

A JOINED-UP APPROACH TO THE IDENTIFICATION, ASSESSMENT AND MANAGEMENT OF  
EMERGING FOOD SAFETY HAZARDS AND ASSOCIATED RISKS (FOODSAFER)



# Emerging food safety hazards in novel/low regulated food chains

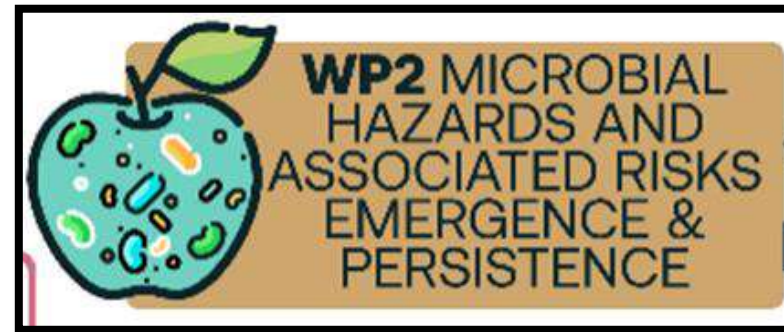
## Cintia Mayr (AIT-FSR)

Safe Food, Smart Future: European Innovations for a Changing World  
FoodSafeR and HoliFood Final Conference – Wageningen, June 10-11<sup>th</sup> 2026

Cintia Mayr – AIT Austrian Institute of Technology



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## **Task 2.2. Detection and monitoring of microbial risks in alternative food networks and novel or low regulated food production systems**

# Selected Case Studies



- Insufficiently regulated (?)
- Increased consumer interest
- Short food/alternative supply chains
- Not well characterized raw materials
- Undefined 'good practices' of production, distribution, storage, handling...

Detection and monitoring of process hygiene, microbial quality and foodborne pathogens

## Task 2.2 Six Food Types Defined



1. Ethnic Foods



2. Artisanal Dairy



3. Last Mile Delivery RTE-bowls



4. Fermented Vegetables



5. Aquaponic Farm Foods



6. Plant-based protein foods



### 3. Last Mile

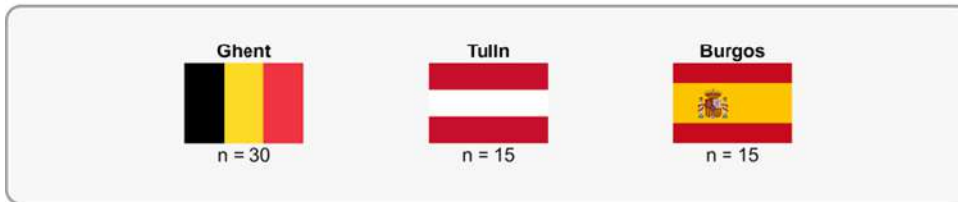
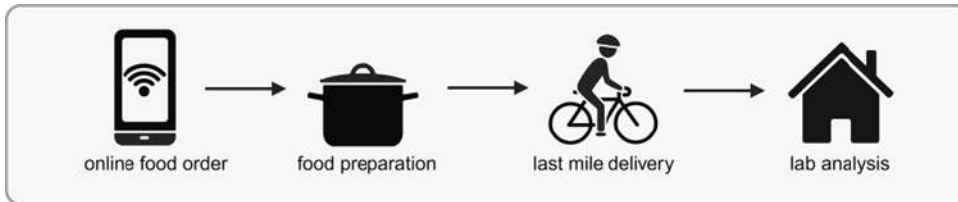




Mixed ready-to-eat multi-ingredient salads with raw or cooked ingredients; from delivery services.





### 3. Last Mile



	Seafood	Chicken	Other	Total
 Carbohydrate	n = 12	n = 9	n = 9	n = 30
 Vegetable	n = 9	n = 9	n = 12	n = 30
<b>Total</b>	<b>n = 21</b>	<b>n = 18</b>	<b>n = 21</b>	<b>n = 60</b>



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#### Food safety assessment of last mile delivery as an alternative food distribution system for ready-to-eat multi-ingredient salad bowls<sup>☆</sup>

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### 3. Last Mile



- ***Salmonella* spp. was not detected. *L. monocytogenes* was detected only in one sample and remained below critical CFU.**
- Short delivery time (~35 min), limiting microbial growth during transport despite temperature fluctuations.
- **Challenge tests showed minimal growth (<0.5 log CFU/g) of *L. monocytogenes* and *B. cereus* at RT for up to 3 h after delivery.**
- Extended storage or temperature abuse (especially >5 h at RT) increased pathogen growth potential.
- **The greatest food safety risk: improper consumer storage or delayed consumption.**
- General microbiological safety when food is consumed shortly after delivery and the cold chain is maintained.
- **Recommendation:** tailored food safety guidelines for delivery personnel, improved hygiene practices, and **consumer awareness on safe food handling.**



## 4. Fermented Vegetables



**Unpasteurized, spontaneously fermented, ready-to-eat vegetable products from retail and small producers.**

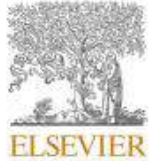




# 4. Fermented Vegetables



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## Microbiological survey of spontaneous vegetable fermentations: A food safety perspective<sup>☆</sup>

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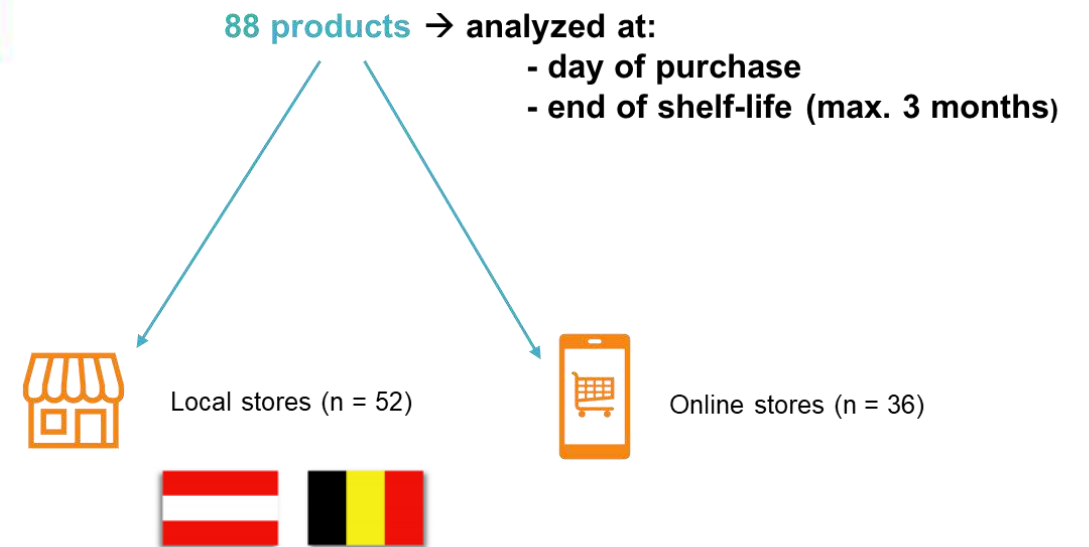
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## 4. Fermented Vegetables



- High variability in fermentation, pH ranging from 3.1–4.3, LAB counts from <math><1.0</math> to 8.8 log CFU/g. Spontaneous nature of fermentation.
- **No *Salmonella spp.*, *L. monocytogenes*, or *E. coli*.** No immediate food safety or hygiene concerns.
- **Enterobacteriaceae were detected in 6 samples.** Incomplete acidification or short fermentation.
- Prevalent LAB species included *Pediococcus parvulus*, *Lactiplantibacillus plantarum*, *Levilactobacillus brevis*, and *Lentilactobacillus buchneri*.
- **Biogenic amines** were detected. Potential food safety concern for adverse health effects.
- Challenge tests showed that ***L. monocytogenes* growth was controlled when pH dropped** rapidly below 4.4, followed by sufficient fermentation time.



## 4. Fermented Vegetables



- Rapid acidification (pH <4.4) and at least 14 days of fermentation are critical to suppress pathogen survival and ensure food safety.
- Good fermentation practices and sensory evaluation are essential to maintain product consistency, quality, and safety.





### FoodSafeR

FoodSafeR is a 4-year Horizon Europe funded research project that started in October 2022.

The project aims to design, develop, and test the building blocks of an innovative proactive and holistic food safety warning and management system, which focuses on emerging of food safety hazards and associated risks.

FoodSafeR embodies integrated approaches to hazard characterisation and risk management in a comprehensive suite of future-oriented case studies, tools, methods, strategies, models, guidance, and training materials.

These resources are being made available in the FoodSafeR Open Digital Hub, a one-stop-shop platform uniting a community of professionals from the European and international food safety system.

This Project has Received funding from the European Union's Horizon Europe Research and Innovation Programme Under Grant Agreement No. 101060696

Funded by the European Union

### Unpasteurized spontaneously fermented vegetables: A food safety perspective

#### Introduction

Fermentation is one of the oldest techniques used to preserve foods, incl. vegetables. Pasteurized fermented vegetables, produced by controlled fermentation, are preferred from a food safety perspective. However, considering the rising trend in fermented vegetable technology (food and beverages) of recent years, together with the trend to more local consumption, the interest in fermented vegetables (mainly unpasteurized, spontaneous lactic acid fermented vegetables) has increased. This research may support providing guidance on proper fermentation practices, ensuring food safety.

The Horizon Europe FoodSafeR project aims to establish a joined-up approach to the identification, assessment and management of emerging food safety hazards and associated risks. Within Work Package 2 (WP 2), the focus is mainly on microbiological risks in novel and alternative food networks and, in particular, those food processes or products or food distribution or commercialization routes that are innovative and often still lack knowledge on hazard identification or are a grey zone in food safety regulations. All case studies in WP2, including "unpasteurized fermented vegetables set available in restaurants, catering shops, popup or online shops", were selected within this context and are subject to interest by the consumer due to their perception as fancy, healthy, and sustainable.





# 4. Fermented Vegetables



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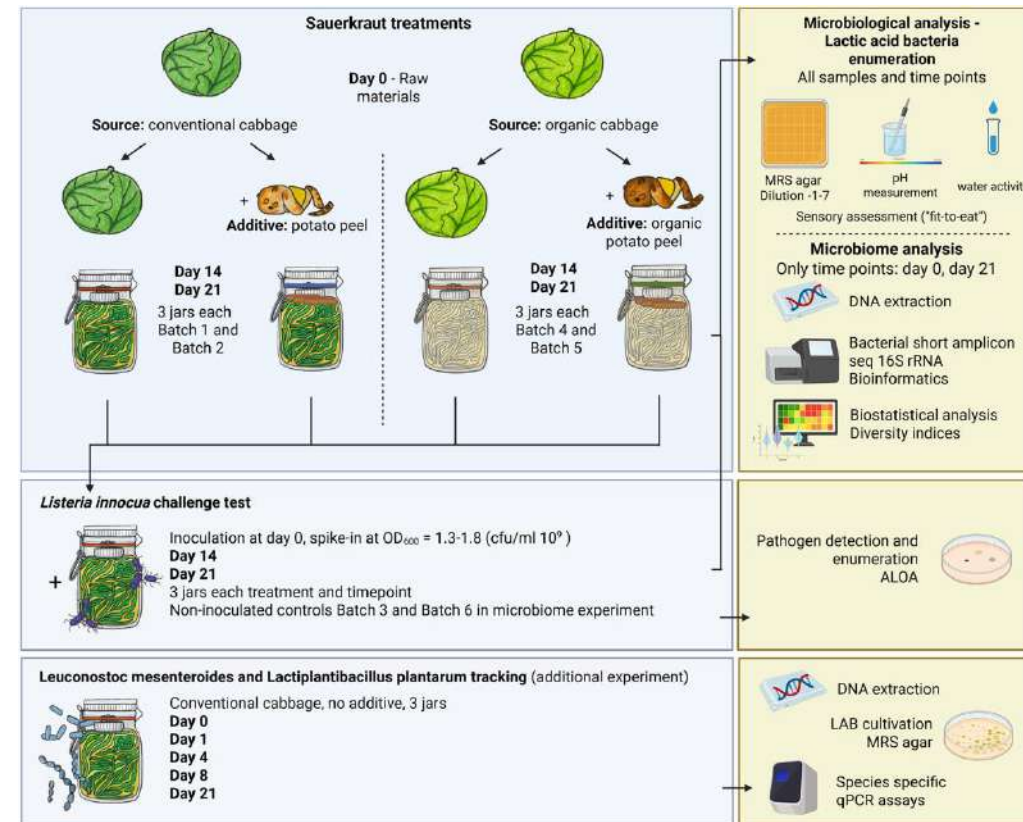


## Influence of cabbage farming practice and potato peel addition on the endpoint microbial community in sauerkraut fermentation<sup>☆</sup>

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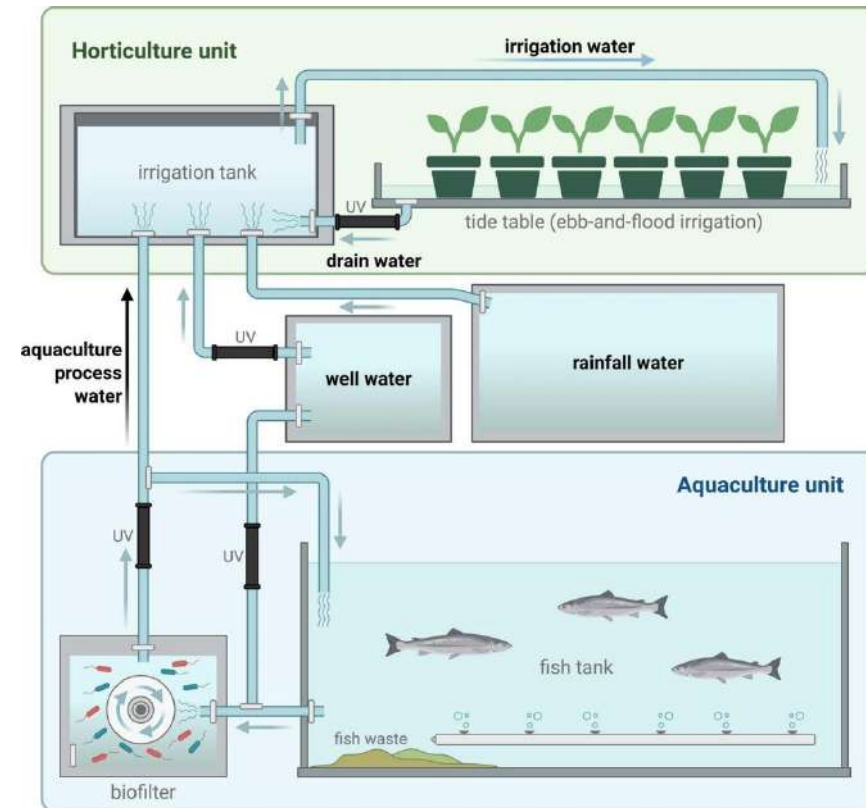




## Case study 5. Aquaponic Farm Foods



**In-company microbial assessment, leafy aromatic herbs, grown in an aquaponic farm in controlled environment.**



Source: Vermeersch et al. 2025



# Case study 5. Aquaponic Farm Foods



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journal homepage: [www.elsevier.com/locate/ijfoodmicro](http://www.elsevier.com/locate/ijfoodmicro)



## Microbiological hygiene and food safety assessment of urban aquaponic farming<sup>☆</sup>

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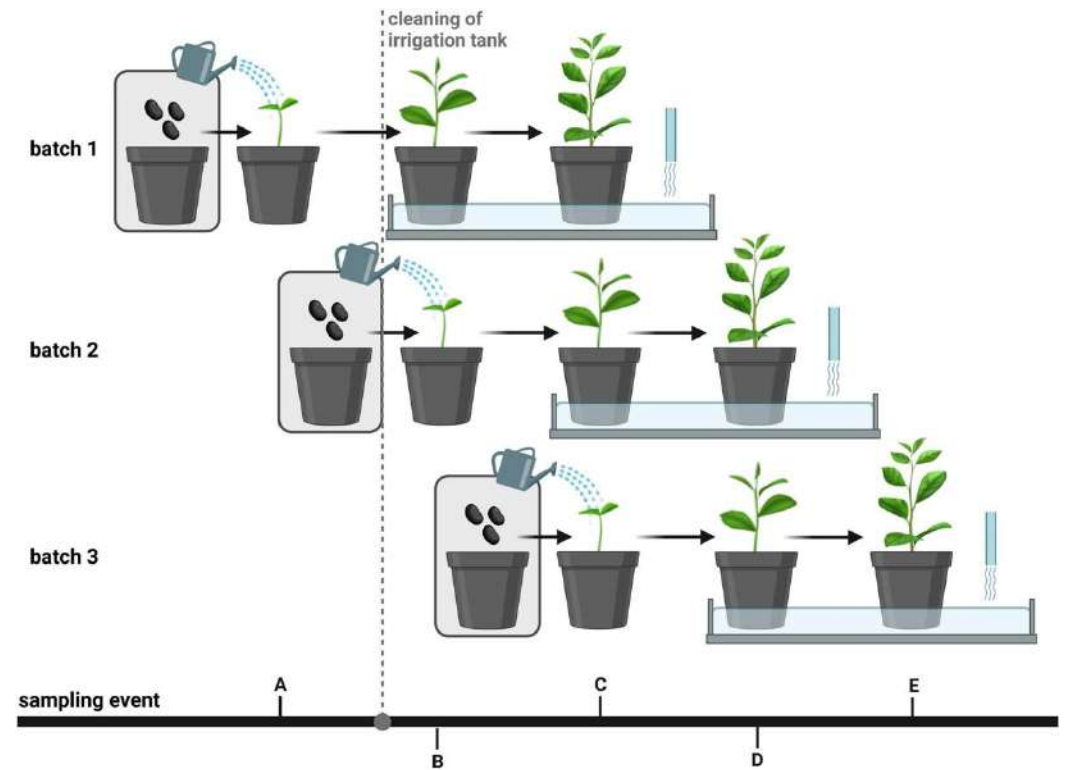
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Source: Vermeersch et al. 2025



## Case study 5. Aquaponic Farm Foods



- **No *Salmonella* spp. or *L. monocytogenes* detected** on ready-to-market basil leaves. No direct food safety concern for consumers.
- ***Salmonella* spp.** was detected in 8/94 **irrigation-related water streams**, particularly in rainfall water and aquaculture process water. Possible contamination pathways.
- **Peat moss substrate** was noted to contain *E. coli* ( $2.7 \pm 0.6$  log CFU/g) and occasional *Salmonella* spp. No transfer to basil leaves was observed.
- **Irrigation water and peat-based substrates are key risk factors** for introducing and spreading foodborne pathogens in aquaponic systems and should be closely monitored.
- *E. coli* alone is not a reliable indicator of *Salmonella* spp. in aquaponic irrigation water, meaning **pathogen testing should not rely solely on indicator organisms.**



## 1. Ethnic Foods



## 2. Artisanal Dairy



## 6. Plant-based protein foods



Ethnic foods from retail markets at various convenience levels.



Fresh and soft cheeses from small producers, unpasteurized, ready-to-eat.



Plant-based protein foods from retail markets at various convenience levels.





	Ethnic foods	Artisanal dairy	Novel protein
Number of samples	N = 99	N= 111	N = 91
pH	3.98 – 7.12	3.97 – 7.44	4.22 – 6.80
Water activity	0.87 – 0.99	0.75 – 0.98	0.90 – 0.99
Total colony counts (log CFU/g)	6.2 ± 2.6	8.3 ± 0.8	4.5 ± 2.0
<i>E. coli</i> (highest: log CFU/g)	N=3 (2.3)	N = 58 (5.70)	N = 0
<i>Salmonella spp.</i> (detected/25g)	N = 0	N = 0	N = 1
<i>Listeria spp.</i> (CFU/g)	3.1 ± 2.1	NA	2.1 ± 0.7
<i>L. monocytogenes</i> (detected/25g)	N = 2	N = 0	N = 0
<i>Enterobacteriaceae</i> (log CFU/g)	5.0 ± 2.9	2.5 ± 2.6	2.6 ± 1.3
<i>B. cereus</i> (highest log CFU/g)	N = 14 (5.26)	NA	N = 8 (4.96)
Lactic acid bacteria (CFU/g)	NA	7.6 ± 1.3	NA

# Conclusions of Task 2.2



- ❖ Low prevalence of pathogens in most products among the Case Studies
- ❖ Recommended to increasing consumer awareness for best food storage and food preparation practices in last mile and fermented vegetables
- ❖ Fermentation methodologies need for certain producers more emphasis on ensuring acid pH and long enough fermentation time
- ❖ Best practices for safe aquaculture need to highlight the microbiological monitoring of water and substrate, as possible contamination pathways
- ❖ Emphasizing hygiene monitoring, raw material quality control, and process standardization at producers in all Case Studies



# Thank you for your attention!



The FoodSafeR Digital Hub is a one-stop-shop community-based platform for European and international food safety professionals. It offers a collaborative environment and access to data and tools for the identification and management of emerging microbial and chemical food safety hazards and associated contaminant risks based on cutting-edge science.

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