

FoodChain Lab Training, Luxembourg, 21st January 2020
10:30 – 11:15



**The challenge
to trace the source
of contamination
in the international
food and feed supply chain**


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Trusted science for safe food



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- EFSA's role in tracing outbreaks
- Complexity of Tracing
 - 1st step: Processing
 - 2nd step: Transport
 - 3rd step: Information flow
 - Granularity
- The revised data model

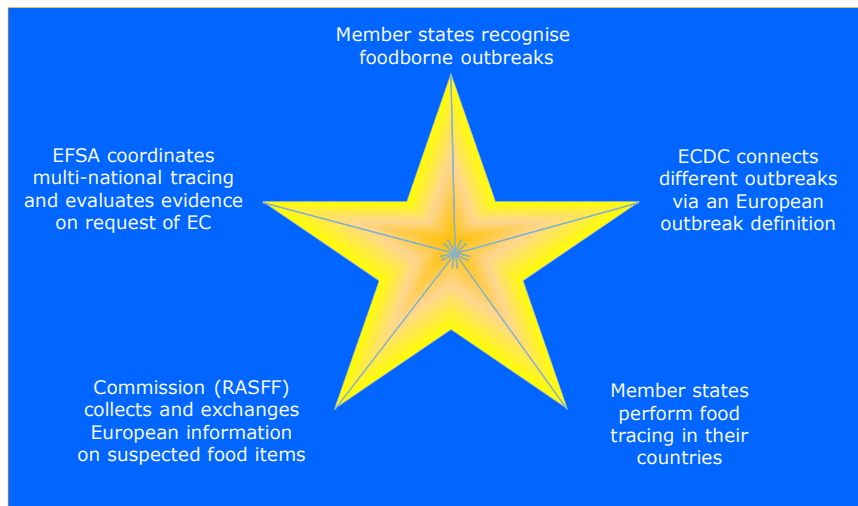
EFSA's Mandate



EFSAs role in outbreak investigations



When EFSA gets involved...



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Mandate for foodborne outbreaks



In accordance with article 31 of EU Regulation 178/2002, EFSA is requested to provide scientific assistance in the area of food-borne outbreak investigation. In particular, EFSA is requested to: (...)

2. When more information on a specific outbreak becomes available, and upon specific request of the Commission, to further collaborate with ECDC in the food-borne outbreak assessment by providing **in-depth analysis of the food data including the robustness of the link to the suspected food source**, based on epidemiological data.
3. **Upon specific request** of the Commission, to **provide technical assistance to the Commission in its conduct of tracing-back and forward analysis** of incriminated batches of animals, food or feed in the affected Member States. (...)

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Perspectives



Tracing is in all interest

Industry

- Optimization
- Ensure supply
- Ensure quality

Consumer

- Guarantee origin
- Ensure quality
- Ensure sustainability

Administration

- Ensure food safety
- Prohibit food fraud
- Ensure food security

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Motivation of Traceability Systems



- Production optimisation / competitive advantages
- Quality assurance / certification
- Sustainability / animal welfare
- Chain communication / trade globalisation
- Food safety / legislation
- Bioterrorist threats

Reference: Karlsen et al. (2013)

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Perspectives



Tracing is in all interest

Industry

- Optimization
- Ensure supply
- Ensure quality

Tracking

Consumer

- Guarantee origin
- Ensure quality
- Ensure sustainability

Certification

Administration

- Ensure food safety
- Prevent food fraud
- Ensure food security


Recall
Tracing

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General Food Law / EC regulation 178/2002



Article 3(15):


Traceability means the ability to trace and follow
a food, feed, food-producing animal
or substance intended to be, or expected to be
incorporated into a food or feed,
through all stages of production, processing and
distribution.

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Several Definitions of traceability



But one important distinction¹:

“**Tracking** is the informative process by which a product is followed along the supply chain keeping records at each stage, (...)” (Prospective data collection)

“**Tracing** is defined as the ability of reconstructing the history of a product, identifying its origin (...)” (Retrospective data collection)

Forward Tracing

Backward Tracing

Recall	Tracking
Tracing	
Retrospective	Prospective


¹ Pizzuti & Mirabelli (2015): The global track&trace system for food

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Several Definitions of traceability



- **Product traceability** is the reconstruction of the physical product flow, the location of a product at any stage of the food supply chain.
- **Process traceability** is the reconstruction of all transformations of the product, including interactions with physical/mechanical, chemical, and environmental factors.
- **Genetic traceability** is the reconstruction of the genetic constitution of ingredients of the product. This is used to identify ingredients, their origin, or if they are genetically modified.
- **Inputs traceability** is the reconstruction of types, source and supplier of all ingredients used during production and processing.
- **Disease and pest traceability** reconstructs the epidemiology of pests and biotic hazards that may contaminate food or feed.
- **Measurement traceability** is the reconstruction of data and quality of measurements.

Reference: Opara (2003)

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Several Definitions of traceability



There exist no common definition of traceability, but several approaches¹

Working definition of (product) traceability

Traceability is defined as the ability to retrospectively follow the movement of food, feed, food-producing animal or substance intended to be, or expected to be incorporated into or in contact with food or feed, through all stages of production, processing and distribution by means of recorded data.

¹ Olsen & Borit (2012): How to define traceability

General Food Law / EC regulation 178/2002



Article 18: 1-step back/ 1-step forward traceability

1. The traceability of food, feed, food-producing animals, and any other substance intended to be, or expected to be, incorporated into a food or feed shall be established at all stages of production, processing and distribution.

"Traceability of food should be established at all stages of production, processing and distribution"

2. Food and feed business operators shall be able to identify any person from whom they have been supplied with a food, a feed, a food-producing animal, or any substance intended to be, or expected to be, incorporated into a food or feed. To this end, such operators shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.

"Food business operators shall be able to identify any supplier"

3. Food and feed business operators shall have in place systems and procedures to identify the other businesses to which their products have been supplied. This information shall be made available to the competent authorities on demand.

"Food business operators shall be able to identify any client"

4. Food or feed which is placed on the market or is likely to be placed on the market in the Community shall be adequately labelled or identified to facilitate its traceability, through relevant documentation or information in accordance with the relevant requirements of more specific provisions.

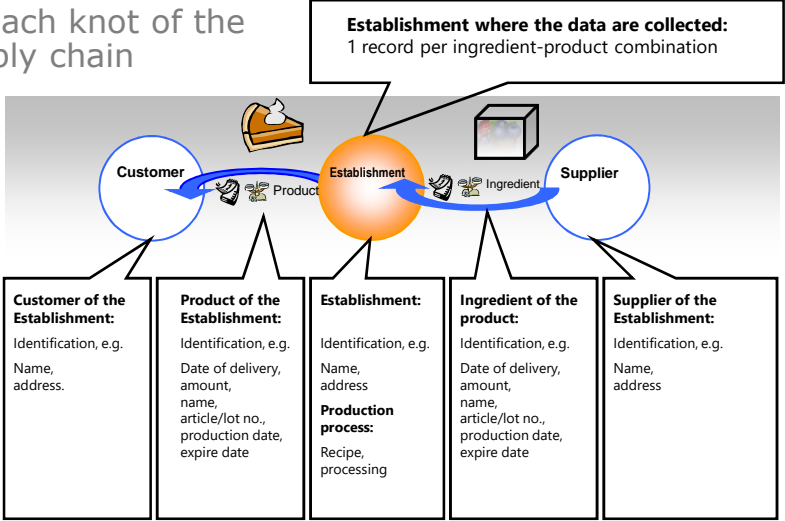
"Food shall be adequately labelled or identified to facilitate its traceability"

5. Provisions for the purpose of applying the requirements of this Article in respect of specific sectors may be adopted in accordance with the procedure laid down in Article 58(2).

Data Collection for Tracing



Data at each knot of the food supply chain



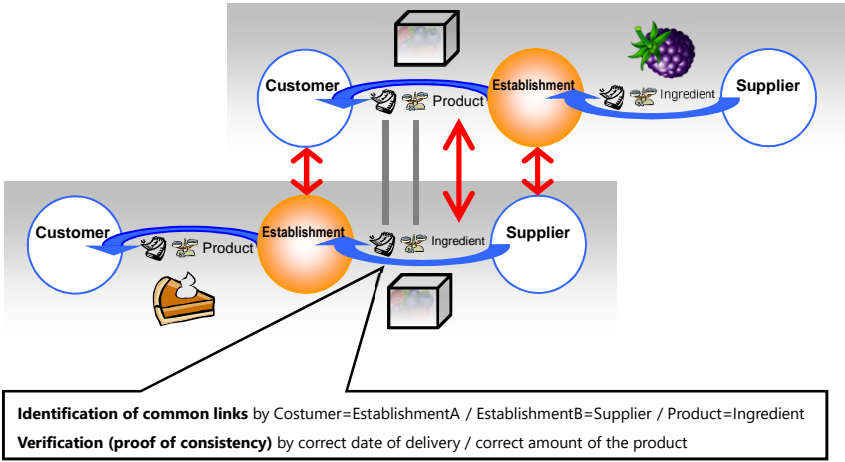
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Data Analysis: Building the Food Chain



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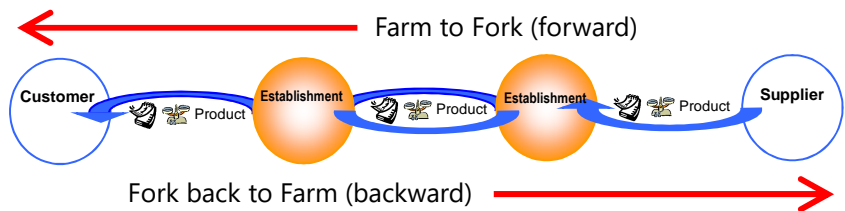
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Result: The Food Supply Chain



Results per analysis:

- Already established parts of the food supply chain
- Open knots (establishments) with missing data
- Missing amount of material (lost in tracing)



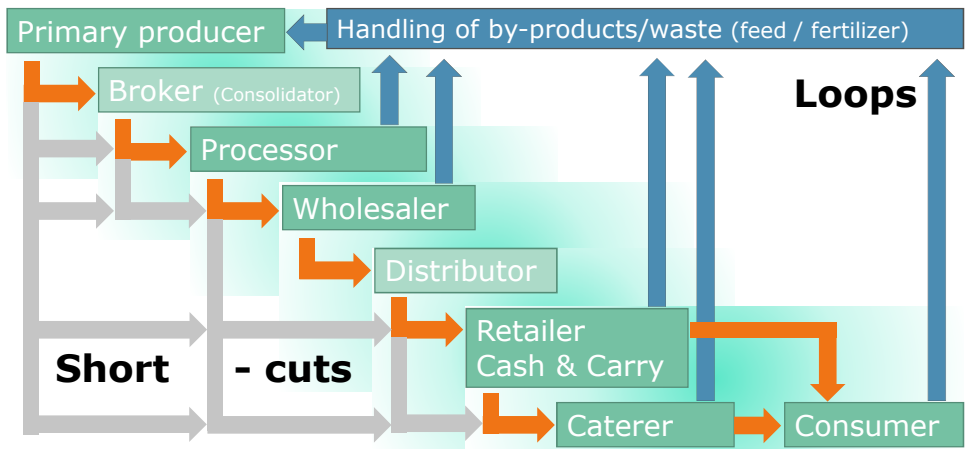
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A Food Chain with its stages / actors



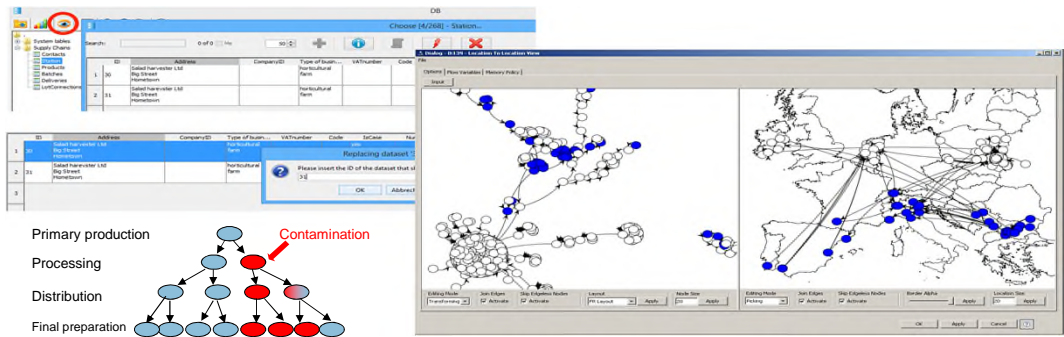
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Tool: Food-Chain-Lab



- Specialized software:
- collects data in the right structure / performs data validation
 - filters and visualizes food supply networks
 - performs data analysis: Scoring, cross-contamination, regional analysis

BfROpenLab: <http://silebat.github.io/BfROpenLab/>
Support / contact: Marion Gottschald marion.gottschald@bfr.bund.de
Authors: A Weiser, et al., German Federal Institute for Risk Assessment (BfR), Ber

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The Complexity



The Start: DEMOS Project

Review of tracing methodologies

- General data structure to collect tracing data
- Extensive literature search on existing guidance
- Expert hearings for several food areas:
 - fresh meat
 - Fish
 - ready-to-eat food of animal and non-animal origin
 - and the retail sector



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Traceability Systems

How to evaluate and define a traceability system:

Data structure:

Primary activities	Traceable resource units
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Data collection:

Critical tracing events	Key data elements
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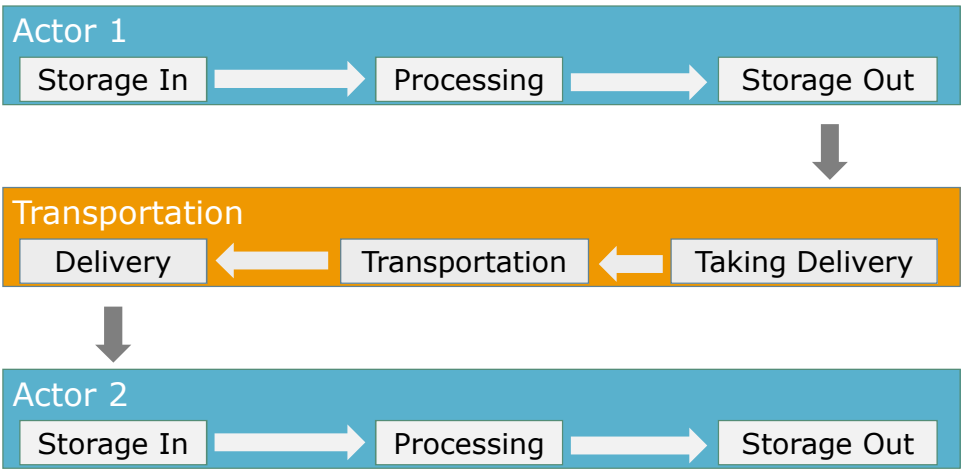
Traceability Systems



Which data do we need
to reconstruct the history of a food item
(suspected to be the cause of a disease) ?

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Micro structure



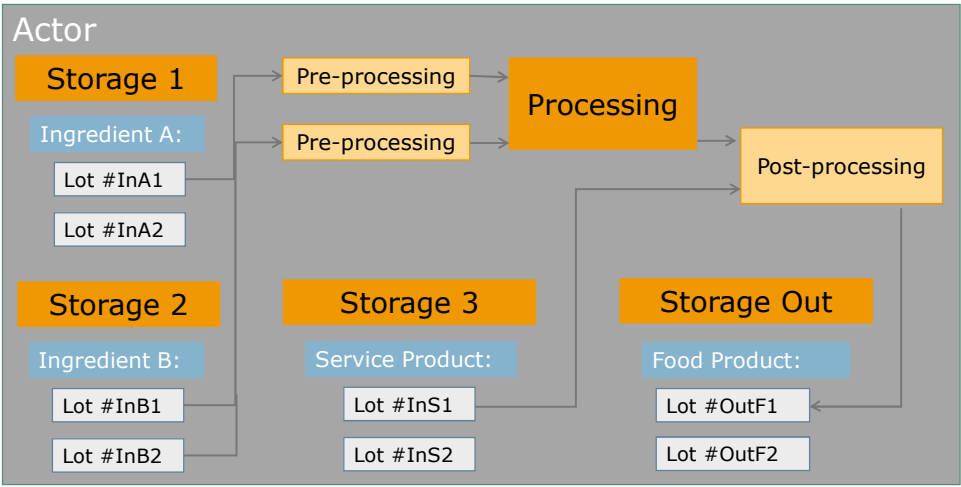
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1st step: Processing



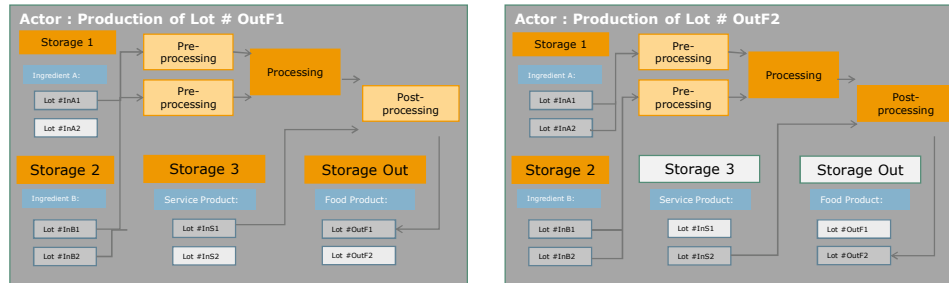
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Granularity of Processing



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Tracing Unit For Processing



The natural Tracing Unit for processing is a lot (or batch):

A lot/batch is "is defined as a quantity that has gone through the same process at a specific place and time period before moving to another place. A production batch is the traceable unit that raw materials and ingredients go into before they are transformed into products placed in new Trade Units and Logistic Units."¹


¹ TraceFood, Wiki, <http://www.tracefood.org/>, accessed 09th Nov. 2015

Definitions



- **'Product category'** identifies the general type of a food item. Food items of the same product category have usually same food safety characteristics.
- **'Product'** identifies the kind of the food item in the usual terminology in the food chain (e.g. product type, brand, package size etc.). Food items with the same product name are usually exchangeable in the food chain.
- **'Lot / batch'** identifies the production process in which the food item was produced. This includes the producer, the location and the date of production. Food items with the same product name and lot number were produced under equal conditions, e.g. equal ingredients, equal production line, equal time slot of production.
- **'Consignment / trade unit'** identifies the single unit of a product which is not divided during transportation. Food items of the same product and consignment had the same provider and recipient in the food chain.

Processing



Processing is any change of the product:

Name	Change
Preparation	New product / new lot (time)
Storage	New product characteristics / time

Processing at distribution:

Trade	New contact (information owner)
Blending, repacking	Merged lots / new consignments
Dividing, splitting	Splitted locations / multiple consignments

Transport as processing:


Transport	New location (time)
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Primary activities



Assemble/ load

Join / merge

Mix

Blend

Transport

Distribute

Unload

Trade

Import

Export

Repack

Relabel

Store

Primarily produce

Primarily process

Produce / manufacture

Process / transform

Retail

Catering

Deplete (exit)


Consume

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2nd step: Transporting




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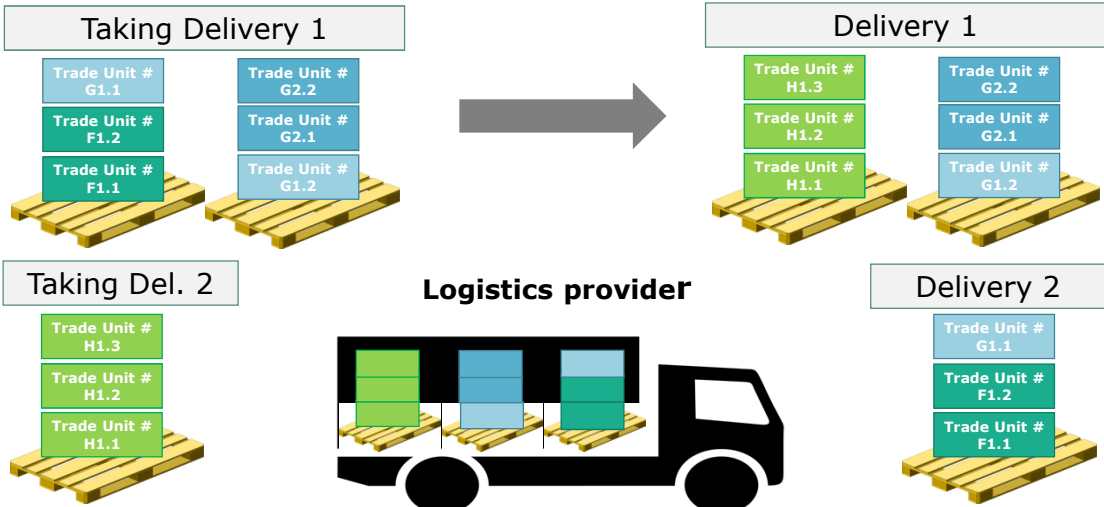
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Complexity of Connections (I)



The units of transportations are Logistic Units, e.g. palletes, container etc.



Taking Delivery 1

- Trade Unit # G1.1
- Trade Unit # F1.2
- Trade Unit # F1.1

Taking Del. 2

- Trade Unit # H1.3
- Trade Unit # H1.2
- Trade Unit # H1.1

Logistics provider

Delivery 1

- Trade Unit # H1.3
- Trade Unit # H1.2
- Trade Unit # H1.1

Delivery 2

- Trade Unit # G1.1
- Trade Unit # F1.2
- Trade Unit # F1.1

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Definitions



- **'Consignment / trade unit'** identifies the single unit of a product which is not divided during transportation. Food items of the same product and consignment have the same provider and recipient in the food chain.
- **'Logistic unit'** is defined as an item of any composition established for transport and/or storage that needs to be identified and managed for logistics.
- **'Lot transaction'** identifies the single transportation unit of a lot which is not divided during transportation. Food items of the same product, lot and consignment had the same provider and recipient in the food chain.
- **'Package unit'** identifies the minimal trade unit, which could not be divided into smaller trade units.

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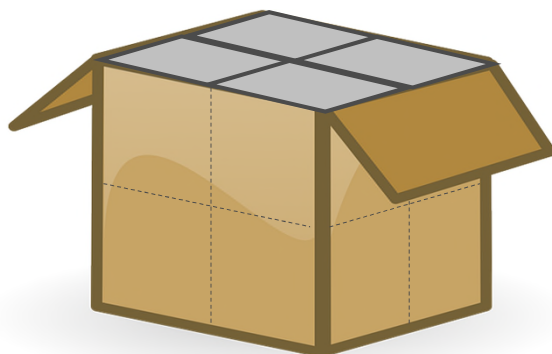
Division of products during distribution



The trade units can change in the food chain, ...

... but they are usually defined in the
Product Information Sheet

Trade Unit of production,
e.g. = 8 boxes = 64 cans



Trade Unit
for distribution,
e.g. 1 box = 8 cans



Trade Unit
for the Consumers,
e.g. 1 can



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3rd step: Information flow



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Different layers of tracing

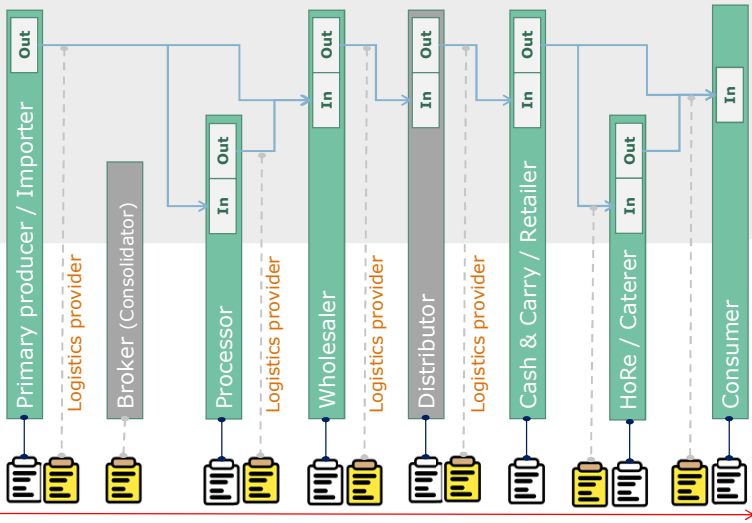


Physical material flow
in the food-supply-chain

Actors and their roles
in the food-supply chain
(Food Business Operators)

Information holder:
= product,
= transport

Time



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Information



Typical documentation

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Definitions



- **‘Information owner’** is a person or an entity, who generates or collates an information on a food item. This person is able to change or correct the information (and decides on confidentiality).
- **‘Information holder’** is a person or an entity, who has access to an information on a food item. This person is able to regularly retrieve the information.
- **‘Contact person’** is a person in a food business, who is contacted by food safety administrations in case of requests.
- **‘Food business operator’** means the natural or legal persons responsible for ensuring that the requirements of food law are met within the food business under their control (EC 178/2002).

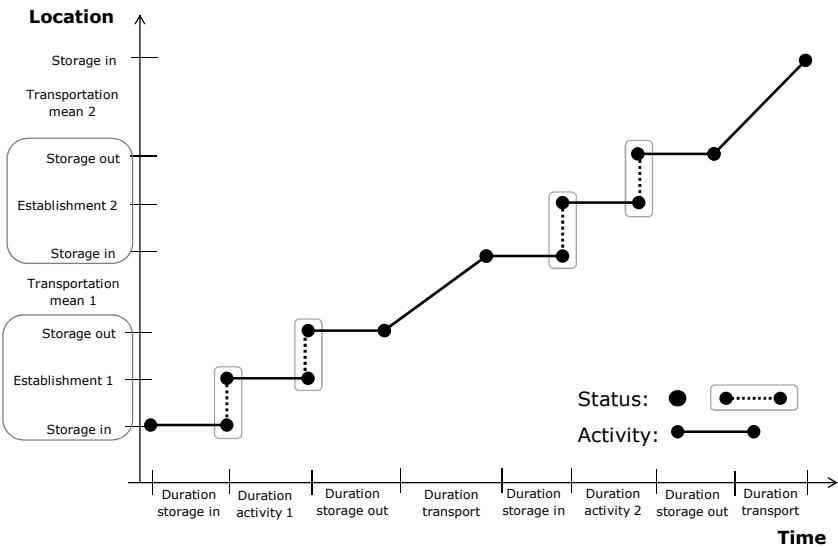
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Granularity of tracing information

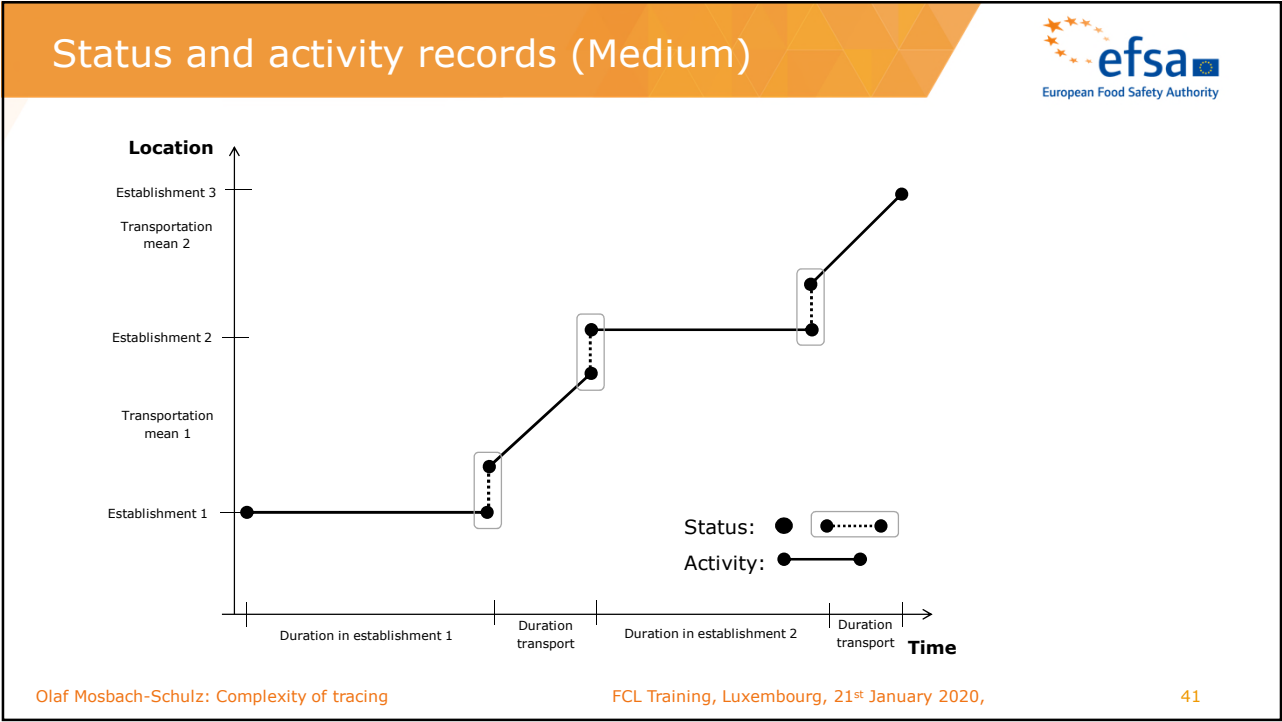


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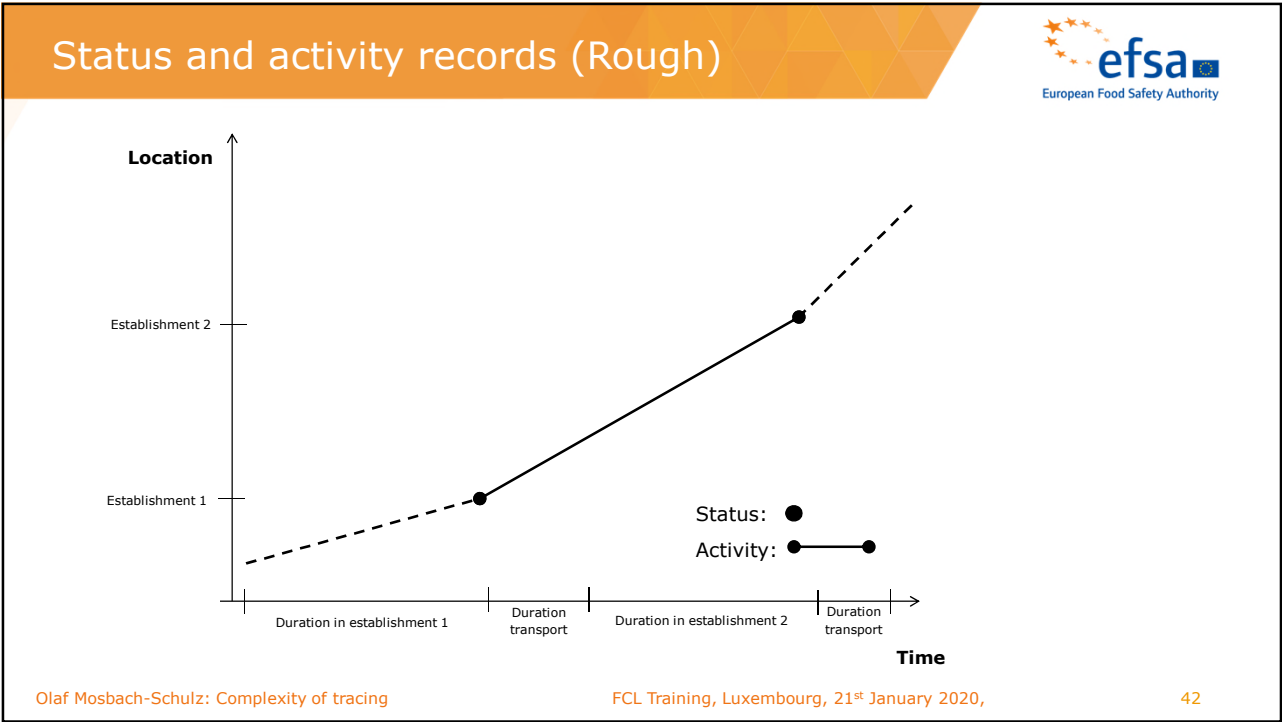
Status and activity records (detailed)



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Quality of Traceability Systems

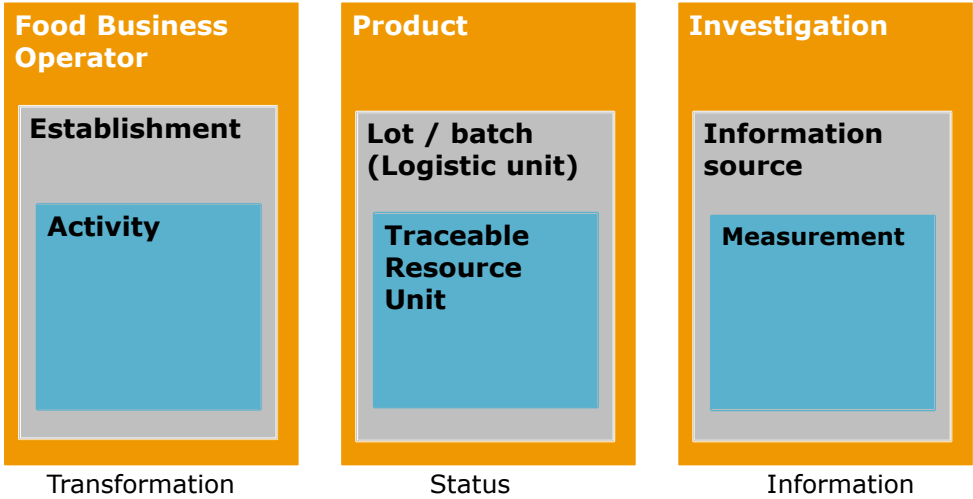


- The **precision** is mainly described by the granularity of the differentiation of the traceable resource units and activities.
- The **completeness** is mainly described by the percentage of necessary information, which it is possible to retrieve retrospectively.
- The **reliability** is mainly described by the accuracy of the stored information.

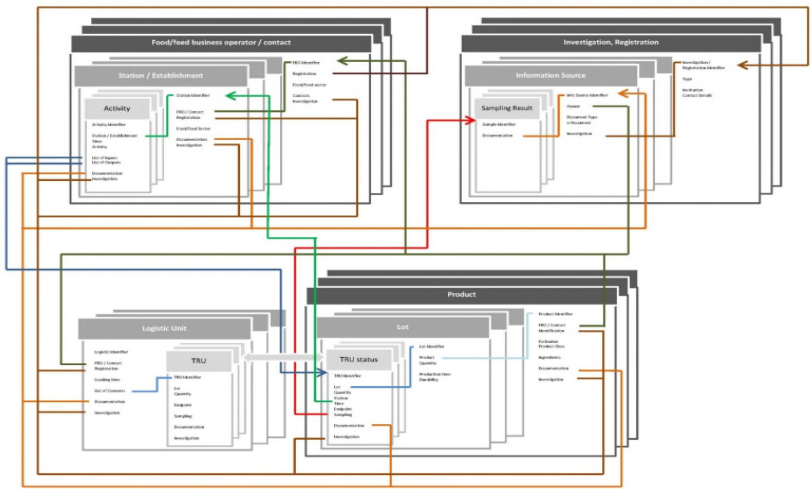
The revised data model



Revised Data Structure: 9 tables



Relations between the tables



Revised Data Structure



Main concepts

- Comprehensive structure for tracing
- Flexible for inputs:
 - Fine to rough traceability systems
 - Low data quality / incomplete data
 - Covers different perspectives
- Master plan for coming solutions

For example: Status in RASFF



Product

- Product Identifier
- FBO / Contact ID
- Packaging
- Product class
- Ingredients
- Info Source ID
- Investigation ID

Products	
Product name:	sesame paste - Sesamcreme
Product category:	nuts, nut products and seeds
Product description	
Product name on label:	Sesam Creme
Brand/trade name:	
Product aspect:	Glas mit Schraubdeckel
Barcode no.:	
Other labelling:	
Weight:	320.0 g
Temperature:	ambient
Notification number: 3272	
Reference: 200408	



Thank you for your attention



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