Proteomics in India

AN OVERVIEW

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Protein research has been a forte of Indian biological research for many years, and it is with this scientific background, Proteomics activities and efforts in the country evolved around the turn of the century. Scientific research in India is largely supported by central research agencies under the Government of India. One of them, the Council of Scientific and Industrial Research (CSIR)1 supported the first Proteomics program on cancer in 2001–2002 under a new millennium initiative at the Center for Cellular and Molecular Biology (CCMB) in Hyderabad. Over the years, the proteomics lab at CCMB has grown into an advanced center with a range of proteomic workflows and projects. The group has also played a significant role in developing proteomics among other institutions in the country; through inter-institutional collaborations, educational workshops, and services to biotech industry. Subsequently a number of other centers in the country have initiated Proteomics programs funded by other national research agencies; the Department of Biotechnology contributing the major share, and the trend seems to be gradually increasing. A private organization, the Institute of Bioinformatics (IOB) in Bangalore is engaged in large scale Bioinformatics programs. IOB is now attracting public funding, which may help in expanding its activities and role that are more focused in the Indian perspective. Other private centers like the Center for Genomics Applications, New Delhi or the Vimta Labs in Hyderabad, offer Proteomics services, which are helpful to research groups that do not maintain their own infrastructure. Companies providing technology like GE Healthcare, Agilent Technologies, or Bio-Rad have also set up their Research and Development labs or are planning their Research and Development programs in collaboration with Proteomics groups affiliated to universities or research institutes.

Cancers of the oral cavity occupy a high volume in India and have been the obvious initial targets for Proteomic investigations. The joint work of Advanced Center for Treatment, Research, and Education in Cancer (ACTREC) in Mumbai and CCMB (1) and also the recent work from the All India Institute of Medical Sciences in collaboration with York University, Canada (2) are some of the key efforts on these tumors. Central Nervous System tumors such as gliomas have low incidence but are highly significant in terms of cancer-related deaths. The CCMB group has been pursuing the Proteomics of these complex tumors (3). Now, with the help of clinical neurology groups and the Indian site of the Swedish Human Proteome Resource Center and HUPO antibody initiative, CCMB is organizing a nucleus for collaborations on antibody-based proteomics of gliomas. There are other major efforts on neurological conditions that are likely to be initiated under the Department of Biotechnology support. The CCMB group is also carrying on large scale protein expression analysis of embryonic stem cells and will expand it further. Some Infectious diseases are more relevant in the Indian context, malaria and leprosy being two among them. A group at the Indian Institute of Science, Bangalore has been working on protein-protein interactions involving molecular chaperones in Plasmodium falciparum to understand their specific roles in the parasite growth and provide rational basis for anti-malarial drug development (4). Work from Madurai Kamraj University, Madurai has revealed changes in haptoglobin isoforms in the sera of leprosy patients (5), reflecting disease-related changes in a member of the abundant plasma proteins, which are generally removed in plasma proteomics workflows. Much of the above work has been published in peer-reviewed journals. Proteomics of body fluids is in general very challenging, and there is a beginning on this front. A program on the study of 5 body fluids was also initiated at the All India Institute of Medical Sciences, New Delhi, under the Department of Biotechnology support three years back and included studies on seminal plasma proteins, cerebrospinal fluid, saliva, amniotic fluid, and sinovial fluid in the context of their relevant clinical abnormalities. Now CSIR has identified a multi-institutional initiative on plasma proteomics led by the CCMB group for which a blue print is being prepared. On the bioinformatics front, there are number of Indian groups who have made significant contributions; however, the efforts concentrated more on the analysis of the dynamics of protein structure and conformations. Work on protein databases or bioinformatics tools for processing proteomic data has been rather limiting. The Human Protein Reference Database developed by IOB is one of the most widely used human protein database, whereas the most recent contribution of the IOB has been the human Proteinpedia (6), which is likely to be a very valuable resource for the community. In the area of basic biology,
proteomic approaches are being used to understand dynamics of nuclear matrix proteins during development, for deciphering protein complexes in the context of chromatin structure or the siRNA-related or other biological processes. All this reflects a good foundation that will help larger Proteomics efforts and programs.

The first Proteomics Conference held at CCMB, Hyderabad in 2003 was attended by students and scientists, and most of them were initial learners in Proteomics. A very recent meeting in February, 2008 on Current Trends in Proteomics was attended by close to 200 senior investigators and students, and all of them were already running Proteomics projects. February 2008 meeting also included a brainstorming session to discuss the challenging issues involved in the design and implementation of plasma proteomics efforts. In between there have been several small workshops at many centers in the country. The Proteomics activities and the critical mass of investigators have thus gradually grown in the country. Meetings and interactions are going to be important for the group to build its capability further. To encourage the growing proteomics activity, CSIR recently initiated the CSIR Proteomics Network for International Collaborations coordinated by a team of scientists led by Ravi Sirdeshmukh. The network will not only facilitate mobility of scientists to attend international conferences or collaborative work but will also support educational activities such as training, theme workshops, and scientific meetings in the country etc. There is no Indian counterpart of HUPO as yet, although several scientists are members of HUPO. Regardless, the Proteomics group that had assembled at the February meeting underscored the HUPO philosophy of cooperation, collaboration, and education among the fraternity. To facilitate these objectives, a wider consortium of the Indian proteomics scientists is being formalized and is expected to take shape soon. These developments and increasing encouragement from public-funded research bodies are undoubtedly going to add further momentum to the growth of proteomics in the country and prospects for richer knowledge directed toward academic and biomedical advantage.

REFERENCES


