



Good Food, Good Life

Food Fraud Prevention

Economically-motivated adulteration

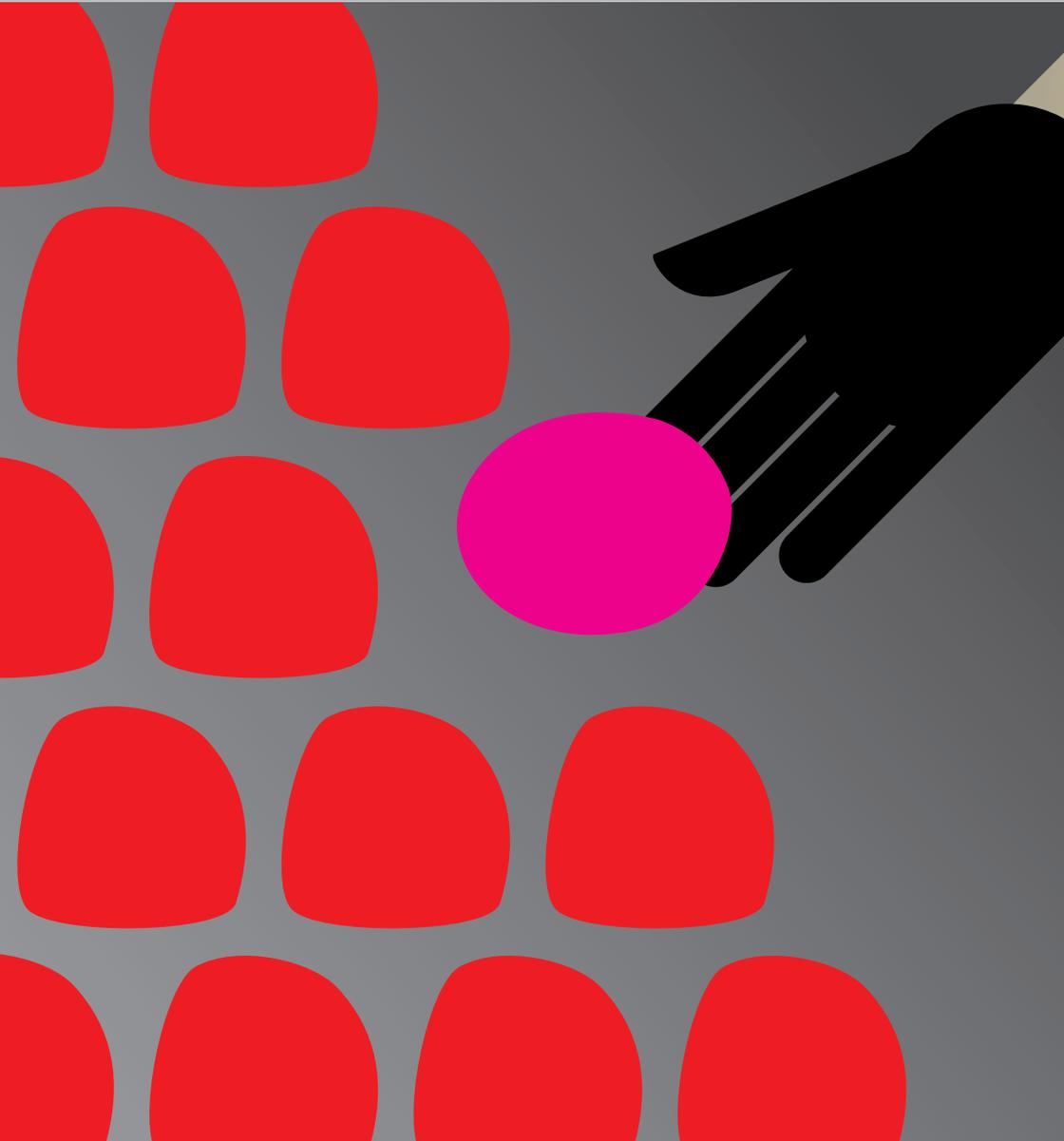


Table of contents

2	Introduction and purpose of this booklet
3	What is food fraud
4	Why is it important to prevent food fraud
4	Glossary of terms used in this booklet
5	Food fraud prevention process
6	Vulnerability assessment
10	Mitigation measures
10	– Raw material specifications
10	– Analytical surveillance
11	– Supplier relationship
13	– Supplier audit
14	– Supply chain transparency and simplification
16	Alert system
16	Frequently asked questions
19	Useful resources & tools

Introduction and purpose of this booklet

The food industry considers the safety of its products as its main concern. Over the years, industry and regulators have developed food safety management systems, making major outbreaks of food poisoning now quite unusual in many countries. These systems typically use Hazard Analysis Critical Control Point (HACCP) principles, which are accepted globally. HACCP has proven to be effective against accidental contamination.

However, HACCP principles have not been routinely used to detect or mitigate deliberate, fraudulent actions on a system or process. These actions include the deliberate contamination of food, or food fraud.

No process can guarantee that food and food supply are not the target of criminal activity. The purpose of this booklet is to guide food operators through approaches and processes to improve the resilience of supply chains to food fraud. It provides guidance on how to assure the authenticity of food by minimising vulnerability to fraud and mitigating the consequences of food fraud.

This booklet

- Describes a process for food fraud prevention and the principles of the vulnerability assessment;
- Outlines measures that can deter fraudsters, or give early detection of food fraud;
- Provides sources of information and intelligence that may help to identify emerging threats.

What is food fraud

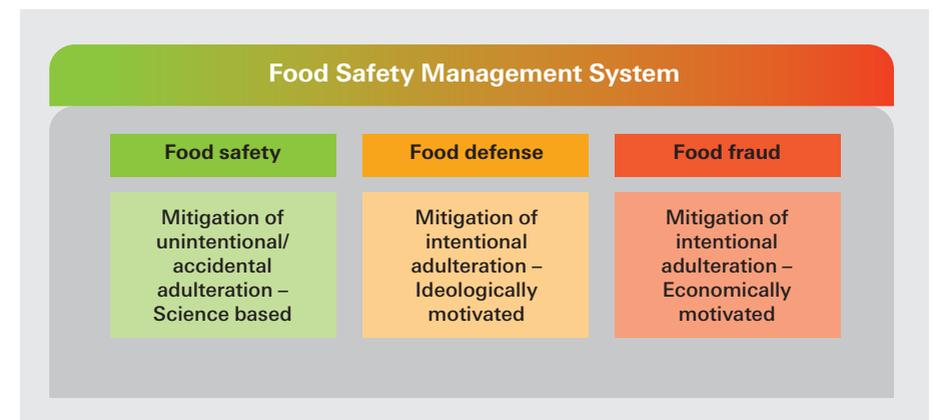
Food fraud commonly encompasses a wide range of deliberate fraudulent acts. The focus of this booklet however, is on one type of food fraud – the intentional and economically-motivated adulteration of foods. This is the fraudulent addition of non-authentic substances, or the removal or replacement of authentic substances without the purchaser's knowledge, for economic gain of the seller.

The two main types of economically-motivated adulteration are:

- Sale of food which is unfit and potentially harmful, such as:
 - recycling of animal by-products back into the food chain;
 - packing and selling of meat with unknown origin;
 - knowingly selling goods past their 'use by' date.

- Deliberate mislabelling of food, such as:
 - products substituted with a cheaper alternative, e. g. farmed salmon sold as wild, or Basmati rice adulterated with cheaper varieties;
 - false statements about the source of ingredients, i.e. their geographic, plant or animal origin.

This booklet does not address the other types of food fraud such as counterfeiting (fraudulently passing off inferior goods as established and reputable brands), product tampering, theft, smuggling, document fraud, and product diversions. Neither does it cover food adulteration intended to cause public health harm, economic harm, or terror (i.e. food defense issues).



Why is it important to prevent food fraud

While it is not the intention of food fraud to harm consumers, such acts can cause illness and even death. This was the case in 2008 when melamine was used as a nitrogen source to fraudulently increase the measured protein content of milk, resulting in more than 50 000 babies hospitalised and six deaths after having consumed contaminated infant formula.

The common factor in many cases of food fraud, is that the adulterant is neither a food safety hazard, nor readily identified (as this would defeat the aim of the fraudster). Common adulterants include water and sugar, or ingredients that may be legitimately used and declared, but whose improper use constitutes fraud. Food fraud deceives the consumers by providing them with lower quality foodstuff, against their knowledge and will.

Economically-motivated adulteration deprives the consumers of the quality products they intend to purchase. It can also have serious implications on food safety and the health of consumers. The prevention of food fraud is paramount to protect the trust of our consumers and to maintain fair, sustainable business practices.

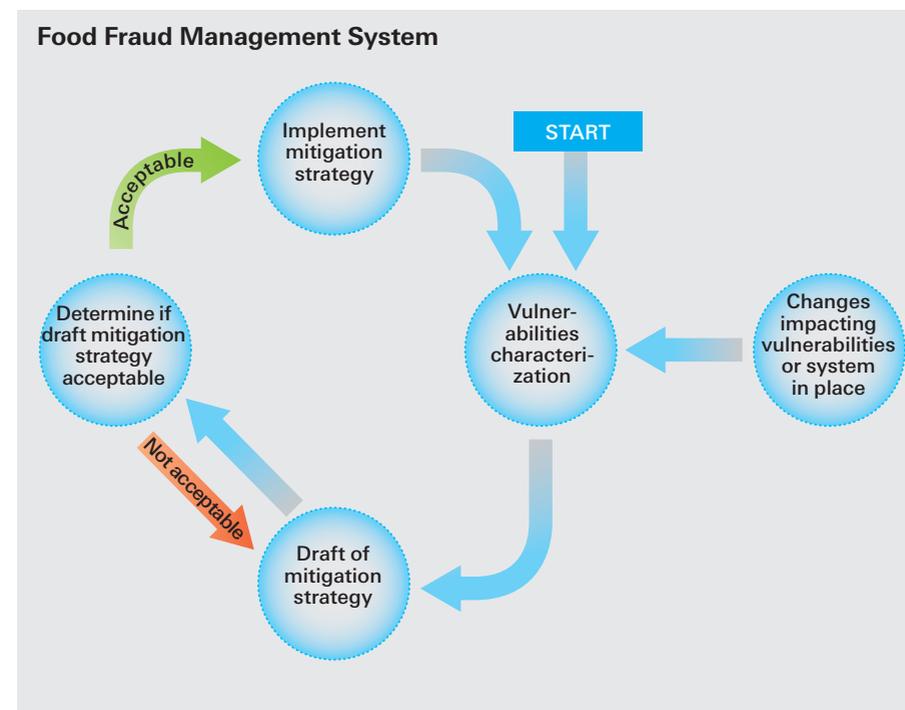
Glossary of terms used in this booklet

- **Economically-motivated adulteration (EMA):** The intentional adulteration of foods, motivated by economic gain. It is the type of fraud covered in this booklet.
- **Vulnerability assessment (or vulnerability characterisation):** Within a food fraud management system, the step aimed at reviewing and assessing various factors, which create vulnerabilities in a supply chain (i.e. weak points where fraud has greater chances to occur).
- **Mitigation measure:** Measure taken to decrease vulnerability to a certain type of adulteration in a given supply chain.
- **Mitigation strategy:** Selected set of mitigation measures aimed at preventing food fraud in a given supply chain.
- **Food operator:** Organisation carrying out any of the activities related to processing, manufacture, packaging, storage, transportation, import, distribution of food, including food services and sale.
- **Supplier:** The party that is supplying materials (raw or semi-finished), food ingredients or food products to other parties (e.g. food operators) in the value chain.
- **Buyer:** The party that is buying materials (raw or semi-finished), food ingredients or food products from suppliers.

Food fraud prevention process

Like any management system, a food fraud management system is a continuous process as depicted in the figure below (from U.S. Pharmacopeia Appendix XVII: Food Fraud Mitigation Guidance). It begins with an evaluation step to characterise food fraud vulnerabilities, followed by the design and review of a mitigation strategy, and its implementation.

Periodically, or as changes occur that may impact the previously identified vulnerabilities (e.g. a newly identified adulterant for an ingredient is reported, changes in the supply chain for an ingredient), the entire process must be carried out again to ensure its continued effectiveness.



Vulnerability assessment

A general approach to prevent food fraud can be summarised as follows:

- Conduct vulnerability assessment, including:
 - Know your materials and risks (history, economic factors, geographical origins, physical state, emerging issues);
 - Know your suppliers (manufacturer, broker, history);
 - Know your supply chain (length, complexity, supply & demand arrangements, ease of access);
 - Know your existing control measures.
- Design mitigation strategy and implement mitigation measures.
- Validate and verify mitigation measures, continually review food fraud management system.

To characterise the vulnerability of an ingredient to food fraud, the following 3 aspects must be assessed:

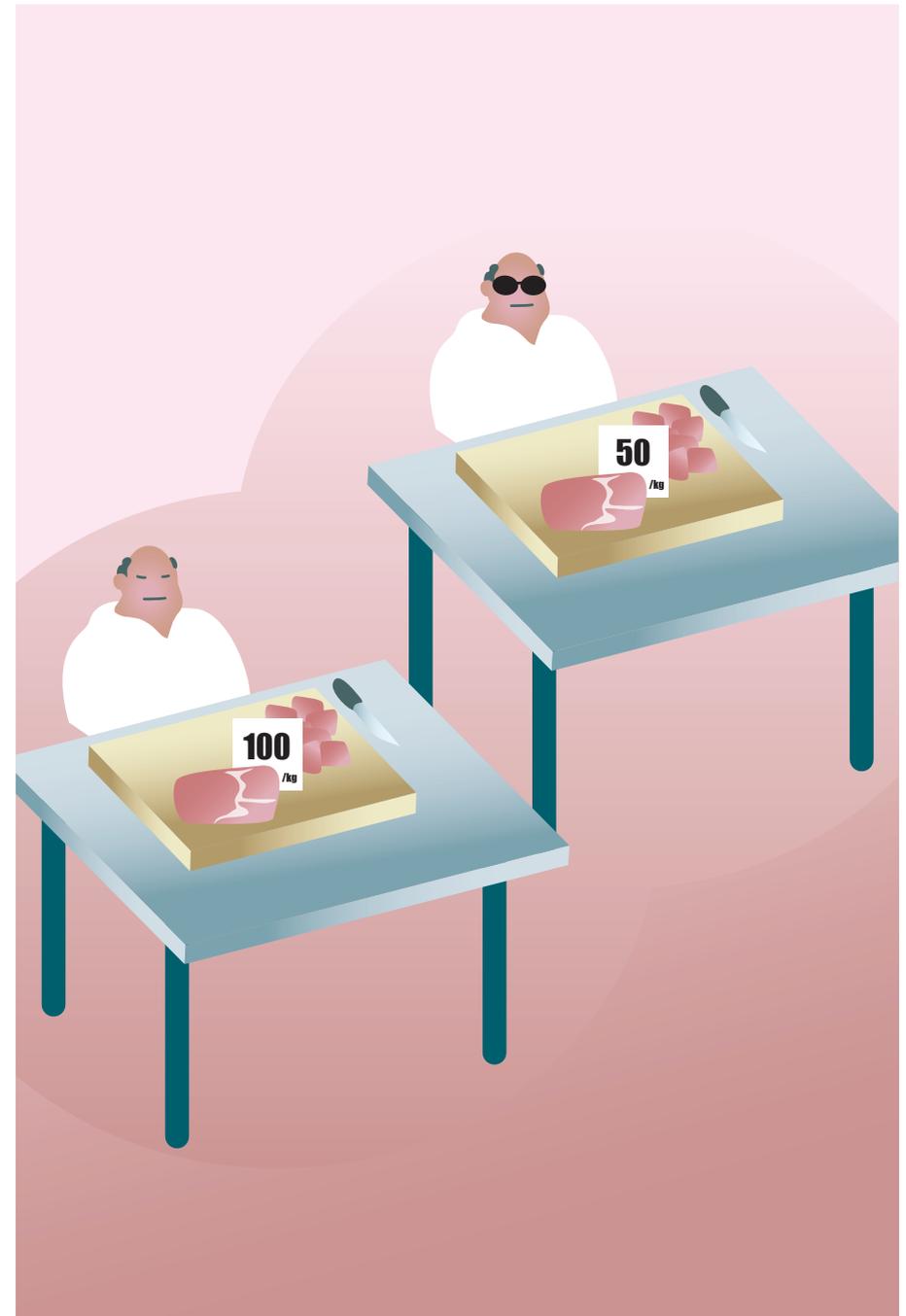
Vulnerability driven by factors inherent to the ingredient

Factors such as the ingredient market price, its fraud history, composition, physical state and level of processing are entirely independent of the actions taken by the buyer to mitigate the risk of fraud. This is defined as the inherent vulnerability of a food ingredient. Certain ingredients are by nature more vulnerable to adulteration (e.g. apple juices or apple purees are more vulnerable than apple pieces).

Fraud history (past cases of adulteration of specific raw materials) is a good source of information. It is an indicator of the raw material potential vulnerability, and an important source of possible adulterants for which detection and deterrence are needed.

Vulnerability driven by factors impacting the business (business pressure)

Factors such as the demand for a specific ingredient (volume), the extent of its use (ingredient used in several products and businesses), or the market price fluctuation may contribute to an increased level of vulnerability to fraud.



If the price of a valuable food is too good to be true, it probably is

Any anomaly in the economics of particular raw material sources is an indicator of the raw material potential vulnerability. Drastic increases in market price and scarce supplies of a raw material (e.g. poor harvest following bad weather, or caused by a new parasite) are good indicators of increased raw material vulnerability based on economic anomalies.

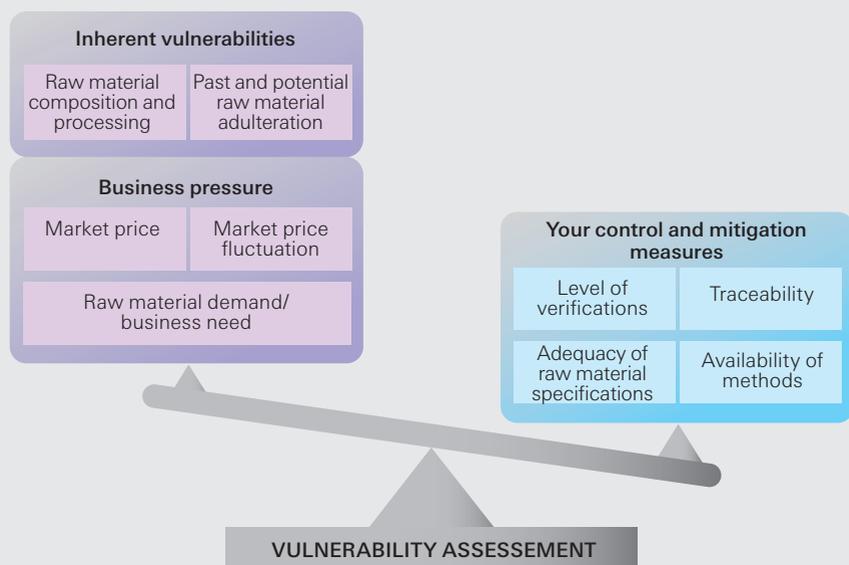
Geopolitical considerations are also important to characterise vulnerability to food fraud. A country-specific low price compared with the rest of the market

may indicate a lack of food control and/or regulatory/enforcement framework in the country of origin (or any other country through which the ingredient may transit).

Vulnerability driven by factors under the control of the buyer

This reflects the strength, or the weakness of a company's mitigation strategy (full traceability, adequate purchasing specifications, availability of analytical methods, robustness of surveillance programmes).

Adequate mitigation measures alleviate vulnerability to food fraud



In summary, assessing the risk of fraud for a food ingredient requires the understanding of the inherent raw material vulnerabilities, the business vulnerabilities, and the existing controls in place. This will allow to define which preventive actions are needed (and where) to mitigate the risk of food adulteration.

It is important to note that such a vulnerability assessment is not a one-time activity but a dynamic process, which needs to be maintained with regards to new information and external pressures (e.g. economic anomalies, bad harvest year).

Self-assessment
Recent food fraud crises have highlighted the need to reinforce companies' ability to combat fraud – within their own organisation, and across the entire food value chain. Companies are expected to work proactively towards mitigating the risk of food fraud. Guidance and self-assessment tools have been developed by a number of organisations (e.g. US Pharmacopeia, SSAFE, BRC) to help food companies undertake their own vulnerability assessments and implement appropriate control plans (see section *Useful resources & tools*).

Mitigation measures

Raw material specifications

Adequacy of raw material specifications is an important preventive aspect against food fraud. Specifications established for raw materials, which are used in the purchase of these materials, must include appropriate authenticity criteria to mitigate – as much as possible – the inherent vulnerabilities identified in the self-assessment. For example, UV absorbance is specified to detect the potential adulteration of extra virgin olive oil with refined oils.

Specification criteria linked to food fraud prevention must be thoroughly defined, in line with the level of complexity and variability of the ingredient's composition.

When a specific parameter needs to be measured to control the raw material authenticity, particular attention must be given to using analytical methods that are fit-for-purpose (i.e. adapted for the natural variability in the raw material).

Analytical surveillance

Once the adulteration risks have been characterised for a given raw material, and a set of analytical control criteria defined – a surveillance plan should be established. The surveillance plan allows to build confidence in the company's suppliers, gain reassurance on the company's raw material supply, and confirm that the prevention measures in place are adequate ... or in contrast, the surveillance plan may allow the detection of food fraud issues.

Raw material monitoring should be performed using appropriate analytical methods for the verification of authenticity. The methods must be selective, specific, and of appropriate sensitivity to verify that the food authenticity process is efficient. There are 2 approaches:

- Targeted analyses (linked to parameters specified in raw material specifications);
- Untargeted techniques (fingerprinting) that assess the raw material integrity against adulteration.

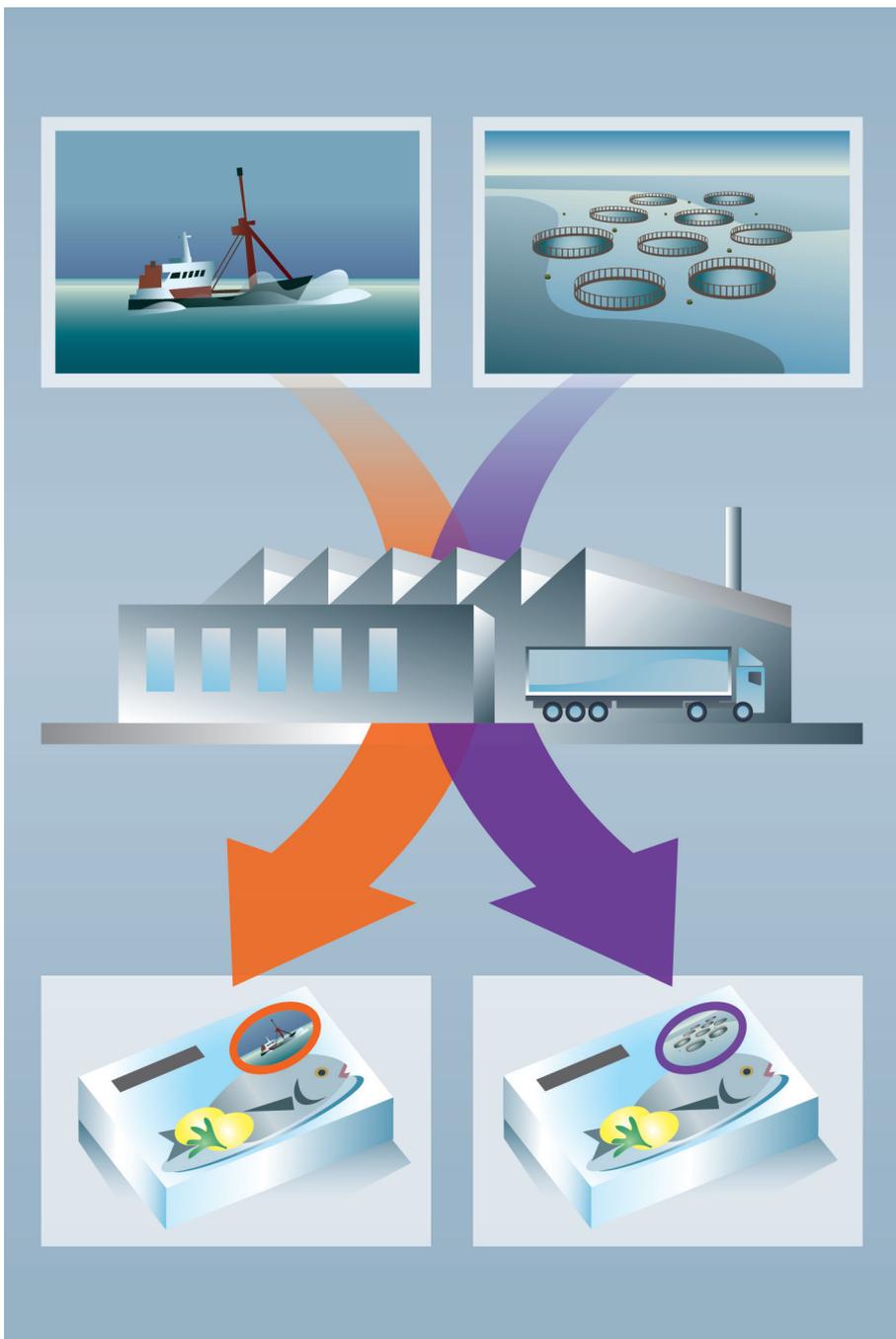
Supplier relationship

As a starting point, processes must be in place to approve the suppliers' production sites, with requirements for approval based on risk (e.g. raw material risk, location of food safety control measures, supplier performance). Once suppliers have been qualified according to a robust approval process, the relationship between buyer and supplier is critical to support any adulteration prevention effort.

The closer the relationship, the more knowledge and confidence will be shared between each party. Ask yourself: How well do you know your suppliers (e.g. how long have you been dealing with them and what is their track record like, what is their business situation and are they under any financial stress)? How can you learn more about them (e.g. partnerships, supplier schemes)?

Confidence is increased with a supplier's readiness to share information on their supply chain and processes. This is why the development of trusted suppliers (rather than continuous rotation) is important in mitigating the risk of food fraud. The closer the relationship, the lower the risk.

- **Trusted supplier:** Long-standing partnership-type arrangement. High degree of confidence established through long positive business relationship, high degree of transparency, and/or testing programmes. Sharing of key information and expectations. Understanding of key needs and controls in both the buyer and supplier processes.
- **Trusted supplier, new ingredient:** Similar to "Trusted Supplier", except the buyer only recently began purchasing a particular ingredient from the supplier. High degree of confidence established through purchase of other ingredients.
- **Established supplier, some relationship:** Short history of business with the supplier, who is well respected in their market with a solid reputation, and no significant issues reported.
- **Established supplier, no relationship:** Supplier respected in their market with a solid reputation. A business relationship and history has not yet been established.
- **Unestablished supplier, no relationship:** Often a new supplier, with whom the buyer has no history or any general industry knowledge of the supplier. The supplier may be new to a given industry.



The facility shall maintain purchasing records and the traceability of raw material usage

Supplier audit

In response to food fraud issues reported in recent years, a number of requirements have been added to

food safety schemes in order to minimise the risk of operating sites purchasing fraudulent, or adulterated raw materials.

One example (from BRC Issue 7, 2015):

- **Processes in place to access information** on historical and developing threats to the supply chain, which may present a risk of adulteration or substitution of raw materials. Such information may come from trade associations, government sources, private resource centres.
- **Documented vulnerability assessment** carried out on all food raw materials or groups of raw materials to assess the potential risk of adulteration or substitution (this assessment shall take into account historical evidence of substitution or adulteration, economic factors which may make adulteration or substitution more attractive, ease of access to raw materials through the supply chain, sophistication of routine testing to identify adulterants, nature of the raw material). The vulnerability assessment shall be reviewed to reflect changing economic circumstances and market intelligence, which may alter the potential risk. It shall be formally reviewed annually.
- **Where raw materials are identified as being at particular risk of adulteration or substitution, appropriate assurance and/or testing processes shall be in place to reduce the risk** (e.g. auditor to review the historical test results of materials identified at risk of adulteration).
- **Where products are labelled or claims are made** on finished packs which are dependent on the status of a raw material – including specific origin, breed/varietal claims, assured status (e.g. GlobalGAP), genetically modified organism (GMO) status, identity preserved, specific trademarked ingredients – the **status of each batch of the raw material shall be verified**.
- **The facility shall maintain purchasing records, traceability of raw material usage and final product packing records to substantiate claims.** The site shall undertake documented mass balance tests (e.g. every 6 months in the absence of a scheme-specific requirement).
- **Where claims are made about the methods of production** (e.g. organic, Halal, Kosher) the site shall **maintain the necessary certification status** in order to make such a claim.

More targeted examination may be carried out by auditors during audits at a specific raw material production/handling site. For example on a meat production site – auditors may detect the presence of unapproved flavours, dyes or preservatives in the production and/or storage areas. On a poultry production site – auditors may look for the presence of equipment used to inject brine.

Supply chain transparency and simplification

A streamlined upstream supply chain improves transparency, traceability, and the management of material safety and quality standards. It also gives fewer opportunities for fraudsters to penetrate your supply chain.

The first step towards supply chain transparency is to ask yourself: Do you have full visibility of your supply chain? Who are your immediate suppliers? Who supplies them? Are you changing a supplier or process?

Supply chain simplification will require that you:

- Map your supply chain;
- Gather information from suppliers to identify those who are most at risk (e.g. via questionnaire and supplier assurance and audit processes), and using expertise from both within your organisation and outside (e.g. your trade association) to gather the relevant information;
- Simplify your supply chain as much as possible to eliminate sources of risk.



How well do you know your suppliers?

Alert system

It is essential to maintain a routine watch of official and industry publications, which give an early warning of changes that may trigger new threats, or change the priority of existing threats, including more local issues as they develop (e.g. climate impact on certain crop yield and subsequent fraud).

Conversely, it is of paramount importance to trigger an alert when a fraudulent material is detected. Alert your business partners to prevent the adulterated material from reaching other parts of the value chain. Report the case to the competent local authorities and/or national food crime unit for further investigation.

Frequently asked questions

Question: What is economically-motivated adulteration (EMA)?

EMA is the intentional sale of sub-standard food products or ingredients for the purpose of economic gain. Common types of EMA include substitution or dilution of an authentic ingredient with a cheaper product (such as replacing extra virgin olive oil with a cheaper oil), flavour or colour enhancement using illicit or unapproved substances (such as unapproved dyes), and substitution of one species with another (such as fish species fraud).

Is EMA the same as “food fraud”?

EMA is often referred to as “food fraud”. The two terms are used interchangeably.

Is EMA the same as contamination?

Whereas EMA is intentional and perpetrated for the sake of economic gain, contamination of a food product or ingredient can be accidental, environmental, or malicious (i.e. not for economic gain).

What foods are affected by EMA?

Many foods are susceptible to EMA. These include meat, fish and seafood, dairy products, fruit juices, oils, honey, spices and wine. EMA is not a new concern, although there seems to have been an increase in incidents over the recent years. This is partly due to increased media coverage and, perhaps, increased surveillance in

certain food products. The number of documented incidents is most likely a fraction of the true number of incidents, since the goal of EMA perpetrators is to avoid detection.

What is Nestlé doing to prevent food fraud?

Nestlé has established a process for prevention and mitigation of EMA, which includes a vulnerability assessment step (per raw material category), the definition of mitigation measures, and the continual review of both the vulnerability assessment and the efficiency of mitigation measures. Nestlé also drives longer-term initiatives (e.g. development of non-targeted analytical methods, development of collaborative tools across the industry and with authorities to create transparency across the food value chain).

What should I do when I detect an adulterated material?

Assess the impact of the deviation (food safety, regulatory, impacted products) with the support of experts whenever needed. Take action based on the outcome of the assessment (e.g. block raw material and/or finished product stock, destroy stock, recall products). You should then conduct a full traceability exercise to identify the source of the adulterated material, and have an investigation initiated. You should alert your business partners

(customers, distributors, companies – including competitors – operating in your business) to prevent the fraudulent material from reaching other parts of the value chain. Finally, you should report the case to competent authorities.

What should I do when I identify a new adulteration risk?

You should include this new risk in your vulnerability assessment for the concerned raw material category, then define measures that could mitigate this particular risk, and continue to monitor this risk (e.g. through analytical surveillance plans) to ensure that your mitigation measures are effective to prevent occurrence of this issue in your supply chain.

What should food operators and suppliers do about food fraud?

To prevent food fraud and better ensure food safety and consumer protection, food operators, their suppliers and all partners along the food value chain (including industry associations and authorities) should consider the following:

- Conduct vulnerability assessments in their supply chains;
- Implement (and verify) mitigation measures accordingly;
- Develop collaborative tools across the industry and with authorities to create transparency across the food value chain.

What should consumers know about food fraud when purchasing food?

There are certain things consumers can do to help protect themselves from food fraud. If the price of a valuable food product is too good to be true, it probably is. Whole, unprocessed foods (such as unground coffee and spices, or whole fruits instead of juice) are more difficult to adulterate, therefore buying these foods may offer some reassurance with regards to fraud. As for processed foods, it is a good idea to buy from reputable sources and brands that have a vested interest in protecting their reputation. When fraud incidents are discovered, they can result in large profit losses and reputation damage for companies. Therefore, companies with brand recognition will actively take steps to protect their products. Some trade associations also certify products through quality and purity assurance testing programmes, such as the North American Olive Oil Association Seal Program (<http://www.naooa.org/sealprogram>).

Does EMA cause harm to health?

The good news is that most incidents of EMA do not result in public health harm. Unfortunately, perpetrators sometimes make mistakes resulting in unintended health consequences. In 2008 for example, some companies in China were found to be adulterating

milk supplies with a chemical called melamine, because it artificially increased the apparent protein content. Melamine-adulterated milk was used in the manufacture of infant formula, which led to the hospitalisation of more than 50 000 Chinese infants, and the deaths of at least six. In 1981, industrial-grade oil adulterated with multiple chemicals was sold as olive oil in Spain, and resulted in more than 300 deaths.

Does EMA only affect humans? What about pets?

Since the food supply chains for humans, pets and production animals are interconnected, EMA in food products can affect both humans and animals. In 2007, an EMA incident involving adulterated wheat gluten used in pet food caused illnesses and death in thousands of dogs and cats in the USA.

Are government regulatory agencies concerned about EMA?

In the USA, the US FDA (FDA.gov), USDA (USDA.gov), and DHS (DHS.gov) are working to protect the food supply from EMA and other food safety risks. In the European Union, the food industry and regulators are working towards an enhanced management framework to prevent food fraud, with guidance available from e.g. the UK Food Standards Agency. Other government agencies provide useful resources (see *section Useful resources & tools*).

Useful resources & tools

GUIDANCE DOCUMENTS

- **U.S. Pharmacopeia Appendix XVII:** Food fraud mitigation guidance http://www.usp.org/sites/default/files/usp_pdf/EN/fcc/food-fraud-mitigation-guidance.pdf
- **BRC Global Standard for Food Safety Issue 7 Understanding Vulnerability Assessment** <http://www.brcbookshop.com/p/1782/brc-global-standard-for-food-safety-issue-7-understanding-vulnerability-assessment-uk-unlocked-pdf-version>
- **UK Food and Drink Federation (FDF)** http://www.fdf.org.uk/corporate_pubs/Food-Authenticity-guide-2014.pdf
- **TACCP (Threat Assessment and Critical Control Point):** a practical guide 2014 (Campden BRI) <http://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=4640>

SELF-ASSESSMENT TOOLS

- **SSAFE Food Fraud Assessment Tool** <https://ffv.pwc.com>; www.ssafe-food.org
- **US Food and Drug Administration (FDA)** Vulnerability Assessment Software <http://www.fda.gov/Food/FoodDefense/ToolsEducationalMaterials/ucm295900.htm>

ALERTS & DATABASES

- **US Food and Drug Administration (FDA) Recalls and Enforcement Reports** <http://www.fda.gov/Safety/Recalls/default.htm>
- **US Food and Drug Administration (FDA) Import Alerts and Refusals** <http://www.fda.gov/ForIndustry/ImportProgram/default.htm>
- **Online tool compiling information on import refusals** <http://www.imprex.us>
- **US Food and Drug Administration (FDA) Enforcement and Criminal Investigations** <http://www.fda.gov/ICECI/>
- **US Food and Drug Administration (FDA) Food Defense** <http://www.fda.gov/Food/FoodDefense>

- **US Pharmacopeial Convention** Food fraud database; <http://www.foodfraud.org/>
- **Canada Recalls and Alerts** <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/index-eng.php>
- **European Union Rapid Alert System** http://ec.europa.eu/food/safety/rasff/portal/index_en.htm
- **UK Food Standards Agency (FSA)** <http://food.gov.uk/enforcement/enforcework/foodfraud/>
- **UK Serious Fraud Office** <http://www.sfo.gov.uk>
- **Australia and New Zealand** <http://www.foodstandards.gov.au/science/surveillance/Pages/default.aspx>
- **The Department of Food Safety, Govt of N.C.T of Delhi** <http://dcwestrev.delhigovt.nic.in/pfa/newweb/CompleteListFoodCategory.asp?SessNull=0>
- **EMA Susceptibility Database** www.FoodSHIELD.org (registration required)

STANDARDS

- **BS 10501**, Guide to implementing procurement fraud controls <http://shop.bsigroup.com/ProductDetail/?pid=000000000030282473>
- **BRC Global Standard Food Safety Issue 7** <http://www.brcbookshop.com/p/1656/brc-global-standard-for-food-safety-issue-7-us-free-pdf>

SUPPLY CHAIN SECURITY

- **BS ISO 28000**, Specification for security management systems for the supply chain
- **BS ISO 28002**, Security management systems for the supply chain – Development of resilience in the supply chain – Requirements with guidance for use
- **PD CEN/TR 16412**, Supply chain security (SCS) – Good practice guide for small and medium sized operators

**SOURCES OF INFORMATION
AND INTELLIGENCE ABOUT
EMERGING RISKS TO FOOD SUPPLY**

- **INFOSAN**
http://www.who.int/foodsafety/areas_work/infosan/en/
- **FAO Early Warning Bulletin**
<http://www.fao.org/food-chain-crisis/early-warning-bulletin/en/>
- **GIEWS**
<http://www.fao.org/giews/english/index.htm>

FURTHER READING

- **GFSI position on mitigating the public health risk of food fraud** http://www.mygfsi.com/files/Technical_Documents/Food_Fraud_Position_Paper.pdf
- **Scottish Government and Food Standards Agency** Expert advisory group report the lessons to be learned from the 2013 horsemeat incident; 2013.
<http://www.scotland.gov.uk/Resource/0043/00437268.pdf>
- **Centre for the Protection of National Infrastructure** Holistic management of employment risk (HoMER). London: CPNI, 2012. <http://www.cpni.gov.uk/advice/Personnel-security1/homer/>
- **US Michigan State University**
<http://foodfraud.msu.edu/>



© 2016, Nestec Ltd., Vevey (Switzerland)

Concept

Nestec Ltd., CO – Quality Management, Vevey (Switzerland)

Design

Nestec Ltd., Corporate Identity & Design
with Christian Stuker, 1097 Riex (Switzerland)

Production

brain'print GmbH (Switzerland)