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 10-11th 2026

Cintia Mayr – AIT Austrian Institute of Technology

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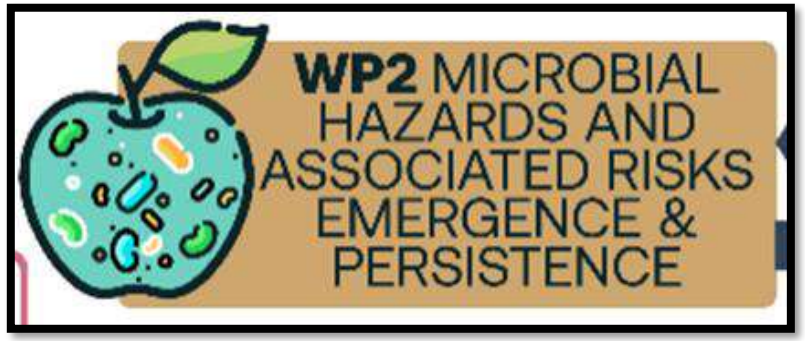


Task 2.2. Detection and monitoring of microbial risks in alternative food networks and novel or low regulated food production systems

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

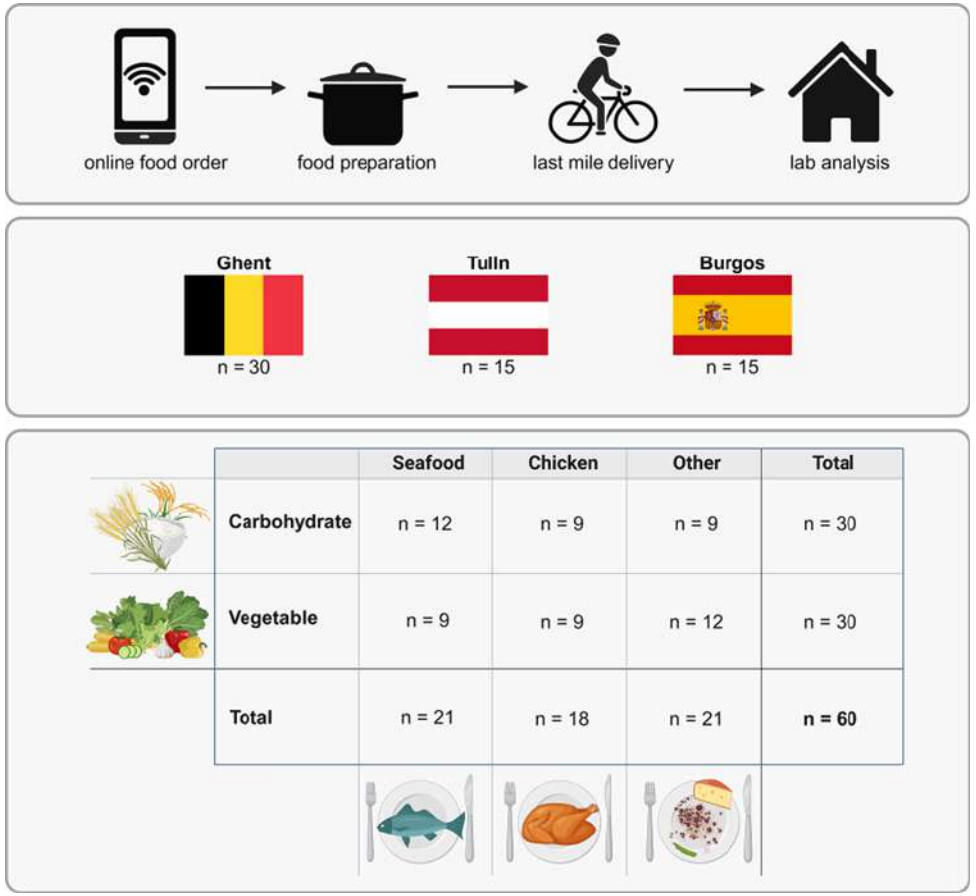

5. Aquaponic Farm Foods


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
Total	n = 21	n = 18	n = 21	**n = 60**

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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☆

Mathis Vermeersch [a], Mieke Uyttendaele [a,*], Cintia Mayr [b], Nadine Yeramian [c,d], Mariana Alves Elois [c,d], David Rodriguez-Lazaro [c,d], Tanja Kostic [b,*], Liesbeth Jacxsens [a]

[a] Food Microbiology and Food Preservation Research Unit, Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium
[b] AIT Austrian Institute of Technology GmbH, Center for Health & Bioresources, Bioresources Unit, Tulln, Austria
[c] Microbiology Section, Faculty of Sciences, University of Burgos, Burgos, Spain
[d] Research Centre for Emerging Pathogens and Global Health, University of Burgos, Burgos, Spain

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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☆

Mathis Vermeersch[a,*], Cintia Mayr[b], An Maes[c], Anneleen D. Wieme[d], Bruno De Meulenaer[c], Peter Vandamme[d], Liesbeth Jacxsens[a], Tanja Kostic[b,*], Mieke Uyttendaele[a]

[a] FMFP, Research Unit Food Microbiology and Food Preservation, Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000, Gent, Belgium
[b] AIT Austrian Institute of Technology GmbH, Center for Health & Bioresources, Bioresources Unit, Tulln, Austria
[c] nutriFOODchem, Research Unit Food Chemistry and Human Nutrition, Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000, Gent, Belgium
[d] BCCM/LMG Bacteria Collection, Laboratory of Microbiology, Department of Biochemistry and Microbiology, Faculty of Sciences, Ghent University, K. L. Ledeganckstraat 35, 9000, Gent, Belgium

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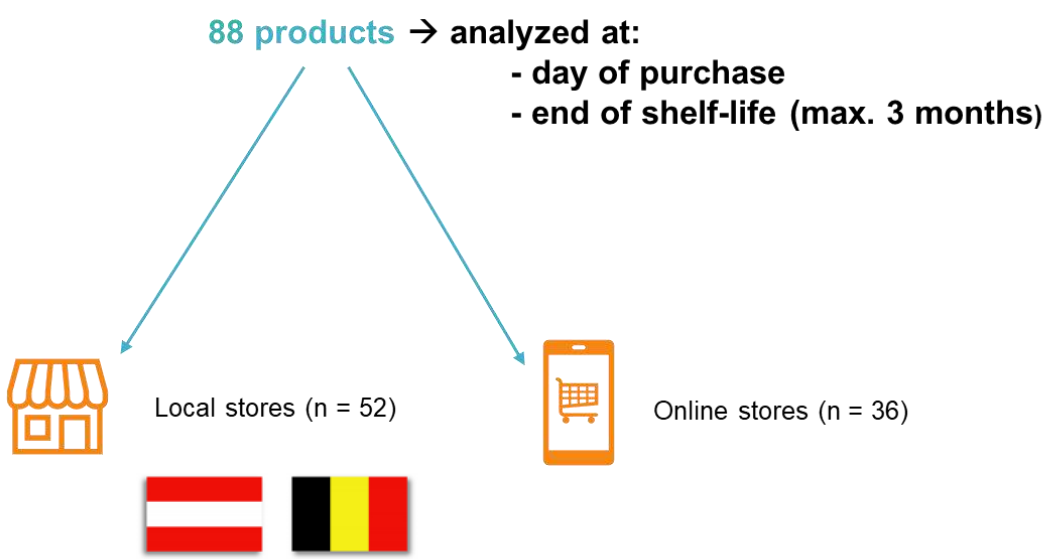

4. Fermented Vegetables

- High variability in fermentation, pH ranging from 3.1–4.3, LAB counts from <1.0 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.

4. Fermented Vegetables

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Influence of cabbage farming practice and potato peel addition on the endpoint microbial community in sauerkraut fermentation☆

Cintia Mayr*, Emese Dankó, Livio Antonielli, Tanja Kostić

AIT Austrian Institute of Technology GmbH, Center for Health & Bioresources, Bioresources Unit, Tulln, Austria

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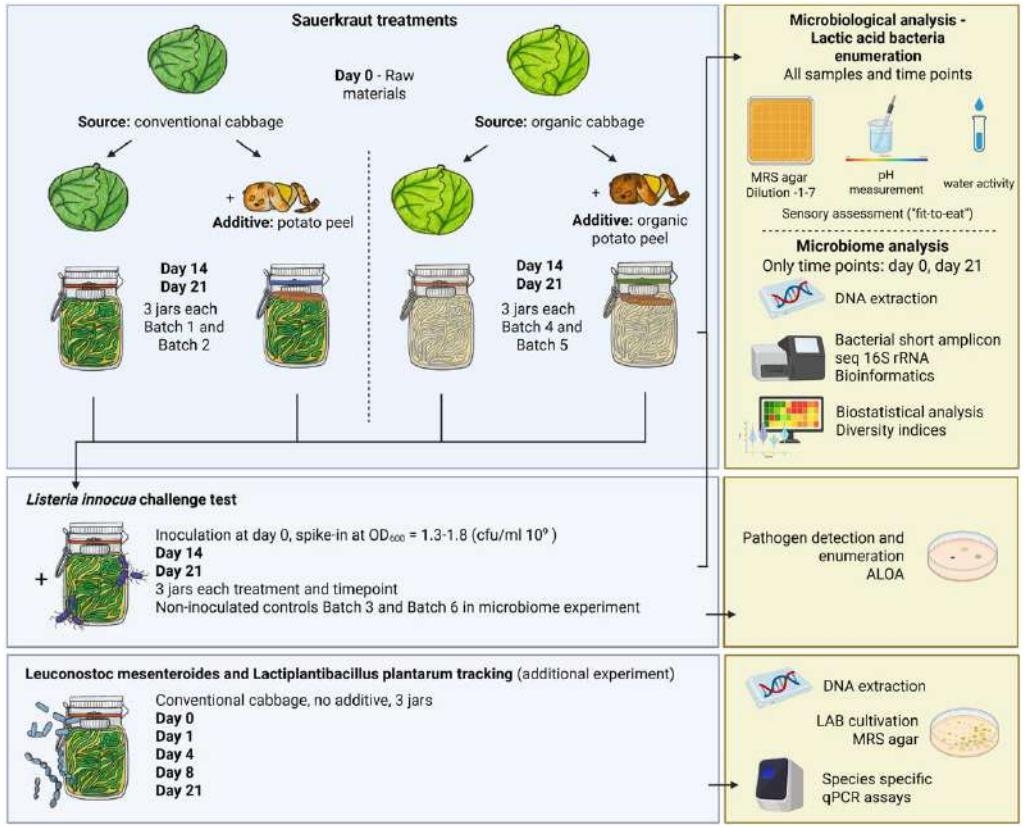
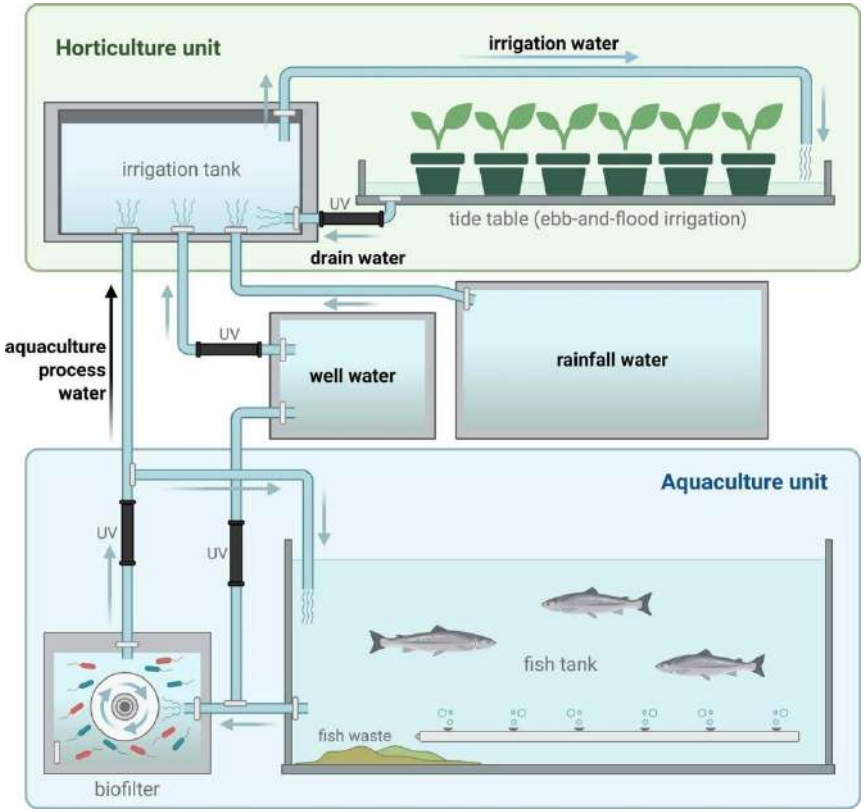


Case study 5. Aquaponic Farm Foods

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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Microbiological hygiene and food safety assessment of urban aquaponic farming☆

Mathis Vermeersch [a,*], Liesbeth Jacxsens [a], Tara Baele [b], Inge Van Damme [c,d], Bavo Verhaegen [d], Nico Boon [e], Mieke Uyttendaele [a]

[a] FMFP, Research Unit Food Microbiology and Food Preservation, Department of Food Technology, Safety and Health, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000 Gent, Belgium
[b] Kytos BV, Technologiepark Zwijnaarde 82, 9052 Gent, Belgium
[c] Department of Translational Physiology, Infectiology and Public Health, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium
[d] Service of Foodborne Pathogens, Sciensano, Rue Juliette Wytsman 14, 1050 Brussel, Belgium
[e] CMET, Center for Microbial Ecology and Technology, Department of Biotechnology, Ghent University, Frieda Saeysstraat 1, 9052 Gent, Belgium

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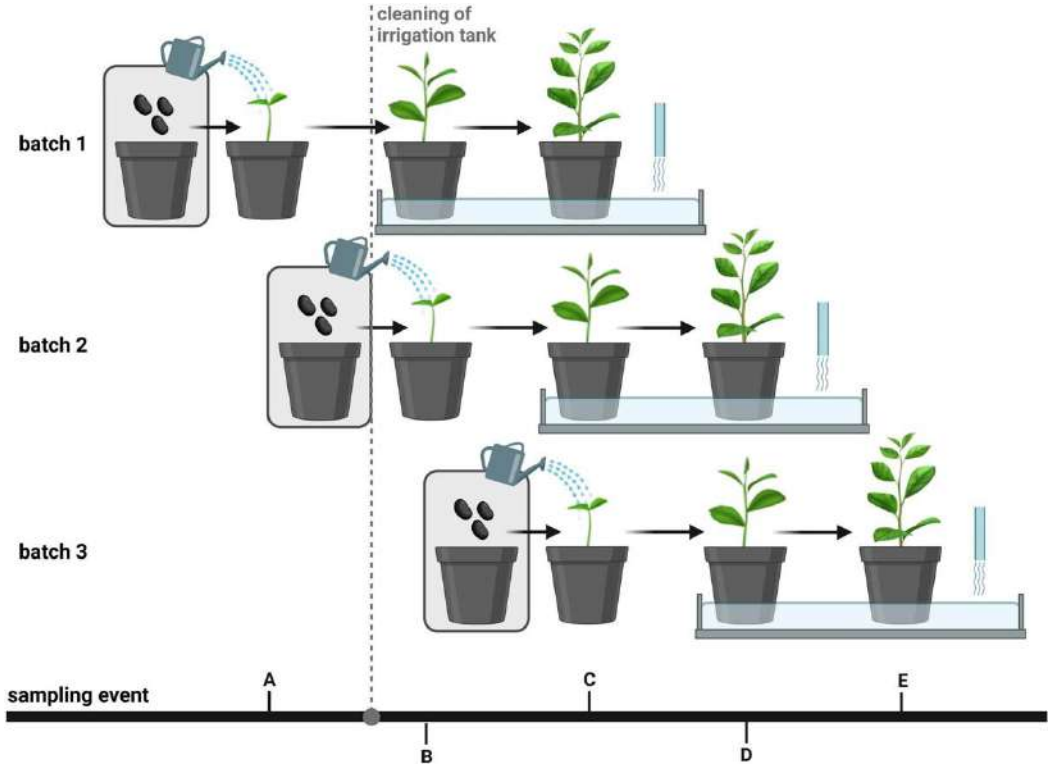

Source: Vermeersch et al. 2025

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 ± 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
E. coli (highest: log CFU/g)	N=3 (2.3)	N = 58 (5.70)	N = 0
Salmonella spp. (detected/25g)	N = 0	N = 0	N = 1
Listeria spp. (CFU/g)	3.1 ± 2.1	NA	2.1 ± 0.7
L. monocytogenes (detected/25g)	N = 2	N = 0	N = 0
Enterobacteriaceae (log CFU/g)	5.0 ± 2.9	2.5 ± 2.6	2.6 ± 1.3
B. cereus (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!