Some Success Stories:

(A) Systems Medicine Cluster – Focus on Oral and Cervical Cancer

The Biotech Science Cluster entitled ‘Multi-dimensional Research to Enable Systems Medicine: Acceleration using a Cluster Approach’ at Kalyani, West Bengal has been sanctioned for implementation in January 2016. The cluster partnering institutes are, (a) National Institute of Biomedical Genomics (NIMMG), (b) Tata Medical Center (TMC), (c) CSIR – Indian Institute of Chemical Biology (CSIR-IICB), (d) Bose Institute, (e) Indian Statistical Institute (ISI), and Indian Institute of Science Education and Research (IISER, Kolkata). The mandate of the cluster is (i) To investigate and understand the dynamic systems of the human body as part of an integrated whole, incorporating biochemical, physiological, and environmental interactions that sustain life, and identify perturbations that cause disease in order to implement Systems Medicine, (ii) Provide improved tools for prediction, prevention and treatment of diseases using Systems Biology approach, and (iii) Create a platform for multi-disciplinary training to build a cadre of scientific, clinical and technical personnel required to drive and sustain Systems Medicine with Cancer as an exemplar.

(B) International Cancer Genome Consortium – India Project

With the objective of obtaining a comprehensive description of the genetic basis of human cancer, a multi-country project – called the “International Cancer Genome Consortium Project” – has been initiated. Specifically, the project aims to identify and characterize all the sites of genomic alteration associated at significant frequency with all major types of cancers. India, after detailed national-level discussions and deliberations, is participating in this important international collaborative project with the goal of excavating and understanding the genomic basis of oral cancer, which is the most prevalent form of cancer in our country. The India project is being led by the National Institute of Biomedical Genomics (NIBMG), in collaboration with the Advanced Centre for Treatment, Research and Education (ACTREC) in Cancer.

(C) Virtual National Cancer Institutes

As part of its commitment to address solutions in cancer research, DBT has supported a variety of team science approaches. One such is the Virtual National Cancer Institute (VNCI) Program. DBT’s support to VNCIs is focused on fostering excellence across two identified cancer research spectrum such as breast cancer and oral cancer. This is DBT’s effort to create a centralized platform for sharing concepts and resources bringing in the complimentary expertise of the individual PIs from different organizational settings, reflecting considerable diversity in the size and complexity of their research emphases and partnering scientific institutions to work together to develop and actualize a cancer research agenda.

(D) Building Skilled Workforce & Leadership in Cancer Disease Biology
In order to create Leaders in Cancer Biology, DBT has awarded Unit of Excellence (UoEs) program to individual PIs who have demonstrated reasonable breadth and depth of research activities in their specialized domain of cancer research. The UoEs are in the areas of gastric cancer, chronic multiple myeloma, chronic myeloid leukemia, immunotherapy of cancer etc.

Attracting the best minds in cancer research is challenging today and retaining the talent is even more challenging. DBT has implemented a program entitled ‘Pilot Projects for Young Investigators’ to investigate new hypothesis for establishing proof-of-concept in cancer research. 113 programs for young investigators have been awarded.

(E) **Indian Chronic Kidney Disease (ICKD) Study**

The Indian Chronic Kidney Disease (ICKD) project is the first prospective, observational cohort study of Chronic Kidney Disease (CKD) patients from a developing country. It will provide a comprehensive description of outcomes of CKD in India and identify potential areas for further research with respect to preventing progression of CKD and its adverse outcomes. The ICKD study is a part of International Network of Chronic Kidney Disease cohort studies (iNET-CKD), an initiative of International Society of Nephrology for building an international network of existing, Chronic Kidney Disease cohort studies.

A total of 3444 patients have been enrolled in this study till date and a total of 1558 subjects have completed 1st follow-up, 313 has completed 2nd follow up and 55 have completed 3rd follow up. Total 262 events have been recorded excluding death (68 subjects) and end-stage renal disease (ESRD) (66 subjects).

(F) **Systemic Lupus Erythematosus (SLE) Cohort Study**

Systemic Lupus Erythematosus (SLE) is an autoimmune disease with prevalence varying from 5-10 per 10,000 population globally but with no data from India. Since it mainly affects women in the reproductive age group, it poses significant social and economic burden to the society. In India, about 20% of SLE starts in childhood, posing a huge challenge. Till date most of the work on SLE has been done on describing the clinical phenotype. Owing to its increasing significance, DBT has recently implemented a Multi-centric Network Program on SLE comprising of basic researchers and clinicians. The group would develop and establish a clinical cohort of SLE from different geographical regions in India to study differences in clinical phenotype, relationship between phenotype and autoantibody response, biochemical predictors of long term outcome, major causes of mortality and establishment of a biorepository.

(G) **Dementia Science Program**

Dementia is relatively less explored condition in India. It is a chronic disabling condition that consumes resources at economic, social and psychological levels. Therefore longitudinal follow-up studies are vital for studying the impact of dementia at the level of family, community and the nation and thus the Department has approved & implemented a comprehensive study in India that will provide reliable data regarding incidence, prevalence, biomarkers and risk and protective factors. The study will be multi-centric involving
researchers and clinicians from across the country. Long-term population-based and hospital-based cohorts of dementia patients will be set-up, and followed up, across the country. All the involved centers will use robust and uniform criteria that have been internationally accepted and validated in the Indian context. This is a first of its kind study that is being implemented in 4 centers across the country. There will be community based sites, hospital based sites and supplemented by basic biology studies across the country. The major participating centers are AIIMS, New Delhi, INCLEN Trust International Palwal, NIMHANS, Bangalore, SCTIMST Thiruananthapuram NEIGRIHMS, Shillong, University of Calcutta, Kolkata with National Brain Research Centre (NBRC), Manesar as the controlling centre.

(F) Glutathione & Neurodegenerative Disorders

A very interesting finding from an on-going study at NBRC, Manesar has shown that specific brain neuro chemical alteration monitoring and quantization before the onset of neurodegenerative disorders is an important area of research. It has been successfully demonstrated that brain antioxidant, glutathione (GSH), is depleted significantly and clinically correlated with the clinical status (mild cognitive impairment (MCI) or Alzheimer’s disease (AD)) of the patients. A comprehensive methodology has been created to bind together MRI derived information (brain volume etc.), neuropsychological outcome and MRS derived various neuro chemicals. This comprehensive package is developed and submitted for National and International patent.

(G) Insulin Signalling Pathway Harbours Intrinsic Property of Suppressing poly (Q) Mediated Neurodegeneration – Potential for Novel Drug Development & Therapeutic Intervention.

An on-going study at University of Delhi has shown that if insulin signalling pathway harbours intrinsic property of suppressing poly (Q) mediated neurodegeneration in Drosophila disease models. That was demonstrated for the first time that tissue specific over expression of Drosophila insulin receptor encoding gene (InR) mitigates the poly(Q) induced cellular toxicity and neurodegeneration in Drosophila disease model (Raj and Sarkar, 2018). Intriguingly, InR mediated suppression in neurodegeneration also corresponds to the restoration of cellular function which suggests refurbishment of the functional impairments caused by the disease manifestation. They have further demonstrated that enhanced expression of InR restricts poly (Q) mediated degeneration of Mushroom body in adult Drosophila brain. First time that modulation of insulin signalling pathway can be exploited as a novel approach to treat the human neurodegenerative disorders. Therefore, that finding could be immensely useful for novel drug development and therapeutic intervention against devastating human brain illnesses.

(4) Outcome of Last 5 Years:
No. of publications:- Approx. 250 (including R&D projects, CoEs, UoEs)

No. of patents filed/granted: - Five

No. of manpower trained:- Approx.200 manpower trained in different positions such as Junior Research Fellow, Senior Research Fellow, Research Associate (I/II/III), Project Assistants, Research Assistants, Lab Technician under R&D projects.