

The Department of Biology and Biotechnology "Lazzaro Spallanzani" is a "Department of Excellence"

The Italian Ministry of Education, University and Research (MIUR, <http://www.miur.gov.it/dipartimenti-di-eccellenza>) recently awarded 180 national university departments based on a "Department of Excellence" funding program. The Department of Excellence Award was based on the evaluation of the quality of the conducted research as well as a five-year developmental project. The Department of Biology and Biotechnology "Lazzaro Spallanzani" of the University of Pavia (DBB, <http://dbb.unipv.it>) received one of the 13 awards (7.3 million euros) in the biological area, which the DBB complements with its own resources, totaling the investment for the next five years to over 14 million euros.

DBB is a multidisciplinary scientific reality of about 230 faculty members, junior scientists, postdoctoral fellows, PhD students, technical and administrative staff, and internship students. We built a developmental program focused on: 1) research on four major scientific topics included in the Horizon 2020 "societal challenges" (<https://tinyurl.com/h2020-challenges>), 2) building of state-of-art core facilities in support of the proposed research activities; 3) recruitment of highly qualified personnel along with the activation of young researchers' positions; 4) implementation of activities towards pre- and post- graduate teaching, such as PhD scholarships, internationalization of master's degree courses in Neurobiology and Molecular Biology and Genetics, training internships in companies for the Master's Degree in Advanced Biotechnologies, creation of new computerized classrooms. Additionally, recognizing the social impact of our research activities, we will engage in dissemination activities to foster scientific awareness and responsible use of biotechnologies.

The four main research topics of the DBB developmental program are as follows:

- **Health & wellness during aging:** Italians have an average life expectancy of 83 years, among the highest in the world. Aging does not constitute a pathology *per se*, but it is often accompanied by pathological processes, including chronic ones. DBB will take advantage of its multi-disciplinarily, investigating the molecular basis of many age-related diseases, including cardiovascular, neurodegenerative, infertility and cancer diseases. Innovative pharmacological treatments, molecular approaches of "drug discovery" and "drug design" and cell therapies will be employed to improve health during aging.
- **Antibiotic resistance:** the intensive and inappropriate use of antibiotics dramatically increased the onset of resistant pathogens. In Italy, 7-10% of hospitalized patients contract a multi-resistant bacterial infection. DBB activities aim to develop bioinformatic models for the prediction of epidemic events and to identify new molecular research targets for therapeutic or preventive strategies. In this context, we will provide genomic analysis of bacterial strains responsible for nosocomial infections and we will study of antibiotic resistance mechanisms to pave the way for the discovery and characterization of new antibacterial molecules.
- **Migrations:** the geopolitical identity of the world is continuously reshaped by human migrations so that current populations are the genetic result of past migratory events. Being at the center of the Mediterranean basin, Italy has been the crossroad for human migrations for millennia. As a consequence our territory is extremely rich in biological remains dating to different ages and civilizations, in a chronological sequence with almost no equals in the world. This national "paleogenomic capital" has remained mostly unexplored because of the lack of specialized laboratories, a challenge that the DBB is taking upon in the next-five years. Besides sociological consequences, human migration and increased global

commerce favor the range expansion of invasive insects, parasites and pathogens thus exposing the European population to new diseases. DBB will engage in activities aiming at identifying routes of invasions and developing strategies for insect control.

- **Environmental sustainability:** the reduction of natural resources, the development of innovative materials associated with low energy consumption and reduced environmental impact and an efficient and environmentally sustainable recycling are real urgencies that industrial biotechnologies and plant and green chemistry must deal with. DBB will support the improvement of the renewable biological resources management, generating new molecules and enzymes in the frame of a sustainable economy (green economy).

The core facilities to be established within the Department of Excellence frame include a "Molecular and Cellular Biology Laboratory", equipped with the latest generation and high-resolution equipment, a "Plant Biology Laboratory" with a greenhouse for controlled environment plant cultivation, the first "Ancient DNA Laboratory" of northwestern Italy, and a specialized Facility for the study of pathogens transmitted by insect bites. With this cutting-edge, infrastructural platform our researchers will be able to investigate at all levels of resolution: from single molecules, to single cells, to plant and animal tissues, to entire populations.

The realization of this project will allow the DBB of the University of Pavia not only to hold on its excellence position in the Italian scenario, but also to establish itself as an international recognized landmark for Biological Sciences and Biotechnologies.