

## LABORATÓRIO ASSOCIADO DE OEIRAS (LAO)

Instituto de Tecnologia Química e Biológica (ITQB)  
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**Director:** Luís Paulo N. Rebelo

### **Thematic Lines:**

Synthesis, structure, and function of biologically important molecules. From genetics, cell and developmental biology to pathogenesis and novel therapies. Computational and theoretical biology: from biochemistry to medicine. Host-microbe and host-cancer interactions. Plant genomics and stress responses. Evolution of ecosystems, biological risk, and food safety.

### **Partnerships:**

Instituto de Biologia Experimental e Tecnológica (IBET) Coordenador: Paula Marques Alves  
Instituto Gulbenkian de Ciência (IGC) Coordenador: Jonathan Howard  
Centro de Estudos de Doenças Crónicas (CEDOC) Coodernador: António Jacinto

Number of researchers (31/12/2009): 209. Number of PhDs: (31/12/2009): 156. Classification (FCT international evaluation): Excellent.

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ITQB, IGC, and IBET have recently made a reevaluation of the associate laboratory structure, research lines, and management. The partners agreed that the IGC will increase the weight of its involvement in the partnership: all of its ca. 40 groups will be involved in the near future, upon approval of Fundação para a Ciência e a Tecnologia. The new architecture of the Laboratório Associado de Oeiras (LAO), will also involve the Centre for Chronic Diseases – CEDOC – of the Faculdade de Ciências Médicas, Universidade Nova de Lisboa. Detailed descriptions of the four institutions, their organization and management, can be obtained in the respective websites.

The expansion of the LAO was the natural outcome of the new thematic lines, which aimed at increasing the breadth of the science and technology made at Oeiras, fostering the interaction between the partners, and optimizing the available resources.

### **(1) Synthesis, structure, and function of biologically important molecules.**

To globally understand Life and the living world and act to control health and disease, requires a deep knowledge of the composition and structure of biological molecules, the identification of their function, and the mechanisms that control their formation, fate and role in the cell, the organism, and often in the environment. Emerging from the interfaces between chemistry and biology, from bacteria to animals and plants, this endeavor has reached medicine, now moving from end user to prime partner of the drug design and development process. A rare and privileged combination of this chain of expertises sets the LAO on course to pursue fundamental and industrially relevant targets in this area of profound scientific, social, and economic relevance.

### **(2) From genetics, cell and developmental biology to pathogenesis and novel therapies.**

Research in this area will (1) pursue cutting-edge fundamental studies in genetics, genomics, cell and molecular biology, and developmental biology; (2) apply the knowledge from fundamental studies to understand the molecular, cellular and physiological basis of disease and develop novel animal models of human disease; and (3) develop novel tools for cell- and gene-based therapies, test them in preclinical studies on disease models, and develop the infrastructure and know-how necessary to carry out clinical trials to test these novel therapies.

### **(3) Computational and theoretical biology: from biochemistry to medicine.**

Theoretical and computational approaches are recognised as key players in biological sciences, bringing the power of mathematics, physics, and computer science to the study of life. The LAO has a privileged environment for developing these approaches, since it hosts the largest concentration of computational and theoretical biology groups in Portugal, working alongside experimental researchers in problems that range from molecules to systems, organisms, and populations.

### **(4) Host-microbe and host-cancer interactions.**

The presence of a pathogen induces several tissue and cell-specific responses that include inflammatory reactions among other, well documented, effects. Similarly, in cancer, the "host" undergoes a series of molecular, cellular and ultimately metabolic changes in response to the presence of the tumour. Research into the basis of host-microbe and host-cancer interactions will focus on the induction of host-specific responses, including cell:pathogen, cell:cell, cell:matrix and cell:molecules communications, cell invasion and migration, and the selection of metabolic traits that accompany and determines the response and adaptation of the host. These lines of research may contribute to the discovery and design of novel, host- and disease-specific targeted therapies.

### **(5) Plant genomics and stress responses.**

Research in plants in the post-genomic era requires an integrated approach to analyse the organism, considering its individual parts and their relationships, as well as the insertion of the organism in the environment, with all the interfaces established with the biotic community and the abiotic surroundings. For such an integrated approach a variety of different expertises and technologies is crucial, requiring a collective effort of all the complementary competences available within the LAO in this area.

### **(6) Evolution of ecosystems, biological risk, and food safety.**

Research in this area will focus on the study of microbial communities in the environment and their evolution, through research on human-associated microbial communities. The evaluation of tools for managing human and animal health and disease, like new diagnostic tools, vaccines, antibiotics, anti-inflammatories, and bioactive compounds (including food additives), are solid areas of expertise within the LAO, setting the ground for further research and education in epidemiology and biological risk in a broad sense.

