Domestication of microbial community in action: a participatory research and multidisciplinary study of sourdough bread

Elisa Michel, Maria Belen Carbonetto, Charlotte Urien, Emilie Lhomme, Stephane Guezenec, Isabelle Hue, Simon Rousselot, Olivier Rué, Xavier Dousset, Judith Legrand, et al.

To cite this version:

Elisa Michel, Maria Belen Carbonetto, Charlotte Urien, Emilie Lhomme, Stephane Guezenec, et al.. Domestication of microbial community in action: a participatory research and multidisciplinary study of sourdough bread. Second Joint Congress on Evolutionary Biology (EVOLUTION 2018), Aug 2018, Montpellier, France. hal-02008729

HAL Id: hal-02008729
https://hal.archives-ouvertes.fr/hal-02008729
Submitted on 2 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Domestication of microbial community in action: a participatory research and multidisciplinary study of sourdough bread

Michel Elisa, Belen Carbonetto, Urien Charlotte, Lhomme Emilie, Guzenec Stéphane, Hue Isabelle, Rousselot Simon, Rué Olivier, Dousset Xavier, Legrand Judith, Onno Bernard and Sicard Delphine

Since the Neolithic time, until nowadays, humans have recurrently selected microbial community for making fermented food and beverage. This represents a good opportunity to study the community ecology and evolution of microbial ecosystem during ongoing domestication.

Using sourdough bread as a model system and an interdisciplinary approach including bakers, farmers, sociologist, bio-mathematicians and biologists, we analyzed the impact of human on the diversity and evolution of microbial communities in France. Natural sourdough bread is made of wheat flour, water and sourdough. Sourdough is composed of flour, water, bacteria and fungi. Bakers initiate a new sourdough by mixing flour and water, and maintained it by regular feedings with flour and water, a process called back-slopping.

Using a social survey of bread-making practices and a microbial ecologist approaches, we showed that bread-making practices impact sourdough microbial species diversity. Farmer-bakers maintained different yeast species than bakers. In addition, we revealed convergent phenotypic evolution of sourdough strains of different yeast species for fermentation traits indicating that bakers have independently selected for phenotype of interest regardless of the yeast species. Finally, we realized an experiment of domestication in action by asking four bakers to initiate new sourdoughs with six different flours. The weekly followed up of sourdough species composition revealed that, for each baker, a single yeast and a single bacteria species dominated the community after 3 weeks of back-slopping. Despite the introduction of new bacteria and yeast from the flour at each back-slopping, the dominant species was the one present in the home sourdough indicating that dispersion and selection occurred mostly within the bakery. All together our study highlighted that domestication of microbial community can be a good model to bridge community ecology and evolution, to study the adaptation dynamic and the genetic architecture of fast evolving traits involved in abiotic and biotic interactions.