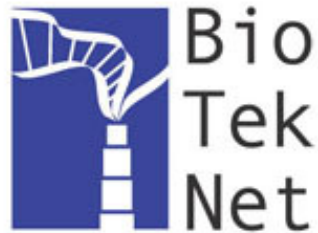




Assessorato all'Università e Ricerca Scientifica,
Innovazione Tecnologica e Nuova Economia,
Sistemi Informativi e Statistica



INTERNAZIONALIZZAZIONE DEI Centri Regionali di Competenza



BIOTEKNET: REGIONAL COMPETENCE CENTRE IN INDUSTRIAL BIOTECHNOLOGIES

BioTekNet S.C.p.A. carries out activities of research, development, training, consulting and technological transfer in the biotechnology sector, with the goal of establishing as a system and developing through integrated management the professional skills and know-how of its partners in a sector of strategic importance for the economic and industrial development of the Campania Region and of Italy as a whole.

A specific focus of the activities of BioTekNet S.C.p.A. is the development of industrial processes and technologies that utilise biological systems or their components, in particular as regards the following areas of expertise: biosensors, biomedical applications, fermentation processes for the production of pharmaceuticals, nutraceuticals and cosmeceutics, biotechnologies for the environment and the food industry.

The main outputs

Fermentation processes for the production of pharmaceuticals

One of the key factors in the enormous development of biotechnologies is the possibility of obtaining microbe and cellular biomasses on the order of hundreds of tons/batch, the use of which, thanks to their metabolism or their molecular components, currently makes it possible, by means of significantly eco-compatible processes, to produce pharmaceuticals, chemicals, foodstuffs, polymer materials etc.. The central importance of microbe and cellular systems in biotechnologies means that the development of innovative technologies for the large-scale production of this type of biomass plays a strategic role as well.

The wealth of human know-how and instrumental capacity possessed by the BioTekNet Regional Competence Centre makes it a focal point of excellence, on both the national and international levels, for the development of innovative processes in the production of biomasses and products that can be obtained from the latter (pharmaceuticals, nutraceuticals and cosmeceutics).

Many processes of fermentation, though of interest from a production standpoint, are not industrially viable, given their low productivity, a result of the progressive reduction in the growth rate of the micro-organism used.

The development of processes of fermentation and cell growth in bioreactors equipped with micro-filtering systems suitable for in-situ removal of toxic products represents the preferred strategy for increasing production yields to levels that make the process moiré than competitive on an industrial scale. This type of process has already demonstrated its worth with numerous systems of interest as applications, with the phase of industrial development now underway, involving the construction of plants for the production, on the order of tons, of polysaccharides of interest for pharmaceutical production.

Bioartificial kidney for hepatotoxicity studies

BioTekNet has developed a "miniature" model of the human kidney, the **MINI BIOARTIFICIAL LIVER (miniBAL)**, which provides an alternative to experimentation on animals for testing the toxicity of pharmaceuticals and other chemical compounds. The development of the miniBAL, in which human hepatocytes are loaded, together with the advantages tied to the process of standardisation of this system, make it a tool of primary importance for the pharmacological and toxicological study and assessment of pharmaceuticals with potential clinical applications for human beings.

The possibility of creating multiple toxicological profiles using a single hepatocyte sample would generate important information for the toxicological and pharmacological screening of an enormous number of molecules during the phase of preclinical development, establishing the miniBAL as an intermediate stage between in vitro and clinical experimentation. At the same time, the miniBAL can be used as an alternative method to animal experimentation, responding to the widespread need to corroborate the worth of systems that lead to a reduction in the number of animals used. As a result, even when there is a shortage of structures authorised for animal experimentation, statistically significant models can be obtained for an initial phase of screening. Traditional analyses on animals, more costly and invasive, could be carried out at a later point in time, and on a limited number of samples, running experiments only in cases where it is absolutely indispensable.

Flow system for the synthesis of nucleotides and peptides

The Regional Competence Centre proposes the construction of a continuous flow device for the synthesis of peptides and/or oligonucleotides, offering noteworthy technical and economic advantages, as compared to the batch synthesisers that currently constitute the most widely used technique. The device in question, developed and already laboratory tested, presents unmistakable advantages, both technical and economic, compared to the most widely used batch synthesisers. A flow system, as opposed to the batch approach, offers greater control of the parameters of synthesis (seeing that the various steps of the process can be monitored in-situ), plus noteworthy savings in the use of solvents, heightened versatility and increased levels of purity in the final product. The use of such systems is especially helpful in the automated synthesis of peptides, which require insoluble catalysts, meaning that they cannot be prepared using a batch system.

The synthesiser can produce peptides/proteins and oligonucleotides at satisfactory levels for both the academic and research sectors and the world of industry.

Biotechnologies for the treatment of liquid industrial waste

The breaking down of pollutants by micro-organisms and/or by their enzyme systems constitutes the core process of biodegradation. Environmental protection and remediation call for the combined use of biotechnological, chemical, physical and engineering methods. The use of biotechnologies constitutes an increasingly valid alternative to traditional methods of treatment (chemical and physical), for application with:

- Waste water and liquid industrial waste
- Drinking and processing water
- Air and gaseous discharges
- Treatment of the soil and the ground
- Solid waste

BioTekNet develops processes of bioremediation for the treatment of waste water.

A specific offering of the Regional Competence Centre is a new bio-reclamation technology for the waste water of the colouring industry, based on two white-rot fungi and their oxidising enzymes. The replacement of conventional treatments with innovative systems of bio-reclamation can result in noteworthy advantages, both environmental and economic, including lower costs, reduced levels of waste and the recycling of water resources.

The offering consists of three different systems of bio-reclamation:

A. Discontinuous treatment of liquid industrial waste with the fungi *P. ostreatus* and *P. chrysosporium*.

B. Discontinuous treatment of liquid industrial waste with various mixes of extra-cellular enzymes produced by the fungi *P. ostreatus* and *P. chrysosporium* and featuring a different iso-enzymatic composition and different properties,

C. Continuous treatment of liquid industrial waste with immobilised oxidising fungus enzymes: the active enzymatic mixes can be used in immobilised form to prepare reactors using impacted beds for the continuous treatment of liquid industrial waste. The potential applications of this technology regard numerous industrial sectors of noteworthy importance, including the colouring industry and the textile and leather industry.

Electrochemical and fluorescent biosensors

Fluorescent biosensors make it possible to carry out analyses at elevated levels of speed and sensitivity (not reachable with indirect assays) in the fields of medicine, the environment and industry. Such sensors utilise proteins and enzymes, isolated from thermophilic bacteria as well. Appropriately engineered and modified, they operate on the basis of the following principle: the binding of a given analyte to the element of recognition (peptide or protein) causes a variation in the protein fluorescence. This variation, tied to structural changes in the protein as a result of the binding of the analyte, can be correlated to the quantity of the analyte present. Of particular note is the fact that the analyte measurement, when performed in this manner, is not destructive of the target analyte, an element of extreme importance when operating on a continuous basis, and especially with living systems. Seeing that, at present, simple, economical, miniaturised systems can be constructed for the determination of fluorescent emissions, the industrial production of a biosensor based on variations in the fluorescence of the protein-ligand system is technically and economically feasible.

BioTekNet develops innovative fluorescent biosensors that use as their element of recognition enzymes and proteins isolated from thermophilic organisms.

One new methodology developed makes it possible to design biosensors that do not consume the substrate which they use as their element for recognising apoenzymes, meaning enzymes lacking a coenzyme. Apoenzymes are still capable of binding the substrate with the same degree of efficiency, with the interaction between the apoenzyme and the substrate being recorded as a variation in the fluorescent properties of the apoenzyme. In addition, advanced methodologies of protein marking and nano-immobilisation have been developed, making it possible to create a biosensor able to make simultaneous determination of different analytes, meaning a "lab-on-chip" model.

The Regional Competence Centre also possesses noteworthy know-how in the preparation of electrochemical biosensors used in toxicological and environmental controls and capable of recognising molecules that have not been marked in advance.

The structure

The BioTekNet Regional Competence Centre in Industrial Biotechnologies was founded on 14 February 2003 with financing of 14,905,800 Euro received under Measure 3.16 of the 2000/2006 Organisational Plan for the Campania Region, and it was transformed into a Shareholder Consortium on 14 December 2007.

The company has share capital of 700,000 Euro, and its registered and operating office is located in Naples, at no. 7 Via L. De Crecchio, inside the Sant'Andrea delle Dame complex, which holds the campus of the Second University of Naples (SUN). The partners of BioTekNet SCpA are the SUN, the majority shareholder, the Federico II University, the CNR, the "A. Cardarelli" Hospital Enterprise of National Importance, the University of Sannio and the G. Pascale Institute. The Chairman of the Company's Board of Directors is Prof. Mario De Rosa, Associate Rector of the SUN and formerly in charge of the project for the creation of the BioTekNet Regional Competence Centre. The Assistant Chairman is Prof. Vincenzo Pavone, Director of the Department of Chemistry at the Federico II University. The General Manager is Dr. Amleto D'Agostino, formerly the Project Manager of the BioTekNet Regional Competence Centre in Industrial Biotechnologies.

BioTekNet's overall strategy is based on the development of **activities of applied research, in partnership with industrial concerns or on behalf of businesses**, considered the priority mechanism for the Centre's growth. Thanks to this mechanism, BioTekNet is able to share with the private sector the risks and the ownership of the research results, giving it a full-fledged "entrepreneurial" role and providing it, as has already been the case in years past, with noteworthy revenues from the royalties generated by ownership of the results. Through this approach, the BioTekNet Regional Competence Centre has created a major portfolio of projects of industrial research and pre-competitive development, worthy of note in terms of both the financial budget and the returns expected from the exploitation of the results.

Another priority objective of BioTekNet is supporting incubation activities involving companies operating in the biotechnologies sector, with an eye towards creating conditions favourable to attracting to the Campania Region industrial investments that can have important positive fallout on local employment.

BioTekNet offers the world of production:

Applied research

Development of industrial processes and technologies that use biological systems of their components, in particular with regard to:

- 1biotechnological production processes for the chemical and pharmaceuticals industry (the development of pharmaceuticals, nutraceuticals and cosmeceutics);
- 2innovative biosensors;
- 3biotechnologies for the environment and the food industry;
- 4biomedical applications

Consulting and services

- 2advanced chemical and structural analyses
- 3bioinformatics
- 4fermentation technologies
- 5methods for the bio-treatment of liquid waste
- 6economic-managerial assistance with the start-up of knowledge-based enterprises and the development of highly innovative industrial projects

Advanced training

- 7on-the-job training of researchers skilled in the transfer of technology and the implementation of innovation in production processes
- 8activation of training procedures for the creation of professional figures with highly specialised technical expertise.

BIOTEKNET also provides the production system with a wide range of skills and know-how able to support companies during the design and implementation of R&D projects and the

industrialisation of the results, in the form of a streamlined organisation that assists companies during the phase in which partners are procured and project proposals are drawn up, as well as in the subsequent phase of project management, all with a willingness to share the risks of research in the course of joint projects.

Potential market

Italian and international companies operating in the biotechnology sector

Partners

The majority of the partner enterprises of BioTekNet SCpA are SMEs. These include:

- Altergon Italia S.r.l.
- Carlo Gavazzi Space S.p.A.
- EOS S.p.A.
- Bio&Geo S.r.l.
- Biotest Italia S.r.l.
- Dermofarma S.r.l.
- Cell therapeutics Inc.
- Life line lab S.r.l.
- CPC Biotech S.r.l.
- Teslab S.r.l.
- New Fadem S.r.l.

But working relationships have also been established with major corporations, including:

- ACS Dobfar S.p.A.
- Novartis Farma S.p.A.
- Hardis S.p.A. (Kedrion Group)
- Tecnogen S.c.p.A. (Sigma Tau Group)

Contacts

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