Emerging Food Safety Risks: New Developments

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The Netherlands
Outline of the presentation

- Food safety crises in Europe
- Food Safety Authorities (EU, The Netherlands)
- Emerging risk definitions
- Emerging risk identification: a holistic approach
DIOXIN CRISIS (1999)

ILLEGAL GROWTH HORMONES

Safe Foods
Food Safety & Risk Assessment

- Broad public concern about the safety of the European food supply
- BSE, dioxin, *E. coli* 0157, GM food crops...
- Low public trust in how food crises were handled
- Low trust in the regulatory system in Europe
The European Commission reacted

- EU White Paper on Food Safety (COM (1999), 719 final)
- General Food Law (Regulation 178/2002)
Moving towards full strength

Following a series of food scares in the 1990s (e.g., BSE, Dioxins...) which undermined consumer confidence in the safety of the food chain, the European Union concluded that it needed to establish a new scientific body charged with providing independent and objective advice on food safety issues associated with the food chain. Its primary objective as set out in the White Paper on Food Safety would be to “…contribute to a high level of consumer health protection in the area of food safety, through which consumer confidence can be restored and maintained.” The result was the European Food Safety Authority (EFSA).

Palazzo Ducale in Parma, Italy
Risk assessment

Risk communication

NOT Risk management!
In many EU members states Food Safety Authorities were established; also in The Netherlands

Ministry of Agriculture, Nature and Food Quality (LNV) (Ministry of Health, Welfare and Sport)

Food and Consumer Product Safety Authority (VWA)

KvW
Inspectorate for Health Protection and Veterinary Public Health

RVV
National Inspection Service for Livestock and Meat
Food Authorities reaction

“To decrease the number of food safety crises it is important to detect the problem in an very early stage, preferably before it develops”

Available tools:
- Monitoring systems
- Rapid Alerts:
  - EU: RASFF
  - WHO: INFOSAN
Overview of early warning systems

- Overview of early warning systems (reactive)
  
  - European Rapid Alert System on Food and Feed (RASFF)
  
  - European Centre for Disease Prevention and Control (ECDC)
  
  - Center for Disease control (CDC, USA)
  
  - WHO early warning activities
    
    - Global Public Health Intelligence Network (GPHIN)
  
  - ...

Source: SAFE FOODS; to be published
Overview of early warning systems

- Predictive early warning: emerging risk systems
  - Early warning systems for mycotoxin in maize and/or wheat
  - Trend analysis using information of early warning systems (e.g. RASFF)
  - Holistic approach
Emerging Risk Projects

Some projects aim to develop new tools for the early detection of emerging risks (with involvement of RIKILT)

- EU 6th FP: PERIAPT
- EU 6th FP: SAFE FOODS; Workpackage 2
- EFSA: EMRISK
- Dutch project: Emerging Risks in the Dutch Food Chain

Holistic approach: look at influences inside and outside the food chain
Emerging Risk:

An emerging risk to human, animal and/or plant health is understood as a risk resulting from a newly identified hazard to which a significant exposure may occur or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard.

Assessment of Emerging Risk:

Early detection of facts related to that risk derived either from research and/or monitoring programs or episodic observation.
Evidence supporting the identification of an emerging risk should preferably be in the form of an “indicator” and of a trend over time or space.

“Indicator”

“Indicator” is a measurement and/or observation that should be reliable, sensitive, quantifiable and should provide the information of the nature of the hazard (agent/process involved) and the source of risk.

“Indicators” may point to a specific emerging risk in different ways, either directly or indirectly related to the food chain.
Holistic approach followed

- Influential sectors
- Critical factors of sector
- Indicators
- Data sources
Examples of Influential Sectors

- Science & Technology
- Environment & Energy
- Government & Politics
- Industry & Trade
- Population & Social conditions
- Information & Communication
- Economy & Finance
- Agriculture
- Health & Welfare

Source: Wim Ooms VWA, 2006
Key information

To determine the indicators (first influential sector) for emerging food safety risks, case studies have been performed on recent food safety incidents.

Examples (from different projects):

- Use of botanicals/ herbs in Food and Feed
  - Renal disease after Chinese slimming pills in Belgium
  - Intoxication by consumption of star anise tea
- BSE
- Antibiotics in cultured shrimp
- Acrylamide
- Perfluorinated contaminants in fish
- PCB’s/ dioxines and organochlooor pesticides in fish
- Dioxine in pork meat
- VTEC Escherichia coli
- ...
A case study

- Antibiotics in cultured shrimp (an example)

Source: “Inventory of possible emerging hazards to food safety and an analysis of critical factors”
Increased demand in Europe for fishery products; increased production in SE Asia
Increased production associated with intensification of aquaculture

- Increase disease pressure
- Increase use of antibiotics (CAP and nitrofuran)
- No MRL existed for these compounds
- EU; zero tolerance
- Increased control
Monthly notifications of chemical contamination in RASFF

Source: Consumer health hazards in international food trade; Thom Achterbosch 2005
Another case: Use of antibiotics in Norway set off against the volume of farmed salmon and trout

Source: van der Roest et al. 2007
Example of holistic analysis

- Increased production → increased disease pressure → antibiotic use → risk. **Indicator:** increased production. **Source:** FAO, EUROSTAT

- Increased small scale production → lack of knowledge → misuse → risk. **Indicator:** increased small scale production; **Source:** FAO

- More resistant strains → other antibiotics → new risk. **Indicator:** more resistant strains; **Source:** science programs

- Lack of international harmonised legislation → zero tolerance → risk.
Emerging risk systems: Holistic approach

Conclusions of the case studies

In every case study influential sectors were identified

- Most frequent influential sectors were:
  - Science and technology
  - Human behavior
  - Nature and environment
  - Legislation & economy

- Many indicators were identified, generic and case-specific

- Emerging risk systems based on holistic principle seem promising but need much more research
Towards a holistic Emerging Risk System

Dutch research project
“Emerging risks in the Dutch food chain”*
4-years project (2004-2008)
Coordinator: Hans Marvin (RIKILT)

*(supervised by VWA and LNV)
Performed studies

- **Pro-active approaches to the identification of emerging risks in the food chain: retrospective case studies** (Dioxin in pork meat, BSE crisis in Great Britain, The HPA1 epidemic in the Netherlands in 2003, Residues of PCBs, dioxins and organochlorine pesticides in cultured fish, Perfluorinated contaminants in fish)

- **Inventory of possible emerging hazards to food safety and analysis of critical factors** (antibiotics in shrimps; pesticides of natural origin)

- Consumer health hazards in international food trade

- The perception of emerging risks among stakeholders in the food production chain


⇒ Focus on the fish production chain

- Option for pro-active identifying emerging risk in the fish production chain

- Development of a prototype
Filtering information documents internet, ...

Knowledge sharing

signals

expert knowledge

Development of a prototype: the approach

Identified Emerging Risks

Source: Hulzebos et al. 2007
4. (10 minutes/10 points) Consider an economy with two goods, timber and fish, and two countries, Canada and Iceland. Draw a graph that reflects the following information.

a. Both countries have increasing marginal costs of production for timber and fish.

b. Iceland has an absolute advantage in fish.

Canada has an absolute advantage in timber.

Under autarky, Canada would devote almost all of its resources to fishing and Iceland would devote almost all of its resources to timber production.

Graph to explain what good, if any, each country has a comparative advantage in producing.

If, if any, will export timber and which, if any will export fish.

Source: Hulzebos et al. 2007
Draw a graph that reflects the following information.

a. Both countries have increasing marginal costs of production for timber and fish.

b. Iceland has an absolute advantage in fish.

Iceland has an absolute advantage in timber. Under mutually Canada would devote almost all of its resources to fishing and Iceland would devote almost all of its resources to timber production.

A graph to explain what good, if any, each country has a comparative advantage in producing. If any, will export timber and which, if any will export fish.

shows that Iceland has a lower opportunity cost of producing fish than Canada. Thus, Iceland has a comparative advantage in producing fish and should export fish to Canada. Canada will then have the comparative advantage in harvesting timber and should export timber to Iceland.
Filtering

Knowledge sharing

organic contaminant on food is a health hazard

expert knowledge

Hatched Salmon is fed with wheat

Wheat is a kind of food

Melamine is an organic contaminant

Bulk products available in North America is available in each country in North America

Salmon is shipped from Canada to Europe

Organic contaminants remain in all derived products in the food chain

Wheat is shipped from China to the USA

Wheat is a bulk product

Filtering information from documents, internet, ...

Identified Emerging Risks

Source: Hulzebos et al. 2007
**Current & historical signals**

- Signals X

**Near/far future**

- Risks Y

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**ERDS system:**
Emerging Risks!

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Now
The USA ceases imports of wheat gluten from a Chinese company.

The FDA ceases imports of wheat gluten from a Chinese company.

Melamine discovered in hatchery fish food in Canada.

Anticipated on emerging risk in Canada.

**ERDS system:** Melamine is an emerging risk in hatchery fish food!
Possible design of the Emerging Risk Detection System; first page

Source: Hulzebos et al. 2007
Source: Hulzebos et al. 2007
<table>
<thead>
<tr>
<th>Melamine</th>
<th>Wheat</th>
<th>USA</th>
<th>Health hazard</th>
<th>Fish</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wheat is a kind of food</td>
<td>• Melamine is an organic contaminant</td>
<td>• Organic contaminant in food is a health hazard</td>
<td></td>
<td></td>
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</tbody>
</table>
• Wheat is a bulk product
• Bulk products available in north America is available in each country of north America

Source: Hulzebos et al. 2007
Fish Farmers breeding salmon are located in Canada

- Salmon is fed with fish feed
- Wheat is a fish feed

Source: Hulzebos et al. 2007
Fish farmers breeding salmon are located in Canada.

- Salmon is a kind of fish.
- Organic contaminants remain in all derived products in the food chain.

Source: Hulzebos et al. 2007
<table>
<thead>
<tr>
<th></th>
<th>Signal</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>ER criterium</th>
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</tbody>
</table>

- Fish is a kind of food
- Organic contaminant in food is a health hazard

Source: Hulzebos et al. 2007
• Exporters of salmon are located in Canada
Importers of salmon are located in Europe. Salmon is transported from Canada to Europe.

Source: Hulzebos et al. 2007
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Source: Hulzebos et al. 2007
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### Found Risks with high health risk, Europe, salmon

<table>
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<tr>
<th>Risk nr.</th>
<th>Importance</th>
<th>#user questions</th>
<th>keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>red</td>
<td>0</td>
<td>high health risk, Chile, antibiotic ...</td>
</tr>
<tr>
<td>2</td>
<td>red</td>
<td>2</td>
<td>high health risk, Chile, farming ...</td>
</tr>
<tr>
<td>3</td>
<td>red</td>
<td>4</td>
<td>high microbiological risk, Listeria ...</td>
</tr>
<tr>
<td>4</td>
<td>orange</td>
<td>2</td>
<td>medium health risk, S.E. Asia, Catfish</td>
</tr>
</tbody>
</table>

Source: Hulzebos et al. 2007
Emerging Risk Detection Support (ERDS): Search for Emerging Risks

Found Risks with high health risk, europe, salmon

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<tr>
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<td>low health risk, chile, farming ...</td>
</tr>
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Risk #3 showing situations related to high microbiological risk, europe, salmon

direct related

Melamine, imported, food, health hazard

Melamine, Canada, Exporter, Fish, Health Hazard

Risk #2

Known Indicators (click to alter)

Environment & Energy
- illegal waste dumps (pacific): rapid increase [WHO]
- illegal waste dumps (atlantic): stable [WHO]

Government & Politics

User Questions (click to assign value)

Industry & Trade
- production trend (asia, fish): (decrease stable, increase)

Agriculture
- disease pressure (salmon, farmed, s.e. asia): Unknown (high, medium, low, unknown)

Source: Hulzebos et al. 2007

Change Search Criteria

Report
Future perspectives: combining two systems

Advice to management (industry/authorities)

Signals

ERDSS

Focus on ER Research

Ontology Improvement

ERI

Text Mining

More Signals
Further questions to be answered

- What is the quality of the data sources?
- How to avoid overkill of output?
- Is there a quantitative relationship between indicator(s) (data source) and the emerging risk?
- Can we make a generic method / procedure to identify emerging risks in the food and feed chain based on the indicators?
Thank you for your attention