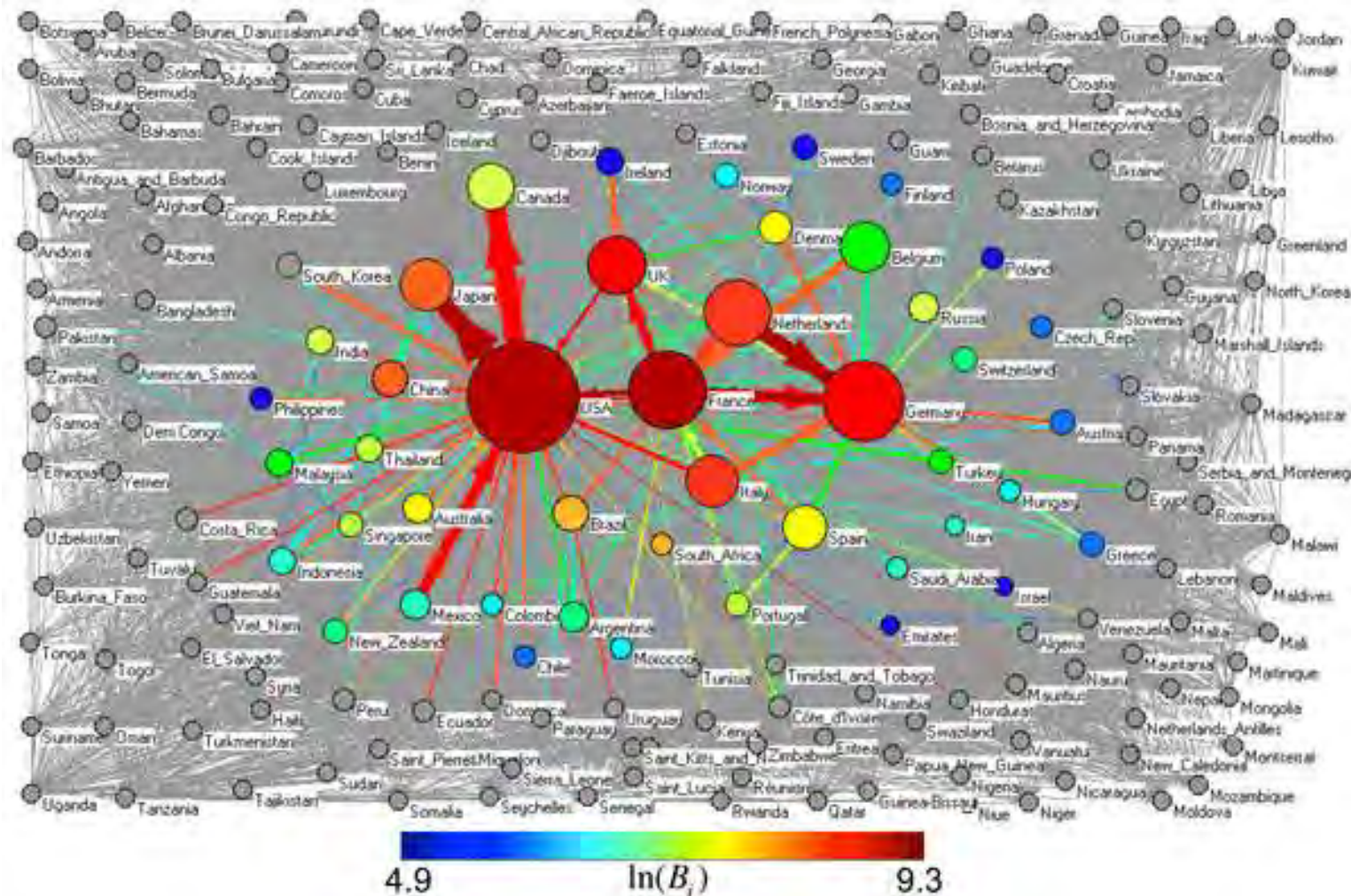


Future challenges for risk assessment and risk communication in a globalised market

Reiner Wittkowski

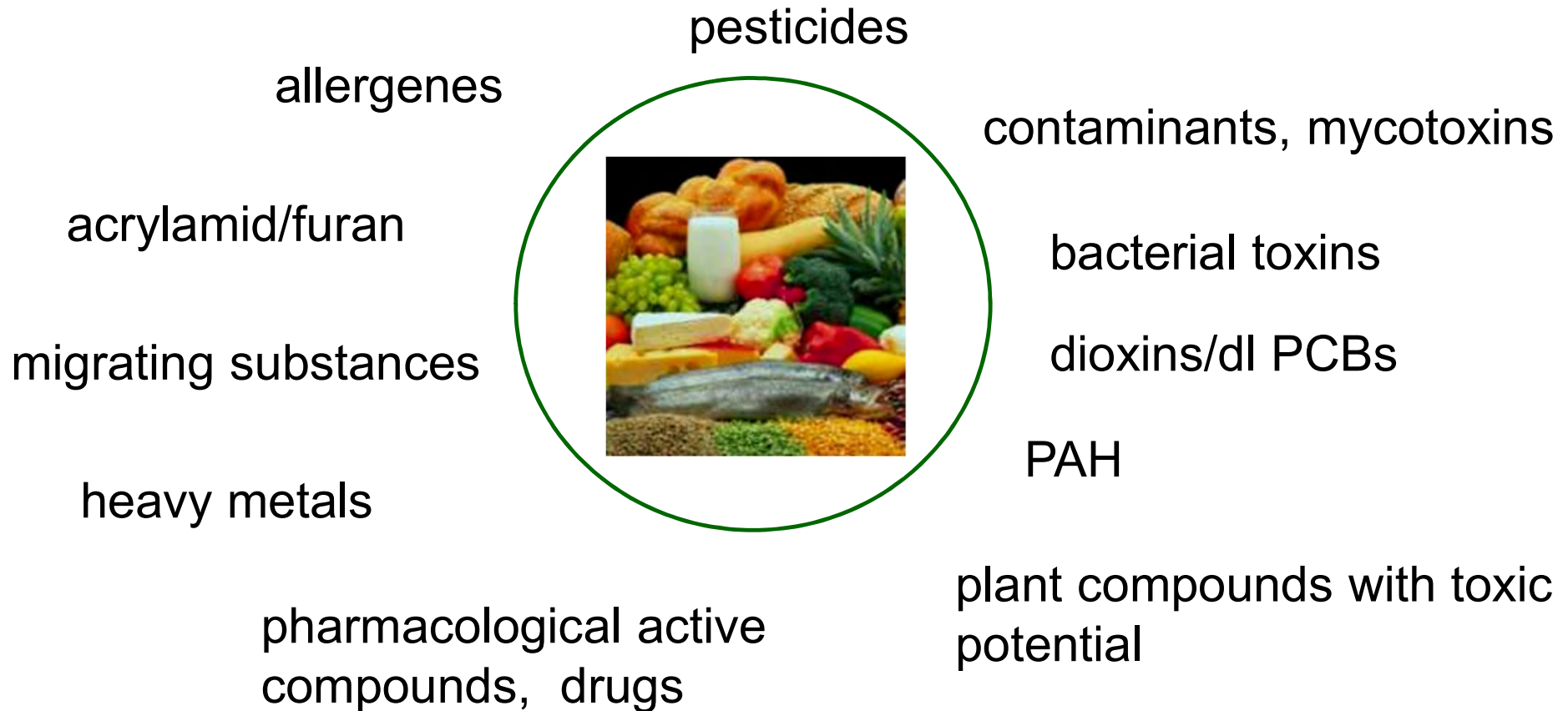
Are we prepared for the global food chain network ?



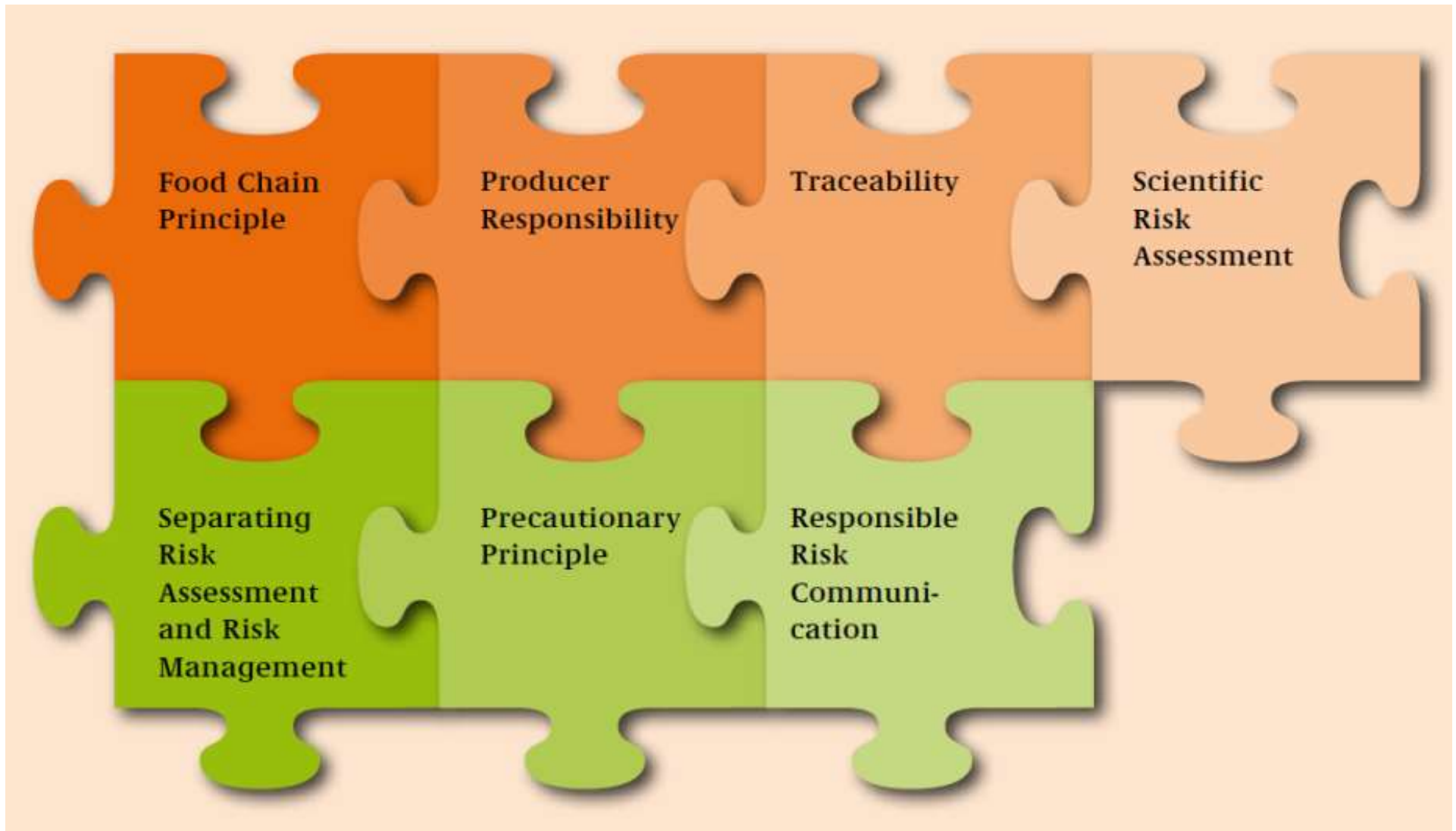
The complete International Agro-Food Trade Network in 1998

Ercsey-Ravasz M, Toroczka Z, Lakner Z, Baranyi J (2012) Complexity of the International Agro-Food Trade Network and Its Impact on Food Safety. PLoS ONE 7(5): e37810. doi:10.1371/journal.pone.0037810

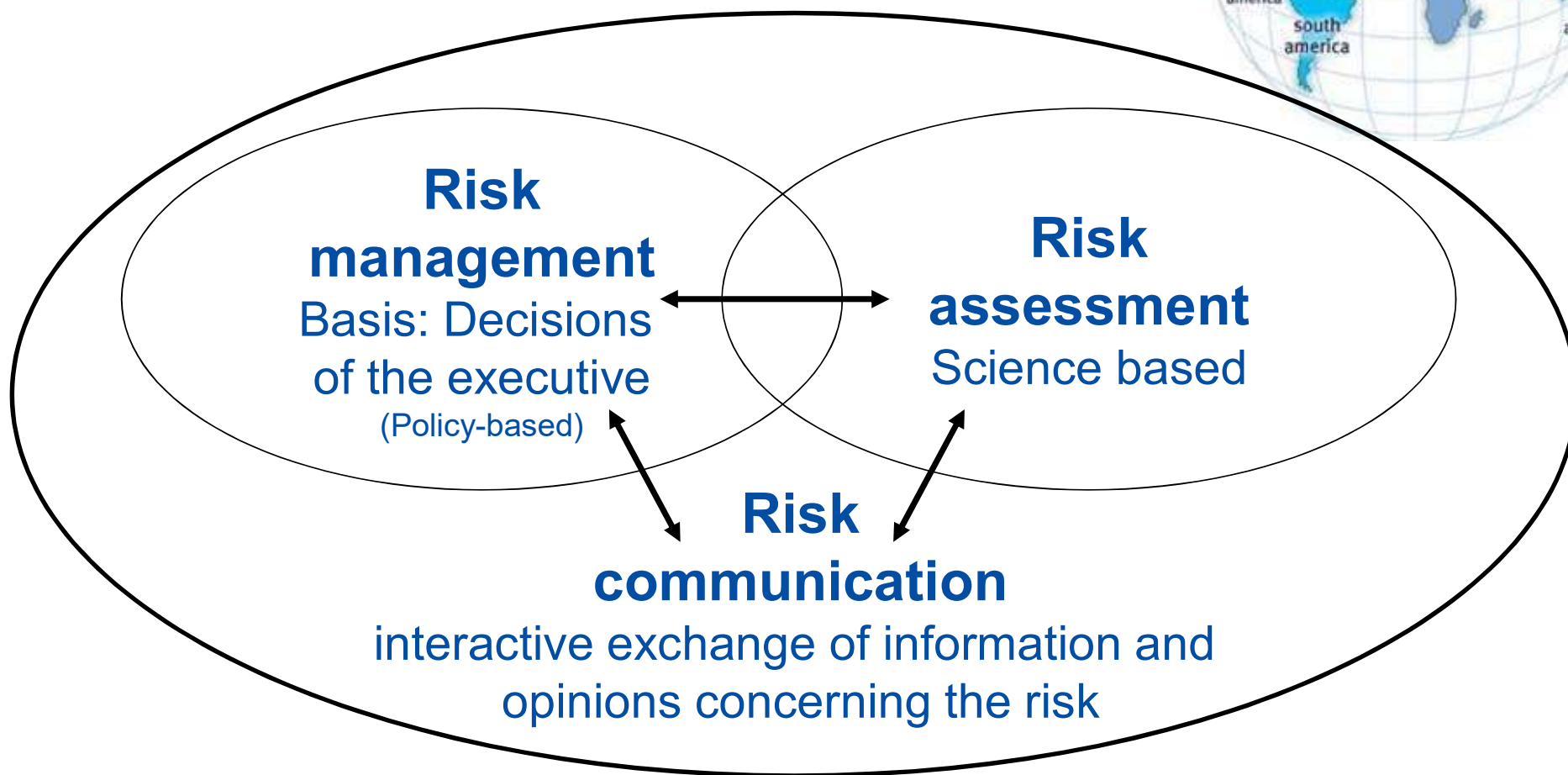
Main Goal: To bring safe foods to the market



Components of the Food Safety Network

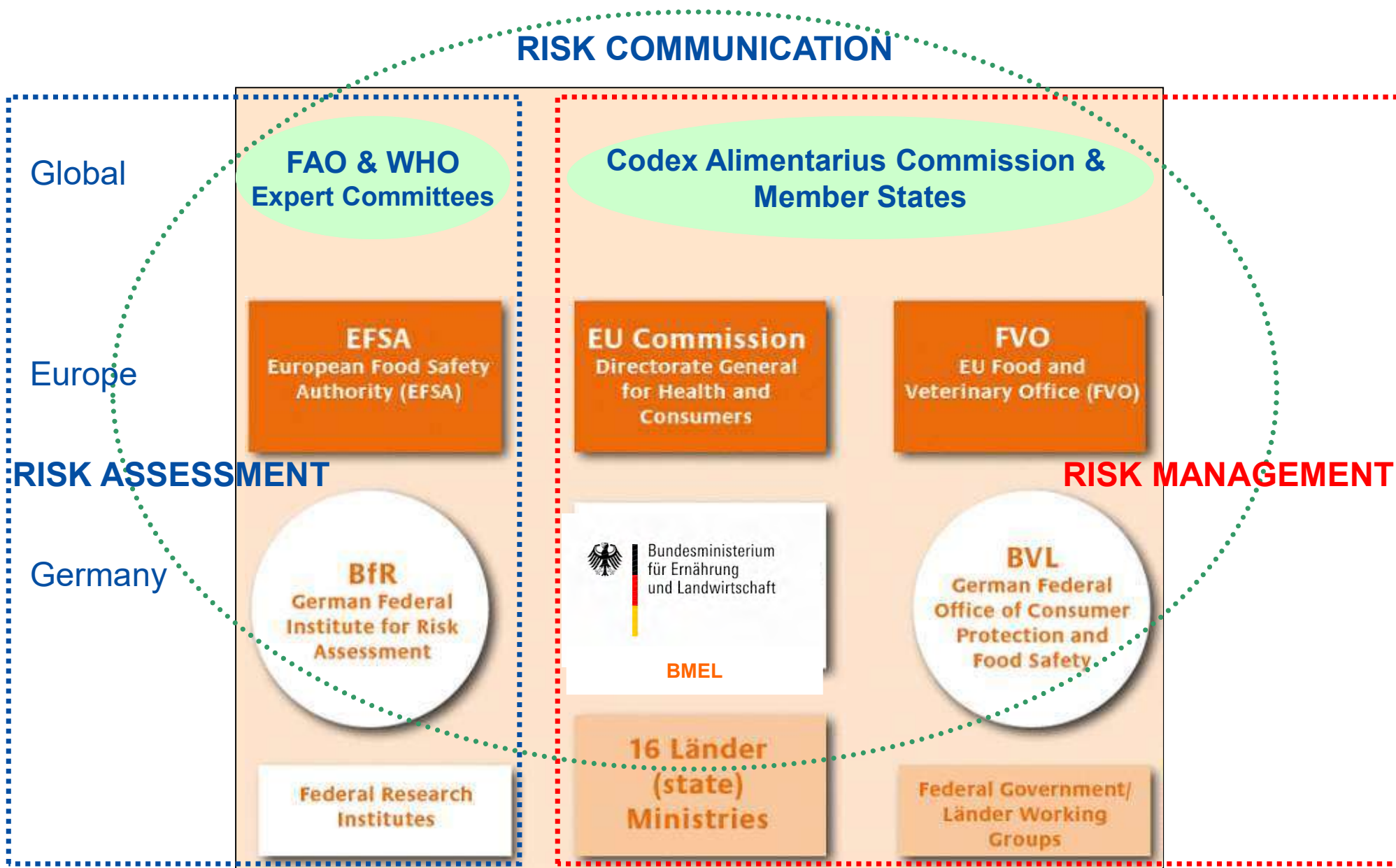


Risk analysis framework



Pirjo-Liisa Penttilä; Application of Risk Analysis to Food Standards Issues; FAO/WHO Expert Consultation, Geneva, Switzerland, 13-17 March 1995

Germany within the Global food safety network



Food Safety



Safety of Substances And Preparations



Bundesinstitut für Risikobewertung

Safety of Consumer Products



Risk-communication

Centre for Alternative Methods to Animal Experiments (ZEBET)



A diagram of a classical temple structure. It features a blue triangular pediment at the top and a blue rectangular base at the bottom. Between them are three golden columns. The word 'Trust' is written in white inside the pediment, and 'Precaution' is written in white inside the base. The three columns are labeled vertically with the words 'Independence', 'Science', and 'Transparency' in blue.

Trust

Independence

Science

Transparency

Precaution

Research for Risk Assessment



Research Focus

- analytical methods in the reference laboratories
- risk assessment, including methods for exposure estimation and mechanisms of action relevant to biological, chemical and food safety
- scientific basis of risk communication and risk perception
- documentation, assessment, development and validation of alternative methods to animal experiments

Reference Laboratories

National Reference laboratories according Regulation (EG) 882/2004

NRL for *Salmonella*

NRL of marine biotoxins

NRL for monitoring viruses and bacteria in bivalve molluscs

NRL for *Listeria monocytogenes*

NRL for coagulase-positive staphylococci including *Staphylococcus aureus*

NRL for *Escherichia coli* including verotoxin-producing *E. coli*

NRL for *Campylobacter*

NRL for *Trichinella*

NRL for antimicrobial resistance

NRL for animal protein in feeding stuffs

NRL for additives for feeding stuffs

NRL for food contact materials

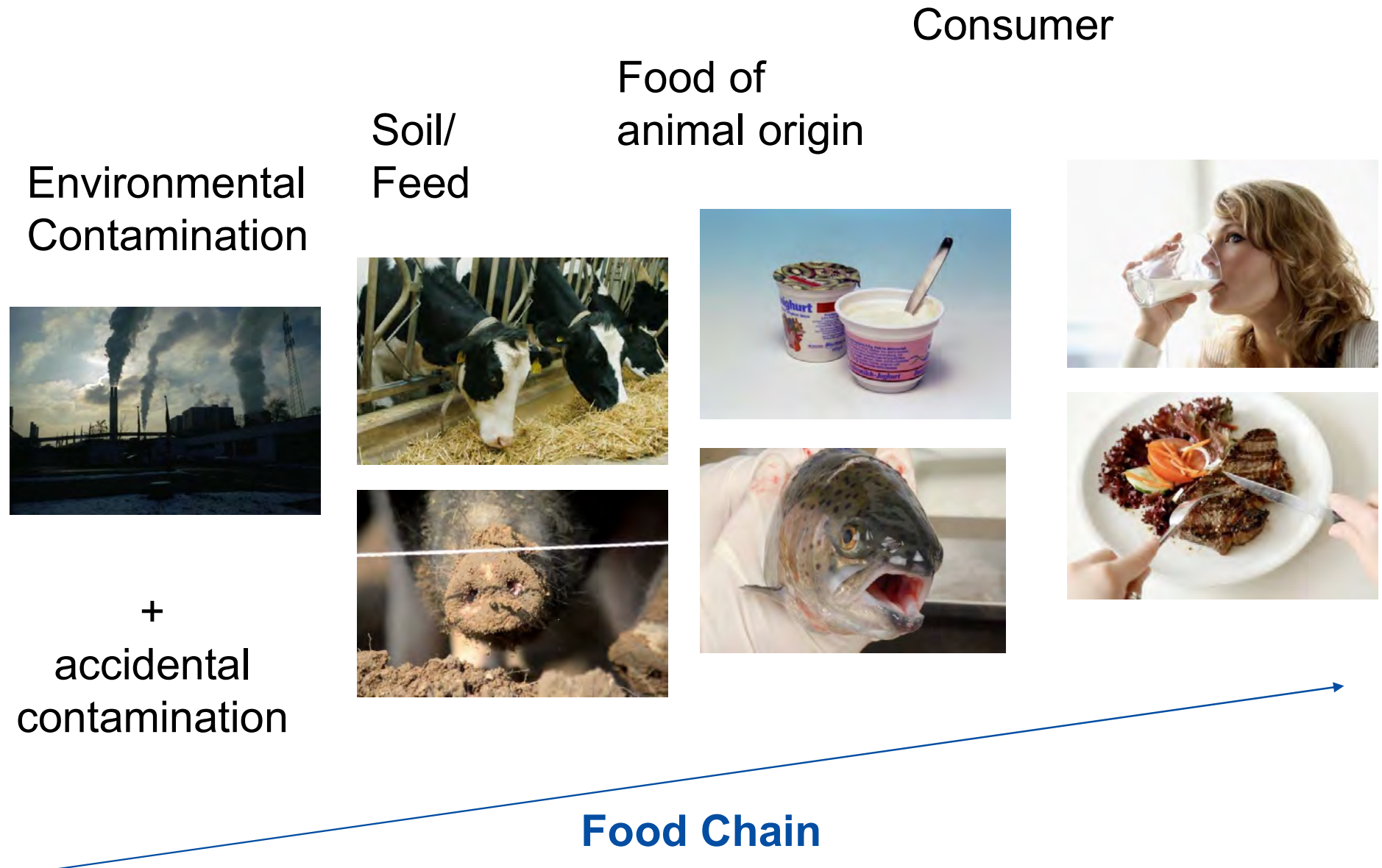
NRL for mycotoxins in food and feed

NRL for dioxin and PCBs in feed and food

Seveso, 10. Juli 1976: about 2 kg TCDD was released



Sources of Dioxins and PCB in Food



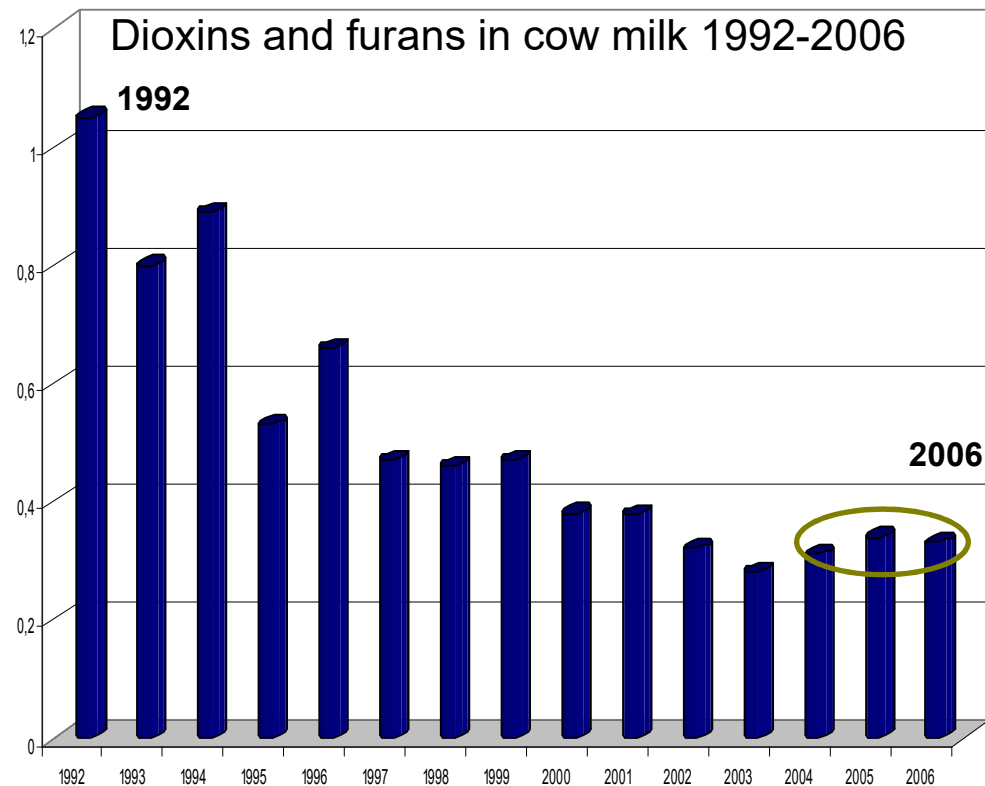
Risk Assessment: Example of Dioxin Burden and Current Data

Press release BfR: 4/2011, 26 January 2011

Current dioxin issue: consumers do not have to worry

BfR has assessed health risks on the basis of the measured content in foods

pg WHO-PCDD/F-TEQ/g fat



Data in toxic equivalents according to WHO (WHO-PCDD/F-TEQ) per gram fat.

pg WHO-PCDD/F-TEQ/ g Fett

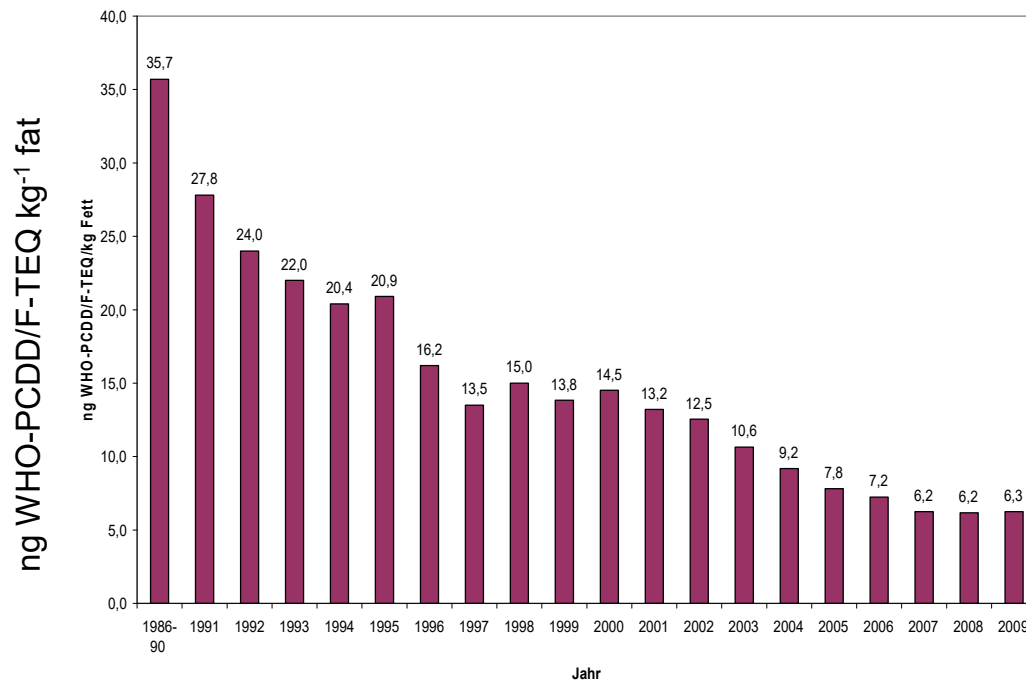
		Hen eggs	Pigs, pork
n (samples)		175	124
Mean value		1.9	0.3
Minimum		0.1	0.1
Maximum		12.1	1.5
Maximum level (ML)		3.0	1.0
%>ML		19	3

Food	MV content (pg/g fat)	Intake in pg/ d/ kg bw (mean contents)		Percentage of TDI (%)	
		average*	high*	average*	High*
eggs, also dried	1.8	0.081	0.199	4.1	9.9
pig, pork	0.3	0.012	0.030	0.6	1.5

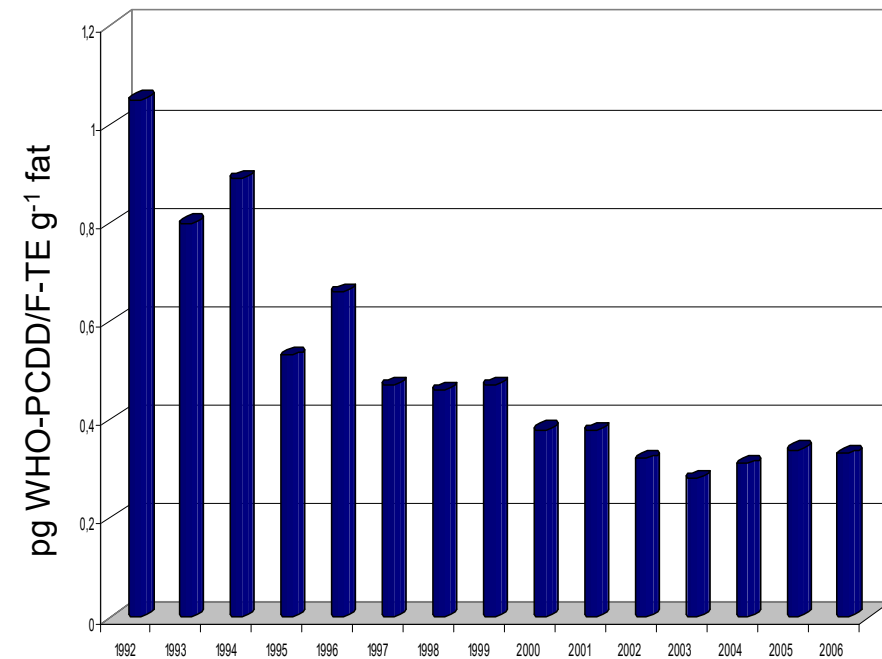
*consumption

Dioxin burden and breast feeding

Time trend of dioxins in breast milk in Germany



Dioxins and furans in cow milk

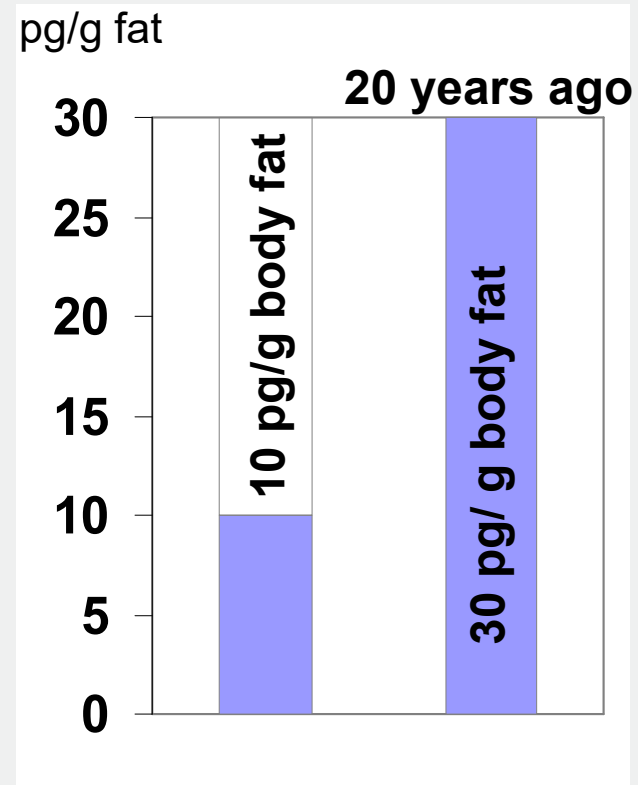


- **Decrease** in mean dioxin concentrations in breast milk
- **95th percentile** and reported maximum values of dioxins **follow this trend.**

BfR Risk Assessment

Body burden of dioxins

Average body burden of young adults with dioxins
(60 kg bw, thereof 15 kg body fat)



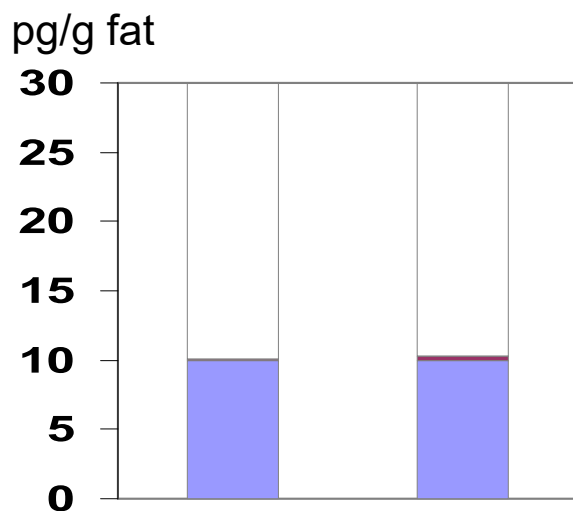
BfR Risk Assessment

Calculation of Dioxin Intake via Consumption of Eggs



Dioxin intake when exhausting or exceeding the EU limit values

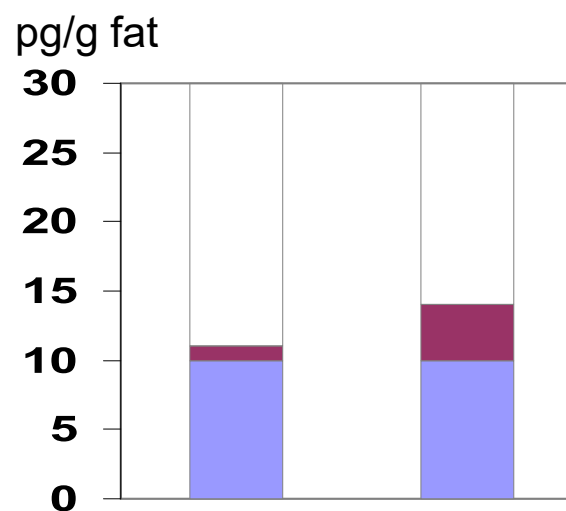
Consumption of 2 eggs/d for 1 month



dioxin ML:
3 pg/g
egg (fat)

4-fold exceedance
dioxin ML:
12 pg/g
egg (fat)

Consumption of 2 eggs/d for 1 year



dioxin ML:
3 pg/g egg
(fat)

4-fold exceedance
dioxin ML:
12 pg/g
egg (fat)



Body burden today (10 pg/g body fat)



Increase of body burden

Ongoing Challenges

– Dynamic Reality



- New technologies and new products (novel foods)
- New contaminants
- Product piracy and food fraud
- Packaging materials
- New substances, additives, technical aids (pesticides, veterinary drugs, flavour compounds etc.)
- Process contaminants (acrylamide, 3-MCPD, furan, glycidol fatty esters etc.)
- Higher standards in using alternative methods of animal experiments

Predictable Trends

– Emerging Challenges



- Climatic change, global warming
- Increasing world population
- Globalization in production, trade and consumption
- New markets
- Demographic trend
- New energy policies

Consequences of Global Trends



- **New strategies for agricultural production**
- **New technologies (nanotechnology, genetic engineering etc.)**
- **Traceability to fight fraud and product piracy**
- **Problems from recycling processes**
- **Increase of aquaculture production**
- **Active packaging**
- **Import controls**
- **Bioethanol production**
- **New feeding stuffs**

Why traceability is necessary ?

- Avoidance of food crises
- Fast reactions in cases of food crises
- Protection of regional markets and producers
- Guarantee of fair trade

Integrated traceability systems are being developed that can verify:

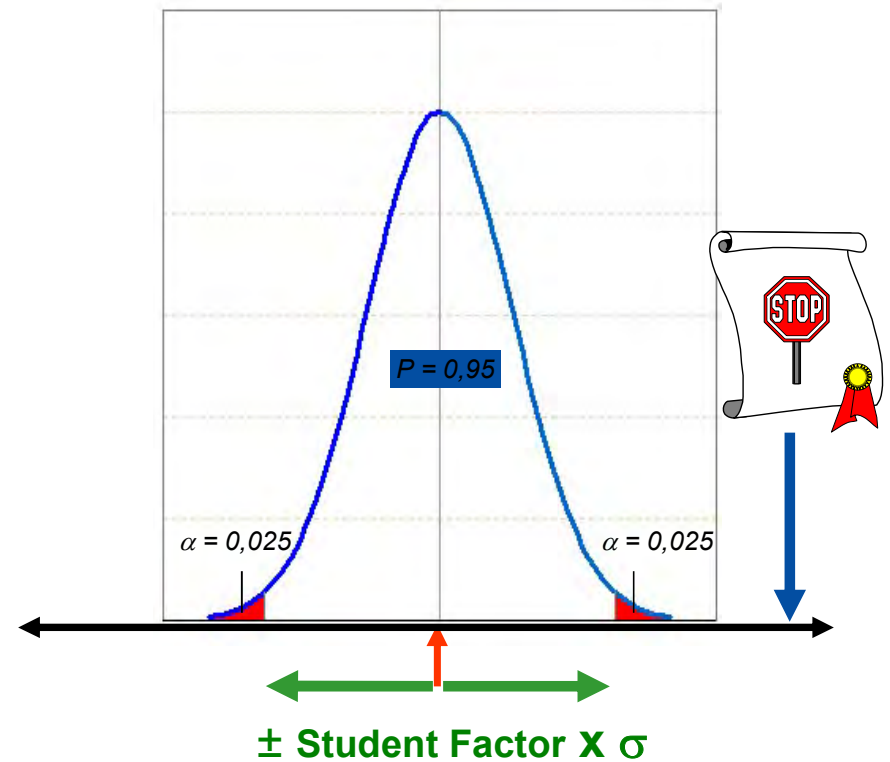
- Geographical origin
- Production origin
- Species origin

Classical approach

Reference Data (bases)

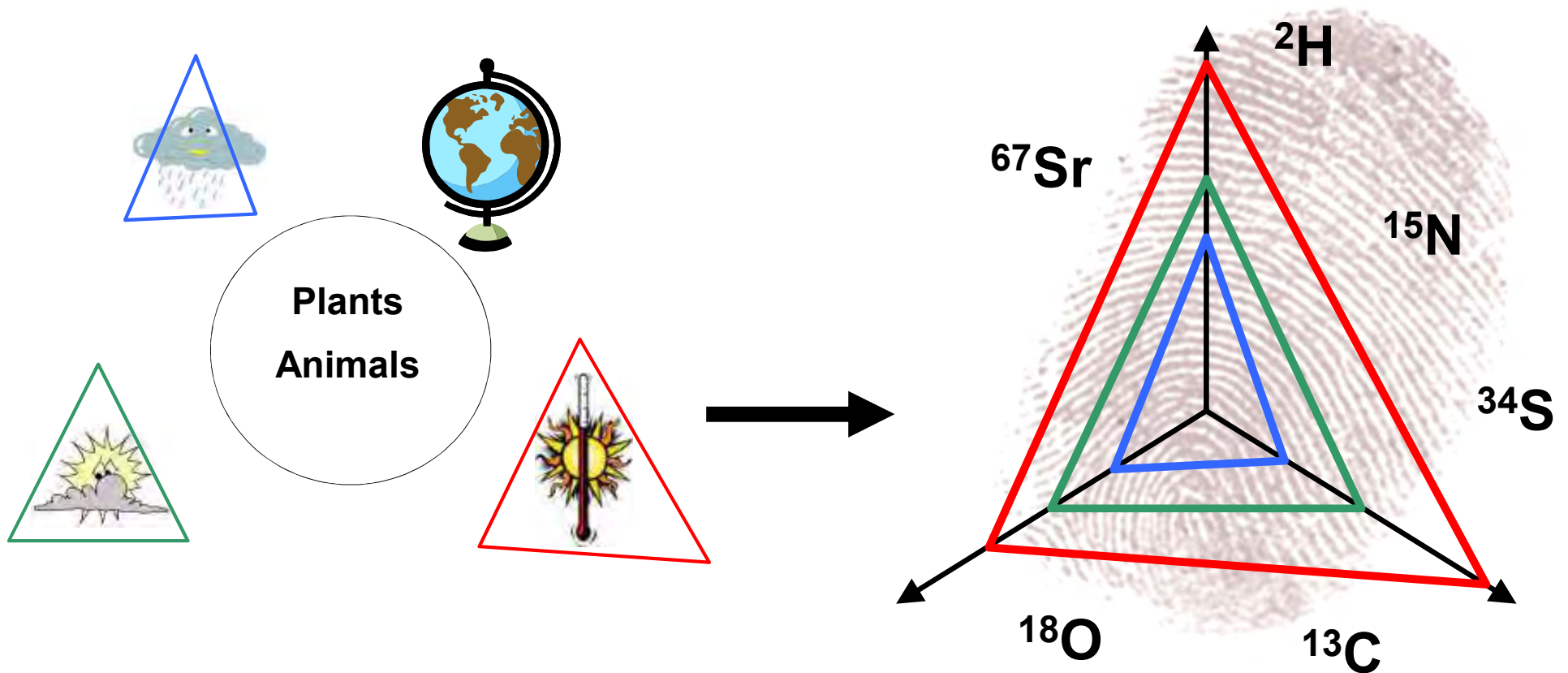


Authentic or unsuspicious samples



Authenticity range

Stable Isotope Ratio Fingerprint

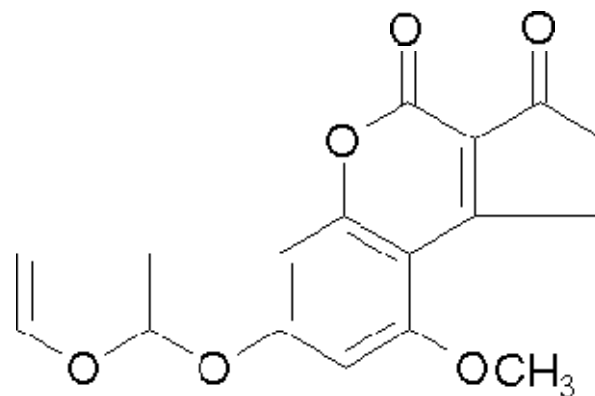


Example - Authenticity control of pistachios



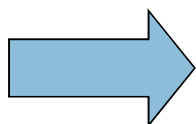
pistachios are popular snacks

Aflatoxins in Iran pistachios
1997 import-stop
strictly EU-import regulations



California
Iran

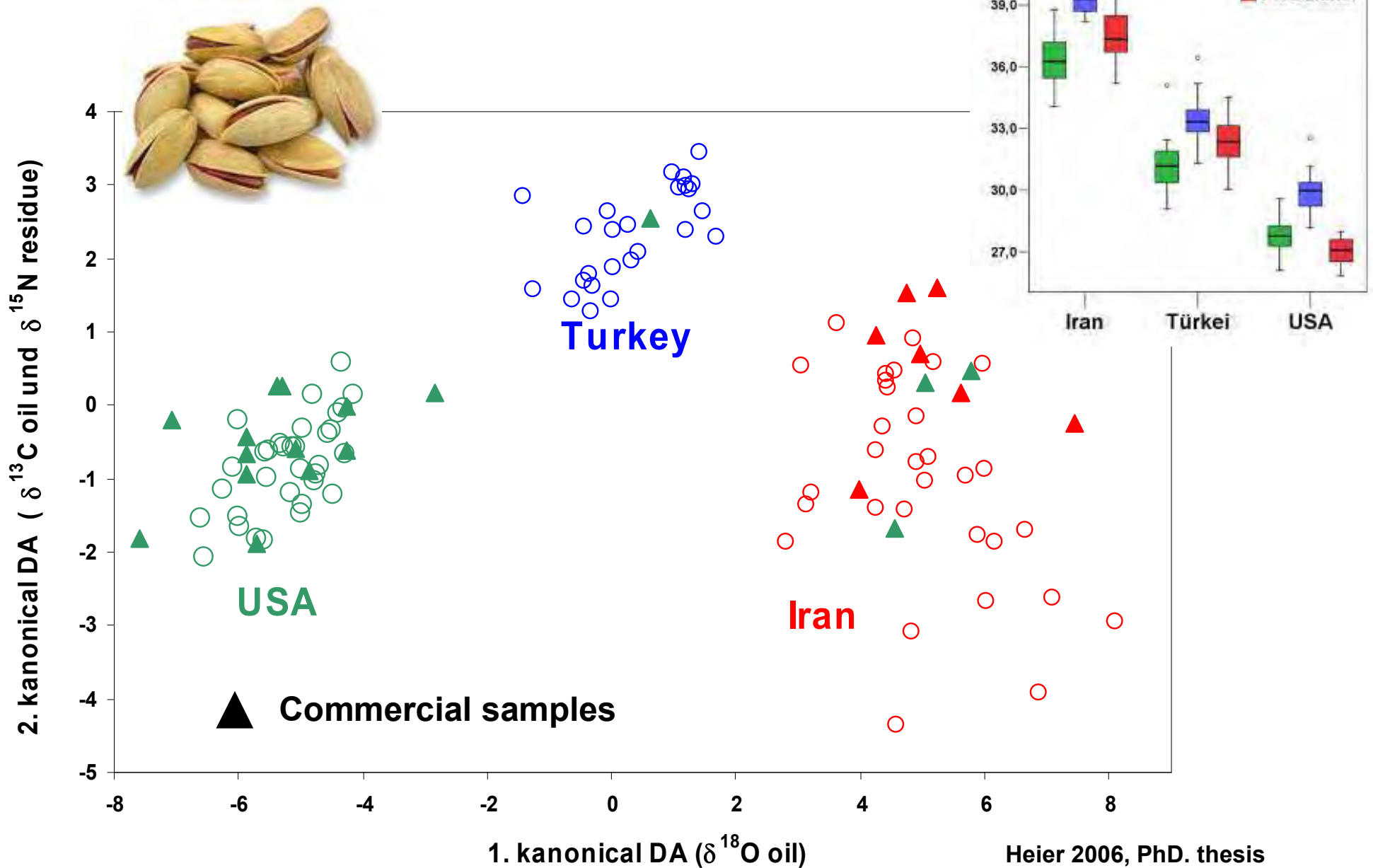
false declaration???



Authenticity control necessary

Origin of Pistachios

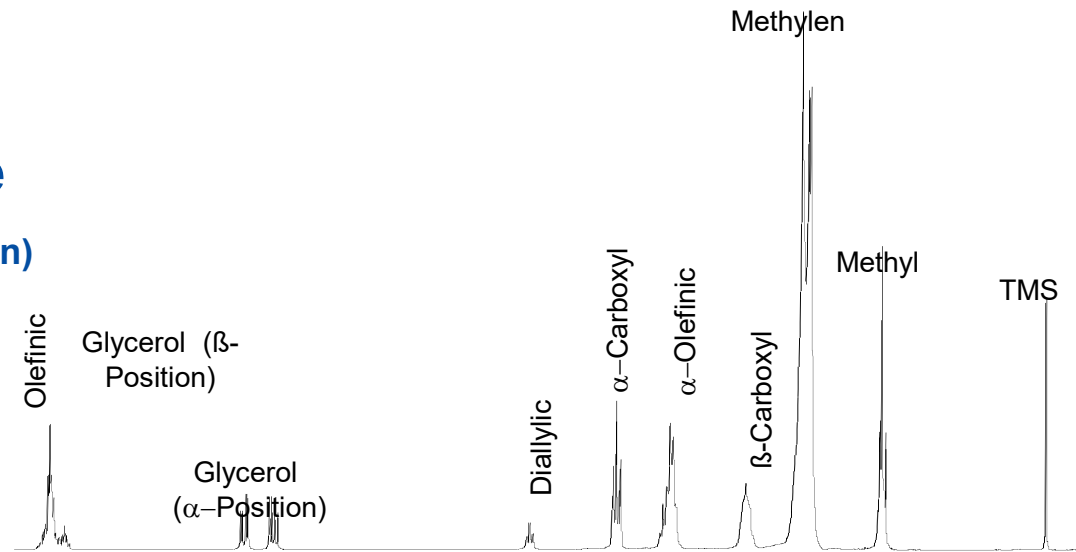
Stable Isotope Ratios



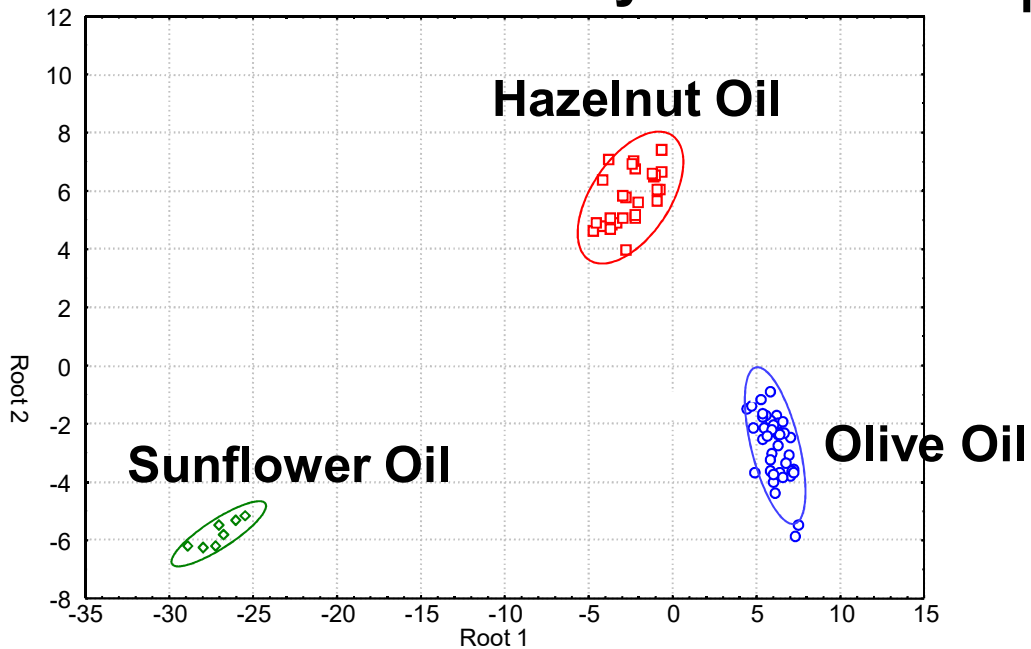
Olive Oil

- subject of falsification
1981 Toxic oil syndrome

(Rapeseed oil denaturated with 2% anillin)



Discriminant Analysis



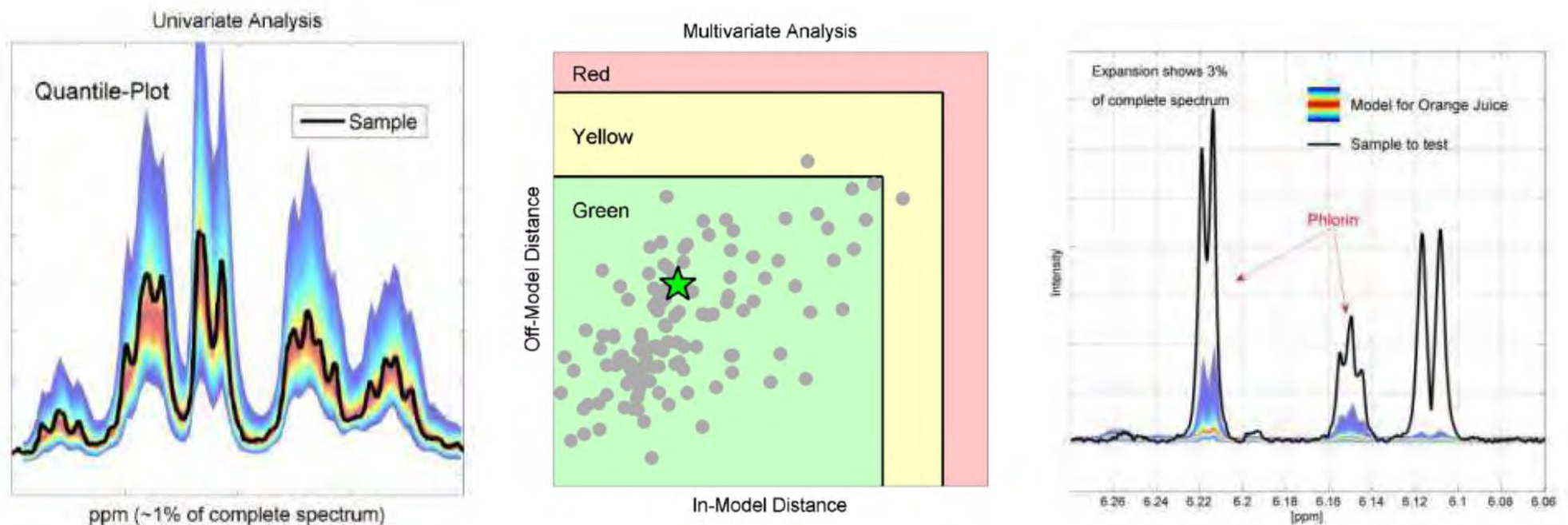
¹H-NMR-Measurements



Fingerprinting/Profiling Analysis

Detection of “”

Fast Screening Techniques: e.g. **NMR**, FT-IR, High-Resolution MS



Taken from: Bruker Juice Screener®

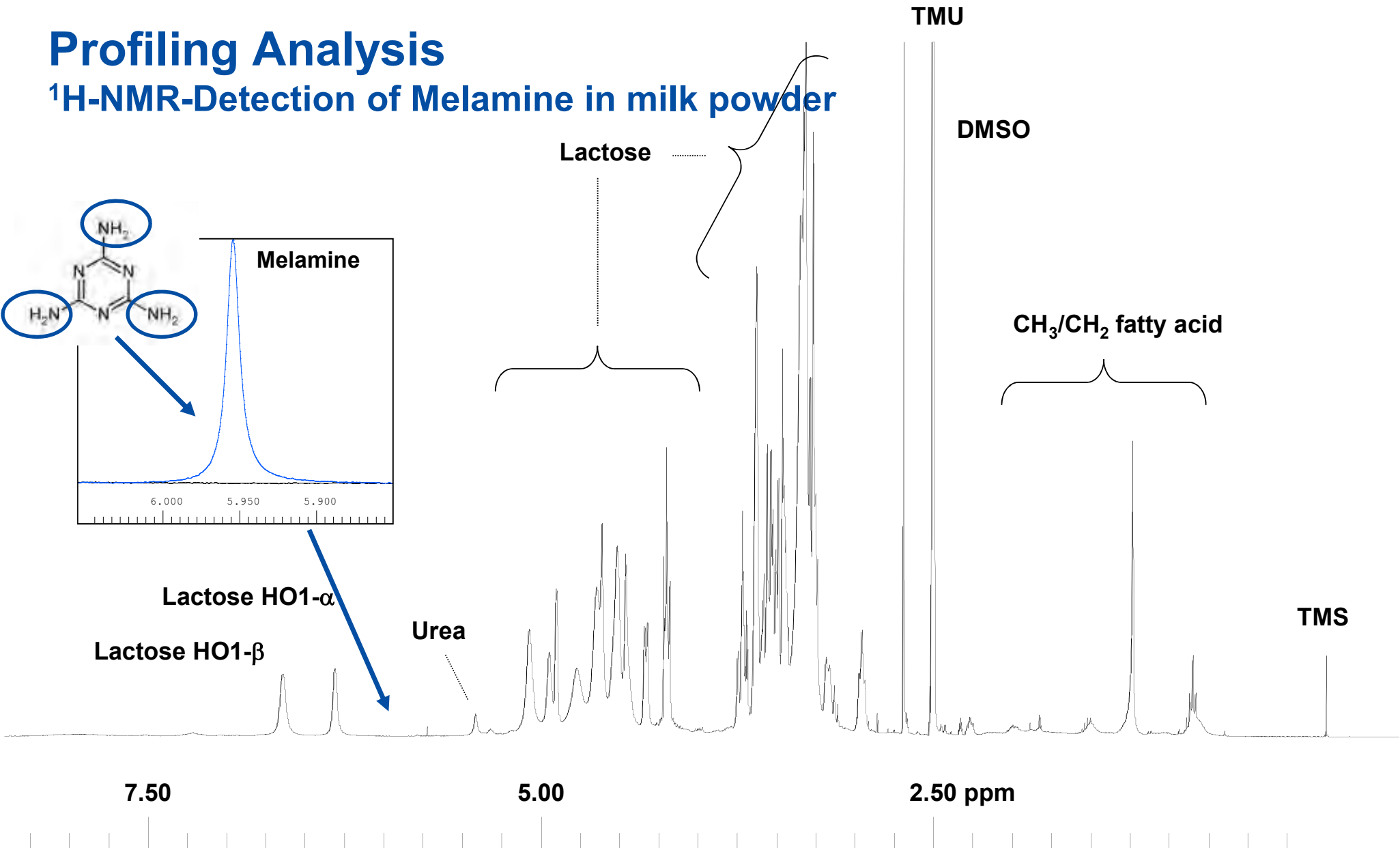
- Applicable with no sample preparation
- Detection of known adulterants
- Detection of “**abnormalities**”



**Further deeper evaluation
Stable isotopes etc.**

Profiling Analysis

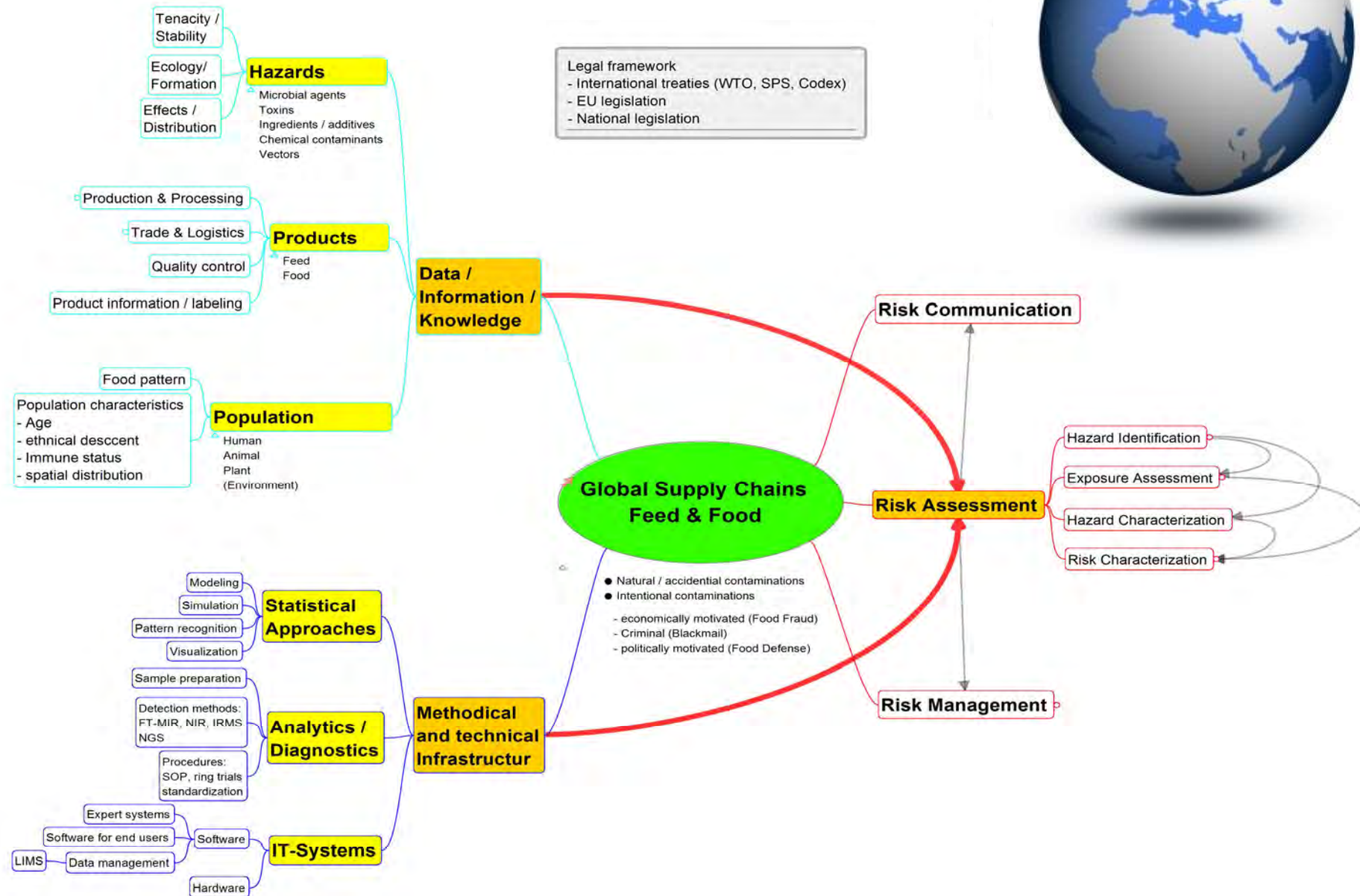
^1H -NMR-Detection of Melamine in milk powder



Black: d_6 -DMSO extract milk powder

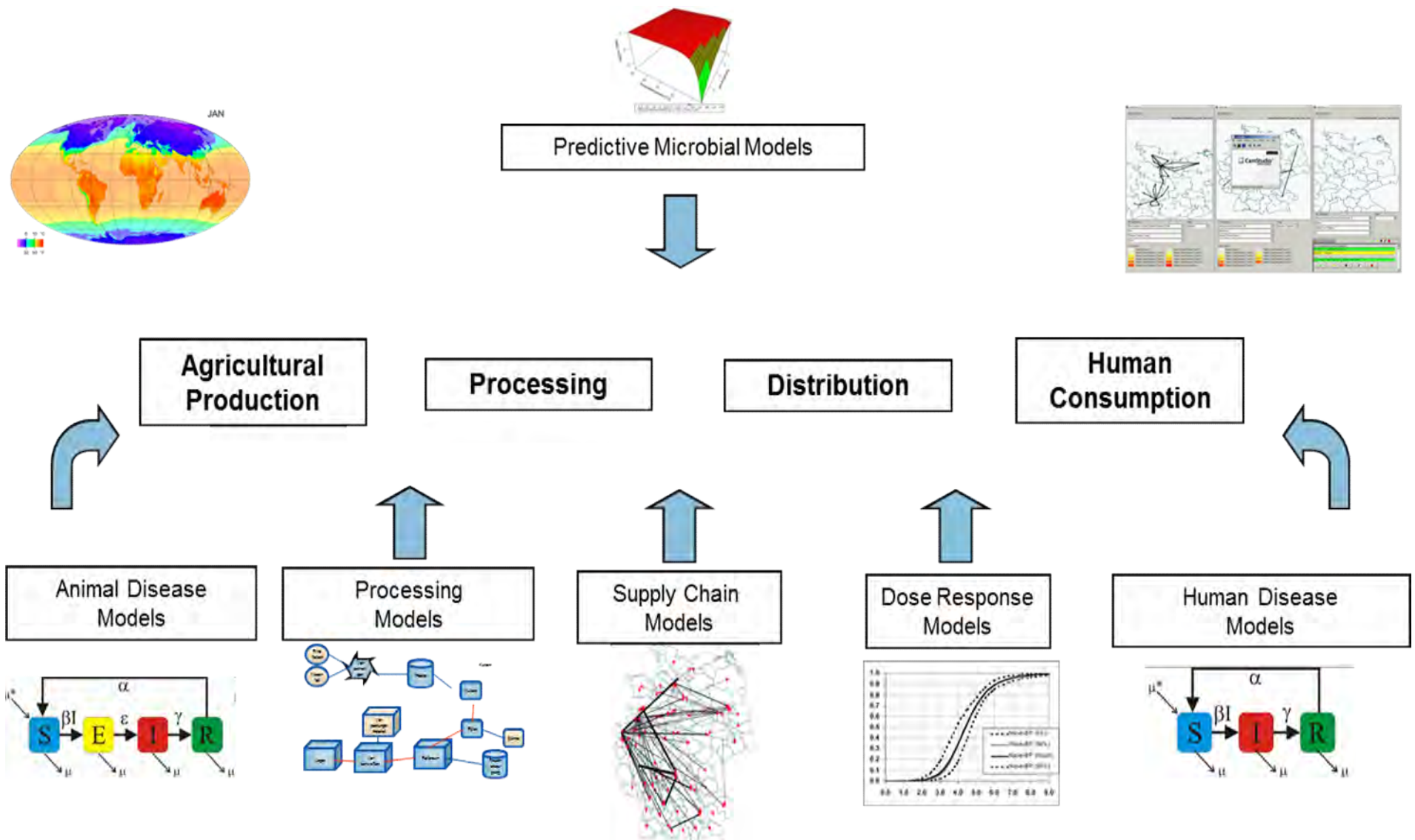
Blue: d_6 -DMSO extract milk powder spiked with melamine

Global Supply Chains and Risk Assessment



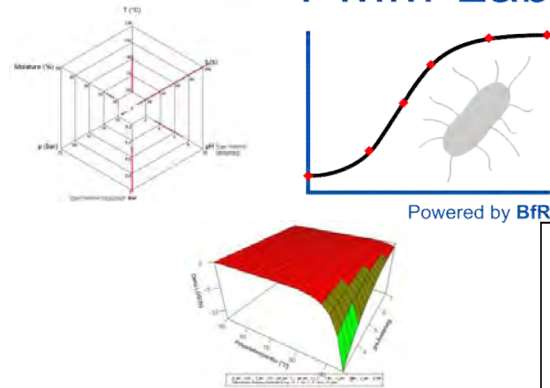
Solution:

Support risk assessors with mathematical models and model-based software tools



BfR open-source modeling software development framework

PMM-Lab



Predictive Microbiology

Tracing Analysis and Visualization

DB

Data Mining Reporting Deployment

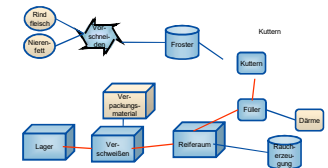
Food Process Simulation

Food Chain Lab
Powered by BfR



<http://sourceforge.net/projects/foodprocesslab/>

Food Process Lab
Powered by BfR



<http://sourceforge.net/projects/pmmlab/>



<https://foodrisklabs.bfr.bund.de/>

FoodRiskLabs
🇩🇪 研究

FoodChain-Lab

Predictive Microbial
Modeling Lab (PMM-Lab)


FoodProcess-Lab

Open Food Safety Model
Repository

Events

Contact


Search _____

Information on BfR

Bundesinstitut für Risikobewertung


Masthead

Data Protection Declaration

FoodRisk-Labs



Bundesinstitut für Risikobewertung

FoodRisk-Labs is a portal
to the following tools
developed by the Federal Institute for Risk Assessment (BfR):



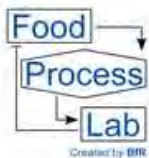
Food
Chain
Lab
Created by BfR

Tracing food back and forward along food supply chains




PMM-Lab
Created by BfR

Modelling bacterial growth or bacterial and toxin inactivation



Food
Process
Lab
Created by BfR

Representation of food process chains and modelling bacterial tenacity


Created by BfR and UFA

Repository for predictive microbial models

Outbreak Investigation

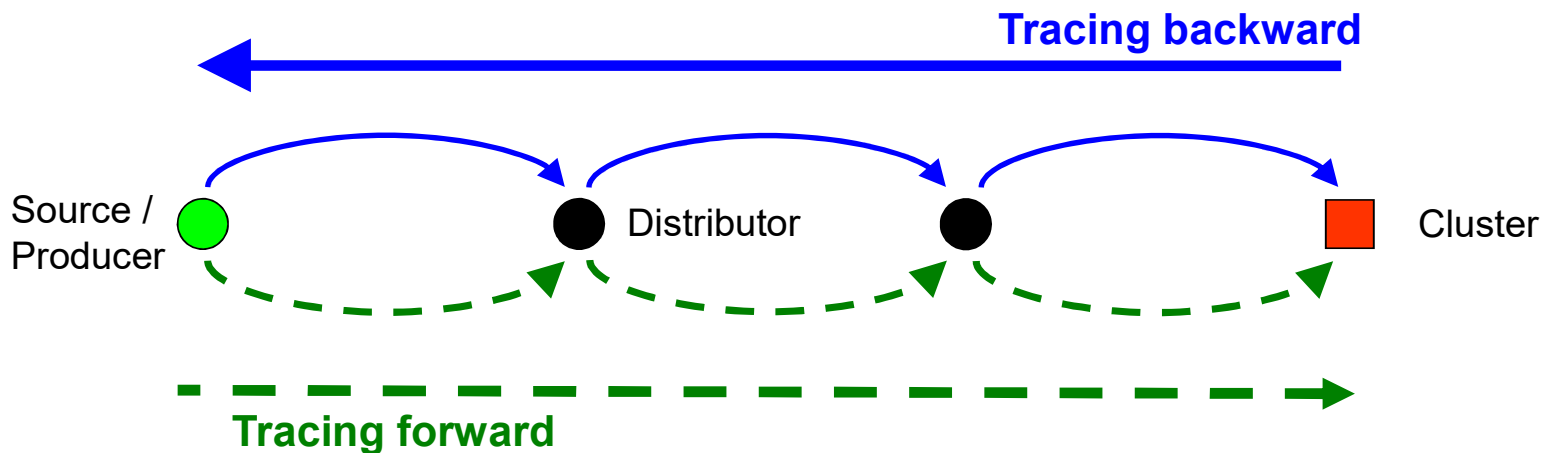
Identification of „Outbreak-Clusters“ (Cooperation Health & Food Safety)

Supply chain analysis

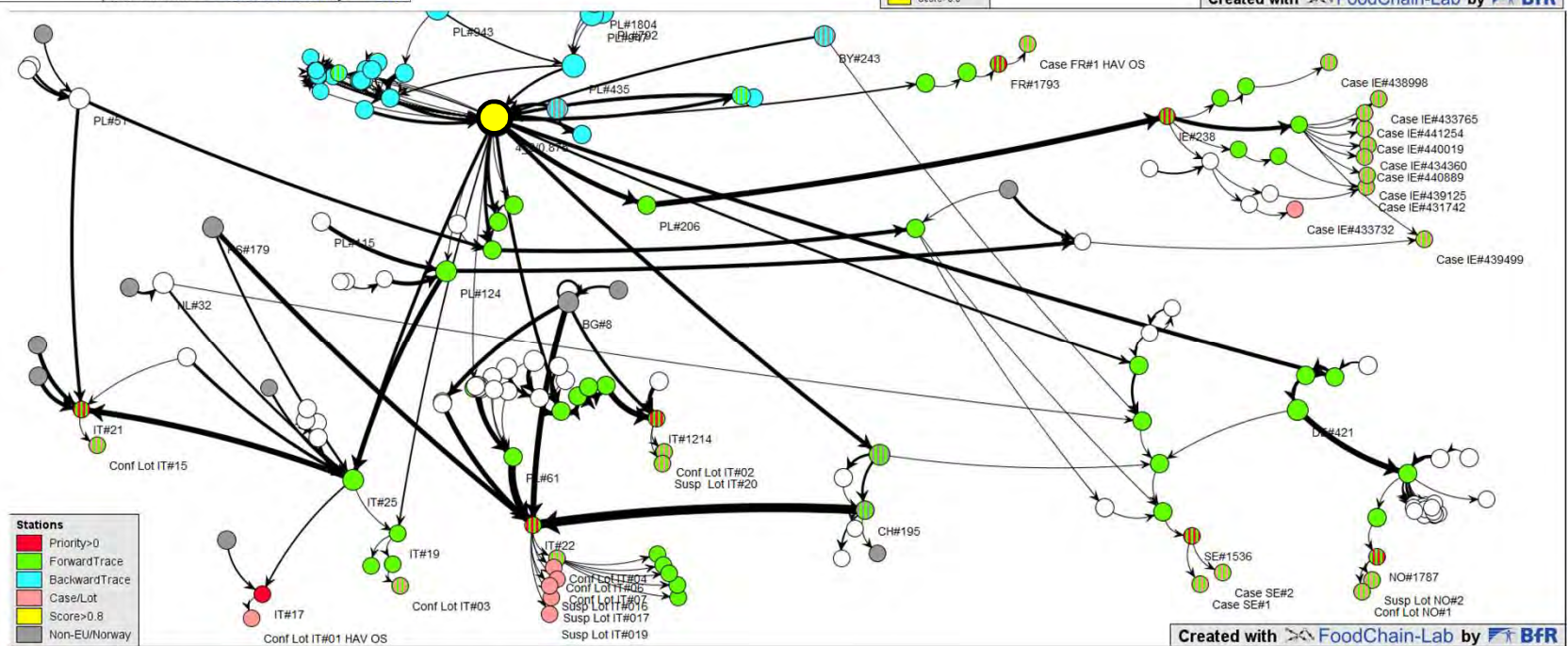
- Tracing backward: identify common nodes of distinct outbreak clusters
- Tracing forward: identify further nodes and outbreak clusters

Network analysis

- Identify “source” and “distributor” nodes in the supply net



EHEC 2011

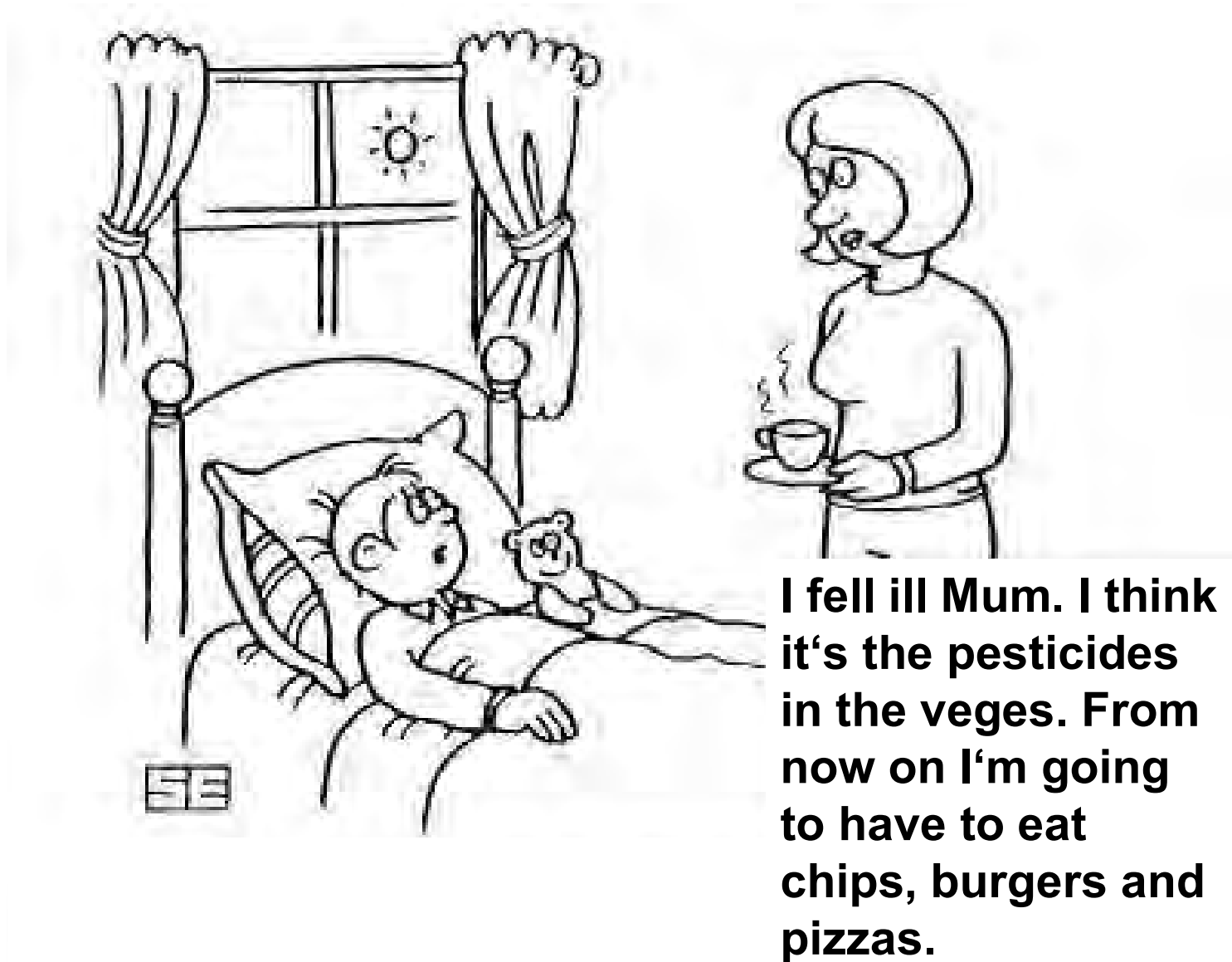


Foodborne outbreaks: Conclusions

Requirements for investigation of large outbreaks

- Clear competences and communication pathways
- Multidisciplinary outbreak investigation team
- Do joint analysis of investigation results
- Adequately qualified and trained staff
- Adequate laboratory capacities and analysis methods
- Appropriate information management systems
- Close cooperation between press office and scientific department for successful risk communication

The real challenge: Risk communication



Influence of the Media for Perceived Risks



Dioxin in Eggs

our food has to become
free of poisons

**USA: Salmonella Danger
in Peanuts**



What can we
eat any more

Risk Communication Activities

Classical Instruments



- Demonstration of the scientific work results of the BfR (peer-reviewed journal)
- Presentation of the institute and its activities to the public and the media (information to the media by interviews and press conferences/releases)
- www.bfr.bund.de as a bilingual internet page
- Publication series for consumers and different Stakeholder groups
- Audiovisual means (photos, films, exhibitions)
- Public targeted events (open door day, consumer fairs)
- Give-aways with BfR-Logo (visit cards, pins)



Risk Communication Activities

New strategies



Participative risk communication with groups of interest representing science, industry, politics, NGOs, unions, consumers

Representative dialog with the stakeholders

Establishment of event formats



- Forum
- Conferences
- Trainings
- Interviews

Use of new media

- Apps
- Twitter
- YouTube, Instagram



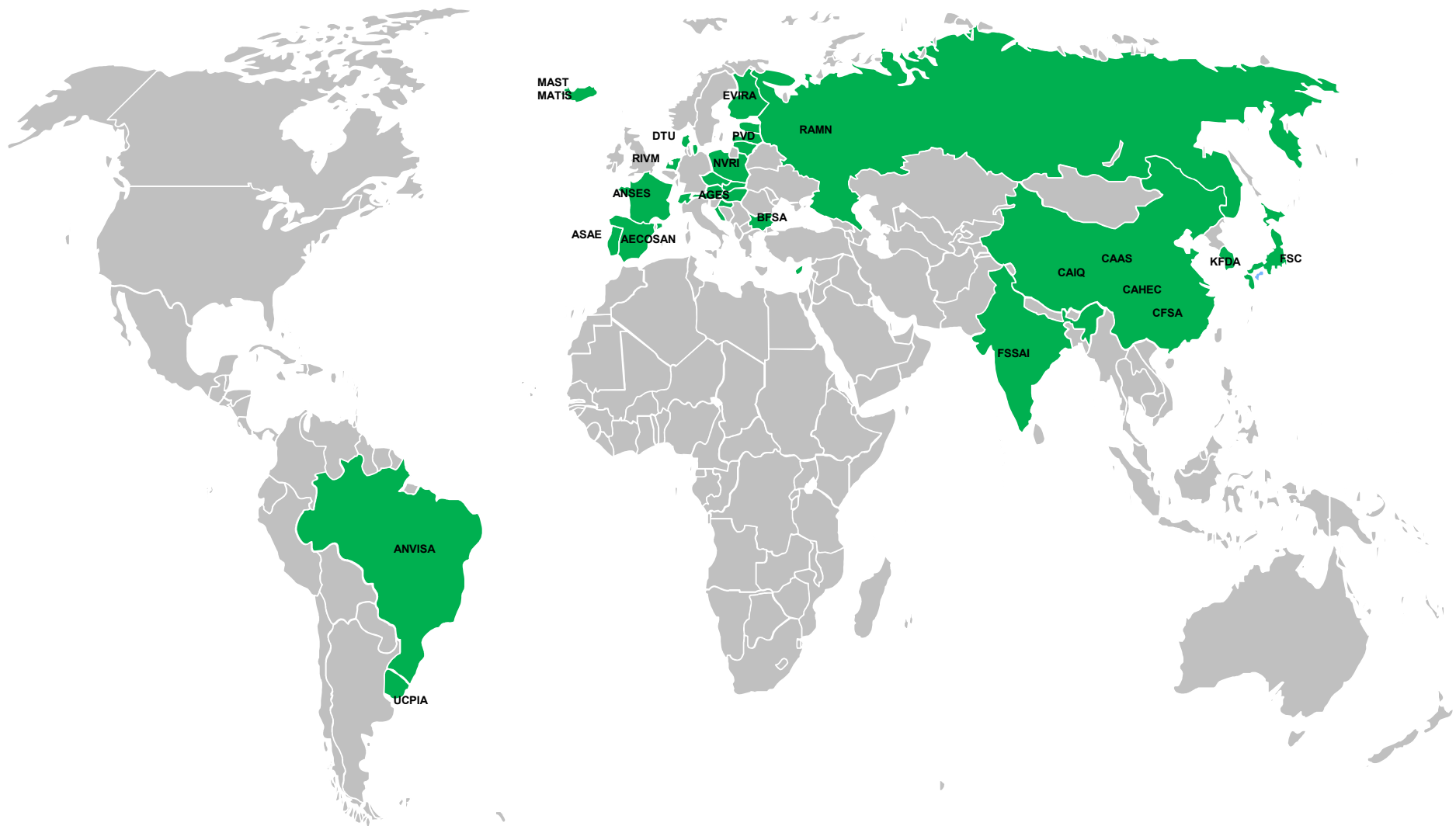
Communicating risk and hazard: The BfR risk profile visualises the risk described in BfR opinions

BfR Risk Profile: Example (Opinion No.)						
A	Affected Persons	General Public (Example)				
B	Probability of impaired health	Practically impossible	Improbable	Possible	Probable	Certain
C	Severity of health impairment	No impairment	Slight impairment	Moderate impairment	Severe impairment	
D	Validity of available Data	High: The most important data are available and there are no contradictions		Medium: Several important data are missing or contradictory	Low: Numerous important data are missing or contradictory	
E	Controllability by the consumer	Control not necessary	Controllable through precautionary measures	Controllable through avoidance	Not controllable	

Cooperation with International Organizations



International collaboration with partner institutions



International collaboration and Capacity building

BfR collaborates with its partners via

- Organisation of conferences, workshops, seminars
- Exchange of information and data
- Joint research projects
- Hands-on training courses
- Guest scientist programme
- Summer Academy



International BfR Summer Academy on Risk Assessment and Risk Communication in Food Safety



2015



2014



2013



2016



2012

Open to our partner institutions in all countries

Global conclusions



- New analytical strategies
- Global harmonisation of standards, methods and data interpretation
- Global quality assurance systems
- Harmonisation of risk assessment procedures
- Joint risk assessment

Thank you for your attention

Reiner Wittkowski

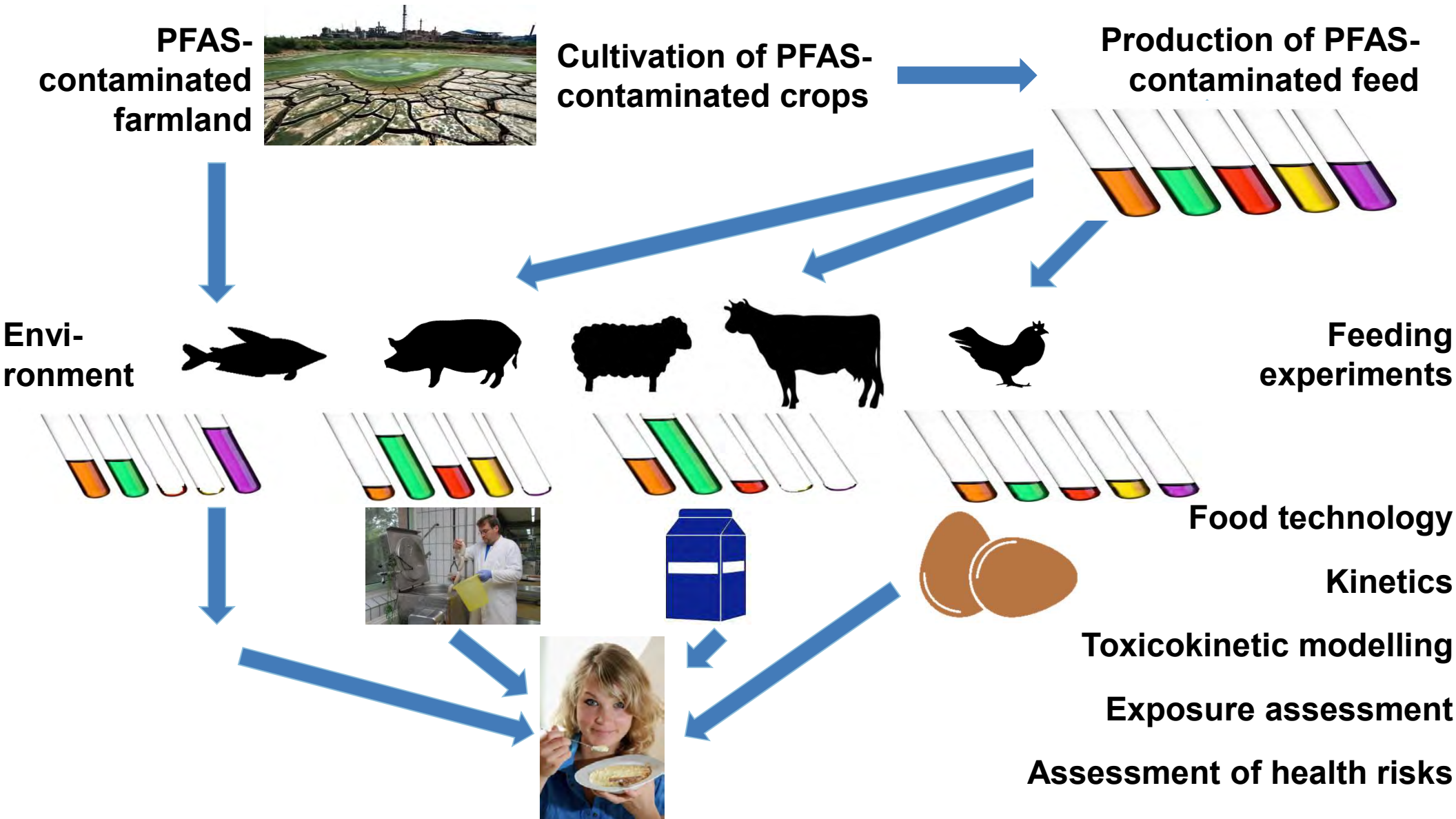
Federal Institute for Risk Assessment

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bfr@bfr.bund.de • www.bfr.bund.de

Consumer health protection through assessment of contaminants (PFAS) along the food chain



Safe Food in the Era of global Trade?



New strategies for Risk Communication

Projects

Population opinion polls
Work in focus groups
Media analysis
Wording projects
Internet analysis
Evaluation of measures
Expert interviews
Target group analysis



Networking

- National and international cooperation
- Establishing commission of external experts
- Internal working group on „Risk communication“



Event forms

- Expert discussions
- Stakeholder conferences
- Scientific symposia
- Consumer conferences
- Open door day

