

E 6: BIOTECHNOLOGY AND BIOANALYSIS (B&B)

The **Biotechnology and Bioanalysis (B&B)** team is an *interdisciplinary* one like the field itself. The Biotechnology group exists in ICECHIM structure since its far beginnings and during the time was focused on following main research directions: **environmental biotechnology**, **human healthcare biotechnology** and **bioanalytical methods** for fast monitoring and control of the environment and food quality (see the scheme below).

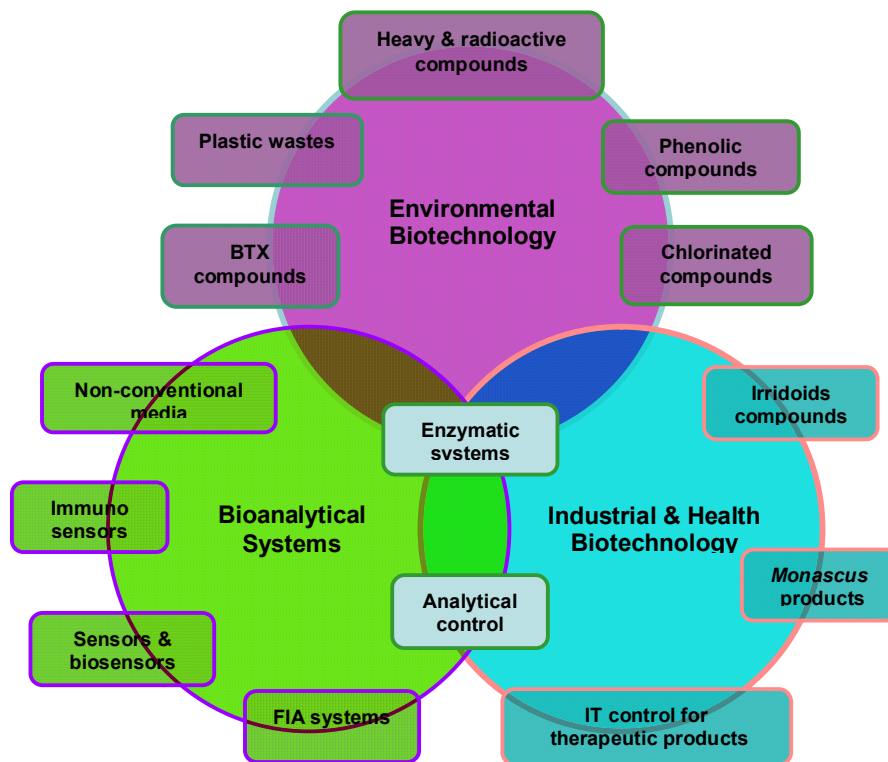


Fig. 1. Schematic representation of the R&D directions of B&B team

Also, B&B team deserved the other groups especially in research activities involving microbiology and biochemical techniques. During 2007-2011, B&B group has coordinated 7 RD projects and was involved in other 4 as partner. The work of team was focused towards the elaboration of scientific papers for publishing and presentation of works at national / international conferences, through research projects within the framework of national R&D programs.

An important achievement was the modernization of RD infrastructure by the financial support of National Authority for Scientific Research, through the **CAPACITIES project CP 49/2007 "Biotechnology & Bioanalysis Laboratory"** coordinated by our group. The four modernized laboratories according to the GLP (Good Laboratory Practice) rules are: Microbiology Lab, Separation Lab, Optical Methods Lab and Biosensors Lab.

The main RD directions with the projects and the main achievements since 2007 are described below.

1. Environmental biotechnology

Environmental biotechnology may offer solutions for elimination of a wide range of pollutants and wastes from the environment. For this reason, in our Microbiology Laboratory was initiated a microbial collection as a starting point for the future modern collection, according to the international requirements. In last years, this research direction was deepened by our team, which has coordinated three projects in partnership with prestigious research units:

Project CEEX 127/2006-2008 "Advanced solutions for reducing of the volatile organic compounds content in surface and underground waters" has realized an integrate system to remove the volatile organic compounds from ground and surface waters, combining the advantages of extraction with liquid membranes and bioremediation. Results: 3 published papers; 2 participations at International Conferences.

Project PNCDI II no. 61-045/2007-2010 "Biocontrol methodology development of microbial systems against fungal contamination (BIOCONTROL)" was conceived to develop biotechnologies having an impact towards life quality. Results: 1 patent application; 5 published papers; 6 participations at International Conferences.

Project PNCDI II no. 32-115/2008-2011 "Eco-efficiency solutions for plastics waste management using degradative potential of biological systems" (ECODEGRAD) investigates the aerobic biodegradability of composites based on a synthetic and biodegradable polymer and natural polymeric

materials. Several microbial strains were selected for their capacity to grow and degrade polymeric materials. Results: 2 published papers, 6 participations at International Conferences, 1 patent request. In 2011, the paper “*Ability of fungal strains to degrade PVA based materials*” published in *Journal of Polymers and the Environment*, 2010, vol. 18, 284-290 was awarded by CNCSIS.

2. Human healthcare and industrial biotechnology

Several bioproducts with therapeutic effects were obtained within research projects, such as project **CEEX 177/2006-2008** “*Therapeutic Nano products based on irridoids compounds isolated from Romanian vegetable species*”, project **PN II 62-081/2008-2011** “*Algorithms for the multicriteria decision and intelligent control of the biotechnologies for the preparation of therapeutic products of human use*”, project **PN II 62-070/2008-2011** “*Concept and development of innovative biotechnologies for preparation of nano products from *Monascus sp.* with potential therapeutic applications*”). Results: 10 published papers, 1 book and 8 participations at International Conferences. Due to the increasing interest in the **replacement fossil fuels with renewable energy**, our team was also involved in production of microbial enzymes used as catalyst in transesterification, in framework of the project **PNCIDI II 61-032/2007-2010** “*Development of biocatalytic systems for the vegetable oils transesterification to biodiesel*”. Results: 3 papers, 1 book chapter and participations at 3 international conferences.

3. Bioanalytical methods for fast monitoring and control of the environment and food quality.

Another important research direction of our team consists in the development of bioanalytical methods for screening / fast detection of the food contaminants as **nitrite / nitrate, heavy metals, antibiotics, pesticides** (project **CEEX 68/2006-2008** “*Innovative systems for fast detection of contaminants in drinks and foodsuffs*”). The developed methods are based mainly on the flow injection analysis (FIA) technique using the luminescence (chemiluminescence and fluorescence) detections, as well as the electrochemical detection. Results: 2 published papers, 1 book and 6 works presented at international conferences.

For **mycotoxins** determination (project **PNCIDI II no. 61-030/2007-2010** “*Fast methods for toxins monitoring during food processing technologies for safety improvement*”) complementary methods based on immunosensors sensors, flow analysis and HPLC were developed. Also, the project aimed to develop new immunosensors based on surface plasmon resonance using new strategies for modification of the SPR sensor surface. Results: 3 papers; 1 patent request; 7 works presented at international conferences.

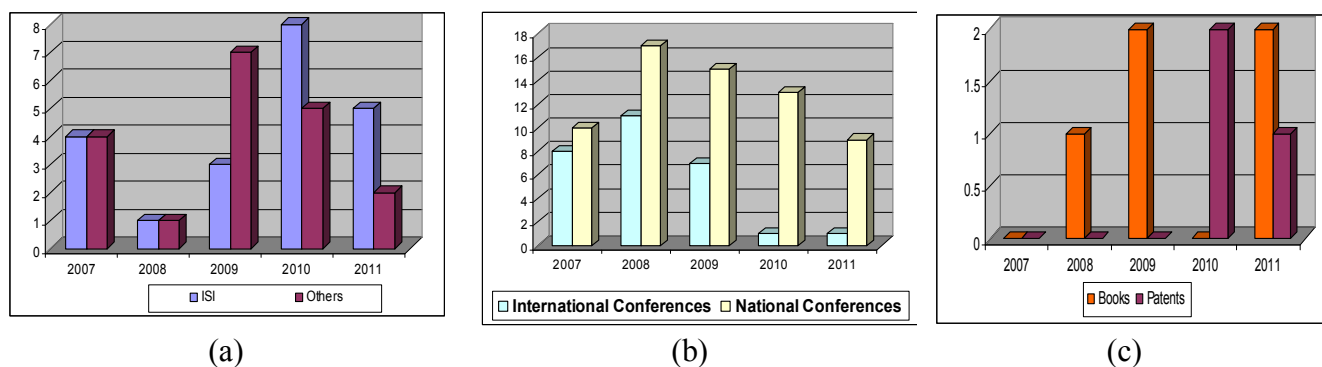


Fig. 2. *Dynamic of the scientific results of B&B team.* (a.) ISI papers and other (non-ISI) papers; (b) works presented to International and National Conference; (c) books and patents.

The dynamic of the scientific results achieved by the B&B team in terms of ISI papers, other papers published in peer-reviewed journals, works presented to international and national conferences, books and patent requests is presented in the figure 2.

Collaborations

B&B team collaborates with numerous prestigious **research units** from Romania such as: University Polytechnic of Bucharest, University of Bucharest, Biochemistry Institute and Biology Institute of the Romanian Academy, Institute for Physical-Chemistry „Ilie Murgulescu”, National R&D Institute for Biological Sciences, Cantacuzino Institute, University of Agriculture Science and Veterinary Medicine of Bucharest, etc. In the *healthcare biotechnology* research area, our traditional collaborators are

hospitals, such as: Hospital „Carol Davila”, Medical Clinique „I.C.Longhin”, Clinique RomGermed, Children Hospital „Grigore Alexandrescu”.

Regarding the collaboration with **SMEs**, in the field of *environmental biotechnology*, one of the most important collaborator and co-funding companies is SC INCERPLAST SA, which is a private SME company whose main activities are in the field of processing polymeric materials with applications in medicine, industry, agriculture, packaging, environmental protection, etc. Our team has successfully collaborated with this company in two PNCDI II projects and also a new joint proposal was submitted in the „2011-Competition of the Joint Applied Research Projects Program”.

S.C. EPI-SISTEM S.R.L. is another company with which we have a strong collaboration in the field of development of new *electrochemical and optical biosensors and immunosensors*. In the most recent competition, was submitted a project based on a consortium coordinated by our team, in which EPI-SISTEM will co-fund almost all the RD activities.

Evolution of human resources

The B&B team lead by Dr. Luiza Jecu is an interdisciplinary group, which consists of **10 researchers** (four biochemists, one chemist, three engineers and two microbiologists) from which **five have Ph.D.** degree and **three are Ph.D. students**. Since 2007 our group supported some important transformations due to the retirement or transferring of several persons, among them, CS III Dr. Amalia Gheorghe and CS Dr. Camelia Ungureanu. A great attention was paid to the recruitment of young and enthusiastic researchers like Emilia Ocnaru, Alexandru Chivulescu, Iuliana Raut and more recently, Mariana Constantin. A prerequisite condition for employing them was to continue their studies and in consequence, the first three are doing their Ph.D. studies in our institution (under the supervision of University of Bucharest). In 2009, they have successfully passed the exam to obtain the *scientific researcher* title.

Also, it can be mentioned that even before 2007 in our team was reintegrated Dr Mihaela (Badea) DONI after a Mare Curie postdoctoral stage (18 months) and 24 months postdoc position abroad (Tor Vergata University, Rome, Italy), where she gained expertise in development of innovative bioanalytical systems. Due to her expertise, Dr. Doni was invited to be *national evaluator expert* for national RD Projects (CNCSIS, CEEEX, PNCDI); *reviewer for scientific journals, EU evaluator expert* in FP7-PEOPLE-2010-IXF and PEOPLE-2011-IXF Programs.

In our group, all the other experienced researchers (Dr. Maria-Luiza JECU, Dr. Ana Aurelia CHIRVASE, Dr. Melania-Liliana ARSENE, Dr. Nicoleta RADU) have *conducted national RD projects*, were invited to be *evaluator experts* for national RD Projects and *reviewers* for scientific journals, were *members in the Ph.D. thesis commissions*, etc.

A significant attention was given to the **continuing vocational training** of B&B team's members in the specific scientific areas and in other important areas, such as the project management, by participation to various courses and seminars. Several of these courses were completed with exams and diplomas recognized by CNFPA, as evidence of the level of expertise achieved.

Other aspects

- The B&B team has supervised and hosted **students for practical stages** from local Universities, as well as from University of Bristol, UK. Also, Dr. Jecu, Dr. Arsene, Dr. Doni and Dr. Chirvase have **co-supervised** several MSc, BSc and PhD thesis.
- Dr. Arsene and Dr. Chirvase are **collaborating as professors** with the Biotechnology Master from University POLITEHNICA Bucharest, Department of Bioengineering and Biotechnology, by teaching various courses.
- In 2010, B&B team submitted as partner the proposal no. EIB.10.009, entitled “*Bioresource-using technologies for a high-yield and high-rate synthesis of hydroxybutyrolactones from renewable carbon (BUTYROLAC)*”, in frame of the **ERA-IB call**, which passed the first step (pre-proposal).
- The B&B senior researchers are founder members of the **Romanian Society for Bioengineering and Biotechnology (RSBB)** (president Dr. Eng. Ana-Aurelia Chirvase), affiliated to EFB (European Federation of Biotechnology).