

MINISTRY OF SCIENCE AND TECHNOLOGY

DEMAND NO. 82

Department of Bio-Technology

A. The Budget allocations, net of recoveries, are given below:

(In crores of Rupees)

Major Head	Budget, 2002-2003			Revised, 2002-2003			Budget, 2003-2004			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Revenue	225.00	10.58	235.58	205.00	15.79	220.79	260.00	13.35	273.35	
Capital	...	...	...	...	...	...	...	...	...
Total	225.00	10.58	235.58	205.00	15.79	220.79	260.00	13.35	273.35	
1. Secretariat - Economic Services	3451	...	4.55	4.55	...	4.41	4.41	...	4.58	4.58
Other Scientific Research										
2. Assistance to Scientific Institutions/ Professional Bodies										
2.01 National Institute of Immunology	3425	25.00	1.08	26.08	24.00	0.97	24.97	25.00	0.85	25.85
2.02 National Centre for Cell Science	3425	9.00	0.45	9.45	9.90	0.41	10.31	9.00	0.42	9.42
2.03 Centre for DNA Finger printing and Diagnostics	3425	8.00	...	8.00	8.00	...	8.00	8.00	...	8.00
2.04 National Brain Research Centre	3425	11.00	...	11.00	11.00	...	11.00	11.00	...	11.00
2.05. National Centre for Plant Genome Research.	3425	7.00	...	7.00	7.00	...	7.00	7.00	...	7.00
2.06 Institute of Bioresources and Sustainable Development	3425	2.00	...	2.00	1.30	...	1.30	2.00	...	2.00
2.07 Institute of Life Sciences	3425	...	...	...	2.50	...	2.50	4.00	...	4.00
<i>Total</i>		<i>62.00</i>	<i>1.53</i>	<i>63.53</i>	<i>63.70</i>	<i>1.38</i>	<i>65.08</i>	<i>66.00</i>	<i>1.27</i>	<i>67.27</i>
3. Assistance to Other Scientific Bodies										
3.01 Human Resource Development	3425	10.00	...	10.00	11.62	...	11.62	13.00	...	13.00
3.02. Bioinformatics	3425	7.00	...	7.00	9.82	...	9.82	10.00	...	10.00
3.03 Biotech Facilities, Centres of Excellence and Programme Support	3425	21.00	...	21.00	21.00	...	21.00	20.00	...	20.00
3.04 Research and Development	3425	104.00	...	104.00	80.50	...	80.50	114.00	...	114.00
3.05 Biotechnology for Societal Development	3425	6.00	...	6.00	3.50	...	3.50	7.00	...	7.00
3.06 Bio-Process and Product Development	3425	8.00	...	8.00	7.86	...	7.86	7.00	...	7.00
<i>Total</i>		<i>156.00</i>	<i>...</i>	<i>156.00</i>	<i>134.30</i>	<i>...</i>	<i>134.30</i>	<i>171.00</i>	<i>...</i>	<i>171.00</i>
4. I&M Sector-Assistance for Technology Incubators, Pilot Projects, Biotechnology Parks and Biotech Development Fund Development	3425	1.00	...	1.00	1.00	...	1.00	15.00	...	15.00
5. International Cooperation	3425	6.00	...	6.00	6.00	...	6.00	8.00	...	8.00
6. International Centre for Genetic Engineering & Bio-	3425	...	4.50	4.50	...	10.00	10.00	...	7.50	7.50
Grand Total		225.00	10.58	235.58	205.00	15.79	220.79	260.00	13.35	273.35
C. Plan Outlay										
Other Scientific Research	13425	225.00	...	225.00	205.00	...	205.00	260.00	...	260.00

1. Secretariat Economic Services: It provides for expenditure on the secretariat of the department.

2. Assistance to Scientific Institutions/Professional Bodies:

2.01 National Institute of Immunology (NII), New Delhi:

The institute was established to undertake, aid, promote, guide and co-ordinate research of a high caliber in basic and applied immunology, to carry out research for development of new vaccines and immunologicals for communicable diseases; to develop immunological approaches for regulation of male and female fertility; to interact with industry for manufacture of products developed from research leads; to organise post-graduate courses leading to Ph.D. degree; to organise workshops, seminars, symposia, training, programmes of specialised nature in immunological methods and related areas; to serve as a national reference centre for immunology and provide consultancy services; to provide and promote linkages between various scientific research agencies/laboratories in the field of immunology, vaccine development and related areas; to collaborate with foreign research institutions, laboratories and other international organisations in the relevant fields. Several technologies related to diagnosis of AIDS virus and contraceptive vaccines are under trial or transferred to industries. Anti-Leprosy Vaccine has been developed and this know – how has been transferred to a major pharmaceutical concern, which is producing and marketing this product. The research in the institute has resulted in patenting of several innovations in USA and India. Three technological leads were granted international patents. 70 research papers have been published on gene regulation, molecular mimicry, reproduction and development as well as immunity and infection in international peer reviewed journals. The institute proposes to take several new initiatives viz., cross talk during signal transduction in neuro degeneration, signal transduction through heterotrimeric G. Protein during developmental transformation of *Leishmania donovani*, role of cell signaling in eukaryotic development, upgrading Electron/ Scanning Transmicroscope facility, initiation of work on Incubator laboratory facility in the second campus of the Institute.

2.02 National Centre for Cell Science (NCCS), Pune: The facility was established to receive, identify, maintain, grow and supply animal and human cell lines, tissues, organs and fertilised eggs and embryos, hybrid-cells including hybridomas, plasmids, genes and genomic libraries; to carry out research and development in these cell lines and related materials and products; to develop quality control and supply culture media and other reagents and materials independently or in collaboration with industry; to organise training programmes for technical personnel in Tissue Culture Technology, Tissue Banking, Cell products and related areas; to serve as a National Reference Centre for Tissue Culture, Tissue Banking, Cell products and Data Bank, etc. and to provide consultancy services to Medical, Veterinary. Pharmaceutical Institutions, Public Health Services and industries in the country; to provide and promote effective linkages between various scientific and research agencies/laboratories and other organisations including industries; to collaborate with foreign organisations in the relevant areas. The technology for large-scale expansion of human skin culture for the treatment of burns, vitiligo and non-healing ulcers and cryo-preservation of cord blood and haematopoietic stem cells transferred to various hospitals. Significant scientific leads such as identification of a new gene involved in tumor formation, induction of apoptosis by inhibitors in cancer cell lines will be pursued by the institute for the development of products and processes through strengthening of technology development programmes. The Centre has obtained a patent for its invention on "New nutrient medium developed to maintain hybridoma cell lines" and filed two more patents. The institute will further take-up research activities namely consolidating the gains of its diabetic programme, studies in cancer biology, cell repository, gene therapy, molecular biology, DNA vaccines for HIV, genomics and proteomics.

2.3 Centre for DNA Finger Printing and Diagnostics

(CDFD), Hyderabad: The objective of the Centre is to provide DNA fingerprinting services for crime investigations, settling paternity disputes and to provide DNA fingerprinting services, undertaking R&D work in the area of DNA fingerprinting and diagnostics, carrying out research in modern biology through cutting edge tools and providing training in DNA fingerprinting techniques. The centre is currently functional in a rented premises. The building construction is already in progress. The centre is providing DNA diagnostic services for human genetic disorders and DNA finger printings for use by Indian judiciary in deciding criminal and other forensic cases. It has EMB (European Molecular Biology) BIOINFORMATICS network as a national nod. CDFD is the only institution from India to be internationally selected for operation of European Molecular Biology (EMB) net national node. Basic research at CDFD is being carried out under four major themes – Genetics, Molecular & Cellular Biology, Molecular Pathogenesis and Bioinformatics. It is also set towards establishing a Disaster Management Cell and development of several new DNA based services in the areas of seed authentication, certification of genetically modified foods (GM foods) and wildlife and animal identification.

2.4 National Brain Research Centre (NBRC), Gurgaon:

The centre has been set-up as an autonomous body of the department and had been registered under the Societies Registration Act. A completely functional interim laboratory has been set up in a rented building at Gurgaon. The centre will undertake research primarily in the areas of neurosciences and basic brain research. A piece land of 38 acres has been allotted to the Centre at Gurgaon and the construction of the building has been started. An action plan for the research activities during the decade has been drawn out with emphasis on networking of centres/institutes doing neurosciences research and evolving comprehensive neurosciences courses. It will also provide centralized facilities for sophisticated and high value equipments, transgenic animals, laser microscopy etc. Research activities have been initiated such as neural stem cell research, systems and cognitive neuroscience that is visuo-motor control with particular reference to saccades and research on neurodegenerative disorders. Multi-institutional research projects are being initiated in areas namely brain mechanisms of visuo-motor control in normal volunteers & patients with focal brain lesions. Construction of the Phase II project of NBRC will be taken up New Research activities in accordance with NBRC mandate will be undertaken.

2.5 National Centre for Plant Genome Research (NCPGR), New Delhi:

The National Centre for Plant Genome Research has been established as an autonomous institution of the Department. The centre started functioning w.e.f. 1st April, 1998 and was formally registered as a Society on 16th July, 1998. The main objective of the Centre is to take up the research work on structural, functional and application genomics of selective crop plants. In addition the Centre will utilise molecular biology approaches alongwith tissue culture and genetic engineering technology to identify important genes and manipulate these for generating transgenic plants with improved agronomic characters and pathogen/stress resistance. The centre is carrying out its research activities from the building of erstwhile CPMB of Jawaharlal Nehru University (JNU). The centre has taken up on genomics of *cicer arietinum*, which include collection and maintenance of germplasm, construction of genetic maps, sequencing of more no. of ESTs. On-going research activities on chickpea genomics, molecular characterisation of calcium mediated abiotic stress signaling pathway with an aim to develop plants tolerant to unfavourable conditions are being pursued. Transgenic potato with high nutrition quality has been developed with the introduction of *Amaranthus Ama1 gene*. Cloning and characterization of regulatory genes involved in dehydration response in legume will be taken up.

2.6 Institute of Bioresources and Sustainable Development (IBSD), Imphal: The Institute of Bioresources and Sustainable Development (IBSD) has been registered as a Society under the Manipur Societies Registration Act, 1989 (Manipur Act (1) of 1990) on 26th April, 2001. The main objectives are to set up the state-of-the-art biotechnology research facilities at Imphal for sustainable development of bioresources, to study and document the unique biodiversity of the region, to develop biotechnological interventions for sustainable development and utilisation of bioresources, to generate technological packages for employment generation and economic progress of the region, to collaborate with other institutions/organisations/universities in furthering research pursuits in bioresources and to undertake capacity building (human resource development). The Director has taken over work of pits filling and lands development around new building completed. Designs and structural drawings for the leased building to make it functional are being made in consultation with experts/architects. The recruitment process for filling up of twenty positions of the institute is planned to be completed work on renovation of building sprucing of laboratories and creating other necessary infrastructure for the institute is being initiated alongwith the research activities.

2.7 Institute of Life Sciences, Bhubaneswar The institute has been taken over from Govt. of Orissa in August 2002. The objectives inter-alia are to conduct and promote basic and applied research in the frontier areas of Life Sciences, foster interaction amongst Scientists of various disciplines and to encourage them to carry out research in areas that interface between physical and biological sciences, to carry out inter-disciplinary research in collaboration with other Research Institutions, various Science Departments of Universities, Medical Colleges and Agricultural Colleges. ,to provide expert advice to various agencies for the application of the new findings, to organize symposia, workshops, conferences and summer schools in frontier areas of Life Sciences for the advancement of knowledge and greater awareness ,to provide advanced training to post-M.Sc. students leading to Ph.D. degree. The institute is carrying out research in biomedical sciences, infectious diseases, cancer ,and plant sciences . The meeting of the Institute Society was held in December 2002 under the chairmanship of Hon'ble Minister (S&T),Govt. of India.

3. Assistance to Other Scientific Bodies:

3.01 Human Resource Development: An integrated manpower development programme comprising M.Sc./M.Tech./ Post Doctoral course in biotechnology at various universities/institutes of many states and union territories; Biotechnology national and overseas associations, short-term training courses, seminars and symposia, popular lectures, biology scholarships, publications and other miscellaneous programmes have been implemented. Five bioscience career development awards and 3 women bio-scientists awards were given to eminent scientists. The main focus of the programme has been to generate a large number of highly trained scientists/students.

3.02 Bioinformatics: The plan scheme of bioinformatics envisages providing a National Bioinformatics Network in the country designed to bridge the gaps in Biotechnology information and to establish links among scientists in Biotechnology. The network aims to provide a single reference to various information resources of importance to biotechnology and modern biology including data banks of genetic importance, published literature, patents and other information of scientific and commercial value. It also aims to provide necessary infrastructural support for modern research in biology involving computationally intensive analysis. The network consists of 11 distributed information centres (DICs) and 46 sub-DICs computational facilities at the national level. It has also established linkages with international institutions like ICCB, a UNESCO based funded bio-informatic programme and is also linked with EMB net, as

well as international legume-data base and information services (ILDIS). Educational and training activities in bioinformatics will also form part of the scheme. A supercomputing facility for in silico studies in genomics, proteomics and drug design has been established at IIT, Delhi New projects for establishing centres of excellence in bioinformatics will be taken up.

3.03 Biotech Facilities, Centres of Excellence & Programme Support: It includes repositories for conservation of plant microbes, specialised biotechnology facilities for advance research, pilot scale manufacturing, centres of excellence and programme support in high priority areas of modern biology. The seven repositories include those on medicinal and aromatic plants, filaria and reagents, cryopreservation of blood cells, tissue culture microorganisms, blue green algae, marine cyanobacteria and drosophila stockcentre. The biotechnology facilities include experimental animal facilities, genetic engineering and strain manipulation unit and biochemical engineering and process development. The programme support in modern biology at IISc. has resulted in over 220 high quality publication in national and international journals, the training of a large number of Ph.D. students and post-doctoral fellows and in catalyzing many interactions between Institute faculty and industry resulting in industry sponsored projects. Several projects have been taken to the stage of technology transfer; most notably the development of hepatitis and rabies vaccines and a peptide based HIV diagnostic kit. National Facility for Virus Diagnosis and Quality Control of Tissue Cultured Raised Plants, a Containment Facility for Transgenic Planting Material is doing well and an International Depository Authority of hazardous microorganisms by upgradation of existing facility of Microbial Type Culture Collection (MTCC) at Institute of Microbial Technology(IMTECH), Chandigarh has been declared of international level. Programme support at RCGB has progressed well. New NMR facilities have been setup at TIFR ,Mumbai and IISc ,Bangalore.

3. 04 Research & Development: Various projects aim at creation of a strong R&D base and product development. These R&D projects mainly fall under: (i) Basic research; (ii) Crop biotechnology; (iii) Medicinal and Aromatic Plants; (iv) Plant biotechnology; (v) Seribiotechnology; (vi) National Bioresource Development Board; (vii) Medical Biotechnology; (viii) Human Genetics and Genome Analysis; (ix) Animal Biotechnology; (x) Aquaculture and Marine Biotechnology; (xi) Environmental Biotechnology. Four National Jai Vigyan S&T Missions in biotechnology have resulted in research leads. More sequence data of Rice genome shall be generated at 10Mb level and beyond after December 2002. This would be followed by precision annotation and validation. A multi-institutional programme on improvement of spices (black pepper, cardamom, ginger and turmeric) using biotechnology tools initiated. The field demonstration of tissue culture raised black pepper has been initiated in hundred hectares. The Network Programme on tea improvement has also been supported. A network programme support has been provided to Rajasthan Council of S&T, for disseminating the tissue culture technology at state level. A multi-institutional coordinated network programme on bioenergy and biofuels has been initiated. National Bioresource Development Board has established a bioresource development unit for characterizing plants and viruses in Western Himalayas. Butterfly Park at Bangalore and coordinated projects on biotechnology of lac, sugarcane, gums and resins are under consideration. Training programmes on bioresources for visually challenged children and college teachers would be started. Recombinant cholera vaccines is likely to complete extended phase-I clinical trials and phase-II activity will be initiated for necessary approval. Efforts are being made to seek approval of RCGO and DCGI for initiation of Dog and Human trials with DNA Rabies vaccine. Programmes of development of cocktail diagnostic molecular tools for infectious diseases, drugs through combinational chemistry and high

screening throughput, detection and management of respiratory infections, basic research on diarrheal diseases, sequencing and molecular typing of infectious agents, neurodegenerative diseases, edible vaccines, reproductive human health and contraception will be initiated. Focused programmes are of oncology, advanced research in stem biology besides continuation of activities under national Jai Vigyan Mission. The Genomic sequencing of microbes relevant to India, establishment of DNA and EBV transformed cell banks, transgenic animal facilities, advanced molecular human genomic research and training centres and courses in medical colleges will be initiated under Human Genomic Programme.

3.05 Biotechnology for Societal Development: Special biotechnology based programme for SC/ST population, women and rural areas have been taken up. The programmes on rural areas has so far benefited around 12,000 rural people. More than 2,100 rural people have been trained to cultivate medicinal plants. Many more people have been also trained in preparation of products like Jams, Jelly, squash, pickle and these products are being sold in local market and are making an additional income of around Rs.2000.00 per month. Biotechnology based programmes for societal development continued to benefit the women, SC/ST population in rural areas. 13 new projects under SC/ST programme, 4 new projects under rural programme were approved. The programme on cultivation of citronella in 5 districts of Arunachal Pradesh in 300 acres benefited 341 people and 700 people were trained. The average income generated by the family through citronella cultivation is about Rs.8000/- per year. About 8000 SC/ST youth and women have been trained in cultivation and processing of mushroom and some of these trainees have already started their own production units. Projects in the areas of such as floriculture, organic farming, food biotechnology and genetic disorders and counseling will be started for the benefit of women in rural areas. 3 bio-village projects are also under consideration.

3.06 Bio-process and Product Development: Financial support is provided for development of technology packages in the areas where sufficient R&D work has been carried out for transfer to the field and large scale production and manufacturing activities. Areas include: (i) Biofertilisers; (ii) Biological Control of plant pests, diseases and weeds; (iii) Tissue culture pilot plant facility for multiplication of forest trees; (iv) Food biotechnology and nutritional security; (v) Tissue cultured elite vanilla & large cardamom; (vi) Micropropagation technology parks (vii) patenting and monitoring and regulation of biosafety guidelines in R&D; and (viii) Biotech product, process development and technology transfer involving bioindustries and other user agencies, industrial and microbial biotechnology. The technology of rapid test for detection of HIV-I&II antibodies by Naked Eye Visible Agglutination assay (NEVA) with autologous RBC agglutination Test developed by Delhi University, South Campus, New Delhi has been commercially launched on the Technology Day. The activities of patent cell will continue with awareness programmes, publications, database development and refresher courses on long term and short term. For biosafety assessment, projects will be initiated and develop protocols for environmental and food safety issues. In the area of food biotechnology, negotiations for transfer of technologies from completed R&D projects have been initiated. The Mission Mode Institutional Programme is being executed on food and nutritional security.

4. I & M Sector-Assistance for Technology Incubators, Pilot Projects, Biotechnology Parks and Biotechnology Development Fund:

- (i) **Bharat Immunologicals and Biologicals Corporation Limited (BIBCOL), Buland Shahr:** Bharat Immunologicals and Biologicals Corporation Limited was incorporated in Public Sector during March, 1989 to manufacture OPV and other immunobiologicals with a view to achieving self sufficiency in manufacturing Oral

Polio Vaccine (OPV). The company has supplied 800 million doses of OPV to National Immunisation Programme since its inception, part of which was also supplied to UNICEF. The company will continue the production of OPV and supply to National Immunization Programme. Production of Hepatitis-B, Measles, Tetanus Toxoid and BCG under the product diversification plan of the company is also being contemplated in addition to implementation of rehabilitation plan.

(ii) Technology Incubators, Pilot Level Facilities, Biotechnology Parks and Biotech Development Fund

Technical assistance to State Governments have been provided for establishment of Biotech Parks. An Expert committee has been constituted to evaluate the proposals from State Governments and to support them in a suitable manner.

5. International Cooperation:

- (i) **International Bilateral Programmes and Scientific Advisory Committee (Overseas):** The Department has on-going bilateral cooperation programmes with Federal Republic of Germany, Israel, Switzerland, Sweden, USA, U.K. while such programmes with Japan, Egypt, France, Kazakhstan, Russia, Sri Lanka, Tunisia, China, Cuba, Mongolia, Poland, Vietnam, Brazil, Myanmar and some other countries are being finalised. Interactions have been made with Australia, Brazil, Hungary, Mexico, Norway, Romania and Slovenia. In addition, multilateral co-operations under SAARC and ASEAN countries are being developed. Agreed work plans have been signed for exchange of visits, training and joint R&D projects with Syria, Sudan and Brazil. Proposals to be establish India-ASEAN Institute of Biotechnology in Indonesia, India-Singapore joint biotechnology park in India in association with MEA and Indo – Russian Centre for biotechnology are under consideration. The 47 joint R&D projects with 10 networks under Indo-Swiss collaboration has resulted in significant research leads for technology development and transfer
- (ii) **Other Programmes:** Multilateral cooperation among G-15 countries for setting up for Gene banks for medicinal and aromatic plants progressed well. A UNDP-GOI funded project in jute-biotechnology became operational for a period of five years.

6. International Centre for Genetic Engineering and Biotechnology:

ICGEB has been established with two components one in New Delhi and the other in Trieste, Italy with the objective of bringing the fruits of modern biotechnology to the developing countries. Intensive scientific research is performed in a total of six groups viz., malaria, virology, immunology, recombinant gene products, plant molecular biology and insect resistance. In addition to research, there are several training and other scheme such as post-doctoral and Ph.D. programmes as well as organisation of training courses and symposia. In addition to the two components, the ICGEB has a network of national regional and international co-operating R&D centres which endeavour to promote an active programme of research and development towards fulfilling the stated objectives. Government of India is providing assistance for meeting recurring cost for running the Centre in New Delhi. The research work in the area of Hepatitis, Malaria, recombinant gene product, plant molecular biology, plant resistance and plant transformation is continuing. ICGEB had transferred Technologies for HIV-I and HIV-II diagnostic kits, hepatitis C diagnostic kit, hepatitis B vaccines, erythropoietin, alpha-interferon, genome interferon, human growth hormone and granulocyte colony stimulating factor.