A global virtual laboratory to improve consumer safety and to reduce the economic impact of a food safety incident

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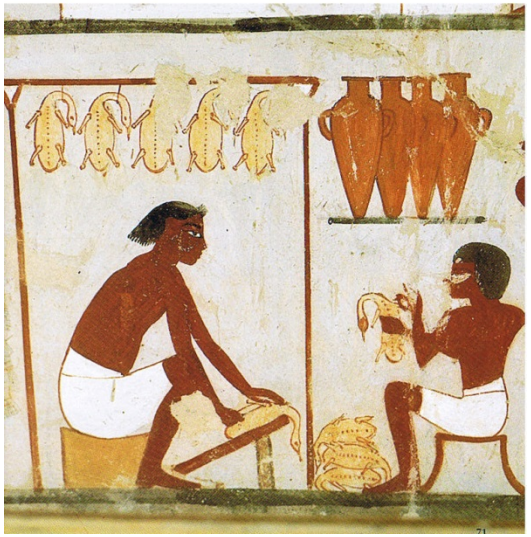
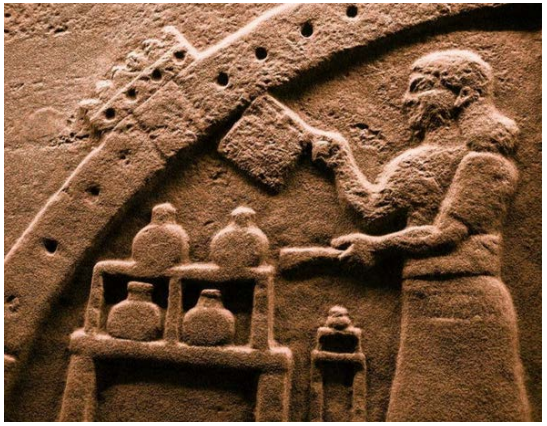
fera

Historical context

CODEX ALIMENTARIUS
International Food Standards
World Health Organization
Food and Agriculture Organization of the United Nations

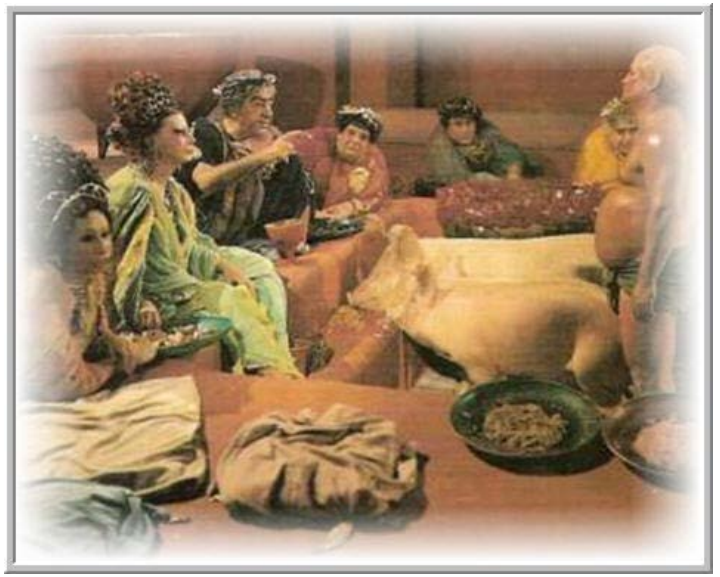
- Food control and regulation is not new!
- Codex Alimentarius - name comes from the code used during the Austro-Hungarian Empire between 1897 and 1911
- Assyrian tablets of stone described the method to be used in determining the correct weights and measures for food grains
- Egyptian scrolls detailed the labelling required for certain foods





Focus of control

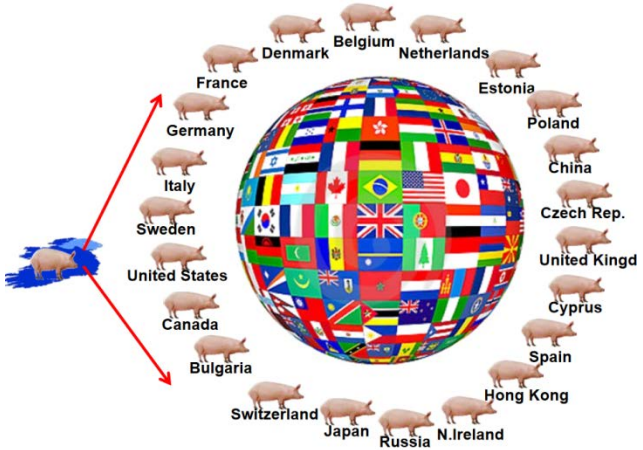
- Beer and wines were inspected for purity and soundness in ancient Athens
- Romans had a well-organized state food-control system to protect consumers from fraud or bad produce
- In Europe, during the Middle Ages, individual countries passed laws concerning the quality and safety of eggs, sausages, cheese, beer, wine and bread. Some of these ancient laws still exist today
- Familiar problems to modern day context!

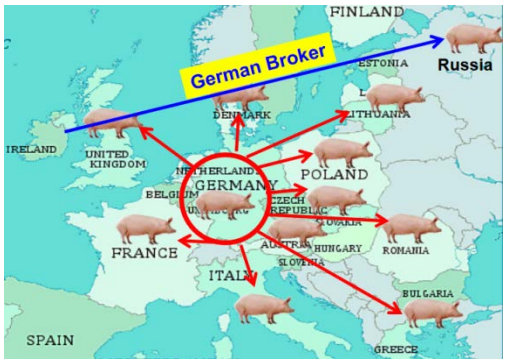


Martin Rose and Kathy Ridgway. Chapter 5. Food Analysis and Food Standards: Raw Materials, Traceability and Authenticity. in: Food: The Vital Ingredient. A. Bryan Hanley and Wendy R. Russell (Editors) ISBN: 978-1-53614-402-4

Food Chemical Incidents

- There have been many Food Chemical incidents
- Due to the increasing global nature of food production and distribution, these increasingly can have a global impact





Images taken from FSAI

Food incidents - Dioxins

Incidents with PCDD/Fs and dl-PCBs in the feed and food chain, the sources and an indication of the highest levels reported. Also the discovery and the laboratory involved is indicated.

Country	Year	Source	Highest levels[a] (food in pg TEQ/g fat,	Discovered by	Reference
US					
US					
Japan					
Taiwan					
Netherlands					
US					
Germany					
Belgium					
Austria					
Germany, Spain					
Italy					
Germany					
Italy	2004	Wood shavings, PCP	Wood shavings 51, eggs 88	Authorities	Diletti et al., 2005, Brambilla et al., 2009
Netherlands	2004	Potato peels, kaolinic clay	Peels 44, Milk 20	Private	Hoogenboom et al., 2010
Netherlands	2006	Feed fat, gelatine, HCl	Feed fat 440, feed 8, pork 3	Authorities	Hoogenboom et al., 2007
Switzerland	2007	Guar gum	Guar gum 480	Private	Wahl et al., 2008
Chile	2008	Feed, zinc oxide	Zinc oxide 17,148; feed 14, pork 37	Authorities	Kim et al., 2011
Ireland	2008	Dried bakery waste, PCBs in fuel	Bakery waste 8500; Pork 600, Beef, 1000 pig liver 16,000	Private, authorities	Heres et al., 2010, Tlustos et al., 2012, Marnane, 2012
Netherlands, Germany	2010	Organic corn, unknown	Corn 2.7; eggs 11	Private, authorities	RASFF 2010.0519
Germany	2010	Industrial fatty acids, chlorophenols	Feed 1.5; eggs, meat	Private	Abraham et al., 2011

[a] levels were as reported by the authors and not corrected for different TEF schemes.

Contents lists available at ScienceDirect

Food Control

journal homepage: www.elsevier.com/locate/foodcont

European developments following incidents with dioxins and PCBs in the food and feed chain

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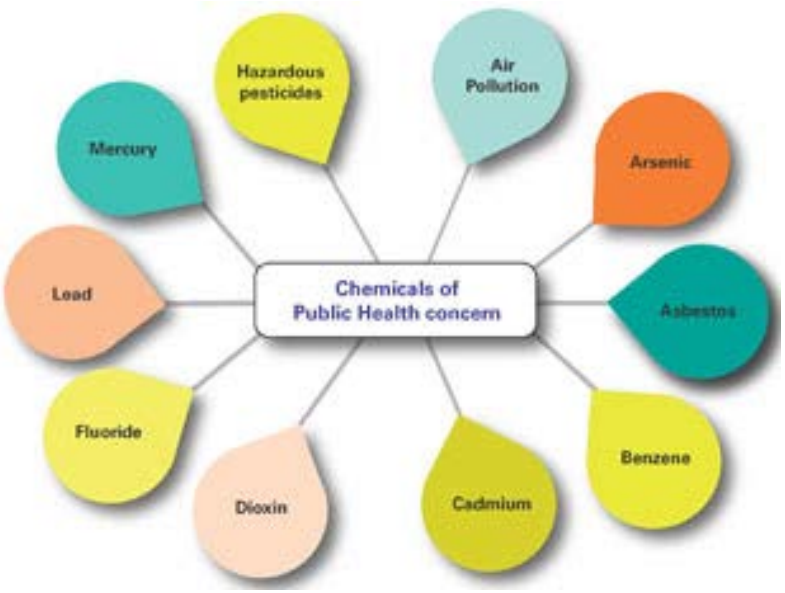
Impact of food chemical incidents

- Health
- Economic
- Consumer confidence
- Food choice



Media and public awareness

Image taken from FSAI

Consumer confidence

- To change the attitudes of consumers and build trust following a food safety incident can take much effort
- Perception and choices may not be made on a purely rational or scientific basis
- Work is on-going to look at differences in consumer behaviours between Europe and China

Barriers to trade

- Tariffs, import bans and other measures have an impact on trade
- Other specifications such as unfeasible limits that are imposed with no real value in terms of food safety may also have an impact
- Regulations should relate to consumer safety and food quality, and should not be imposed to give an unfair competitive advantage

Economic cost of a food chemical incident

- easy to estimate
  - removing food from the market and destroying it,
  - analytical laboratory testing,
- more difficult to estimate
  - Damage to brand reputation,
  - consumer changes in food choices and behaviour etc..

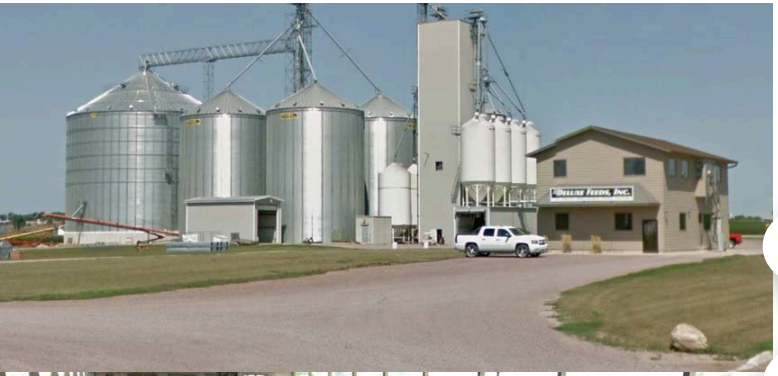
Associated costs can be considerably higher and longer lasting than the immediate direct financial impact

Case study – cost of food chemical incident

- Dioxins in Irish pork
- Estimation of Direct Effects
- Estimation for Indirect Effects. 2 models used:
  - EU Common Agricultural Policy Regional Impact Model (CAPRI)
  - Chinese Agricultural Policy Simulation and Projection Model (CAPSIM) for food safety policy analysis as tools to perform ex-ante evaluation modelling

Case study on melamine in milk products to be developed later

Direct Economic cost of pig meat dioxin case



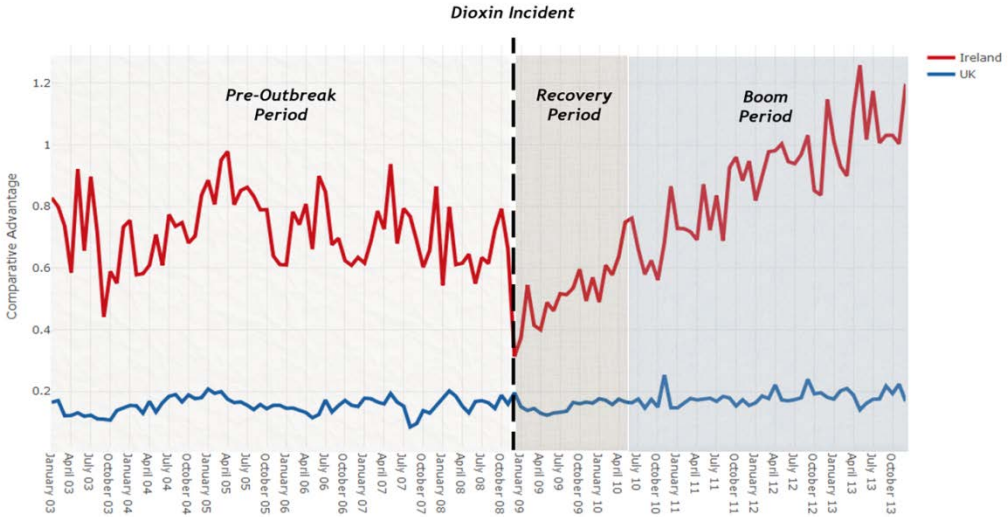
1. FEED SUPPLIERS
2. PIG FARMS
3. SLAUGHTERHOUSES
4. MEAT PROCESSORS
5. MEAT RETAILERS

€191,4 Million Lost

28% output value 2008

Risk Analysis | Tracking and Tracing | Sampling and Testing | Identification and registration | Blocking | Recalling | Replace | Destruction

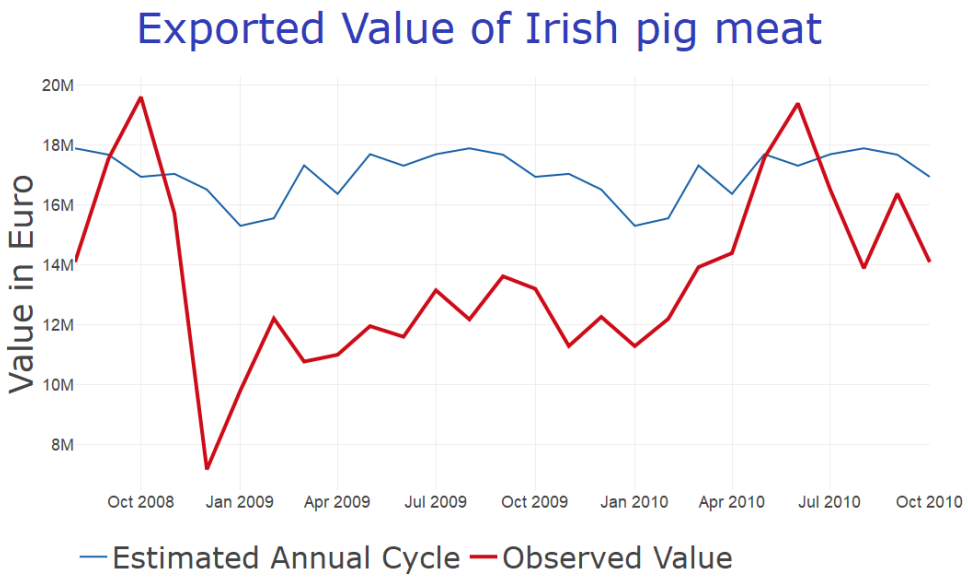
Impact on export of Irish pig meat



€80,4 Million Lost

during the recovery period

33.6% of the expected exports



From Case studies to ex-ante policy evaluation

- Introduction of food safety policy scenarios,
- Effect of simulated policies on the agro-food economy at Country level:
  - Trade;
  - Production and Consumption;
  - Generated Income.

Support to policy decision makers

CAPRI and CAPSIM models

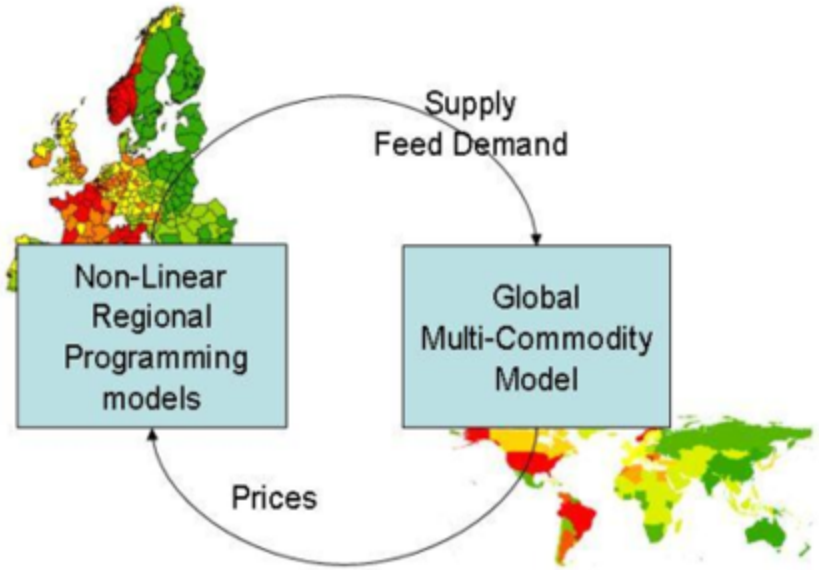


Figure 1: Framework of the Common Agricultural Policy Regional Impact Model (CAPRI)[1]

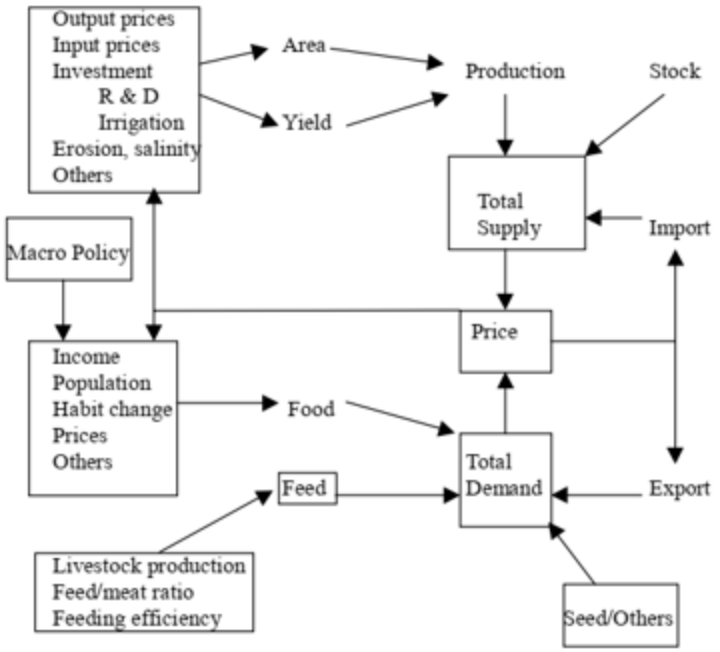


Figure 2: Framework of China's Agricultural Policy Simulation and Projection Model (CAPSIM)[8]

How to minimise impact

Coordinated global response

Organisations world wide working in cooperation

Share methods

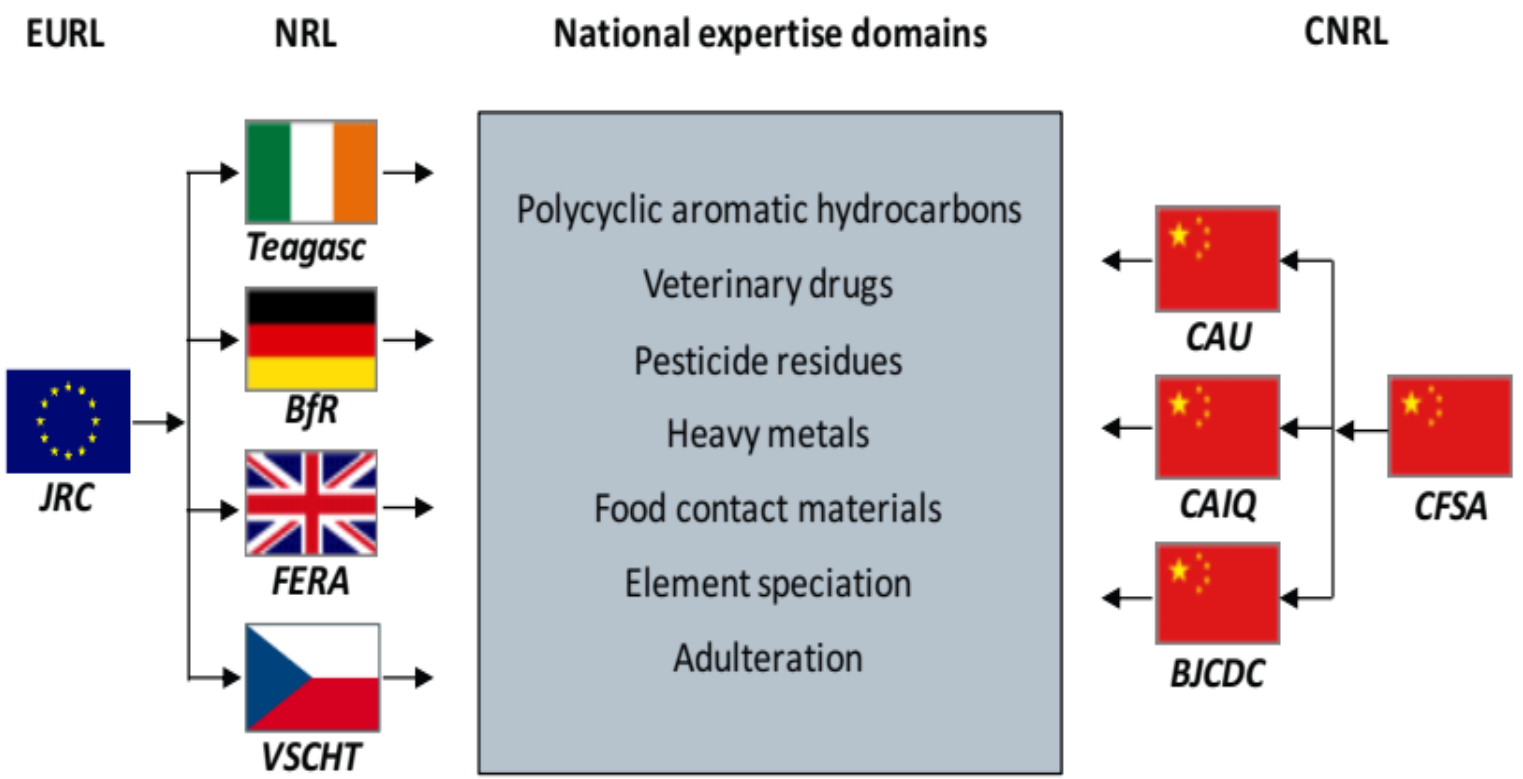
Share results

Joint monitoring

Global food control

Harmonised action

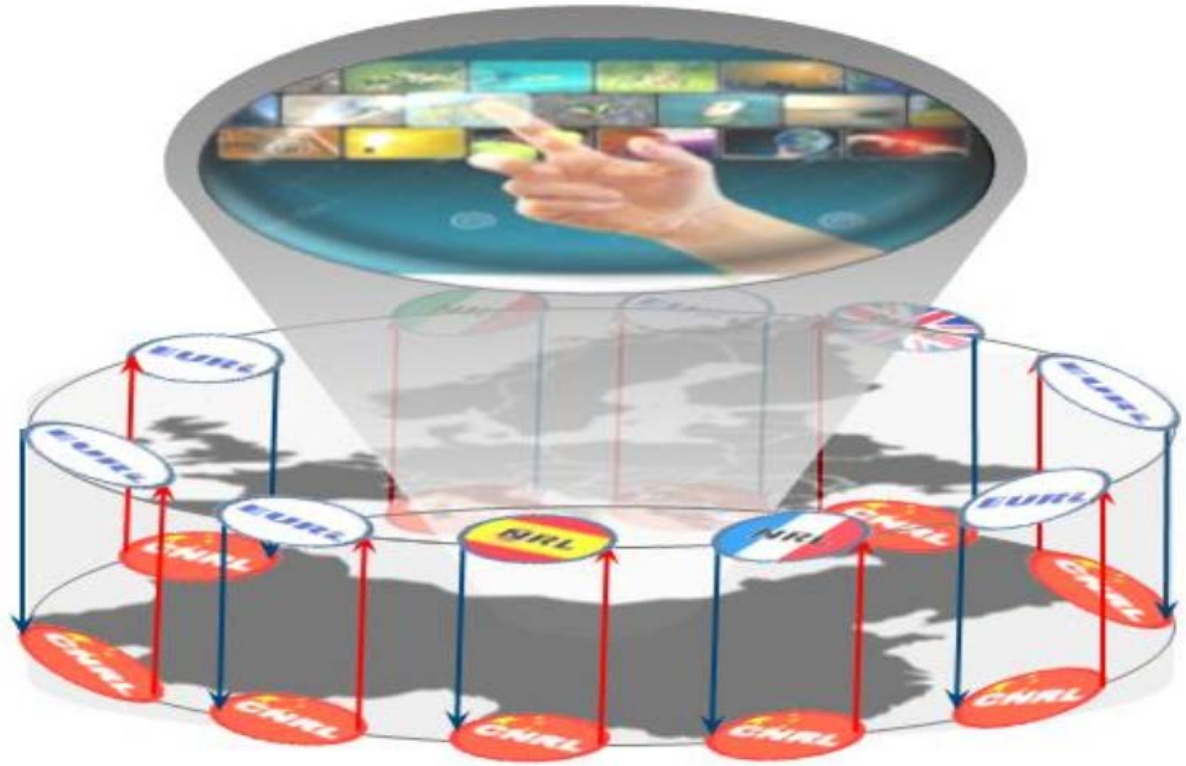
Existing networks



EU-China-Safe project

Use the existing Chinese and European networks to form the basis of a new global cooperation

Vision



Exchange within and between European and Chinese existing networks

Virtual Laboratory - RL2020

First example – Dioxins

One European and one Chinese Lab

Similar instrumentation

Similar methodology

Dioxins – MS/MS Validation

- Establishment of virtual lab and testing of concept
- Joint validation of MS/MS confirmatory method for dioxins and dioxin-like PCBs
- Laboratories involved: Fera Science Ltd, CSFA and Hubei CDC
- GC-MS/MS systems provided by Agilent and Thermo Scientific

Dioxins – MS/MS Validation

Thermo Trace1310 GC
TSQ9000 AEI MS/MS

Agilent 7890B GC
7010B HES MS/MS

Dioxins – MS/MS Validation

- Includes dioxin-like and marker PCBs
- MS/MS vs. GC-HRMS (Magnetic sector)
- Analysis of spiked samples and extracts
- Analysis of old PT materials
- Participation in PT rounds (e.g. Norwegian Institute of Public Health POPs in foods, EURL, FAPAS)
- Analysis of real samples

Dioxins – MS/MS Validation

- Shellfish, Fish and fish products
- Milk/ dairy products
- Beef
- Pork
- Infant feed and formula
- Eggs
- Animal feed – Not in CSFA remit

Dioxins – MS/MS Validation

Dioxin analysis

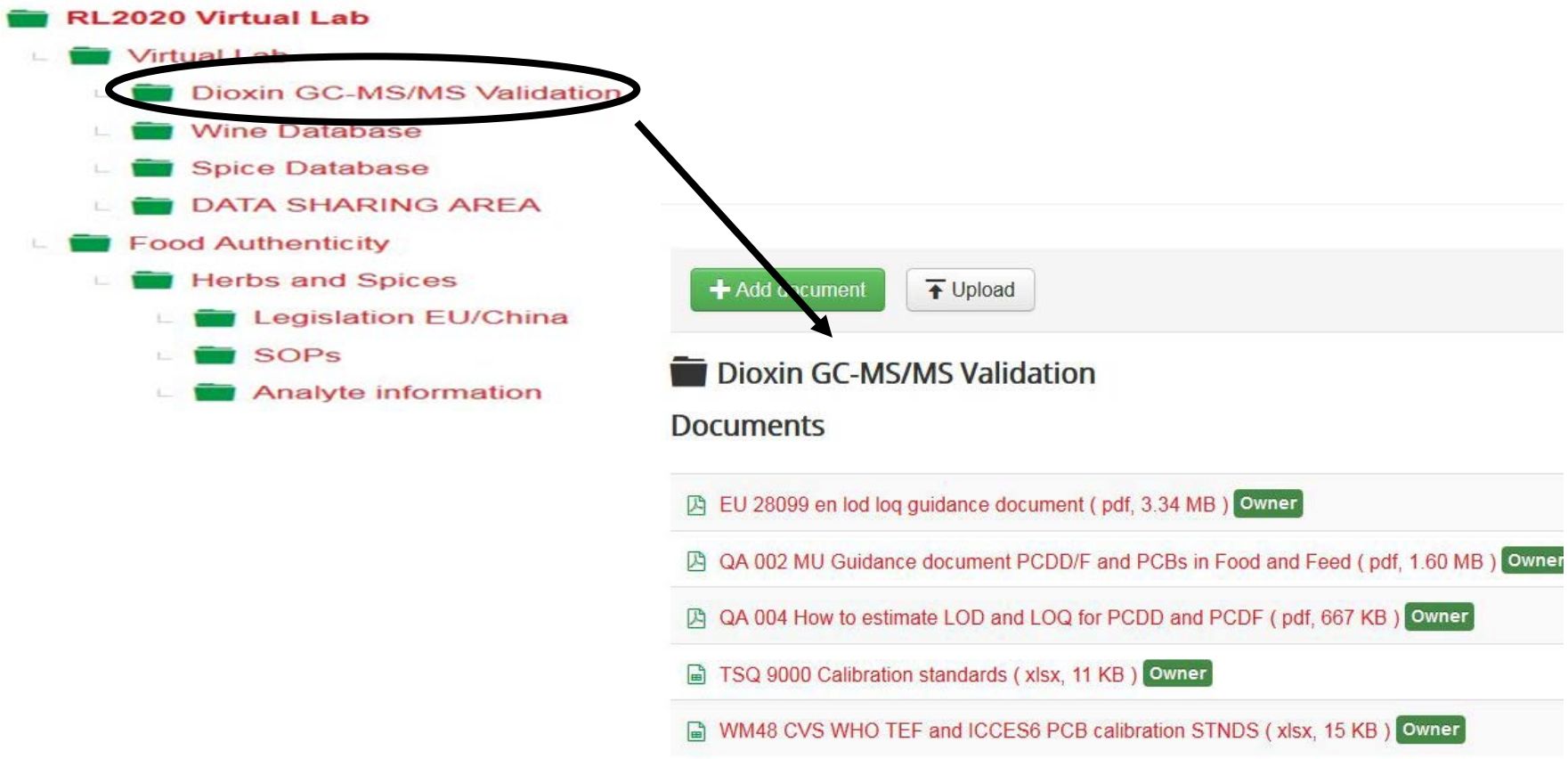
- DL-PCBs included in method
- Two columns:
  - DB-5ms UI
  - VF-Xms

Marker PCB analysis

- Column: HT-8

Dioxins – MS/MS Validation

- Validation data to be stored centrally in virtual lab



Other applications for RL2020

Supporting import / export of food products

- Products can be analysed by the exporting country with access to analytical data being granted to importers.
- Reduces the need for testing by the importers, and thus speeds up release at port resulting in reduction in cost and fresher produce reaching the consumer

Next stages

- Increase the number of laboratories acting in the network
- Choose other chemical analytical methods
- Use the network where there may be differences in analytical methods

Impact

- Can RL2020 reduce the impact of a food chemical incident?
- Scenario to be planned for hypothetical food chemical incident
- Evaluate application of RL2020
- Economic analysis using methods developed for case studies

www.euchinasafe.eu

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