Detection of food fraud: the analytical challenge

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Serving society
Stimulating innovation
Supporting legislation
25 June 2014

Auction price beef: 3.71 €/kg

Auction price horse: 0.80 €/kg
Food supply chain

• Numerous possible routes for introduction and transmission of foodborne hazard
• Each link in the chain is responsible for the quality and safety of its products
• Coordination of intervention and control strategies
• Communication between many stakeholders

Approach
* Multisectoral
* Multidisciplinary
Traceability systems
Key characteristics of food fraud:

1. non-compliance with food law and/or misleading the consumer
2. which is done intentionally
3. for reasons of financial gain.
Chemistry of crime

Opportunity for Fraud

Fraudster

Hurdles

Victim

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Main types of food fraud

- sale of food which is unfit for consumption and potentially harmful,
- knowingly selling goods which are past their 'use by' date,
- 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
- making false statements about the source of ingredients, i.e. their geographic, plant or animal origin
## Recent examples

<table>
<thead>
<tr>
<th>Adulterant</th>
<th>Analytical solution</th>
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<tbody>
<tr>
<td>Sudan dyes in spices</td>
<td>Chromatography</td>
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<td>Melamine in milk powder</td>
<td>Chromatography</td>
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<td>Horsemeat in beef</td>
<td>PCR</td>
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<td>Gelatine in chicken breast</td>
<td>Proteomics</td>
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<td>Misdescription of fish species</td>
<td>PCR, <a href="https://en.wikipedia.org/wiki/DNA_bar_coding">DNA bar coding</a></td>
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<td>Conventional food/organic food</td>
<td>HPLC, stable isotopes, etc</td>
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<td>Seed oils in olive oil</td>
<td>Chromatography</td>
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<td>Cow's milk added to sheep's milk</td>
<td>Electrophoresis</td>
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<td>Adulteration of fruit juices</td>
<td>Chromatography, stable isotopes, SNIF-NMR</td>
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<tr>
<td>Adulteration of wine</td>
<td>NMR, stable isotopes</td>
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Strategies to detect fraud

Fundamental difference

Empirical difference
Targeted – untargeted analysis
What we need

Chemistry

Suitable, validated analytical method(s)
Reference materials/substances/data

Forensics

Criminological characteristics of food fraud
Horizon-scans and intelligence gathering
Whistle blowing

Management

Vulnerability analysis
Risk management
Joint Research Centre (JRC)

www.jrc.ec.europa.eu

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