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The Biotech Centers of Excellence

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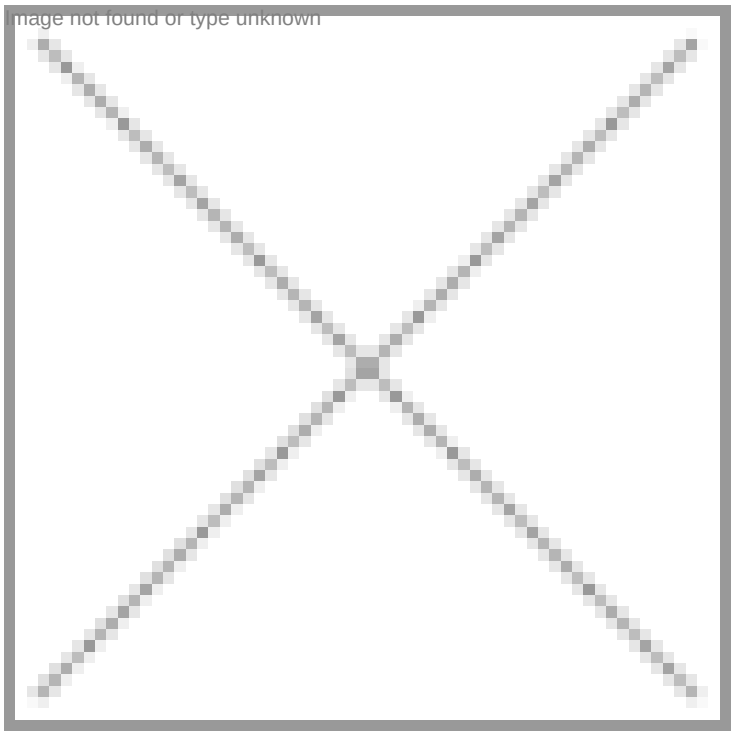

The Biotech Centers of Excellence

The Department of Biotechnology (DBT) has been instrumental in giving a fresh impetus to the development of modern biology and biotechnology in India. DBT has been identifying and setting up Centers of Excellence for R&D and promoting large-scale use of biotechnology. It has set up seven autonomous institutes in frontier areas of modern biology, which not only facilitate focused research but also offer appropriate avenues for skilled, domain specific researchers in India and those coming from abroad. These institutes have played a big role in attracting Indian researchers working in foreign destinations. For instance, at the National Brain Research Centre, nearly 60 percent of the faculty comprises scientists who have returned from abroad.

All the centers of excellence also play an important role in imparting specialized training to students and scientists. Most of the institutes have a doctorate program imparting wide exposure and experience to students in the select areas of neurology, plant genomics, immunology, cell science, etc.

These Centers of Excellence are:

- Centre for DNA Fingerprinting and Diagnostics, Hyderabad
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Institute of Bioresources and Sustainable Development, Imphal

- Institute of Life Sciences, Bhubaneswar
- National Brain Research Centre, Manesar
- National Centre for Cell Science, Pune
- National Centre for Plant Genome Research, New Delhi
- National Institute of Immunology, New Delhi

Centre for DNA Fingerprinting and Diagnostics

The Centre for DNA Fingerprinting and Diagnostics (CDFD) has been providing services for DNA fingerprinting, diagnostics and bioinformatics in addition to basic research in frontier areas of modern biology such as genetics, molecular and cell biology, molecular pathogenesis and bioinformatics. It provides DNA fingerprinting services to various government and law enforcement agencies. In the diagnostics area, CDFD has broadened the range of services provided, encompassing cytogenetic, biochemical, molecular diagnosis and molecular cytogenetics. The institute has been designated as the Indian node for the European Molecular Biology Network and it also hosts an unusually large number of software and databases on its website. It has been imparting training in DNA fingerprinting. An active summer training and project training program attracts and enables young scholars to take up the PhD program at different institutes in the country. The students enrolled at CDFD register for their PhD degrees at the University of Hyderabad.

The research areas being pursued in the frontier area of modern biology include genetics, epidemiology and diagnostics of childhood blindness; cancer biology and metastasis of HPV induced cervical cancer; structural and functional genomics of Mycobacterium tuberculosis; silkworm genome sequencing partnership at the global level; sequencing of the Mycobacterium W; computational biology, etc.

Sun Microsystems Inc. has identified the CDFD as a vital center of excellence in the field of bioinformatics. It has joined hands with the CDFD consortium comprising the CDFD and the Government of Andhra Pradesh to set up the Center of Excellence at Gandipet, Hyderabad. The main focus of this center would be striving for excellence in the field of "Medical Bioinformatics".

Institute of Bioresources and Sustainable Development

The focus of this institute is bioresource development and their sustainable use through biotechnological interventions for the socio-economic growth of the North Eastern region. The institute operates with three scientific divisions, viz, bioresources database unit, medicinal plants and horticultural resources division and microbial resources division. It has developed a model-digitized database of bioresources with more than 3000 species record of flora and fauna of the North-East region. It has established in vitro cultures in various Zingiberales and has characterized the microbial resources associated with traditional fermented foods of Manipur. The institute has also carried out surveys for collection of phosphate solubilising microorganisms and cyanobacterial flora from the rice growing areas of Manipur as well as Loktak lake and other freshwater reservoirs. It is also active in training young researchers.

Institute of Life Sciences

The institute conducts basic and applied research in the frontier areas of life sciences. Molecular biology of aging and cancer, infectious diseases including malaria, filariasis, cholera; biorsource development and ulitization including molecular aspects to stress adaptation, plant microbe interaction and microbial prospecting, plant molecular biology and functional genomics; and environmental biotechnology are some of the important research areas for the institute. It gives advice to various agencies on the application of the new findings and disseminates scientific knowledge.

Affiliated to the Utkal University, Bhubaneswar and Sambalpur Univeristy, Sambalpur, for PhD degree, the institute has a doctorate program in various areas of life sciences. It also provides advance training to post MSc students.

National Brain Research Centre

The National Brain Research Centre (NBRC), established in 1999 as an "Apex Coordination Centre" for neuroscience research, has the mandate to create state-of-art facilities in the country through a networking approach and generate highly trained human resource. Major areas identified for research include computational neuroscience, system and cognitive neuroscience, stem cell research, developmental neurobiology and basic research towards understanding of neurological and psychiatric disorders. Currently a functional magnetic resonance imaging facility for neuroscience research is being developed at NBRC.

As a deemed university, NBRC offers a PhD program and has initiated a MSc degree program in neuroscience. The center is networked with 44 neuroscience groups/institutions in the country to promote multidisciplinary research and provides the facility of a digital library, which it shares throughout the nation.

At NBRC the research focus has been on identification of components of mitochondrial electron transport chain, which are specifically affected and interplay between protein thiol homeostasis and mitochondrial dysfunction. In stem cell research, the function of different types of proneural and neural differentiation genes is being studied using embryonic stem cells as a model system for studying neuronal differentiation. A novel computational approach has been initiated to study acoustic features of human speech by setting up the modulation spectrum.

Several research projects have been awarded to scientists from international and national agencies at the Centre. The scientists at the institute have bagged many research grants including two from the Welcome Trust UK, two from the National Institute of Health, US, one each from the FIRCA, US, RIKEN Brain Research Institute, Japan, the US-India Fund for Cultural, Educational and Scientific Cooperation and the Third World Academy of Sciences. The institute has long-term collaborations with the national institute of Mental health, USA and Pavlov Institute of Russia.

National Centre for Cell Science

The National Centre of Cell Science is involved in research in the areas of cell biology, cancer biology, immunology, diabetes, signal transduction, and gene regulation. The center serves as a National Cell Repository for cell lines and hybridomas and supplied 1017 cell lines to 163 scientific institutes in India during 2004. The efforts towards establishment and characterization of cell lines resulted in establishment and characterization of new immortalized and primary cell lines with unique features. Some of the significant R&D achievements at the institute include identification of signaling pathways for controlling the mobility and invasiveness of breast cancer cells, role of IL-3 and Granultocyte towards blocking TNFa induced osteoclast differentiation. During the last few years, the NCCS has drawn special attention towards stem cell research in India. In the stem cell biology area, it has generated stable embryonic cell clones, which have the potential for neural cell lineage.

Some other major findings at the institute include identifying a novel bacterial strain from the mosquito gut, which seems to have a role in host-parasite interaction; identifying a novel immune evasion strategy for defining drug targets in leishmaniasis; role of whole bone marrow in correcting hyperglycemia in diabetic mice; demonstration of strong anti-HIV activity in a fraction emanating from marine bivalve; understanding the potential mechanism of tat mediated modulation of cellular genes in HIV biology; among others. During the year, NCCS has published 35 scientific papers in international journals, obtained two US patents and filed six patent applications.

The institute has tie-ups with many global organizations such as Pasteur Institute, Paris, France Medical Research Laboratory, University of Hull, UK, London School of Hygiene and Tropical Medicine to carry out research works.

National Institute of Immunology

The National Institute of Immunology (NII) has made intensive commitments to basic research in areas of modern biology related to the immune system. A wide range of issues have been addressed imaginatively and successfully by the scientists resulting in high impact publications in prestigious journals. Major areas of commitment-immunity and infection, reproduction and development, molecular design and gene regulation, - are well-placed to provide unity in diversity by their synergism in the broader cause of health and disease. The institute during its formative years was a recipient of UNDP grants to develop immuno-diagnostic kits relevant to tropical climates. This led to the development of diagnostic kits for detection of pregnancy, typhoid, hepatitis B and amoebiasis. The institute has developed, validated, and transferred the technology of two pregnancy

kits, typhoid, hepatitis B, amoebic liver abscess and intestinal amoebiasis kits to the industry. The institute has developed a repository of high quality immunological reagents, restriction enzymes and plasmids.

The institute is a collaborating center for the national mission project on cattle herd improvement through embryo transfer techniques. Seventy-eight papers by the scientists and scholars of the institute have been published/accepted for publication during the year. And the institute has filed three patents in India and one in PCT.

Every year a large number of trainees, including both young students and scientists with specific training needs visit the institute for various periods. NII offers a PhD program, which draws nearly twenty students through a nation-wide entrance process.

National Centre for Plant Genome Research

The National Centre for Plant Genome Research aims at nutritional, structural, and functional genomics of various plant systems with the ultimate goal to manipulate plant genes to breed improved varieties of crop plants. The Center is currently engaged in plant genomic research with focus on structural and functional genomics for crops like chickpea, catharanthus, potato, tomato, lathyrus, rice, sweet potato, and cassava. The studies on chickpea are being pursued with overall objective to develop transgenics resistant to diseases, pest and drought conditions, while the Catharanthus studies are directed mainly to develop and use markers for construction of lines that hyper-accumulate commercially important alkaloids.

The center has developed nutritionally enriched potato lines developed by transfer of Ama 1 gene of Amaranthus hypochondriacus into elite cultivars of potato accumulate proteins in large amounts (30-60 percent increase) with considerable increase in the amount of essential amino acids in transgenic tubers. To remediate oxalate toxicity in vegetables and grain crops, transgenic tomato has been developed using OXDC gene, which have very low content of oxalate and are tolerant to fungal infection. Both these crops are under field trials. A high artemisinin content and high leaf yielding variety of Artemisia annua cv Jeevanraksha-2 has been developed and the technology has been transferred for commercialization. A considerable amount of progress has been made in cloning and characterizing U-mannosidase gene from capsicum and tomato.

The center is making significant contribution towards scientific manpower development in the advanced areas of plant molecular biology, genomics, and genetic transformation and around 25 students are presently registered for their pre and postdoctoral training.