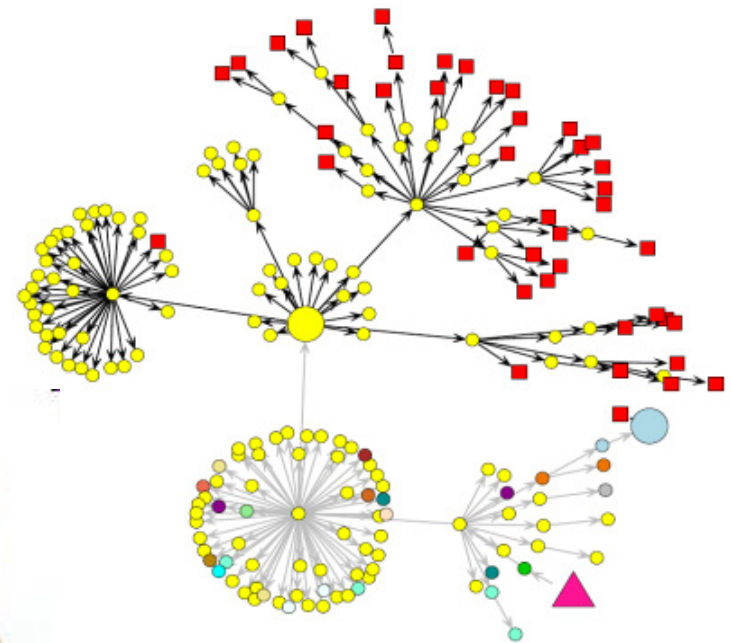


## FoodChain-Lab: an innovative tool to increase food safety through supply chain analyses



Marion Gottschald, Alexander Falenski, Marco Rügen, Birgit Lewicki, Isaak Gerber, Dominic Tölle, Annemarie Käsbohrer and Armin A. Weiser

# Globalised food supply chains

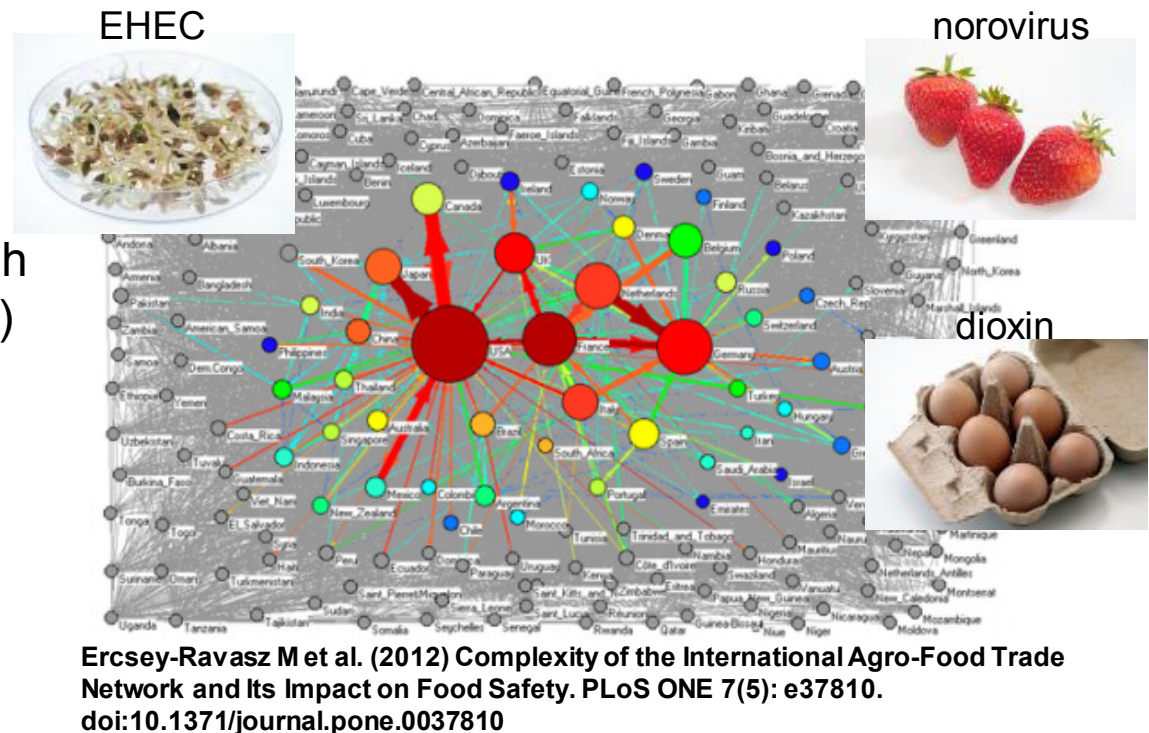
## Challenges

Globalised supply chains **facilitate**

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

Globalised supply chains **increase**

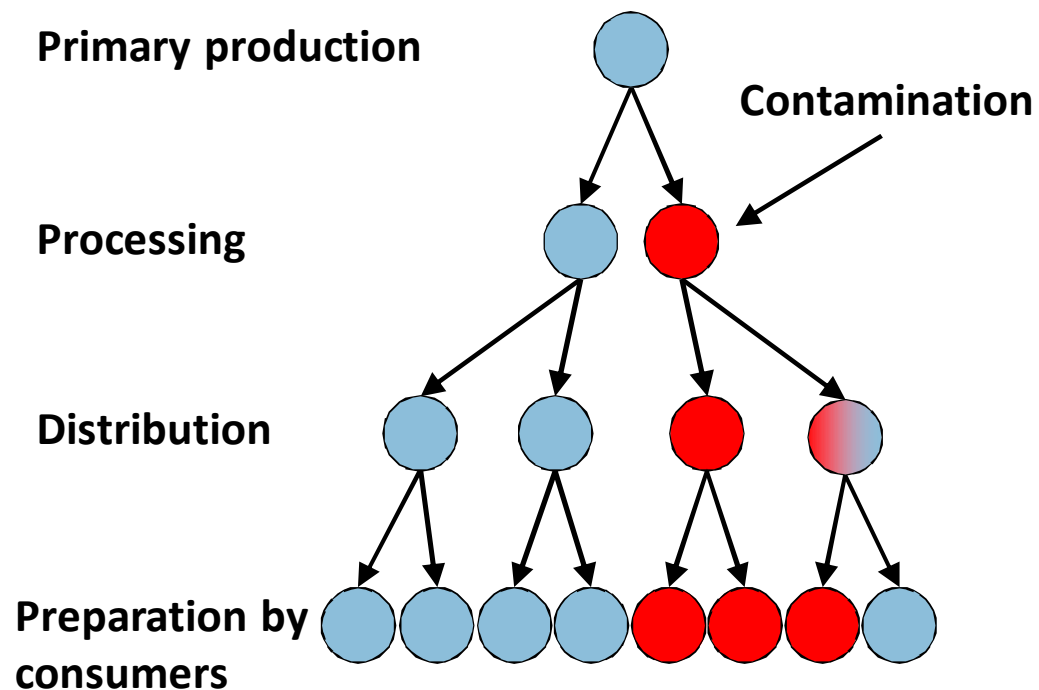
- Complexity of risk/exposure assessments



➡ Importance of e-tools

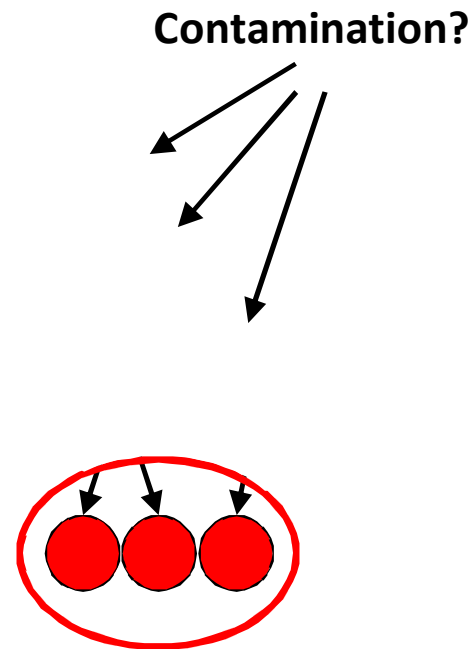
# Traceability in foodborne crises

Foodborne disease outbreak affecting multiple locations/countries



# Traceability in foodborne crises

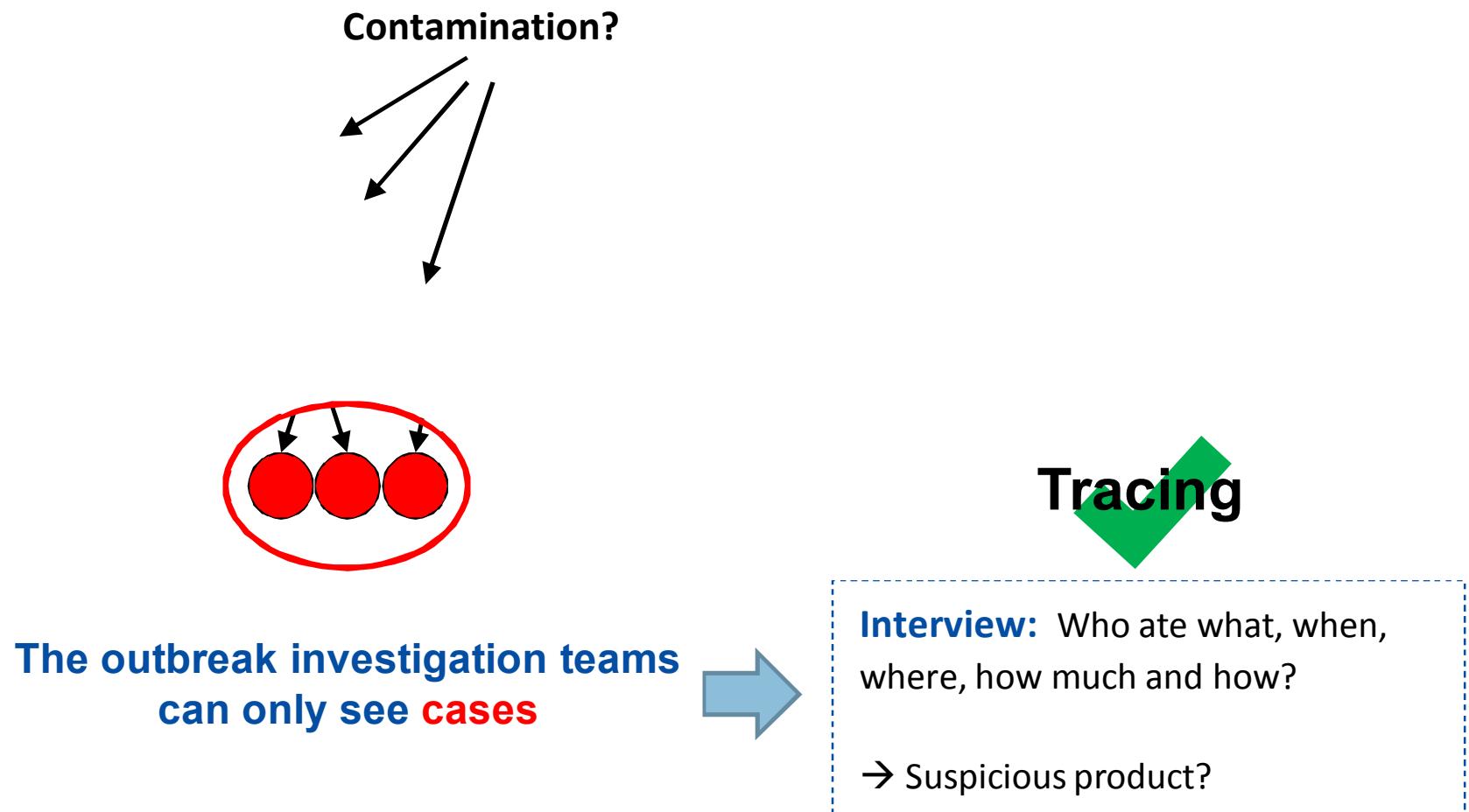
Foodborne disease outbreak affecting multiple locations/countries



The outbreak investigation teams  
can only see **cases**

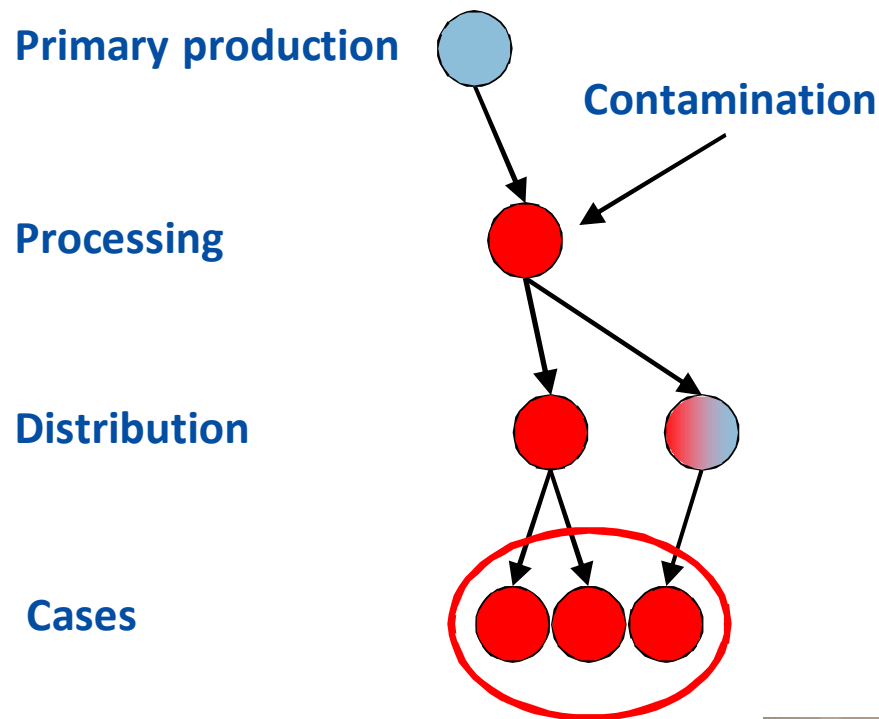
# Traceability in foodborne crises

Foodborne disease outbreak affecting multiple locations/countries



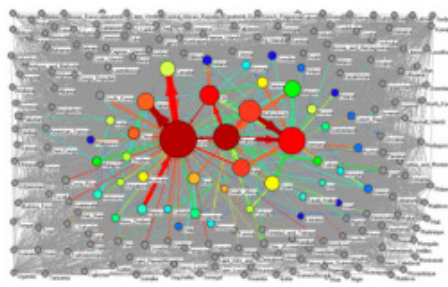
## Traceability in foodborne crises

## Foodborne disease outbreak affecting multiple locations/countries

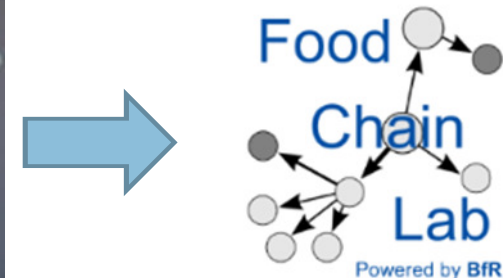


## Backtracing

- Step-by-step upstream the supply chain (REGULATION (EC) No 178/2002)
- Collecting delivery data for suspicious products and their ingredients
- Combine fragmented information
- Origin of contamination?



Ercsey-Ravasz M et al. (2012). PLoS ONE 7(5): e37810. Doi:10.1371/journal.pone.0037810



# FoodChain-Lab – What is it?

- Tool to trace back and forward suspicious food items along complex supply chains to help solving foodborne crises (outbreaks, chemical contaminations)
- Free open source Software

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



# FoodChain-Lab – What is it?

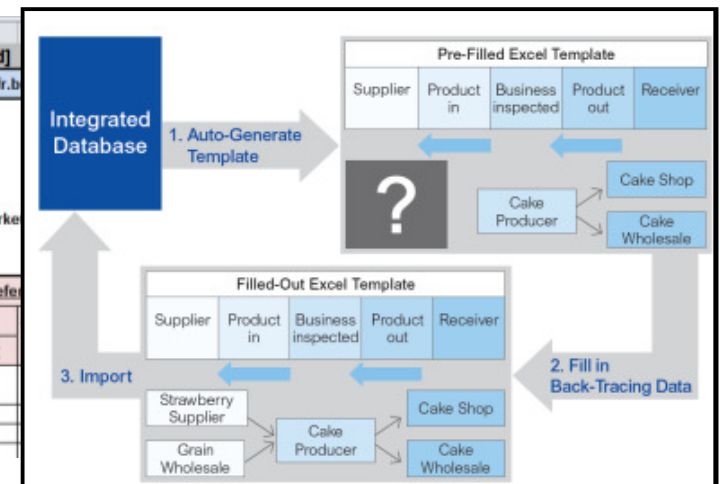
- Tool to trace back and forward suspicious food items along complex supply chains to help solving foodborne crises (outbreaks, chemical contaminations)

- Free open source Software

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

- Database for managing food tracing data

A	B	C	D	E	F	G	H	I	J	K
1	Anzufragender Betrieb:	Fall 1	[Adresse]	[Land]						
2	Bei Rückfragen bitte einfach Kontakt aufnehmen mit dem BfR FoodRiskLabs-Team, +49 (30) 18412-4444, foodrisklabs@bfr.bund.de									
3	Produkte im Fokus:	relevanter Zeitraum des Verkaufs:	Erkrankungsbeginn (EB):							
4			21.07.2017							
5										
6	Bitte alle angelieferten Produkte chargengenau erfassen, auf die die Produktbeschreibungen passen und die in dem relevanten Zeitraum verkauft worden sind									
7	Sollten weitere Informationen vorliegen zurück bis zum Hersteller - bitte als neue Zeile miterfassen und im Kommentarfeld aussagekräftig vermerken auf welche Lieferke bezieht									
8	Sollte der Lieferant der Hersteller des Produktes sein, bitte im Kommentarfeld vermerken									
9	Lieferant			Produkt		Lotinformation		Lieferdatum		
10	Name	Adresse (Straße Hausnummer, PLZ, Ort)	Land	Betriebsart	Bezeichnung	EAN	Chargennummer	MHD oder Verbrauchsdatum	Tag	Monat
11										
12	Tante Emma Laden	Musterstraße 1, 12345 Musterstadt	DE		gemischtes Hackfleisch					
13										
14										
15										





# FoodChain-Lab – What is it?

- Tool to trace back and forward suspicious food items along complex supply chains to help solving foodborne crises (outbreaks, chemical contaminations)

- Free 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)

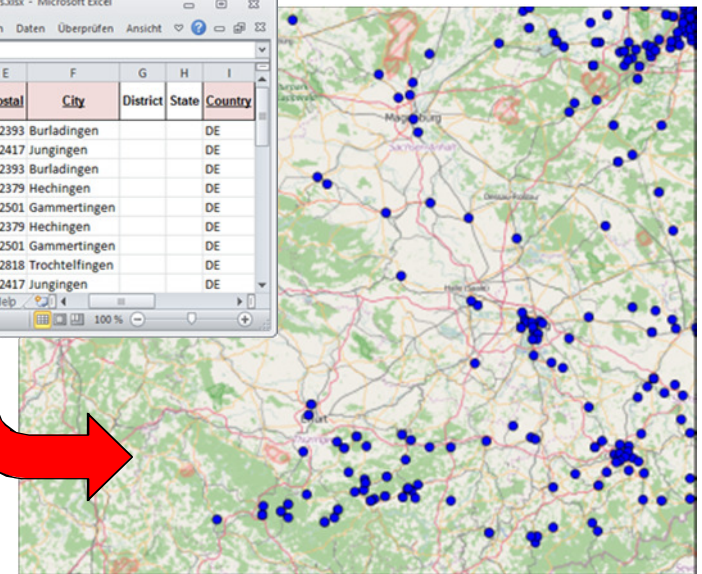
M A Y O N N A I S E  
= = = = = - = = = =

M A Y O N A I S E

B I O M R A K T  
= = = = - - = =

B I O M A R K T

	Street	Street Number	Postal	City	District	State	Country
1	Kantstraße	1	72393	Burladingen		DE	
2	Heuweg	1	72417	Jungingen		DE	
3	Lichtensteinweg	1	72393	Burladingen		DE	
4	Stillfriedstraße	1	72379	Hechingen		DE	
5	Steinbeisstraße	1	72501	Gammertingen		DE	
6	Gammertinger Straße	1	72379	Hechingen		DE	
7	Hechinger Straße	1	72501	Gammertingen		DE	
8	Schillerstraße	1	72818	Trochtelfingen		DE	
9	Brunnenstraße	1	72417	Jungingen		DE	
10							



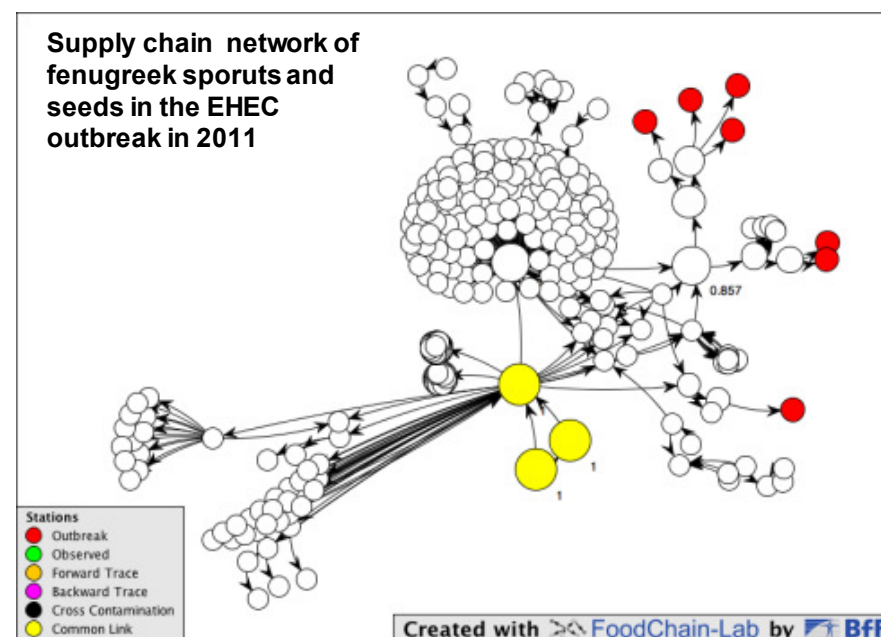
# FoodChain-Lab – What is it?

- Tool to trace back and forward suspicious food items along complex supply chains to help solving foodborne crises (outbreaks, chemical contaminations)

- Free 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)
- Visualisation and interactive reasoning
  - Automated visualisations according to nature of the delivery relations



**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.** 2013.

**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.**

# FoodChain-Lab – What is it?



- Tool to trace back and forward suspicious food items along complex supply chains to help solving foodborne crises (outbreaks, chemical contaminations)

- Free 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)

- Visualisation and interactive reasoning

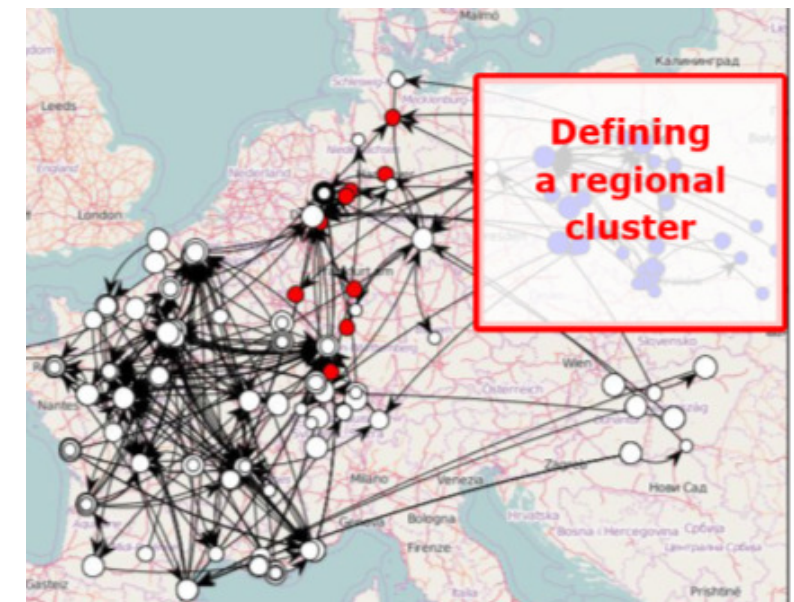
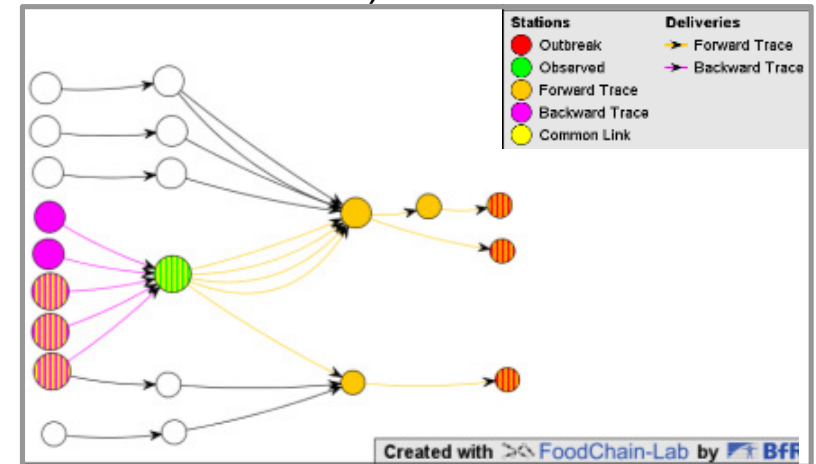
- Automated visualisations according to nature of the delivery relations

- Analyses/simulations

- Tracing, scoring, clustering, cross contamination, etc.

**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.** 2013.

**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**.



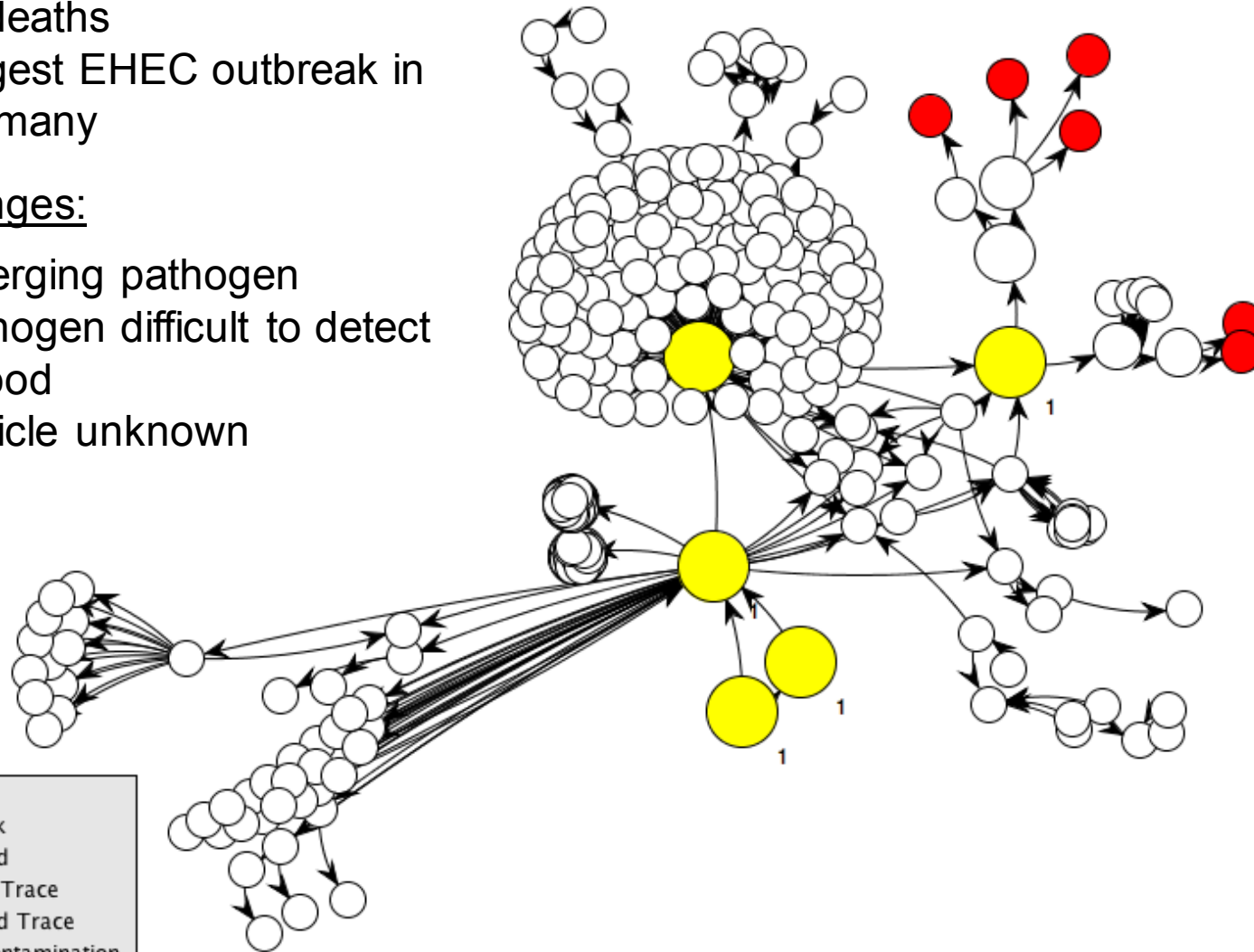
# Successful applications of FoodChain-Lab

## EHEC 2011

- Over 4000 cases (HUS + gastroenteritis)
- 53 deaths
- Biggest EHEC outbreak in Germany

### Challenges:

- Emerging pathogen
- Pathogen difficult to detect in food
- Vehicle unknown



Stations	
Red circle	Outbreak
Green circle	Observed
Yellow circle	Forward Trace
Pink circle	Backward Trace
Black circle	Cross Contamination
Yellow circle	Common Link

Created with  FoodChain-Lab by  BfR

## Other applications

DE:

Norovirus 2012

Salm M. 2015

EHEC 2017

Fipronil 2017

EU:

HAV 2013/14

C. Bot. 2017 (Plötze)

Salm 2017 (Sesam)

UK:

EHEC 2016

AT:

Listeriosis 2015-17



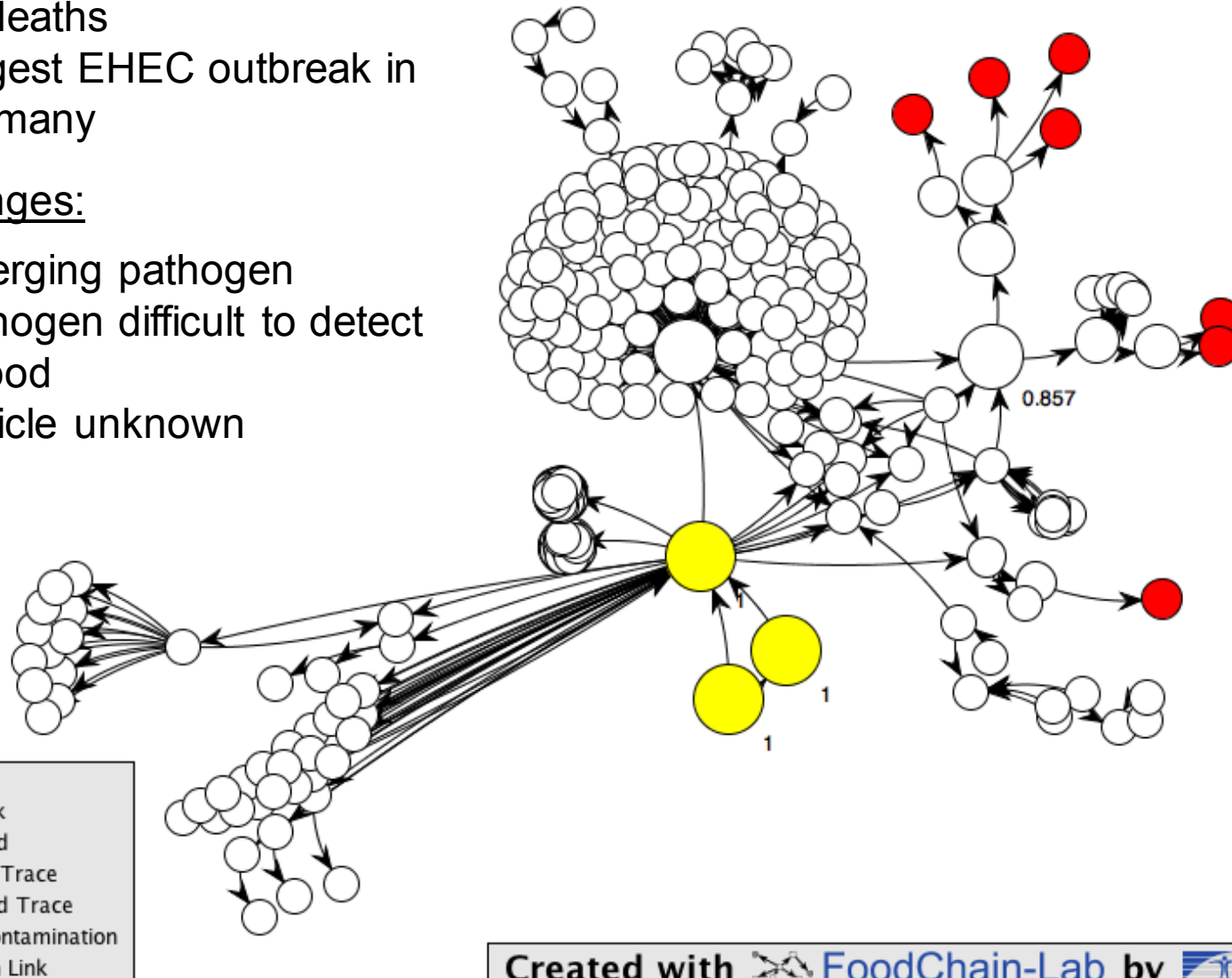
# Successful applications of FoodChain-Lab

## EHEC 2011

- Over 4000 cases (HUS + gastroenteritis)
- 53 deaths
- Biggest EHEC outbreak in Germany

### Challenges:

- Emerging pathogen
- Pathogen difficult to detect in food
- Vehicle unknown



## Other applications

DE:

Norovirus 2012

Salm M. 2015

EHEC 2017

Fipronil 2017

EU:

HAV 2013/14

C. Bot. 2017 (Plötze)

Salm 2017 (Sesam)

UK:

EHEC 2016

AT:

Listeriosis 2015-17

# FCL support team

→ in the framework of EFSA-BfR cooperation

Autonomous application of FCL  
during outbreak investigations:  
→ UK, AT, HU

## Recent:

- 2017: forward tracing of eggs and egg products contaminated with fipronil
- 2017: backtracing of minced meat and sausages during EHEC outbreak in Germany
- 2018: forward tracing analysis in listeriosis outbreak in Austria to associate location of cases with distribution of the suspect products

## Current:

- tracing analysis in multicountry Salmonella Enteritidis outbreak (NO, DE, LU, UK)

## Near future (decision pending):

- forward tracing analysis in listeriosis outbreak in North Rhine-Westphalia;
- multicountry HAV outbreak
- listeriosis outbreak in Germany

**Support needed?**

**Please contact [foodrisklabs@bfr.bund.de](mailto:foodrisklabs@bfr.bund.de) or +49 30-18412-88888**

## FoodChain-Lab – Where does the road take us?



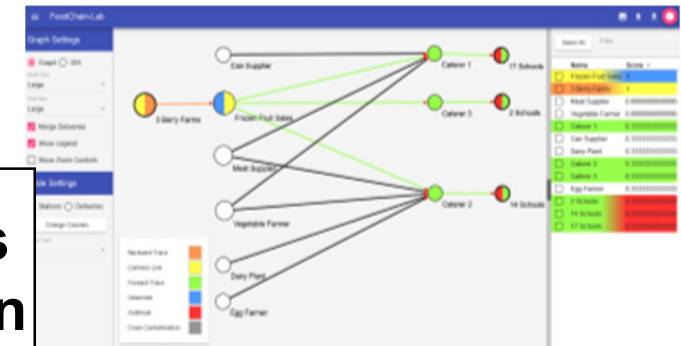
# The Tracing (Web-) Portal

outgoing goods		incoming goods	
Recipient	Product detail	Current dataset	Connectivity solutions
Product name:	Mehl	Product amount:	10000
Trade name:	Vollkornmehl	Amount unit:	Stück (0: null)
Article number:	47200	Number of trading units:	Number of trading units
EAN code:	EAN code	Trading unit name:	Trading unit name
Lot:	ZM170422	BEO:	800-Chemical (1) MEK 2008 null/null/null
Comment:	Comment		

# Data Collection

RASFF  
Local  
Bulk

# Data Analysis & Visualization

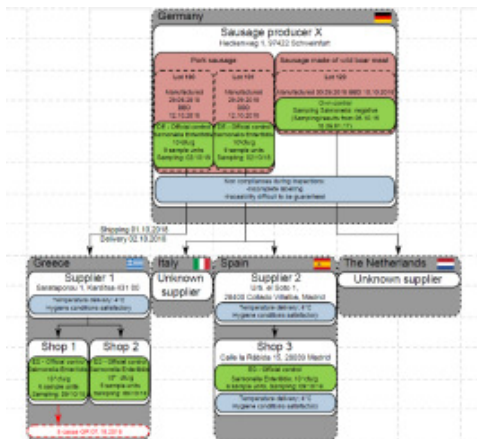


## Reporting

## Sync with Desktop App



<https://fcl-portal.bfr.berlin/>





# Outlook

## FoodChain-Lab – Where does the road take us?



- **Implementation as FCL web application**
  - 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://fcl-portal.bfr.berlin/>

# Outlook

## FoodChain-Lab – Where does the road take us?

**The local view – Improved quality of tracing data through guided data assessment (local authorities):**

### Development of a browser-based data collection form

- Initiative of German Federal State North-Rhine Westphalia in cooperation with BfR, EFSA, BVL
- Guided data assessment
- On-site plausibility checks
- Interfaces to registers providing master data and RASFF system
- To be applied during foodborne events/crises
- Developed in a way to allow a potential German-wide/EU-wide application if requested
- 2019: test pilot version data entry mask in real-world tracing exercise

Warentemplate Erfassungstool Neues Template laden | Export

Fall: 2018-4 - Salmonella in Finkeis Zusammenfassung

Status: In Bearbeitung Auftragsnummer: 2018-1211 Ersteller: Mr. Meier  
Betriebsname: FinEggs Erstelldatum: 20.2.2019 Erfassungsort: Stadt Gelsenkirchen, Referat Veterinär- und Lebensmittelüberwachung

Warenausgang Wareneingang Wareneingang

Empfänger Produkt Details Aktueller Datensatz Wareneingang Wareneingang

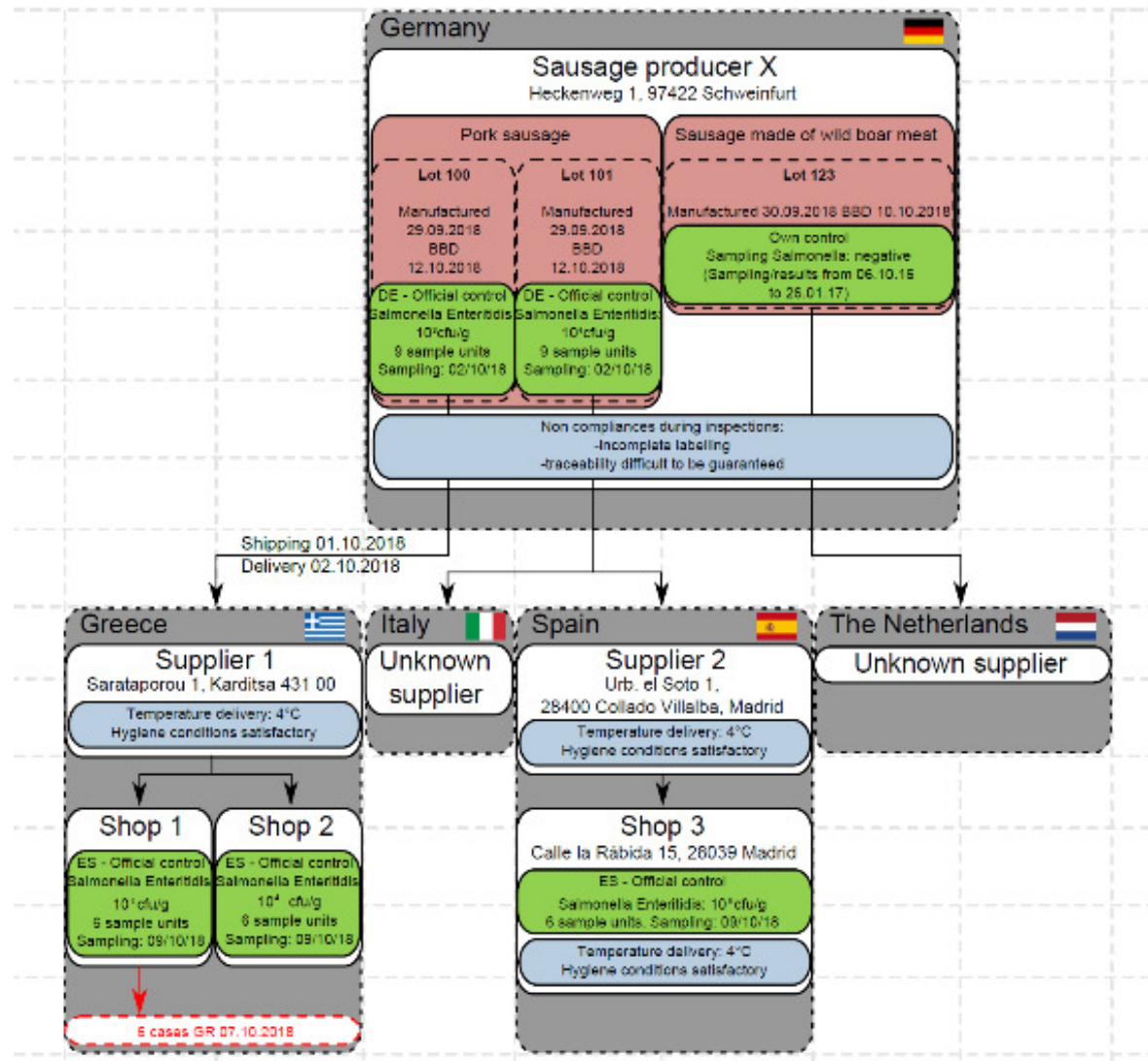
Name des Empfängers: FinEggs Warenausgangsdatum: 20.02.1990  
EG Zulassungsnummer: DE-0123122 Lieferscheinnummer: Lieferscheinnummer  
Betriebsart: Bäckerei  
Straße, Nr.: dampfstr. 1 PLZ: 50090  
Ort: Köln Staat: Deutschland  
Kommentar: lecker

Hinweis: Keine Änderungen möglich! Sie können aber einen Kommentar verfassen

BfR - Bundesinstitut für Risikobewertung Landesamt für Natur, Umwelt und Verbraucherschutz NRW  
Version 4.1 Last changes: 25.11.2018

# Outlook

## FoodChain-Lab – Where does the road take us?



# 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
  - Tests hypotheses and generates new ones
- Support through FCL support team

<https://foodrisklabs.bfr.bund.de> FoodChain-Lab software to download  
Tutorials, scenario, events/workshops

**FoodRiskLabs**

FoodChain-Lab  
Predictive Microbial Modeling Lab (PMM-Lab)  
FoodProcess-Lab  
SiLeBAT News Radar  
Warenstrom-Info  
BfR-Produktschutz-Checkliste  
Kontakt  
Veranstaltungen

Search ...

**FoodRisk-Labs** Powered by **BfR**

FoodRisk-Labs ist ein Portal  
für die vom Bundesinstitut für Risikobewertung (BfR)  
entwickelten Software Tools:

**Food Chain Lab** Powered by BfR  
**PMM-Lab** Powered by BfR  
**Food Process Lab** Powered by BfR

SiLeBAT News Radar  
Warenstrom Info  
BfR Produktschutz Checkliste



**FoodChain-Lab Team**  
Tel. +49 30 - 184 12 – 88888  
[foodrisklabs@bfr.bund.de](mailto:foodrisklabs@bfr.bund.de)  
<https://foodrisklabs.bfr.bund.de>



**Thank you for your attention**

**Marion Gottschald**

**Federal Institute for Risk Assessment**

Max-Dohrn-Str. 8-10, 10589 Berlin, GERMANY

Tel. +49 30 - 184 12 - 0

Fax +49 30 - 184 12 - 99099

[bfr@bfr.bund.de](mailto:bfr@bfr.bund.de)

[www.bfr.bund.de](http://www.bfr.bund.de)



**FoodChain-Lab Team**

Tel. +49 30 - 184 12 - 88888

[foodrisklabs@bfr.bund.de](mailto:foodrisklabs@bfr.bund.de)

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