Free digital newsletter to support your food safety management journey

LGC ASSURE

Insights

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Food fraud – are you getting what you paid for?

Welcome to the fourth edition of LGC Assure Insights, a free digital newsletter to support your food safety management journey. If this is your first venture into the newsletter then you can sign up to receive issues here.

In this edition I want to focus on food fraud and hope to touch upon the broad areas of authenticity and adulteration in the context of intentional or motivated fraud. But there has been a lot going on in the last month and here's an overview of some of the issues and incidents happening across the world.

Old hazards but the same problems with controls

Outbreaks of infection due to contamination of foods with *Salmonella* species have been the centre of attention recently prompting international recalls of peanut butter made in the USA, chocolate products from Belgium, Halva (tahini-based) from Syria and confectionary products from Israel. All of these low moisture, high fat foods provide a protective effect to *Salmonella* spp. enabling them to better tolerate heat processing, survive extended periods in finished products and resist the effects of gastric acids in the gut. Ensuring absence of the organism in these foods is the only way to ensure safety for the consumer.

LGC ASSURE Insights is different from other news sources as it combines otherwise unpublished food safety management data held across the LGC ASSURE Network of companies with real-time events to provide an unparalleled view of current and emerging issues and trends. And, of course, it is free.

Food recall highlights of the month

This month's list of recalls is led by an allergen alert on imported cakes where the label failed to be translated into the language of the country of sale, an increasingly common problem. Undeclared milk resulted in multiple recalls including ready-to-eat chicken meals, a food supplement and a plant based 'dairy-free' vegan dip. A number of products were recalled due to the presence of gluten, including gluten-free black pudding, various sausage products and gluten-free muesli.

Other allergen recalls included undeclared egg in a pasta salad due to mispacking/labelling, undeclared almonds in plain croissants due to a packaging error and peanuts in a frozen dessert due to mispacking of the product into the packaging of a non-peanut containing variant. Undeclared soya from a compound ingredient used in savoury jams and undeclared mustard in pickled curried Kraut due to non-declaration of an ingredient (curry powder) wrapped up the individual allergen alerts.

Multiple allergen risks caused a number of recalls including a flavoured snack (milk, egg, fish and soya) due to obscuring the allergenic ingredients with a sticker and wheat and soy in cooked and smoked wild Alaskan salmon due to mispacking of a Teriyaki sauce containing product in a non-sauce containing variant packaging. Physical contamination events were less prevalent this month; the risk from potential explosion of over-carbonated drinks cans led to one recall, while metal fragments resulted in the recall of soft confectionary products and ready-to-eat pork. Pieces of plastic in sugar and fine nylon fibres from a conveyor belt in biscuits added to the recalls from foreign matter.

Microbiologically, the recalls were dominated by the peanut butter and associated products but there were some other interesting issues and incidents that occurred including recalls due to the presence of *Listeria monocytogenes* in double cream and yellow flesh peaches, Norovirus contamination of IQF raspberries, high levels of clostridia in minted meat kebab and the incorrect date coding resulting in unsafe shelf life of a pasta bowl salad. There was also a report of a large outbreak affecting over 100 individuals in California caused by catered food that tested positive for *Staphylococcus aureus* enterotoxin.

And finally, a case of botulism in Italy implicating locally produced broccoli and almond pesto for self-consumption and given as gifts locally highlights the known danger associated with home-produced vegetables in oil. Chemicals in foods resulted in a couple of product recalls including elevated levels of histamine in dried silver fish and alfatoxins in ground black pepper.

Don't be fooled by food fraud

The authenticity of food is a fundamental right that every party in the food chain, from source to consumer, should expect. Adulteration of food in any way that perverts its intended purity and conceals this from any subsequent customer in the supply chain is food fraud. This may occur through addition, substitution, or removal of key elements of the foods or through misrepresentation via its description. It is often economically motivated but, in some cases, may be criminally motivated. Some good summaries on food fraud and food crime more generally can be found in texts from the US Food & Drug Administration, the European Commission and the Food Standards Agency and, likewise, there are introductory videos on the topic from the FAO and the EU Food Science Hub.

Food fraud is a significant risk to global supply chains and perhaps more so in the current climate of commodity shortages and price pressures due to economic and social events throughout the world. However, fraud is certainly nothing new, as long as foods have been traded, fraud has been evident. References exist in Deuteronomy 25:13 to the need for standard weights and measures and in the extensive texts, *Naturalis Historia*, by Pliny the Elder (AD 23-79) who cites multiple examples of adulteration during Roman times including long pepper with Alexandrian mustard and the industrial use of smoke and noxious herbs and drugs in wines. Indeed, politically motivated adulteration was a frequently cited occurrence in Roman times often with deadly consequences for the recipient.

Proclamations and penalties

Regulations went hand in hand with adulteration insofar as they were introduced to specify the nature and substance of foods with an early example being the Assize of Bread, proclaimed by King John of England in 1202. Of course alongside laws and regulations, came early penalties, initially in the form of pillories but extending to more draconian measures such as one quoted from the Turkish medieval period in the excellent History of the Adulteration of Food before 1906 by F. Leslie Hart published in 1952 that is roughly translated as, "If a baker gave false weight or adulterated his bread, his ear was nailed to his door post".

The contamination of foods and food fraud was probably at its worst in many countries in the 1800's with England being particularly stricken by adulteration. Indeed, the Laboratory of the Board of Excise (later to become the Laboratory of the Government Chemist, LGC) was established back in 1842 to regulate the adulteration of tobacco under the Pure Tobacco Act.

Early pioneers in exposing fraud were famous analytical chemists including Frederick Accum and A. H. Hassall. Accum, in his 1820 text Treatise on Adulterations of Food and Culinary Poisons cites examples of pickles contaminated with copper, cheese with mercury or lead and gin with ether, terpentine and sulphuric acid. Hassall, who highlighted that nearly 90% of foods sampled in England were adulterated cited examples of formaldehyde in milk and red lead in cayenne pepper. He was one of the first to employ official naming and shaming in the quarterly Analytic and Sanitary Commission of the Lancet, later collated and published in his book on Food and its Adulterations. Who would have thought that 150 years later, the use of toxic chemicals to illegally enhance the colour of a spice remains a continued threat.

Throughout the centuries there have been some very high profile cases of adulteration resulting in serious illness and death. In the Bradford sweet poisoning in 1858 humbugs were contaminated due to sugar being substituted with arsenic. Sold by "Humbug Billy" they caused over 200 cases of illness and 21 deaths. The Manchester beer poisonings of 1900 also due to arsenic from contaminated brewers sugar resulted in 6,000 becoming ill and over 70 fatalities. The Spanish toxic oil syndrome in 1981 caused

over 20,000 illnesses and 300 deaths due to the consumption of olive oil that was adulterated using rapeseed oils (allegedly for industrial use) denatured with 2% aniline and then illegally refined to remove aniline. The contamination of spice with Sudan I (chilli) and added to Worcester sauce subsequently used across the UK food industry resulted in the recall of over 350 processed foods. In 2007, pet food was recalled due to the illegal use of melamine in wheat gluten and rice protein concentrates imported from China. Used in over 150 brands of pet food it caused the deaths of numerous cats and dogs.

The Chinese milk fraud in 2008, also due to adulteration with melamine but this time to restore the apparent protein content after diluting milk with water caused 300,000 cases of illness and six deaths. And finally, the UK horsemeat scandal in 2013 where beef was substituted with horsemeat in burgers, pies, ready meals and even Swedish meatballs. Indeed, prosecutions from the horsemeat scandal continue to this day.

Of course most food fraud does not actually result in illness or death but has huge financial impact on the industry and its customers with estimates for the trade in fraudulent food and drink ranging from $6.2 – $40bn. Regulation, enforcement and official controls to protect the consumer against food fraud exist in many counties (EU, Australia, Canada, New Zealand and USA, UK), with significant penalty for non compliance. However, international sourcing of raw material and finished products make fraud very difficult to eliminate.

Official controls play an important role in preventing fraud but the industry has a huge role to play in regulating itself by managing its supply chains and precluding the use of materials or sources where fraud is evident or exposed. This is seen in many industry initiatives including third party assurance standards such as the GFSI-recognised BRCGS Global Standard Food Safety where food vulnerability assessment is a mandatory component that must be in place to achieve certification. There are some useful materials available in this area including a food fraud resilience self-assessment tool from the FSA and a guide on understanding vulnerability assessment from BRCGS (free for BRCGS-certified sites through BRCGS Participate). Training in this important competence is also key to managing supply chains to reduce vulnerability.

Sharing insight from assurance

Food fraud is international by nature and the longer and more complex the supply chain, the greater the exposure to risk. Recognising this threat, industry groups have been formed to share insight from assurance programmes to maximise the combined effort of the supply chain in preventing exposure to fraud. Examples include the Food Industry Intelligence Network (FIIN) and the Food Fortress model that have achieved significant success by taking a collaborative approach to this challenge and the public-private partnership model adopted by the Food Authenticity Network has also provided an excellent platform for shared insight.

Information sharing is key to protecting supply chains from fraudulent operators and a welcome recent addition is the EU Food Fraud Network and the monthly publication of fraud reported throughout Europe – this can be a very useful source of insight regarding threats to your supply chains and so make sure you take a look. For example, in April alone there were reports of illegal saffron from China imported into Spain who were also investigating fake olive oil and extra virgin olive oil containing a mix of other oils. Fish authenticity in Mexico was highlighted as well as six deaths in the Dominican Republic due to the consumption of alcoholic beverages contaminated with methanol. Spices in India contaminated with clay, dirt and husk were also noted amongst many other interesting insights.

Analytical testing plays a pivotal role in exposing and preventing food fraud. This is particularly relevant as fraud is very difficult to expose through audit alone in areas such as ingredient substitution and provenance. Traceability testing as part of audit can expose potential malpractice although this often needs detailed forensic auditing techniques to expose true fraud. Hence, analytical techniques are often applied as part of a robust food vulnerability plan. Analysis is available to detect or provide insight into a range of potential food fraud events including detecting substances that should not be present e.g. illegal dyes, genetically modified ingredients, etc., ingredients that should be present but are not (totally or in the quantities claimed) e.g. Basmati rice, British chicken, Manuka honey, products of protected designation of origins (PDO), and of protected geographical indications (PGI), etc., and processes that are illegally applied e.g. irradiation.

Analytical testing does have its limitations and an excellent overview of the use of analysis in food fraud has been published by the Institute of Food Science and Technology (IFST). It goes without

saying that it is essential that accredited laboratories are used for analytical testing although in some cases, especially where leading edge techniques are being developed to detect fraud, this may not be possible early in their use.

Laboratory participation in proficiency testing schemes can provide confidence in the measurements derived using a variety of different methods, as well as supporting the need for accurate, reliable and consistent analytical results, whether over time or across multiple testing sites.

I hope that this has given you some useful insight into the area of food fraud. Look out for the next edition of LGC Assure Insights and sign up to the mailing list if you haven't already.

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Fraud testing in practice

Scotch whisky

The AXIO Proficiency Testing Alcoholic Drinks Scheme covers a wide range of products including distilled spirits, wine, ciders, and prepared lifestyle drinks, such as ready-to-drink cocktails and fruit-based beverages.

Scotch whisky is registered as an item of Protected Geographical Indication (EU PGI) and there are five permitted categories - 'Single Malt Scotch, 'Single Grain Scotch Whisky', 'Blended Malt Scotch Whisky', 'Blended Grain Scotch Whisky' and 'Blended Scotch Whisky'. One characteristic stated within the regulation includes that the minimum alcoholic strength by volume shall be 40%. Figure 1 shows a distribution graph of the results returned for the analysis of the actual alcoholic strength in a Scotch whisky proficiency testing sample.

The alcohol content of a whisky is measured to ensure that quality standards are met and to ensure the integrity of the product. The measurement is also necessary since there is a minimum alcohol strength requirement in the legislation which genuine products must meet, and therefore, this can be a strong indication of a counterfeit product.

In example below the vast majority of returned results demonstrate laboratory proficiency in whisky testing, with one questionable result.

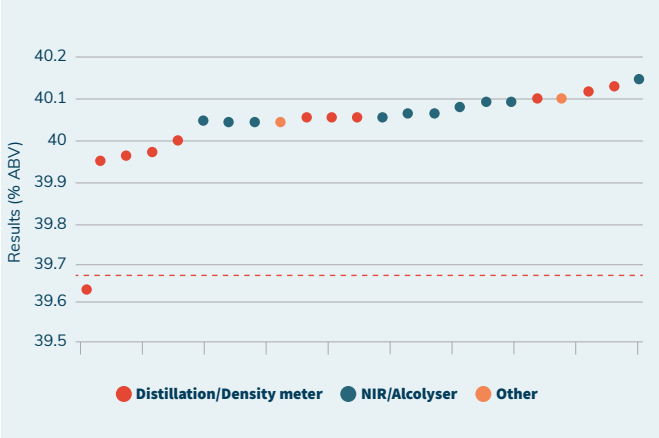

Figure 1: Distribution graph showing actual alcoholic strength in Scotch whisky

Honey

Honey quality is defined at an international level by the FAO/WHO Codex Alimentarius (CODEX STAN 12-1981), and at European level by Directive 2001/110/EC. Both establish methods for analysis.

Directives make the addition of any additives other than honey illegal but fake honey has been in circulation since the 1970s when high-fructose corn syrup first became available. Defining parameters include that the sucrose content must not exceed 5g/100g (with some exceptions) and the sum of fructose and for blossom honey glucose content shall not be less than 60g/100g. Figure 2 shows the data returned for the analysis of fructose in a honey proficiency testing sample. The data demonstrates that participant laboratories are largely consistent in their testing for fructose in honey, although variations at either end of the distribution spectrum may suggest a need for some laboratories to further assess and potentially improve their testing method application.

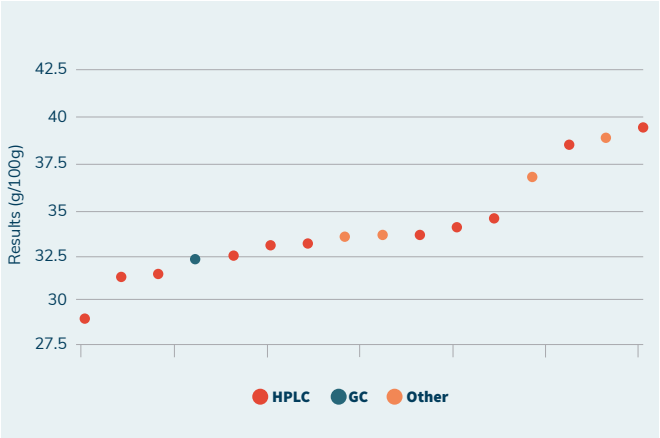

Figure 2: Distribution graph for fructose in honey

Newsworthy

Enhanced investigatory powers for the Food Standards Agency
Consultation running until August 2022, FSA

Deep dive on food safety and the UN Sustainable Development Goals
GFSI webinar issued on World Food Safety Day, June 2022

Fighting food fraud – the role of proficiency testing in protecting product integrity
LGC Axio 2020

Global food supply chain at risk from malicious hackers
BBC News, 20 May 2022

National crackdown improves food security in China
China Daily, 9 April 2022

New UK food safety network to tackle £9m food poisoning challenge
FSA, 7 June 2022

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