Emerging Risks and New Threats to our Food Supply

2009 ThermoFisher Scientific Food Safety Seminar Tour
Europe, USA, Canada, Asia, Japan

www.foodlife.org

Outline of Talk

- Background-definitions
- General approach to anticipating emerging risks
- Indicator and signal of emerging risks
- Examples of emerging risks:-Case Study:
  - climate change
  - food adulteration
  - new technology
  - environmental contaminants
- Reactive early warning systems
- Analytical tools - detecting emerging risk in the food chain
- Summary

Background - definitions

Risk = (probability of event occurring) x (impact of event)

- Emerging risk (EFSA definition):

"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".

Background - definitions

Unforeseen Consequences

Emerging risks rise when things have deliberately or accidentally changed in the food chain

CHANGE → UNFORESEEN CONSEQUENCE

Indicator and signal of emerging risks

- "**indicator**" - component of risk assessment, can be measured qualitatively and/or quantitatively

Ideal indicator - reliable, sensitive,quantifiable and informative as to the source of risk

- A **"Signal"** is a trend of the indicator over time or space

Indicator and signal of emerging risks

Chemical risk

- New research data indicating previously unrecognised toxic properties of substances in food

  Signal = New toxicological data

- Unexpected detection of potential toxic agent in food

  Signals = Analytical data or Clusters of non-infectious disease (poisoning)

- Unexpected evidence of increased exposure of specific populations to particular hazardous chemical /radioactive

  Signals = Analytical results or Food & feed consumption patterns, or Biomarkers)

Indicator and signal of emerging risks

Biological risk

- Emergence of new zoonotic or other foodborne pathogen

  Signals = Outbreak surveillance, clinical diagnostic data, increased prescriptions

- Emergence of increased antimicrobial resistance

  Signals = Surveillance data, Lab. data

- Increased virulence of known pathogens

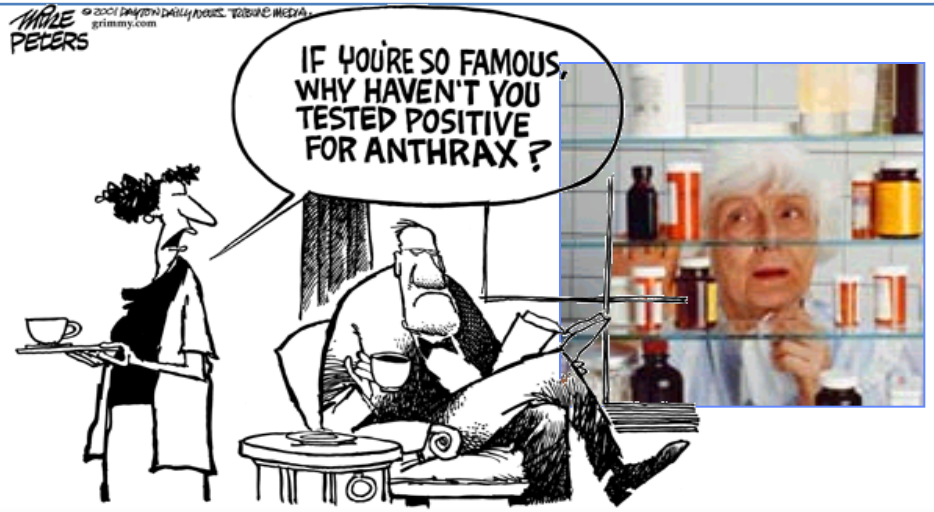
  Signals = Surveillance data, Lab. data)

- Emergence of new or exotic biological agent

  Signals= Surveillance data

Emerging risk scenarios

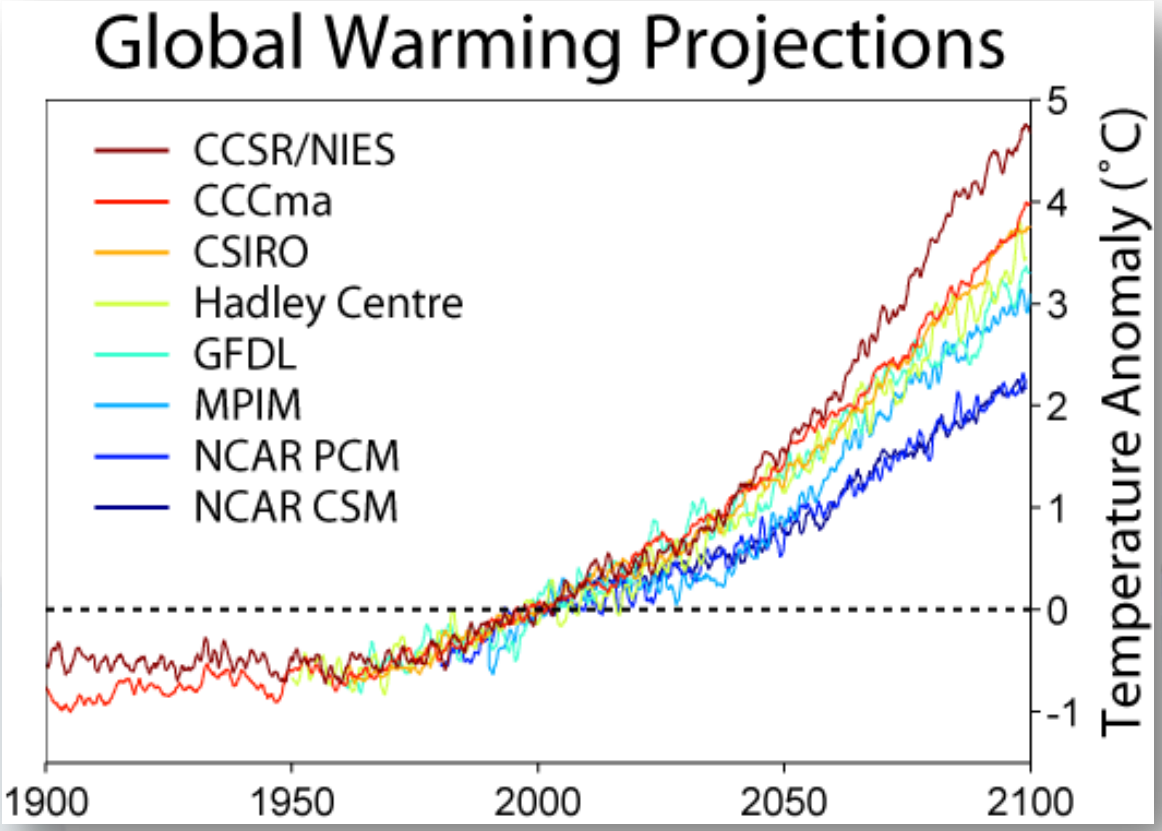
Scenario	Indicator	Signal
Climate change – rising temperatures	Mycotoxin levels & new mycotoxins found	Increased occurrence & higher levels
Climate change – rising temperatures	New zoonotic animal disease detected	Rapid transmission to new parts of world
Economic pressure – adulteration	Illegal additives detected in foods	Widespread contamination globally
New technology – food chain contamination	Nanoparticles detected in foods	Contamination in many food types globally




Climate change is already affecting
natural and social systems

Case study–climate change/mycotoxins

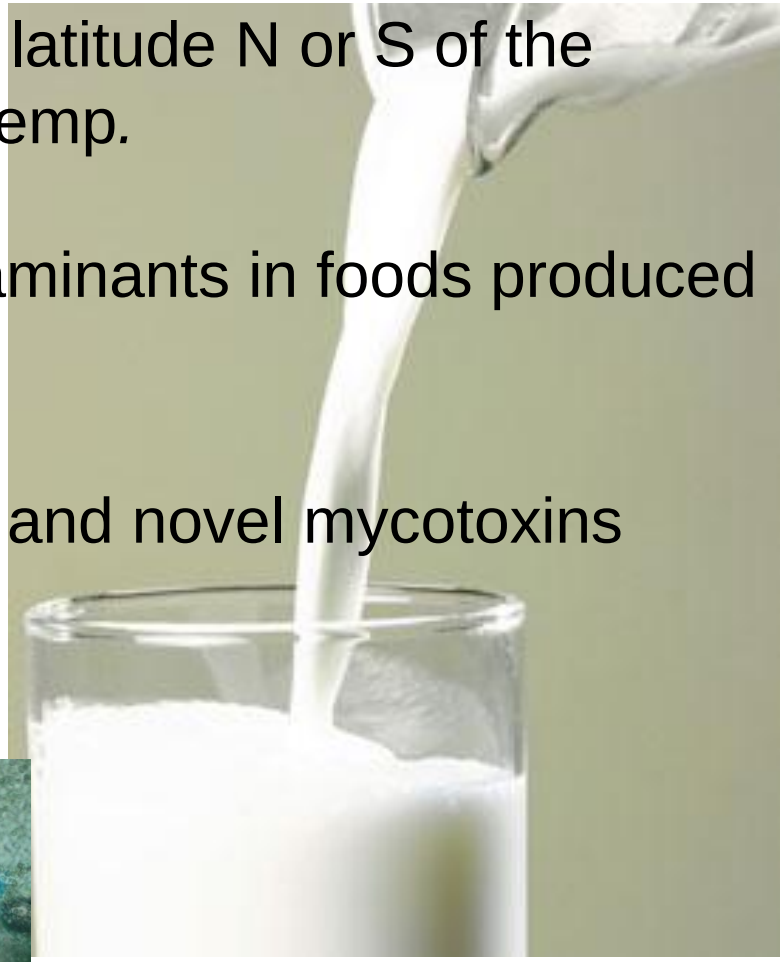
- **Climate change** – Climate model projections indicate that the global surface temperature will probably rise 1.1 to 6.4 °C during the twenty-first century.



Ref 1:IPCC 4th Assessment Report: Climate Change 2007

Case study–climate change/mycotoxins

- Fungi have environmental niches for favourable growth
- *A. flavus* grows within 40 degrees latitude N or S of the equator 25-40^{o}C optimum growth temp.
- Aflatoxins start to appear as contaminants in foods produced outside this area.
- New fungi may become dominant and novel mycotoxins begin to appear in foods.



Ref 2: RASFF Alert 03/87 – November 2003

Case study – adulteration

- Where quality commands a premium price, adulteration to mask poor quality or deceive consumers becomes attractive

Example 1 :-

- Sudan Red dye illegally added

to spices to improve colour

Evidence:- Sudan I dye which is a suspected carcinogen was detected as an illegal adulterant in foods across Europe in 2003. In the UK 300 food products were withdrawn from shops in the biggest recall in history costing the food industry €millions.

Ref 4:- UK Food Standards Agency,July 2007.
http://www.food.gov.uk/multimedia/pdfs/sudanreview.pdf

Media-driven ‘food scares’ – April 2008

Daily Mail

THURSDAY, APRIL 24, 2008 www.dailymail.co.uk 50p FREE

EXPOSED: How cheap factory-farmed meat, fish and eggs are passed off as luxury goods costing shoppers billions

THE GREAT FOOD FRAUD

Increased consumer prosperity

Food fraud e.g. wine, orange juice, olive oil

Case study – adulteration

Example 2 :-

- Melamine illegally added to milk to İncrease apparent nitrogen content

China milk poisoning cases rise

Evidence:-

1-Thousands of samples of milk and milk powder in China and exported worldwide were found to contain high levels of melamine.

2- In China in 2008 there were 290,00 children affected, 51,900 hospitalised, 6 deaths reported and 22.4 million children were screened for symptoms.

Ref 5:- BBC News Monday September 22nd 2008

Case study–new technology/nanoparticles

New technologies offer consumer benefits but there can be unforseen consequences :-

- Nanotechnology used in packaging

  Migration →food contamination

- Nanoparticles used in cosmetics

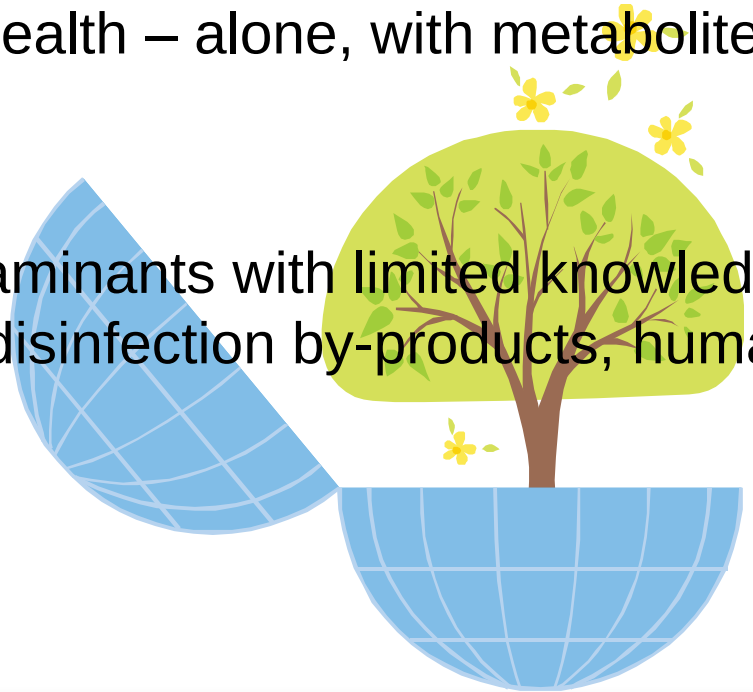
wash/shower → water supply contamination → uptake aquatic organisms → food chain contaminants

Evidence :- uptake of engineered nanoparticles in aquatic organisms which represent a food source for marine and freshwater species higher in the food chain

Ref 6:- Tiede, K., et. al. (2008) Food Additives and Contaminants 25(7):795-821

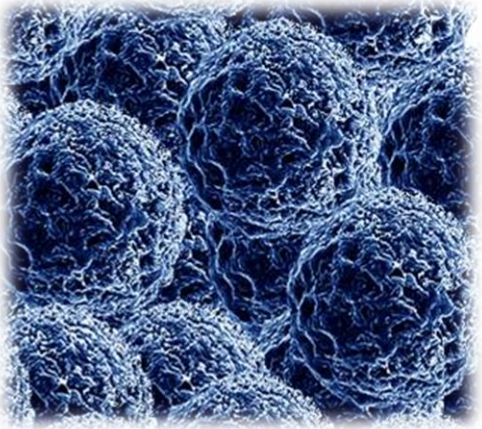
Case study–environmental contaminants

- Occur in the environment as a result of human and/or anthropogenic activities
- Knowledge gap exists in environmental effect and uptake into food chain
- Anticipated risks for human health – alone, with metabolites, or synergistically
- Can be newly identified contaminants with limited knowledge of impact on food chain – e.g., disinfection by-products, human and veterinary antibiotics



Case study–environmental contaminants

- Pharmaceuticals and personal health care products
  analgesics, antibiotics, blood pressure, anti-depressants, fragrances, antimicrobials, engineered nanoparticles



- Pesticides and transformation products

- Veterinary medicines

- Chemicals released from domestic products

Reactive early warning systems

European Commission - RASFF System

- EFSA hosts the Rapid Alert System on Food and Feed (RASFF)
- Required by EU regulation 178/2002/EC.
- Members, are obliged to report recalls of food and feed products and detention of imports that do not comply with food safety standards.
- Information relating to human health risk deriving from food or feed, is immediately notified to the Commission.
- The Commission immediately transmits this information to all members of the network.

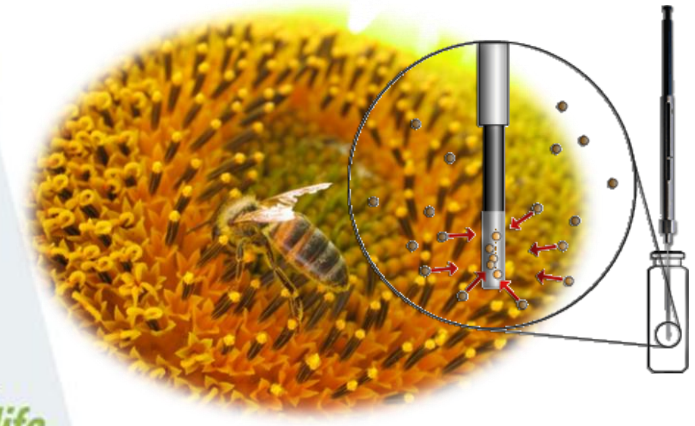
Reactive early warning systems

WHO – INFOSAN Alert System

- INFOSAN established by WHO
- Provides early warning of any developing patterns in food poisoning or any patterns in reports of food contamination, which might indicate a new area of risk.
- Often it is rather late when these alerts indicate a problem

Analytical tools–detecting emerging risk

- Sample extraction and cleanup remain slow rate-limiting steps in analysis – new approaches needed
- Sensitivity generally more than adequate
- Lower cost and faster methods needed to monitor large numbers of foods



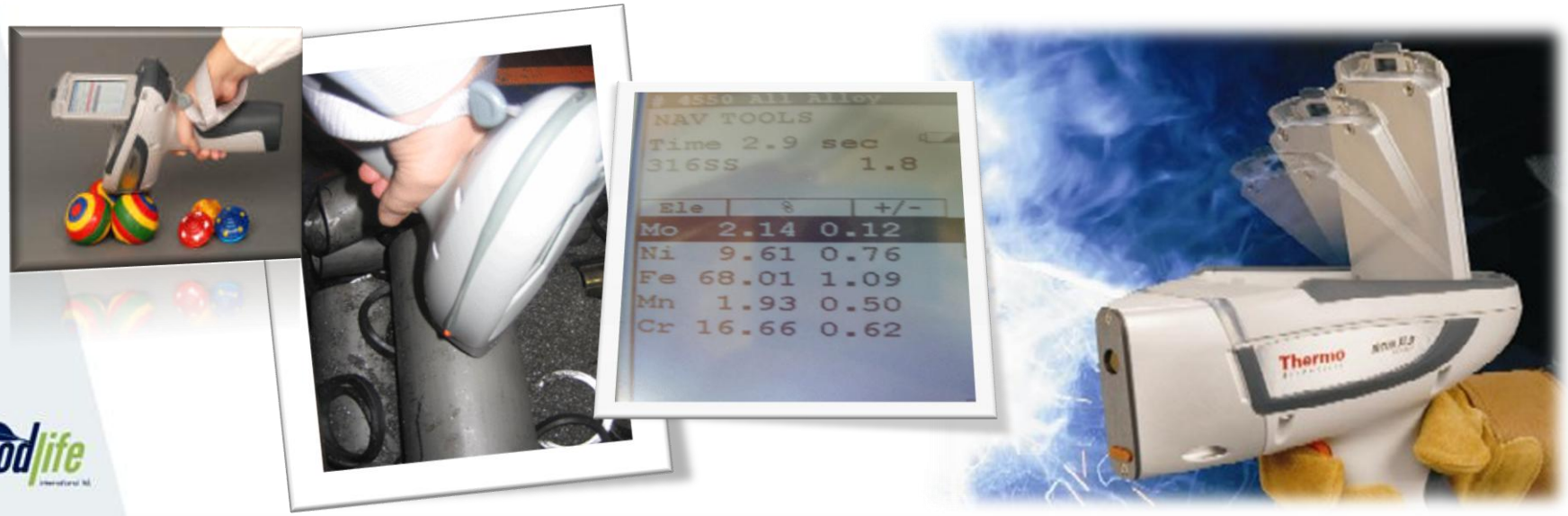
Ref 7:- H. B. Christensen, et.al (2009) Food Additives & Contaminants 26: 1013 –1023

Analytical tools–detecting emerging risk

New instrumental techniques and new approaches being developed

- Size, shape and numbers of nanoparticles more relevent than concentrations

- *In-situ* monitoring - direct analysis without extraction/clean e.g NITON x-ray fluorescence (XRF) Gun already available



Analytical tools–detecting emerging risk

- Techniques are being developed that are more suitable for non-targetted analysis

- Profiling/fingerprinting of foods to look for differences from the normal population – chemometrics

Ref 8:- R. Charlton AJ, et. al. (2008) Anal Chim Acta. 618:196-203

Summary

- Numerous food ‘scares’ that have occurred over the last few years have focussed attention on finding ways to try to anticipate these potential problems (EMERGING RISKS) before they become full scale crises.
- Change can lead to unforeseen consequences
- Tools being developed for predicting and detecting at an early stage will make food safer for the future.
- New analytical tools are becoming available to meet new challenges

Thank you - Tesekkurler

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