



# FOODSAFER

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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.

## 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.



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## The Team

**The FoodSafeR** consortium of 19 leading academic, research and industry organisations from across Europe, is led by FFOQSI.

FFOQSI is the Austrian Competence Centre for Food and Food Quality, Safety and Innovation. It is a multidisciplinary joint research hub that encompasses scientific, national and international business partners food safety authorities and stakeholders, technology SMEs and startups from the food system.

**The FoodSafeR** Advisory Board of 25 leading stakeholders from the food safety field gives us a global reach.

## Materials and Methods

Unpasteurized spontaneously fermented vegetables were sampled in Ghent (Belgium) and Vienna (Austria), both in the local and through online shops. The samples were analysed for microbiological quality and food safety parameters (lactic acid bacteria as beneficial bacteria, Enterobacteriaceae and Escherichia coli as process hygiene indicators, Listeria monocytogenes as a foodborne pathogen etc.), both at the day of purchase and the end of the shelf-life. In addition, (i) data on intrinsic (acidity, water activity, etc.) and extrinsic characteristics (type of packaging, storage temperature) of the food product, and (ii) information on the label (the shelf life, reasonably foreseen handling, and health claims) were collected for all samples taken.

### Resources:

FSAI. (2021). Guidance Note No. 37: Good Manufacturing Practices for the Production of Ready-to-eat Unpasteurised Fermented Plant-based Products. <https://www.fsai.ie/publications/gn-37-good-manufacturin-g-practices-for-the-product>

Battcock, M., & Azam-Ali, S. (1998). Fermented Fruits and Vegetables. A Global Perspective. In Fermented Fruits and vegetables. A Global perspective. Food and Agriculture Organization of United Nations. <https://www.fao.org/3/x0560e/x0560e00.htm>

Van Beeck, W., Verschueren, C., Wuyts, S., van den Broek, M. F. L., Uyttendaele, M., & Lebeer, S. (2020). Robustness of fermented carrot juice against Listeria monocytogenes, Salmonella Typhimurium and Escherichia coli O157:H7. International Journal of Food Microbiology, 335, 108854. <https://doi.org/10.1016/J.IJFOODMICRO.2020.108854>

## Summary of the findings

When fermenting vegetables, often mentioned key factors which ensure the safety of the product are (i) the use of starter cultures, and (ii) a heat treatment. However, these control measures will affect the bacterial biodiversity and probiotic quality and may result in an altered lactofermentation. Therefore, spontaneous fermentation is often preferred. However, the reliance on indigenous microbiota can affect safety and predictability of the fermentation process because the microbial load and activity of naturally present lactic acid bacteria that reside on the (shredded/cut) vegetables can be variable. It has been observed in the FoodSafeR project experimental research work that during this phase it is crucial to follow up on the following factors. A good practice is to see that:

(i) Washed vegetables are completely submerged in (3-4%) saltwater brine until the jar is almost full and the jar is tightly closed

(ii) The acidification (pH drop) by the lactic acid bacteria should result in a pH < 4.2

(iii) The fermentation time should be at least 14 days (usually at 18-21°C under anaerobic conditions)

(iv) The sensory attributes are acceptable: check for off-odours or visual mould formation.

If one of these conditions has not been met, discard the product as not only the quality, but also the safety of the spontaneous fermented vegetable product cannot be guaranteed.

Furthermore, during the FoodSafeR project survey, most (but not all) market samples have shown to comply with a pH level lower than 4.2. On a few occasions, persisting Enterobacteriaceae indicated either a too slow pH-decrease with related favourable initial growth conditions or a too short fermentation time.



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