

## The Evolutionary Microbiology Lab

The Evolutionary Microbiology lab's (<https://www.ibe.upf-csic.es/evolutionary-microbiology-group>) goal is to study the molecular mechanisms that facilitate adaptation to changing environments, as well as the limits of adaptation, using a combination of computational approaches, experimental evolution (of bacteria and single proteins) and *omics* (sequencing, transcriptomics). The group is part of the Biodiversity Program at the Institute of Evolutionary Biology (IBE). IBE is a joint Institute of the Spanish National Research Council (CSIC) and Pompeu Fabra University (UPF), located in Barcelona. The IBE is part of the Barcelona Biomedical Research Park (PRBB), a stimulating international research environment with state-of-the-art facilities.

The Evolutionary Microbiology lab is a small, but collaborative and dynamic group. The team currently consists of postdoctoral researchers, one PhD student, one master's student, and one lab manager.

## Project description

Environments change constantly, but bacteria can rapidly adapt to stressful conditions. How can bacteria adapt so quickly? While most research on bacterial adaptation centers on well-established model organisms, in our lab we investigate the mechanisms of adaptation in understudied bacterial species.

The candidate will use experimental evolution to investigate how bacteria with multipartite genomes adapt to nutrient limitation under both constant and fluctuating environmental conditions. The evolution experiments will be coupled with whole-genome sequencing to identify the genetic changes underlying adaptation. Particular emphasis will be placed on studying the role of copy number variations in driving adaptation to nutrient scarcity.

## Specific Tasks

- Experimental evolution of bacterial populations
- Transcriptome/genome sequencing and analysis
- Directed laboratory experiments to test hypotheses derived from the evolution experiments

## Relevant bibliography

Vega-Cabrera LE, Skovgaard O, Toll-Riera M. Chromosomal plasticity drives rapid adaptation in a cold-adapted bacterium. bioRxiv. <https://doi.org/10.1101/2024.12.11.627208>

Toll-Riera M, Olombrada M, Castro-Giner F, Wagner A. 2022. A limit on the evolutionary rescue of an Antarctic bacterium from rising temperatures. Science Advances 8(18): eabk3511. doi: 10.1126/sciadv.abk3511.