical techniques (eg, compound-specific stable isotope analysis and next-generation sequencing) can fall into either group because they provide a multi-parameter fingerprint/profile and, as such, may point to very specific indices of differentiation or evidence of alteration.

There are several official methods and standards, issued by different authorities and organisations (eg, EU, CEN, AOAC, OIV), that refer to the use of such analytical techniques for food authentication.

Currently, the regulatory context of food authenticity testing is changing; this is a consequence of increasing concern both from consumers and the food industry about food fraud. It is now widely acknowledged that food fraud has a much deeper impact on food safety aside from the obvious economic implications.

A wider range of new, official methods and standards will help to harmonise food authenticity testing and convince more stakeholders to adopt it. Stakeholders within the food chain can now use the results of such methods – which are fully validated with defined performance characteristics and scope, recognised and confirmed as fit for purpose for the assessment of compliant samples/goods – to define official regulation criteria.

In Europe, the Regulation (EU) 2017/625 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products is specifically related to food authenticity. The European Standardization Committee (CEN) has created a dedicated technical committee (TC 460 – Food Authenticity) for the standardisation of analytical methods for verification of food authenticity and data evaluation aspects, including validation concepts.

The CEN/TC 460 comprises several working groups, focused on developing stable isotope, molecular and NMR methods, among others. By applying harmonised methods of food analysis standardised by CEN/TC 460, food industry and food control can avoid generating conflicting results when using different methods.

One aim of CEN/TC 460 is to develop, if possible, full EN standards in the area of food authenticity that are more widely recognised than Technical Specifications in CEN member states.

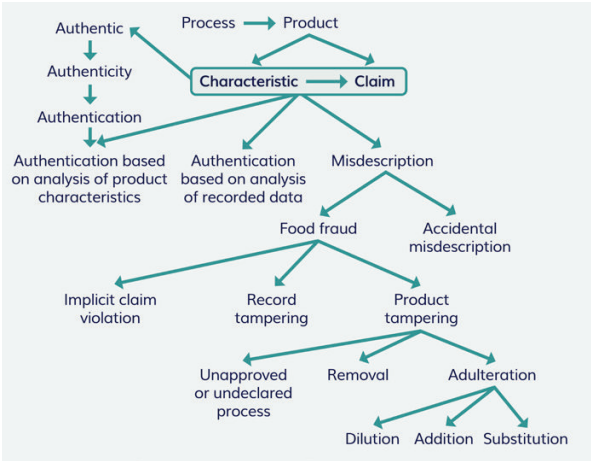
AOAC International has also been working on a food authenticity/fraud programme, after identifying that confidence in methods that detect food fraud will improve the quality and safety of the food supply while maintaining the reputation of products. There are two approaches for AOAC:

- Targeted testing (TT) (linked to parameters specified in raw material specifications)
- Non-targeted testing (NTT) (fingerprinting) that assess the raw material integrity against adulteration.

The aim of the programme is to develop a series of Standard Method Performance Requirements (SMPRs) for TT of 'vulnerable to fraud' matrices. The hope is to create a generic SMPR that can evaluate NTT methodologies on their reliability and usefulness, and to devise criteria for the validation of NTT methodologies, which will be used as ingredient screening tools in domestic and international trade (eg, for milk, honey and olive oil).

Recent studies show that it is becoming harder to attract the attention of the consumer through product claims due to rising distrust; so what could be more effective than providing authenticity verification evidence directly to the consumer? In this context, the execution of a food authentication programme could be used for brand protection in more than one sense, enabling food companies to maintain, strengthen, or even regain consumer trust in their products.

Figure 1



Outline of hierarchy of terms and definitions (CWA 17369:2019)

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David works as Head of the Laboratory and Business Development Manager at Imprint Analytics GmbH. He holds a PhD in isotope geochemistry with scientific background in environmental and climate research. Being a member of international research teams, David has published more than 70 contributions in scientific journals and conferences. Since 2013, he has settled in Neutal, Austria, as a member of the grounding team of Imprint Analytics. He holds a regular member position in international committees and working groups, including AOAC and CEN, related to food authenticity testing.

In his current role, David is responsible for supervising and managing all operations related to the laboratory, planning method development to meet customer demands, and reporting scientific results and interpretations to clients. He also leads the global food authenticity business development strategy, brand development and business collaborations within global networks and international consortia, as well integrating applied science into market needs, creating new synergies, tools and solutions.