EFSA Emerging Risks Activities

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OUTLINE

- EFSA mission and tasks
- Emerging risk definition
- Emerging risk identification (ERI) procedure
- Our networks
- Drivers
- Examples of our ongoing projects
- Final thoughts
- Examples of emerging issues



EFSA mission and tasks



FOOD LAW



REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 January 2002

Laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety

Article 34 Identification of emerging risks

1. The Authority shall establish monitoring procedures for systematic searching for, collecting, collating and analysing information and data with a view to the identification of emerging risks in the fields within its mission.



EFSA 2020 STRATEGY

- Prioritise public engagement in the process of scientific assessment
- Widen EFSA's evidence base and maximise access to its data
- Build the EU's scientific assessment capacity and knowledge community

Prepare for future risk assessment challenges

Create an environment and culture that reflects EFSA's values



EMERGING RISKS – WHY ARE WE INTERESTED?

Anticipation of future risk assessment needs

- Data / Knowledge
- Risk assessment methods

Help risk manager anticipate and even prevent future safety challenges



EFSA SCIENTIFIC PANELS





Emerging risk definition





A function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard;





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 significant exposure may occur or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard" (EFSA 2007).





NEW CHALLENGES AND THREATS



Environmental risks e.g multiple stressors and bees



Evaluation of the safety of new products •e.g. novel foods



Development of new assessment methods:

nanotechnology, active and intelligent packaging
`-omics', less animal testing



Chemical mixtures/ combined toxicity of substances in food



Antimicrobial resistance



Hazards linked to globalisation: plant pests, animal diseases, vectorborne diseases



Emerging risk identification (ERI) procedure in EFSA



ERI PROCEDURE











ACCESSIBLE DATA





PRIORITIZATION CRITERIA

- Novelty
- Soundness
- Severity
- Imminence
- Scale

UNCERTAINTY

AMBIGUITY

RISK PERCEPTION



Our networks



NETWORKS OF KNOWLEDGE



Emerging Risks Exchange Network (EREN) Member states



Stakeholder Consultative Group on Emerging Risk (StaCG-ER) - Civil society & Private sector



StaDG-ER - HISTORY



2011 - The EFSA Scientific Cooperation (ESCO) Working Group (WG) on emerging risks



EVOLUTION OF THE COMPOSITION OF THE STADG-ER BY CATEGORIES



Total 19 StaCG-ER members

Total 19StaDG-ER members and 4 alternates20



IDENTIFICATION OF EMERGING ISSUES BY EREN & STACG-ER





WITHIN EUROPE...

- National food safety agencies from 28 EU Member States
- 400 research institutes
- EU Agencies





OUTSIDE EUROPE...









EMERGING RISK DRIVERS

- How do we recognise changes?
- How can we anticipate changes? Is prediction possible?
- What are the implications of changes for managing risk?
- Can we learn from the past?





EFSA, 2015: http://www.efsa.europa.eu/en/efsajournal/pub/4257







Introduction into EU of Tomato leafminer *Tuta Absoluta*







CHANGE FROM PRODUCTION OF TRADITIONALLY COOKED FOOD TO RAW FOOD







Food borne disease outbreaks linked

Toxic dermatitis









by-products ∞ Waste

Drug residues Heavy metals Household

chemicals



Examples of our ongoing projects

- AQUARIUS
- CLEFSA
- TNO



AQUARIUS

Objective:

To determine whether the "food chain analysis" methodology can be used to identify key vulnerabilities and drivers of change for future emerging risks for animal and human health on selected fish species (Atlantic salmon) in the aquaculture food chain



FOOD CHAIN ANALYSIS SHOULD ADDRESS THE FOLLOWING QUESTIONS

- What is the "farm to fork" pathway for the products
- What are known and emerging hazards that can be introduced
- What are the key vulnerabilities and where do they exist
- What type of controls (monitoring) are in place, are they effective
- What drivers (e.g. environment, governance, trade, prices, globalisation, etc.) act upon the supply chain and how do they influence the vulnerabilities and emerging risks
- What type of data of drivers (and indicators) can be identified
- How to monitor these

Mapping of the supply chain



completed



rop* OR Faroe* OR

W chain* OR close



Delphi results


A summary of results (for Norwegian supply chain) per segment:

- Existing/ emerging hazard (animal/ human)
- Top 2 vulnerabilities
- Top 2 drivers of change linked to the 2 vulnerabilities
- Top 2 indicators linked to the top 2 drivers of change
- Data sources identified and accessed for quality



Data





AQUARIUS NEXT STEPS

- Methodology to baseline the key indicators for selected key vulnerabilities in Norwegian salmon supply chain
- Bayesian Network (BN) model in development



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AQUARIUS BAYESIAN NETWORK







Climate Change and Emerging Risks for food safety, including plant and animal health (CLEFSA)



NETWORKS OF KNOWDLEDGE



Emerging Risks Exchange Network (EREN) Member states





Stakeholder Consultative Group on Emerging Risk (StaCG-ER) - Civil society & Private sector







CIGUATERA



Presence of ciguatera: poisoning, CTXs in fish





CLEFSA PROJECT



Drivers

• Climate change



Horizon scanning

- Crowdsourcing
- Broad range of signals

Prioritization

- CLEFSA discussion group
- MCDA



CRITERIA FOR IDENTIFICATION





SURVEY

- EFSA's areas
- 606 respondents
- Non EU:72
- 241 issues



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BIOTOXINS/HAB

- Vibrio parahaemolyticus and Vibrio vulnificus
- Palytoxins (Ostreopsis)
- Pinnatoxins
- Cyclic Imines
- Domoic acid
- Cyanotoxin (*Microcystis*, *Aphanizomenon*)
- Diatoms (Pseudo-nitzschia and Thalassiosira spp.)





CLEFSA DISCUSSION GROUP





PRIORITIZATION PROCESS





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PRIORITIES

PRIORITIZATION: MCDA

Prioritization criteria Imminence
Evidence base
Spatial/temporal scale
Severity

- Likelihood
- Strenght of the association
- Risk management measures



Scoring system

WeightsLevelsScaled values



TNO ERIS project

TESTING A TEXT MINING TOOL (ERIS) FOR THE IDENTIFICATION OF EMERGING RISKS



BACKGROUND

EFSA REMIT : SCER unit's remit: to evaluate application of innovative technologies to support the identification of emerging risks in the food and feed chain

NEW TECHNOLOGIES AT HAND : New ontology based text mining tools are becoming available

TNO: Over the last years TNO has been developing the Emerging Risk Identification Support System (ERIS) to identify new and unexpected hazards in the food chain and feed chain; (van den Brug et al., 2014)

Unique text mining system based on a specific food ontology Mining the scientific literature Supported by network of scientific experts



EMERGING RISK IDENTIFICATION SUPPORT – ERIS





TNO TOOL (ERIS)- EFSA

> EFSA Objective 1: Test and assess the practical applicability and capabilities of the TNO tool (ERIS) for the identification of emerging chemical and biological risks in the food chain for the case of two species of sea water farmed fish farming food chain (Salmon and Oyster).

> EFSA Objective 2: <u>Identify new and emerging</u> chemical and biological risks in the sea water fish farming food chain through the ERIS system.



2 PHASES TO ACHIEVE THE OBJECTIVES

First Phase

Step 1: An iterative and interactive **ontology adaptation**



Step2: an expert evaluation adaptation, to tailor ERIS to EFSA's needs





PHASE 1 - STEP 1 : ONTOLOGY ADAPTATION



Ontology adaptation workflow



PHASE 1 - STEP 2: EXPERT EVALUATION ADAPTATION



To benchmark inter-expert variation between TNO and EFSA, a **BLIND TRIAL** was carried out resulting in an agreed expert protocol.

EXPERT PROTOCOL

- two rounds of expert evaluation
- benchmarking exercise with the ERIS baseline dataset (historical overview of relevant literature on the 2005-2014 data)





2 PHASES TO ACHIEVE THE OBJECTIVES

Second Phase

Step 1 Text mining tool was applied



Scientific abstracts from databases MEDLINE[®]/PubMed[®] and FSTA[®], published January 2015-June 2016

Step 2 Expert protocol was applied



Two rounds of expert evaluation

Benchmarking exercise with baseline





ERIS REPORT - EXAMPLE



http://onlinelibrary.wiley.com/doi/10.2903/sp.efsa.2016.EN-1154/abstract



HOW THE ERIS REPORTS ARE BUILT

a survey of wild marine fish identifies a potential origin of an outbreak of viral haemorrhagic septicaemia in wrasse, labridae, used as cleaner fish on marine atlantic salmon, salmo salar farms.

ERIS identify grammatical and contextual relationships in article titles and abstracts between potential hazards, effects and exposure





PHASE 2 : RESULTS





RESULTS – SALMON- 18 POTENTIAL ER



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CONCLUSION

MAIN BENEFITS/ADVANTAGES- ERIS TOOL

Automated text mining systems associated with expert evaluation are useful for the identification of potential emerging risks and other early signals covering chemical and biological hazards for human, animal and environmental health.

MAIN CHALLENGES ERIS TOOL

To reach a relevant output customised for the end-user's scope, the ontology and the expert evaluation protocol requires intensive adaptation through an iterative process that takes time and resources.



THE WAY FORWARD

FUTURE PLANS

Extension of the contract until 2018 to produce 4 semestral ERIS reports on salmon including expert evaluation and a summary list of potential emerging risks

The results from this contract regularly feed into the ongoing EFSA project AQUARIUS

Integration with the Machine learning project (AMU Unit) as case study for the validation of the applicability of machine learning techniques on expert review for systematic reviews



Final thoughts



WHAT HAS WORKED

Identification of relevant issues

- Expertise and networking are a vital part of the process, particularly for filtering signals
- Sharing information without creating unnecessary scares
- Focused monitoring and follow-up activities





- Keep the aim focused (and defining success)
- How to handle uncertainty
- It is not only about preparing for risk assessment
- Avoided risks are often "invisible"





We cannot isolate ourselves:

- New food safety problems will occur, often through very unexpected routes;
- Networking is key as the answers may already be out there;
- Use of new technologies to assist the emerging risk identification process;
- > A mixed approach: expert knowledge & new technologies



Examples of emerging issues



Some examples from 2015

Issues discussed at StaCG-ER:

- Xylella fastidiosa (StaCG-ER)
- Food safety and nutritional risk for allergic consumers-lack of guidance on allergen action level and agreed upon methodologies StaCG-ER)
- **B**iphenyl, **a**nthraquinone and **2-p**henylphenol (StaCG-ER)
- Possible associations between post mortem lesions and organic pig production systems (StaCG-ER)
- Potential risks associated with the uses of **seaweed**

Some of the issues discussed at Emerging Risk Exchange Network (EREN):

- Long term effects of food emulsifiers on intestinal barriers
- Increase of deoxynivalenol and zearalenone levels in Italy in 2014
- Outbreaks related to the consumption of raw beetroot
- Consumption of bitter apricot kernels and bitter almonds
- Fluorinated alternatives to PFAS





Some examples from 2016

Issues discussed at (StaCG-ER)

- Level playing field in aquaculture (StaCG-ER)
- Abnormal increase of megaoesophagus cases in Latvian dogs (StaCG-ER)
- Bovine leukaemia virus associated with breast cancer (StaCG-ER)



Some of the issues discussed at Emerging Risk Exchange Network (EREN) :

- Circular economy –pollution from waste to fertiliser to the food chain
- Recycled electric and electronic plastics
- Echinococcus multilocularis eggs on vegetables and berries grown close to the ground
- Risks associated with the use of aloe plant extracts in food or as food
- Adulterated food supplements on sale via internet



Some examples from 2017

Issues discussed by StaDG-ER members)

- African Swine Fever assessment of biosecurity in pig herds
- Potential risk associated to the increased use of meat and bone meal as feed materials
- Food defence and bioterrorism- adequacy of the EU regulatory framework
- Potential risk related with "high level/content of nutrients in fortified foods

Some of the issues discussed at Emerging Risk Exchange Network (EREN) :

- Nanoemulsions in the food sector
- Possible epidemic of wheat stem rust and yellow rust in the 2017 crop season
- Foodsharing Food collection points
- Shiga toxin-producing E. coli O121 in flour
- Increase of human infections with azol-resistant Aspergillus spp. presumably driven by agricultural practices







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Emerging risks

The successful identification of emerging risks is at the heart of protecting public health and the environment. By identifying emerging risks in the food chain early, EFSA supports risk managers in anticipating risks and taking effective and timely prevention measures to protect consumers. Identifying emerging risks also helps to improve EFSA's ability to meet future risk assessment challenges. EFSA defines an emerging risk 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."

Networks

Activity reports Methodologies Co

ologies Completed work

Emerging risk identification is a complex process requiring broad expertise and close cooperation with Member States, stakeholders, and EU and international agencies. Dedicated networks provide the structures needed to exchange experience, methods and data and to assess emerging issues.

- Emerging Risks Exchange Network
- Discussion Group on Emerging Risks

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EFSA Staff

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- Emerging Risks Exchange Network
- Stakeholders discussion group
- JRC
- DG SANTE
- ECDC
- **FAO.....**





THANK YOU