MICROORC: ORCHESTRATINGFOOD SYSTEM MICROBIOMESTO MINIMIZE FOOD WASTE

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Aim: Food loss and waste (FLW) pose significant challenges globally, affecting the environment, food security and economies. Approximately, 1.3 billion tonnes of food are lost or wasted annually, which could feed about 1.26 billion hungry people worldwide. In the EU, 14% of food produced for human consumption is lost or wasted, with households and distribution accounting for 70% of this waste. Consequently, reducing FLW has become a critical priority on the sustainability agenda at all levels.
This study aims to showcase the efficacy of microbiome-based tools and solutions in enhancing the microbial quality and safety of protein-rich perishable food products, thereby reducing and preventing food spoilage and waste.

Method: The MICROORC project is designed to develop sustainable solutions for the microbiome monitoring and orchestration by a) developing predictive analytics models incorporating microbiome information to predict shelf-life; b) implementing time-temperature indicators (TTIs), sensors and smart label solutions for dynamic shelf life labelling; c) creating rapid detection assays for microbial indicators of food spoilage; d) enhancing microbiome-based protection technologies to replace synthetic chemicals and increase shelf-life and safety; e) introducing novel packaging solutions targeting spoilage for sustainable development and increased shelf-life. Three selected products serve as case studies: fresh chicken, smoked salmon, and plant-based meat analogues.These products represent high quality, healthy protein sources with relatively low greenhouse gas emissions and land use.

Results: The results of the study revolve around the optimal combination of sustainable microbiome-based solutions to reduce food waste caused by spoilage, pathogen growth or expiration by 50%, and 10% of products implementing new packaging concepts. By combining microbiome-based packaging technologies with bioprotective strategies that naturally extend the products shelf-life, MICROORC is expected to significantly reduce FLW, potentially saving more than 400 ktons of protein rich food in Europe annually.

Conclusion: The MICROORC methodology not only aligns with the EU and FAO's emphasis on the untapped potential of microbiome-based innovation for transformative change in the food systems, but also offers a strategic and business pathway to improve sustainability and reduce FLW through advanced biotechnology food applications.