



UMR7267

ECOLOGY AND
ENVIRONMENT

BIOLOGICAL SCIENCES

EBI

ECOLOGY AND BIOLOGY OF INTERACTIONS

Research objectives of the EBI lab aim to analyze and understand the interactions between host species, microorganisms and environmental factors.

Indeed, there is likely no organism on the planet that does not interact with another microorganism during all or part of its life cycle. The ubiquity and diversity of these symbioses (initially defined as "living together"), or "sustainable interactions" (including both conflictual and mutualistic interactions) confirm their essential roles in the evolution and adaptation of species, at both the micro- or macro-evolutionary time scales. These interactions are also fundamental to the functioning and stability of ecosystems as they contribute to the adaptation of host populations, particularly in the context of global changes.

In this context, the research activities of the EBI lab develop an integrated approach from molecules to organisms and ecosystems, focusing on different plant, arthropod or amoeba models. Accurately, the research focuses on global change, the impact of human activities on the environment and its effects on health. Finally, our research also allows the development of eco-innovative technologies.

Zoom in on an ovary portion of a woodlouse infected with *Wolbachia* bacteria © EBI



RESEARCH TOPICS

EBI is structured into 3 research teams:

ECOLOGY, EVOLUTION, SYMBIOSIS

This team studies the interactions between terrestrial crustaceans and bacteria of the genus *Wolbachia*. These bacteria are considered to be parasites because they induce reproductive disturbances in their hosts, such as the feminisation of genetic males in crustaceans. The research uses an integrated analysis to access the evolutionary consequences on populations of this phenomenon. The team also measures in situ the impact of the microbial community on the biology and population dynamics of hosts recognised as biological indicators of continental ecosystems such as agrosystems (terrestrial isopods) and of aquatic ones (crayfish).

SUGARS AND PLANT-ENVIRONMENT EXCHANGES

This team studies the mechanisms of carbon allocation in source-sink relationships and its distribution at the subcellular and whole-plant level, under biotic and abiotic environmental stresses. Using the model plant *Arabidopsis* and two plants of agronomic interest: Grapevine and Pea, research activities are focusing on the biological roles of sugar transporters, carbohydrate signalling and sugar metabolism in plant interactions with phytopathogenic or non-phytopathogenic microorganisms, and plant responses to water deficit. Moreover, our research focuses on applications of agronomic and environmental health interest, such as the adaptation of plants to global warming and the use of polyphenols from grapevine wood as phytosanitary and biocontrol molecules to reduce chemical inputs and preserve biodiversity.

WATER MICROBIOLOGY

This team studies mainly the development and interactions of pathogenic microorganisms in water and biofilms. The research activities evaluate equally the effectiveness of treatments (e.g. antimicrobial components from different sources, oxidants, etc.) to control their growth. The model microorganisms are mainly *Legionella pneumophila*, *Candida albicans* and free-living amoebae, described as reservoirs of pathogenic microorganisms. More recently, work has started on different microbiota, human, animal or environmental. The study of micro-organisms is accessible through multi-scale approaches, ranging from the molecule to the cell to microbial ecology. The description of microbial communities, the study of their interactions and, in some cases, attempts to control their development should ultimately make it possible to limit their impact on human health.

EXPERIMENTS

Biotron platform: greenhouses, phytotron, photosynthesis measurement, microcosms, multi-climate environmental chambers, animal house, bacterial strainer, bioreactors;

Environmental genomics platform: 454 RocheJunior sequencer, BioAnalyzer MCE[®]-202 MultiNA Shimadzu, DELL bioinformatics cluster;

Transcriptomic and proteomic analysis platform: LC MS-MS Waters, GC -EAD Agilent Electro-antenna-gram SynTech, quantitative PCR Roche LightCycler[®] 480 System, pipetting machine Eppendorf; **Imaging platform:** Apotome Zeiss, fluorescence microscopy, micro-tomes, vibratome.

TRAINING

- Master degrees: "Biodiversity, ecology and evolution", "Biology-health"
- Doctoral school: "Chemistry, Ecology, Geosciences, Agrosiences (Théodore Monod)"

COLLABORATIONS

The laboratory collaborates with universities and institutes located in several European countries (e.g. Austria, Finland, Germany, Ireland, Italy, Norway, Poland, Spain, Sweden, United Kingdom) as well as in North America, Brazil and Thailand. It is involved in four research groups (GDR):

- Sustainable Interaction Ecology Network (REID - GDR 3449),
- Mobile Genetic Elements: from mechanism to populations, an integrative approach (EGM - GDR 3546),
- Biological Invasions (REID - GDR 3647),
- Chemical Mediation in the Environment - Chemical Ecology (MediatEC - GDR 3658).

KEY FIGURES

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researchers (CNRS) and professors-assistant Professors

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PhD students and postdoctoral researchers

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engineers, technicians and administration staff

1 rue Georges Bonnet,
TSA 51106
86073 POITIERS cedex 9 - FRANCE
Tél. : (33) 5 49 45 40 06
Fax : (33) 5 49 45 40 15
<http://ebi.labo.univ-poitiers.fr/>

Director: Jean-Marc BERJEAUD
jean-marc.berjeaud@univ-poitiers.fr

