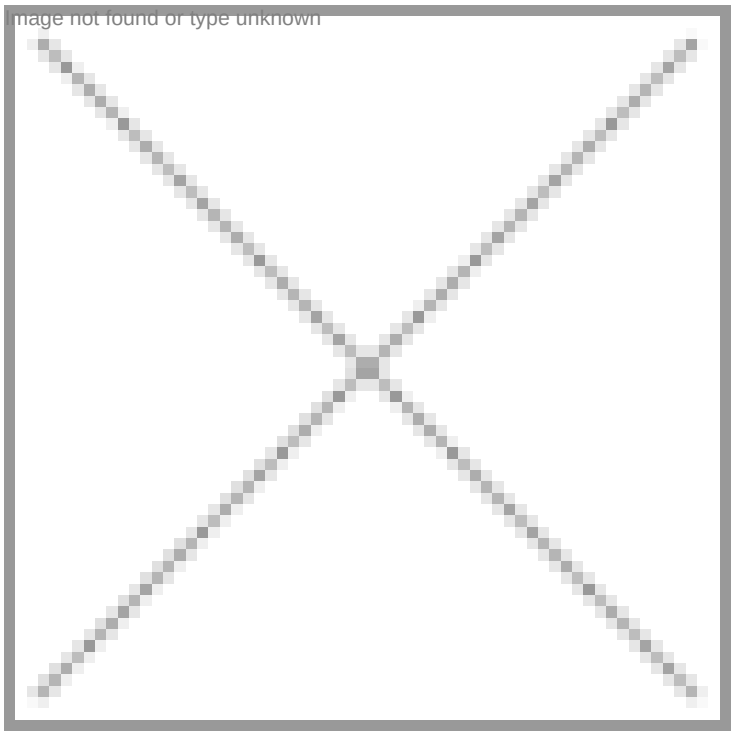
BioSpectrum the business of Bio & Health Sciences

Moving research to market

20 October 2003 | News



NATIONAL CHEMICAL LABORATORY

With the changing scenario in science, technology, and industry, this premier organization is changing constantly to be current and contemporary.

Pune-based National Chemical Laxboratory (NCL), a constituent laboratory of the Council of Scientific and Industrial Research (CSIR), started five decades ago with the purpose to advance knowledge and to apply chemical sciences for the good of people, is a vibrant organization. It is striving to deliver outstanding performances in each sphere of its activities and live up to the mission that it was entrusted with.

It has one of the best track records in the nation through its contributions to the corpus of human knowledge in the area of chemistry and allied disciplines. It has been committed to the development of processes, materials, and products. It is second to none in terms of maintenance of national resource centers of expertise, facilities, information and knowledge. It has created and trained a cadre of highly skilled scientific workers. Its influencing role in national and international scientific associations, governmental bodies etc., is very lofty. For all this and more, it falls in the category of "high output, high impact" institutions in the country along with IISc, TIFR, AIIMS, IIT-B, IIT-K, IACS and Hyderabad University.

The laboratory over the years has forged strong industrial and academic collaborations in pursuit of its objectives. It works closely with many international companies and over 50 Indian companies. Some of the largest companies, within and outside India, have benefited by such collaborations. Examples include Reliance Industries, Indian Oil Corp., Oil and Natural Gas Commission, and pharma majors like Ranbaxy, Cipla, and Cadila, and global companies like GE, Dupont, Dow Chemicals

and Unilever. It has close academic links with several universities both Indian and foreign as well as with several multilateral international R&D organizations.

Besides biotechnology, the core R&D areas of NCL include catalysis, organic chemistry, polymer science and engineering, advanced molecular materials, chemical and process engineering, scientific computing, theory and molecular modeling. Strong biochemical science and engineering backed by inputs from other diverse disciplines provided an extra dimension to NCL's biotechnology program.

Multidisciplinary biotech group

The biotechnology group at the laboratory is a multidisciplinary and multi-skill R&D group with interest in the area of biochemistry, molecular biology, microbiology, botany, and biochemical engineering. It is supported by the state-of-the-art experimental facilities, large-scale pilot plants for plant tissue culture, and scaled up facilities for microbial processes and downstream separation.

The laboratory's strong knowledge base has established its competency in taking up projects in the areas like plant molecular biology and agricultural biotechnology, plant tissue culture and microbiology, and enzyme technology. In addition to taking up the projects, its process development and design activity provides the vital link for translating a laboratory process to a commercial plant. A team of chemists, technologists, and engineers work together in achieving this task. The team members have acquired considerable experience by implementing a number of projects of NCL and also participating with industrial organizations and engineering companies on other projects. The process technologies developed and implemented encompass a variety of areas like catalytic and non-catalytic processes involving esterification, hydro-genation, oxidation, acylation, chlorination, fermentation as well as polymerisation. The process design and development groups has state-of-the-art of pilot plants for scale ups as well as design tools for preparing basic and detailed engineering packages, equipment specifications and mechanical design.

Title
• Cultural medium for bamboo shoot sprouting and multiplication and a method for sprouting and multiplication of bamboo plantl
• Strain of cephalosporium having ATCC accession no. 74297, A process of isolating said strain of cephalosporium and a process for preparing extra-cellular endoxylan
• Process for producing alcohol

A strong team of scientists at NCL, having vast experience in academic as well as industry, is working on several biotechnology-related projects. The projects are from as diverse fields as agriculture, environment, and industry. The scientists, in agri division, are working on transgenic crop plants, micropropagation, production of phytochemicals, biotechnological investigations for improvement of mango and medicinal plants. They are involved in the development of eco-friendly bioprocesses like use of enzymes as alternatives to hazardous chemicals in leather processing, cellulase-free xylanases in biobleaching of wood pulp, biosorption of heavy metals and biocontrol of injection in plants. Although the focus is on taking up pilot projects, the NCL is doing to good work by having tie-ups with universities and companies.

Market-oriented research

To meet the requirements of the society and industry in particular, NCL is offering services in the form of technology licensing, doing contract research, working on collaborative projects, doing consultative and technical services, and information-based products and services by developing state-of-the-art technologies for clients in India and abroad. With a mission to "Linking NCL Research to Market Needs" the laboratory has a Research Planning and Business Development (RPBD) Group that handles all administrative matters relating to agreements between NCL and a client.

Even though, it is part of CSIR, it has faced financial hurdles. In early Nineties, it had taken loans from private financial institutions and the World Bank to pay for reimbursement of research facilities. This drove NCL to look at contract research with multinationals as a business opportunity. These lessons helped the laboratory to negotiate with the companies, which have immense legal clout far superior to what a lab like NCL possesses, to generate more than 18 percent of its total budget. Over the years, it has improved its credibility and aggressively pursued the patents as a goal and this has helped the organization in earning the respect among customers. NCL has learnt to negotiate and license IPR's to the companies outside India.

NCL plans to look at such technologies, which are highly proprietary and are difficult to source. This, it wants to create an inventory of such technologies and explore its relevance to India. Besides NCL looks at materials whose transportation costs are higher. Indian manufacturers of such products are effectively insulated from the threat of competition by imports. At the dawn of new century, NCL looks to the future with renewed optimism. Its vision is to ensure the supremacy of the laboratory in emerging areas of chemical and biotechnology related fields and to perform research, which is intellectually challenging and globally competitive. To fulfil its mission to use chemical and related sciences to produce useful materials and substances efficiently thereby creating value to the customers in particular and society in general, NCL believes that its research must be related to the real world and go beyond mere intellectual stimulation.

Narayan Kulkarni

Biotechnology research activity

The division of biochemical sciences comprises of 30 scientists and 20 Ph.D students. Scientists are specialized in biochemistry, microbiology and molecular biology. Besides the inhouse funding, the research is also supported through external grants from Government funding agencies such as DST and DBT, New Delhi; industries and international organizations. Besides carrying out high quality basic research, major emphasis has been to exploit the research findings for developing, products and processes of commercial importance. The three main areas where the ongoing research finds potential applications include environment, agriculture and health related issues.

MICROBIAL TECHNOLOGY

Development of eco-friendly technologies using enzymes

Leather industry: NCL, in collaboration with CLRI, Chennai, has developed a fungal alkaline protease which has shown promising results when evaluated for soaking, dehairing and bating in commercial tanneries. NCL is one of the participating institutes in a New Millennium Indian Technological Leadership Initiative Coordinated Program devoted to the development of cleaner biotechnological leather processing.

Textile industry: Application of cellulases in textile industries for denim washing is relatively a recent area of research interest. NCL has identified an alkalothermophilic actinomycete culture producing an alkali stable cellulose. Evaluation of this cellulose in textile industry conducted in collaboration with Ahmedabad Textile Industry Research Association (ATIRA) has demonstrated that the performance of the enzyme was comparable with the commercial enzymes but the enzyme was superior to them in the property of being able to function under non-buffering conditions which is a desirable feature for its commercial application.

Paper and pulp industry: Use of cellulose-free xylanases for biobleaching of pulp is expected to prevent environmental pollution caused by the paper industry. NCL has identified several extremophilic microorganisms, which produce xylanases that are useful in enhancing the brightness of the pulp in par with chlorine bleaching exploiting the vast microbial biodiversity.

Aspartic Protease Inhibitor for HIV

NCL has isolated the first biologically derived molecule that inhibits HIV-1 protease, the enzyme involved in the multiplication of the AIDS-causing virus (HIV). The NCL team has demonstrated that an Aspartic Protease Inhibitor (ATBI) is+olated from a bacterium the alkalothermophilic Bacillus sp. That thrives in adverse environments shows inhibition against recombinant HIV 1 protease. NCL inhibitor has an amino acid sequence that shows no similarity to existing inhibitors and represents an exciting new class of inhibitors with important implications for AID therapy. The US and Indian patents have been granted for the process of preparation of aspartic protease inhibitor.

Cysteine protease Inhibitors against malaria

Malaria is one of the most prevalent infectious diseases of mankind. Its control is becoming increasingly difficult due to the increasing incidence of strains resistant to currently used drugs. A program on screening of microbes for isolation of antimalarial compounds sponsored by a pharmaceutical company has resulted in the isolation of a few potent cysteine protease inhibitors which exhibit a significant growth inhibitory activity against Plasmodium falciparum in a biological assay based on the inhibition of trophozoite formation.