MINISTRY OF SCIENCE AND TECHNOLOGY

DEMAND NO. 72

Department of Bio-Technology

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

(In crores of Rupees)

	Major Head	Budget, 2001-2002 Plan	Non-Plan	Total	Revised, 2001-2002 Plan	Non-Plan	Total	Budget, 2002-2003 Plan	Non-Plan	Total
Revenue		175.00	11.34	186.34	175.00	10.52	185.52	225.00	10.58	235.58
Capital		...	...	...	...	...	...	...	...	...
Total		**175.00**	**11.34**	**186.34**	**175.00**	**10.52**	**185.52**	**225.00**	**10.58**	**235.58**
1. Secretariat - Economic Services	3451	1.20	4.64	5.84	1.20	3.99	5.19	...	4.55	4.55
Other Scientific Research										
2. Assistance to Scientific Institutions/ Professional Bodies										
2.01 National Institute of Immunology	3425	16.00	1.20	17.20	16.00	1.08	17.08	25.00	1.08	26.08
2.02 National Centre for Cell Sciences	3425	8.50	0.50	9.00	8.50	0.45	8.95	9.00	0.45	9.45
2.03 Centre for DNA Finger printing and Diagnostics	3425	10.25	...	10.25	10.25	...	10.25	8.00	...	8.00
2.04 National Brain Research Centre	3425	8.00	...	8.00	8.00	...	8.00	11.00	...	11.00
2.05. National Centre for Plant Genome Research	3425	5.00	...	5.00	5.00	...	5.00	7.00	...	7.00
2.06 Institute of Bioresources and Sustainable Development	3425	...	...	...	...	...	...	2.00	...	2.00
	Total	*47.75*	*1.70*	*49.45*	*47.75*	*1.53*	*49.28*	*62.00*	*1.53*	*63.53*
3. Assistance to Other Scientific Bodies										
3.01 Human Resource Development	3425	10.00	...	10.00	10.00	...	10.00	10.00	...	10.00
3.02 Centres for Excellence, Facilities, Repositories & Services	3425	11.00	...	11.00	11.00	...	11.00	...	...	...
3.03 Basic & Product Oriented R&D	3425	77.25	...	77.25	77.25	...	77.25	...	...	...
3.04 Bio-Tech. Product & Process Development	3425	11.00	...	11.00	11.00	...	11.00	...	...	...
3.05.Bioinfomatics	3425	6.30	...	6.30	6.30	...	6.30	7.00	...	7.00
3.06 National Bioresource Development Board	3425	7.00	...	7.00	7.00	...	7.00	...	...	...
3.07 Biotech Facilities, Centres of Excellence and Programme Support	3425	...	...	...	...	...	...	21.00	...	21.00
3.08 Research and Development	3425	...	...	...	...	...	...	104.00	...	104.00
3.09 Biotechnology for Societal Development	3425	...	...	...	...	...	...	6.00	...	6.00
3.10 Bio-Process and Product Development	3425	...	...	...	...	...	...	8.00	...	8.00
	Total	*122.55*	*...*	*122.55*	*122.55*	*...*	*122.55*	*156.00*	*...*	*156.00*
4. I&M Sector-Assistance for Technology Incubators, Pilot Projects, Biotechnology Parks and Biotech Development Fund	3425	...	...	...	...	...	...	1.00	...	1.00
5. International Cooperation	3425	3.50	...	3.50	3.50	...	3.50	6.00	...	6.00
6. International Centre for Genetic Engineering & Bio- Technology	3425	...	5.00	5.00	...	5.00	5.00	...	4.50	4.50
7. Lumpsump provision for Projects/ Schemes for N.E.R and Sikkim.	2552	...	...	...	...	...	...	...	...	...
Grand Total		***175.00***	***11.34***	***186.34***	***175.00***	***10.52***	***185.52***	***225.00***	***10.58***	***235.58***
B. Investment in Public Enterprises	Head of Dev	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total
Joint Venture/PSU										
6.01 Investment in Bharat Immunologicals and Biologicals Corporation Ltd.	13425	...	...	...	...	...	...	...	...	...
6.02 Indian Vaccines Corporation Ltd.	13425	...	...	...	...	...	...	...	...	...
	Total	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*	*...*
C. Plan Outlay										
Other Scientific Research	13425	175.00	...	175.00	175.00	...	175.00	225.00	...	225.00

1. **Secretariat-Economic Service:** 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. One Australian, 2 American and one Canadian patents were granted. Over 150 research papers have been published on gene regulation, molecular mimicry, reproduction and development as well as immunity and infection. A biosafety level-3 facility has been established. The institute proposes to take several new initiatives viz., analyses of the molecular mechanisms controlling commitment to immune memory and to alternate immune effect or directions, examination of the ability of intracellular pathogens such as Salmonella, Mycobacteria and Leishmania to enter cells, evade death and acquire nourishment, elucidation of the molecular mechanisms of cell entry, replication and dissemination of viruses particularly those crucial in public health terms such as HIV and JEV, provide novel insights into possible solutions, generation of a state-of-the-art internet connectivity and utilisation infrastructure for NII's participation in the worldwide bioinformatics revolution, 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.

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 have been transferred to various hospitals. There are several significant scientific leads such as identification of a new gene involved in tumor formation, induction of adoptosis by inhibitors in cancer cell lines which will be pursued by the institute for the development of products and processes through strengthening of technology development programmes. The institute will further take-up research activities namely consolidating the gains of its diabetic programme, studies in cancer biology, understanding mechanisms of wound healing, differentiation of bone marrow cells, cellular and molecular regulation of osteoclastogenesis and bone resorption, radio protection of haemopoietic stem cells, molecular biology, DNA vaccines for HIV, genomics and proteomics.

2.03 **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 already 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 node. A new learning Centre in finger printing is likely to be set-up. CDFD is the only institution from India to be internationally selected for operation of European Molecular Biology (EMB) net national node. The centre has already generated 1.5 mega byte sequence data bank. Amongst the research areas, tuberculosis and helico bacter pilory are two diseases being researched upon priority basis. It is also a partner in a global effort to sequence the entire genome of silk worm Bombyx mori.

2.04 **The 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, effect of malnourishment on cognitive functions using fMRI and molecular mechanisms underlying gender-related differences in the outcome of stroke.

2.05 **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 university has allotted 15 acres of land on its campus and the construction of the building has been started. The centre has taken up on genomics of cicer arientinum, 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 will be vigorously pursued. Transgenic potato with high nutrition quality has been developed with the introduction of Amaranthus Ama1 gene.

2.06 **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 first meeting of the Society and the Governing Council of the IBSD, Imphal were held on 18th May, 2001 and 23rd July, 2001, respectively. The Scientific Advisory Committee (SAC) and Finance Committee (FC) of the Institute have been constituted. A research programme on " Inventorisation of Bioresources of Indo-Barma Biodiversity Hot-Spot" has been initiated. The activities on collection and inventorisation of data of bioresources of North-East Region will be continued. Other research activities in the areas of medicinal plants and horticultural bioresources of the region will be started.

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 associateships, 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.

3.05 **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 45 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 . National Jai Vigyan Mission on Mirror Sites for Genomic Research to establish four major databases at Indian Institute of Science, Bangalore; University of Pune; Jawaharlal Nehru University and Institute of Microbial Technology, Chandigarh have progressed well. New projects for establishing centres of excellence in bioinformatics will be taken up.

3.07 **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 200 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, both direct and also under the Technology Development Mission, realizing over Rs.3.00 crores. 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. A National Facility for Virus Diagnosis and Quality Control of Tissue Cultured Raised Plants, a Containment Facility for Transgenic Planting Material have become operational 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 setup. Programme support at RCGB has progressed well.

3.08 **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. Out of the four missions ,three missions have been undertaken under the Basic Research and Development. These are missions on development of new generation vaccines, coffee development, herbal product development and mirror sites for genomic research. The department has initiated programmes in the areas of functional genomics, proteomics etc. For testing and evaluation of transgenic plants, it is proposed to setup 3-4 containment facilities for different agro-climatic regions. Projects on new drugs through combinatorial chemistry and high sequencing throughput by molecular tools, diagnostics of respiratory disorders, basic research on mechanism of infection will be taken up. Special projects on molecular approaches to understand disorders like diabetes, coronary heart diseases, regenerative diseases and cancer will be initiated. Basic research in the areas of metabolic engineering, biomaterials and chemical ecology at molecular level and stem cell biology will also be started.

The National Bioresource Development Board has been established for development, conservation and utilization of biological resources of the country by using modern biology and biotechnology. The objectives of the board are to decide the broad policy framework for effective application of biotechnological and related scientific approaches for research and development and

sustainable utilisation of bioresources specially for development of new product and process; to develop a scientific plan of action for contributing to the economic prosperity of the nation through accelerated research and development using the most modern tools of biosciences. Three projects entitled "Development of Database on Microbial Resources of HP", "Domestication, Characterization Conservation and sustainable Utilization of Endangered Medicinal Plant Species of HP" and "Development of Database on Plant Resources in the State of Himachal Pradesh" have also been funded.

3.09 **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 10,000 rural people. More than 2,000 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. 24 projects in women biotechnologist were supported in 11 States and Union Territories. These projects have resulted in training of women for entrepreneurship development in various areas such as food processing, sericulture, mushroom cultivation, micropropagation of orchids and other ornamental plants, biofertilizer production, goat and poultry rearing, fish farming, rabbit rearing for quality wool production and establishment of nurseries of medicinal and aromatic plants as well as formulation of certain herbal products. So far, around 8000 women are benefited with the programme. A total of 102 projects have been supported in 20 States and Union Territories benefiting about 15, 000 families under the programme for SC/ST. The programmes will be started with the objective to create awareness on biotechnology packages for income generation and better healthcare, using biotechnological processes and tools for creating new avenues of employment and promoting biovillage concept for socio-economic upliftment of target population in rural area and women and SC/ST.

3.10 **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 autologus RBC agglutination Test developed .by Delhi University, South Campus, New Delhi has been commercially launched on the Technology Day. The technology of xanthan gum production developed by BISR , Jaipur has been transferred to M/s Sriram Biotech Ltd. Hyderabad. Programmes on food and nutritional security for enhancing food quality and development of nutraceuticals will be taken up. Five biotech product & process development and commercialisation awards recognising outstanding contributions of scientists for developing a new process/product/technology have been given.

4. **I & M Sector:** Provision has been made for meeting expenditure for providing assistance for Technology incubators, pilot projects, Bio-technology Parks etc.

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, Khazakistan, Russia, Srilanka, 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. In addition to on going activities, new projects are being finalised/identified for implementation with USA, UK, Switzerland, Germany, China, Japan, Israel, Tunisia, Poland and Kazakistan and agreement is under consideration with France where specific areas have been identified at Joint meetings. An Indo-Russian centre of Biotechnology is being established in Allahabad.

(ii) Other Programmes: Multilateral cooperation among G-15 countries for setting up for Gene banks for medicinal and aromatic plants have progressed well. A UNDP-GOI funded project in jute-biotechnology is also 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 progressed satisfactorily. ICGEB has already transferred Technologies for HIV-I and HIV-II diagnostic kits, hepatitis C diagnostic kit, hepatitis B vaccines, erithropoietin, alpha-interform, genome interferon, human growth harmone and granulocyle colony simulating factor.