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

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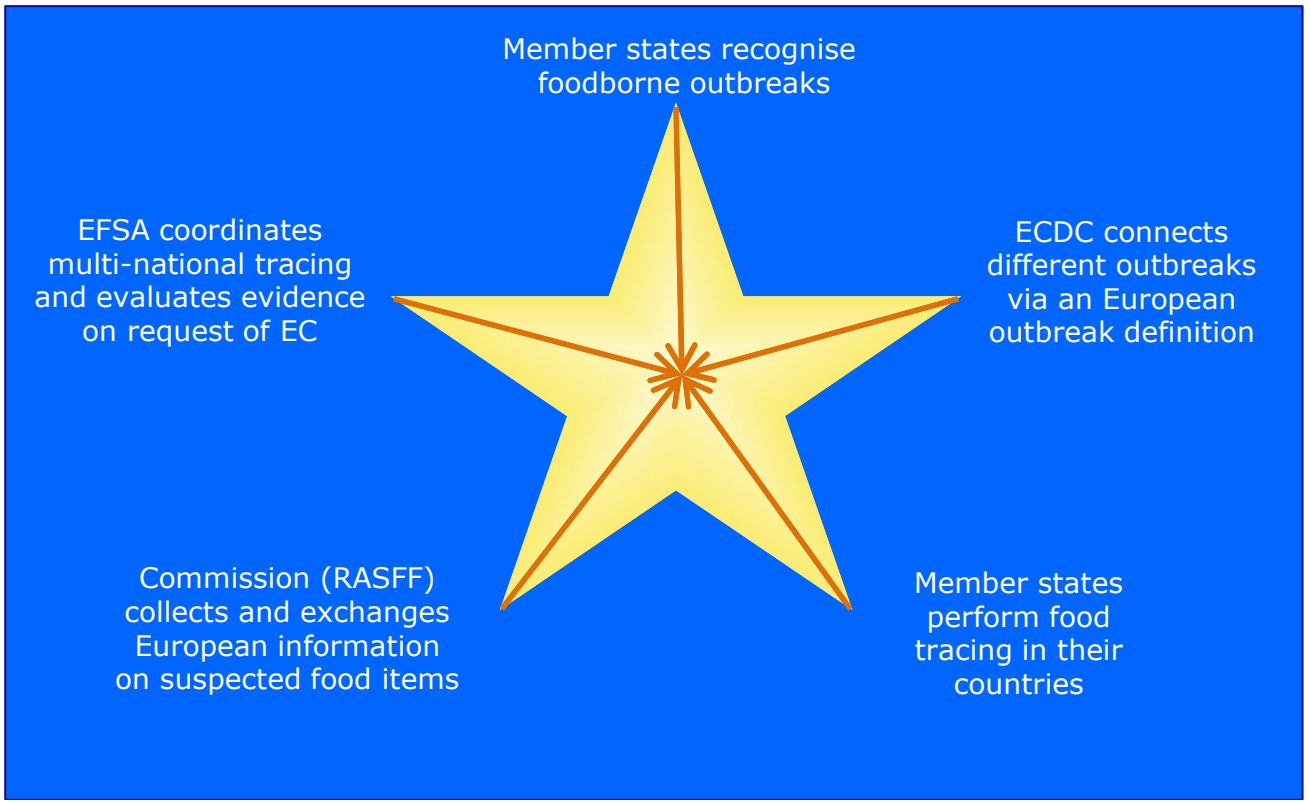
- EFSAs role in tracing outbreaks
- DEMOS project: Complexity of Tracing
  - 1st step: Processing
  - 2nd step: Transport
  - 3rd step: Information flow
- The revised data model

EFSAs Mandate

EFSAS ROLE IN OUTBREAK INVESTIGATIONS

When EFSA gets involved…



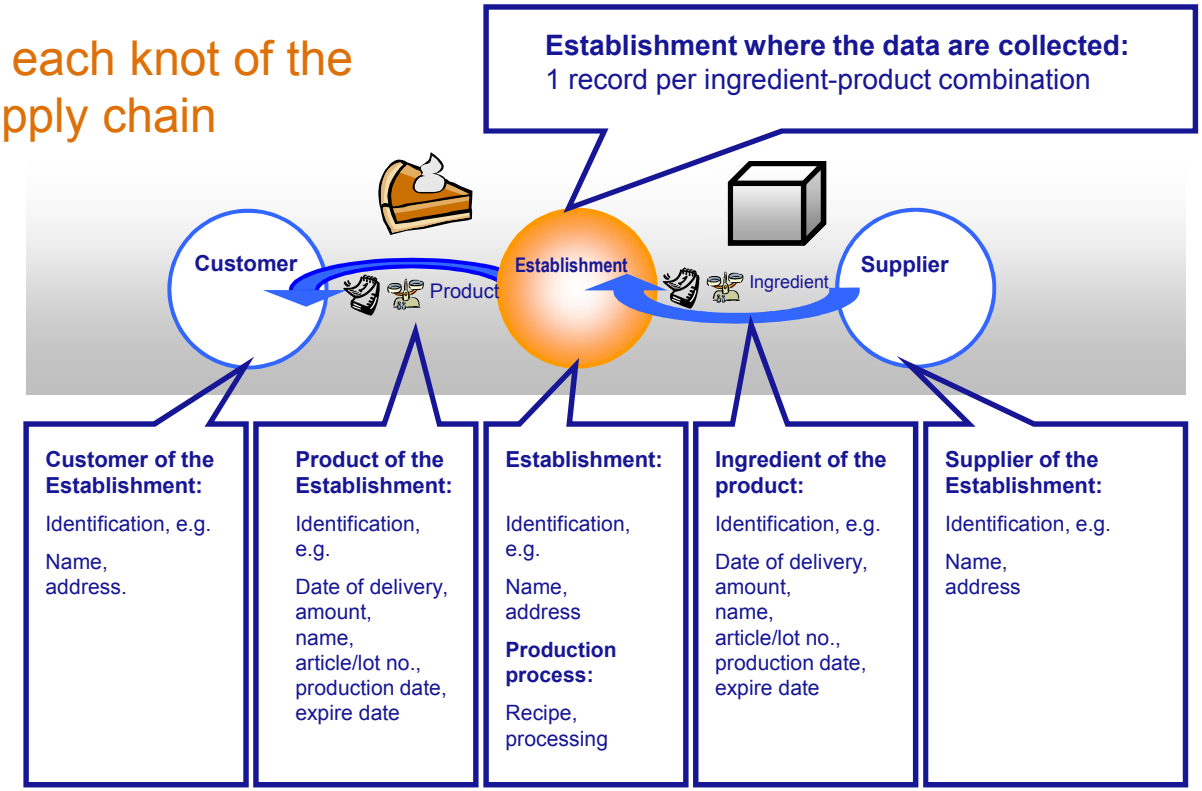
MANDATE FOR FOODBORNE OUTBREAKS

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: (…)

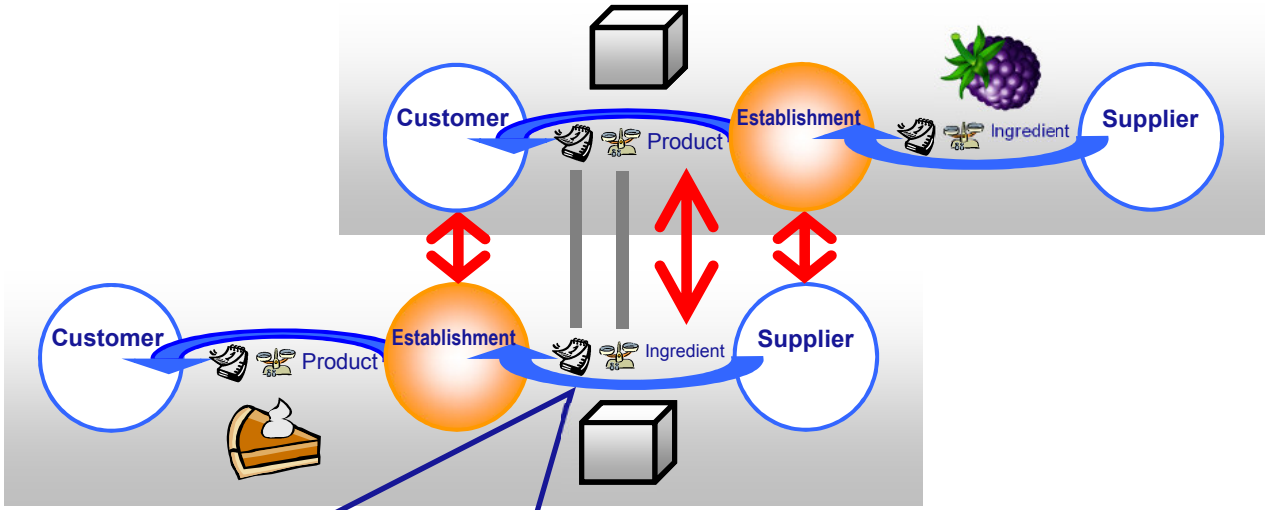
2. When more information on a specific outbreak becomes available, and upon specific request of the Commission, to further collaborate with ECDC in the food-borne outbreak assessment by providing **in-depth analysis of the food data including the robustness of the link to the suspected food source,** 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. (...)

DATA COLLECTION FOR TRACING

Data at each knot of the food supply chain



DATA ANALYSIS: BUILDING THE FOOD CHAIN



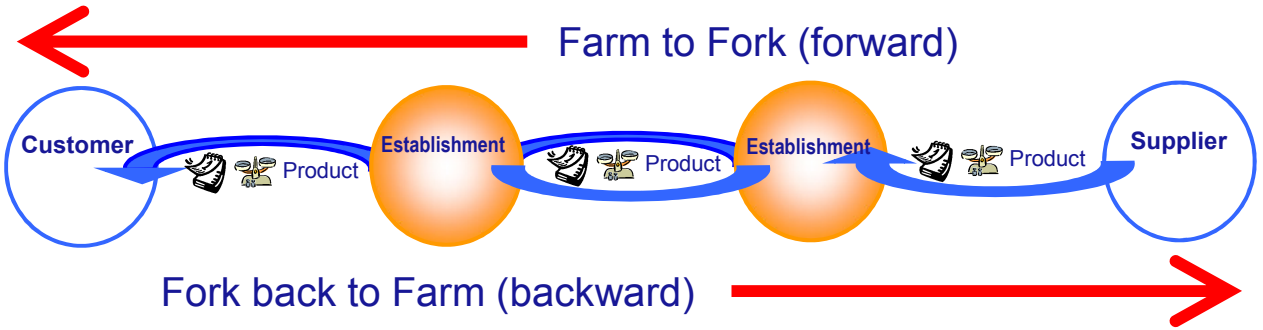
Identification of common links by Costumer=EstablishmentA / EstablishmentB=Supplier / Product=Ingredient

Verification (proof of consistency) by correct date of delivery / correct amount of the product

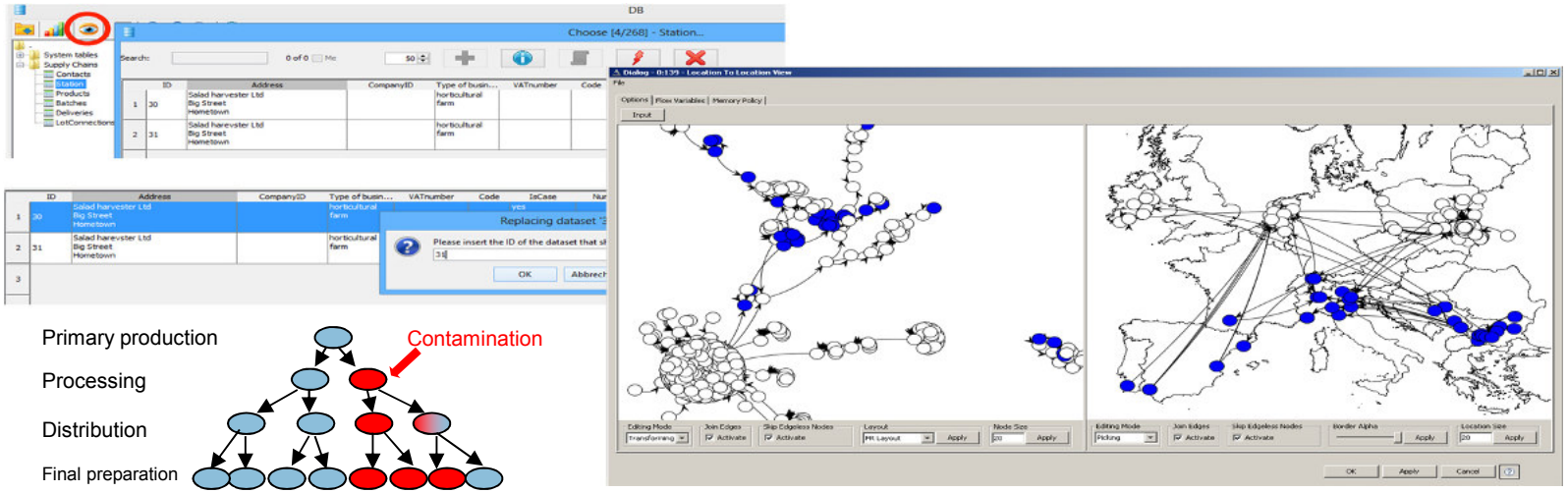
RESULTS: FOOD SUPPLY CHAIN

Results per analysis:

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



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: Christian Thoens, christian.thoens@bfr.bund.de
Authors: C Thoens, A Weiser, M Filter, A Falenski, A Kaesbohrer, B Appel
German Federal Institute for Risk Assessment (BfR), Berlin

The Complexity

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

EFSA WORKING GROUP

EFSA working group
on
"Tracing food and feed products for outbreak investigations"
(DEMOS WP 1)

revising the data structure.

- Judith Leblanc
- Beate Pinior
- Jim McLauchlin
- Armin Weiser

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

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

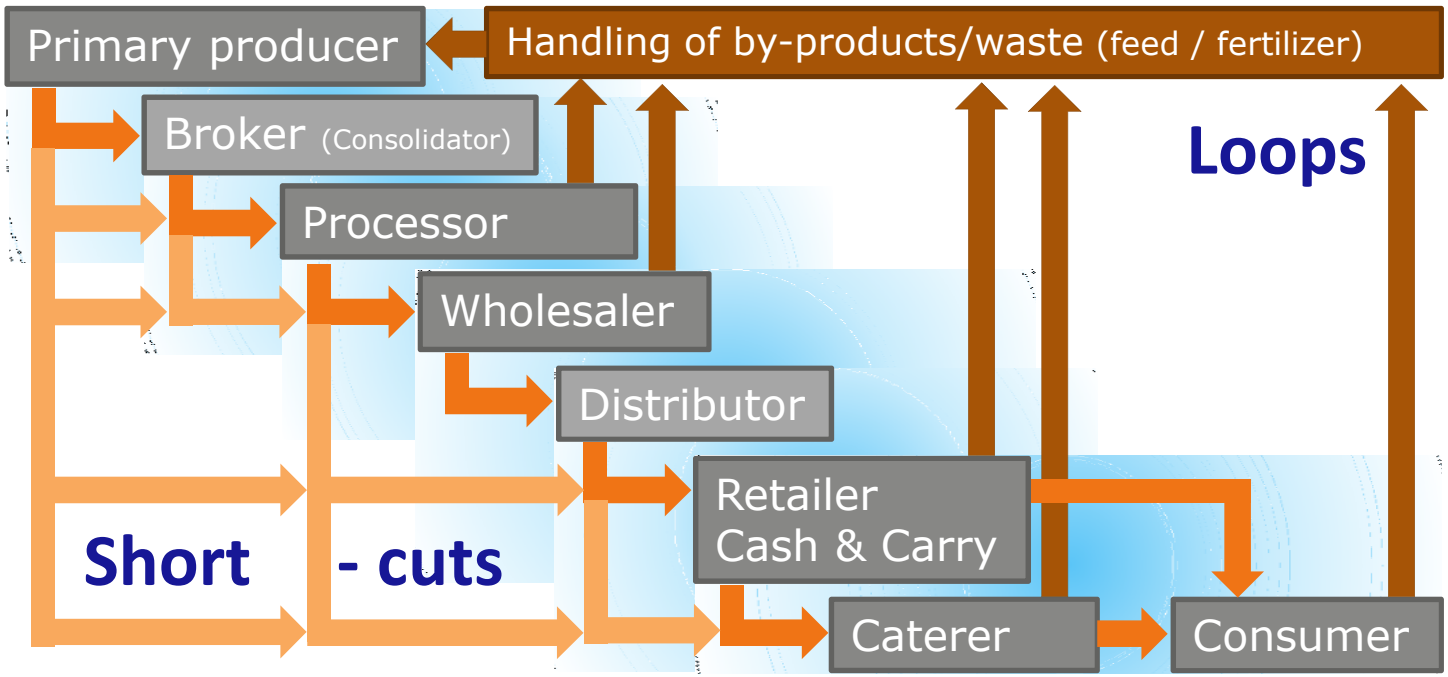
SEVERAL DEFINITIONS OF TRACEABILITY

- **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.

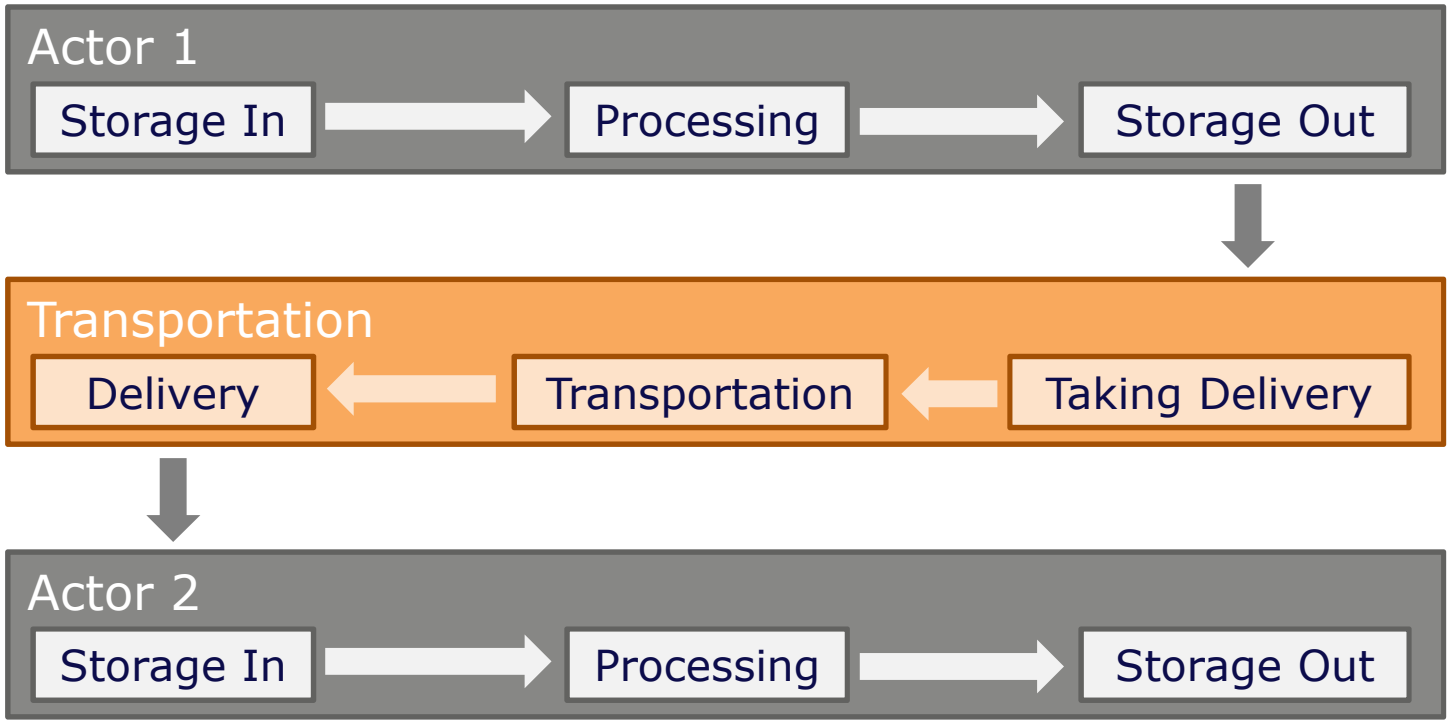
Reference: Opara (2003)

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

A FOOD CHAIN WITH ITS STAGES / ACTORS

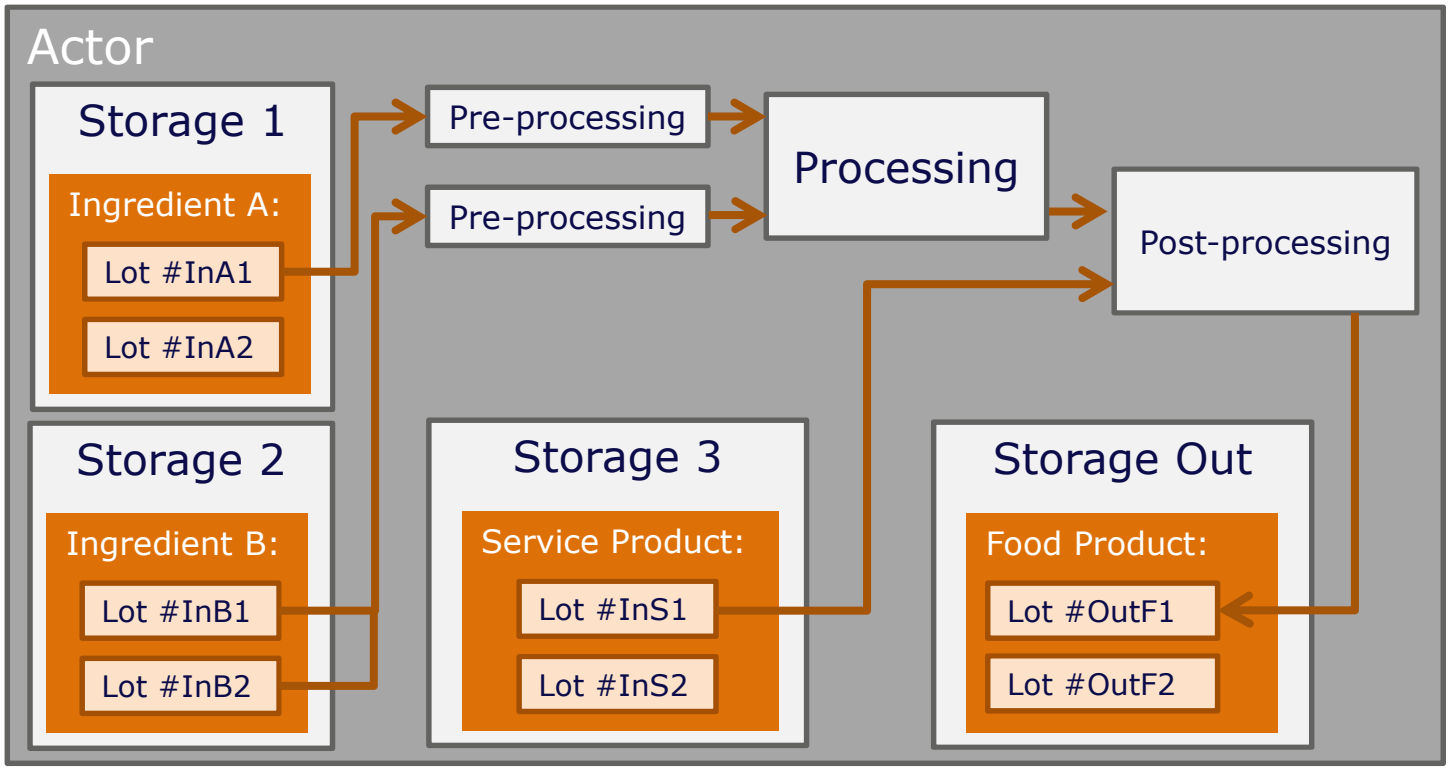


MICRO STRUCTURE

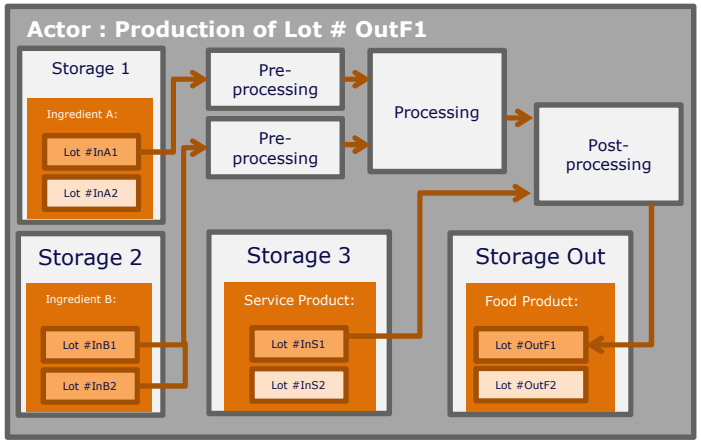


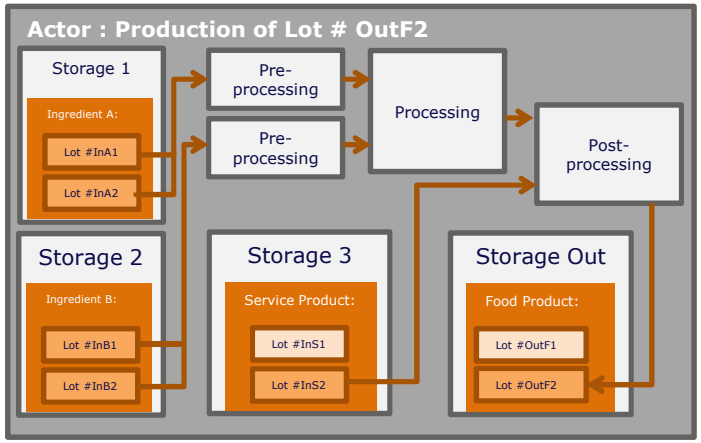
1st step: Processing

GRANULARITY OF PROCESSING



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)

PRIMARY ACTIVITIES

Assemble/ load

Join / merge

Mix

Blend

Unload

Transport

Distribute

Export

Trade

Import

Store

Repack

Relabel

Primarily process

Primarily produce

Process / transform

Produce / manufacture

Retail

Catering

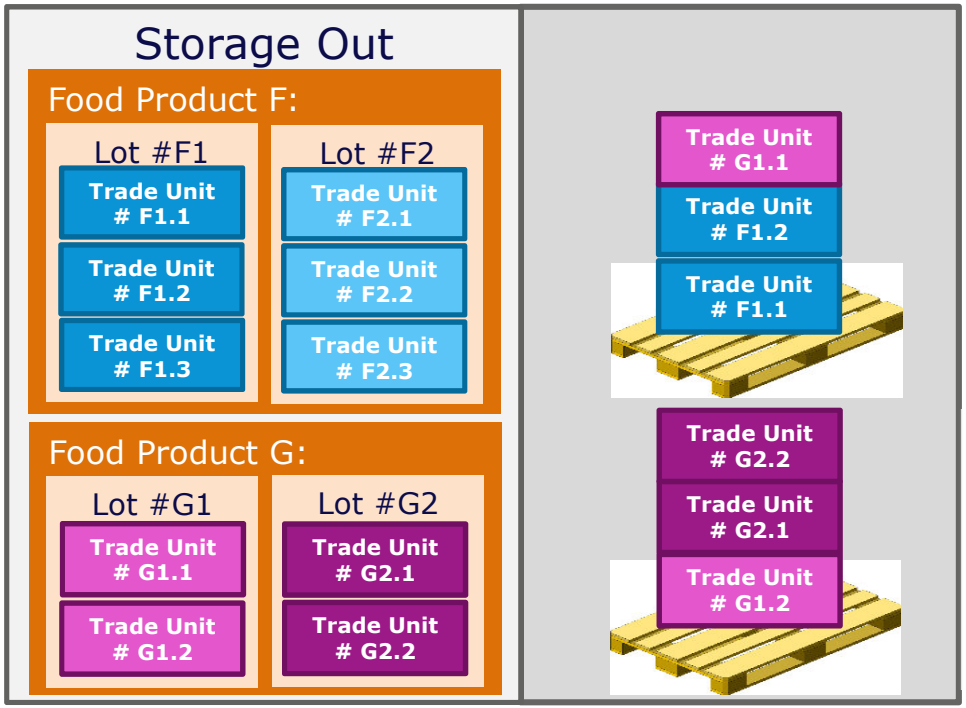
Deplete (exit)

Consume

2nd step: Transporting

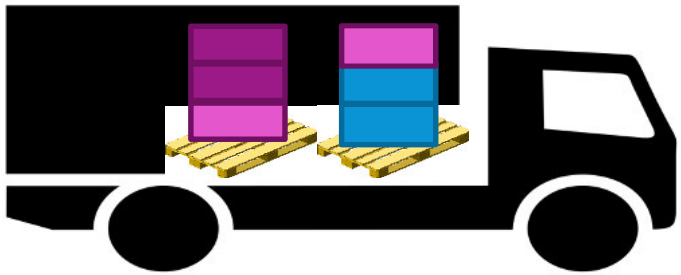
GRANULARITY FOR TRANSPORTATION

Trade Units in Storage



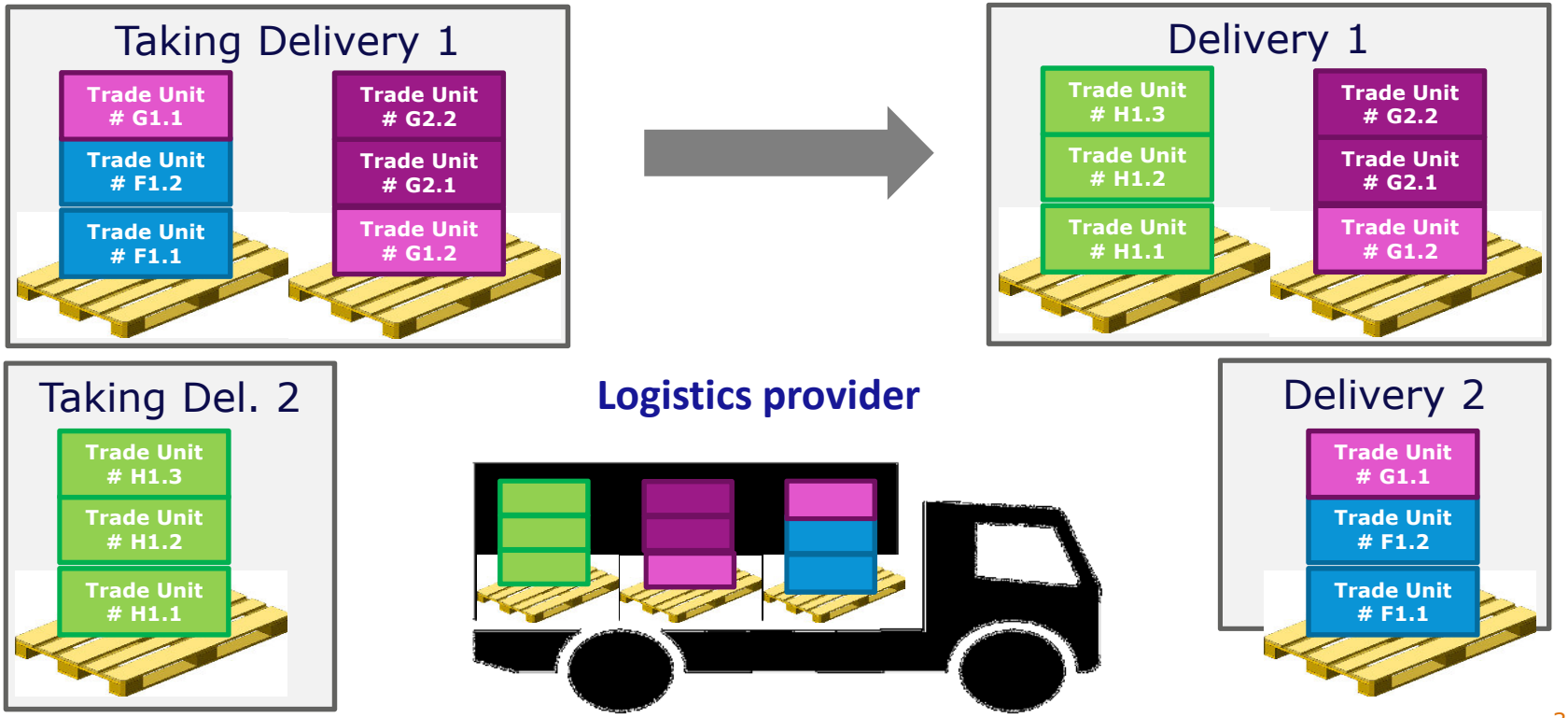
Logistic Units under Transportations

Transportation Mean



COMPLEXITY OF CONNECTIONS (I)

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



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.

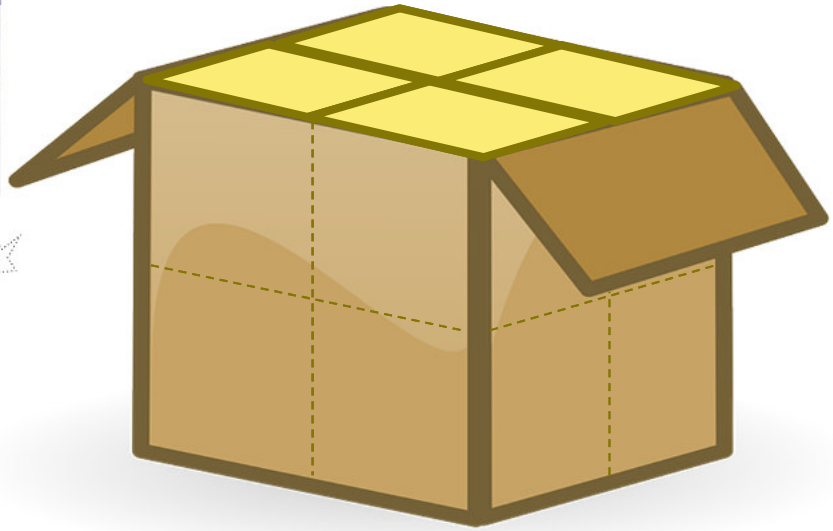
'Package unit' identifies the minimal trade unit, which could not be divided into smaller trade units.

DIVISION OF PRODUCTS DURING DISTRIBUTION

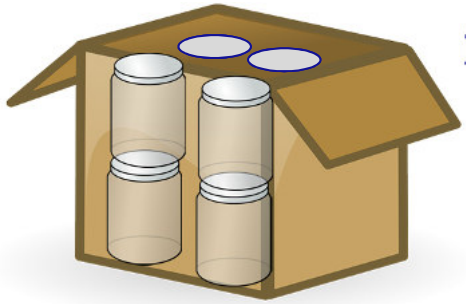
The trade units can change in the food chain, …

… 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

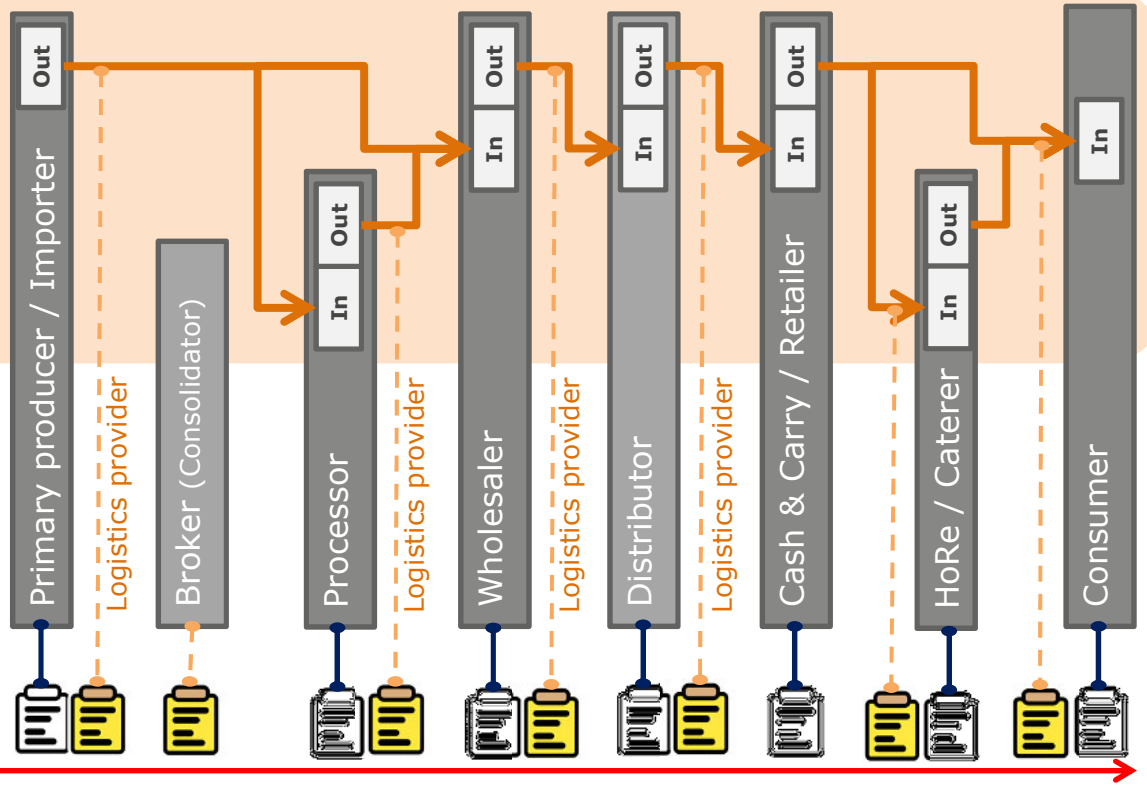
DIFFERENT LAYERS OF TRACING

Physical material flow in the food-supply-chain

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

Information holder:

= product, = transport



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).

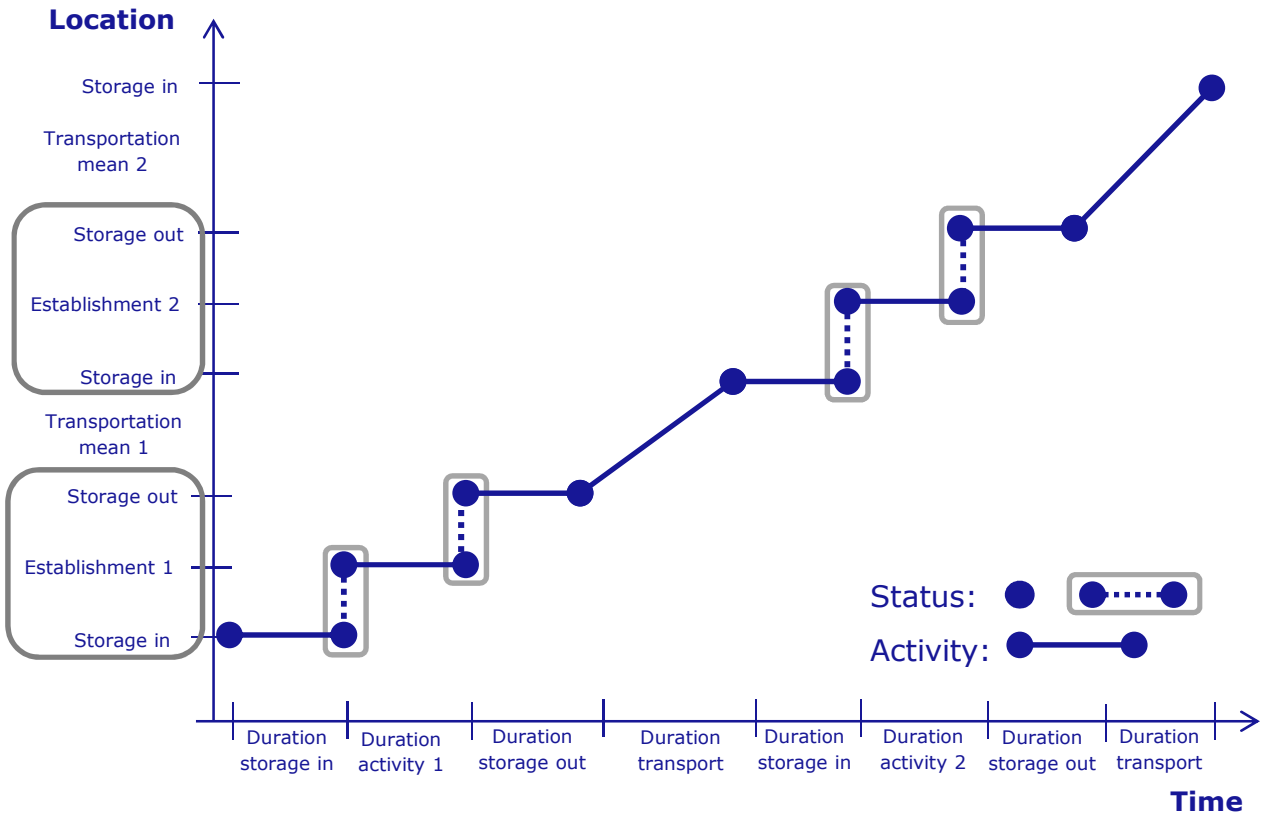
DOCUMENTATION FOR TRACING

Source	Content	Owner
Product information sheet (specification)	Processor, product, EAN, description, ingredients, package (consumer, retail, trade), transport conditions, storage / use conditions, food safety characteristics, etc.	Processor
Invoice	Supplier, receiver, product, lot, amount, price, logistic provider, date of shipment	Supplier
Consignment note	Sender, place of taking, place of delivery, date of delivery, inspection results	Logistic provider
Receipt	Date of delivery, content, product, lot, amount	Receiver
Label	Product, EAN, lot, expiry date, etc.	Product holder

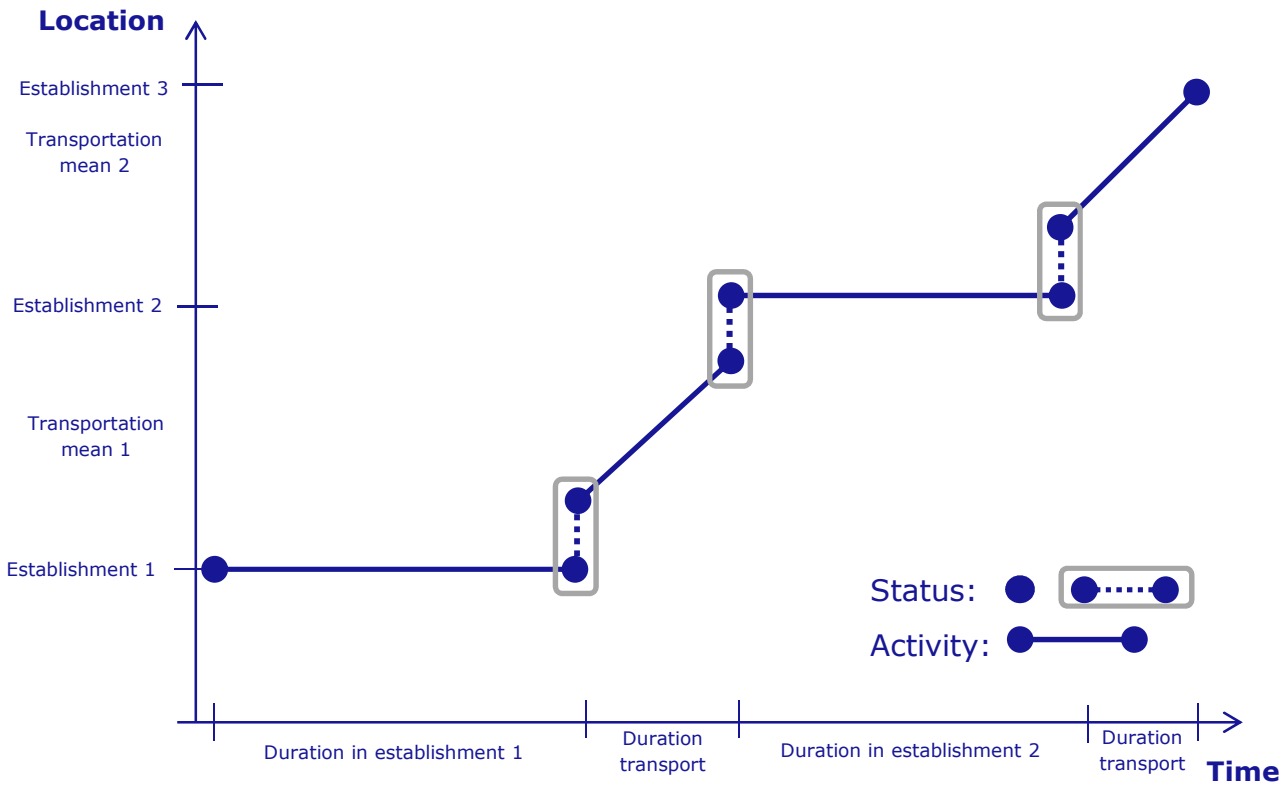
…but how is the flow of information managed?

Granularity of tracing information

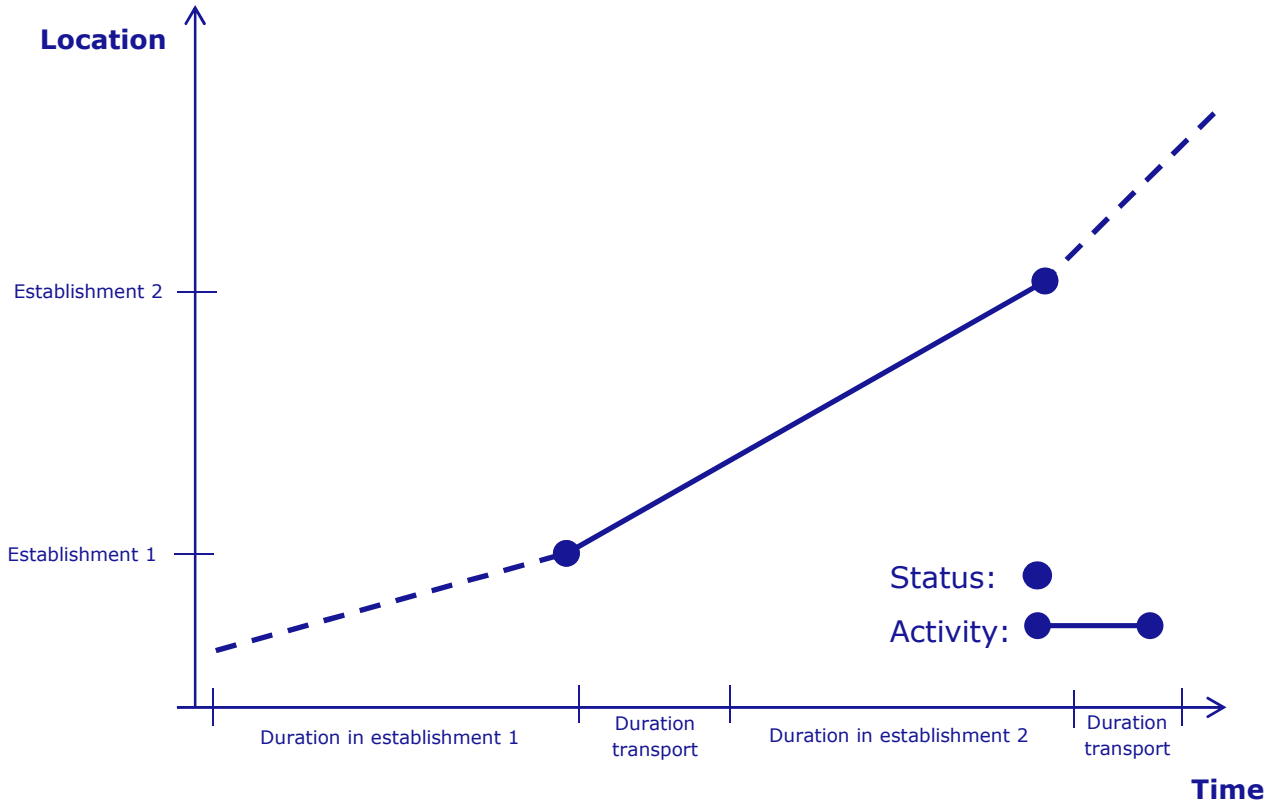
STATUS AND ACTIVITY RECORDS (DETAILED)



STATUS AND ACTIVITY RECORDS (MEDIUM)



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.

MOTIVATION OF TRACEABILITY SYSTEMS

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

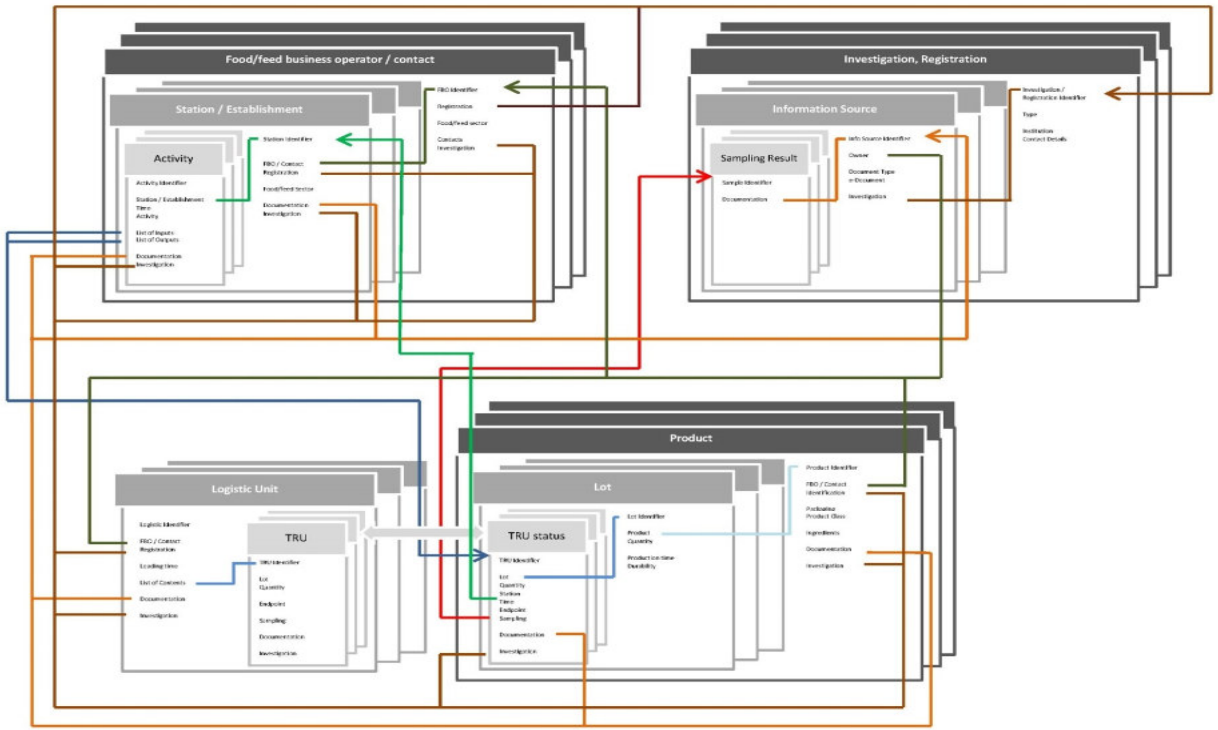
Reference: Karlsen et al. (2013)

The revised data model

REVISED DATA STRUCTURE: 9 TABLES

Food Business Operator	Product	Investigation
Establishment	Lot / batch (Logistic unit)	Information source
Activity	Traceable Resource Unit	Measurement
Transformation	Status	Information

RELATIONS BETWEEN THE TABLES



INFORMATION IN RASFF (1)

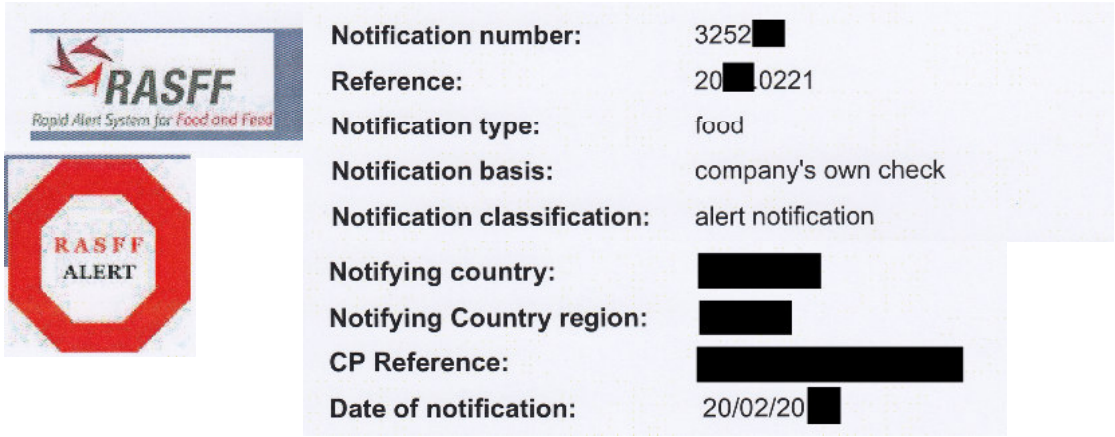
Investigation / Registration

Investigation / Registration Identifier

Type

Institution

Contact



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

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

INFORMATION IN RASFF (3)

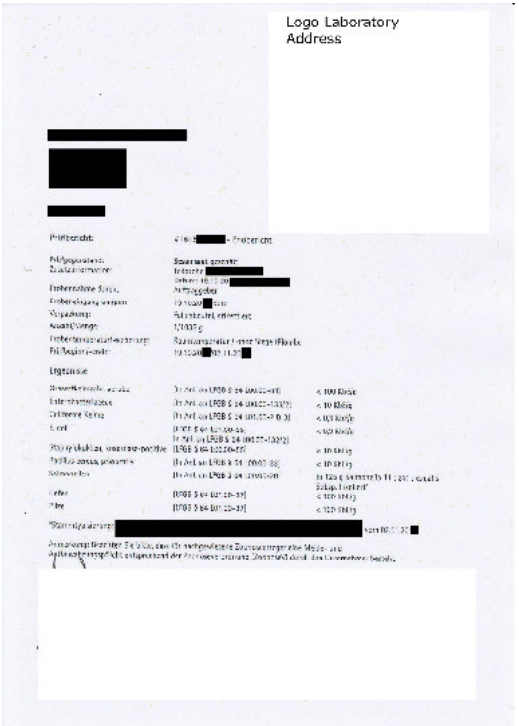
Sampling Result

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

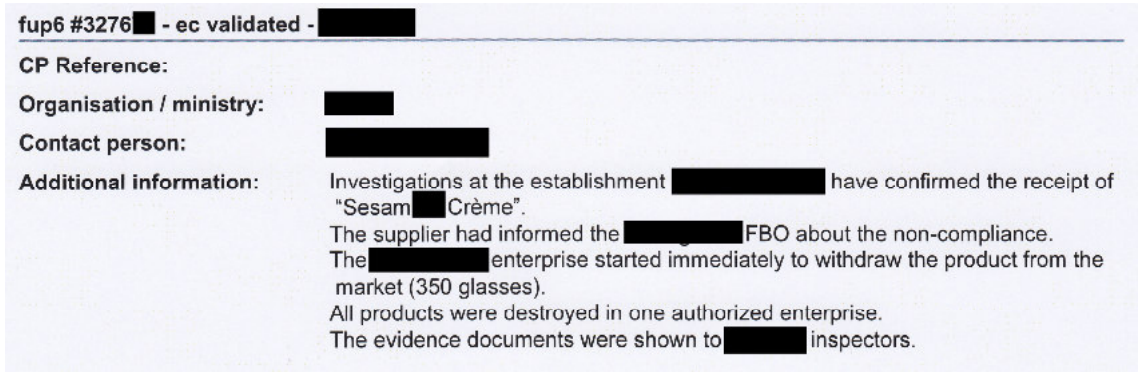
Durability

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

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".
The supplier had informed the [redacted] FBO about the non-compliance.
The [redacted] enterprise started immediately to withdraw the product from the market (350 glasses).
All products were destroyed in one authorized enterprise.
The evidence documents were shown to [redacted] inspectors.

STATUS IN RASFF (2)

Logistic Unit

Logistic Identifier

FBO / Contact ID

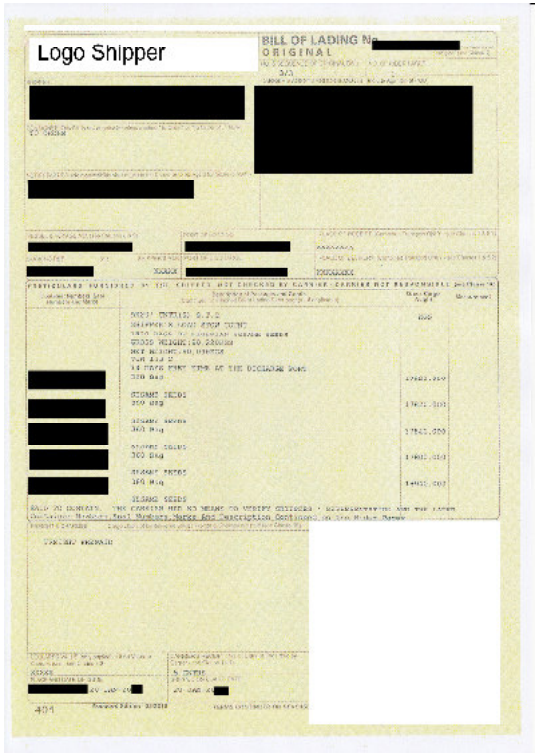
Loading time

List of Contents

Info Source ID

Investigation ID

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



STATUS IN RASFF (3)

Traceable Resource Unit (TRU) Status

TRU Identifier

Lot ID

Quantity

Endpoint

Sampling ID

Documentation ID

Investigation ID

MS[redacted]/20DV SEAL/EU0721[redacted]	SESAME SEEDS 360 Bag	17820.000

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

TRANSFORMATION IN RASFF (2)

Station / Establishment

Station Identifier

FBO Contact ID
Registration ID

Food/feed sector

Info Source ID
Investigation ID

INFORMATION IN RASFF (3)

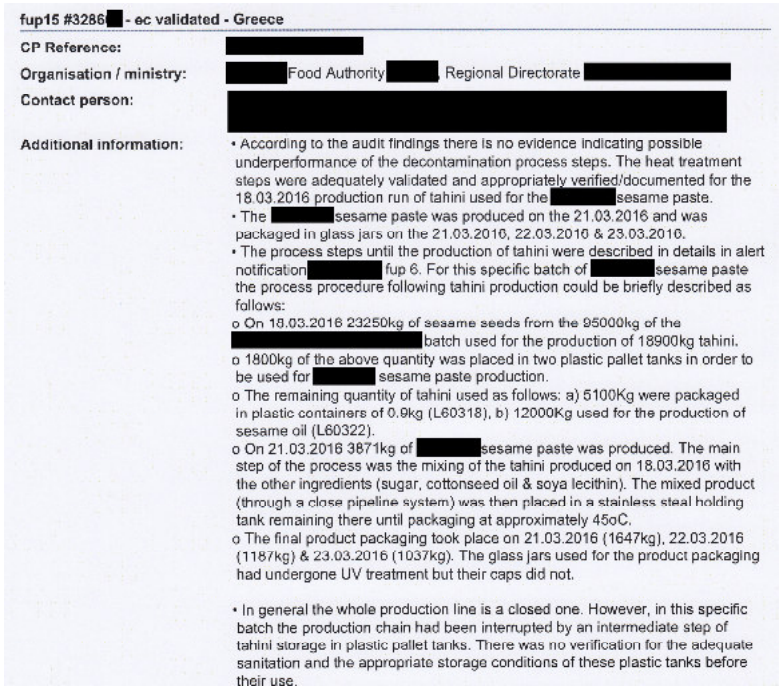
Activity

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 95000kg 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.

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

THANKS FOR YOUR ATTENTION

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

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