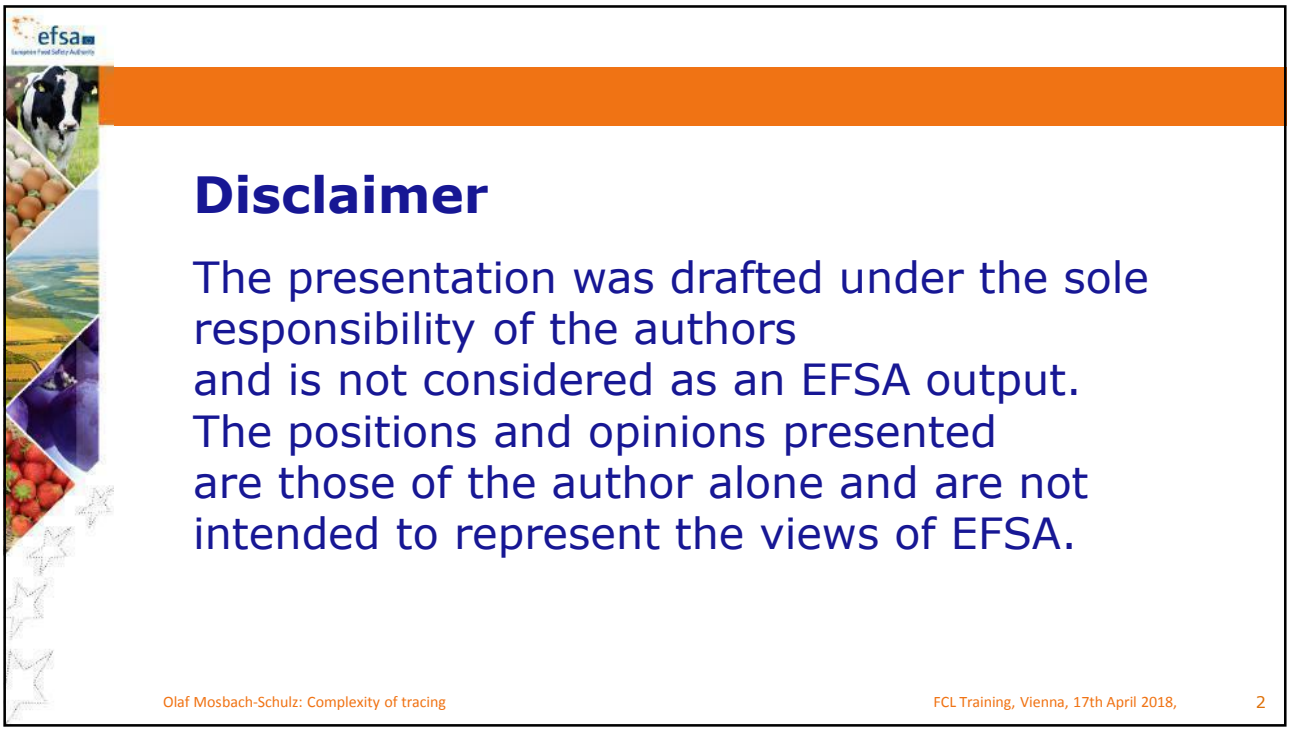

The challenge to trace
the source of contamination
in the international
food and feed supply chain
efsa
European Food Safety Authority
www.efsa.europa.eu


efsa
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The positions and opinions presented
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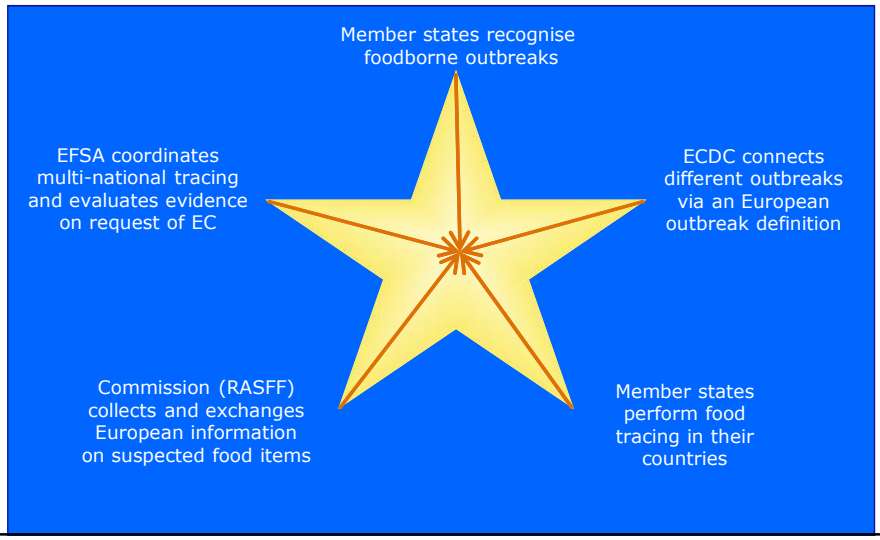
- EFSAs role in tracing outbreaks
- Complexity of Tracing
  - 1st step: Processing
  - 2nd step: Transport
  - 3rd step: Information flow
  - Granularity
- The revised data model



## EFSAs 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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Main title

## ÖSTERR. EIERDATENBANK

# http://www.eierdatenbank.at


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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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## PERSPECTIVES

**but not one fits all**

### Industry

- Optimization
- Ensure supply
- Ensure quality

**Tracking**

### Consumer

- Guarantee origin
- Ensure quality
- Ensure sustainability

**Certification**

### Administration

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

**Recall**
**Tracing**

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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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## 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.***



## SEVERAL DEFINITIONS OF TRACEABILITY

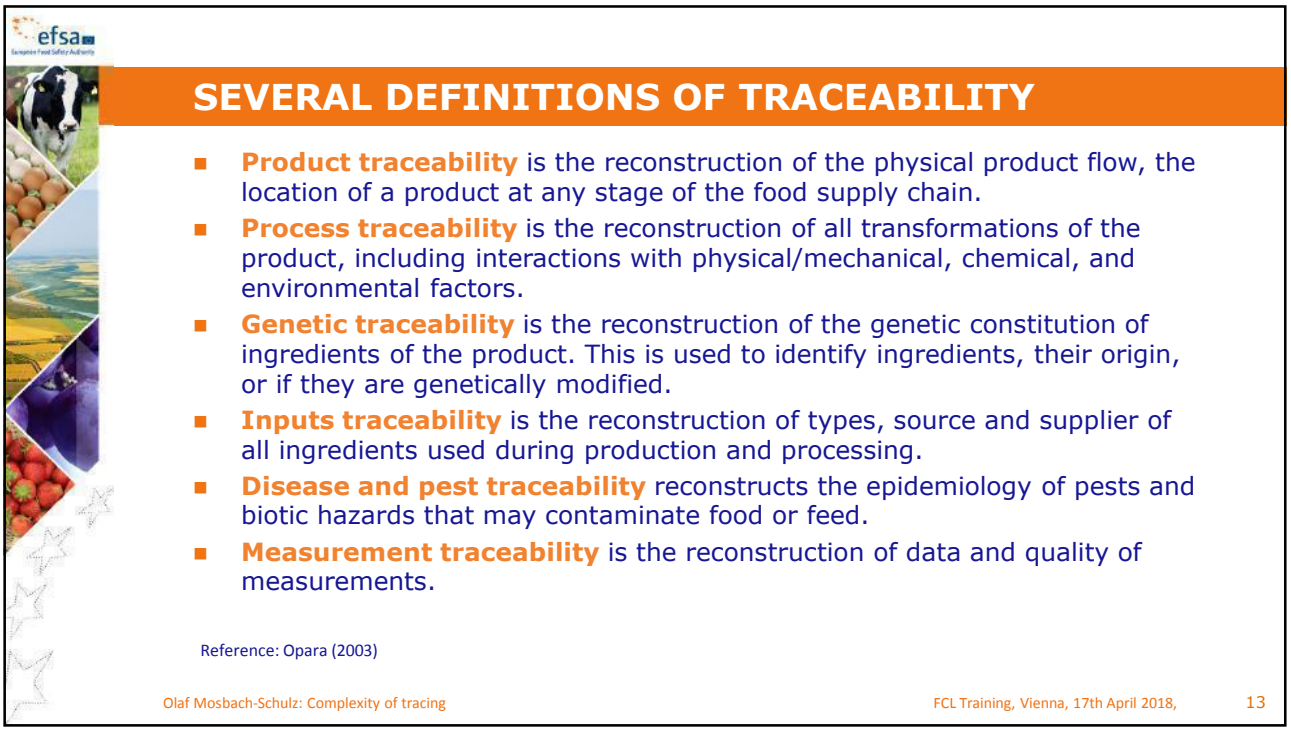
But one important distinction[1]:

"**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)

| | Retrospective | Prospective |
|---|---|---|
| Forward Tracing | Recall | Tracking |
| Backward Tracing | Tracing | |

[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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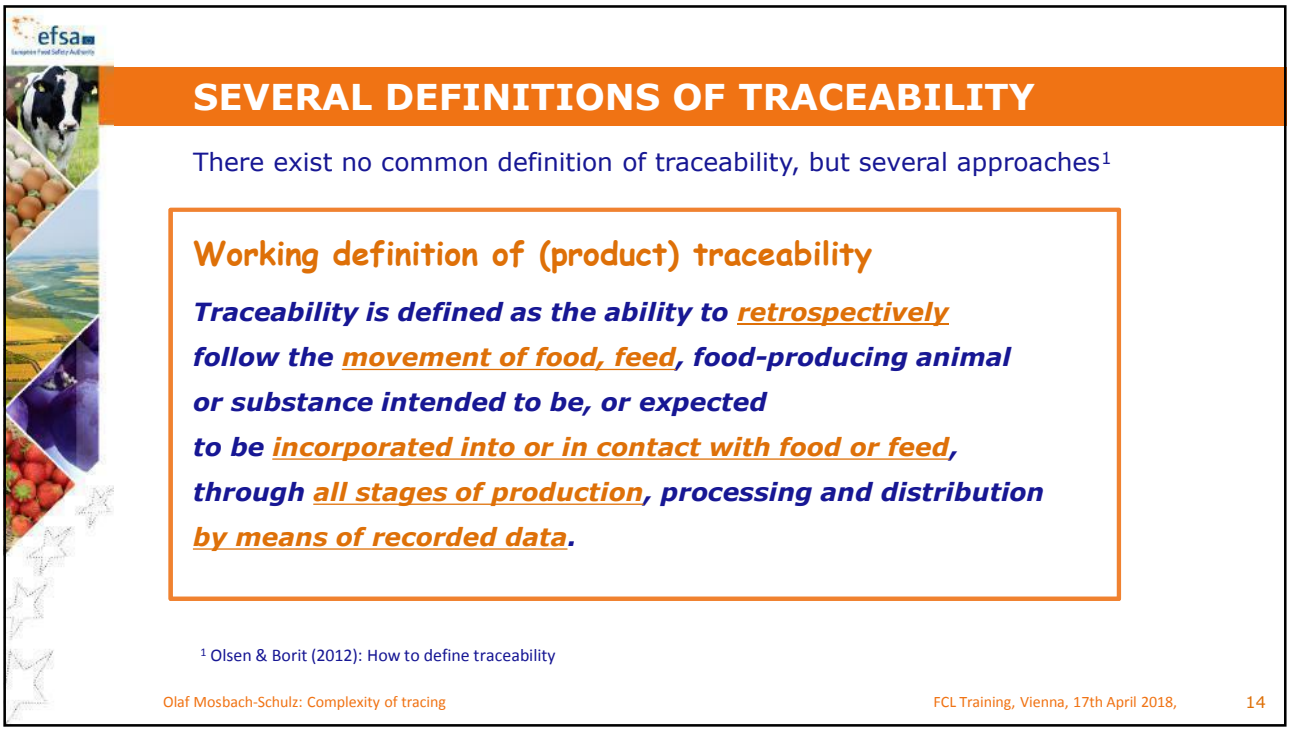
efsa
SEVERAL DEFINITIONS OF TRACEABILITY
There exist no common definition of traceability, but several approaches[1]
Working definition of (product) traceability
Traceability is defined as the ability to retrospectively follow the movement of food, feed, food-producing animal or substance intended to 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
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# 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).*

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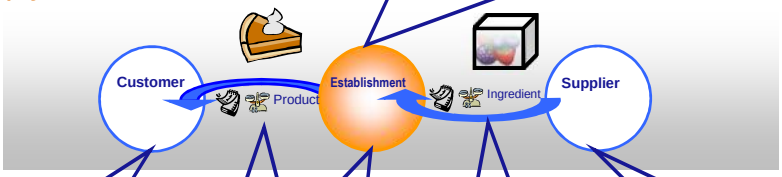
# DATA COLLECTION FOR TRACING

Data at each knot of the food supply chain

**Establishment where the data are collected:**
1 record per ingredient-product combination




| Customer of the Establishment: | Product of the Establishment: | Establishment: | Ingredient of the product: | Supplier of the Establishment: |
|---|---|---|---|---|
| Identification, e.g. Name, address. | Identification, e.g. Date of delivery, amount, name, article/lot no., production date, expire date | Identification, e.g. Name, address **Production process:** Recipe, processing | Identification, e.g. Date of delivery, amount, name, article/lot no., production date, expire date | Identification, e.g. Name, address |

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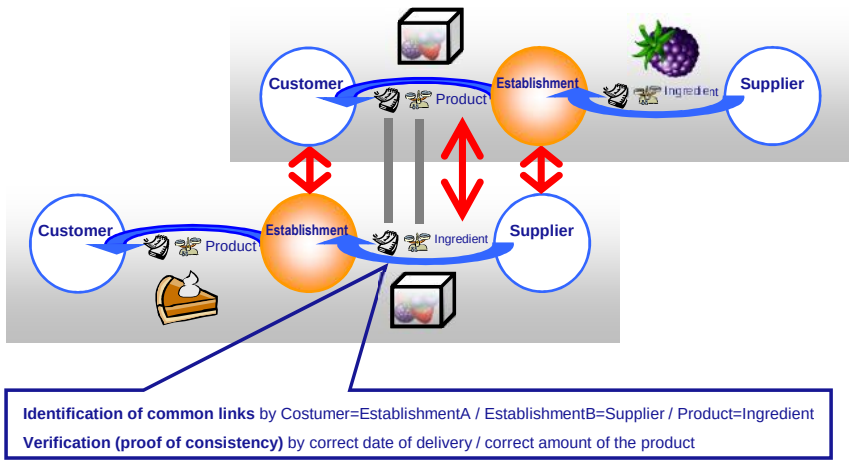
## DATA ANALYSIS: BUILDING THE FOOD CHAIN



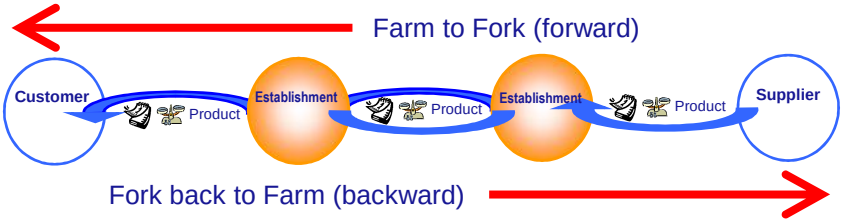

**Identification of common links** by Costumer=EstablishmentA / EstablishmentB=Supplier / Product=Ingredient
**Verification (proof of consistency)** by correct date of delivery / correct amount of the product



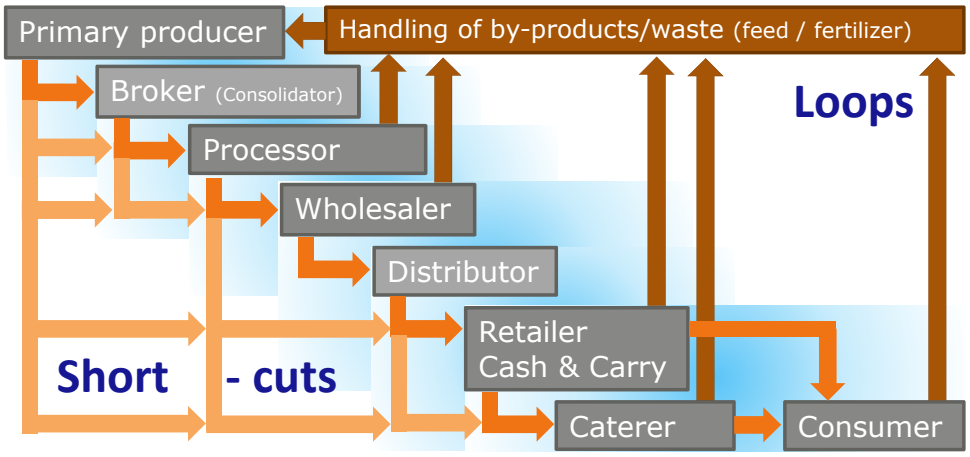
## RESULTS: FOOD SUPPLY CHAIN

**Results per analysis:**

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



## A FOOD CHAIN WITH ITS STAGES / ACTORS

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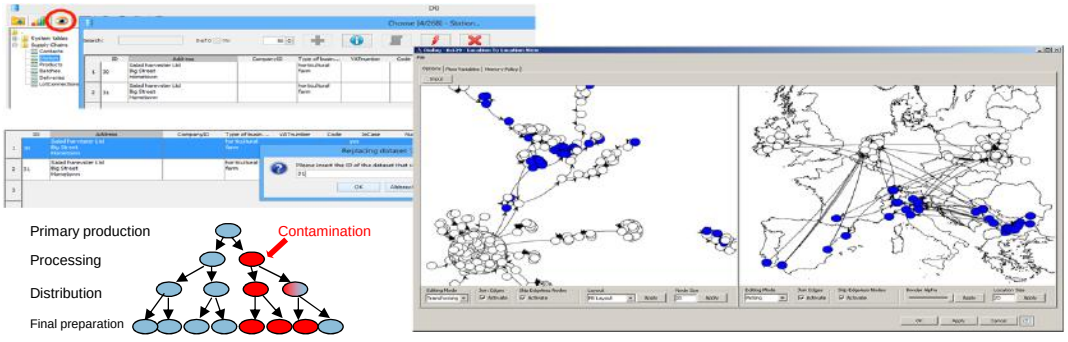
## TOOL: FOOD-CHAIN-LAB




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), Berlin

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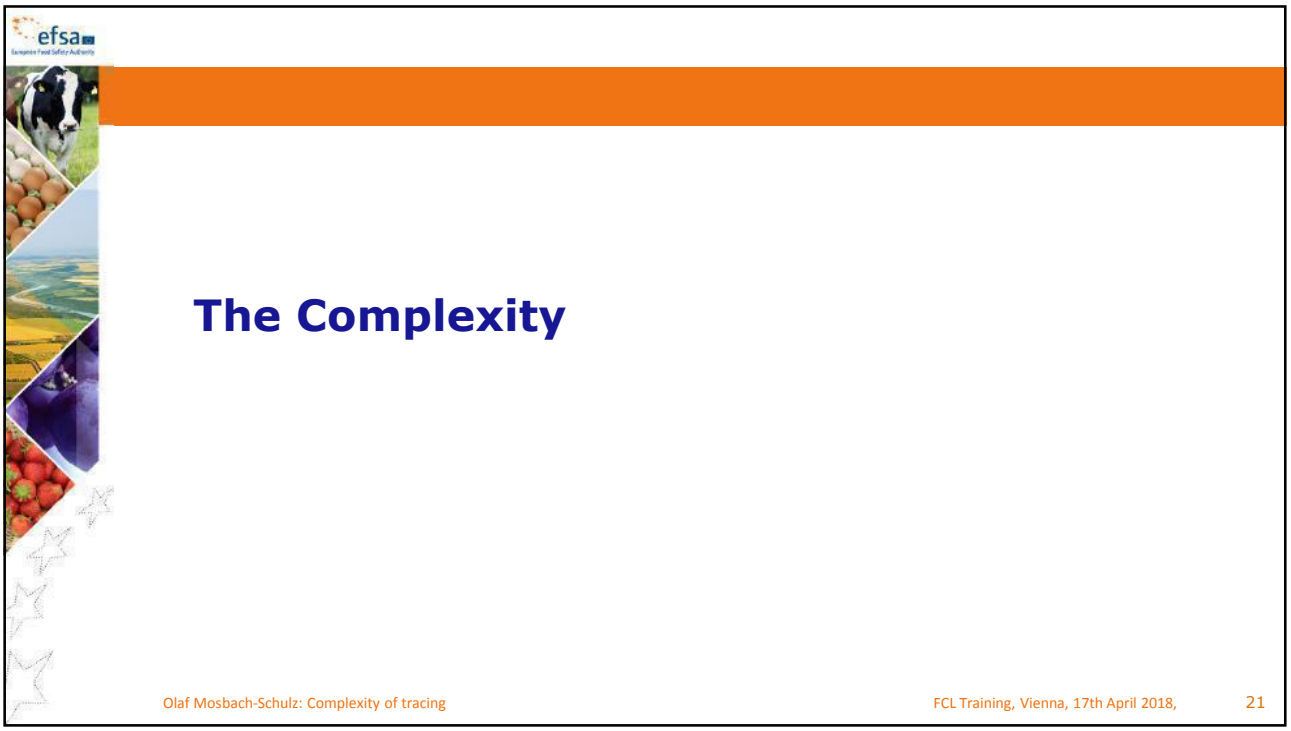
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The Complexity
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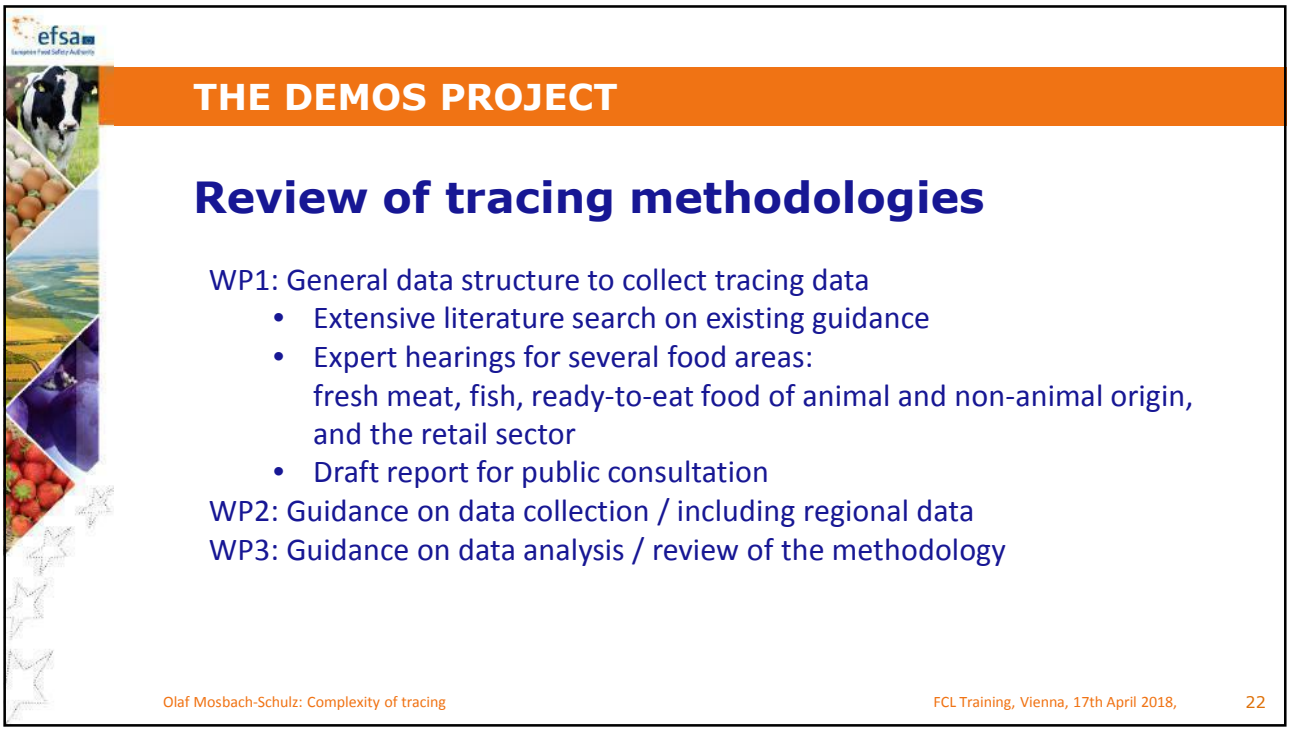
efsa
THE DEMOS PROJECT
Review of tracing methodologies
WP1: General data structure to collect tracing data
• Extensive literature search on existing guidance
• Expert hearings for several food areas:
fresh meat, fish, ready-to-eat food of animal and non-animal origin, and the retail sector
• Draft report for public consultation
WP2: Guidance on data collection / including regional data
WP3: Guidance on data analysis / review of the methodology
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## TRACEABILITY SYSTEMS

How to evaluate and define a traceability system:

Data structure:

| | |
|---|---|
| **Primary activities** | **Traceable resource units** |

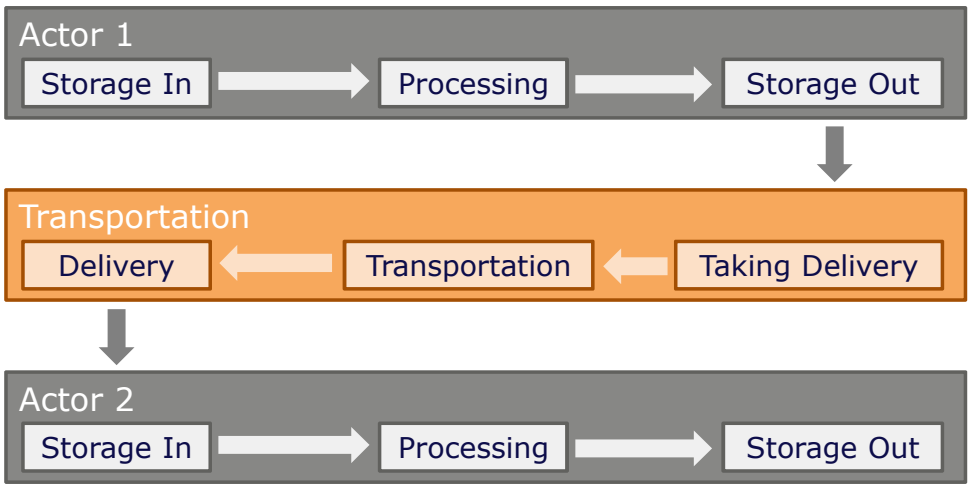
Data collection:

| | |
|---|---|
| **Critical tracing events** | **Key data elements** |



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

## MICRO STRUCTURE

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## 1st step: Processing

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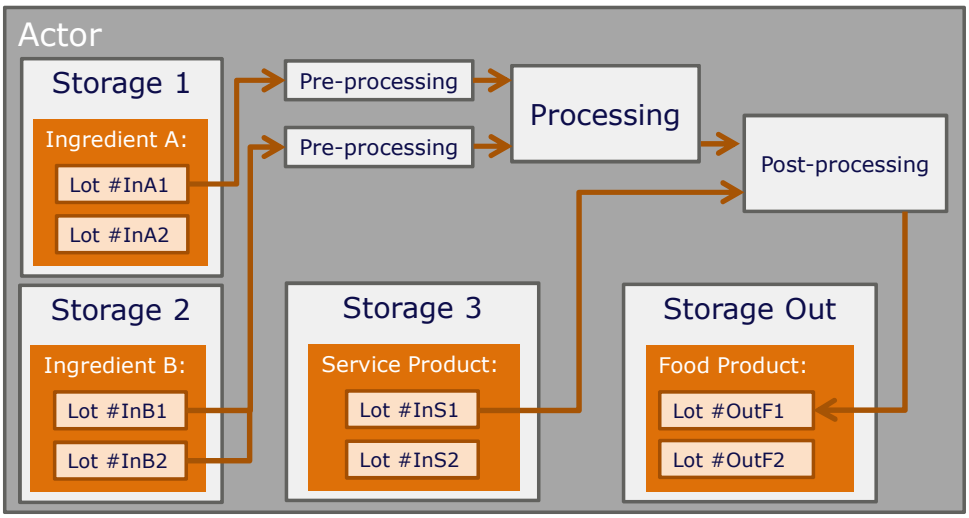
## GRANULARITY OF PROCESSING

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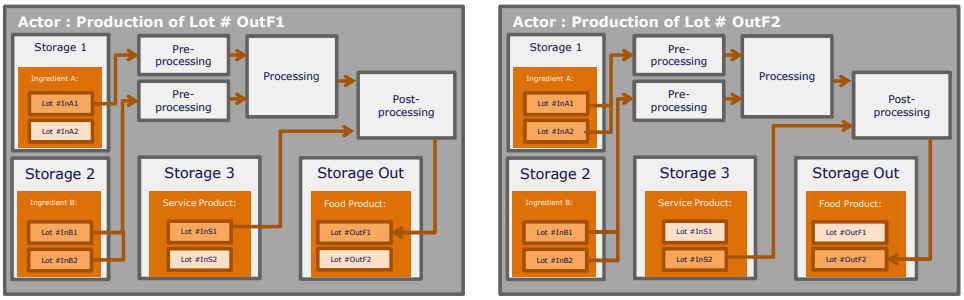
## TRACING UNIT FOR PROCESSING




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

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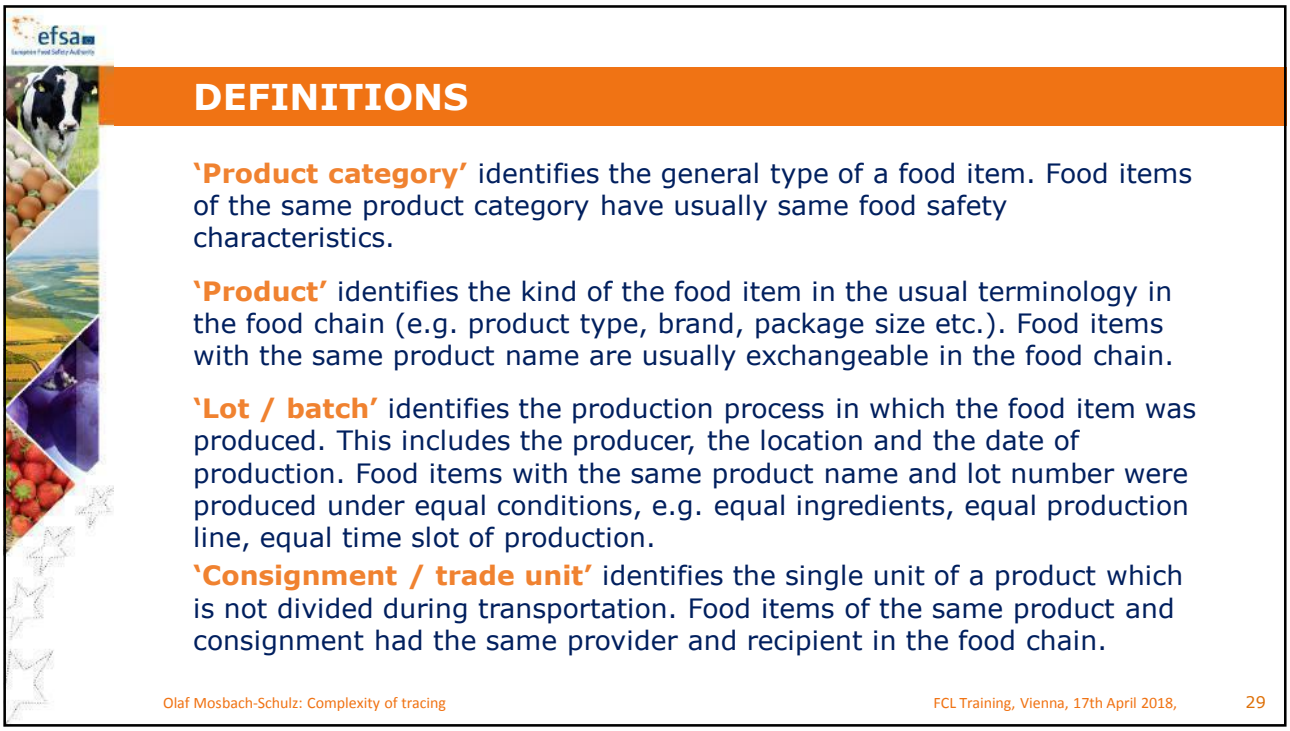
DEFINITIONS
'Product category' identifies the general type of a food item. Food items of the same product category have usually same food safety characteristics.
'Product' identifies the kind of the food item in the usual terminology in the food chain (e.g. product type, brand, package size etc.). Food 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.
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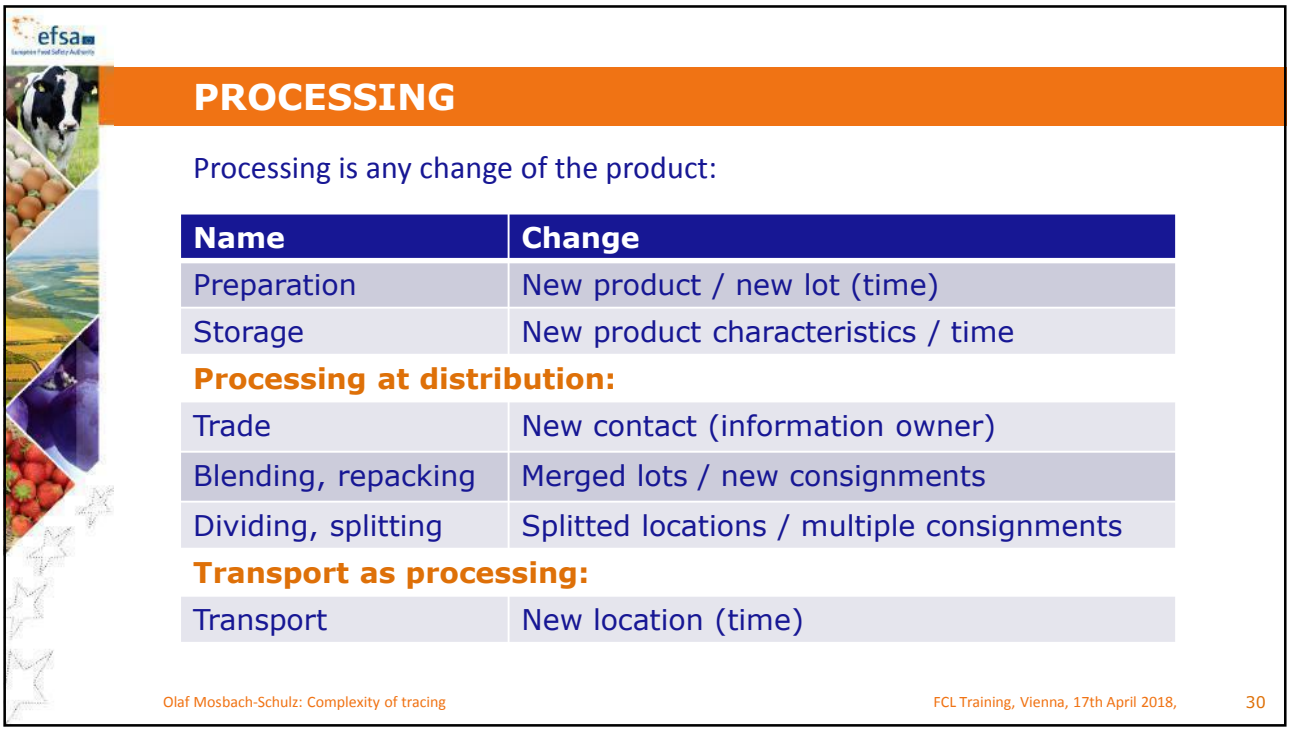
PROCESSING
Processing is any change of the product:
Name
Change
Preparation
New product / new lot (time)
Storage
New product characteristics / time
Processing at distribution:
Trade
New contact (information owner)
Blending, repacking
Merged lots / new consignments
Dividing, splitting
Splitted locations / 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
Store
Repack
Relabel
Primarily process
Primarily produce
Produce / manufacture
Process / transform
Retail
Catering
Deplete (exit)
Consume

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## 2nd step: Transporting

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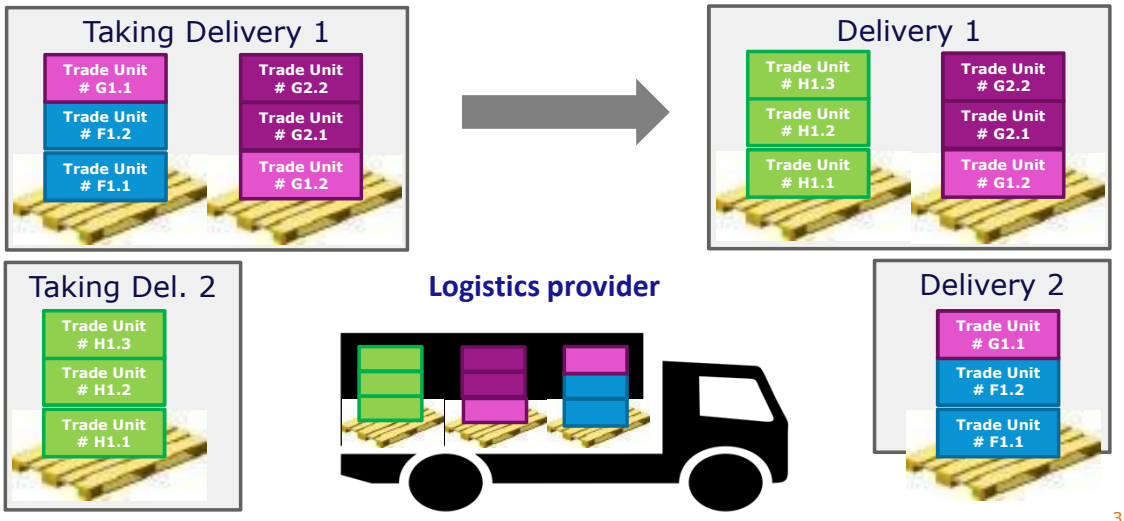
## COMPLEXITY OF CONNECTIONS (I)

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

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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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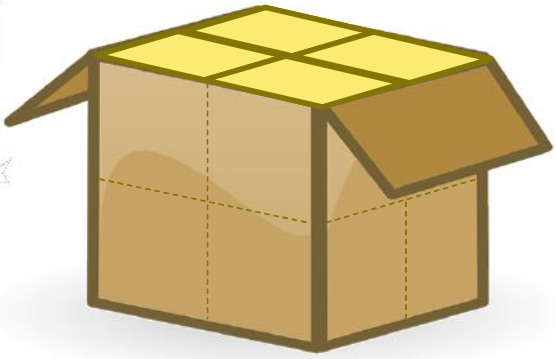
## DIVISION OF PRODUCTS DURING DISTRIBUTION

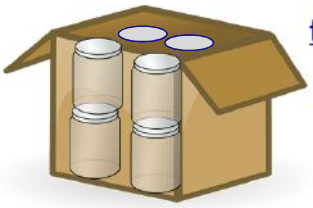
**The trade units can change in the food chain, …**

… 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**



## 3rd step: Information flow

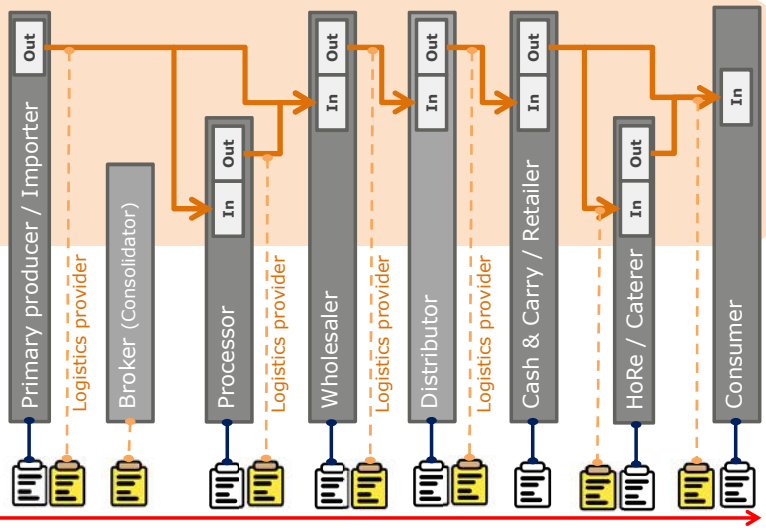
## DIFFERENT LAYERS OF TRACING

**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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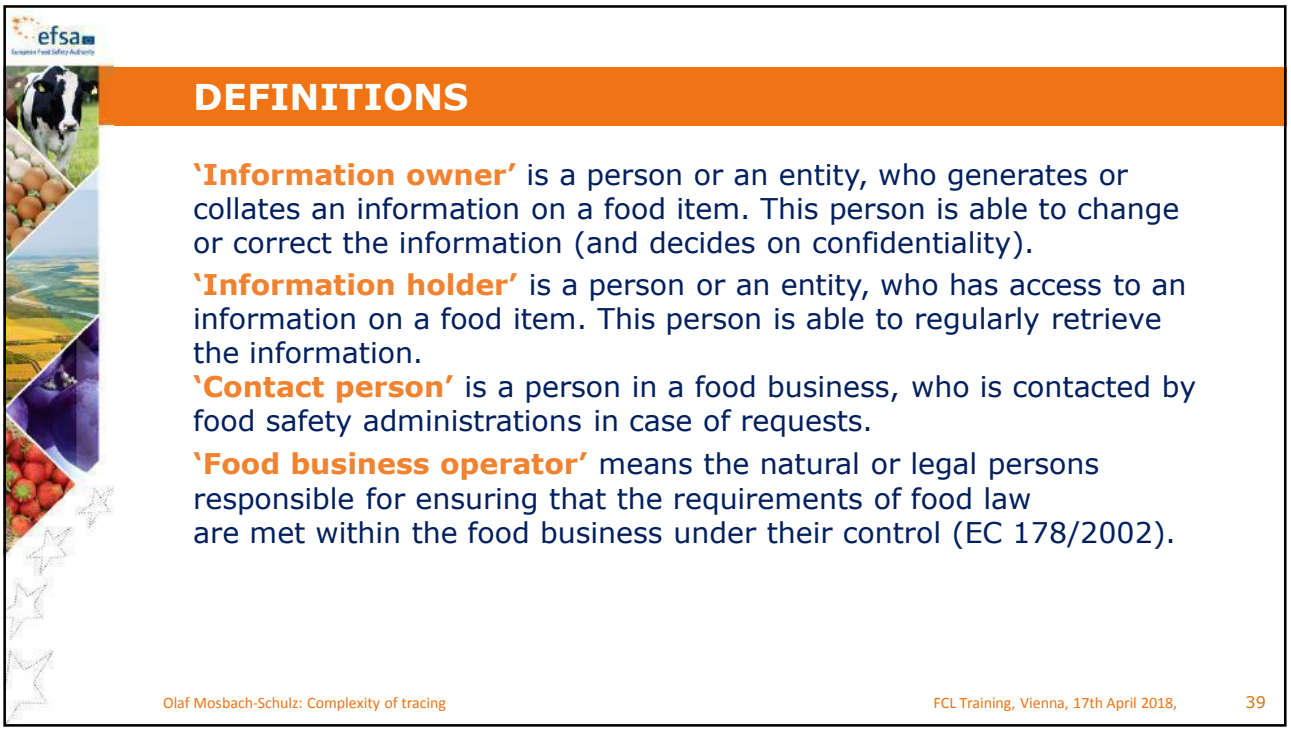
DEFINITIONS
'Information owner' is a person or an entity, who generates or collates an information on a food item. This person is able to change or correct the information (and decides on confidentiality).
'Information holder' is a person or an entity, who has access to an information on a food item. 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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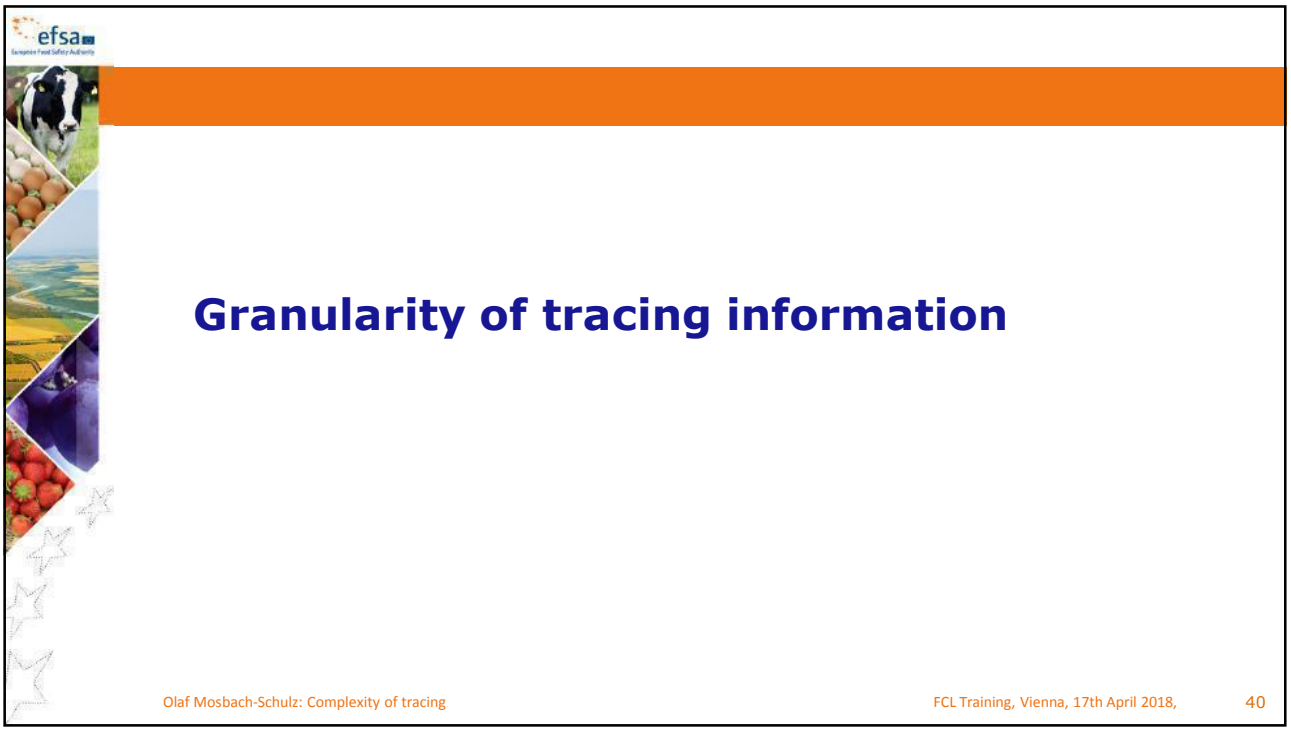
Granularity of tracing information
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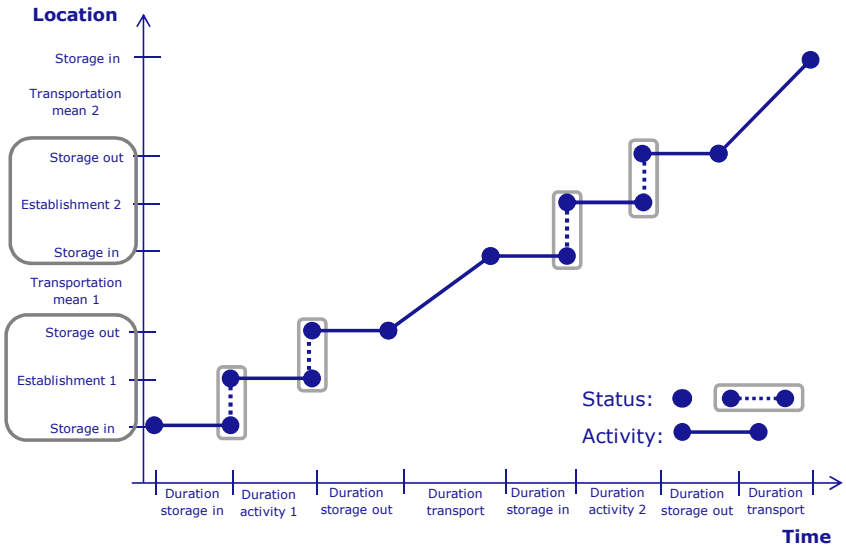
## STATUS AND ACTIVITY RECORDS (DETAILED)

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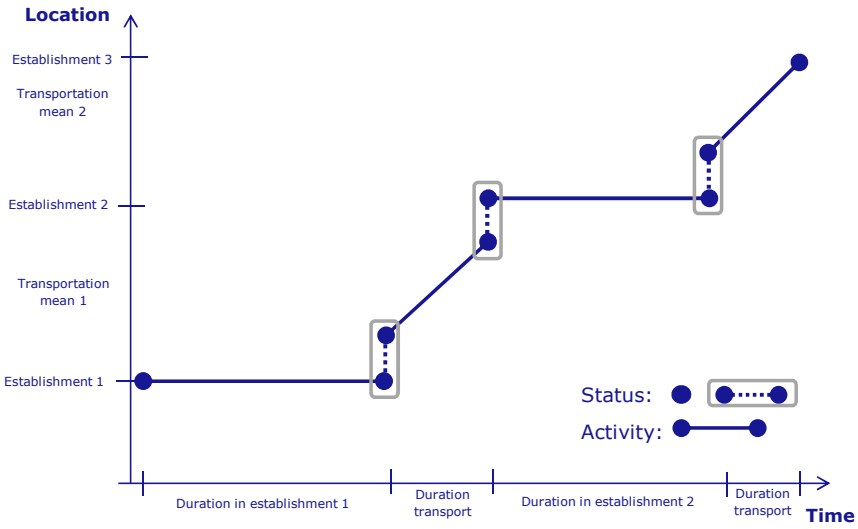
## STATUS AND ACTIVITY RECORDS (MEDIUM)

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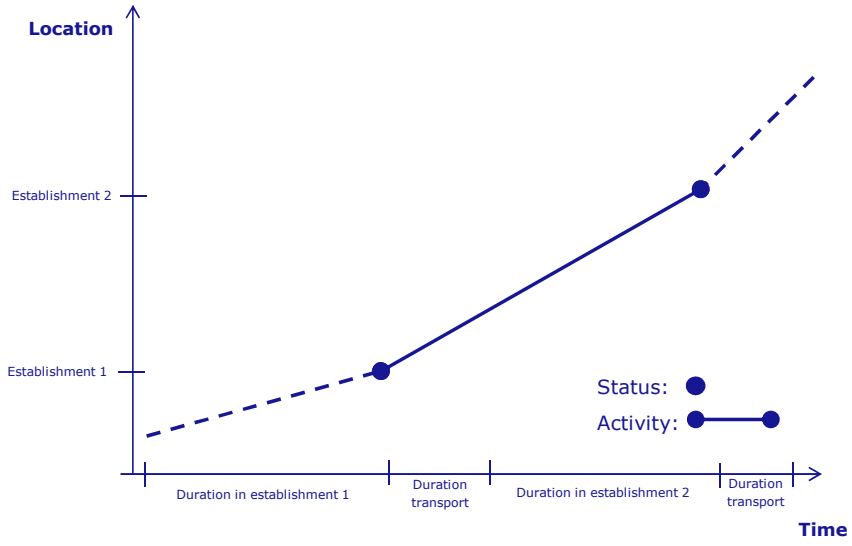
## STATUS AND ACTIVITY RECORDS (ROUGH)





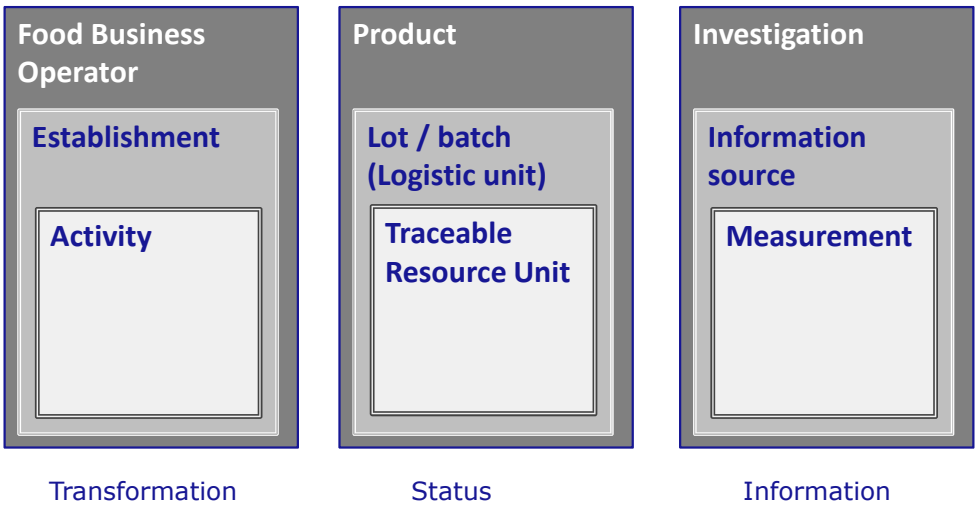

## QUALITY OF TRACEABILITY SYSTEMS

- **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.

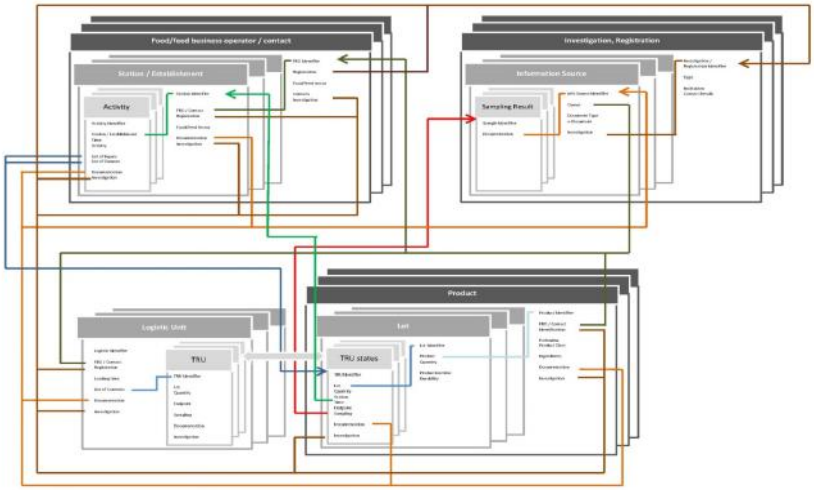
# The revised data model



## 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

## DRAFT REPORT FOR PUBLIC CONSULTATION

SCIENTIFIC REPORT

EFSA Journal

APPROVED: 29 March 2016

PUBLISHED: dd mmmm 2016

doi:10.2903/j.efsa.2016.4040

**Data structures for tracing back and forward of products in multinational food and feed safety incidents**



## INFORMATION IN RASFF (1)

### Investigation / Registration

Investigation / Registration Identifier

Type

Institution

Contact

RASFF Rapid Alert System for Food and Feed

RASFF ALERT

| | |
|---|---|
| Notification number: | 3252[redacted] |
| Reference: | 20[redacted]0221 |
| Notification type: | food |
| Notification basis: | company's own check |
| Notification classification: | alert notification |
| Notifying country: | [redacted] |
| Notifying Country region: | [redacted] |
| CP Reference: | [redacted] |
| Date of notification: | 20/02/20[redacted] |

## INFORMATION IN RASFF (2): FOLLOW-UP

### Information Source

Info Source Identifier

Owner

Document type e-Document

Investigation ID

fup14 #3305[redacted] - ec validated - [redacted]
CP Reference: [redacted]
Organisation / ministry: [redacted] Food Authority [redacted] Regional Directorate [redacted]
Contact person: Mr [redacted] Tel: [redacted] Fax: [redacted] E-mail: [redacted]
Additional information:
Follow-up type: additional information

Reference: 20[redacted]0221

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## INFORMATION IN RASFF (2): ATTACHMENTS

### Information Source

Info Source Identifier

Owner

Document type e-Document

Investigation ID

General documents:

| notId | Type | File name |
|---|---|---|
| 3252[redacted] | analytical report | [redacted].pdf |

Products Operators information documents:

| notId | Type | File name |
|---|---|---|
| 3261[redacted] | bill(s)/delivery document(s) | BILL_OF_LADING_[redacted].pdf |

Reference: 20[redacted]0221

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## INFORMATION IN RASFF (3)

### Sampling Result

Sample Identifier

Sampling result

Info Source ID

| Analysis | |
|---|---|
| Laboratory: | [redacted] |
| Street: | [redacted] |
| Locality: | [redacted] |
| ZipCode: | [redacted] |
| Country: | germany |
| Sample treatment / analytical matrix: | Bakterienanreicherung ASU L 00.00-20, 2008-12 |
| Analytical method(s): | Bakterienanreicherung ASU L 00.00-20, 2008-12, Salmonellen-Diff. |
| Number of samples: | 3 |
| Counter analysis: | |




## STATUS IN RASFF (1)

### 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 [redacted] Creme |
| Brand/trade name: | [redacted] |
| Product aspect: | Glas mit Schraubdeckel |
| Barcode no.: | |
| Other labelling: | |
| Weight: | 320.0 g |
| Temperature: | ambient |

| | |
|---|---|
| Notification number: | 3272[redacted] |
| Reference: | 20[redacted]0408 |

## STATUS IN RASFF (2)

### Lot

Lot Identifier
Product ID
Quantity
Production time
Durability

| Consignment | |
|---|---|
| Consignment / lot number: | L60318 |
| Origin: | Greece |
| Public health certificate number: | |
| Public health certificate date: | |
| CVED number: | |
| Other document: | |
| Number: | |
| Durability date: | best before 01/02/2018 |
| Description of the lot no. of units: | 12.099 |
| Description of the lot total net weight: | 3.871,68 kg |

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## STATUS IN RASFF (3)

### Traceable Resource Unit (TRU) Status

TRU Identifier
Lot ID
Quantity
Station
Time
Endpoint
Sampling
Info Source ID
Investigation ID

| fup6 #3276[redacted] - ec validated - [redacted] | |
|---|---|
| CP Reference: | |
| Organisation / ministry: | [redacted] |
| Contact person: | [redacted] |
| Additional information: | Investigations at the establishment [redacted] have confirmed the receipt of "Sesam[redacted] Crème".<br>The supplier had informed the [redacted] FBO about the non-compliance.<br>The [redacted] enterprise started immediately to withdraw the product from the market (350 glasses).<br>All products were destroyed in one authorized enterprise.<br>The evidence documents were shown to [redacted] inspectors. |

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## STATUS IN RASFF (2)

### Logistic Unit

Logistic Identifier

FBO / Contact ID

Loading time

List of Contents

Info Source ID

Investigation ID

https://www.msc.com/track-a-shipment


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## STATUS IN RASFF (3)

### Traceable Resource Unit (TRU) Status

TRU Identifier

Lot ID

Quantity

Endpoint

Sampling ID

Documentation ID

Investigation ID


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## TRANSFORMATION IN RASFF (1)

### Food / feed business operator / Contact

FBO Identifier

Registration ID

Food/feed sector

Contacts

Investigation ID

| Operator | |
|---|---|
| Operator type: | produced for |
| Name: | [redacted] |
| ApprovalNumber: | |
| Address: | [redacted] |
| Location: | [redacted] |
| Postal code: | [redacted] |
| Country: | Germany |
| Distribution to: | France,Luxembourg,Portugal |

| | |
|---|---|
| Operator type: | manufacturer |
| Name: | [redacted] |
| ApprovalNumber: | |
| Address: | [redacted] |
| Location: | [redacted] |
| Postal code: | [redacted] |
| Country: | Greece |
| Distribution to: | Austria,Belgium,Estonia,France,Germany,Switzerland |

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## TRANSFORMATION IN RASFF (2)

### Station / Establishment

Station Identifier

FBO Contact ID
Registration ID

Food/feed sector

Info Source ID
Investigation ID

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## INFORMATION IN RASFF (3)

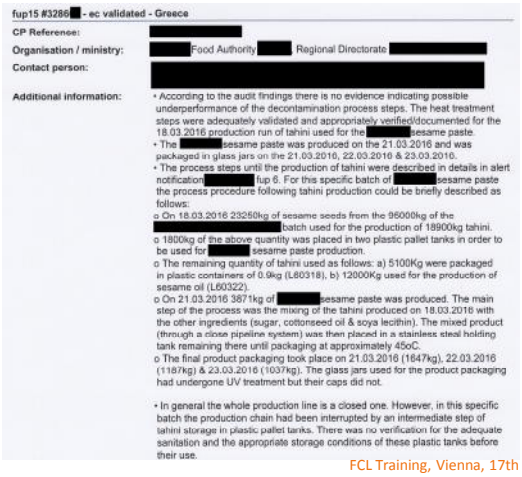
### Activity

Activity Identifier

Station ID
Time
Activity

List of Inputs
List of Outputs

Info Source ID
Investigation ID



fup15 #3286[redacted] - ec validated - Greece

CP Reference: [redacted]

Organisation / ministry: [redacted] Food Authority [redacted] Regional Directorate [redacted]

Contact person: [redacted]

Additional information:

- According to the audit findings there is no evidence indicating possible underperformance of the decontamination process steps. The heat treatment steps were adequately validated and appropriately verified/documented for the 18.03.2016 production run of tahini used for the [redacted] sesame paste.
- The [redacted] sesame paste was produced on the 21.03.2016 and was packaged in glass jars on the 21.03.2016, 22.03.2016 & 23.03.2016.
- The process steps until the production of tahini were described in details in alert notification [redacted] fup 6. For this specific batch of [redacted] sesame paste the process procedure following tahini production could be briefly described as follows:
  - On 18.03.2016 23250kg of sesame seeds from the 96000kg of the [redacted] batch used for the production of 18900kg tahini.
  - 1800kg of the above quantity was placed in two plastic pallet tanks in order to be used for [redacted] sesame paste production.
  - The remaining quantity of tahini used as follows: a) 5100Kg were packaged in plastic containers of 0.9kg (L60318), b) 12000Kg used for the production of sesame oil (L60322).
  - On 21.03.2016 3871kg of [redacted] sesame paste was produced. The main step of the process was the mixing of the tahini produced on 18.03.2016 with the other ingredients (sugar, cottonseed oil & soya lecithin). The mixed product (through a close pipeline system) was then placed in a stainless steal holding tank remaining there until packaging at approximately 45oC.
  - The final product packaging took place on 21.03.2016 (1647kg), 22.03.2016 (1187kg) & 23.03.2016 (1037kg). The glass jars used for the product packaging had undergone UV treatment but their caps did not.
- In general the whole production line is a closed one. However, in this specific batch the production chain had been interrupted by an intermediate step of tahini storage in plastic pallet tanks. There was no verification for the adequate sanitation and the appropriate storage conditions of these plastic tanks before their use.



## THANKS FOR YOUR ATTENTION

(Thanks to an unknown lady who permitted this photograph of her tattoo, 2016, photograph by Olaf Mosbach-Schulz)

European Food Safety Authority (EFSA)
Assessment and Methodological Support Unit (AMU)

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