Taiwan's Development Center for Biotechnology

Taiwan's Development Center for Biotechnology (DCB) was established in 1984 as an autonomous, non-profit research and development organization, with the objective to promote and upgrade the biotechnology industry in the country. The center is supported partially by the Taiwan government.

MISSION AND FUNCTIONS

The mission of the center is two-fold:

1. To establish a biotechnology R&D capability which is internationally competitive.

2. To raise the level of the local biotechnology industry.

The center functions as a mid-stream development unit, i.e. it employs the results from basic research to fulfill practical needs, developing products for the industries, including pharmaceutical, agriculture, specialty chemicals and environmental protection.

STRATEGIC APPROACH

DBC's strategy is two-pronged:

1. It acts as a link between the academic community and the industrial sector via developmental research. Its pilot plants develop technologies originating from the academic researchers and then transfer the technologies to the industry. The center also provides information on market research and assessment services for academic institutes, industries, as well as the government.

2. The center sources for and adopts suitable biotechnology projects from around the world with the view to transferring these projects to the local industries.

DCB places great emphasis on collaboration with upstream research units (universities and the Academia Sinica), consolidation of advanced technologies and resources, as well as looking out for opportunities for product development.

FACILITIES

Housed in four modern buildings at two separate campuses, DCB's laboratories occupy a total area of 30,000 m².

The first building, also the headquarters, is located at the National Taiwan University campus and was established in mid-1986. The other three buildings, which were built in 1995, are located at Hsichi, Taipei County, an industrial town situated 15 km away from Taipei City.

DCB has numerous pilot plants to carry out mid-to-full scale process development in fermentation, animal/plant cell culture, drug formulation and diagnostic kit manufacturing. In addition, the center is capable of carrying out pre-clinical studies on new pharmaceutical products.

AREAS OF FOCUS

The center's work can be divided into 4 main areas:

1. Promotion of the medical biotechnology industry.

2. Promotion of the agricultural biotechnology industry.

3. Technological development of the pharmaceutical industry.


Out of a total of 350 staff, 85% have technical degrees, while 72 are Ph.D holders, 134 have masters' degrees and 114, bachelors' degrees.

PROMOTION OF MEDICAL BIOTECHNOLOGY INDUSTRY

The medical biotechnology industry aims to achieve the following objectives:

1. To integrate the core biotechnologies.

2. To adopt advanced technologies through international collaboration.

3. To provide services to the enterprises.

4. To develop processes for large-scale production of biotechnology products.
Product and technology development

Biopharmaceutical industry

This industry focuses on the design and production of diagnostic kits for cancer marker, drug abuse/drug residue, cell surface marker, hormone and automatic system for their diagnoses. Another area of focus is the establishment of core technologies for tissue engineering and protein drugs.

Establishment and promotion of biotechnology product pilot plants

These include:
1. Diagnostic kits pilot plant.
2. Microbial fermentation pilot plant.
3. Animal cell and tissue culture pilot plant.
4. Plant cell and tissue culture pilot plant.

Goals for the future

The medical biotechnology industry has set the following goals for the future:
1. To industrialize the diagnostic kits and diagnostic automation technology and commercialize the products.
2. To produce artificial skin, pancreas grafts, and protein drugs for therapeutic use.
3. To establish and promote the bioprocessing pilot plants and develop key technologies for the production of biotechnology products.

PROMOTION OF AGRICULTURAL BIOTECHNOLOGY INDUSTRY

The industry aims to achieve the following objectives:
1. To develop core biotechnologies for animal and plant uses.
2. To adopt advanced technologies through international collaboration and technology transfer.
3. To provide services to the local bioindustries with the view to strengthen their competitiveness.
4. To develop processes for large-scale production.

Product and technology development

1. Animal health products

The core technologies available here include genetic engineering and cell culture techniques, vaccine manufacturing, and large-scale production technology.

The industry produces: 1) animal vaccines — domestic pseudorabies vaccines, recombinant fowlpox/Marek's bivalent vaccine and ILTV/IBD bivalent vaccines, hog cholera live vaccines, castration vaccines for animal use; 2) enzymes and feed additives — beta-glucanase, protease, lipase, growth hormones, chitinase, alpha-amylose, xylanase, and probiotic microorganisms.

2. Fermentation products

The core technologies are: culture screening, strain improvement, biological activity assay, fermentation processing formulation design, and commercialization of biopesticide products.

The fermentation products include: 1) bioinsecticides — B.t.k., B.t.i., entomopathogenic nematodes; 2) biofungicides — Pseudomonas spp., Bacillus subtilis, Streptomyces spp., for a wide range of fungal pathogens, including Fusarium, Rhizoctonia, Pythium, Botrytis, Phyto-phthora, and powdery mildew; 3) animal health products — lactobacteria, chitosan (polymer and oligomer).

3. Plant Tissue and Cell Culture Development

The core technologies are: Plant tissue culture, gene transformation and bioreactor design.

The products include: 1) micropropagated ornamentals — lily bulb, anthurium, statice, calla lily and orchid; 2) insect-resistant transgenic chrysanthemum; 3) replicase gene from banana bunchy top virus; 4) plant secondary metabolites: ginsenosides, natural colorants, berberine; 5) bioreactors — novel bioreactors and control systems.

Goals for the future

The industry aims to achieve the following goals:
1. To produce improved animal health products.
products for domestic needs as well as export to mainland China and Southeast Asia.

2. To produce high-value industrial enzymes by recombinant DNA technology.

3. To produce environmentally friendly pesticides, including bioinsecticides, biofungicides and biofertilizers.

4. To mass produce source bulblets to meet local growers' needs.

5. To produce pharmaceutically important compounds of plant origin.

TECHNOLOGICAL DEVELOPMENT OF PHARMACEUTICAL INDUSTRY

Objective
This program aims to establish a complete system for the development of new drugs with a view to promoting the pharmaceutical industry in Taiwan. Its long-term mission is the discovery and development of new chemical entities with a high probability of commercial success in both the local pharmaceutical companies and the global market. Its short- and medium-term mission is to assist local pharmaceutical companies to develop bulk and generic drugs and their new formulations.

Product and technology development
There are four main areas of focus:

1. In vivo toxicity test, including acute, subacute, subchronic, and chronic as well as cytotoxicity assays, gene mutation assays, cytogenetic assays, and micro-nucleus assays.

2. Pharmacokinetic/ADME studies, comparative metabolism studies, and absorption studies.

3. Bulk drug process development including, cefotaxime, cefazolin, Cefamandole, cephaledin, cefadroxil, cefuroxime, terfenadine, and bezafibrate.

4. Sustained released formulation of Etofibrate, Captopril, and Misoprostol as well as injection and nasal formulations of Calcitonin.

Goals for the future
The program aims to achieve the following goals:

1. To establish a preclinical testing system and to attain GLP accreditation.

2. To apply biotransformation, genetic engineering, and asymmetric synthesis to process development of bulk drugs.

3. To develop protein drug formulations and sustained released dosage forms of generic drugs.

DEVELOPMENT OF ENVIRONMENTAL BIOTECHNOLOGY AND PRODUCTS

Objective
The objective of this program is three-fold:

1. To develop key technologies and products for the treatment of industrial wastes by the application of biotechnology.

2. To promote environmental biotechnology and to establish the domestic bioindustry.

3. To help domestic industries solve environmental pollution problems.

Technology and products development
The main areas of focus are:

1. Biomonitoring technology for environmental toxicants.

2. Microbial products for organic waste recycle and reutilization.

3. Treatment system for the recycle and reuse of industrial wastewater.


5. Biochemical de-inking process and industrial lipase for waste paper recycle.

6. The production of polyunsaturated fatty acids such as DHA and EPA by carbon-dioxide-fixing microalgae.


Goals for the future
In order to promote the emerging environmental bioindustry and to meet the further stringent environmental regulations set by the Environmental Protection Administration in the near future, the main areas for the development of environmental biotechnology and products are as follows:

1. Development of a biotreatment reactor and process for the recycle and reuse of industrial organic wastes.

2. Development of biochemical products for the minimization of industrial wastes.


4. The development of a fully integrated biotreatment system for industrial wastes.

5. Bioremediation for the clean-up of contaminated sites.

For further information, please contact:

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