New approaches for tracing the origin of food

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To be discussed

- Importance of tracing food origin
- Introduction to TRACE
- Traceability and data interchange
- Analytical tools for verification
Traceability: European drivers

- Consumer socio-economic concerns and preferences relating to the origin of food-
  - BSE,
  - dioxins,
  - Sudan red,
  - regional foods,
  - type of production

- One step up one step down legislation introduced 178/2002

- EU FPVI Food 2003 2A T 4.1 “Development of reliable traceability methods and systems to establish the origin/ mode of production of food products”
Tracing the origin of food - high profile
US peanut recall

“More peanut products added to recall list
More than 31 million pounds, 125 items affected in salmonella probe”  
Associated Press  Jan. 23, 2009

“Salmonella outbreak eases way for food safety reforms
Lawmakers, industry in accord after salmonella outbreak”
By Matthew Hay Brown | matthew.brown@baltsun.com  February 15, 2009
New US traceability legislation*?

- **S.510 FDA Food Safety Modernization Act**
  - Safe And Fair Enforcement and **Recall** for Meat, Poultry, and Food Act of 2009

- **H.R. 1332: Safe FEAST Act of 2009 SEC.**
  - To amend the Federal Food, Drug, and Cosmetic Act with respect to the safety of the food supply. Section 204. **Enhancing Traceback and Recordkeeping**

- **H.R. 814 TRACE Act of 2009**
  - To amend the Federal Food, Drug, and Cosmetic Act, the Federal Meat Inspection Act, the Poultry Products Inspection Act, and the Egg Products Inspection Act to improve the safety of food, meat, and poultry products **through enhanced traceability, and for other purposes**

*Source www.govtrack.us/congress
The US Food and Drug Administration (FDA) is to hold a meeting designed to find ways to prevent the adulteration of food for economic reasons.

FDA defines economically motivated adulteration (EMA) as “the fraudulent, intentional substitution or addition of a substance in a product for the purpose of increasing the apparent value of the product or reducing the cost of its production”.
Traceability a global issue

- Melamine

Added to foods to extend apparent protein content
China milk scandal: 4 deaths and 53,000 children fall ill from contaminated milk powder, Daily Telegraph
September 22 2008

China tainted milk scandal: 22 arrested, The Daily Telegraph
September 29 2008

Cadbury hit by tainted milk scandal and withdraws Eclairs and Dairy Milk, The Times September 30 2008
Use of traceability systems

• Support food safety

• Risk management

• Food quality- quality assurance

• Support food authenticity

• Business management tool
Increasing consumer confidence

• Improved (cost effective) traceability for all

• European food perceived as higher quality as quality (and safety) specifications can easily be traced and verified.

• Promotes value added foods and sustainable agriculture e.g. regional foods, organic, country of origin.

• Benefits the food industry as well as consumers
Traceability is a tool

- Traceability does not make food safe
- Traceability systems track and trace food packaging
- Need methods for verifying the contents
To develop traceability methods and systems that will provide consumers with added confidence in the authenticity of European food.

- 19 M€
- 60 months
- 50 participants (13 SME’s)

European Commission - DG Research

Traceable data capable of verifying the origin of food

Consumers

Technology Transfer

Demonstration

Farm

Supply chain management systems + Analytical Tools

www.trace.eu.org
TRACE: General Approach

- Develop/harmonise traceability processes and language for tracking and tracing

- Develop methods for verifying “origin”
  - e.g. quantify geographical origin

- Develop food verification procedures
  - Compliance assessment

- Integrate into traceability systems?
TraceCore - facilitating data exchange

Information exchange without a standard:

Information exchange with a standard:

Group Leader: Petter Olsen

XML TraceCore
TraceFood Framework

- Identification through use of Global Trade Item Number (GTIN+)
- Generic Good Traceability Guidelines
- Sector specific Good Traceability Guidelines
- Documentation of transformations
- TraceCore eXtensible Markup Language (XML)
- Sector specific eXtensible Markup Language (XML)

(www.tracefood.org)
Analytical tools for verifying origin

- WP1 Food Origin Mapping (geo origin)
  ICP-MS, SIRMS, geochemistry, statistics

- WP2 Food verification methods
  NMR, Raman, M-IF, NIR, GC-MS, LC-MS, statistics

- WP3 Species origin methods,
  Real time PCR, microarray, microsatellite analysis
Can we confirm where a food has come from?

• Most traceability systems trace the packaging not the food

• There is a need to reassure the consumer about product integrity

• How can we cheaply provide a method for verifying a food’s origin?
Determining geographical origin

To investigate the correlation between soil geochemistry & bioclimatic factors and locally produced food and mineral water.

WPL Andreas Rossmann (Isolab, DE)
WPL Jurian Hoogewerff (Univ. East Anglia)
WPL Grishja van der Veer (Geochem, NL)
Food Origin Mapping: rationale

• Can components in a food and its environment be linked?

• If so can we predict the levels of certain components in a food of declared provenance?

• Can the predicted levels (specifications) be used as an objective means of verifying geographical origin?
TRACE: Food mapping rationale

Check when necessary

X = + ?
Y = + ?
Z = + ?
Specifications relating to origin included in traceability system

Eventually could be generated independently from website

Specification can be checked by any stakeholders in the chain

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<th>Result</th>
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<td>[&lt;-z-&gt;]</td>
<td>✓</td>
<td>TRACE</td>
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</tbody>
</table>
New opportunities for analysis

• Previously analytical community has played largely a reactive role to problems
  – “Tell me what the analyte is and I will detect/measure it”

• Advances in technology now allow a more proactive role in identifying problems
  – “I think we may have a problem”
  – “We do have a problem”
  – “We have a completely new problem/analyte”
Food verification methodology

- Increasing specificity
  - FT-IR spectroscopy
  - NMR spectroscopy
  - Mass spectrometry
- Increasing coverage
Generic food verification methods

- Generic methods to verify food integrity

Contains spectral information characterising sample(s)/batches
Data capture/interpretation
Food verification systems

www.trace.eu.org

Code specification containing specification
Coffee authenticity

Instant coffee from factory 1
Instant coffee from factory 2
Coffee authenticity

- HMF identified as principal difference in composition.
- Related to different roasting temperatures in the factories.
- Production now harmonised.

Summary

- Increased use of methods and systems to substantiate “origin”

- Need for improved chain traceability

- (Gradual) move away from targeted to non target methodology e.g. spectroscopic fingerprinting, microarray

- Greater emphasis on traceability systems to verify as well as track and trace
Acknowledgements to the consortium....: