Understanding and adopting VACCP and TACCP

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TakeOff Consulting
What does it all mean?
Food Defence and Food Fraud – Some Definitions
Food Defence - GFSI

The process to ensure the security of food and drink and their supply chains from all forms of intentional malicious attack including ideologically motivated attack leading to contamination or supply failure.

*Food safety, food defence, and food fraud risk assessments consider different criteria in order to determine the degree of situational risk for each criteria and the measures that need to be implemented to mitigate that risk.*
Food Defence – PAS 96:2014

Procedures adopted to assure the security of food and drink and their supply chains from malicious and ideologically motivated attack leading to contamination or supply disruption

*The term food security refers to the confidence with which communities see food being available to them in the future. Except in the limited sense that a successful attack may affect the availability of food, food security is not used and is outside the scope of this PAS.*
Food Fraud

Committed when food is deliberately placed on the market, for financial gain, with the intention of deceiving the consumer.

Although there are many kinds of food fraud, the two main types are:

- the sale of food which is unfit and potentially harmful, such as recycling of animal by-products back into the food chain and packing and selling of beef and poultry with an unknown origin or knowingly selling goods which are past their ‘use by’ date.

- the deliberate misdescription of food, such as products substituted with a cheaper alternative, for example, farmed salmon sold as wild, and Basmati rice adulterated with cheaper varieties or making false statements about the source of ingredients, i.e. their geographic, plant or animal origin.

Food fraud may also involve the sale of meat from animals that have been stolen and/or illegally slaughtered, as well as wild game animals like deer that may have been poached.
Food Supply

Elements of what is commonly called a food supply chain
Food Protection

Procedures adopted to deter and detect fraudulent attacks on food
Vulnerability Assessment and Critical Control Points: Systematic management of risk through the evaluation of vulnerabilities of (generally) raw materials

Vulnerability = Susceptibility or exposure to a gap or deficiency that could place consumer health at risk and/or have an economic or reputational impact on a food company’s operations if not addressed.
TACCP

Systematic management of risk through the evaluation of threats, identification of vulnerabilities, and implementation of controls to materials and products, purchasing, processes, premises, distribution networks and business systems by a knowledgeable and trusted team with the authority to implement changes to procedures.

*Threat = something that can cause loss or harm which arises from the ill-intent of people*
TACCP and VACCP go hand in hand in the quest to demonstrate product authenticity. Both are designed to prevent the intentional adulteration of food:

**TACCP** identifies the threat of behaviorally or ideologically motivated adulteration

**VACCP** identifies how vulnerable various points in the supply chain are to the threat of economically motivated adulteration.
Approach to Food Fraud Prevention

Food Safety Management System

- **Food Safety**
  - HACCP
    - Hazards
      - Prevention of unintentional / accidental adulteration
        - Science based
        - Food borne illness
  - TACCP
    - Threats
      - Prevention of intentional adulteration
        - Behaviourally or ideologically motivated
  - VACCP
    - Vulnerabilities
      - Prevention of intentional adulteration
        - Economically motivated
Food Defence vs Food Safety vs Food Security

In order to prevent, protect against, mitigate, respond to, and recover from threats and hazards of greatest risk to the food supply, it is important that preparedness efforts encompass food safety, food defence, and food security.

**Food Defence** - the protection of food products from contamination or adulteration intended to cause public health harm or economic disruption

**Food Safety** - the protection of food products from unintentional contamination

**Food Security** - when all people, at all times, have both physical, social, and economic access to sufficient, safe, and nutritious food.
Food Fraud

Why do we need to do this?
Fraud – Middle Ages (18\textsuperscript{th} & 19\textsuperscript{th} Centuries)

• Spices
  Price of imported spices increased, merchants would substitute spices with seeds, stones or dusts.

• Milk was commonly diluted with water, sometimes dirty water, and colored with chalk or plaster
Manuka Honey

Particular type of honey, produced in New Zealand by bees that pollinate the native Manuka bush... 100% pure, natural

‘Most precious and priciest honey… health & beauty elixir (1-hr facial $179.00)’

Believed value by Advocates - antibacterial properties, skin treatment e.g. acnes, eczema, cuts, burns, combat ulcers, infections, digestive ailments and other conditions.

10,000 tons Manuka-labelled honey sold annually, only 1700 tons of it is actually produced in New Zealand (per Mass spectrometer analysis of honey four specific compounds that should be present in Manuka Honey, were NOT).
Recent Past

2013 Horsemeat Burgers

Consumers in England, France, Greece and several other countries were duped and unknowingly purchased meatballs and burgers containing meat other than beef. UK Dept. of Agriculture, Food and Rural Affairs along with Food Standards Agency of Ireland (FSRI)

Traceability

Identified Meat Sources: 2 processing facilities in the Irish Republic:
• Liffey Meats & Silvercrest Foods and
• the Dalepart Hambleton plant in North Yorkshire

Point of Sale: Dunnes Store, Lidl and Aldi

Analysis:

29% of meat content in one sample (Tesco) – Horse meat
31 beef meal products checked – 10 contained horse DNA, 21 were positive for pig DNA
Melamine in Infant Formula - 2008

Melamine was being used to dilute milk in order to elevate nitrogen levels to get higher protein results gain more money. This lead to the poisoning of many infants and children through contamination of milk formula and other products.

Peanut tainted Cumin - 2015

Spice supply chain is long and complex.
1 supplier ➔ 38 different companies

Nearly 600,000 pounds of beef, pork and chicken contaminated - Vegetarian products containing the same ingredients were affected.
GFSI defined food fraud as:

“A collective, tampering or term encompassing the deliberate and intentional substitution, addition, misrepresentation of food, food ingredients or food packaging, labelling, product information or false or misleading statements made about a product for economic gain that could impact consumer health.”

GSFI requires that a Food Fraud Vulnerability Assessment be completed and documented and a Food Fraud Prevention Strategy be applied across the Food Safety Management system.
Opportunity + Motivation - Controls = Actual Fraud Vulnerability

related to Fraud Risk Factors related to Fraud Risk Factors Fraud Control Measures
FOOD FRAUD

- Substitution
  - Sunflower oil partially substituted with mineral oil
  - Hydrolysed leather protein in milk
- Concealment
  - Poultry injected with hormones to conceal disease
  - Harmful colourings added to F&V to conceal defects
- Mislabelling
  - Expiry, Provenance (unsafe origin)
  - Toxic Japanese Star Anise labelled as Chinese Star Anise
- Unapproved Enhancement
  - Melamine added to enhance protein content
  - Use of unauthorised additives (Sudan Dye)
- Grey Market Production/Theft/Diversion
  - Sale of excess unreported product
- Dilution
  - Watered down product using unsafe water
  - Olive oil diluted with potentially toxic tea tree oil
- Counterfeiting
  - Copies of popular foods
  - Not produced with acceptable safety assurances
- Take Off Consulting
Economically Motivated Adulteration

- In 2013, allegations were reported that a food factory in Asia was labelling cooking oil as peanut, chilli and olive when it contained none of these oils.

- A 2013 report suggested that one third of retail fish in the USA was mislabelled. Examples included, tilapia sold as red snapper and tilefish sold as halibut.

- In 2010, some producers of buffalo mozzarella in Italy were accused of adulteration of their product with cow’s milk.

- Staff in a European meat packer felt, mistakenly, that they could avoid a product being condemned as carrying foot and mouth disease by covering it with disinfectant.
Malicious Contamination

• In 2005, a major British bakery reported that several customers had found glass fragments and sewing needles inside the wrapper of loaves.

• In 1984, the Rajneeshee sect in Oregon attempted to affect the result of a local election by contaminating food in ten different salad bars, resulting in 751 people affected by salmonella food poisoning.

• In 2013, a major soft drinks supplier was forced to withdraw product from a key market when it was sent a bottle which had had its contents replaced with mineral acid. The attackers included a note indicating that more would be distributed to the public if the company did not comply with their demands.

• In 2007, a bakery found piles of peanuts in the factory. It withdrew product and closed for a week long deep clean to re-establish its nut-free status.
Extortion

• In 1990, a former police officer was convicted of extortion after contaminating baby food with glass and demanding money from the multi-national manufacturer.

• In 2008, a man was jailed in Britain after being convicted of threatening to bomb a major supermarket and contaminate its products.
Espionage

- In July 2014, Reuters reported that a woman was charged in the USA with attempting to steal patented U.S. seed technology as part of a plot to smuggle types of specialized corn for use in China.
Counterfeiting

- In 2013, enforcement officers seized 9 000 bottles of fake Glen’s Vodka from an illegal factory.

- In 2011, 340 bottles of Jacobs Creek wine were seized, following complaints of poor quality to the owner, which had no link with Australia.
Cyber Crime

- In 2014, Financial Fraud Action UK advised restaurant managers to stay vigilant as fraudsters are attempting to target their customers in a new phone scam. They phone restaurants claiming there is a problem with their card payments system, the restaurant is then told to redirect any card payments to a phone number provided by the fraudster.
Understanding the Aggressor

• The extortionist
• The extremist
• The irrational individual
• The disgruntled individual
• The hacktivist and other cyber criminals
• The professional criminal
• The opportunist
Prevention Methods

- Conduct a Documented Food Fraud Vulnerability Assessment
- Target all types of Food Fraud
- Implement Documented Food Fraud Prevention Strategy
- Conduct an annual Food Fraud Incident Review

Confirm that the scope covers all products; including both incoming goods (e.g. ingredients) and outgoing goods (e.g. finished goods) to the consumer.
VACCP & TACCP Assessments

How do we do this?
Vulnerability Assessment - WSEP

1. List of Materials
2. Map Out Supply Chain
3. Evaluate Risk
4. Assess Need for Additional control
5. Record Findings
6. Review at least annually
Vulnerability Assessment – PAS 96
Vulnerability Assessment - SSAFE

SSAFE is a non-profit membership driven organization that aims to foster the continuous improvement and global acceptance of internationally recognized food protection systems and standards through public private partnerships. In 2015 they developed a tool that will help any food business, irrespective of geographical location or size, determine where they may be vulnerable to fraudulent activities and prepare control plans. The tool will be available in three versions - in excel, on the web and as an app - and will be free of charge.
Outline of the 15-step TACCP Process

1. Assess new information
2. Identify and assess threats to organization
3. Identify and assess threats to operation
4. Select product
5. Identify and assess threats to product
6. Devise flow chart of product supply chain
7. Identify key staff and vulnerable points
8. Consider impact of threats identified
9. Identify which supply points are most critical
10. Determine if control procedures will detect the threat
11. Likelihood v Impact → Priority
12. Identify who could carry it out?
13. Decide and implement necessary controls
14. Review and revise
15. Monitor horizon scans and emerging risks
Risk Assessment

• Can be done in many different ways

• Often can utilise current risk assessment tools to assist.

• Examples include
  • Likelihood vs Impact (PAS96)
  • Priority Risk Number (PRN) Matrix (BRC)
## Likelihood vs Impact Risk Assessment

### Threat levels categorisation

<table>
<thead>
<tr>
<th>Likelihood of threat happening</th>
<th>Score</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high chance</td>
<td>5</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>High chance</td>
<td>4</td>
<td>Major</td>
</tr>
<tr>
<td>Some chance</td>
<td>3</td>
<td>Significant</td>
</tr>
<tr>
<td>May happen</td>
<td>2</td>
<td>Some</td>
</tr>
<tr>
<td>Unlikely to happen</td>
<td>1</td>
<td>Minor</td>
</tr>
</tbody>
</table>

**Notes:**

1. This is an example of a scoring matrix.
2. Likelihood of a threat happening could be judged, for example over a 5 year period.
3. Impact could consider death or injury, cost, damage to reputation and / or public and media perceptions of these consequences.
## Likelihood and Impact

<table>
<thead>
<tr>
<th>Impact</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Threat C</td>
<td>Threat B</td>
<td>Threat A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Threat E</td>
<td></td>
<td>Threat D</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Threat C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Threat D</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>Threat E</td>
<td></td>
</tr>
</tbody>
</table>

### Likelihood

- **Very high risk**: Threat A
- **High risk**: Threat B
- **Moderate risk**: Threat C
- **Low risk**: Threat D
- **Negligible risk**: Threat E

Note: This is an example of a risk matrix. Organisations may choose different criteria for the different risk categories.
<table>
<thead>
<tr>
<th>LIKELIHOOD OF OCCURRENCE</th>
<th>LIKELIHOOD OF DETECTION</th>
<th>PROFITABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historic incidents</td>
<td>Ease of access to raw materials (e.g. broken tamper-proof seals are clear evidence of an attempt to access)</td>
<td>Economic factors/price fluctuations*</td>
</tr>
<tr>
<td>Emerging concerns (e.g. recent news or alerts)</td>
<td>Physical form (e.g. whole items, chopped, minced, powdered or liquid)*</td>
<td>Ease of access to raw materials*</td>
</tr>
<tr>
<td>Economic factors/price fluctuations</td>
<td>Existing controls (e.g. supply chain audits)</td>
<td>Nature of the raw material (e.g. value of raw material/size of market)*</td>
</tr>
<tr>
<td>Geographic origin/length and complexity of the supply chain*</td>
<td>Length and complexity of the supply chain*</td>
<td>Availability/seasonality*</td>
</tr>
<tr>
<td>Ease of access to raw materials (e.g. long or convoluted supply chains which allow multiple points of entry for fraudulent material)</td>
<td>Routine product testing (consider both the types of test used i.e. how likely they are to detect any adulterated materials, and the frequency at which the tests are completed)</td>
<td>Complexity and cost of committing the fraud</td>
</tr>
<tr>
<td>Nature of the raw material (e.g. value of raw material/size of market)</td>
<td>Relevant audits (i.e. those which consider adulteration, traceability, mass balance testing etc.)</td>
<td>Availability of cheaper adulterants or substitutes</td>
</tr>
<tr>
<td>Physical form (e.g. whole items, chopped, minced, powdered or liquid)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability (e.g. seasonality/ harvest variability)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Some information may have an impact on more than one of the criteria and may therefore need to be considered in both parts of the assessment.
## PRN Rating

<table>
<thead>
<tr>
<th>RATING</th>
<th>LIKELIHOOD OF OCCURRENCE (O)</th>
<th>LIKELIHOOD OF DETECTION (D)</th>
<th>PROFITABILITY (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very unlikely or none</td>
<td>Certain</td>
<td>Very low</td>
</tr>
<tr>
<td>2</td>
<td>Unlikely or minor</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Moderate or significant</td>
<td>Fairly unlikely</td>
<td>Moderate or significant</td>
</tr>
<tr>
<td>4</td>
<td>High</td>
<td>Unlikely or remote</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Very high</td>
<td>Very unlikely</td>
<td>Very high</td>
</tr>
</tbody>
</table>
Carver-Shock

This is the tool used by the military targeting weaknesses by assessing their:

- **Criticality**
- **Accessibility**
- **Recognisability**
- **Vulnerability**
- **Effect**
- **Recoverability**
Carver-Shock

Team members put themselves in the place of the prospective attacker and ask:

If I wanted to cause harm, or make more money, or gain publicity, or take advantage of the situation in some other way:

• What would I do?
• Where would I do it?
• When would I do it?
Summary - Key Steps to Food Defence

• Broad Mitigation Strategies

• Vulnerability Assessments

• Focused Mitigation Strategies

• Food Defence Plan
Examples of Vulnerability Assessment Methods:

Vulnerability Assessment Methods - Food Fraud Advisors
www.foodfraudadvisors.com/vulnerability-assessment-methods

SSAFE and PwC tool helps assess vulnerability to food fraud
www.foodqualitynews.com/Industry-news/SSAFE-and-PwC-tool-helps...

FDA food fraud vulnerability assessment_pdf

VACCP: HACCP for vulnerability assessments | 2016-02 ...
www.foodengineeringmag.com/articles/95205-vaccp-haccp-for...

Vulnerability Assessment Tools - Food Fraud Advisors
www.foodfraudadvisors.com/vulnerability-assessment-tools
A tool to help you with food fraud vulnerability assessments.
Examples of Self-Assessment Tools:

SSAFE and PwC tool helps assess vulnerability to food fraud
www.foodqualitynews.com/Industry-news/SSAFE-and-PwC-tool-helps...

Vulnerability Assessment Tools - Food Fraud Advisors
www.foodfraudadvisors.com/vulnerability-assessment-tools
The Vulnerability Assessment Tool v2.0 and the Vulnerability Assessment Tool (BRC method) are Microsoft Excel Spreadsheets that are designed to help you

U S Food and Drug Administration (FDA)
Vulnerability Assessment Software
http://www.fda.gov/Food/FoodDefense/ToolsEducationalMaterials/ucm295900.htm
Examples of Other Guidance Documents:

– U.S. Pharmacopeia Appendix xvii : Food fraud mitigation guidance

– BRC Global Standard for Food Safety Issue 7 Understanding Vulnerability Assessment

– UK Food and Drink Federation (FDF)

– TACCP (Threat Assessment and Critical Control Point): a practical guide 2014 (Campden BRI)
  http://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=4640
Thank You

[Diagram of the Fraud Triangle with labels: Opportunity, Motivation, Rationalization]