MICROORC

Orchestrating food system microbiomes to minimize food waste

Revolutionizing Food Safety and Sustainability with Microbiome-Targeting Innovations

The MICROORC project is paving the way for sustainable solutions to tackle food spoilage and waste by leveraging microbiome-targeting technologies and tools. These innovations—focused on monitoring and enhancing microbiomes in food and the food processing chain—will help reduce spoilage, extend shelf life, and improve overall food quality.

The collaboration between the scientific and industry partners has been amazing and after just one year, we have a lot of interesting results and promising concepts to investigate further, says Solveig Langsrud, MICROORC coordinator at NOFIMA.

By integrating advanced bio-solutions, such as food cultures and fermentates, MICROORC is addressing spoilage at the microbial level, making a real impact on products like cold-smoked salmon, fresh chicken, and plant-based alternatives. With the project's solutions set to reach a high level of research and innovation maturity (TRL 6-7), MICROORC is driving a future where sustainable, microbiome-based technologies are at the forefront of reducing food waste and ensuring food safety.

Discover more by reading MICROORC newsletter issue #2!

Business solutions for shelf-life prediction and labelling

Emerging food sensing and labeling technologies are revolutionizing the industry by offering smarter ways to monitor food quality and safety. From color-based sensors and nanotechnology to IoT-enabled smart labels, these innovations help prevent spoilage and contamination in real time. Biosensors in packaging continuously monitor spoilage, while printable sensors and interactive labels provide cost-effective solutions for consumers and businesses alike.

We are focusing on three key developments:

- Predictive models using microbiome data to estimate shelf life.
- Sensor and smart label solutions for dynamic shelf-life monitoring.
- Rapid assays for detecting microbial spoilage indicators.

Our case studies target high-value perishable products like chicken and salmon fillets, where microbiological factors limit shelf life and contribute to food waste. After completing initial microbial sampling at three factories (Norsk Kylling, Lusiaves, Cermaq), we are moving to the next phase, combining data with factory metrics to test innovative solutions.

This work will deepen our understanding of microbiomes in food production, helping extend shelf life and reduce food waste across the EU. Learn more by reading the interview with Annette Fagerlund, Senior Scientist at Nofima.

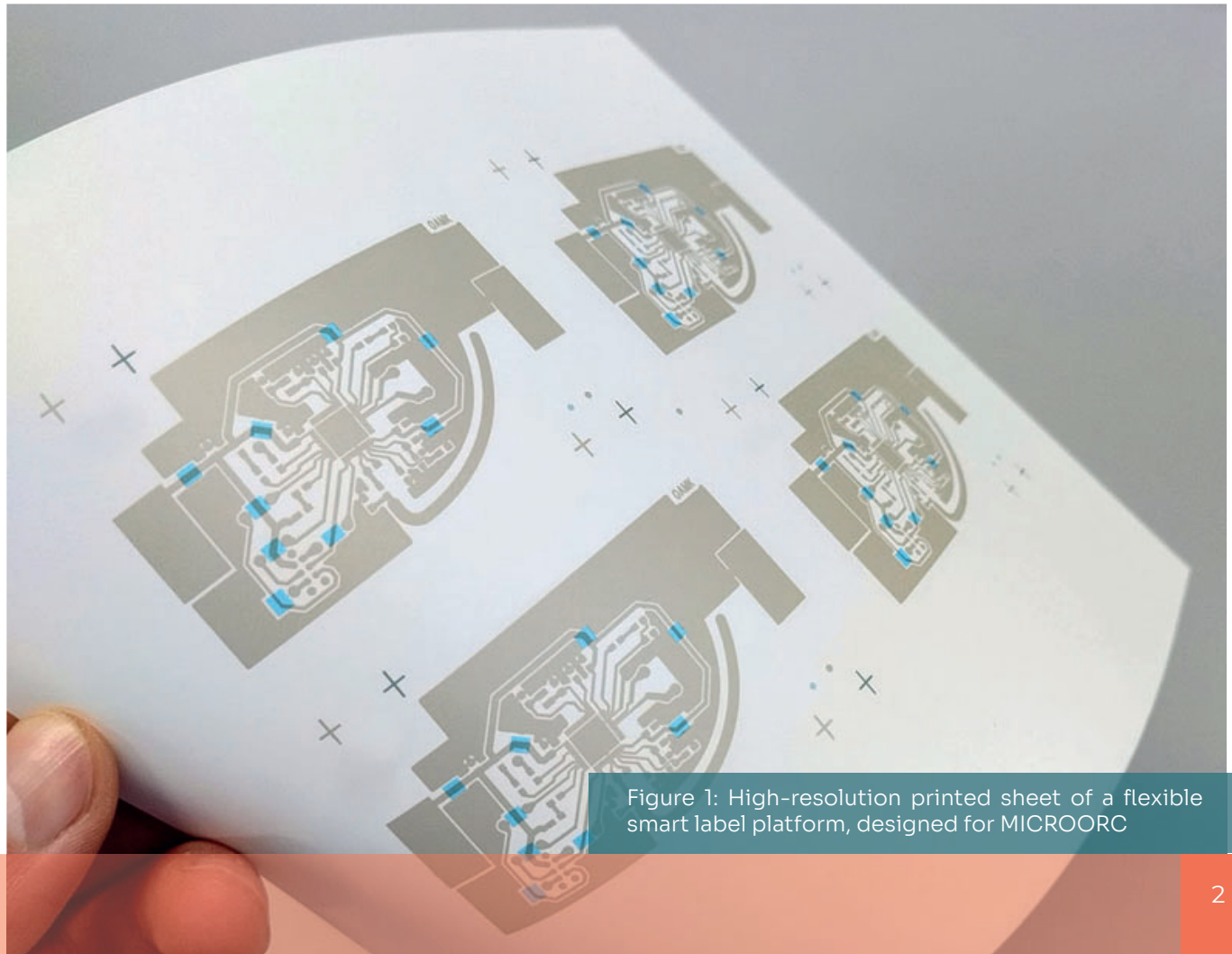


Figure 1: High-resolution printed sheet of a flexible smart label platform, designed for MICROORC

Microbiome-based protection for optimized food quality and safety

Our goal is to holistically evaluate bio-solutions for improving food safety and extending the shelf life of cold-smoked salmon, fresh chicken, and plant-based meat alternatives. These bio-solutions include food cultures (live microorganisms) and fermentates (compounds from fermentation).

We selected bio-solutions based on efficacy, cost, labeling, consumer acceptance, environmental impact, and sensory properties. Tests will focus on inhibiting harmful bacteria like Listeria monocytogenes through challenge tests and shelf-life studies. Advanced tools like metabarcoding and MALDI-TOF will help analyze microbial communities, while sensory panels will assess taste, texture, and overall quality. Key updates:

- The bio-solution selection process is complete, considering factors like regulatory status and sensory impact. A white paper is being prepared to share findings with food industry stakeholders.
- Microbial experiments have begun, exploring bio-solutions' impact on spoilage and pathogens like Listeria in salmon and Campylobacter in chicken. Sensory analysis is also underway.
- Cold-smoked salmon testing has started (focusing on food cultures), while protocols for chicken and plant-based meat alternatives are being finalized. Chicken experiments will occur at Nofima and UCP, requiring further alignment. For plant-based meat, early research at UCP is helping define the experimental plan.

Want to learn more about this work? Read the interview with Véronique Zuliani, Director of the Applied R&D team at Novonesis.

Figure 2: Traditionally, bacteria has been used to keep food products safe and stable through fermentation. In MICROORC we will develop protective cultures for fresh products, aiming to prevent spoilage.

Networking with the FOODGUARD project

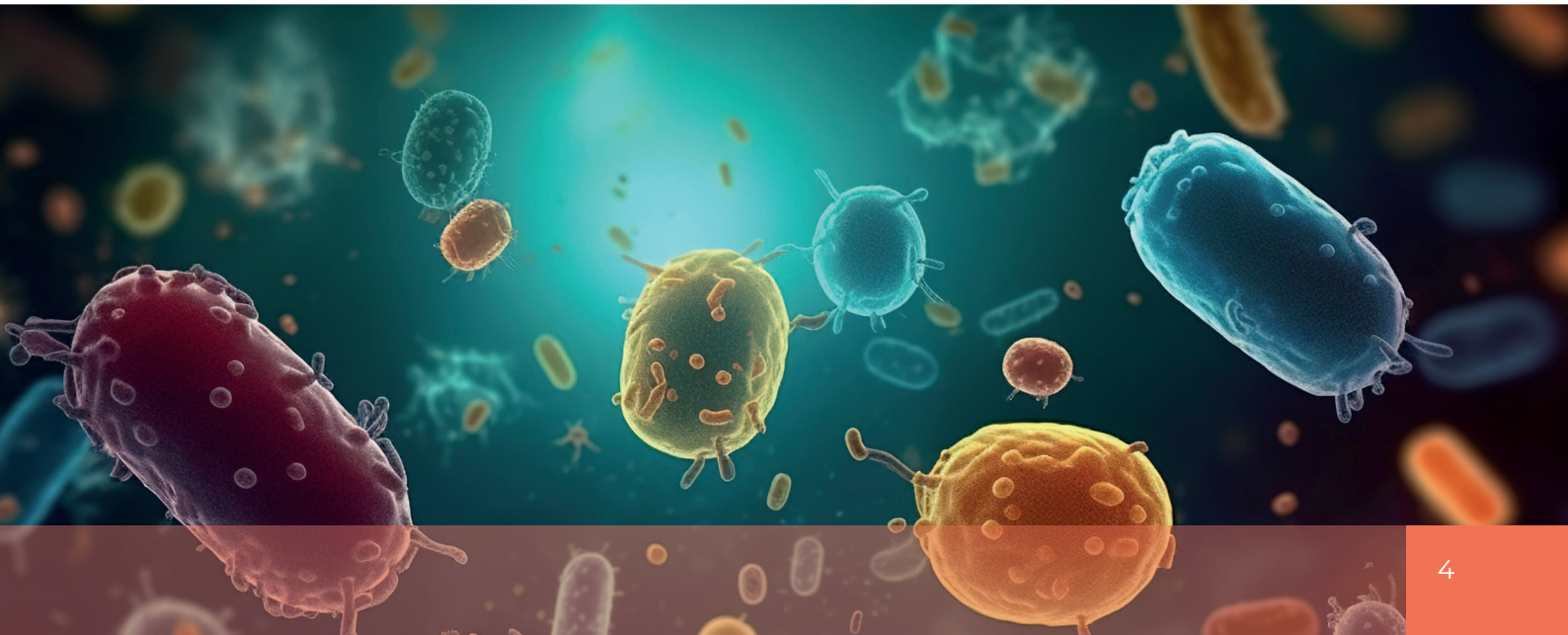
MICROORC has initiated efforts to cluster with other European, national, and international projects focused on microbiome-based innovations and advancements, aiming to connect with similar initiatives to enhance its magnitudeimpacts. The goal is to engage in networking activities that will build relationships with key stakeholders from other EU-funded projects, thereby amplifying the project's impact.

FOODGUARD

The **FOODGUARD** project aims to develop and demonstrate co-created microbiome-based solutions to tackle food, health, economic, and environmental challenges. It will offer sustainable innovations for food processing, packaging, and the value chain, focusing on extending shelf-life and reducing waste.

Key solutions include:
- extending shelf-life through novel packaging, bio-preservation, and antimicrobial technologies;
- monitoring food quality and safety with microbial indicators and smart packaging;
- predicting shelf life and improving traceability using AI, IoT, and digital tools.

These innovations will be tested in four pilot demonstrations across different countries. FOODGUARD's outcomes aim to reduce food loss, support industry adoption of preservation techniques, drive policy engagement, increase consumer trust, and optimize the food system from farm to fork.



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Funded by
the European Union

Funded by the European Union under Grant Agreement N° 101136248. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or REA. Neither the European Union nor REA can be held responsible for them.