

Summary of NCCS Activities

NCCS carries out research in cell biology, which involves the study of cells, the 'basic unit of life'. The bodies of all animals, including humans, are composed of trillions of different types of microscopic cells. These cells, in turn, are composed of a variety of molecules, including DNA, RNA, proteins, and several others, which determine the structure, properties and biological activities of the cell. Cellular activities are also influenced by other determinants, including interactions between these molecules, as well as interactions of the cells with the environment and molecules outside the cell, with each other, and with microorganisms that they encounter.

All these molecules, interactions and other factors that influence the functioning of cells, collectively determine the functioning of the animal as whole. Consequently, to gain essential insights into how the body functions under conditions of health and disease, it is necessary to study the nuances of how cellular activities operate at the molecular level and decipher all the determinants involved.

We carry out such studies at NCCS to address challenging questions about human health, especially those related to cancer, diabetes, infectious diseases, functioning of the immune system, regeneration of bone and other tissues, gut microorganisms in health and disease, stem cell biology, etc. Through achieving the proximal goal of understanding the basic biology of cells, we aspire to eventually contribute towards improvements in methods for diagnosis, and treatment regimens/ therapeutics for management of diseases. Our studies hold special relevance for this purpose, since they are mainly focused on the Indian population.

While engaging in basic research, we also explore possibilities for translating our promising breakthroughs into tangible benefits for the people through collaborations with clinicians. Transfer of medically useful technologies like 'large scale expansion of human skin culture for the treatment of burns, vitiligo and non-healing ulcers' & 'bone marrow cryopreservation' to Government medical colleges and hospitals in the past exemplify our efforts in this direction.

NCCS also has service-oriented components which play a big role in facilitating high quality research not only at NCCS, but also at other organizations. One of the aims of NCCS is to function as a national cell repository for animal cell lines, which are essential to study the biology of cells. Cell lines are different types of cells obtained from animals, including humans, which are grown and maintained under laboratory conditions. This cell repository provides cell lines to cell biologists from academic and research institutions across the country. Therefore, a significant proportion of cell lines-based research in India is dependent on the cell repository at NCCS, and is also supported by the training that is conducted routinely, and by the guidance provided by NCCS to develop the skill required to handle cell lines.

The NCCS Centre of Excellence, National Centre for Microbial Resource (NCMR) plays a big role in preserving the nation's microbial biodiversity, by serving as a national depository for microorganisms. It has successfully undertaken the enormous task of obtaining several different microorganisms from a



variety of environments across India, preserving them in the laboratory in the form of 'cultures', and characterizing them to identify them and to explore their potential for application in biotechnology.

The NCMR is the largest individual collection of microorganisms in the world and is instrumental in India being internationally ranked among the top few countries with the largest collection of microbial cultures. It also facilitates high-quality research in microbiology in universities, colleges, other research institutions, and industries all over the country, by supplying authentic microbial cultures and providing related services, such as identifying microorganisms using cutting-edge techniques. Further, NCMR has been recognized by the World Intellectual Property Organization (WIPO) in Switzerland, as an International Depository Authority (IDA) for the deposit of microorganisms to fulfill the requirements of the patent procedure in over 50 countries. It is planned that the NCMR will also serve as a repository for antibiotics-resistant microorganisms in the future, to help tackle antimicrobial resistance (AMR), one of the most serious global public health threats.

In addition to carrying out research and extending services as mentioned above, NCCS also contributes immensely to capacity building of the nation and human resource development through several teaching, training & outreach activities that benefit students, researchers & academicians from various organizations across the country, as well as the general public. NCCS conducts the Ph.D. (biotechnology) coursework for students registered with the S. P. Pune University. The NCCS scientists also visit various educational organizations to deliver lectures and provide hands-on training for students in their own organizations. For example, 'Edu-Bridge', was initiated by NCCS as an extramural teaching programme wherein the scientists teach fundamental concepts of science through lectures & hands-on activities to students and faculty of the Jankidevi Bajaj College of Science (JBCS), Wardha. Students and faculty members from educational institutions across India also visit NCCS throughout the year, which provides them the opportunity to learn about cutting-edge approaches and tools used in biology, which they may not have exposure to at their own institutions. Furthermore, the scientists at NCCS provide valuable mentorship and training in research to Ph.D. students, as well as other students who carry out short-term research projects at NCCS every year as summer trainees (selected from among the Indian Academies' Summer Research Fellows) and project trainees (from various academic institutions).

NCCS serves to create awareness among the general public and students about diverse topics in science through various outreach activities. These include public talks by eminent scientists, including Nobel laureates; open day at NCCS on the National Science Day and on other occasions (including public talks by eminent speakers); display of exhibits at various science exhibitions like the India International Science Festival and 'Kutuhel', Vigyan Rail (the science exhibition on wheels initiated by Government of India); articles published in newspapers and magazines in English as well as Indian languages; science-themed talks & discussions broadcast through All India Radio, podcasts and TEDx talks; participation in science documentaries for telecast on channels like the BBC Marathi, DD National channel, DD Bharati, Lok Sabha TV & Rajya Sabha TV, etc.

