

Fermenting metacommunities of food interest: an invaluable biodiversity asset to be maintained overtime in its wholeness and functionality Micro4ever

Ferrara, Massimo¹; Latronico, Rosanna²; Cozzi, Giuseppe¹; Verrone, Laura¹; Zotta, Teresa³; Filannino, Pasquale²

¹ *Institute of Sciences of Food Production, National Research Council (ISPA-CNR), Bari, Italy;* ² *Department of Soil, Plant and Food Science, University of Bari Aldo Moro, Bari, Italy;* ³ *Department of Agricultural, Forestry, Food and Environmental Sciences, University of Basilicata, Potenza, Italy*

Micro4ever aims to investigate the effect of cryopreservation (CrP) and freeze-drying (FD) on the functionalities of whole microbial consortia (MC) associated with different fermented foods (dairy and bakery products) after their long-term storage and revitalization. Specifically, we will use the MC of milk starters (lattoinnesto; LI), whey starters (sieroinnesto; SI) and sourdoughs (SD) as models of dynamic MC characterized by a high level of biodiversity. The main objectives of Micro4ever are: (i) to preserve intact MC with retained viability and functionality for future meta-omics studies, cultivation, and application; (ii) to preserve and exploit in situ the invaluable biotechnological potential behind the poorly cultivable microbial players of MC; (iii) to optimize the conditions of sampling and long-term storage of MC, providing the maximum protection to different kinds of cells and cellular components within the MC; (iv) to validate the post-preservation viability and functionality of preserved MC; (v) to propose new models governing the assembly, organization, functionality and stability of MC of food interest. While the advantages of fully exploiting the whole functional potential of MC are clear, the accomplishment of that intent is fraught with conceptual and technical challenges. Micro4ever will establish and optimize the cultivation and preservation methods that protect the full phenome of MC and ensure genotypic stability of the MC, which is essential for the preservation of MC biodiversity. In particular, Micro4ever will implement a multi-omics workflow, through which we will first decipher the taxon composition and the functional redundancy of MC from LI, SI, and SD at metagenomics, metatranscriptomics, meta-phenomics and metabolomics levels. Then, we will investigate in depth the effect of short- and long-term storage, and will validate the effectiveness of CrP and FD protocols and the functionality of preserved MC also in food matrices.

Acknowledgements

Project funded by the European Union Next Generation EU; Project code P2022RJYCN, CUP H53D23010720001, Project title "Fermenting metacommunities of food interest: an invaluable biodiversity asset to be maintained overtime in its wholeness and functionality Micro4ever".