

Bundesinstitut für Risikobewertung

FoodChain-Lab – an innovative tool to increase food safety through supply chain analyses



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Globalised food supply chains

Challenges

Globalised supply chains facilitate

- Outbreaks (fast and thorough spread of contaminated food items)
- Food fraud

Globalised supply chains increase

 Complexity of risk/ exposure assessments



Ercsey-Ravasz M et al. (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

Solution

- **Trust** as a prerequisite for international food trade
- Trust achieved through
 - → Harmonization of food safety standards and analytical methods
 - \rightarrow Transparency (traceability of food)



Tracing investigations - the past





Tracing investigations - the past



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Local foodborne outbreak



- mistake during preparing
- single source, exists only for short time
- high dosis
- high rate of infection
- local accumulation of cases
- local investigation

e.g. street vendor





- Contamination during production/processing
- Diffuse distribution of cases
- Low dose
- Low infection rate
- Complex investigation





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The outbreak investigation teams can only see cases





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The outbreak investigation teams can only see cases

Interview: Who ate what, when, where, how much and how?

 \rightarrow Suspicious product?





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After the outbreak = Before the outbreak

Weiser et al., 2013: "Trace-Back and Trace-Forward Tools Developed Ad Hoc and Used During the STEC O104:H4 Outbreak 2011 in Germany and Generic Concepts for Future Outbreak Situations", Foodborne Pathog Dis.

Weiser et al., 2016: "FoodChain-Lab: a trace-back and trace-forward tool developed and applied during food-borne disease outbreak investigations in Germany and Europe", PLoS ONE.

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Framework Partnership Agreement EFSA and BfR to work jointly on global food safety tools

Title: Risk Assessment Tools for the Safety of Global Food and Feed Supply Chains (Number: GP/EFSA/AMU/2016/01)

- ED visit to Germany on 30th October 2014
- Framework Partnership Agreement, signed on 8th December 2016





- Description: Trace-back and predictive modelling tools for use during food safety outbreaks and created by scientific teams led by the German Federal Institute for Risk Assessment (BfR) will be further rolled out under a new funding partnership agreed between EFSA and BfR. The two agencies will be able to further benefit from each other's research efforts and avoid duplication of future work programmes.
- Life span: 4 years
- Press releases: <u>https://www.efsa.europa.eu/en/press/news/161208</u> http://www.bfr.bund.de/cm/349/efsa-and-bfr-to-work-jointly-on-global-food-safety-tools.pdf



FoodChain-Lab – What is it?

- Tool to trace back and forward suspicious food items along complex supply chains to help solving foodborne disease outbreaks
- Open source Software

https://foodrisklabs.bfr.bund.de

- Database for managing food tracing data
- Data processing
 - Cleaning/validation (e.g. duplicate detection)
 - Enrichment (e.g. geocoding)
- Tool for visualisation and interactive reasoning
 - Automated visualisations according to nature of the delivery relations
- Analyses/simulations
 - Tracing, scoring, clustering, cross contamination, etc.
- Facilitates decisions/prioritisation/ interactive reasoning





Basis for data assessment



REGULATION (EC) No 178/2002, Article 18, Traceability

The traceability of food and feed shall be established at all stages of production, processing and distribution.

Food and feed business operators shall be able to identify their direct suppliers and their direct customers. They shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.



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FoodChain-Lab

Scoring



- Visualization of backward / forward "trace"
- Simulations based on
 - Cross Contamination
 - Regional Effects (e.g. environmental contamination)
 - Weights for Outbreak Stations
- Tracing score as simulation result
 - \sim likelihood a station is involved in the outbreak







The graphical view on the food supply chain







Actors in the food supply chain







The database behind: Stations (Status)





The database behind: Cases (Epi connection)



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Food

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Food Chain La

The database behind: Deliveries (Transaction)







The database behind: Multiple deliveries







Tracing back the food of a case







Trace forward the products of a supplier







The view on each delivery

Show Deliveries without Date Show Deliveries until: 2014-09-05 trawberries awherries trawherries rozen Strawberries rozen Strawberries G1 MED eat Bro Sugar anrika Nople Sweet Cur All deliveries are shown Stations Deliveries Outbreak Ou + Observed Observed Forward Trace Forward Trace Backward Trace Backward Trace Created with >>>> FoodChain-Lab by T BFR Cross Contamination





The supplier and customers of one delivery







This delivery went into the storage...







Showing all deliveries of strawberries







The timeline: 12th August 2014



The timeline: 21st August 2014

The timeline: 28th August 2014

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The timeline: 31st August 2014

The timeline: 2nd September 2014

The timeline: 4th September 2014

Identification of a "Hot Spot"

Aggregation of information

Switching between network and map view

FoodChain-Lab Data Enrichment – Geocoding

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5	Stillfriedstraße	1	72379	Hechingen			DE			
6	Steinbeisstraße	1	72501	Gammertingen			DE			
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Available Providers:

- (Google)
 - $\circ~$ Web service
- MapQuest
 - Web service with open data
- Gisgraphy
 - Locally installable
 - Data stays confidential
 - $\circ \ \ \text{Unlimited requests}$

Successful applications of FoodChain-Lab

FoodChain-Lab rapid deployment team

Support in tracing analysis needed? Please contact foodrisklabs@bfr.bund.de or +49 30-18412-88888

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Outlook

FoodChain-Lab – Where does the road take us?

RŧR

- Implementation as web app
 - Browser-based
 - Easy and intuitive user interface, visualisation and analysis tools
 - Additional automated layout styles
 - JSON-based data exchange with FCL desktop version
 - Data remains on client side to ensure data protection (future: central data management)

https://foodrisklabs.bfr.bund.de/fcl-web-app/

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- Support more data formats
- Working groups
 - ALB defining a standard data format (DE)
 - Data format for EU

Outlook

FoodChain-Lab – Where does the road take us?

- Simplification of data collection
 - browser-based data collection form (cooperation with North-Rhine Westphalia) with onsite plausibility checks, interfaces to master data bases and RASFF system → potential German-wide/EU-wide application if requested
 - event-driven automated retrieval of delivery information from industry
- Centralized data management
- Improved automated layout styles
 - farm-to-fork
 - "Visio" style for simplified reporting

Benefits of using FoodChain-Lab

- Unifies all available tracing information in one database and visualization
- All steps integrated in one modular framework
 - Data Management
 - Data Cleaning
 - Data Analysis (automated, calculation of scores)
- Helps during Outbreak Investigation
 - Assists in Brainstorming / Prioritizing
 - Identifies missing data
 - \circ $\;$ Tests hypotheses and generates new ones
- Support through FCL rapid deployment team

https://foodrisklabs.bfr.bund.de

FoodChain-Lab software to download Tutorials, scenario, events/workshops

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Workshops

free of charge

Content:

Basic training

- Introduction into tracing and the software FoodChain-Lab
- Live demonstrations
- Intensive hands-on training (interactive tutorials, working on a fictitious outbreak scenario)

Advanced training

- Participants present their institutional tracing practice and share supply chain data
- Work on tracing issues relevant for one or more of the participating countries

Recent and upcoming workshops and workshop materials can be found on https://foodrisklabs.bfr.bund.de/events/

Workshops

Recent:

- Country-specific workshop (2017: UK, 2018: HU, AT)
- International workshop (2017: Berlin)
- May 2018: ECDC-EFSA joint workshop on "Preparedness for a multi-national food safety-public health incident" in Vienna
 - session on tracing and FoodChain-Lab
 - involvement in conducting the food/tracing part of the interactive crisis training

Upcoming:

- 3rd 5th Dec. 2018: International FoodChain-Lab workshop in Parma, Italy
- Summer 2019: EFSA-BfR joint workshop on crisis preparedness in Berlin
 - focus on tools (e.g. FoodRiskLabs)

Your country? Please contact foodrisklabs@bfr.bund.de

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Thank you for your attention

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