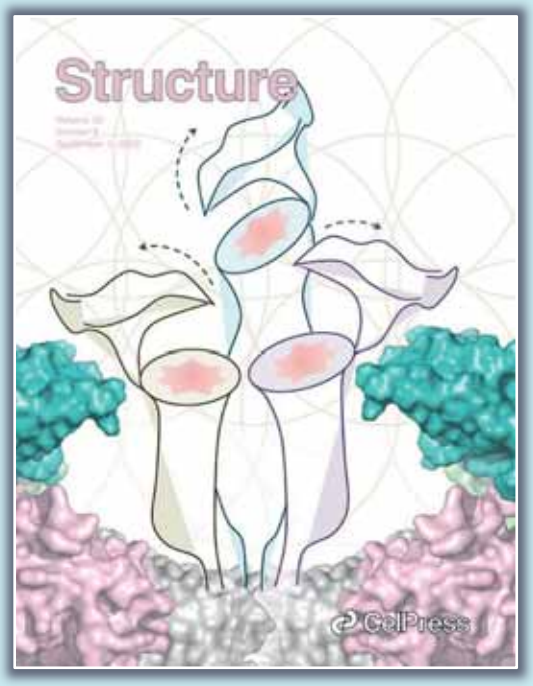
ADVANCED CENTRE FOR TREATMENT, RESEARCH & EDUCATION IN CANCER (ACTREC)



Annual Report 2021

ADVANCED CENTRE FOR TREATMENT, RESEARCH & EDUCATION IN CANCER NAVI MUMBAI

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Message from Director, ACTREC

DR. SUDEEP GUPTA

The past year has been challenging and interesting in many ways, mainly because of the COVID pandemic, which, thankfully is on the wane and hopefully for good. The supply lines for ongoing activities and new projects had to be maintained and I am happy to report that, for the most part, this was done. Many staff members and other well-wishers of ACTREC helped in this endeavor and my sincere thanks to all of them.

We bring to a culmination, two big ongoing projects – the Women's and Children's building and the Powergrid Radiological Research Unit. Even as this reaches you, surgeries have commenced in the state-of-art operation theatres in the Women's and Children's building. We are grateful to Powergrid Corporation of India for facilitating the modern operation theatres in this building, which will help tens of thousands of underprivileged cancer patients in the next decades.

The Asha Nivas building, kindly donated by the Infosys Foundation has become functional and is home to outstation patients who take their treatment at ACTREC or TMH. This is an invaluable resource for underprivileged patients and our grateful thanks to the Infosys Foundation for making this possible.

India's first CAR-T cell therapy was done at ACTREC in 2021 as a collaboration between TMC and IIT-Bombay. We aim to bring this enormously expensive treatment to Indian patients at an affordable cost. Our scientists and clinicians continue to publish top class basic, translational and clinical research in the world's most impactful journals, some of the results being practice-defining in the field of cancer care. We will continue to keep a sharp focus on producing the highest quality research in the year to come.

I wish to thank our scientists, nurses, doctors, students, trainees, technical staff, kitchen staff, administration, engineering, housekeeping and auxiliary staff for their contributions in the ongoing journey of ACTREC. Our special thanks are also due to our NGO friends and donors for their invaluable partnership with ACTREC and TMC.

Dr. Sudeep Gupta
Director
ACTREC

Message from Director, Centre for Cancer Epidemiology (CCE), ACTREC

DR. RAJESH DIKSHIT

The Centre for cancer Epidemiology focuses research at community level to identify burden , life style and genetic risk factors, and evaluate screening strategies for cancer prevention/early detection.

To fullfill these goals the centre has been organized into six department/divisions This report highlight the activities of each of these division/depratment in last years. I am happy to convey with great pride that every unit of CCE has contributed immensly at National and International level towards cancer prevention and published in a high impact journals. Many of the activities of CCE can be labelled as “first” in India. The outcome of research findings have translated into action at population level in cordinations with Central and State Government units. The centre has developed collaboration with numerous International and National (IITs , IIPS) organizations to conduct cutting age research.

Establishments of longitudinal cohort studies with detailed lifestyle information with collection and storage of blood samples in automated biobank, skilled man power to carry out large scale data analysis and conduct genotyping and sequencing together with baseline lifestyle information and long term follow up has built up a platform to conduct and analyze the data to understand cancer burden, causation and progression. I can visualize that in next ten years these large studies will result in information which will be immensly useful to understand compexity in development of cancer and other chronic diseases.

Dr. Rajesh Dikshit
Director,
Centre for Cancer Epidemiology
Tata Memorial Centre, ACTREC

Message from Dy. Director, Centre for Cancer Epidemiology (CCE), ACTREC

DR. PANKAJ CHATURVEDI

Complementing our staff for converting challenges into opportunity.

The previous year was an exceptional year following the ravages of Covid in the preceding years. The Cancer Registry department of CCE has been instrumental in developing and monitoring the population-based cancer registries at Chandigarh, Sangrur, Mansa, SAS Nagar, Varanasi, Muzaffarpur, Vizag, Ratnagiri, and Sindhudurg district. The department also monitors the hospital-based cancer registries at various Tata Memorial Centre (TMC) units. These registries cover more than 17 million people including their follow up and publish an annual report outlining various epidemiologic trends. Under the agreement performance of work between SEARO-WHO, we provide technical support to cancer registries from Nepal, Bhutan, Sri Lanka, Indonesia, and Timor-Leste. In 2021, we conducted various virtual training programs on cancer registration and using the CanReg5 software, with participation from cancer registries across the SEARO region. The department has also undertaken research projects to understand the challenges in implementing health schemes for the treatment of cancer patients in TMC.

The Tobacco Quit Line Services is also managed by the department with the support from the Ministry of Health. In the last three years, more than 13,000 tobacco users have quit their habit using this service. We also conduct training programs for the state government staff on the Tobacco Cessation Process and Protocol of the National Tobacco Quit Line.

To make cancer care accessible to people living in districts and bring down incidence of its preventable forms, TMC conceptualized the project “Access to Affordable Cancer Care for One and All” in 2016. This was launched as a pilot in 6 districts of Maharashtra, and has now covered 34 districts in the state. In the past two years it has been scaled up with implementation at the national level. The broad scope of activities conducted under the project are state level awareness workshops, training the trainer programs, infrastructure and skill gap analyses at District Hospitals, on-site district level training programs. In Maharashtra, 900 doctors and 1207 para medical staff at the district level have been trained through this program. The hands-on training program conducted in Mumbai has trained 62 Medical officers, 18 physicians, 22 staff nurses, 6 general and ENT surgeons.

The Centre for Cancer Epidemiology, Tata Memorial Centre established the Unit for Strengthening Cause of Death Data (USCOD) on 6th August 2021 and launched the Medical certification of cause of Death (MCCD) e-learning course. The Unit supports, promotes, and advocates for best practices in cause of death quality in civil registration and vital statistics in India. The unit has received support from the Office of the Registrar General of India. According to the Annual Report on MCCD by the Registrar General of India (RGI), 2020, medically certified deaths accounted for 22.5 per cent of total registered deaths in 34 States/UTs. Various activities conducted by USCOD include face-to-face & virtual training/workshops for MCCD, e-Learning course on Omnicuris. Nearly 9,500 doctors have enrolled for the MCCD E-Learning Course & 1200 doctors have been trained via hybrid mode, training and advocacy efforts for MCCD. It has expanded from Maharashtra and 5 other low performing states in India including Uttar Pradesh, Bihar, West Bengal, Nagaland, Andhra Pradesh, capacity building in mortality coding (ICD-10 and ICD-11) and providing support for IRIS Automated Coding Software Implementation in all these regions.

Tata Memorial Centre under its Hub and Spoke Model has developed and established its Rural Preventive Oncology Services at Khopoli in the Raigad District, Maharashtra, for the implementation of comprehensive cancer prevention, screening and early detection programs for Oral, Breast and Cervical cancers. These services are located in the Dr Babasaheb Ambedkar Municipal Council Hospital, Khopoli. The integrated system of community-based prevention and early detection of common cancers at the primary care level is provided by cancer screening services, Cancer awareness/ health promotion program activities, stakeholder sensitization program, special clinics and skill development training programs. The program's achievements include cancer awareness and education program being provided to 14,603 individuals, 10,485 individuals screened for cancer, tobacco cessation counseling services provided to 4279 individuals, 672 individuals provided diagnostic investigations for cancer after being screen positive, 6 cases being detected with cancer and referred for treatment. The program has also provided training programs for 245 members of the district health services, stakeholder sensitization programs, covered 1300 students in the school Health Tobacco Control Programs and enrolled 20 participants in the one-year Primary Health Worker Skill Development Program.

The oral cancer screening program is planned to cover rural Varanasi targeting a population of around 10,000 high risk individuals for developing oral cancer, i.e., visible oral lesions, older age and tobacco/ Areca nut/alcohol use. The aim is to determine the efficacy of technology, m-health, for oral cancer/pre cancer screening compared to the current standard of visual examination performed by an on-site expert and a trained healthcare worker. The images are currently being analyzed by a team remotely, but are also being used to develop an algorithm to screen these lesions using artificial intelligence. Biopsies and cytology of these suspicious lesions add another layer of accuracy.

I would like to congratulate the entire team for the good work that they are doing.

Dr. Pankaj Chaturvedi
Deputy Director,
Center for Cancer Epidemiology

Message from Deputy Director, CRC (ACTREC)

DR. NAVIN KHATTRY

2021 has been a watershed year not only for ACTREC, TATA MEMORIAL CENTRE, but also for the world at large. While the havoc caused by Covid -19 pandemic was settling down, measures to prevent further damages due to it were initiated across the globe. ACTREC started its Covid vaccination clinic in January 2021.This clinic not only helped us to vaccinate our patients and staff but also helped Panvel Municipal Corporation in its drive to vaccinate all eligible persons in the Kharghar Node. We delivered more than 50,000 Covid vaccination doses helping thousands of individuals. The second Covid - 19 wave in May-June 2021 did lead to some difficulty in managing the surge of patients, however we were prepared better than before. With adequate stocks of life saving drugs for Covid-19 and adequate supply of oxygen (both in house and with donations of oxygen plants and portable oxygen concentrators), we managed to treat all patients and staff in the second wave with very low mortality. Vaccination, complete or partial, possibly helped in decreasing the severity of the disease.

There was resurgence of hectic activities to complete many ongoing projects in the clinical wing of ACTREC after the slumber of 2020.ASHA NIVAS, a 12 storeyed hostel for patients and their attendants was inaugurated by the honourable Chief Minister of Maharashtra, Mr Uddhav Thackeray, in presence of Smt. Sudha Murthy, chairperson of the INFOSYS Foundation. We are ever so grateful to INFOSYS Foundation for this generous donation. Similarly work was on full swing for the other 3 projects i.e Women & Children Cancer Centre, Radiation Research Unit and Proton Therapy Unit. The number of new patient registrations also limped back to pre Covid times. This progress would not have been possible without the sincerity, dedication and motivation of all staff working in ACTREC.

ACTREC, Tata Memorial Centre, became the first centre in the country to treat patients with CAR-T Cell therapy, a mode of immunotherapy which has revolutionised leukaemia treatment across the world. We initiated the first clinical trial of CAR-T therapy in the country for treating children with acute lymphoblastic leukaemia and the first patient received this therapy on 4th June 2021. This new beginning opens the door for a gamut of cell based therapies that will be initiated in ACTREC in the years to come.

As we welcome 2022, we hope to see many of our ongoing infrastructure projects being completed and commissioned. We also hope to initiate new projects so as to serve our patients with best of our abilities!

Dr. Navin Khattry
Dy. Director, CRC, ACTREC

Message from Deputy Director, CRI (ACTREC)

Prasanna Venkatraman

"I believe in innovation and that the way you get innovation is you fund research and you learn the basic facts."

- Bill Gates

Dear Readers,

Greetings! With one more year behind us, we are happy to present the 2021 Annual Report of ACTREC!

Like the rest of India, we navigated the Covid wave and vaccinated all our staff and students. In a commendable effort CoviScience@actrec sponsored vaccination for the under privileged - street vendors, domestic helpers by collecting funds and contributing to it. Like Yin and Yang of life, this turbulent year also saw our students winning several awards: J.B. Joshi Foundation Innovative Award, the prestigious Prime Minister's Fellowship for Doctoral Research by the Science & Engineering Research Board (SERB), and the Outstanding Doctoral Student Award from HBNI. Several of our Faculty bagged National awards and International recognition. Several patents were filed.

Many of the projects such as the renovation of the CRI, the laboratories, a proposal for the expansion of the animal house to host clinically relevant animal models of cancer have begun to take shape. This year is significant for CRI as we bagged funding for Basic and Translational Research, Animal Imaging and for Capacity Building. The next few years we hope that Research is at its helm and in the Golden Era, for pursuit of excellence and bench to bedside (vice versa) translational research.

To ensure a better life for the students which they deserve, we found a new and comfortable abode for them. We have planned playgrounds and sports arenas within the Institute and procured funding. A High-rise hostel building will take shape within the Institute with all amenities. In short, we are expanding in term of buildings, people and in our Research and Educational capabilities. With this we rise above the previous standards of excellence and set newer and tougher goals.

As always, focusing on a brighter and glorious future for ACTREC with the team X.

Prasanna Venkatraman
Deputy Director, Cancer Research Institute, ACTREC

OVERVIEW OF ACTREC

The **Advanced Centre for Treatment, Research and Education in Cancer** (ACTREC) of the Tata Memorial Centre in Kharghar, Navi Mumbai comprises of (1) the Clinical Research Centre and a 120+ -bed Hospital that together address clinical and translational cancer research and treatment of cancer patients, (2) the Cancer Research Institute that focuses on basic and applied research on cancer, and (3) the Centre for Cancer Epidemiology. Clinicians and scientists of the Centre are committed to numerous basic, applied, translational and clinical research projects that strive for a comprehensive understanding of cancer and attempts to achieve early diagnosis and improved survival of cancer patients. Most of these interdisciplinary projects involve collaborations both within the Centre and also with national/ international centres of repute from academia and industry, and are supported by institutional, intramural or extramural funding. During 2021, there were 217 on-going projects at ACTREC- 106 of these projects received financial support of Rs 15.96 crores from governmental agencies such as DBT, DST, ICMR, etc.; 99 of these were institutional intramural projects which received Rs 2.4 crores. In addition, 9 projects were funded by Pharmaceutical companies and sanctioned Rs. 0.23 crores and all of it has been received for the calendar year. Research carried out by faculty of the Centre resulted in 289 total publications in the year 2021, of which 235 were in reputed international journals, 49 in widely circulated Indian journals, 4 were book chapters and 1, a book. Besides these in 2021, research inventions also culminated into patents. During 2021, 182 regular staff memberswere appointed in different grades in Medical, Scientific, Technical and Administrative cadres, adhering to the reservation policies of the Government of India, besides staff were appointed on-contract under Technical, Non-Technical & Nursing Category to manage the work load due to inflow of cancer patients at the Centre. Presently a hundred members are working under an outsourced contractor at ACTREC.

Several important TMC projects located in the ACTREC campus made good progress during 2021. The patient hostel- ‘Asha Niwas’, a thirteen storey building with 268 rooms generously donated by the Infosys Foundation was inaugurated in October 2021, a Medical Gas Manifold Room (Oxygen Plant) graciously donated by the TATA Trust was commissioned in November 2021. A Patient Transport Ambulance donated by “Doctors for You” (a registered society focused on providing medical care to vulnerable communities during crisis and non-crisis situations) was inaugurated by Director, ACTREC and Dy. Director, CCE in September 2021.

Clinical Research Centre

The Clinical Research Centre (CRC) and Hospital continue to be at the forefront of new developments at ACTREC. Currently CRC has a total of 132 beds which include 13 ICU, 6 Bone marrow transplant and 16 Day care beds. In addition, for cancer patients and ACTREC staff, the Archival Block has been repurposed to a COVID Care Facility with 36 beds which include 6 ICU beds required to manage COVID complications.

The major objective in 2021 was to cease the delays in patient care services that occurred in 2020 due to the COVID pandemic and associated lock downs, and to exhilarate the patient care projects at ACTREC deferred due to the COVID crisis. The Centre had to gear up to take care of cancer patients with COVID 19 infection given their generally immunocompromised status. The challenges encountered in the Pandemic have affirmed that ACTREC is also ready to face exigencies in the future and continues to spearhead innovation. In 2021, ACTREC treated a total of 257 COVID cases which also included staff members. An uninterrupted supply of PPEs and COVID essentials like sanitizers, masks, and gloves to staff was ensured and primarily managed through donations and tight monitoring of supply/issue inventory. A COVID vaccination facility initiated in January 2021 was provided at ACTREC in association with the Panvel Municipal Corporation. The vaccination benefits were extended to patients, patient caregivers, staff and their dependents, students, senior citizens and also to residents in the vicinity of ACTREC. Covishield as well as Covaxin vaccines, were provided as per the availability with Panvel Municipal Corporation. In 2021, this Centre completed 52456 COVID vaccination doses. Due to the increased requirement a Workplace Vaccination Centre operational at the Faculty Club was introduced in June 2021. A total of 5713 individuals [Staff dependents] received the vaccination. The Faculty (scientists and clinicians) from ACTREC- Tata Memorial Centre, under the CoviScience@ACTREC project created social awareness about COVID-19, distributed sanitation kits (masks + sanitizer + soap), and sponsored vaccine shots- exclusively among the underprivileged (street vendors, contractual workers, security guards and domestic helps) with funds amounting to over Rs. 10 Lakhs generated through Philanthropic donations.

Patient registration at ACTREC has seen a significant and steady increase. The total new registrations in 2021 were 2312 in ACTREC, 15590 transfer cases from TMH and 3564 referrals for diagnostic and 328 expert opinion requirements. Day-care services were used by 613 new patients. RT new referrals were a total of 1666 and 1988 patients have undergone Interventional Radiology procedures. In 2021 surgeries carried out were 2593(major) and 358

(minor) in 5 Operation theatres. The ACTREC Diagnostic Laboratories appeared for NABL Desktop Surveillance and were granted continued accreditation with validity until 19th May 2022. New advanced diagnostic tests have been introduced at ACTREC viz. 5 tests Dental surgery, 1 test in Flow Cytometry, 1 test in Molecular Hematology, 5 tests in Cancer Cytogenetics, 5 tests under Transplant Immunology and Immunogenetics laboratories and 9 tests under Transfusion medicine. In 2021, two landmark studies were published by clinicians from ACTREC which clarified and refined the role of radiotherapy in prostate and cervical cancer, respectively.

The **Clinical Research Centre** and **Hospital** constitutes; the Department of **Medical Oncology** which administers chemotherapy in the neoadjuvant, adjuvant and palliative setting for solid tumors. It comprises of the adult solid tumor unit, the bone marrow transplant unit and the pediatric oncology unit. In 2021: the BMT unit carried out 32 autologous, 44 allogeneic transplants and 2 CAR-T cell infusions; the hematolymphoid unit catered to 12639 (OPD) and 644 (ward) patients; the adult solid tumour unit recorded 19447 outpatient visits. The 7 in-patient beds dedicated to solid tumours had 338 admissions with 23068 patient visits to the Day Care services (chemotherapy + emergency managements + hydrations). Paediatric oncology unit treated 306 (ward) and 2751(OPD) patients. The Department was also actively involved in managing the COVID ward with 257 patient and staff admissions in 2021. The Department conducts various trials with extramural and intramural funds. The Department of **Radiation Oncology** provides high quality radiotherapy services and in 2021, Radiotherapy units worked extended hours to treat a total of 1154 patients on 2 linear accelerators with more than 70% being specialized procedures such as IGRT, SBRT, SRS, TBI and TSET. ACTREC was one of the few Centres that offered Radiotherapy to COVID-positive patients. The brachytherapy unit, large pet animal treatments as well as mice and cell irradiation continued through the pandemic. The Bhabhatron-II telecobalt unit was decommissioned in March 2021 (inaugurated -2013). The Proton Beam Therapy Centre is burgeoning with 2 of the 3 gantries given AERB approval for Radiation Safety Survey and 1 gantry passing Acceptance Testing Protocol. With the on-going expansion of clinical (surgical and medical oncology) services at ACTREC, radiotherapy services needs to keep pace, as nearly 70% of all patients will require this modality. The **Surgical Oncology** Department at ACTREC provides continued care to a wide range of cancer patients, and includes in-patient care as well as outpatient clinics. The service conducts five regular operating theatres five days a week and two operating theatres during Saturdays. The department also maintains regular OPDs (newly registered as well as pre- and

postoperative care follow-up OPDs) for breast, head and neck and neurosurgery. The Department of **Anaesthesiology, Critical Care and Pain**provides: Anesthesia services for 5 Major OT, Interventional Radiology, MRI, Radiotherapy OT and Endoscopy; Critical Care for a 10-bedded ICU (3 isolation beds) plus a 3-bedded PACU with a CPR team; renders Acute Pain services and care in the COVID ICU.During 2021, Anesthesia services were provided for 2965 major OT, 121 Radiotherapy OT, 200 MRI, 401 Interventional Radiology and 8 Endoscopy procedures. Critical Care was provided for 2416 Recovery room, 395 ICU (156 - ventilated) and 9 ICU admissions, as well as 920 Acute Pain Services. Dialysis (11 patients) in 37 sessions and Pre-anesthesia check-up for 2132 patients (new + follow-up) was done. The **Radiodiagnosis and Interventional Radiology** Department provides a wide spectrum of diagnostic imaging services including conventional radiology, ultrasonography including colour Doppler, digital mammography, fusion positron emission, computed tomography (PET-CT), magnetic resonance imaging, as well as interventional radiology procedures during working hours, and extends emergency radiological services 24x7 for patients and clinical services at ACTREC. In 2021, a total of 3619 radiographic investigations (302 X-rays/month), 2897 USG/ Colour Doppler (241 scans/month), 6265 Diagnostic CT scans (522 scans/ month), 1174 Radiotherapy planning CT scans (98 patients/month), 2897 MRI (241 patients/month) and 1946 MGs (162 patients/month) were performed. In addition, IR performed 863 various procedures (72 patients /month) and 536 were USG guided procedures. The Department of **Transfusion Medicine** provides safe and adequate supply of blood components round the clock to meet the needs of patients admitted at ACTREC. In a continuous effort to achieve zero risk with transfusion transmitted infections, an automated chemiluminescence platform is used. Specialized blood components including leucodepletion, gamma-irradiation, granulocyte apheresis, peripheral blood stem cells (PBSC) harvest and its cryopreservation are integral part of the services. Advanced graft manipulation procedures like αβ-T cell depletion, CD45RA+ depletion as a rescue in complicated bone marrow transplant patients have been successfully performed. The department has played a pivotal role in performing lymphocytapheresis for the first in-human immunotherapy trial of CAR-T cells. The **Nursing** department provides comprehensive, quality nursing care to all cancer patients undergoing various treatment modalities at ACTREC with due attention focused on the implementation of patient safety goals, continuing education, and research. The **Cancer Cytogenetics** department received diagnostic samples (3599), for cytogenetic and molecular cytogenetic testing (7352). Tests (25,597) including comprehensive FISH panels for hematolymphoid malignancies, chimerism studies in sex mismatch post-BMT patients; karyotyping, chromosomal breakage studies and

ploidy assessment were performed. In 2021, five new tests were introduced and existing panels were upgraded for detection of cytogenetic abnormalities of clinical significance. The External Quality Assessment Scheme (EQAS) in Cytogenetics (FISH and conventional karyotyping) for proficiency testing with premier cytogenetic laboratories in the country and recruitment of de-novo B-ALL patients for ICMR extramural ad-hoc cytogenetic and molecular study was achieved in the report year. The **Surgical Pathology** laboratory at ACTREC is a part of the Department of Pathology, TMC, and all the pathology consultants and resident doctors work on rotation at TMH as well as ACTREC. At any given time, the ACTREC laboratory has one pathology consultant and four residents (senior residents and junior residents; all by rotation). The **Hematopathology Laboratory** is a service laboratory at ACTREC and undertakes the diagnosis and sub classification of hematological malignancies as well as, monitoring of patients while on therapy, for all malignancies. The laboratory uses morphology, flow cytometry and molecular techniques for diagnosis. The laboratory does minimal residual disease testing and post treatment monitoring of patients with Chronic Myeloid Leukemia, B cell Acute Lymphoblastic leukemia in children, T cell Acute Lymphoblastic Leukemia, Acute Myeloid leukemia and Multiple Myeloma. These tests are used to tailor the treatment for individual patient based on response to initial treatment.The **Microbiology Laboratory** provides cancer patient related diagnostic services which encompass bacteriology, serology, clinical microbiology, mycology, mycobacteriology, molecular microbiology and hospital services for sterility testing. Syndromic Multiplex PCR testing introduced for five infectious panels ; Respiratory, Pneumonia, Gastrointestinal, Blood culture Identification and Meningitis/ Encephalitis, has facilitated early detection of infections and antibiotic resistance markers in cancer patients, particularly in medical oncology and Bone Marrow Transplant recipients, leading to earlier diagnosis and aiding treatment. The NABL accredited **Composite Laboratory** at ACTREC consists of four sections; sample collection area, hematology, biochemistry, cytology and provides 24 hours patient related and hospital services comprising of routine hematology and biochemistry. During the period January to December 2021, the laboratory performed 4, 69,980 tests for routine biochemistry, 12,014 immunoassays and 1, 17,526 tests for haematology. Murine and canine blood samples are also processed for research in this laboratory. Students from the 2020 batch of the Advanced Medical Laboratory Technology course, initiated in November 2015, completed their training in August 2021 and are currently serving their bond period. Faculty of the laboratory participates in training undergraduate, post-graduate science and DMLT students.The **Translational Research Laboratory** has its primary focus on the role of cell-free chromatin particles in ageing, degenerative disorders and cancer. The **Clinical Pharmacology Laboratory** aims at developing

new drugs for graft versus host disease (GVHD), acute lymphoblastic leukemia (ALL) and radioprotection. In addition, critical support and expertise necessary to conduct early-phase clinical trials in oncology and also training personnel and developing capacity in the field of cancer pharmacology, biostatistics and clinical research operations is provided by the faculty. This laboratory is identified as an adverse drug reaction monitoring centre under the pharmacovigilance program of India for capturing and reporting adverse events due to drugs and devices occurring at TMC, and also the ICMR Centre for Advanced Research and Excellence in Clinical Pharmacology (ICMR-CARE). The **Clinical Scientist Laboratory** endeavours range from basic to translational research with the primary objective of identifying fundamental biological processes in tumorigenesis of breast cancer, with emphasis on hypoxia, Epithelial-to-Mesenchymal Transition (EMT), stemness and tumour dormancy. The laboratory also works in the field of lung and head & neck cancers to unravel complexities at the gene level and to translate preclinical outcomes into relevant interventions for clinical issues. Further non-invasive, NGS-based assays to decipher the genomic landscape of breast cancer patients as surrogate markers of tumour burden and progression are being developed. This laboratory's NGS facility has provided sequencing facility to over 500 patients and the Tape Station has been extensively used as part of quality control for both, diagnostic tests and research purposes.

Cancer Research Institute

The programs of the Cancer Research Institute's Principal Investigator led laboratories continued during 2021, with the on-going projects steadily progressing towards fulfilling their aims and new projects initiated in the area of basic and applied research on cancer. Several accolades were won by the scientists and students of the Cancer Research Institute during the year 2021. **Dr Rohan Khadilkar** was awarded the "Har Gobind Khorana-Innovative Young Biotechnologist Award – 2020" by the Department of Biotechnology (DBT) Ministry of Science & Technology, Government of India; **Dr. Shalini Dimri** (De Laboratory) received the J.B. Joshi Foundation Innovative Award 2021 from HBNI; **Ms. Deepshikha Dutta**, (JRF- Dr. Hasan) has been awarded the prestigious Prime Minister's Fellowship for Doctoral Research by the Science & Engineering Research Board (SERB), Government of India. (November 2021) and **Dr. Maitreyi Rathod** (De Laboratory) received the Outstanding Doctoral Student Award 2021 from HBNI.

The Cancer Research Institute also procured equipment such as Robotics for Crystallization, INCUCYTE Live Cell Imaging System, Electroporator, Low Temperature Incubator, Centrifuges, Dry Baths, CO_2 Incubator, Biosafety Cabinets, Refrigerators, Water Purification Systems,

Printers, Water Baths, Microscopes, Pipettes, Rockers and Shakers, Weighing Balances, Stirrers, -86°C Freezer, Liquid Nitrogen Container through the Institutional funds, to cater to the growing needs of various laboratories and facilities, in the year 2021. Several other equipment through Corporate Social Responsibility [CSR] fund were also procured, such as; the Automated Western Blot System (Smt. Ushaben Khambatta), UV Spectrophotometer (M/s Supreme Group), Microscope and CO_2 Incubator (General CSR).

A brief description of some of the research areas pursued at the Cancer Research Institute:

In the **Biomolecular Structure, Function and Alteration**Group, the research focus of **Bose Laboratory** is on the study of macromolecules involved in the apoptotic pathway, and their implications in normal cellular functions and pathogenesis. The group works on the high-temperature requirement family of serine proteases (HtrA); the interaction between proteins of extrinsic cell death pathway, and the Bcl2 family proteins and their interacting partners. Moreover, the group is now entering into application-based translation research that includes enzymes involved in metabolic reprogramming and their role in altering cancer signaling pathways. The **Prasanna Laboratory**progressed in efforts to find the Achilles' heel in the proteasome network. The salient features are a) PSMD9 the assembly chaperone of the 19S regulatory particles is necessary for nucleolar structure, integrity and turnover of p53; b) In breast cancer patients, severe loss of RNA expression correlations among the 19S regulatory particles, translated into enrichment of the 20S catalytic core in MCF7 cells. This altered ratio was dependent on PSMD9 which provided survival advantage to these cells. c) Established that Novel Nexus with NFκB, β-catenin and RB1 empowers PSM10/Gankyrin to counteract TNF-α induced apoptosis. The **Varma Laboratory** pursues projects based on integrated genomics, proteomics and structural biology like evaluation of pathogenicity of mutations identified from cancer predisposing genes and proteomics studies of HNSCC treated with radiotherapy. Seven PhDs and two project scientists are actively working on projects from international and national collaboration which led to two international peer reviewed publications in 2021. This laboratory with the support of DBT, India has started the Indian Cancer Database for Translational Research and under the program "Azadi Ka Amrit Mahotsav", Varma Laboratory organized 4 national level webinars/workshops in the report year. **Rukmini Laboratory** aims at delineating the molecular alterations mediating resistance to tyrosine kinase inhibitors (TKIs) in chronic myeloid leukemia (CML). This laboratory is investigating the mechanism of resistance to imatinib in blast phase of CML with the objective of identifying potential therapeutic targets for

the non-responders, achieved by proteomic analysis and studies to find more therapeutic targets are on-going. The other aspect is to identify early markers to predict development of resistance before start of therapy. Towards this a DNA finger print analysis of Raman spectrum which could capture the altered DNA content detected in genomic alterations observed in resistant cells has provided a simple and single assay to detect occurrence of resistance. In the **Cell and Tumor Biology** group, **Teni Laboratory**research programs aim to gain insights into the molecular basis of oral and cervical tumorigenesis. Studies to identify the deubiquitinases which interact with mutant p53 and impact its stability are underway. Studies to decipher the role of Mcl-1 in radiation induced DNA damage response and autophagy in oral cancer cells are ongoing. The molecular mechanism by which TCTP contributes to radioresistance is being explored using knockdown strategies while the first of its kind chemoradioresistant cervical cancer *in vitro* model using the patient's regimen is being established. Studies to understand the regulation of Activin A and role of CLU in oral tumorigenesis are also underway. **Sorab Laboratory** demonstrated that the iron siderophore Lipocalin2 (LCN2) is required for therapy resistance in colorectal cancer cell lines by inhibiting ferroptosis. In collaboration with colleagues at MSMF and Beyond antibody, the group demonstrated that a novel monoclonal antibody targeting LCN2 inhibits therapy resistance and tumour progression. Further, this laboratory has established a syngeneic mouse model that leads to disease progression in the colon with a concomitant increase in LCN2 levels and has also identified novel mechanisms by which the 14-3-3 family of proteins regulate centrosome duplication and centrosome clustering, which is often disrupted in human cancers. **Dr. Hasan's** Laboratory has initiated new collaborative work with INTAS pharma on high risk acute promyelocytic leukemia. In this joint effort, a second year PhD student of this laboratory has been awarded the prestigious Prime Minister's Fellowship for Doctoral Research by the Science & Engineering Research Board (SERB), Government of India in November 2021. **Dr. Warawdekar** works on Gap Junctions implicated to assist in the antineoplastic effect of therapies adopted to treat cancer, absence of which results in compromised therapeutic outcomes. The expression of Connexins and the functionality of intercellular communication were ascertained in NSCLC adenocarcinoma cell lines in the presence and absence of phosphorylation, identified by western blotting and confocal imaging. Under study is also tumour cell derived signalling through expression and activation of proteins that lead to invasive properties, like cellular Fibronectin. Different cancers and subtypes have been assessed and analysis of this protein with antibodies recognizing two different domains qualitatively and quantitatively in the plasma of patients is ongoing. Amongst the various research activities undertaken by **Dr. Patwardhan** the major focus was to unravel

the effect of ECM stiffness on cancer progression. This laboratory showed that of ECM-rigidity regulates breast cancer motility and invasion through stiffness-tuned exosomes with exosomal thrombospondin-1 playing central role in conjunction with FAK and MMPs. Further attempts were made to discern the influence of ECM dynamics on exosome biogenesis and trafficking. So far, the differential regulation of various ESCRT pathways in the exosome production has been probed. In parallel, contributions are made in a collaborative project demonstrating MMP modulated differentiation of embryonic stem cells on engineered cell derived matrices. **Dr. Arandkar** aims to understand the tumor-stroma cellular interaction and their role in tumorigenesis. Extensive data analysis generated in this laboratory suggests that various stromal factors influence tumour cell behaviour. Experiments done in this laboratory; have identified that IGFBPs proteins were elevated in the tumour-associated stroma, also TGFBI, a secreted protein, is highly expressed in the stromal cell compartment, and currently, its role in tumorigenesis is being elucidated, that p53 gene mutations in pancreatic cancer cells promote the immunosuppressive microenvironment. In the year 2021 this laboratory received a Start-up Research Grant of Rs. 30 Lakhs from SERB, DST. The **Carcinogenesis, Genome Biology, and Precision Medicine** group comprises of four investigators**,** The **Sarin Laboratory** focuses on inherited cancer syndromes. In 2021; the fully ACTREC supported Cancer Genetics Clinic (at TMH and ACTREC) enrolled 1198 new families with hereditary cancers; Multigene Germline NGS panel diagnostic service was initiated in the Genomics Laboratory and NGS germline mutations (SNV, Indels and Copy Number Variation) were analysed for 510 families. Further, rare mutations including 4 novel and 4 double mutations were identified in DNA repair genes in 158 families and VUS in 175 families, EBV Cell lines (LCL) were made from 13 rare or double germline mutations carriers. In addition, several key findings and publications were generated from the ICGC Oral cancer cohort with indigenously made cell lines from these patients.Studies from **Gupta Laboratory**have shown overexpression of H2A and H3 histone isoform, HIST2H2AC and HIST2H3A/C respectively in various human cancer cell lines and human tumor samples compared to normal counterparts. HIST2H2AC is positively regulated by YY1-E2F1-GCN5 in breast cancer. Physiologically, H2A2C depletion affects cell proliferation and induces cell death. Moreover, HIST2H3A/C in human gastric cancer is regulated through the EGFR-FOXC-G4-GCN5. H3.2 protein undergoes K9 methylation and favours heterochromatin organization at the nuclear periphery. The Valproic acid decreases methylation with an increase in H3K9 acetylation, leading to cell death in gastric cancer cell lines highlighting the importance of epidrug as sensitizer.In the **Mahimkar Laboratory** integrative analysis of genomic, transcriptomic and methylomic data on OSCC revealed that specific signature of differentially

methylated promoter and gene copy were associated with shorter survival**.** Clinically relevant biomarkers predictive of EGFR targeted therapy response that can guide treatment decisions in HPV negative HNSCC patients were explored. High HIF1α expression is a predictor of poor clinical response to chemo-radiation therapy (CRT) in HPV-negative HNSCC patients. The laboratory demonstrated that polymeric black tea polyphenols (PBPs), inhibit carcinogen induced lung adenoma in A/J mice and oral tumors in hamsters. The **Dutt Laboratory** presented the first genetic landscape of alterations underlying 430 Indian lung squamous genomes and uncovers targetable somatic alterations using next generation sequencing followed by validation using mass spectrometry (*Oncotarget*, 2021). In a separate study, using a preclinical orthotopic NOD-SCID mouse model, results reveal that there may be no need to give daily dosing of adjuvant osimeritinib following surgical resection of early stage lung tumors. The effect can be achieved even by weekly dosing. This is an important bench-to-bed contribution that is likely to reduce the cost of treatment by 1/7th from more than Rs. 1 Lakh per month (*Translational Oncology* 2021).In the **Therapy Resistance and Stem Cell Biology** Group, **Waghmare Laboratory**is interested to delineate the cell signaling pathways such as Wnt that govern cancer stem cells in epithelial cancers. Secretory phospholipase A2 (sPLA2-IIA) overexpression in mice skin showed depletion of hair follicle stem cells with an increased c-Jun activation.sPLA2IIA in human breast cancer cell lines showed tumor reduction. Sfrp1, a Wnt inhibitor loss showed increased tumorigenic potential of cancer stem cells in skin squamous cell carcinoma. Further, expression profiling on Sfrp1-/- CSCs revealed up regulation of EMT and Sox-2. Inverse co-relation of Sfrp1 expression was observed in human skin, HNSCC and breast cancer, which suggests its importance in clinical implications. The focus of the **Ray Laboratory** is to delineate the key molecular signatures associated with acquirement of resistance and metastasis in Epithelial Ovarian Cancer (EOC) and Gastric Cancer (GC). The group's research findings in 2021 have led to deeper understanding of the role of different mutants of P53 in autophagy, platinum resistance and PIK3CA signalling, role of autophagy in maintaining drug induced homeostasis in cancer stem cell population, delineation of temporal dynamics of Notch3 signaling in real time and role of protein-protein and protein-lipid interaction in conferring multi-drug resistance in platinum-resistant EOC cells. This Laboratory is also evaluating the effects of herbal compounds in sensitive and 5-FU resistant GC cells and the molecular association between wtp53/mp53 with HER2 expression and localization in GC cells and patients tissues.The **Shilpee Laboratory** works on understanding the molecular mechanisms of therapeutic resistance in glioblastoma and leukemia using patient derived cellular and pre-clinical mouse models developed in-house. In 2021, this laboratory identified

DUSP6 (Dual Specificity Phosphatase 6) radiosensitivity in glioblastoma by modulating the recruitment of phosphorylated DNAPKcs at DNA double-strand breaks (JCS Dec 2021). Additionally, it was shown that nuclear localization of p65 reverses therapy-induced senescence in glioblastoma (JCS March 2021) and that 14-3-3ζ negatively regulates mitochondrial biogenesis in GBM residual cells (Heliyon 2021). Furthermore, this laboratory demonstrated that down-regulation of metabolic pathways offset poor prognosis conferred by co-existent diabetes mellitus in pancreatic adenocarcinoma (ANZ J Surg 2021). The **Nandini Laboratory** is interested in understanding the molecular basis of variable responses to chemotherapeutic agents in a very aggressive breast cancer subtype, the Triple Negative Breast Cancer (TNBC). TNBC is a heterogeneous disease and has 4 different subtypes. Therefore subtype-specific cellular model systems that can be used to study drug resistance in TNBC are being developed. Phenotypic and molecular characterization of these cellular models suggests that there can be multiple cellular mechanisms involved in determining response to chemotherapeutics. Apart from this the laboratory is actively involved in research training to post-graduate students and subject specific lectures to undergraduate students. The **Cancer Theranostics and Clinical Pharmacology** Group comprises of two investigators. Research in **De Laboratory** focuses on molecular functional imaging of cancer in experimental animal model with true potential for translating basic research findings to the clinic. In 2021 students from this laboratory received accolades; a PhD student, 'first in ACTREC' received the "J.B. Joshi foundation innovative award" (HBNI), a student's PhD thesis received - "Outstanding Doctoral Student Award (HBNI)"and yet another student received – "NASI-Swarn Jayanti Puraskar-2021" (oral presentation). In 2021 a graduate student from this laboratory submitted and was awarded the PhD degree in Life Sciences. Work from this laboratory resulted in 7 articles in high impact international journals and one Indian patent application was filed jointly with IISER, Pune. **Chilakapati laboratory** aims to develop and evaluate non-invasive and minimally-invasive Raman spectroscopy (RS) approaches for detection of early alterations in cancers, with emphasis on oral-cavity. RS studies of bio fluids, such as saliva are being explored to stratify normal, tobacco habitué and tumour subjects. Further serum Raman studies in hamster-buccal-pouch has demonstrated detection of early changes- by week 5^{th} in 14-week carcinogenesis model. Raman maps of tissues show feasibility of identifying tumor ablative effects/margins of photothermal-therapy. Further, RS could successfully assess radioresistance, chemoresistance, effect of CAP therapy, nanoparticle based targeted drug delivery and correlation between spectral and biomarkers. In the **Tumour Immunology and Immunotherapy Group, Dr. Kode** focuses on investigating; immune phenotype, soluble factors landscape and immune

evasion in patients; understanding crosstalk of stem cell niche, immune cells, innate inflammasome pathway and mesenchymal stem cells in the tumor microenvironment in oral cancer and acute myeloid leukemia.Immunomodulatory effects of ayurvedic formulations are being tested in two clinical trials on patients with ovarian and oral cancer. This Laboratory has identified CD26, an immunoregulatory-enzyme and few immune subtypes as prognostic biomarkers for Graft-versus-Host disease (GVHD) in stem cell transplant patients. CD26 inhibitor and one phytoextract showed interesting leads in reducing inflammasome–associated molecules in GVHD mice model. The primary research question of **Dr. Khadilkar** is to understand how genetic modulation of cellular ageing using different transgenes alters cellular properties and organ homeostasis. This is studied using two model organs in *Drosophila*– Intestine and larval lymph gland, the hematopoietic organ. Findings show that there are alterations in parameters like proliferation, apoptosis, DNA damage, stem cell differentiation and the mechanistic details of this process are being investigated. Members of this group attended the Indian *Drosophila* Research Conference and National Research Scholar's meeting – 2021. Dr. Khadilkar has been awarded with 3 prestigious extramural grants from DBT and SERB, New Delhi, India.

Centre for Cancer Epidemiology

The Centre for Cancer Epidemiology focuses research at community level to identify burden, life style and genetic risk factors screening strategies for cancer prevention/early detection. To fullfill these goals the Centre has been organized into six department/divisions. The Center conducts PhD programme in Epidemiology and MSc in Epidemiology and Public health. The Centre has developed collaboration with numerous International and National (IITs , IIPS) organizations. The major achivements of the Centre in the year 2021 are; demonstrating effectiveness of clinical breast examination in reducing mortality from breast cancer, establishing a platform for Molecular Epidemiology research and identification of lifestyle and genetic risk factors of gall bladder cancer and establishment of Cancer registries at various locations in North India and local Nuclear Power Centres.

Academics at ACTREC

To fulfil the third mandate of the Centre, strong momentum is given to its educational programs. The main focus is on its doctoral program conducted under the aegis of the Homi Bhabha National Institute – a deemed university recognized by the University Grants

Commission. Between January and December 2021, a total of 108 graduate students were working towards the Ph.D. degree in Life Sciences at ACTREC; these included 21 JRF 2021 batch students who joined in August 2021. Under the short term and summer training program, a total of 222 trainees worked in close supervision of the Centre's faculty during the year; these included 109 MSc dissertation students. In 2021, the Centre organized 46 local/ national/ international conferences, symposia, workshops, training programs, etc., most of which were shared on a virtual platform due to the global COVID pandemic that affected normal life since March 2020. ACTREC observed and celebrated days of National and International importance, some of which were the Republic Day, the Independence Day, Women's Day, Sadbhavana Diwas, Hindi Diwas and the Fire Service Week. The Vigilance Awareness Week was observed between October 26th and November 1st in 2021. The Centre conducts Yoga sessions as a part of the staff welfare activity. In 2021, the 7th International Yoga Day was held on the 21st June which extended to a 7-day program titled, 'Yoga se Hoga' organized virtually and observed by staff and students from their homes in accordance to the pandemic protocol.

International Day of Yoga (IDY-2021)

The ACTREC Administration- Public Relations Cell, in accordance with the Ministry of AYUSH guidelines, observed the "7th International Day of Yoga" (IDY) on 21st June 2021. The one week - virtual yoga session (45 minutes) named ***'Yoga se Hoga'*** began from the same day. The Ministry of Ayush (MoA), has been taking various steps to boost the adoption and acceptance of practice of Yoga. One such step that can be called a milestone is the formulation of the Common Yoga Protocol (CYP) training program. The CYP, in different ways, is the soul of the IDY observance, as it offers harmony and peace among millions of people. This form of physical exercise includes safe practices to improve the mental, physical, emotional, and spiritual health of the population. With many program registrations, it was a great week, filled with fun and fitness. The 7-day virtual program had morning and evening sessions with different themes on each day and concluded with 'Laughter Yoga Practice - benefits of laughter', on the seventh day. It was emphasized, Yoga is safe and beneficial but like any other health programs, it needs to be practiced judiciously, correctly, and cautiously.

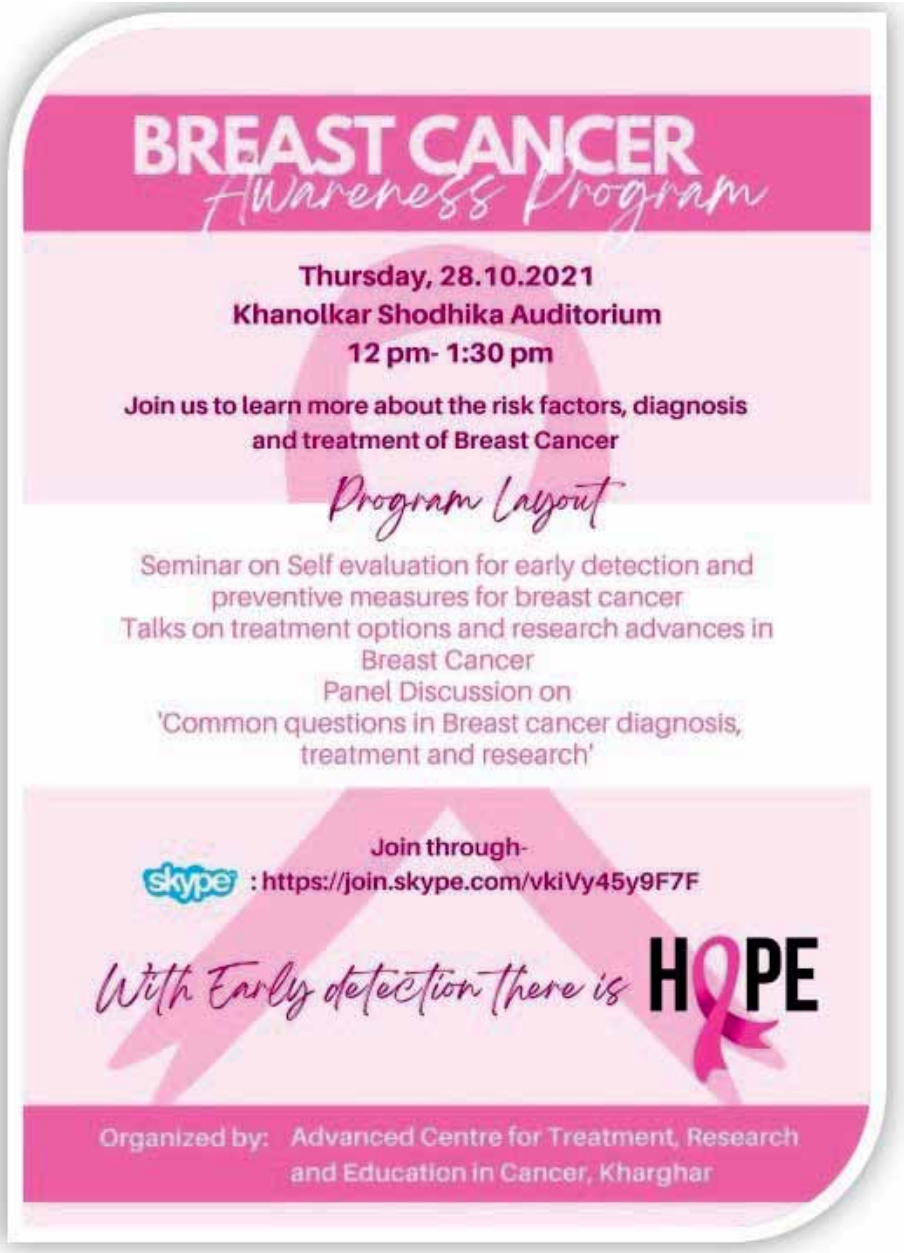
Sadbhavana Diwas 2021

On the eve of 77th Birth Anniversary (August 20th) of the former Prime Minister of India, late Shri Rajiv Gandhi, Sadbhavana Diwas was observed at ACTREC in the presence of Dr. Navin Khattry, Dy. Director, CRC ; Mr. M. Y. Shaikh, Administrative Officer, ACTREC and other Staff members of ACTREC.

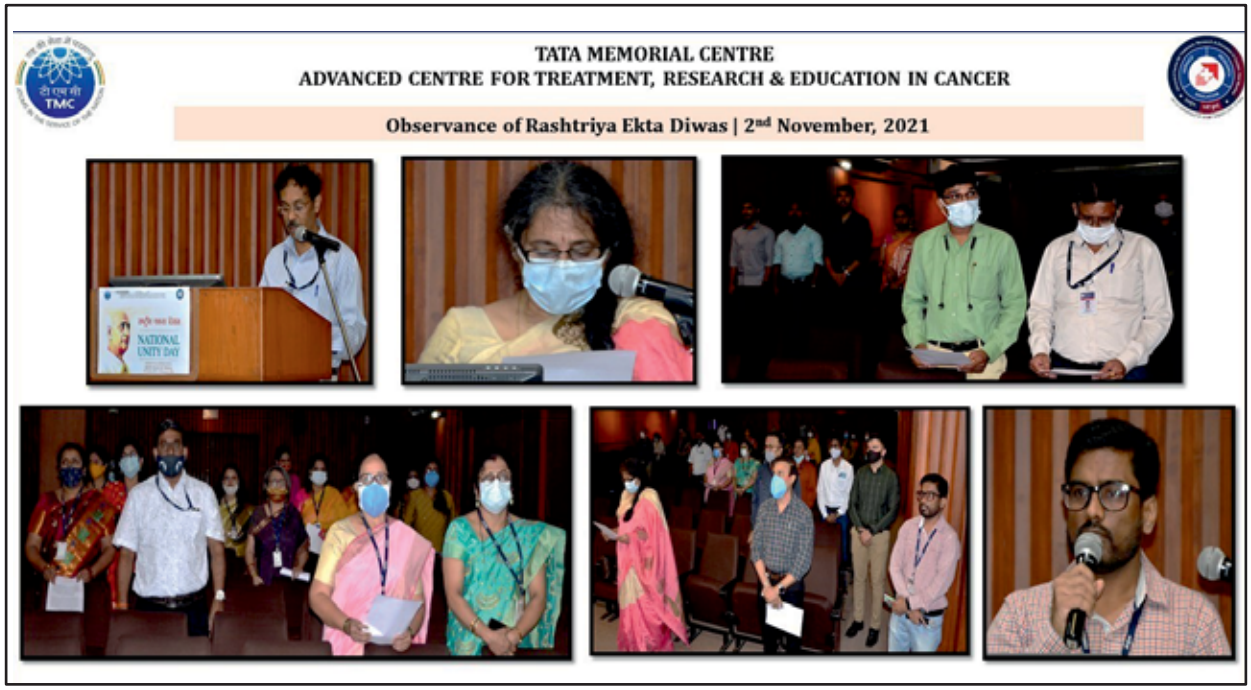
In support of National Integration and Communal Harmony, a Pledge in English & Hindi language was administered to promote goodwill and to eliminate violence against humanity.

Breast Cancer Awareness Program

October is observedas the,'Breast Cancer Awareness Month' world-wide to disseminate awareness about Breast Cancer. The month also celebrates the spirit of warriors who are fighting the war against Breast Cancer. To support this initiative ACTREC organized the Breast Cancer Awareness program with an objective to educate women about self-evaluation for early Breast Cancer detection, common risk factors involved along with the preventive measures for the same.



Rashtriya Ekta Diwas



Honoring the directive received from Department of Atomic Energy, Government of India, Rashtriya Ekta Diwas was observed in ACTREC on 2nd November, 2021 as 31st October, 2021(Sunday) was a public holiday. Paying tributes to Honorable Shri. Sardar Vallabhbhai Patel (the Iron Man of India) for his exceptional contribution towards Indian unity and integrity, a Rashtriya Ekta pledge was administered by the dignitaries present for the program.

The Rashtriya Ekta Pledge in English language was led by Dr. Venkatraman Prasanna, Dy. Director, CRI and Mr. M.Y. Shaikh, Administrative Officer, ACTREC undertook the Rashtriya Ekta pledge in the Hindi language. The pledge taking ceremony was followed by the National Anthem and a vote of thanks.

Samvidhan Diwas (Constitution Day)

In accordance with guidelines received from Ministry of Parliamentary Affairs, Government of India and subsequently from DAE, Samvidhan Diwas (Constitution Day) was observed in ACTREC on 26th November, 2021 (Friday) in the KS Main Auditorium. As directed, live streaming of Constitution Day Celebration from the Central Hall of Parliament was arranged in the Auditorium.

The virtual Preamble Reading ceremony was undertaken by the Honorable President of India in the Hindi language. The observance of Samvidhan Diwas was attended by dignitaries like Dr. Sudeep Gupta, Director, ACTREC, Dr. Navin Khattry, Dy. Director, CRC, Dr. Venkatraman Prasanna, Dy. Director CRI and Mr. M.Y. Shaikh, Sr. Administrative Officer, ACTREC. The staff, students and trainees were also present for the ceremony. The ceremony ended with the singing of the National Anthem and a Vote of thanks.

Additionally, celebrating "Azadi ka Amrit Mahotsav" on completion of 75 years of Independence, a group Quiz competition was organized for all the staff, students and trainees of ACTREC.

AUGMENTATION OF RESOURCES

COVID Support

ACTREC continued to treat cancer patients with COVID and the staff members at the rep-purposed COVID care Centre. During 2021,257 COVID cases were treated in this facility. Uninterrupted supply of PPE's and COVID essentials like sanitizers, masks, and gloves to staff/s was ensured and primarily managed through donations and tight monitoring of supply/issue inventory. COVID Vaccination facility was provided at ACTREC in association with Panvel Municipal Corporation from 25th January 2021 in the Archival block. Covishield as well as Covaxin vaccines, were provided and the centre has completed 52456 COVID vaccination doses in 2021. The faculty (scientist and clinicians) from ACTREC- Tata Memorial Centre, under the CoviScience@ACTREC project, generated social awareness about COVID-19, distributed sanitation kits (masks + sanitizer + soap), and sponsored vaccine shots-- exclusively among the underprivileged (street vendors, contractual workers, security guards, domestic help, etc.). Over Rs.10 Lakhs was generated through donations.

Patient Transport Ambulance

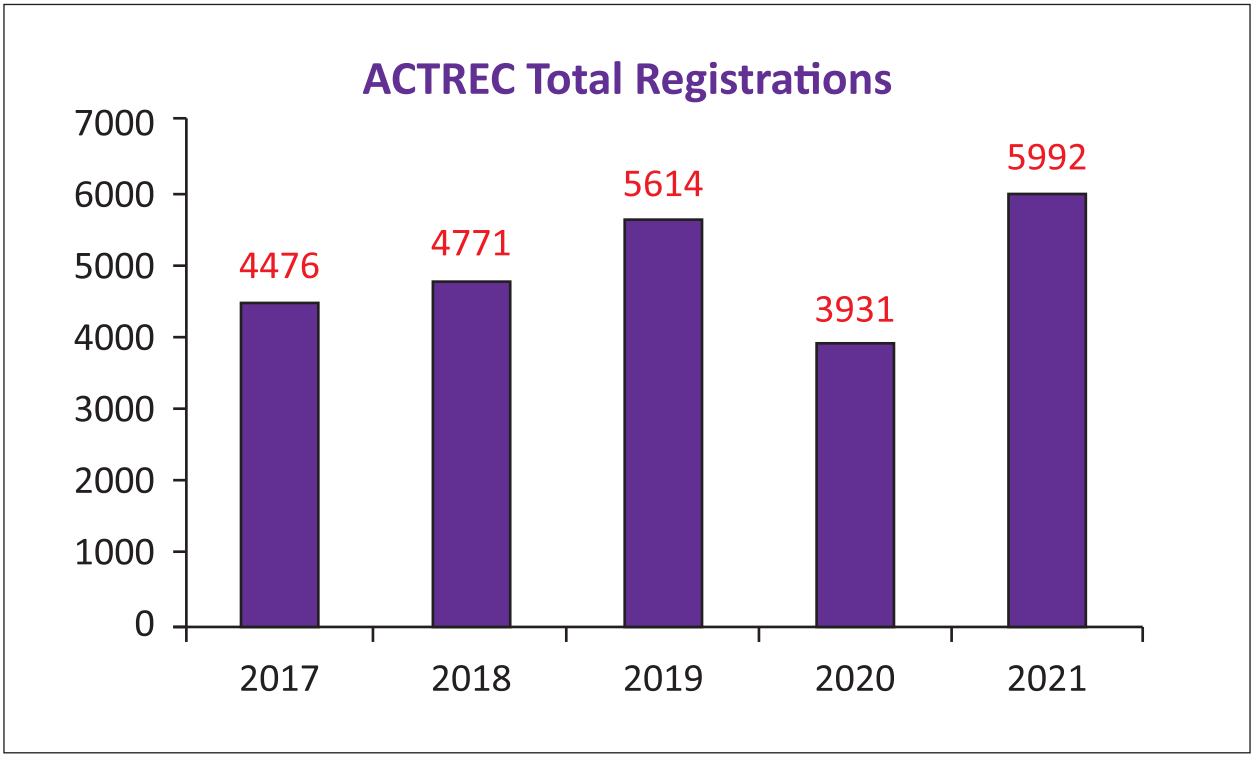
A Patient Transport Ambulance donated by "Doctors for You" (a registered society focused on providing medical care to vulnerable communities during crisis and non-crisis situations) was inaugurated by Dr. Sudeep Gupta, Director, ACTREC & Dr. Pankaj Chaturvedi, Dy. Director, CCE on 14th September 2021 at ACTREC Campus.

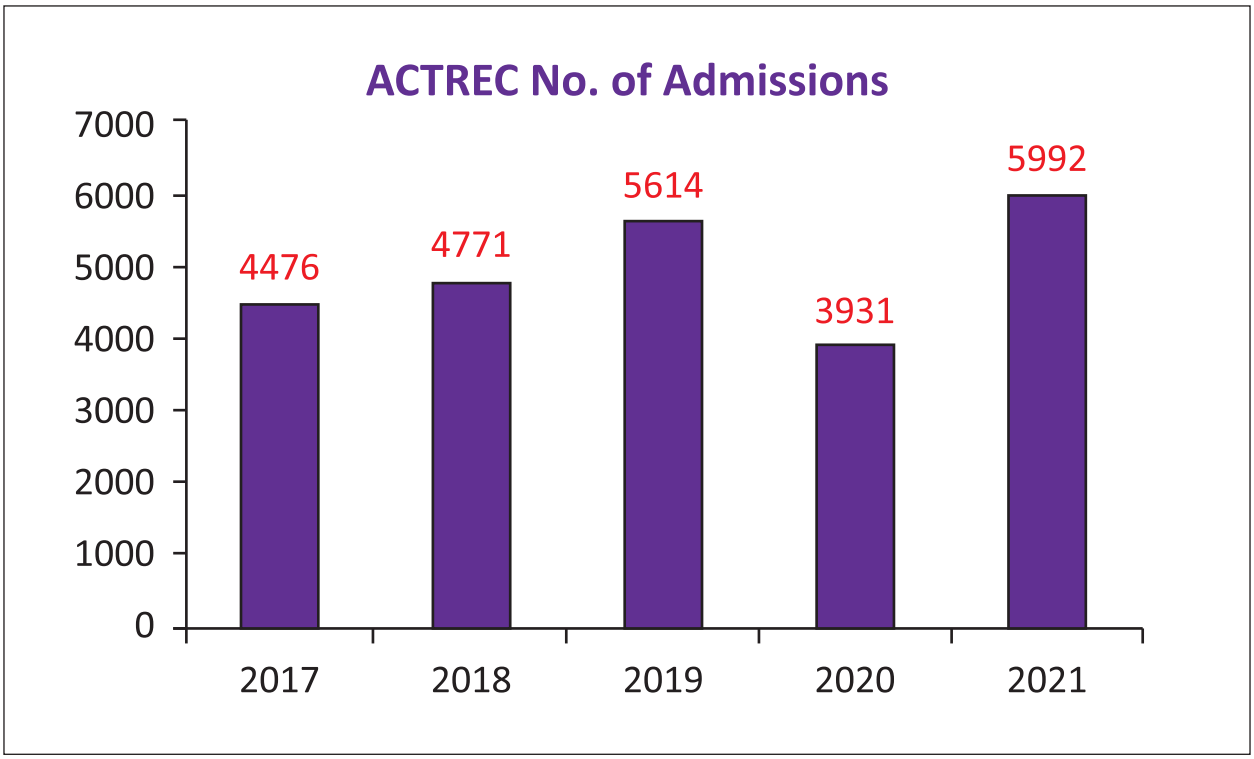
Asha Nivas

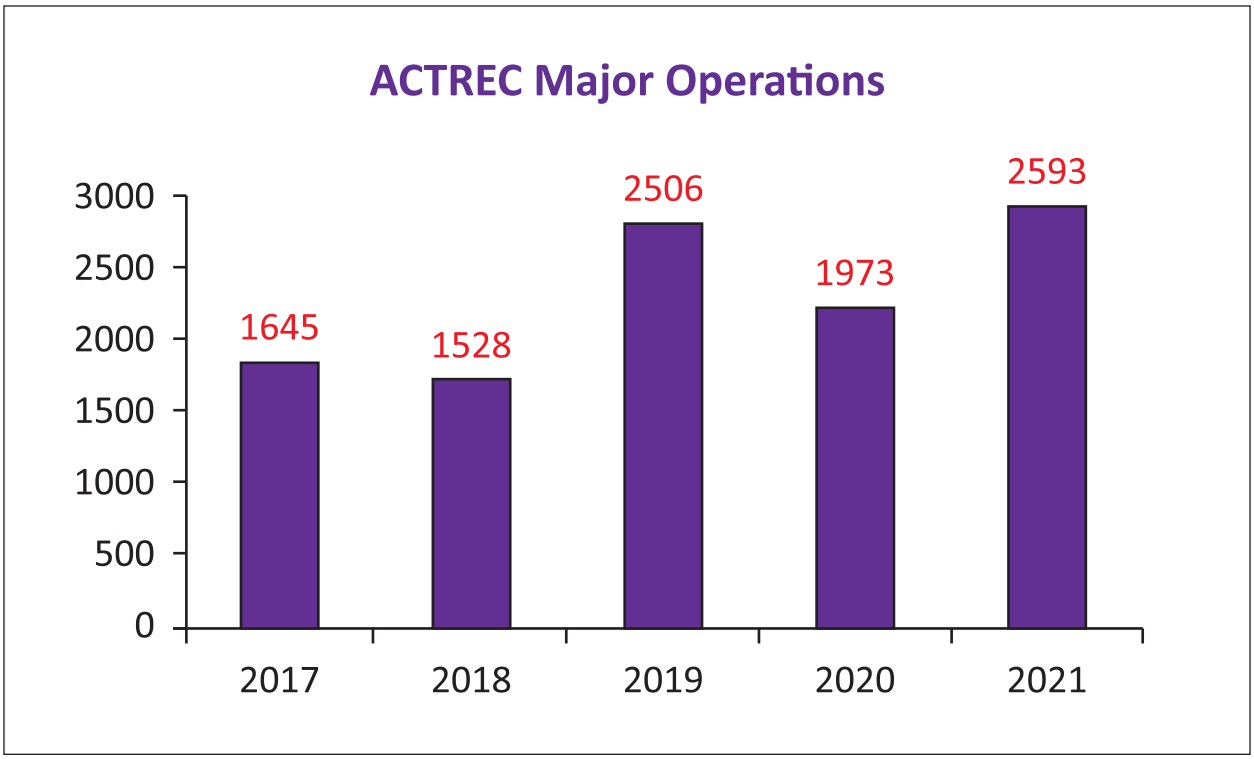
Asha Nivas (a Patient hostel) was inaugurated on 7th October 2021 by HonourableShri. Uddhav Thackeray, Chief Minister of Maharashtra; Smt. Sudha Murty, Chairperson of Infosys Foundation; Shri. K.N.Vyas, Secretary, DAE, and Shri. Dr. Rajendra Badwe, Director, Tata Memorial Centre.

Medical Oxygen generator Plant

An inauguration ceremony of Medical Oxygen generator Plant was organized on 19th November 2021. This equipment has been procured through a generous donation to ACTREC by TATA Trusts and is exclusively providing medical oxygen to the COVID care facility.


ACTREC Total Registrations
7000
6000
5000
4000
3000
2000
1000
0
4476
4771
5614
3931
5992
2017
2018
2019
2020
2021


ACTREC No. of Admissions
7000
6000
5000
4000
3000
2000
1000
0
4476
4771
5614
3931
5992
2017
2018
2019
2020
2021


ACTREC Major Operations
3000
2500
2000
1500
1000
500
0
1645
1528
2506
1973
2593
2017
2018
2019
2020
2021

PERFORMANCE STATISTICS ACTREC

PERFORMANCE STATISTICS ACTREC	2020	2021
General New Patient Registrations– (1)	9022	13490
Private New Patient Registrations–(2)	2864	4411
Total New Patients – Total (1+2) – (3)	11886	17901
Patient Referrals for Investigations – (4)	6392	3564
Patients Referred for Consultation (Expert Opinion) – (5)	187	328
Preventive Oncology Patients – (6)	SNA	SNA
Total Patient Registrations (3+4+5+6)	18465	21793
INPATIENT SERVICES		
Total Beds	132	132
Number of Admissions	3931	5992
Average Length of Stay (Days)	5.74	5.15
Bed Occupancy %	64.48	83.74
SURGICAL ONCOLOGY		
Major Operative Procedures	1973	2593
Minor Operative Procedures	974	1058
Robotic Surgery	SNA	SNA
MEDICAL ONCOLOGY		
Day Care- General	13759	19230
Day Care- Private	2574	3068
Number of Bone Marrow Transplants	37	48
DIGESTIVE DISEASES AND CLINICAL NUTRITION		
Endoscopies	04	06
Nutrition Clinic	SNA	SNA

PERFORMANCE STATISTICS ACTREC	2020	2021
ANAESTHESIOLOGY, CRITICAL CARE & PAIN		
Number of ICU Admissions	2133	2820
Patients in Recovery Ward	1865	2415
Pain Clinic	295	960
RADIATION ONCOLOGY		
External Beam Therapy	911	1161
Brachytherapy	68	86
Treatment Planning / Beam Modification	917	1137
IMAGING SERVICES		
Conventional Radiography	2723	3619
Ultrasound / Color Doppler	1688	2625
Mammography	1225	1988
C.T. Scan (Diagnostic)	4349	6265
C.T. Scan (for Radiotherapy Planning)	935	1174
M.R.I Scan	2349	2897
Interventional Radiology	697	863
Bone Densitometry	SNA	SNA
NUCLEAR MEDICINE		
PET-CT Scan	1991	2782
SPECT-CT Scan	SNA	SNA
SPECT- Scan	SNA	SNA
C.T. Scan (Diagnostic)	SNA	SNA
High Dose Therapy	SNA	SNA
GENERAL MEDICINE		
ECG	3432	3933
Echo Cardiography	1767	2438
Pulmonary Function Tests	SNA	SNA

PERFORMANCE STATISTICS ACTREC	2020	2021
LABORATORY DIAGNOSTICS		
Pathology - Histopathology + IHC + Frozen Section	10910	16696
Biochemistry	50812	67295
Cytopathology	SNA	SNA
Molecular Pathology.....	SNA	SNA
Microbiology	14871	19024
Bacteriology	6951	8554
Mycobacteriology	66	93
Mycology	129	184
Serology	5914	7191
Clinical Microbiology	1767	2591
Hematopathology.....	44946	61046
Cytogenetics.....	18141	23325
Flow Cytometry & Molecular Hematopathology		
Bone Marrow Aspiration Morphology	4519	5476
Flow Cytometric Immunophenotyping	5325	6991
Molecular Hematopathology	4787	9789
Transfusion Medicine		
Blood Components Prepared		
[Whole Blood + packed Red Cells + Platelets (RDP)+ Fresh Frozen Plasma + Cryoprecipitate + Factor VIII Deficient Plasma]	4371	5828
Single Donor Platelets (SDP) prepared.....	967	1160
Specialized Procedures		
(Irradiation of blood Products+ Granulocyte Harvest +Therapeutic Leukapheresis + Therapeutic Plasma Exchange)	4423	5235
Laboratory Investigations		
[Blood Grouping +Cross matching+ Antibody Detection]	13617	23594

PERFORMANCE STATISTICS ACTREC	2020	2021
Blood Units Collected	2870	3446
Platelet Pheresis	967	1160
HLA Lab		
HLA Typing	4061	5766
Antibody Screening	117	143
OTHER CLINICAL SERVICES		
Central Venous Access Devices (CVAD) Clinic	SNA	SNA
Stoma Clinic	SNA	SNA
Occupational Therapy	SNA	SNA
Physiotherapy	6498	8702
Speech & Swelling Therapy	SNA	SNA
Psychiatry and Clinical Psychology	SNA	SNA
Dental Services		
General Dentistry	2406	3558
Prosthetics Services	100	85
Tissue Bank		
Allografts Produced	SNA	SNA
Palliative Medicine		
Number of Patients	SNA	SNA
Home Care Visits	SNA	SNA
Medical Social Service		
Number of Beneficiaries for Accommodation	1000	1000
Number of Beneficiaries for Financial support	264	576

PERFORMANCE STATISTICS ACTREC	2020	2021
EDUCATION		
Residents & Others		
Fellows		
Medical Observers		
Nursing Trainees		
Paramedical Students		
Medical Physicists trainees		
Medical Laboratory Trainees		
RESEARCH PROFILE		
Extramural Projects		
Pharmaceutical Company Sponsored		
Intramural +Extramural Projects		
Institutional Intramural ProjectsNil Funding		
Postgraduate Student Thesis (Dissertation)		
Publications		
International		
National		
Book Chapters		
Conferences / Workshops / Seminars		
Wherever applicable, mention:		
DNA for Data Not Available.		
NA for Not Applicable		
SNA for Services Not Available		

PERFORMANCE STATISTICS OF CRC-ACTREC (2021)

NAME	NUMBER	DETAILS
Education		
Total PG Students admissions		
Number of passed outs	NA	
PhD (Health Sciences)	NA	
MD		
DM		
MCh		
Others		
Residents		
Fellow(Medical)	27	
Kevat, Patient Navigation Course	-	
Nursing Trainees	1	
Paramedical Students	-	
Medical Physicists Trainees	2	
Medical Laboratory Trainees		
Medical Observers		
Research Profile		
Extramural Projects	28	DTM (2); Cyto (1);Clin Pharmacology(1);Radiobiology(4); CSL (9); MO (17)
Pharmaceutical Company Sponsored	49	CSL (23); MO (26)
Intramural + Extramural Projects	53	DTM (2);Comp Lab (1); Cyto (1); Clin Pharma (6); Radiobio (4); CSL (12);MO(27)

NAME	NUMBER	DETAILS
Nil Funding	22	DTM (1); Microbiology(3);CSL (3);MO(15)
Postgraduate Student Thesis (Dissertation)	20	DTM (1); Cyto (3); Clin Pharma (3); Radiobio (2);CSL (3); MO(8)
Publications		
International	140	
National	36	
Books	Nil	
Book Chapters	02	
Patent	01	
Conferences/ Workshops/ Seminars	179	
Awards and Recognition	3	**Dr Sudeep Gupta (3)**
Value of Medicines Dispensed (To be obtained from Dr. P. Bhat – Medical Superintendent)	Rs.288783561.70	

PERFORMANCE STATISTICS OF CRI- ACTREC [2021]

	NUMBER ONLY	DETAILS
Extramural Projects	27	Bose(3);Dutt(2); Gupta (1); Khadilkar(3);Kode(3);Patwardhan(1);Prasanna (2); Ray (1); Sarin(1); Sharat (1);Shilpee(3);Sorab(2);Varma (1); Waghmare(3)
Pharmaceutical Company sponsored Projects	5	De (2); Hasan(1); Patwardhan(1); Prasanna (1)
Intramural Projects +Extramural Projects	38	Bose (4); Chilakapati (2); Dutt(2); Gupta (1); Khadilkar (3);Kode(3);Patwardhan(1);Prasanna (2); Ray(1); Sarin (4);Sharath(1);Shilpee(4);Sorab(2);Teni (3);Varma(1);Waghmare(4)
Nil Funding	10	Shilpee Dutt (4 projects); Jyoti Kode (3 projects) Rajiv Sarin (3 projects)
Postgraduate Student Thesis (Dissertation)	35	De(1); Dutt(4); Gupta(1); Hasan(7); Khadilkar(4); Kode(2); Nandini (4) Patwardhan(2); Prasanna(2); Sharath(2); Shilpee(1); Sorab(3); Warawdekar(2)
Publications	83	
International	76	
National	4	
Books	Nil	
Book Chapters	3	
Conferences/Workshops/ Seminars	94	Bose (3); Chilakapati (4); De (2); Dutt(30); Khadilkar (2); Kode (3); Nandini (3);Patwardhan(4);Prasanna (3); Sarin (25);Sharath (1); Shilpee (4); Sorab(1); Teni (2);Varma(4); Waghmare (3)
Patents		De (1-filed); Gupta (1); Kode (1-filed); Shilpee(1-filed); Sorab (2)
Awards and Recognition	19	Bose (3); Chilakapati(3);De(4); Hasan (1);Khadilkar (1);Kode(3); Sarin (3); Shilpee (1)

PERFORMANCE STATISTICS OF CCE- ACTREC (2021)

	NUMBER ONLY	DETAILS
Extramural Projects	20	Budukh(1); Mhatre (6); Oak (5); Pimple(8)
Pharmaceutical Company sponsored Projects	2	Pimple(2)
Intramural Projects +Extramural Projects	28	Budukh (2); Mhatre (10); Oak (6); Pimple (10)
Nil Funding	4	Pimple(4)
Postgraduate Student Thesis (Dissertation)	Nil	
Publications	31	
International	20	
National	10	
Books	1	
Book Chapters	Nil	
Conferences/Workshops/Seminars	34	Budukh (1); Oak (5); Pimple (28)
Patents	Nil	
Awards and Recognition	Nil	

CLINICAL RESEARCH CENTRE

Dr. Sudeep Gupta (Director, ACTREC)

Dr. Navin Khattry (Dy. Director, CRC-ACTREC)

Anesthesiology, Critical Care and Pain

Dr. Reshma Ambulkar
Dr. Bhakti Trivedi *(OIC)*
Dr. Amol Kothekar
Dr. Malini Joshi
Dr. Raghu Thota
Dr.Ketan Kataria
Dr. Ashwini Rane
Dr. Anjana Wajekar
Dr. Mahima Gupta

Cancer Cytogenetics

Dr. Dhanlaxmi Shetty *(OIC)*
Ms. Hemani Jain

Cancer Genetics

Dr. Rajiv Sarin

Clinical Pharmacology

Dr. Vikram Gota *(OIC)*
Dr. Manjunath Nookala

Clinical Research Secretariat, ACTREC

Dr. Jayant Goda Sastri *(OIC)*
Mrs. Sadhana Kannan

General Medicine

Dr. Prafulla Parikh
Dr. Sujit Kamtalwar
Dr. Ashwini More

Microbiology and Composite Laboratory

Dr. Vivek Bhat *(OIC)*
Dr. Preeti Chavan *(OIC)*

Nursing

Dr. Meera Achrekar *(Deputy Nursing Superintendent)*
Ms. Anjali Rawat *(Asst. Nursing Superintendent)*

Pathology

Dr. Epari Sridhar *(OIC)*
Dr. Asawari Patil
Dr. Swapnil Rane

Radiation Oncology

Dr. Tejpal Gupta
Dr. Vedang Murthy
Dr. Supriya Shastri
Dr. Jayant Goda Sastri
Dr. Tabassum Wadasadawala
Dr. Sangeeta Kakoti
Dr. Priyamvada Maitre
Dr. Shwetabh Sinha
Dr. Jifmi Jose
Dr. Revathy Krishnamurthy

Radiodiagnosis and Interventional Radiology

Dr. Nitin Shetty *(OIC)*
Dr. Amit Kumar Janu
Dr. Kajari Bhattacharya
Dr. Daksh Chandra
Dr. Nivedita Chakraborty

Hematopathology

Dr. Subramanian Ganesan *(OIC)*
Dr. Nikhil Patkar *(Clinician Scientist)*
Dr. Prashant Tembhare *(Clinician Scientist)*
Dr. Gaurav Chatterjee
Dr. Sweta Rajpal
Dr. Shruti Choudhary
Mrs. Swapnali Joshi

Clinician Scientist Laboratory

Dr. Sudeep Gupta

Medical Administration

Dr. Prashant Bhat *(Medical Superintendent)*
Mrs. Chital Naresh

Medical Physics

Dr. Jamema S V
Ms. Reena Phurailatpam
Mr. Kishore Joshi
Ms. Jeevanshu Jain

Medical Oncology

Dr. Sudeep Gupta
Dr. Navin Khattry
Dr. Amit Joshi *(OIC)*
Dr. Anant Gokarn
Dr. Sachin Punatar
Dr. Sumeet Mirgh
Dr. Akansha Chichara

Surgical Oncology

Dr. Vani Parmar
Dr. Sajid Qureshi
Dr. Aliasgar Moiyadi
Dr. Vinay Shankhdhar
Dr. Sudhir Nair *(OIC)*
Dr. Deepa Nair
Dr. Prakash Shetty
Dr. Vineet Kumar
Dr. Manish Pruthi
Dr. Parthiban Velayutham

Transfusion Medicine

Dr. Shashank Ojha *(OIC)*
Dr. Sumati Hiregoudar
Dr. Minal Poojary
Dr. Suryatapa Saha

Translational Research Laboratory

Dr. Indraneel Mittra *(Dr. Ernest Borges Chair)*
Dr. Ranjan Basak
Dr. Kavita Pal
Dr. Raghuram GV

ANESTHESIOLOGY, CRITICAL CARE AND PAIN DEPARTMENT

Officer-in-Charge: Dr Bhakti Trivedi

Anesthesiologists: Dr. Reshma Ambulkar, Dr. Raghu Thota (Resigned-August 2021), Dr. Malini Joshi, Dr. Ketan Kataria, Dr. Ashwini Rane, Dr. Anjana Wajekar, Dr. Mahima Gupta, Dr. Veer Thakar (Joined in October 1st 2021)

Intensivist: Dr. Amol Kothekar

Overview

Anaesthesia, Critical Care and Pain Management services are provided by the Department of Anaesthesiology, Critical Care and Pain of TMC (TMH and ACTREC). These include nine permanent staff members and twelve senior residents from ACTREC as well as full-time consultants and residents from TMH.

Service

The service component of the department in 2021 provided its value towards Anesthesia for up to 5 Major OT, Interventional Radiology, MRI, Radiotherapy operation theatre and Endoscopy. The department also administers Critical Care for a 10-bedded ICU (includes 3 isolation beds) plus a 3-bedded PACU with a CPR team and renders Acute Pain services. A formal Pain team is formed compromising of Anesthesia consultant, resident & nurse who round the wards taking care of the post-operative and chronic pain patients. The department also takes care of the COVID patients admitted and getting ventilated in the COVID ICU.

During 2021, the department provided Anesthesia services for 2965 major OT procedures, 121 procedures in the Radiotherapy OT, 200 MRI, 401 Interventional Radiology procedures and 8 Endoscopy procedures. Critical care services were provided for 2416 Recovery room admissions, 395 ICU admissions (156 of which were ventilated) and 9 ICU admissions for procedures, as well as 920 Acute Pain Services. Dialysis was done for 11 patients in 37 sessions. Further, in the Pre-anesthesia check-up, physical was done for 2132 patients (new + follow-up). As 2021 was the year of the continuing COVID-19 pandemic, COVID patients were also treated. The Department also extended its service towards patients in the COVID-ICU.

Research

The Department had 102 (Investigator Initiated:40/ Thesis: 62) clinical studies, in the year 2021. There are 67 ongoing studies and 35 studies were completed in the year 2021. Project discussion meetings are held at regular intervals where investigators discuss planned projects in the department before submission to the IRB. These meetings went virtual in view of the COVID pandemic. Members of the Department serve on the Institutional Ethics Committee and the Data and Safety Monitoring Sub-committee.

Education

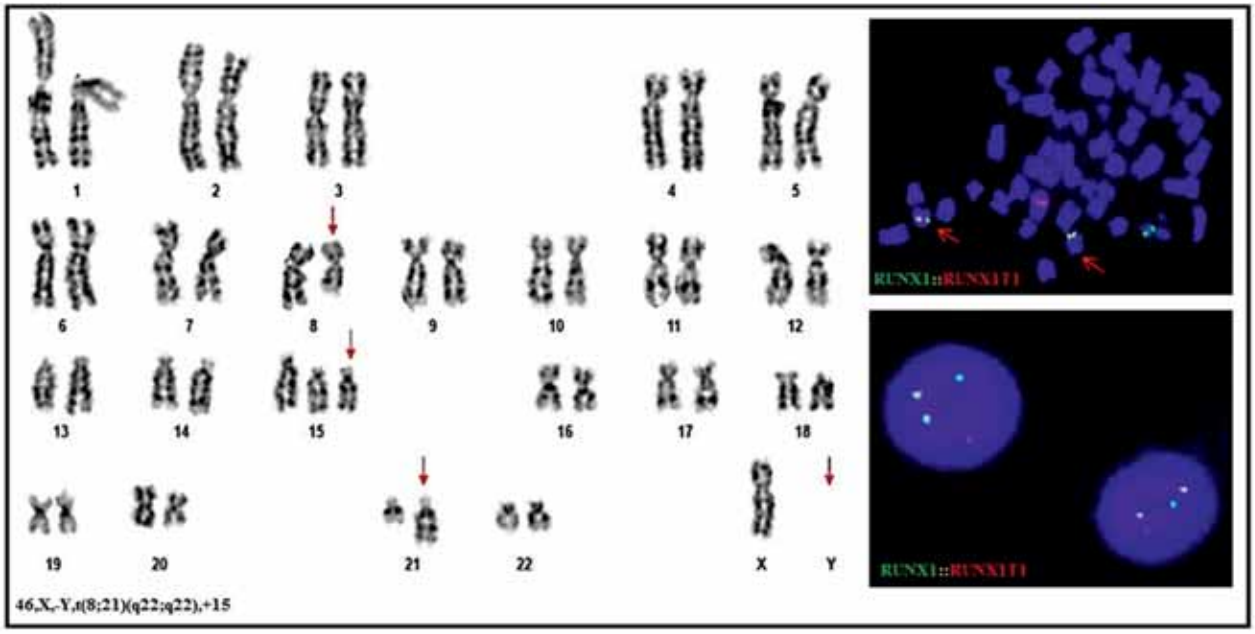
The Department organized a 2-day course (BRITE) for the intensive care trainee in July 2021. Due to the pandemic, the educational activities were transferred to online teaching modules, lectures and classes. The members of the Department were invited as faculty for various conferences.

The Department also conducted the annual national teaching program ‘ARC 2021’ in March 2021. Apart from this the annual international program ‘DAC 2021’ was conducted by the Department in December 2021.

CANCER CYTOGENETICS DEPARTMENT

Officer-in-Charge: Dr. Dhanlaxmi Shetty

Scientific Officer: Ms. Hemani Jain



Detection of Chromosomal aberrations in haematological malignancy

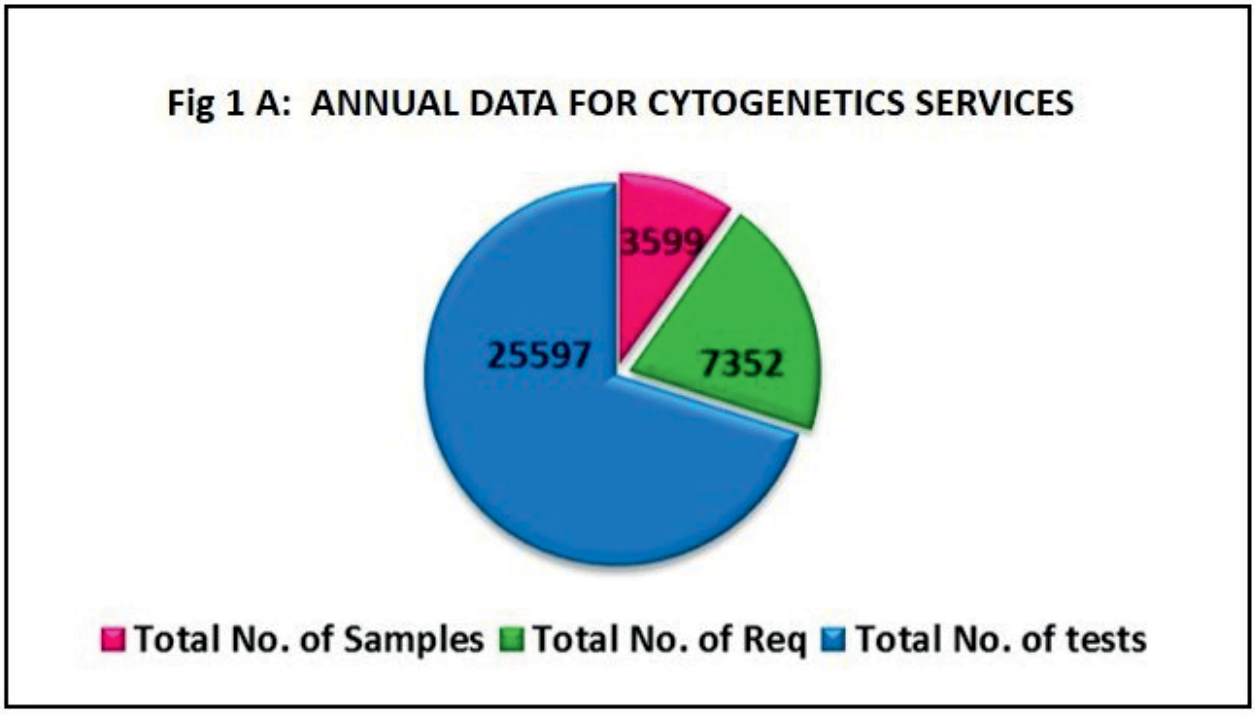
Overview

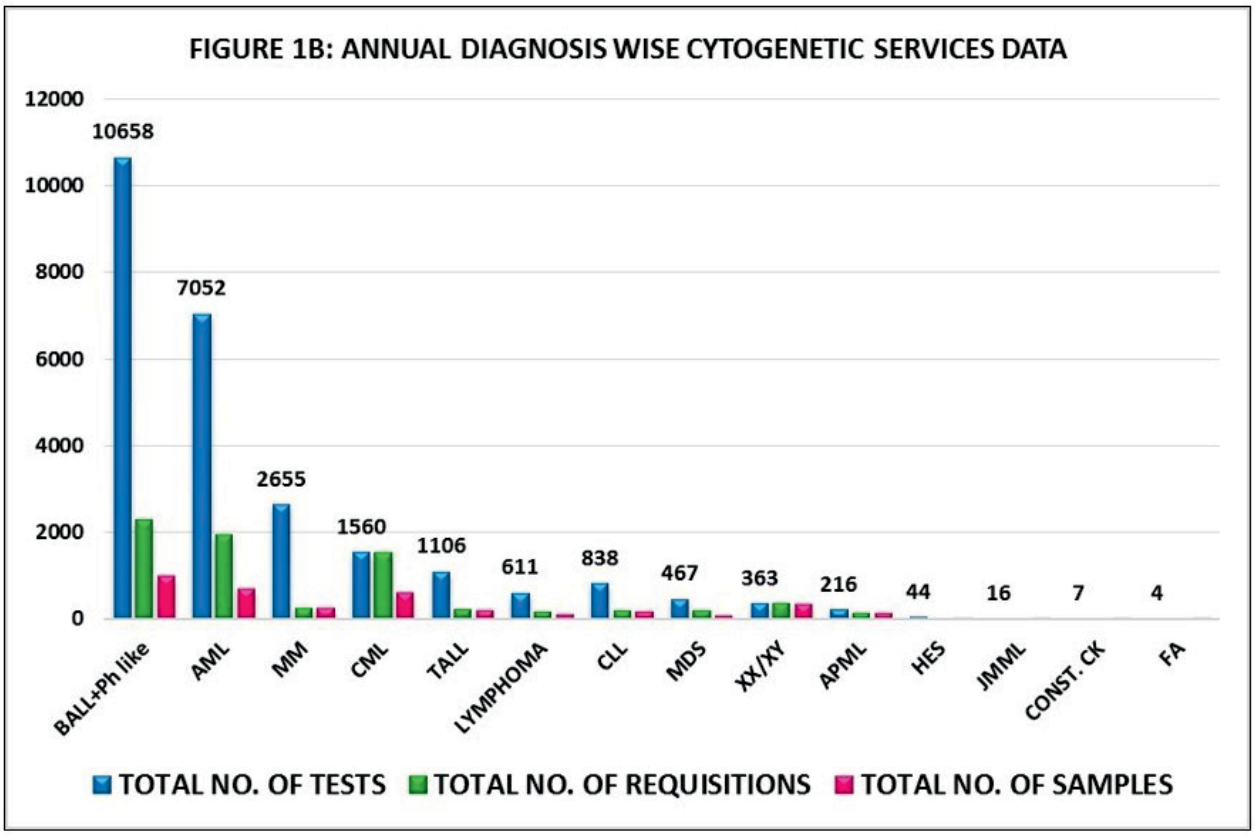
Cancer Cytogenetics Department is a high volume service laboratory providing diagnostic services [Conventional Karyotyping (CK) and Fluorescence In-situ hybridization (FISH)] for all hematolymphoid malignancies both in-house and referrals. The Department provides comprehensive FISH panels and CK in leukemia cases for assessing cytogenetics at baseline and follow-up thereby assisting in diagnosis, prognosis, treatment-planning and response assessment. The Department is equipped with state of art equipment/technology for patient care, is accredited by National Board of Accreditation for Testing & Calibration Laboratories (NABL), participates in External Quality Assessment program (EQAS) with College of American Pathologist (CAP) and provides PT service to premier laboratories in the country.

Service

The Cancer Cytogenetics Dept. received 3599 diagnostic samples, with 7352 requests for

cytogenetic and molecular cytogenetic testing (Figure 1A). The Department performed 25,597 tests including comprehensive FISH panels for hematolymphoid malignancies (AML, APL, B-ALL, T-ALL, MDS, MPN, CML, CLL, Lymphoma and MM), chimerism studies in sex mismatch post-BMT patients; karyotyping, chromosomal breakage studies and ploidy assessment. (Figure 1B). During the year, five new FISH tests: t(11;19)(q23;p13.1)/KMT2A::ELL,t(5;11)(q35;p15.5)/ NUP98::NSD1,t(10;11)(p12;q14)/MLLT10(AF10)::PICALM, 1p33/TAL1 deletion and t(6;14)(p21; q32)/ IGH::CCND3 were introduced for detection of recurrent and poor prognostic markers in diagnostic samples of AML/MPAL, TALL and MM patients. The Dept. has been instrumental in establishing and successfully providing diagnostic services for samples received from HBCH, Varanasi. The Department successfully completed two cycles of EQAS in Cytogenetics (FISH and conventional karyotyping) for proficiency testing with 3 cytogenetic laboratories in the country.





Research

During 2021, the Department successfully recruited de-novo B-ALL patients for ICMR extramural ad-hoc project to determine the incidence and complete clinical, cytogenetic and molecular profile of the B-other ALL subgroup.

Education

The Department appointed 4 postgraduate trainees for experience training and 3 MSc students for Master's dissertation as a part of the training program. Cytogenetic training was provided to clinicians from Medical Oncology. The Department participated in DMG meetings, joint clinics/multidisciplinary activities and in virtual CME's. The staff members participated in poster presentation at International conferences and in internal audits during the year. One staff member was trained in ISO15189:2012 Quality Management System & Internal Audit Training Course. Dr. Shetty has been an invited speaker at national programs and conferences during the report year.

CLINICAL PHARMACOLOGY LABORATORY

Officer-in-Charge: Dr. Vikram Gota

Scientific Officer: Dr. K. Manjunath Nookala

Overview

The clinical research efforts of this laboratory are aimed at developing new drugs for graft versus host disease (GVHD), acute lymphoblastic leukemia (ALL) and radioprotection. In addition, critical support and expertise necessary to conduct early-phase clinical trials in oncology is provided by the faculty, as well as training personnel and developing capacity in the field of cancer pharmacology, biostatistics and clinical research operations. This laboratory is identified as an Adverse Drug Reaction Monitoring Centre under the pharmacovigilance program of India for capturing and reporting the adverse events due to drugs and devices occurring at TMC, and also the ICMR Centre for Advanced Research and Excellence in Clinical Pharmacology (ICMR-CARE).

Service

This laboratory offers therapeutic drug monitoring (TDM) services for voriconazole, posaconazole, imatinib, mycophenolate mofetil and L-asparaginase. More than 3100 samples [voriconazole (2000), posaconazole (1107), MMF (12), l-asparaginase (09) and imatinib (08)] were reported for drug levels in 2021, benefitting more than 700 patients undergoing treatment for leukemias and BMT. Assays for 5-flurouracil (5-FU) have been established and the TDM service for 5-FU will start early next year.

Research

Notable contributions in the field of research include the development of chlorophyllin for COVID-19 – a phase 2 trial is underway, a mutant asparaginase for the treatment of ALL in collaboration with IIT-Indore, and Withaferin-A for the prevention of GVHD. The laboratory is actively engaged with a Mangalore based incubator where the GMP manufacturing of diseleno dipropionic acid (DSePA), a radioprotector, is being carried out. This work is being done with financial support from DBT-BIRAC. The laboratory is collaborating with the EORTC for designing and validating quality of life questionnaires in various cancers. Three graduate students are

working on the development of phytopharmaceuticals for indications such as lung cancer and GVHD. The OIC was granted an US patent for the 'Use of Jack bean Lectin for increasing the abundance of hematopoietic stem cells and progenitor cells in bone marrow and/or epidermal stem cells in skin in vivo' in collaboration with IIT-Mumbai.

Education

The OIC is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute, and four students- Ms. Dievya Gohil, Ms. Megha Garg, Mr. Saurabh Gupta, Mr. Girish Panigrahi and Ms. Aishwarya J are presently working on their doctoral theses. The laboratory continues to offer Fellowship in Oncotherapeutics which attracted a number of applications in 2021. Two students of MSc Clinical Research interned from the laboratory in the report year.

COMPOSITE LABORATORY

Officer-in-Charge: Dr. Preeti Chavan

Consultant: Dr. Avinash Pagdhune

Overview

The Composite Laboratory is NABL accredited and provides 24 hours' services to the hospital. The laboratory consists of three sections: sample collection area, haematology, and biochemistry (routine biochemistry and immunoassay). The laboratory also processes murine and canine blood samples for research purposes. Six international and two national research papers was published by the faculty in 2021. One research project is being conducted in the laboratory. The laboratory conducts a one year advanced training course in Medical Laboratory Technology since November 2015.

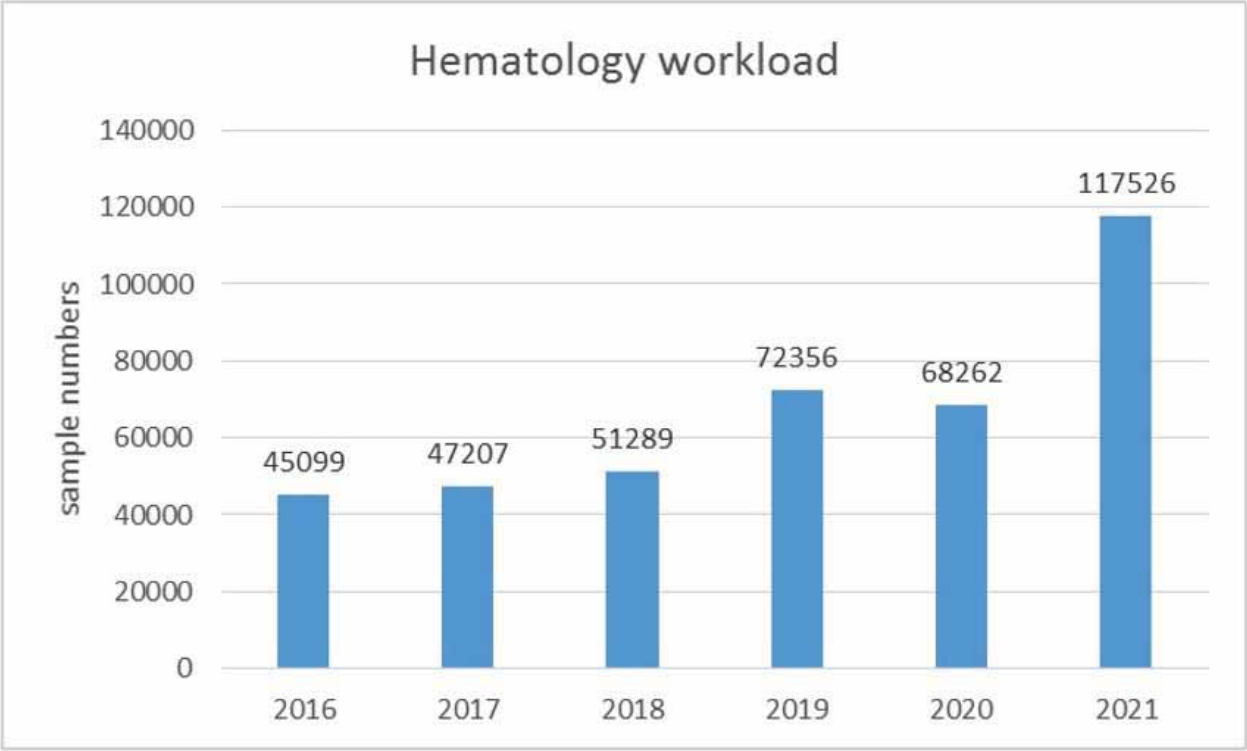
Service

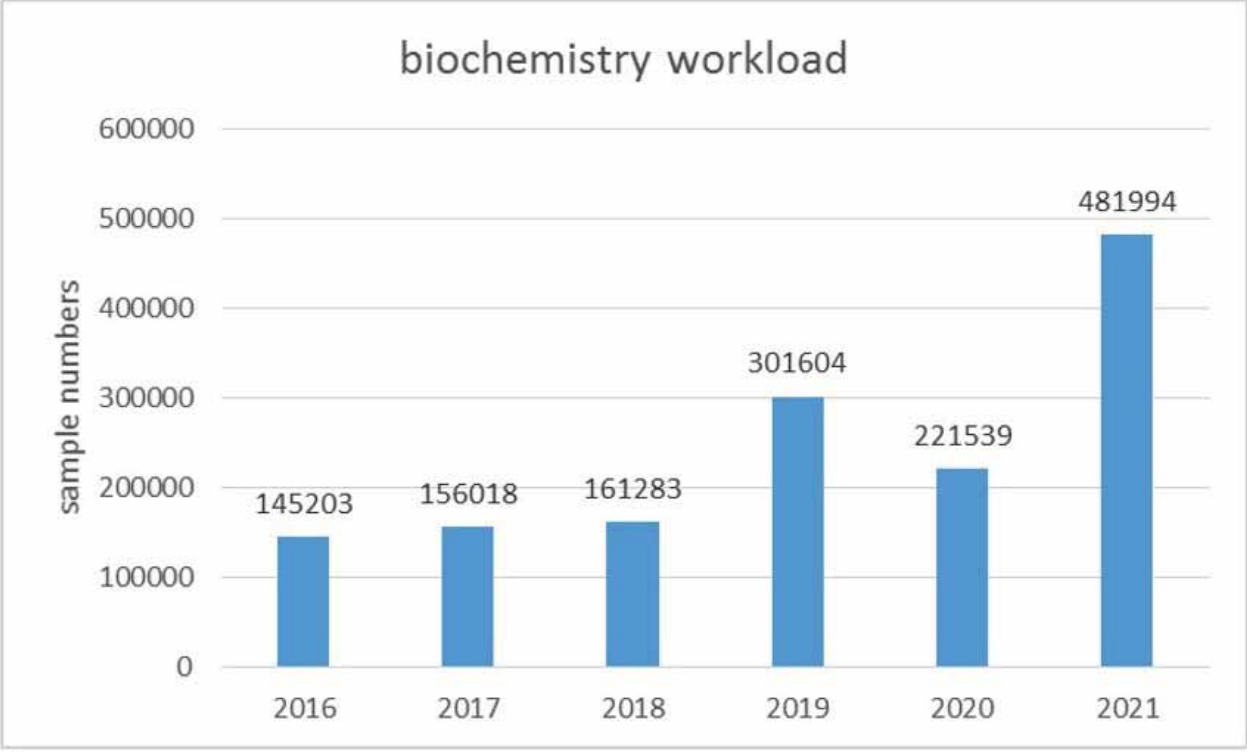
The Composite Laboratory provides the following patient-related hospital services; routine hematology (CBC, coagulation and peripheral blood smear examination) and biochemistry (LFT, RFT, electrolytes, cardiac enzymes, osmolality, immunoglobulins, ferritin, tumor markers, assays for vitamin B12,vitamin D, folate, thyroid function tests, drug assays (Cyclosporine, Tacrolimus, Sirolimus and Methotrexate). The laboratory performed; 469980 tests for routine biochemistry, 12014 immunoassays, 117526 tests for hematology, during the period January to December 2021.

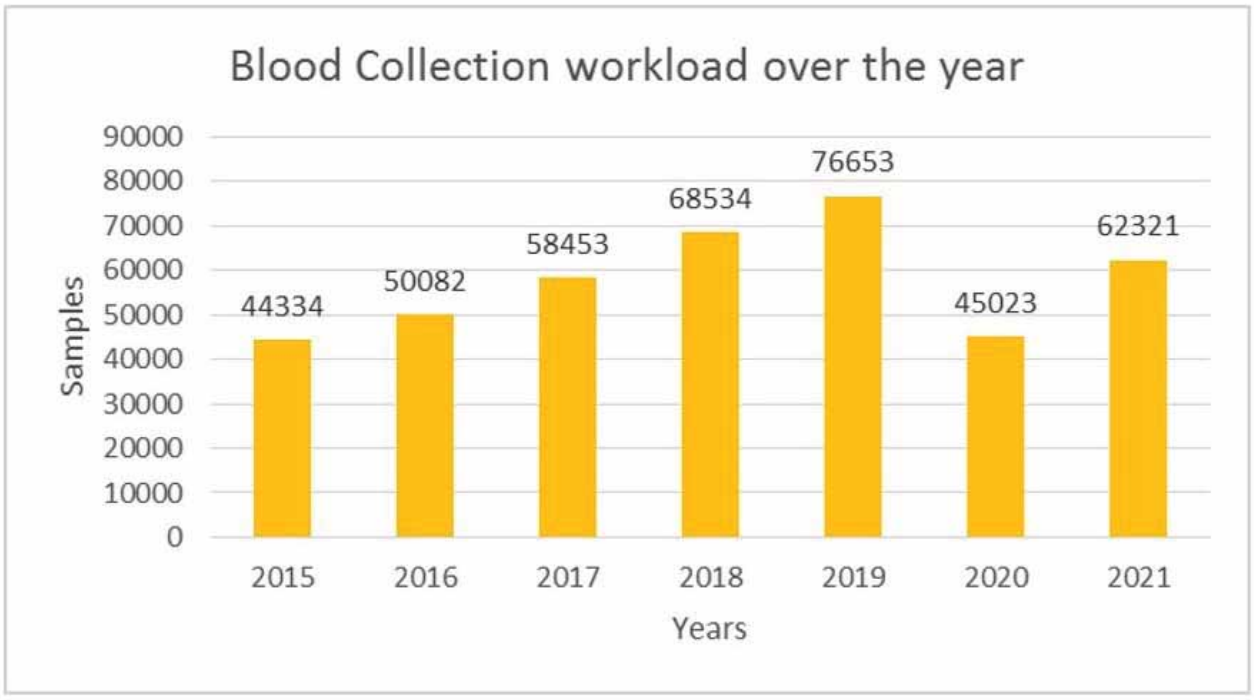
Research: Six international and two national research papers were published by the faculty in 2021. One research project is being conducted in the laboratory.

Education

Two interns and three students enrolled for advanced training course in Medical Laboratory Technology. Mr. Pratik Poladia SA'E' won the "First prize" in oral presentation in 3rd Indo Oncology Summit in September 2021.


Hematology workload
sample numbers
140000
120000
100000
80000
60000
40000
20000
0
45099
47207
51289
72356
68262
117526
2016
2017
2018
2019
2020
2021


biochemistry workload
sample numbers
600000
500000
400000
300000
200000
100000
0
145203
156018
161283
301604
221539
481994
2016
2017
2018
2019
2020
2021


Blood Collection workload over the year
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Samples
44334
50082
58453
68534
76653
45023
62321
2015
2016
2017
2018
2019
2020
2021
Years

CLINICIAN SCIENTIST LABORATORY

Clinicians: Dr. Rajendra Badwe, Dr. Sudeep Gupta, Dr. Kumar Prabhash, Dr. Nita Nair, Dr. Shalaka Joshi

Scientists: Dr. Anuradha Choughule

Overview

The prime focus of Clinician Scientist Laboratory is to unravel the role of hypoxia in cancer exacerbation and metastasis, clonal evolution of a tumor leading to therapy resistance, and developing novel assays to monitor tumor burden and anticipate therapeutic outcome.

Research

Hypoxia in cancer metastasis: In this study, the molecular effects of surgery induced hypoxia on primary breast cancer tumors with a serial tissue sampling strategy, including an intra-operative sample were documented. Variety of assays; whole genome transcriptome, targeted transcriptome on Nanostring and real-time qPCR revealed modulation of multiple pathways with AP-1 as a key regulator. To further probe the role of AP-1 in promoting aggressive tumor phenotype triggered by surgery induced hypoxic stress, gene expression studies were done with MCF7 and MDA-MB-231 cells after exposure to 0.1% and 1% oxygen concentrations for short (1h) and long time (24h and 48h). Concomitant with CA-9 and VEGF (hypoxia markers), AP-1 genes namely C-Fos and C-Jun were highly expressed in hypoxic conditions compared to normoxia and normoxia followed by reoxygenation. FOSL1 expression was high during early hypoxic condition with a subsequent gradual reduction. In case of other AP-1 genes (JUNB and JUND) no significant regulation was observed in culture condition tested for both cell lines.

Clonal evolution of cancer in triple negative breast cancer: Multi-omics analysis of longitudinally collected TNBC samples from 3 patients identified sequential clonal bursts of evolution. Analysis carried out suggests that longitudinally sampled TNBC tumors, including those from germline BRCA mutated patients, show a branching evolution pattern with a single founding clone, are polyclonal at diagnosis and through disease course, and have largely stable copy number variations. Acquisition of subclones may be associated with chemotherapy resistance and targeting the stem clone may be therapeutically useful.

Therapy resistant breast cancer: In this Virtual National Cancer Institute (VNCI) study, attempts to understand mechanisms of endocrine therapy resistance in breast cancer patients were made. Despite being a pandemic year, 270 breast cancer patients were recruited, with the clinical phenotype of hormone receptor positive, HER2/ Neu receptor expression negative with multiple biological specimens bio-banked for scientific research. Presently designing novel Next Generation Sequencing based assays to characterize the cfDNA from resistant and sensitive patients to identify early predictors of relapse, and response to treatment is being done.

Standardization of proteomics from routine diagnostic core-biopsies of cancer patients: The clinical challenges to be addressed include availability of tissues with defined ischemic exposure time, the collection and preservative methodologies as well as the amount of tissue availability for the assay. In collaboration with Prof. Sanjeeva Srivastava at IIT-Bombay, these conditions in clinical settings using breast cancer patients undergoing surgical resection as a model, will be standardized and has been initiated with 10 breast cancer patients.

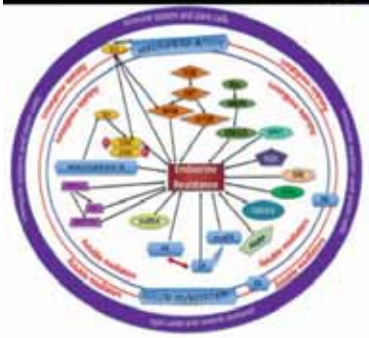
Education

Dr Sudeep Gupta is a recognized PhD Health Sciences mentor of the Homi Bhabha National Institute. Presently, three students-Mr. Nilesh Gardi, Mr. Rohan Chaubal and Mr. Jinesh Maniar are working on their doctoral theses. The Laboratory has 3 Research Fellows, working on different projects. In 2021, four trainees were selected for their Master's dissertation and laboratory experience.

DBT VNCI (Virtual National Cancer Initiatitive) MULTI-OMICS HORMONE RESISTANCE IN BREAST CANCER STUDY BT/MED/30/VNCI-Hr-BRCA/2015

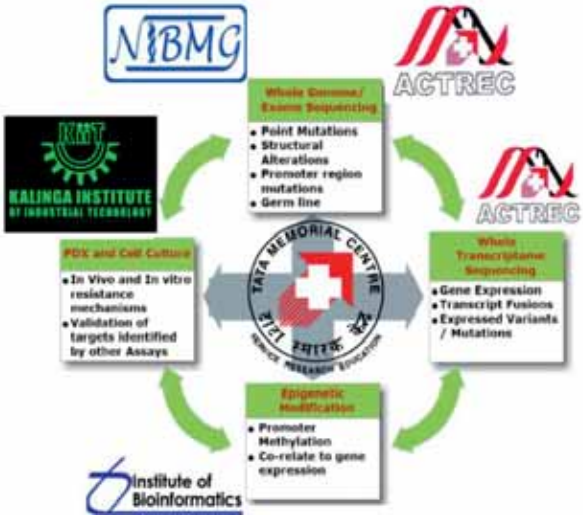
1 in 5 women diagnosed with Breast Cancer DEVELOP endocrine hormone therapy RESISTANCE

Molecular mechanism of resistance UNKNOWN in majority of patients

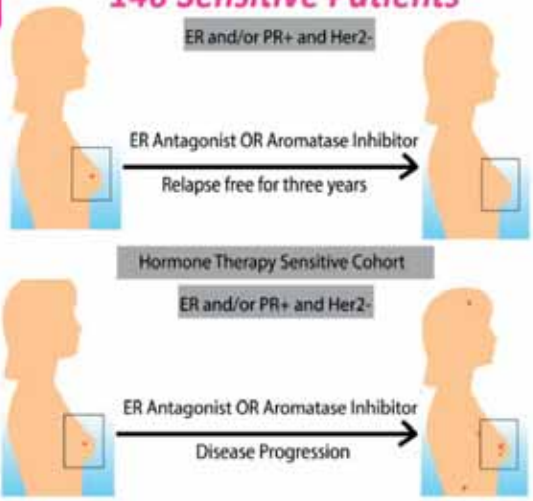


MULTIPLE pathways of resistance; Data on targeting MOST EFFECTIVE pathway that ABBROGATES resistance, leads to lasting DISEASE REMISSION & LASTING CURES UNAVAILABLE

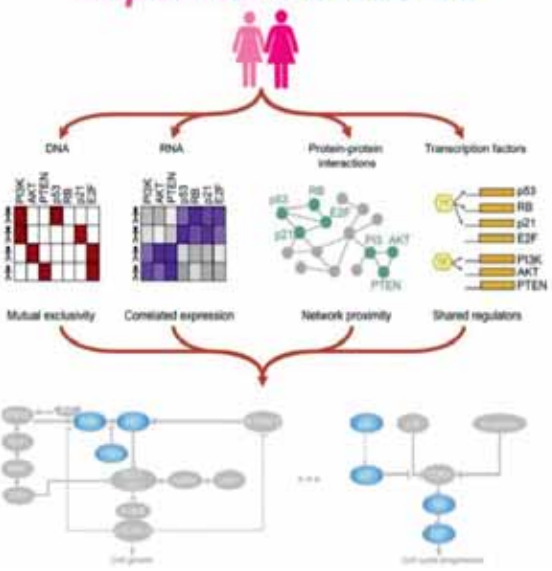
VNCI Study: Multi-omics analysis from primary patient samples to identify mechanisms of hormone therapy resistance and sensitivity



Recruited 132 Resistant & 146 Sensitive Patients



Expected Outcomes



HEMATOPATHOLOGY LABORATORY

Officer-in-Charge: Dr. P.G. Subramanian

Haematopathologist: Dr. Sumeet Gujral

Clinician Scientists: Dr. Nikhil Patkar, Dr. Prashant Tembhare, Dr. Gaurav Chatterjee, Dr. Sweta Rajpal

Scientific Officers: Dr. Shruti Choudhary, Mrs. Swapnali Joshi

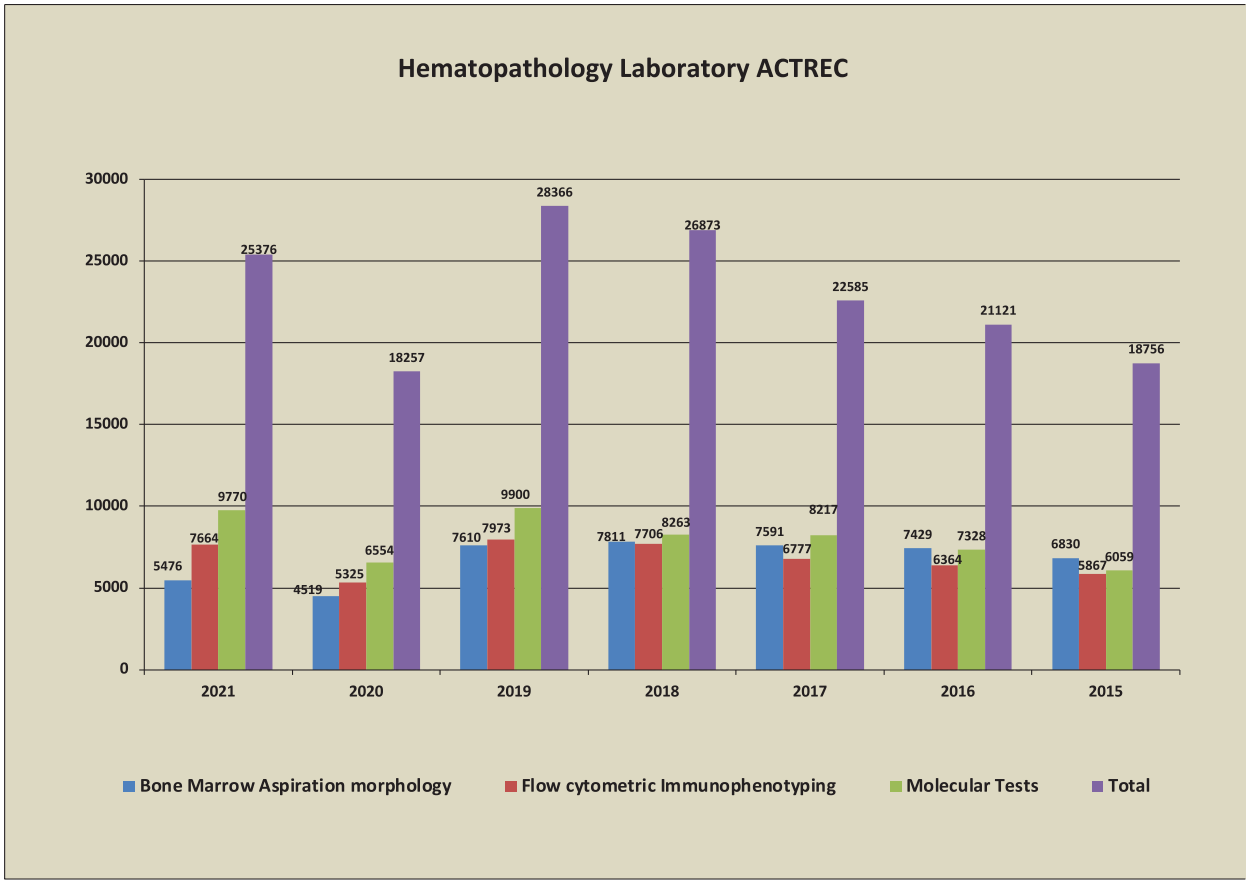
Overview

Hematopathology Laboratory is a service laboratory at ACTREC and undertakes the diagnosis and sub classification of hematological malignancies as well as, monitoring of patients while on therapy, for all malignancies. The laboratory uses morphology, flow cytometry, molecular techniques for diagnosis and performs minimal residual disease testing and post treatment monitoring of patients with Chronic Myeloid Leukemia, B cell Acute Lymphoblastic leukemia in children, T cell Acute Lymphoblastic Leukemia, Acute Myeloid leukemia and Multiple Myeloma. These tests are used to tailor the treatment for individual patient based on response to initial treatment.

Service

This laboratory carries out examination of blood, bone marrow and body fluids for the diagnosis of leukemia and lymphoma, investigations like detection of Minimal Residual Disease for Acute Leukemia and Multiple Myeloma and involvement of hematolymphoid malignancies in cerebrospinal fluid and other rare sites. Post allogeneic stem cell transplant monitoring for chimerism by analyzing Short Tandem Repeats and extended immune subset monitoring for both post allogeneic stem cell transplant and for patients affected with COVID 19 is done. Further, IL-6 and other interleukin assays required for diagnosing and monitoring cytokine storms as well as molecular testing for diagnosis, subtyping and monitoring of hematolymphoid malignancies has been established by this laboratory. The laboratory carries out Next Generation Sequencing for identifying unknown fusions in the hematological malignancies, which can be targeted with specific drugs for optimal treatment of patients. The laboratory also performed real time PCR for diagnosis and screening for patients for SarsCov 2 in the year 2021.

In 2021, the laboratory has provided molecular diagnostics service to more than 25,000 patients and has the largest hemato-oncology molecular diagnostics workload in the country.



The following are the total number of tests done in this laboratory in the year 2021.

	Name of the Tests	Total No. of Tests performed
1.	**Bone Marrow Aspiration Smears**	**5476**
2.	**Cytochemistry**	**4548**
3.	**Flow cytometric Immunophenotyping**	**7664**
	Extended Immune subset monitoring	673
4.	**Body Fluids for cell counts & Morphology**	**2466**
5.	**Molecular Hematopathology**	**9770**
	Chronic Myeloid Leukemia monitoring by BCR-ABL1 Quantitation	4968

	BCR-ABL1 and other Leukemia Transcript identification	516
	ABL Kinase Domain Mutation studies	344
	Acute Promyelocytic Leukemia PML-RARA Quantitation	329
	IGH or TCR gene for clonality and other tests	22
	Chimerism testing by STR markers for Bone Marrow transplantation	1500
	MYD 88	13
	Next Generation Sequencing Assay	2078
6.	**Testing for SarsCov2**	**7612**

Research

Faculty members are engaged in several research projects, some with a focus on the SarsCov2 virus; Immunological profile and predictors of severity in COVID 19 and sequencing of SarsCov2 virus in cohort of patients at ACTREC. Other projects are on; Minimal Residual Disease (MRD) in both B cell and T cell Acute Lymphoblastic Leukemia and its predictive value in outcome, MRD in Acute Myeloid leukemia and its value in Clinical management in Indian context, gene mutations in Acute Myeloid Leukemia and use of Artificial Intelligence algorithms for better risk stratification for management, detection of minimal disseminated disease in pediatric round cell tumors by flow cytometric immunophenotyping, investigating value of circulating plasma cells and serum miRNA levels for therapeutic response evaluation in newly diagnosed multiple myeloma and immune reconstitution post allogenic stem cell transplant.

Education

The laboratory conducts specialized courses, a 2-year post MD - Hematopathology Fellowship Program, and a 6-month advanced training program in Oncology for pathologists (1 trainee in 2021). Advanced training courses in Hematology, Flow Cytometry (6 trainees in 2021) and Molecular Hematology (6 trainees in 2021) are also conducted for technologists. In 2021, country-wide representation of50 Pathologists, participated as observers for training in morphology, cytochemistry and flow cytometry. In 2021, the laboratory has actively run free online program in collaboration with the Tata Trust, for teaching of resident and post graduate pathologists with participation from more than 500 delegates from over 25 countries.

MEDICAL ADMINISTRATION

Medical Superintendent:	Dr. Prashant Bhat
Assistant Medical Superintendent:	Dr. Puneeth Thattikonda
General Medicine:	Dr. Prafulla Parikh, Dr. Sujit Kamtalwar, Dr. Ashwini More
Staff Physician:	Dr. Amol Patil
Quality Manager & COVID Vigilance Officer:	Ms. Chital Naresh
Medical Social Worker:	Ms. Bhagyashree Tilu
Physiotherapy:	Dr. Mohua Chatterjee, Dr. Supriya Nakhate
Medical Records Officer:	Mr. Madhumohan Maddirala
CSSD (In Charge):	Mr. Sachin Walawalkar
Biomedical Engineering (In Charge):	Mr. Shine Kumar
Surgical Purchase (Jr. Purchase Officer):	Ms. Roshni D'mello
Surgical Stores (Asst. Admin Officer):	Mr. Shanoj
Medical Stores (Sr. Pharmacist):	Mr. N V Chavan
Pharmacy (Sr. Pharmacist):	Mr. K N Chaudhari

Overview

The outpatient, inpatient, diagnostics, clinical and support services together with patient hostel 'Vasundhara' are managed by Medical Administration headed by the Medical Superintendent. The General Medicine for the management of medical co-morbidities, Staff Clinic and super-specialty consultation through honorary specialists is organized by the Medical Administration. Associated clinical services viz. dietetics and patient nutrition, physiotherapy, Patient support services through medical social work and Medical Records are managed by the Office of Medical Superintendent. Pharmacy along with material management of drugs and surgical supplies, procurement of capital equipment for CRC, healthcare government schemes MJPJAY and AYUSHMAN BHARAT implementation at ACTREC is facilitated by Medical Administration. MS office is actively involved in the various infra-structure projects under progress at ACTREC. CSR funding for poor patient treatment support, infrastructure development, equipment

donation and small and large monetary donation to various patient welfare funds are liaised and coordinated from MS office. Patient activities organized by NGO's and voluntary organizations are also facilitated by Medical administration.

Service

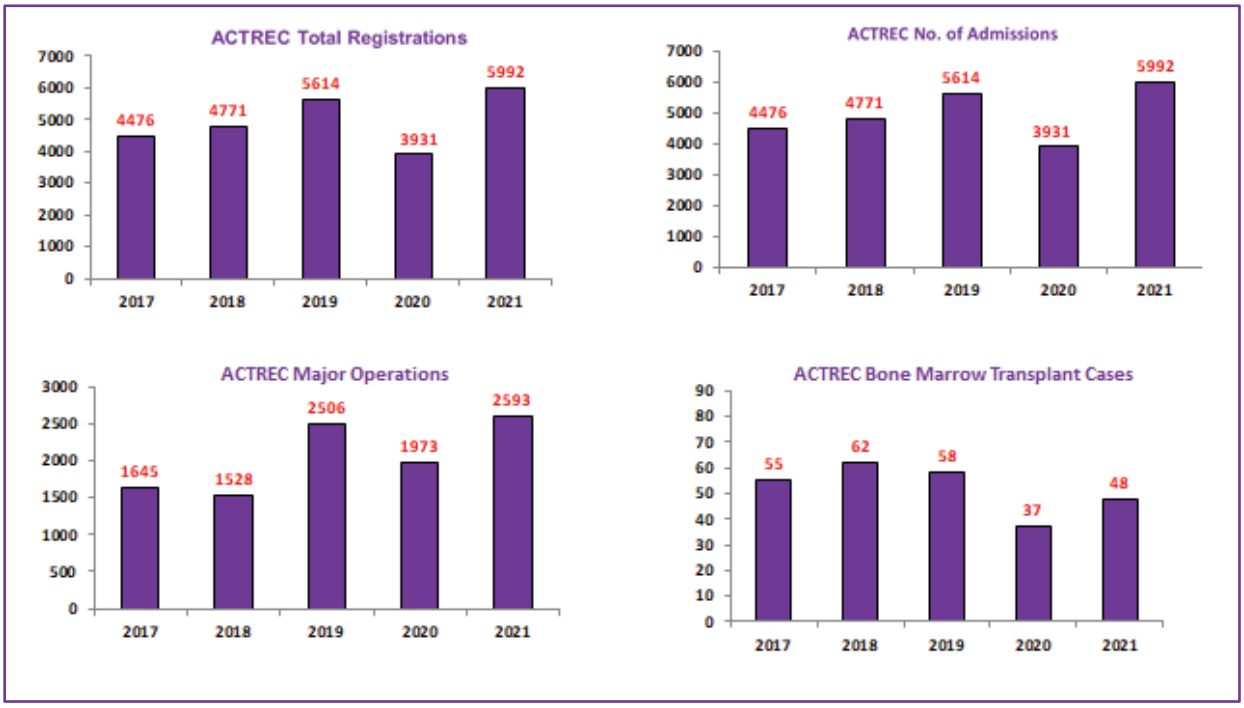
Medical Superintendent Spearheads Medical Administration comprising outpatient, inpatient, diagnostics, clinical, and support services together with patient hostel Vasundhara and Asha Nivas. The Medical Administration organizes the management of medical co-morbidities, Staff clinic, and super-specialty consultation through honorary specialists. Associated clinical services viz. dietetics and patient nutrition, physiotherapy, Occupational therapy, medical social works, and Medical Records are managed by the Office of Medical Superintendent. Pharmacy along with material management of drugs and surgical supplies, capital equipment procurement for CRC are overseen by Medical Administration. Healthcare schemes promoted by the State and the Central government viz. MJPJAY and AYUSHMAN BHARAT (PMJAY) are implemented at ACTREC and facilitated by Medical Administration. MS Office is actively involved in various infrastructure projects in progress at ACTREC. CSR funding for Poor patient welfare to meet the treatment expenses, infrastructure development, equipment donation, small and large monetary donations to various patient welfare funds are liaised and coordinated from MS office. Patient activities organized by NGOs and voluntary organizations are also facilitated by Medical administration.

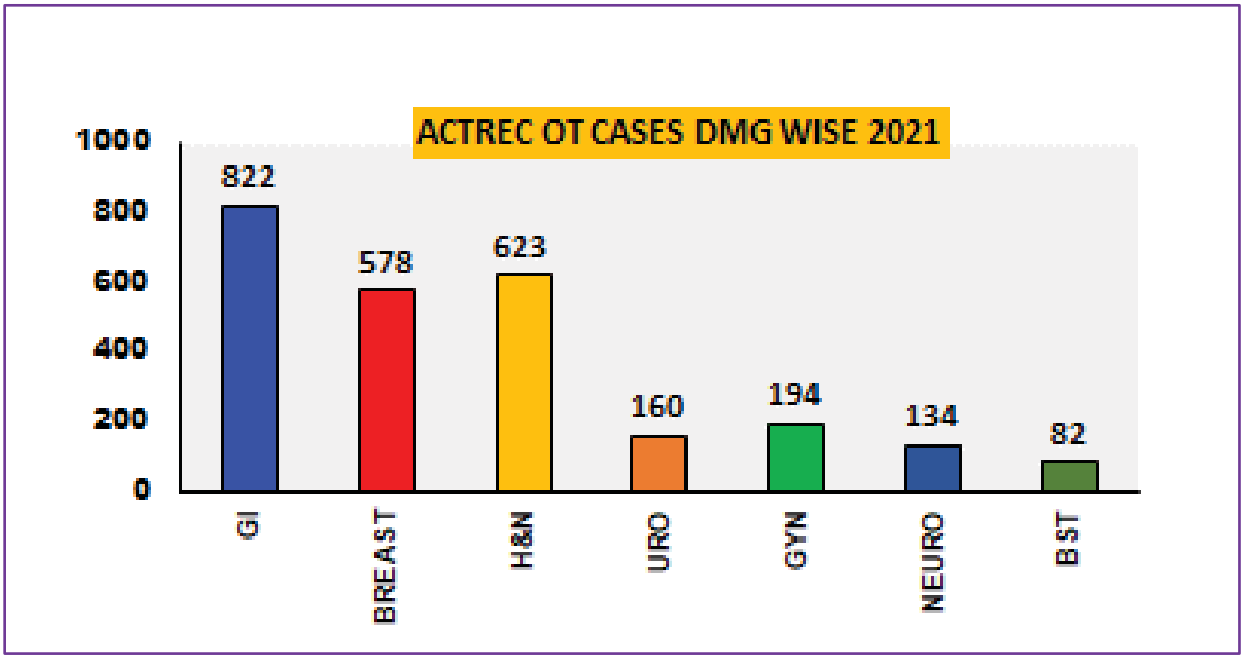
Research

The year 2021 has seen 2312 new ACTREC registrations, 15590 transfer cases from TMH, and 3564 referrals for diagnostic and expert opinion requirements. 613 new patients have used Daycare services. RT new referrals were 1666, and 1988 patients have undergone Interventional radiology procedures.

During the year we have carried out 2593 major surgeries and 358 minor surgeries in 5 Operation theatres. The ACTREC Diagnostic laboratories appeared for NABL Desktop Surveillance and were granted continued accreditation until the validity of 19th May 2022. Despite the global pandemic, there were justifiable numbers of patient care provided at ACTREC. 1,06, 484 patients were seen at the OPD at ACTREC. 3446 blood donations and 1160 apheresis were conducted in the Department of Transfusion Medicine. 2,01,011 total samples

received for investigations at various diagnostic facilities viz—Biochemistry, Hemato-oncology, Flow Cytometry & Molecular Hematopathology, Microbiology, Surgical Pathology, Cancer Cytogenetics, and Transplant Immunology & Immunogenetics lab. Additionally, 17,761 samples were received for RT PCR tests for COVID diagnosis in 2021.





The year 2021 was different from previous year. The aim in 2021 was to make up for the delays in inpatient care services that occurred in 2020 due to the global COVID pandemic and the associated lockdowns and to rejuvenate the patient care projects at ACTREC delayed due to the COVID crisis. All this was continually pursued amidst following COVID-appropriate behavior.

1. Asha Nivas patient hostel was inaugurated on 7th October 2021. Medical administration is involved in furniture planning, planning of services and commissioning of the building.
2. Medical administration has worked extensively during the year for infrastructure works, equipment procurement and installation, Furniture procurement and installation, manpower recruitment etc. for the HWCC and RRU projects in ACTREC campus.

3. Medical administration managed purchase of Medicines and Surgical consumables and tightly controlled the inventory factoring in the variation in requirements.

4. Plan for customized training programs at ACTREC for staff/s handling various tasks, in association with Dr. Reddy's Foundation for Health Education (DRFHE).

MEDICAL ONCOLOGY DEPARTMENT

Officer-in-Charge: Dr. Amit Joshi

Medical Oncologists: Dr. Sudeep Gupta, Dr. Navin Khattry, Dr. Jaya Ghosh, Dr. Anant Gokarn, Dr. Sachin Punatar, Dr. Sumeet Mirgh, Dr. Ankansha Chichara, Dr. Nishant Jindal

Overview

The Department of Medical Oncology started its services in ACTREC in 2006. The Bone Marrow Transplant unit shifted to ACTREC in November 2007; since then, ~1000 autologous/ allogeneic transplants have been performed with an overall transplant-related mortality of 10% (2% in autologous, 18% in allogeneic). Since October 2011, adult patients with hematolymphoid neoplasms not undergoing transplant are also being treated in ACTREC. CAR-T cell therapy for refractory leukemia was also started in 2021. The Department participated in COVID-related activities and treated all patients and staff who needed admission for covid-related complications. The solid tumor unit has been routinely administering chemotherapy in the neoadjuvant, adjuvant, and palliative settings since 2006.

Service

Bone Marrow Transplantation and Adult Hematolymphoid Unit: In 2021, 44 allogeneic and 32 autologous patients were admitted in 6 bed HEPA filtered BMT unit. Twelve thousand one hundred and eleven outpatient visits took place in BMT and adult hematolymphoid unit in 2021, at an average of ~1000 visits per month, and ~200 new referrals (non-TMH) were registered while 300 new referrals from TMH were examined. There were 644 in-patient admissions in the hematolymphoid ward, and step down non HEPA filtered BMT ward for chemotherapy or supportive care administration. There were 76 PBSC collections and 11 CAR-T cell harvests done in 2021. The first CAR-T infusion was performed on 4th June 2021, making this the country's first CAR-T cell infusion. The unit routinely performs matched unrelated donor transplants using HLA matched stem cells from international/national unrelated donor registries and the most challenging - haploidentical transplants for patients who do not have a fully matched related/ unrelated donor.

Adult Solid Tumor Unit: In 2021, 19447 outpatient visits took place in this unit, and tumors of the head and neck, breast, ovary, testicular, cervix, and gastrointestinal region comprised the bulk of cancers. The seven patient beds dedicated to solid tumors had 338 in-patient admissions in the report year.

Pediatric Oncology Unit: In the pediatric oncology OPD approximately 3000 outpatient visits took place in 2021, and with the five inpatient beds, about 306 in-patients were admitted. Approximately 1000 OPD procedures, including ascitic tapping, bone marrow aspiration and biopsies, intrathecal methotrexate, endoscopy, and pleural fluid tapping, were performed in the procedure room situated in the leukemia ward. Approximately 23068 patient visits in the day-care services (chemotherapy + emergency management + hydrations) were undertaken in 2021.

Research

Faculty members of the department are involved in several investigator-initiated and sponsored clinical trials and collaborative research projects, both in the hematolymphoid and solid tumor units. There has been a thrust on doing clinically relevant research with medicinal plants, and a few ongoing projects use curcumin, resveratrol-Copper, and ashwagandha.

Education

The department of Medical Oncology at ACTREC has an active educational program, which encompasses daily academic sessions about transplantation and hematolymphoid neoplasms for the DM students posted in ACTREC, and a monthly Journal Club that includes faculty and students from the departments of medical, radiation, surgical oncology, and other allied branches.

MICROBIOLOGY LABORATORY

Officer-in-Charge: Dr. Vivek Bhat

Scientific Officer 'E': Dr. Sujata Lall

Overview

The Microbiology Laboratory is involved in patient service, academics and research. Patient services include processing and reporting of bacteriology, serology, mycobacteriology, molecular diagnostics, mycology and other clinical microbiological samples at ACTREC. Sterility testing for Blood Bank services, environmental surveillance, infection control guidance and waste management support is also provided by the laboratory. The department staff is also involved in research projects and scientific publications. Educational activities include teaching (TMC & other institution) postgraduate students in microbiology, nursing department, TMC laboratory staff & Advanced Training Course in Medical Laboratory Technology (ATMLT) course.

Service

The Microbiology Laboratory provided the following patient related & hospital services at ACTREC. A total of 26,289 clinical samples were processed in the laboratory for the period Jan 2021 – Dec 2021. These includes Bacteriology cultures for Blood (4426), CSF/Body fluids (204), Drain Fluids (107), Pus (59), urine (978), feces (1229), swabs (973), Respiratory samples (208) & others (388). Serology: HBsAg (2282), HIV (2259), HCV (2259), HBCT (438), HBCM (400), PCT (2021), Dengue (751) & others (1108); Molecular Microbiology- Syndromic multiplex PCR testing: Blood Culture Identification (37), Meningitis/ Encephalitis Panel (33), Pneumonia Panel (78), Respiratory Panel (172), Gastrointestinal panel (58); Clinical microbiology testing for urine (1572), faeces (644), Clostridium difficile (406) & Adeno/Noro/Astro/Rota virus antigen detection (305), Mycobacteriology (Acid Fast Staining) (98), Mycology (188) (Identification of fungi in clinical material and susceptibility testing and special staining, Routine Fungal Culture). Sterility testing for Blood Bank services: PBSC (146), SDP (1282), RDP (62), PCS (937), Fresh frozen plasma (44), Cryoppt(2), others (96) & environmental surveillance for OT/ ICU/ Brachytherapy/ BMT units/CCE & water testing. Infection control guidance and waste management support is also provided by the department.

Research

The Laboratory is involved in four ongoing research projects that are IEC approved. Research areas include testing for susceptibility profiles and resistance patterns of multidrug resistant pathogenic microorganisms commonly found in hospital patients to newer antibacterials such as ceftazidime- avibactam, levonadifloxacin and ceftaroline fosamil. Preliminary data indicate good in-vitro effectiveness of ceftaroline and levonadifloxacin against staphylococcus aureus and of ceftazidime-avibactam in some MDR Gram negative infections. A total of 7 publications were authored/co-authored by the members of this Laboratory during the report year.

Education

The Laboratory is involved in teaching post-graduate students of Microbiology, laboratory staff, nursing and housekeeping staff and also project/ dissertations/internship for MSc/B. Tech students from other institutes. The ATMLT (Advanced training course in Medical Laboratory Technology) is also conducted and coordinated by the Laboratory in association with the Composite Laboratory. The staff participated in 7 National/ International Conferences /workshops during the year.

NURSING DEPARTMENT

Deputy Nursing Superintendent: Dr. Meera Achrekar

Assistant Nursing Superintendent: Ms. Anjali Rawat

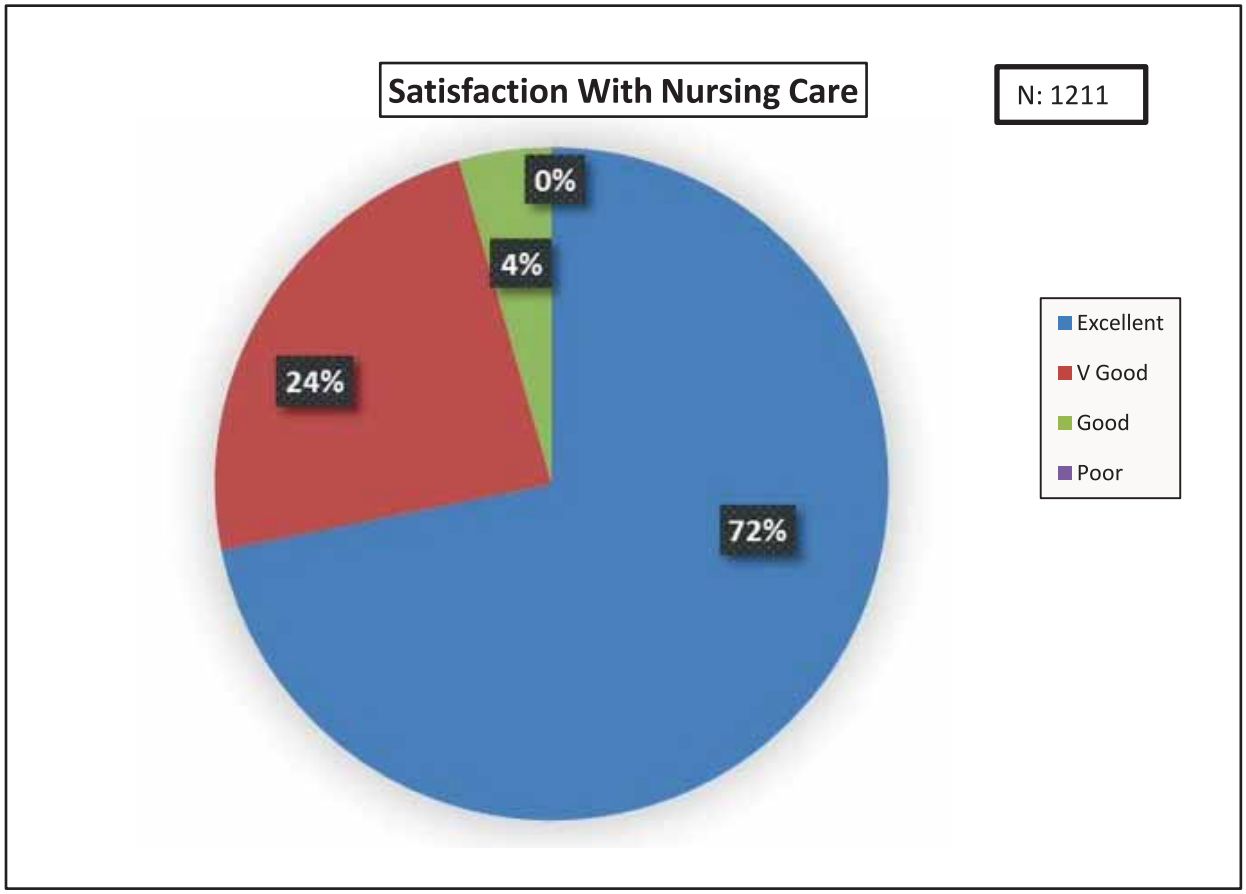
Overview

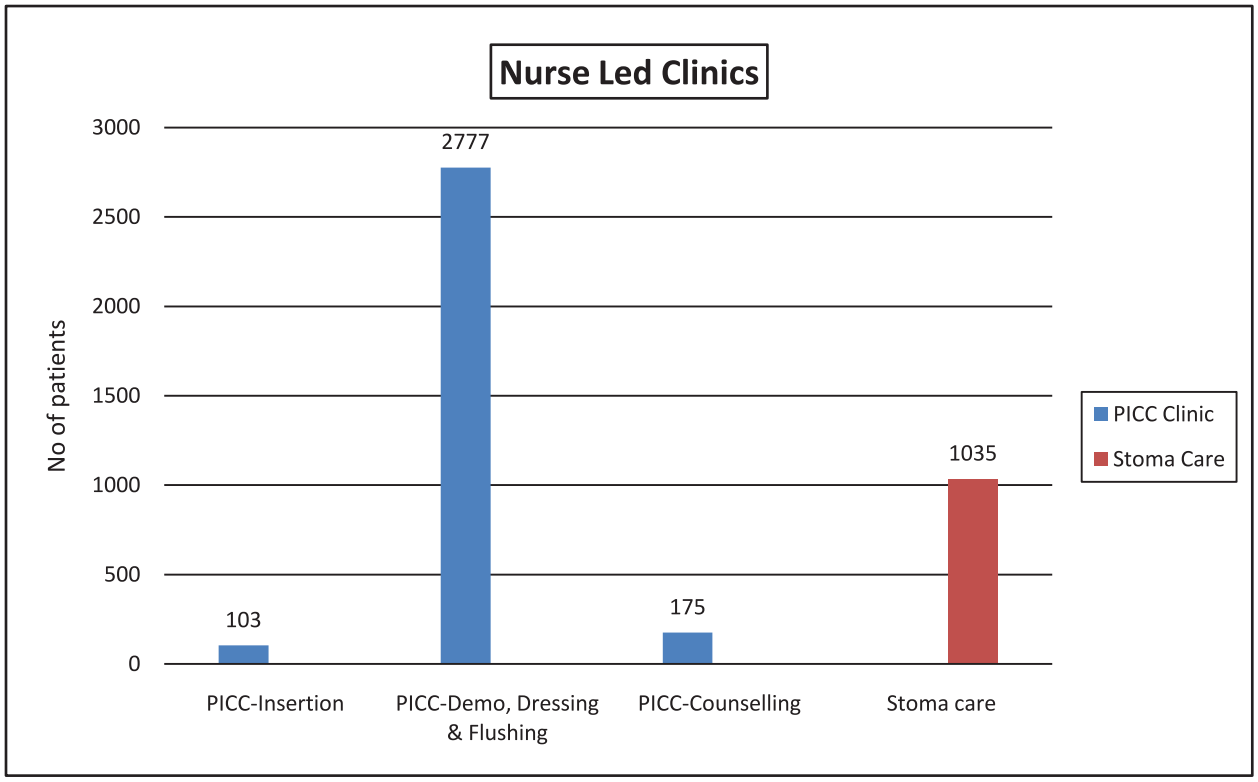
The Nursing Department at ACTREC, constantly strives to provide safe environment and positive experience to patients/caregivers. It is committed and focused on bridging the gap between theory and practice through the Continuing Nursing Education Program. In 2021, efforts were focused on management of COVID patients and staff along with ensuring quality care to the routine patients. New initiative taken were digitalization and automation of OT sample label, mid night census, patient occupancy report and nurse supervisor report. Soft copy of induction booklet was made available to all new joiners to orient them to hospital policies and protocols. Health education material for patients undergoing radiation therapy and PICC was prepared, translated and provided to patients. The patients expressed satisfaction for the health education material provided. The first CAR-T cell therapy in India was done at the Bone marrow Transplant unit at ACTREC on June 4, 2021. Two students enrolled for one-year fellowship program in Bone Marrow Transplant Nursing. The Nursing Department has initiated its journey towards Nursing Excellence certification.

Service

The emphasis in 2021 was on finalizing SOPs, promoting continuous quality improvement and continuing in-service nursing education. The Nursing team along with the Engineering team is working towards commissioning of the new R. S. Rao block. Eighty- six new nurses were inducted on permanent positions in 2021. Nurses at ACTREC were an integral part of the Covid vaccination team and around 58662 individual were vaccinated at ACTREC in 2021. Continuous monitoring and follow up, helped maintain pressure ulcer rate below 2 % i.e. 0.35% and fall rate at 0.41%. New admissions to day care were 633 with a total of 21516 sittings. Minor surgeries were done on 1416 patients and 358 major surgeries were undertaken. Forty-eight patients underwent hematopoietic stem cell transplant: 23 autologous, 14 allogeneic, and 8 haploidentical, 3 matched unrelated donor. Complications were handled with expert medical and nursing care. When asked about overall satisfaction with nursing care, around 96% of

patients expressed very good and above. In CVAD clinic: 103 PICC were inserted, 175 patients were given CVAD counselling, 2777 demonstrations and flushing were done. In 2021, a total of 2952 activities were done in nurse- led CVAD clinic and it showed good clinical outcomes. 1035 patients undergoing GI surgeries attended the stoma clinic. Complications like peri-stomal skin excoriation, high output stoma, stoma retraction were resolved by our specialized stoma care nurses





Research

Various audits on nursing assessment, biomedical waste management, thrombophlebitis, pain management, hand hygiene were carried out. SSI, CLABSI, CAUTI and VAP surveillance helped to assess rate of these infections in the prevalent setting. Nursing document audit and medication administration audits were finalized.

Education

Under the Continuing Education Program, the department conducted online CNEs on “Essentials of pain medications” and “Essentials of CPR” in collaboration with Maharashtra Nursing Council. Six days induction program for new joiners was organized. In house training on CPCR was given to all staff. Nursing staff was deputed for Master’s program in Nursing and Infection Control Program.

PATHOLOGY LABORATORY

Officer-in-Charge: Dr. Sridhar Epari

Staff Pathologists: Dr. Asawari Patil, Dr. Swapnil Rane,

Dr Subash Yadav, Dr Katha Kante

Overview

The Surgical pathology laboratory at ACTREC is a part of the Department of Pathology, TMC, and all the pathology consultants and resident doctors work on rotation at TMH as well as ACTREC. At any given time, the ACTREC laboratory has one Pathology consultant and four residents (senior residents and junior residents; all by rotation).

Service

The Surgical Pathology laboratory provides diagnostic services for histopathology, frozen section and immunohistochemistry for patients treated at ACTREC as well as for referral cases from outside hospitals. The laboratory is equipped with automated tissue processors, automated stainer, cryostat and two automated immunostainer. This laboratory is accredited by NABL for all services and participates in EQAS (External Quality Assessment Scheme) offered by national agency (Anand Lab, Bangalore) and an International agency (College of American Pathologists). The cytology samples from ACTREC are processed in the laboratory and the prepared smears are sent to TMH Cytopathology laboratory, which is accredited by NABL.

In the year 2021, the laboratory processed around 4929 histopathology specimens (i.e. 68878 paraffin blocks) and 2584 frozen sections on 1012 cases. In this year, the laboratory has standardized additional 7 antibodies – amounting to a total of 66 standardized antibodies IHC panel and performed around 9183 IHC tests in 3793 cases.

Research

The laboratory archives all the slides and blocks and when required, retrieves and issues them for approved projects of pathologists, clinicians and scientists. The pathologists are involved as principal investigators or co-investigators in many IEC approved DMG projects,

junior residents (MD students) thesis projects, as well as projects in collaborations with scientists in ACTREC.

Education

Pathologists at Tata Memorial Hospital and ACTREC participate in DMG (Disease Management Group) meetings, joint clinics/multidisciplinary meetings and virtual tumor boards regularly. They also participate in national/international conferences as expert faculty or for oral/poster presentations. Resident doctors are encouraged to participate in conferences for oral/poster presentations and continuing medical education (CME) programs. The technical staff is also encouraged to participate in conferences, workshops as well as internal audit course for NABL.

RADIOBIOLOGY LABORATORY

Radiation Oncologists: Dr. Jayant Sastri Goda

Dr. Supriya Sastri, Dr. Sangeeta Kakoti

Overview

The Radiobiology Laboratory is working on various aspects of radiation biology and cancer therapeutics in collaboration with ACTREC basic scientists, oncologists and institutes like IIT Mumbai, BARC, Manipal & Yenepoya University. This laboratory is working in the field of developing newer formulations of radiation modifiers, besides repositioning drugs for radiation modification and is actively conducting translational aspects of clinical trials. Recently, work on cellular therapy using CART cells in glioblastoma in collaboration with IIT Mumbai has been initiated.

Research

The scientific investigations performed in the laboratory, in the area of radiation sensitization and protection, has led to the development and verification of the bio efficacy and bio distribution of novel nano formulations incorporated chemotherapeutic agents. These novel formulations examined for biological efficacy are liposomal gel combination of paclitaxel and cisplatin for loco regional delivery of the chemotherapeutic drug, data published in high impact factor journals (Journal of Controlled Release: IF 9.8; Nanoscale, IF: 7.8). A novel selenium compound (3-3 DSePA) as a lung radio protector against radiation pneumonitis is in the final stage of development wherein its efficacy as a radiation protector against radiation induced pneumonitis has been proven and presently under the BIRAC grant is being developed as a GMP grade formulation to be used for Phase –I and Phase-II clinical trials.This laboratory in collaboration with Manipal University is co-developing a Dual Drug Loaded Liposomal Nano vectors Targeting Integrin α6: A Glioblastoma Stem Cell marker in Intracerebral Orthotropic Xenografts of glioma. In collaboration with IIT Mumbai, the laboratory is co-developing a liposomal formulation of temozolamide for intranasal delivery of temozolamide. The laboratory is co-developing an active plant extract called lupeol which is an antiangiogenic agent as a radiation sensitizer in orthotopic GBM models. This laboratory along with the department of Pathology is the coordinating lab for international translational research study, BIOEMBRACE.

This study is investigating impact of various biomarkers on outcomes of locally advanced cervix cancer (Dr Supriya Sastri, co-lead of the project). The laboratory is actively involved in preclinical development of multifunctional CAR-T cell therapy in GBM in collaboration with IIT Mumbai. Presently, the laboratory has grants from BRNS and DBT and BIRAC.

Education

The faculty associated with this laboratory actively train MSc Biotechnology students in molecular biology pertaining to Radiobiology. One MSc student was trained in the year 2021. In the report year, 1 US patent has been granted for a selenium compound DSEPA that has both anticancer properties and is also a mitigator for radiation pneumonitis delivery of radio sensitizers, and 1 each of international and national patents have been filed by the senior faculty in collaborative work with other investigators at the Centre. In 2021, two students from this Laboratory (Mentor: Dr. Jayant Sastri Goda) got post-doctoral positions at the Ivy League Institutes (John's Hopkins Institute and Yale University in the United States of America).

RADIODIAGNOSIS AND INTERVENTIONAL RADIOLOGY DEPARTMENT

Officer-in-Charge: Dr. Amit Kumar Janu

Medical Officers: Dr. Kajari Bhattacharya, Dr. Nivedita Chakraborty, Dr. Pooja Atkuri

Overview

The Department of Radio-Diagnosis and Interventional Radiology is equipped with radiography, ultrasonography (USG), Color Doppler, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Mammography (MG) with Digital Breast Tomosynthesis (DBT), and Interventional radiology (IR). The Department provides 24 x 7 radiological services. Some additions in the Department were; two portable direct radiography (DR) machines, one of which is exclusively used for COVID-19 patients, high end Unicorn DenMart, Dental cone beam CT (CBCT) was added for evaluation of maxillofacial lesions and a high-end USG machine (Samsung RS80 EVO) which provides excellent resolution along with advanced applications for imaging and interventional procedures. With the CT modality which begins at 7am, apart from imaging routine cases (shared with Nuclear medicine for PET-CT and Radiotherapy for planning); essential services were provided during the COVID-19 pandemic for diagnostic and follow-up imaging. For the MRI modality, routine MRI and under general anesthesia for patients from pediatric services and adults, advanced MR imaging including perfusion and spectroscopy, is performed. All these services are provided to ACTREC registered patients on priority and further extended to TMH patients to optimize time slots on the machines. Preventive, diagnostic, and follow-up mammograms are performed regularly. Diagnostic and Therapeutic invasive procedures are done under sonographic or fluoroscopic guidance. The on-site cytopathological evaluation has been initiated to assess adequacy and appropriateness of samples collected under image guidance with a dedicated IR-OPD for care of these patients. Emergency services of urgent radiography, sonography, Doppler studies, and CT are available all time. Besides these, USG and CT examinations of animals are also done as part of approved animal research projects. In addition to the regular staff, 2 senior and 4 junior registrars from TMC are posted on rotation to support these activities. The senior registrars in Radiodiagnosis and Interventional Radiology (IR) serve as residential doctors for the department. In this crucial year of the COVID-19 pandemic, this Department has been on the front line in COVID care by imaging these patients (Radiography, CT, USG, and MRI) screening, swabbing and ward duties.

Service

In 2021, a total of 3619 radiographic investigations (average 302 X-rays/month), 2897 USG/ Color Doppler (average 241 scans/month), 6265 Diagnostic CT scans (average 522 scans/ month), 1174 Radiotherapy planning CT scans (average 98 patients/month), 2897 MRI (average 241 patients/month) and 1946 MGs (average 162 patients/month) were performed. In addition, IR performed 863 various procedures (average 72 patients /month) and 536 were USG guided procedures. Additionally Joint Clinic services with Head & Neck DMG for better communication among faculty and for better patient care were initiated. Also the less consuming protocol in MRI with better patient compliance was adopted.

Research

The department faculty members are involved in clinical research projects as PIs and promote the research of other Clinical colleagues by providing support in imaging services. Collaboration with various startups especially in Artificial Intelligence field is ongoing - to work on AI characterized lung nodule, pick up lung abnormalities and triage between benign and malignant lung lesions.

Education

The Officer-in-Charge and department staff have presented their research work at several national/ international conferences in 2021, using various online and hybrid platforms. Weekly teaching for MD Radiology residents, observers and fellows via case-based approach, didactic lectures, spotters and journal club meetings were conducted. Local and guest faculty lectures on internet platforms were made available for residents to view at their convenience. Regular update was provided to paramedical staff regarding radiation safety, MRI safety and emergency procedures in the Radiology Department.

RADIATION ONCOLOGY DEPARTMENT

Officer-in-Charge: Dr. Vedang Murthy

Radiation Oncologists: Dr. Tejpal Gupta, Dr. Supriya Sastri, Dr. Jayant Goda Sastri, Dr. Tabassum Wadasadawala, Dr. Sangeeta Kakoti, Dr. Priyamvada Maitre, Dr. Shwetabh Sinha, Dr. Jifmi Jose, Dr. Revathy Krishnamurthy

Medical Physicists: Dr. SV Jamema, Ms. Reena Phurailatpam, Mr. Kishore Joshi, Ms. Jeevanshu Jain

Overview

The Department of Radiation Oncology is a comprehensive, state-of-the-art department aiming to provide holistic and efficient patient care through a dedicated team of radiation oncologists, medical physicists, radiotherapy technologists, nurses and other supporting staff.

Service

In the year 2021, 1160 patients underwent external beam radiation therapy and 274 brachytherapy fractions were delivered. The number of patients treated during the report year were about 25% higher than 2020. To achieve this and in an attempt to battle the waiting list as well as non-functioning treatment units, the department increased the treatment hours on the RT machines and worked from 7.00 am to 8.00 pm. Brachytherapy forms an integral part of treatment for advanced gynaecological tumors which are now treated with the modern and sophisticated brachytherapy applicators (Venezia and Vienna Applicator) that allow the delivery of image-based brachytherapy. The in-house indigenous facility for fabrication of radiotherapy treatment accessories functional since a decade, has now been extended to fabrication of brachytherapy applicators and breast boards with the use of 3 D printing facility at ACTREC. During this year Radiation Oncology Information System (ROIS) which is already in use for various processes like patient scheduling, planning and treatment delivery has also been robustly configured for billing of the procedures.

Research

The faculty in the department has been actively involved in institutional/ multi-institutional national & international research protocols. Physicians in the department continued to publish their original research in peer reviewed journals like the Lancet Oncology, Journal of Clinical Oncology, JCO Global Oncology, International Journal of Radiation Oncology, Biology and Physics, Radiotherapy and Oncology and Clinical Oncology. In 2021, progress on the National Hadron Therapy Project continued towards installation and commissioning. The department had 2 symposia with the Gunma University, Japan, focusing on areas of collaboration between the 2 centres.

Education

The department is a training hub for all cadres of radiation oncology personnel in the country and region and organizes the “Radiation Oncology Practicum” annually which was on “Practice and nuances of Spine SBRT” in September 2021. Despite the ongoing pandemic, there were 20 national trainees and fellows in the department. Faculty is involved in national and international teaching programs and Joint academic sessions with the Princess Margaret Hospital and University of Toronto. The faculty are assessors and examiners for the MD and DNB programs at various Institutes and serve as examiners for global workshops and examinations, have been resource persons for the IAEA training course in Palliative treatment and Oesophageal cancers held online (organized by Malaysia and Mongolia), delivered lectures and participated as panelists for regional webinars conducted by the FARO (Federation of Asian Radiation Oncologists). Faculty in the department serve as section editors for peer reviewed journals of international repute, are on the board of international and national professional societies, as resource persons for the Education and Quality Improvement modules at the UICC Master Course, involved in setting up radiation oncology services across different TMC Centres, offering advice on setting up Oncology services across the country, as advisors for the NHA Health Benefit Packages for the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana and on Selection Committees for various Government and non-Government organizations. The department faculty have been nominated to various prestigious academic positions and have won several awards.

SURGICAL ONCOLOGY DEPARTMENT

Officer-in-Charge: Dr. Sudhir Nair

Surgical Oncologists: Dr. Vani Parmar, Dr. Sajid Qureshi, Dr. Aliasgar Moiyadi
Dr. Vinay Shankhdhar, Dr. Deepa Nair, Dr. Prakash Shetty,
Dr. Vineet Kumar, Dr. Manish Pruthi, Dr. Rohini V Kulkarni,
Dr. Rathan Shetty

Neurophysiologist: Dr. Parthiban Velayutham

Overview

The department of Surgical Oncology has been providing continued care to a wide range of cancer patients. This includes in-patient care as well as outpatient clinics. The service is running five regular operating theatres five days a week and two operating theatres during Saturdays. The department also conducts regular OPDs (newly registered as well as pre- and postoperative care follow-up OPDs) for breast, head and neck and neurosurgery.

Service

The breast and head and neck surgical services have regular outpatient clinics 5 days a week and offer all major surgical procedures besides providing emergency services. The speech and swallow therapy service now conducts outpatient clinics every Thursday at ACTREC. The neurosurgical services offer intra-operative neurophysiologic monitoring and image guided surgeries, which help to perform safer surgeries in patients with tumours in eloquent areas. The GI services provides state of the art clinical services like minimally invasive laparoscopic surgery, HIPEC and other complex surgeries like excentration. The department of plastic surgery has enhanced its service at ACTREC and augmented other surgical services by providing complex surgical reconstructions.

Despite the disastrous second wave of COVID-19 during March – June 2021, the department bounced back from the previous year's lockdown induced dip in clinical services. The Head and Neck (8524) and the Breast (6840) services together had more than 15,000 OPD consultations (>50% from previous year), which included 843 new registrations for head and neck and 742 new registrations for breast service. During 2021, over 2500 major procedures and 350 minor

procedures were performed. These major surgeries were done by the Head and Neck (623), Breast (578), GI (822), Uro-Oncology (160), Neuro (134), Bone and Soft Tissue (82), and Gynae-Oncology (194) units.

Research

The faculty members are involved in several DMG coordinated research projects. The division of neurosurgery in collaboration with the Department of Remote Sensing and Robotics, BARC, Mumbai has developed a fully functional Neuro-Robotic Lab/OT setup at ACTREC. The division of Head and Neck is coordinating the multicentre AREST (Adjuvant Radiotherapy in Early Stage Oral Cancer) study funded by the National Cancer Grid involving seven cancer centres across India. The 3D Modelling Laboratory developed under the guidance of breast service has extended its service in designing and printing customised face shields during the pandemic in a short period of time.

Education

As part of the postgraduate training program, every year more than twenty surgical oncology postgraduate trainees rotate through ACTREC and are exposed to various clinical and academic activities at ACTREC. The Head and Neck Unit at ACTREC conducts regular teaching program consisting of lectures by faculty, presentations by resident doctors, case discussions and Journal Club on every working Wednesday using online platforms. The Division of Plastic surgery is now developing the anatomy Skills laboratory and is planning to conduct regular workshops in microvascular training for young doctors.

DEPARTMENT OF TRANSFUSION MEDICINE

Officer-In-charge : Dr Shashank Ojha

Associate professor : Dr Sumathi Hiregoudar

Blood Bank Officer : Dr Minal Poojary

Assistant professor : Dr Suryatapa Saha

Overview

DTM is an essential component of tertiary care oncology centre that provides safe and adequate supply of blood components round the clock to meet the specialized hemotherapy need of patients admitted at ACTREC especially Bone Marrow Transplant (BMT), haemato-lymphoid (adult and pediatric), radiation and surgical-oncology units. It also caters to the blood component requirements of patients admitted in other hospitals in Navi Mumbai. DTM is a fully-equipped licensed blood centre complying with the highest standards ensuring consistency at every step in the transfusion chain to provide safe and quality blood components.

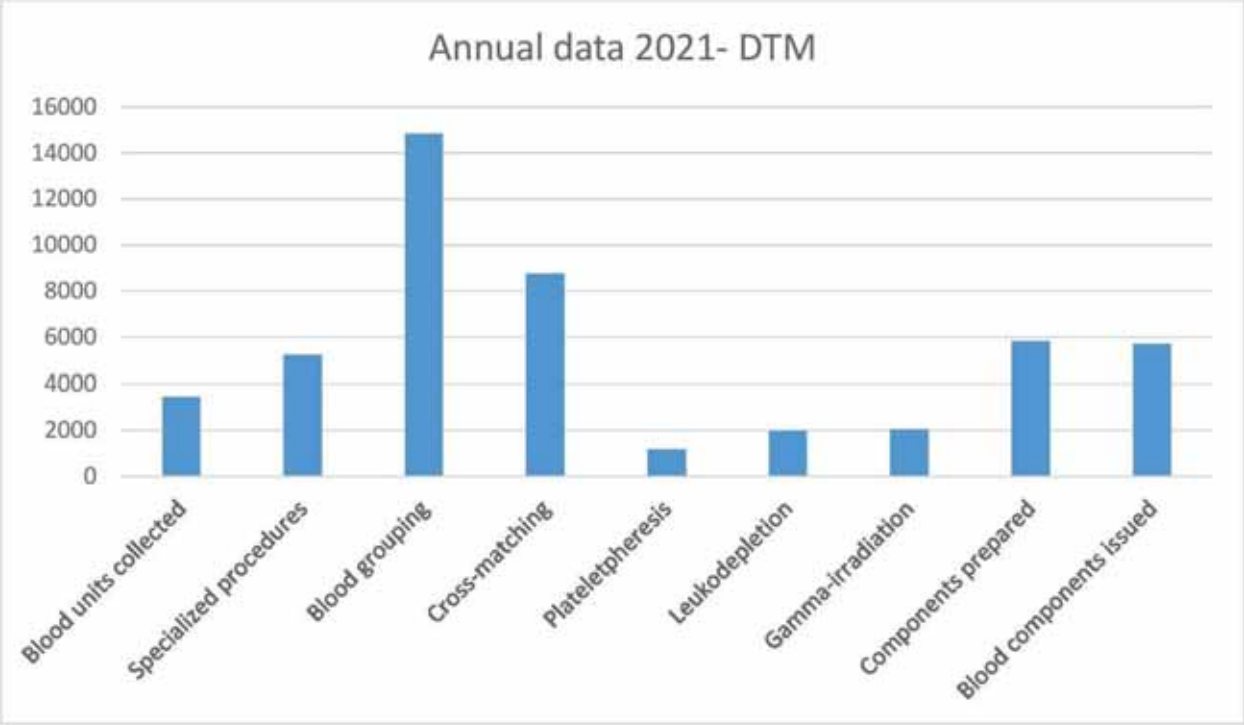
Service

The services offered by this Department includes blood donation and apheresis including platelet apheresis, granulocyte apheresis, therapeutic leukapheresis, red cell serology, blood component separation, Transfusion Transmitted Infections (TTI) testing, storage and issue of blood products. Specialized services include peripheral blood stem cell (PBSC) harvest, cryopreservation, storage and inventory management of hematopoietic stem cells (HSCs), leukodepletion and gamma irradiation of blood components are integral part of our services. Advanced graft manipulation procedures like αβ-T cell depletion and CD45RA+ depletion procedures using Clinimacs plus immuno-magnetic cell sorter are performed in complicated Bone Marrow Transplant patients. Department has played a pivotal role in performing lymphocyte apheresis for first in human immunotherapy trial of CAR T cells.

In a continuous effort to achieve zero risk with transfusion transmitted infections, automated chemiluminescence immunoassay platform has been introduced. During the period from January to December 2021, the department collected a total of 3446 blood units, prepared 5828 blood components, and issued 5717.5 blood components. DTM has commissioned its

dedicated mobile blood van equipped with all the medical equipment required to conduct outdoor voluntary blood donation camps. In addition, 1160 platelet apheresis and 64 leukapheresis procedures were performed. Under specialized blood components, 1976 units were leuco-depleted and 2035 gamma-irradiated. Blood grouping and cross-matching was done on 14830 and 8764 blood samples respectively. The department organized 52 outdoor blood donation camps during the challenging situation of COVID 19 pandemic. DTM routinely participates in EQAS program conducted by Indian Red Cross Society EQAS.

Figure: DTM data-2021



Research

Faculty members are currently involved in two collaborative projects with other departments at TMC of exploring the role of indigenously developed Chimeric Antigen Receptor (CAR) T cells in relapsed/ refractory B-cell Acute Lymphoblastic Leukemia ineligible for Stem Cell Transplantation and adult patients with relapsed/ refractory diffuse large B-cell lymphoma".

In addition, two projects were undertaken by the Principal Investigators of the department namely "Analysis of donor safety and product quality in apheresis granulocyte collection" and

“Evaluation of Intra operative transfusion indicators in surgical oncology patients in a tertiary care Oncology Centre”.

Education

The doctors and staff members imparted training in PBSC harvest and other transplant-related activities to three MD students from other centres as a part of their curriculum and two doctors from other hospitals. Faculty and staff members presented scientific papers and attended 8 national/ international conferences/ scientific meetings including virtual conferences/ meetings and also underwent training to keep abreast with the latest developments in the field.

TRANSLATIONAL RESEARCH LABORATORY

Principal Investigator: Prof. Indraneel Mittra

(Dr Ernest Borges Chair in Translational Research)

(Professor Emeritus, Department of Surgical Oncology)

Scientific Officers: Dr. Ranjan Basak

Dr. Kavita Pal

Dr. Raguram GV

Mr. Naveen Kumar Khare

Overview

The primary focus of research in this Laboratory is studying the role of cell-free chromatin particles in ageing, degenerative disorders and cancer.

Research

The following projects are being undertaken-

Intracellular activities of cell-free chromatin particles

This Laboratory has shown earlier that cell-free chromatin particles (cfChPs) derived from dying cells are readily internalized by healthy cells and that internalised cfChPs function as miniature genomes. They autonomously synthesize DNA, RNA and multiple proteins inside the host cells. They also represent LINE and ALU elements and function as transposable elements. These properties impart oncogenic properties to the host cells. These findings have implication for evolution, ageing and cancer.

Prevention of fertility loss following chemotherapy

Loss of ovarian function and infertility are common side effects of cancer chemotherapy. Earlier studies from this Laboratory have shown that toxicity of chemotherapy is largely due to cfChPs released from drug induced dying host cells and that chemotherapy toxicity can be prevented by concurrent treatment with a combination of resveratrol and copper (R-Cu). R and Cu when

combined leads to generation of free radicals which can deactivate cfChPs, thereby preventing chemo-toxicity. Investigations in the ongoing work is on whether R-Cu given concurrently with Adriamycin would maintain ovarian functions and prevent loss of fertility in mice.

cfChPs activate hallmarks of cancer and immune check-points

Hallmarks of cancer as proposed by Hanahan and Weinberg have provided a conceptual framework for cancer research. However, how cancer hallmarks are activated is unknown. Research from this Laboratory has shown that cfChPs isolated from sera of cancer patients and healthy individuals can activate all cancer hallmarks and immune check-points both in vitro and in vivo. Further observations show that R-Cu given for two weeks to patients with advanced oral cancer down-regulates all cancer hallmarks and immune check-points. These findings hold promise for future treatment of cancer.

cfChPs activate immune function in lymphocytes

Immune activation and cell death are closely associated phenomena. However, how cell death promotes immune response is unknown. Findings from this Laboratory show that cfChPs released from dying cells directly activate immune cells and trigger inflammatory cytokine production. In this context, this Laboratory reported that treatment of patients with severe Covid-19 with R-Cu, which deactivates cfChPs, prevented mortality by 50%. Treatment with R-Cu may be a promising approach to treat severe infections.

cfChPs released from dying cells inflict mitochondrial damage and ROS production in living cells.

1X10^9-1X10^12 cells die in the body every day. Results from this Laboratory show that cfChPs released from dying cells which are internalized by living cells inflict physical damage to mitochondria leading to ROS production. This finding suggests that cfChPs from dying cells may have important bearing on human health and disease. Deactivation of cfChPs by R-Cu may provide a novel approach to retard ageing and associated degenerative conditions that are linked to oxidative stress.

Education

Two trainees gained research experience in fulfillment of MSc dissertation projects.

Dr. Sudeep Gupta (Director, ACTREC)

Dr. Prasanna Venkatraman (Deputy Director)

Basic Research Team

- Dr. Sharathchandra Arandkar
- **Dr. Kakoli Bose**
- Dr. Pradip Chaudhari
- **Dr. Murali Krishna Chilakapati**
- **Dr. Sorab Dalal**
- **Dr. Abhijit De**
- Mr.Shashadhar Dolas
- **Dr. Amit Dutt**
- **Dr. Shilpee Dutt**
- Mr.Nikhil Gadewal
- Dr. Poonam Gera
- **Dr. Rukmini Govekar**
- **Dr. Sanjay Gupta**
- Dr. Syed Hasan
- Dr. Arvind Ingle
- Dr. Rohan Khadilkar
- Dr. Jyoti Kode
- Dr. Pradnya Kowtal
- **Dr. Manoj Mahimkar**
- Dr. Sonam Mehrotra
- Dr. Sejal Patwardhan
- **Dr. Pritha Ray**
- **Dr. Rajiv Sarin**
- Dr. Sharada Sawant
- **Dr. Tanuja Teni**
- Dr. Rahul Thorat
- **Dr. Ashok Varma**
- **Dr. Nandini Verma**
- **Dr. Prasanna Venkatraman**
- **Dr. Sanjeev Waghmare**
- Dr. Ujjwala Warawdekar

Principal Investigators (PIs) are shown in bold

Bose Laboratory

Principal Investigator: Dr. Kakoli Bose

Overview

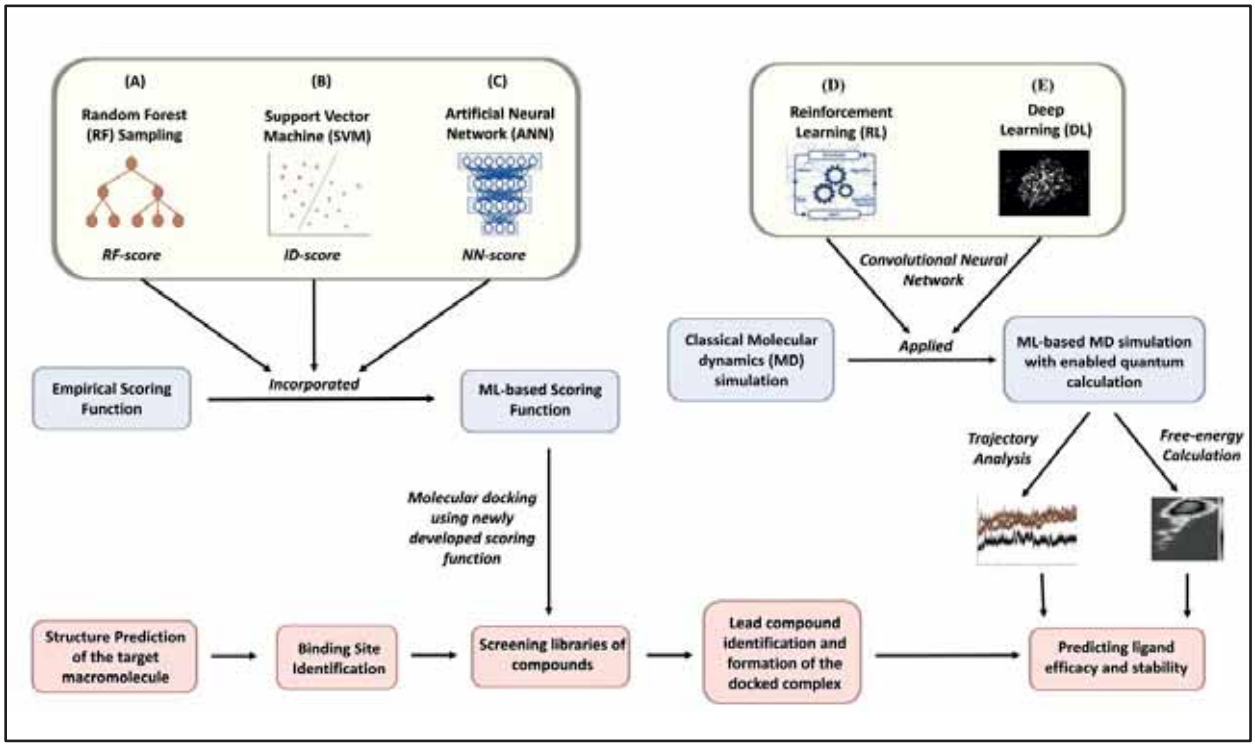
The research focus of this group is study of macromolecules involved in the apoptotic pathway, and their implications in normal cellular functions and pathogenesis. The group works on the high-temperature requirement family of serine proteases (HtrA); the interaction between proteins of extrinsic cell death pathway, and the Bcl2 family proteins and their interacting partners. Moreover, the group is now entering into application-based translation research that includes enzymes involved in metabolic reprogramming and their role in altering cancer signaling pathways.

Research

The highlights of the research findings in 2021 include the solution of a crystal structure of HtrA2 variant (PDB id: 7VGE). The association of novel mutations in HtrA2 from Indian patient cohorts with Parkinson's disease have been identified and characterized. Further,the interaction of HtrA2 with its natural substrates and its mode of allosteric activation quantitatively has also been characterized. A review article on proteins of extrinsic cell death pathway has been published in Trends in Cancer (IF: 14.3).

Education

The Principal Investigator is recognized as a guide for the Ph.D. (Life Sciences) degree of the Homi Bhabha National Institute. Currently, four graduate students - Ms. Rashmi Puja, Ms. Aasna Parui, Ms. Rucha Kulkarni, and Ms. Trishita Banerjee, are working on their doctoral dissertation. Members of the Laboratory participated in weekly in-house seminars and journal club and presented their findings at Conferences and Meetings in the Report year.



Role of Machine Learning (ML) - based scoring functions to revolutionize the conventional molecular docking and simulation techniques.

Prasanna Laboratory

Principal Investigator: Dr. Prasanna Venkatraman

Overview

Protein-Protein Interactions (PPI), typify physical, signalling and regulatory networks that orchestrate cellular responses. PPI are sensitive to levels, mutations, post translational modifications (PTM), and subcellular boundaries. Cancer cells exploit these to rewire networks to maintain mosaic correlations that allow them to survive. The laboratory tries to understand PPIs at different hierarchical levels with a long-term goal to expose the Achilles heel in cancer. The biomolecules of interest are chaperones; PSMD9, PSMD10, which help in proteasome assembly and 14-3-3 which interacts with phosphoproteins. In this direction, structure guided inhibitor design and phenotypic screening has been initiated.

Research

New findings include: a) identifying crystallization conditions for high-throughput drug discovery for PSMD10; b) screening and identification of Doxorubicin as an inhibitor of PSMD10; c) establishing that PSMD10 acts along the NF-kB signaling pathway; this is an important contribution in the field which previously considered PSMD10 as an inhibitor of NF-kB, a key survival factor in cancer cells; d) establishing a novel ligand specific role of ATP in 14-3-3 proteins and describing its allosteric role in ligand dissociation/binding; e) structure guided inhibitor of CLIC1 an ion channel protein that interacts with PSMD10 was identified.

Education

PI is an active member of the current academic committee and a member of the doctoral committee of more than 20 students and a chair of many Doctoral Committees. In the report year, from students registered with the PI, one has submitted the thesis and one has submitted the synopsis.

Administration: As the Deputy Director CRI, PI has made enormous effort to bring funding for cancer research. Three main projects have been sanctioned by DAE that would allow overall growth of research and help the momentum towards translational research. New project cell and purchase office has been established in CRI for the benefit of the faculty.

Varma Laboratory

Principal Investigator: Dr. Ashok Varma

Overview

Overall goal of Varma Laboratory is to use multidisciplinary approach such as genomics, proteomics, structure biology and bioinformatics to perform better Translational Research. Structure analysis of different cancer associated proteins such as BRCA1, BRCA2, PML-RARA, MAPK, FANCI, EPHs are ongoing projects in the laboratory. At present seven PhD students are working on different projects and a very good proteomics work has been compiled by one of student. Indian cancer database for Translational Research has been initiated with the support of Department of Biotechnology. Macromolecular crystallography and X-ray diffraction facility, Bioinformatics and computation system biology of cancer-BIC centres are actively used for research work. Under the program “Azadi Ka Amrit Mahotsav”, the Varma laboratory has organized four national level webinars/workshops.

Service

Macromolecular crystallography and X-ray diffraction facility provides hands on training to users in collecting good diffraction data for protein crystals. A very good Bioinformatics Centre (BIC) supported by Department of Biotechnology (DBT) provides support to scientists in their research work. A dedicated staff hired in the Centre from the DBT funding provides full support to train research scholars and faculty.

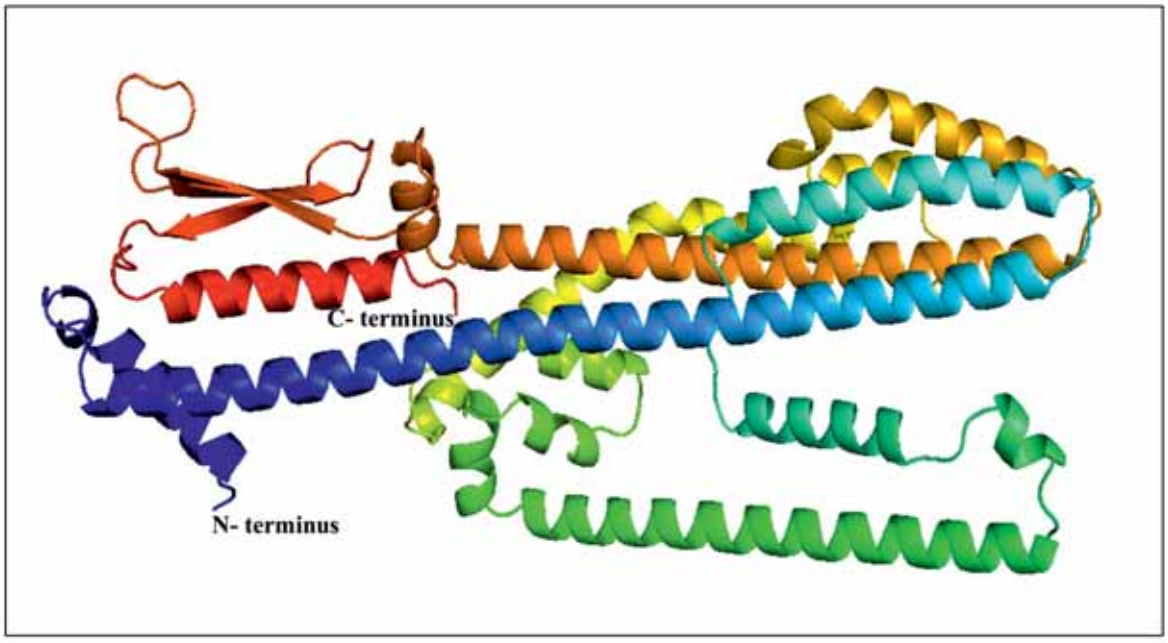
Research

Multi-modelapproach are being used to analyse i) genetic signature identified in BRCA1, BRCA2, EPHs, PML-RARA, MAPK genes reported in different data base and also through collaborative work. ii) Different functional domains and binding partners of BRCA1, EPHs wild-type and mutants have been crystallized and their crystal structures unravelled the folding pattern caused by clinically associated mutations. Furthermore, clinically important mutations have been retrieved from databases and the crystal structure of Gly656Arg, Gly656Glu and Asp751His mutations identified in the kinase domain of EphA7 have been determined iii) The protocol standardised from the laboratory of chilled Acetonitrile being able to successfully remove highly abundant proteins from the serum and retain the sufficient amount of low

molecular weight proteins, has identified 12 proteins from the serum of patient treated with radiotherapy. It has been observed that clusterin (CLU) and gelsolin (GSN) are consistently and differentially regulated protein and may have ability to act as biomarkers to provide early indications of disease iv) Furthermore, the model structure of secretory clusterin could assess the pathogenicity of mutations identified in the evolutionarily conserved regions

Education

The Principal Investigator is a recognized guide for PhD in Life Sciences of the Homi Bhabha National Institute. Presently seven students -Ms Suchita Dubey, Ms Lipi Das, Mr. Mudassar Ali Khan, Mr. Siddharth Barua, Ms. Neha Mishra, Mr. Subhashish Chakraborty and Ms.Vaishnvee Chikhale are working towards a doctoral thesis. The projects of these students are on: structural and functional aspects of PML-RARA (Ms. Suchita); Proteomics (Ms. Lipi); BRCT domains (Mr. Siddhartha); structural evaluations of different parts of BRCA1 (Ms. Neha); Ephs (Mr. Subhasish) and MAPK Pathways (Ms. Vaishnvee).A project trainee has compiled work on check point kinases Chk1/2 and Wee1. Varma Laboratory actively provides training to faculty and research scholars for their bioinformatics and X-ray diffraction related work. Members of this laboratory actively participated in a National seminar on crystallography (NSC-48).



ab-initio Modelled structure of psCLU.

Rukmini Laboratory

Principal Investigator: Dr. Rukmini Govekar

Overview

The group is using multi-'omics' approach to delineate the mechanism of resistance to tyrosine kinase inhibitors (TKI) in chronic myeloid leukemia (CML). In the initial chronic phase (CP) of CML about 90% patients respond to the TKI- imatinib (IM). Failure of salvage strategies such as increased dose of imatinib or next generations of TKIs leave non-responder CPs and 80% of patients in terminal stage of blast crisis (BC) without an effective treatment option. Delineation of mechanism of resistance to TKIs is expected to: 1) Identify potential therapeutic targets for the non-responders; 2) Identify early markers to predict which of the initially responding CP patients would turn resistant during therapy.

Research

Previous genomic and proteomic analysis of imatinib sensitive and resistant cells undertaken in the laboratory identified important features of the mechanism of imatinib resistance in CML-BC, despite inhibition of activity of Bcr-Abl by imatinib. In proteomic analysis, levels of p38MAPK and 14-3-3ε, both components of Bcr-Abl pathway were found to be up- and down-regulated respectively in resistant cells. Their levels indicated active Bcr-Abl pathway, through imatinib inhibited Bcr-Abl activity. In recent studies it was demonstrated that in resistant cells, reduced levels of β1 integrin, a differentiator which did not belong to Bcr-Abl pathway, caused observed alterations in levels of p38MAPK and 14-3-3ε. This provided a vital clue for the mechanism of illegitimate activation of Bcr/Abl pathway in imatinib resistance. Further, previous genomic analysis showed that aberrations accumulate in chromosome 8 with progression of resistance. The most affected region on chromosome 8 harbored gene for transcription factor PLAG1, which is amplified in resistant cells. In subsequent studies, silencing of PLAG1 expression led to reduced expression of β1 integrin was demonstrated. Thus the chromosomal aberration could be linked to illegitimate activation of pathway of Bcr-Abl, thereby unraveling a novel mechanism of imatinib resistance in CML-BC.

Education

The Principal Investigator is a recognized PhD Life Sciences mentor of the Homi Bhabha National Institute. Presently four graduate students – Mr. Rahul Mojidra, Mr. Manish Bhat, Ms. Neha Agarwal and Ms. Shashikumari are working towards their doctoral degree. Two trainees worked in this Laboratory in the report year.

Teni Laboratory

Principal Investigator: Dr. Tanuja Teni

Overview

This groups research programs aim to gain insights into the molecular basis of oral and cervical tumorigenesis. Studies to identify the deubiquitinases, which interact with mutant p53 and impact its stability are underway. Studies to decipher the role of Mcl-1 in radiation induced DNA damage response and autophagy in oral cancer cells are ongoing. The molecular mechanisms by which TCTP contributes to radioresistance is being explored using knockdown strategies while the first of its kind chemoradioresistant cervical cancer *in vitro* model is being established using the patient's regimen. Studies to understand the regulation of Activin A and role of CLU in oral tumorigenesis are also underway.

Research

To decipher the underlying molecular mechanisms of mutant p53 destabilization post WP1130 treatment of cancer cells, inhibition of proteasomal and lysosomal pathways using MG132 and Chloroquine respectively, could not rescue the depletion of mutant p53 post WP1130 treatment, indicating involvement of other mechanisms in its destabilization. Treatment of putative Mcl-1 and Bcl-2 dual inhibitors ABC4 and AFC3 showed Caspase 3 and PARP cleavage in a dose dependent as well as time dependent manner. Further, the treatment of cells with ABC4 led to dissociation of Mcl-1 from Bim and Bak from Bcl-2 but failed to dissociate Bax from Bcl-xL, which proves that the designed inhibitors are targeted only against Bcl-2 and Mcl-1.Studies done also demonstrate a significant association of high TCTP protein expression with poor overall survival of oral cancer patients ($p<0.05$) and with radioresistance in oral cancer cells. *In vitro* establishment of a chemo-radioresistant line, has been successfully completed for HPV 16 positive SiHa cells and its characterization viz. ultra-structural alterations, expression of resistance-associated markers, autophagy markers, mitochondrial markers, EMT markers, stem cell markers, drug influx/efflux markers and phenotypic assays is ongoing. Further, knockdown of SMAD2/3 proteins by siRNA as well as inhibition of Activin pathway by EW-7197 inhibitor attenuate cell migration and invasion of AW8507 and SCC029B oral cancer cells.Also the

docking studies of sCLU revealed the involvement of the amino acid region 140-155 residues, specifically the Phe152 residue of sCLU in its interaction with NPM1, Nucleolin, UBF and Fibrillarin nucleolar proteins

Education

The Principal Investigator is a recognized guide for PhD in Life Sciences of the Homi Bhabha National Institute. Presently four students –Mr. Abhay Uthale, Ms. Dipti Sharma, Mr. Swapnil Oak and Ms. Reshma Reddy are working on their doctoral theses. This year Ms. Rajashree Kadam and Ms. Dhanashree Mundhe defended their doctoral thesis and four trainees worked in the Laboratory for Master's dissertation or research experience. The Laboratory also has an in-house program of data presentations and Journal club every week. Faculty and students of the Laboratory attended two online National conferences.

Sorab Laboratory

Principal Investigator: Dr. Sorab Dalal

Overview

This laboratory has demonstrated that the iron siderophore Lipocalin2 (LCN2), is required for therapy resistance in colorectal cancer cell lines by inhibiting ferroptosis. In collaboration with colleagues at MSMF and Beyond Antibody, it was demonstrated that a novel monoclonal antibody targeting LCN2 inhibits therapy resistance and tumour progression. In addition, a syngeneic mouse model that leads to disease progression in the colon with a concomitant increase in LCN2 levels has been established. Further, novel mechanisms by which the 14-3-3 family of proteins regulate centrosome duplication and centrosome clustering, which is often disrupted in human cancers have been identified.

Research

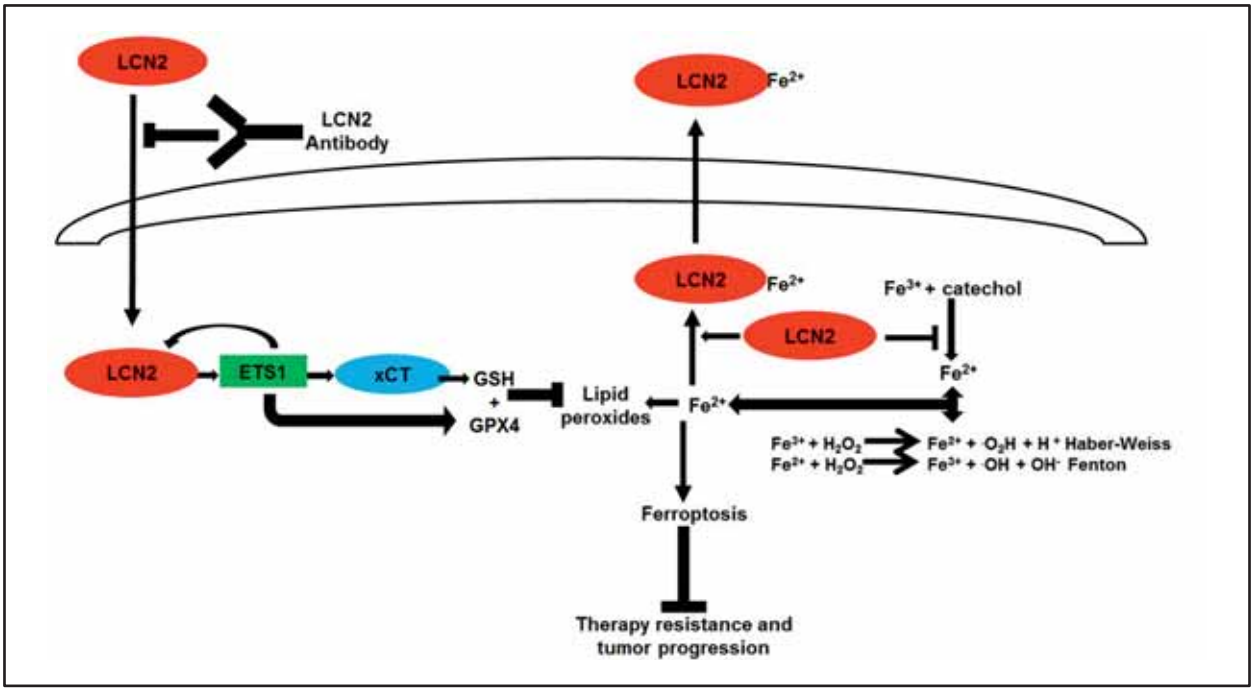
Ferroptosis is an iron dependent form of cell death that is activated when tumor cells are treated with cytotoxic therapies. Therefore, multiple tumor types have developed ways in which to inhibit ferroptosis thereby promoting therapy resistance. The iron binding siderophore, LCN2, is over-expressed in multiple solid tumors and research from this laboratory demonstrated that it promoted therapy resistance in colorectal cancer by reducing intracellular iron and stimulating the expression of genes required for detoxifying peroxidated lipids. Also, it was demonstrated that a novel monoclonal antibody developed (by collaborators), sensitized tumors to therapy and inhibited tumor progression. Further, a syngeneic mouse model that leads to disease progression in the colon with a concomitant increase in LCN2 levels has been established.

Additionally, a novel role for acidic residues in the 14-3-3 peptide binding groove in ligand binding has been identified and mutation of these residues either promotes or inhibits complex formation with ligands was demonstrated. Work from this laboratory has also demonstrated that a knockout of two 14-3-3 isoforms, 14-3-3ε and 14-3-3γ, leads to centrosome amplification. However, cells with a 14-3-3ε knockout undergo multipolar mitoses and cells with a 14-3-3γ knockout preferentially undergo clustered pseudo-bipolar mitoses. This is due to the fact that desmosome function is compromised in cells lacking 14-3-3γ. As 14-3-3 proteins

regulate multiple cellular pathways, analysis of the phenotypes underlying loss of a specific 14-3-3 isoform must consider how different pathways contribute to the observed phenotype.

Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute and seven students; Sarika Tilwani, Nazia Chaudhary, Amol Lonare, Bhagyashree, Monika Jaiswal Rinki Doloi and Luxmipratha Rajendran worked on their doctoral thesis in this laboratory during 2021. Dr. Dalal was instrumental in setting up the MD/PhD program at the Tata Memorial Centre that has now been approved by HBNI. Six students; 3 for dissertation and 3 for experience were trained in this Laboratory in the report year. Members of the Laboratory participated in weekly in-house seminars and journal club and presented their findings at four meetings in 2021.



LCN2 promotes therapy resistance and inhibits ferroptosis by reducing intracellular iron levels and stimulating the clearance of peroxidated lipids. LCN2 binds iron leading to an inhibition of the conversion of ferric to ferrous iron and promotes iron export. In addition, LCN2 stimulates the expression of xCT and GPX4, leading to an increase in intracellular glutathione levels and an increased clearance of peroxidated lipids.

Scientific Officer 'F': Dr. Ujjwala Warawdekar

Overview

Tumor cell derived signalling through expression and activation of proteins can lead to change in stromal remodelling and invasive properties, and may contribute to cellular dis-regulation and transformation. One such protein is cellular Fibronectin and the interest is to assess differences in expression and protein levels in different subtypes of breast cancer, other cancers and evaluate therapeutic outcomes. Antineoplastic effect of therapeutic regimens adopted to treat cancer can be assisted by gap junction communication. This facilitation is by virtue of the presence of the family of constitutive proteins called Connexins. Expression of Connexin type is cell and tissue specific, reported to be reduced in malignancies resulting in compromised therapeutic outcomes. Efforts are towards validating the functionality of gap junction communication and identifying Connexin types in breast and lung cancers.

Research

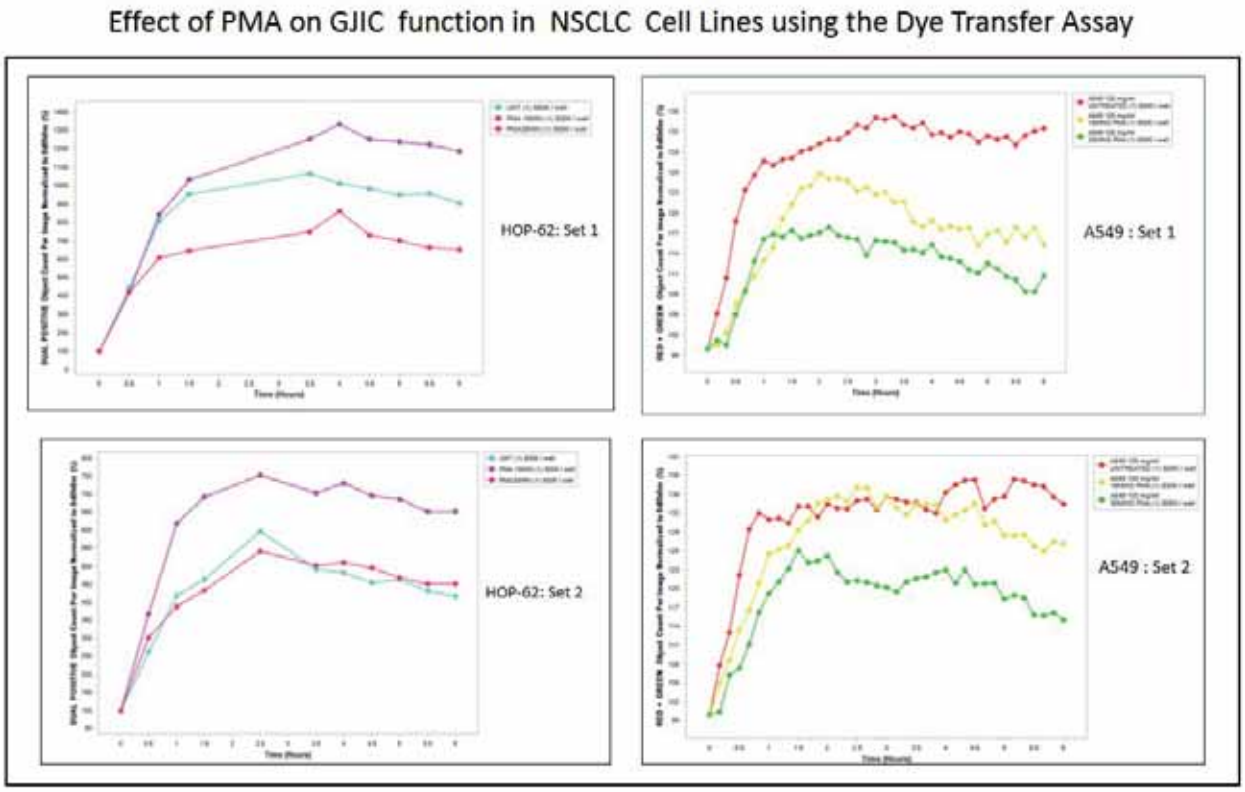
The efficacy of therapy would be dependent on efficient communication between many cell types like tumour- tumour cells, tumour and endothelial cells as well as tumour and the surrounding microenvironment which is comprised of the Extracellular Matrix. Current work involves a quantitative analysis for expression and protein levels of Connexins, cell surface and ECM proteins; in breast cancer cell lines classified by sub types, lung cancer cell lines, in primary specimens from early operable and metastatic breast cancer and, in primary specimens from NSCLC and adjacent normal biopsies. Connexin 43, 32 and 26 proteins were assayed by immunostaining and RT-PCR in breast and lung cancer. Some of the novel observations are the enhanced expression and protein levels of Connexin 43 with atypical localization in cell lines derived from NSCLC. The functional competence of gap junctions is modulated by the phosphorylation status of the Connexin molecule. The differences observed in communication on treatment with PMA, a potent activator of PKC, were assessed at different time points over a 24h period, with the dye transfer assay (Figure). The expression of Connexins and the functionality of intercellular communication were ascertained in NSCLC adenocarcinoma cell lines in the presence and absence of phosphorylation, identified by western blotting and confocal imaging. The other aspect under study is of tumour cell derived signalling through expression and activation of proteins which can lead to invasive properties. Assessment of cellular Fibronectin in different cancers and subtypes has been done using cell lines. Also

analyzing the presence of this protein with antibodies recognizing two different domains qualitatively and quantitatively in the plasma of patients is ongoing.

Education

In the year 2021, the faculty contributed to the Centre's academic and training program.

Four students for Master's dissertation and one for experience training were accepted in this laboratory in the report year. The faculty also participated in area-specific virtual conferences and webinars.



Scientific Officer 'E': Dr. Syed Hasan

Overview

The major focus of this Laboratory is to understand the signalling between anti-apoptotic proteins and cyclin dependent kinases and combining their targeted actions for the improved therapeutic strategies to overcome apoptotic resistance in Acute Myeloid Leukemia (AML) and Breast cancer. Functional and molecular aspects of novel agents in leukemia using xenografts models of AML is another important research focus of the Laboratory. With the advent of targeted therapy using arsenic trioxide (ATO) and All-Trans Retinoic Acid (ATRA) very high cure rates (>90%) can be achieved in low/intermediate risk group Acute Promyelocytic Leukemia (APL). However, high risk group patients (white blood cell counts >10000/μl) still require chemotherapy. The majority of post-remission deaths and relapses are linked to high risk group patients due to toxicity associated with chemotherapy or acquired ATO resistance.

Research

This Laboratory has initiated new collaborative work with INTAS Pharma on high risk acute promyelocytic leukemia (APL). In this joint effort Ms Deepshiskha Dutta, a second year PhD student of this laboratory has been awarded the prestigious Prime Minister's Fellowship for Doctoral Research by the Science & Engineering Research Board (SERB), Government of India in November 2021. The high risk APL patients have inferior survival compared to low and intermediate risk groups. In low and intermediate risk groups, arsenic trioxide works synergistically with ATRA to cure the disease while high-risk group patients still require chemotherapy. There is no systematic study to genetically and molecularly characterize high-risk APL and associated features (such as FLT3-ITD), therefore, using proteomics and genomics based approaches, this Laboratory is working to molecularly and genetically characterize high risk APLs. The survival of Acute Myeloid Leukemia (AML) blasts is dependent on the mitochondrial apoptotic pathway involving BCL-2 family of proteins. In AML, BCL-2 inhibitor (ABT-199) has shown encouraging anti leukemic activity but resistance is emerging due to high expression of MCL-1. In collaboration with Aurigene Discovery Technologies a CDK7 inhibitor (CRI-256) which reduces MCL-1 expression in AML cells without affecting the transcriptional profile of normal cells has been developed. The purpose of the present study is to determine whether a selective and targeted BCL-2 inhibitor (ABT-199) would cooperate with highly specific CDK7 inhibition to kill AML cells, and to elucidate the molecular mechanisms underlying this

phenomenon using *in vitro* and *ex vivo* models of AML. From January-December 2021, this Laboratory has contributed with three important articles on AML (PMIDs: 33057846, 33558666, and 34692556).

Education

The Principal investigator is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute. Presently Ms Tarang Gaur, Ms Deepshikha Dutta and Mr Akash Maiti are working towards their doctoral thesis. Ms Tarang Gaur bagged the best oral presentation award in the 17th National Research Scholars Meet in Life Sciences held on December 9-10, 2021 at ACTREC, Navi Mumbai

Sarin Laboratory

Principal Investigator: Dr. Rajiv Sarin

Overview

The group aims to understand the molecular basis of inherited and sporadic cancers, and develop translational algorithms through molecular biology and functional genomics. The group addresses these questions through: A) Large cohort of over 11000 families with various inherited cancer syndromes using banked DNA and lymphoblastoid cell lines; B) BRCA-GEL case control study with 2800 breast cancer cases / matched healthy controls; C) TMC International Sarcoma Kindred Study (TISKS) a case control study with 560 osteosarcoma cases / matched controls enrolled from TMC; D) International Cancer Genome Consortium (ICGC) project covering 480 Gingivo-Buccal SCC patients with full clinico-pathological annotation, follow up and somatic / germline NGS analysis and functional studies.

Service

The genetics and genomics research methodologies, variant database and clinical phenotype correlation established by the group has helped start a comprehensive NGS Cancer Genetics Laboratory in ACTREC in May 2021. It is the only laboratory in any Government institution providing Comprehensive Germline NGS Genetic Testing services and serves as the national referral laboratory. During 2021 germline NGS was done in house for 642 cases and the cancer genetics clinic enrolled 1180 new families.

Research

The group has established the genetic basis of rare inherited cancer syndromes, penetrance estimates and genotype – phenotype correlation for different gene mutations. The group has characterized several rare and novel germline variants as likely benign or pathogenic based on co-segregation, co-occurrence and functional studies. The group had previously identified 18 frequently occurring germline mutations in BRCA1, BRCA2, MLH1 and MSH2 genes associated with various Indian geo-ethnic groups. In the report year, 4 additional recurrent and several novel germline mutations were identified. Rare occurrence of germline EpCAM gene deletion

causing Lynch Syndrome through epigenetic silencing of MSH2 gene was identified and causality established in 3 families. Under the ICGC project the genomics leads were followed with functional characterization and the novel mechanism of action of aspirin in chemoprevention and its effect mediated through AAM pathway genes was established. Three rare brain tumour cell lines were established and their genotype phenotype characterisation is being carried out.

Education

The Principal Investigator is a recognised guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute. The group provided training to 10 students in the laboratory genetics and cancer genetics counselling. The laboratory conducts an active weekly academic program in which the updates in laboratory work, seminal research papers and interesting research papers are presented.

Gupta Laboratory

Principal Investigator: Dr. Sanjay Gupta

Overview

Histone proteins play a central role in our genome's packaging, organization, and functions. Further, site-specific histone post-translational modifications and polyadenylation of replication-dependent histone genes are emerging as key players in cancer and the resistance mechanisms. Recent advances from the group have shown the role of replication-dependent histone genes, HIST2H2AC and H3C14, in human breast and gastric cancers. Moreover, changes in chromatin organization are associated with tumorigenesis and resistance mechanism. Further, the critical role of chromatin modifiers like class 1 histone deacetylase in drug, radiation, and hypoxia-induced resistance mechanisms are identified in human cell lines and cancer tissues. These epigenetic regulators have significant clinical importance as they provide an opportunity for 'epi-drugs' to alter the chromatin dynamics for better management of cancer and resistance phenomena.

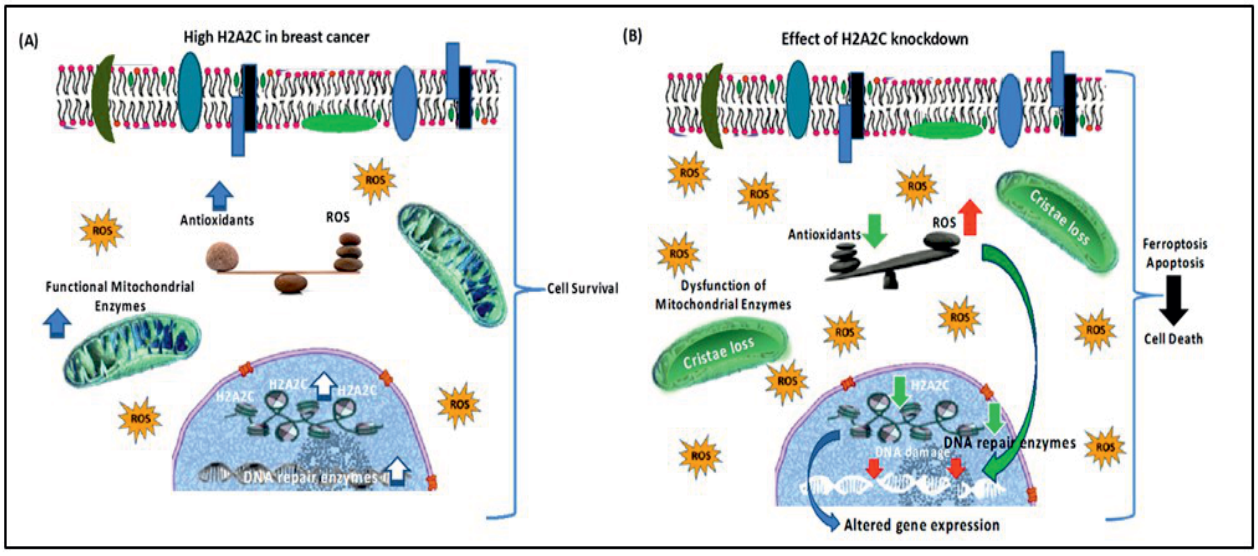
Research

Recently, the group has shown high expression of histone isoform, HIST2H2AC in multiple tumor tissue types. In breast cancer, the positive interplay between YY1, E2F1, and GCN5 with an increase in H3K9ac leads to increased expression of HIST2H2AC. Physiologically, H2A2C depletion affected cell proliferation and induced cell death predominantly through ferroptosis and apoptosis. In gastric cancer, the altered expression and incorporation of histone H3.2 in the chromatin of cancer cells increases H3.2 specific K9me2/3 leading to an increase in chromatin condensation at the nuclear periphery mainly due to the H3.2K9me2-HP1α-lamin-B axis. The increase in the expression of the H3.2 coding gene, H3C14, is mediated via FOXC1, G-quadruplex structure, and GCN5. The replication-dependent histone isoform mRNA under stress conditions like hypoxia, drug-treatment, despite tight regulation, undergo polyadenylation rendering their presence throughout the cell cycle. The downregulation of SLBP and BRF1 and an accumulation of HuR increases histone isoforms polyadenylation in liver and breast tumor tissues. The histone isoform polyadenylation potentially disturbs the DNA: histone ratio leading to genomic instability and cancer. Moreover, ongoing studies in drug and hypoxia-induced resistance have shown altered mitochondrial structure and slow proliferation in DoxR HeLa and breast cancer cells, respectively. The DoxR phenotype is attributed to the

downregulated glycolysis and oxidative phosphorylation, with autophagy acting as a survival mechanism. The altered metabolic state of the drug-tolerant persistor or drug and hypoxia-induced resistant cells resulted in hypo-acetylation of chromatin. These studies in cancer and resistant cells suggest combining specific epi-drug like HDACi with standard chemotherapy drugs potentially may offer beneficial clinical outcomes with tolerable side-effects.

Education

The Principal Investigator is a mentor for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Mr. Ramchandra Amnekar was awarded with Ph.D. degree in 2021. Mr. Sanket Shah, and Mr. Mudasir Rashid have submitted their thesis. Presently, six students – Ms. Tripti Verma, Mr. Abhiram Natu, Ms. Sukanya Rauniyar, Ms. Anjali Singh, Ms. Parul Sachdeva and Ms. Flevia Anthony are working on their doctoral theses. PI is in doctoral committees of research scholars undergoing Ph.D. program at ACTREC as well as other institutes like BARC, NIRRH. During the year, trainees were taken for their Master's dissertation and experience. Lab members have in-house data presentation, abstract and journal club and participated in national/ international conferences.



Cellular events in H2A2C overexpressing tumor cells and effect of knockdown

(A) Tumor cells have high expression and levels of HIST2H2AC, functional mitochondria,high antioxidants and DNA repair proteins. These events contribute in cell survival.

(B) Upon HIST2H2AC knockdown, mitochondrial structure and function is impaired. The balance between ROS and antioxidants is affected. Due to decrease in antioxidants, it results in elevated ROS which induces more DNA damage and induces cell death majorly through ferroptosis and apoptosis. Arrow indicates low or high levels.

Mahimkar Laboratory

Principal Investigator: Dr. Manoj Mahimkar

Overview

Mahimkar laboratory focuses on understanding the genetic basis of tobacco-related cancers by studying genomic alterations in copy number across the genome, and identifying genes/ gene clusters underlying the altered genomic loci. Signatures associated with progression of pre-invasive lesions to invasive oral squamous cell carcinoma have been identified, and candidate driver alterations unique to primary tumors with lymph node metastasis and related to patient survival have been established. In parallel studies, the chemopreventive efficacy of polymeric black tea polyphenols (PBPs), abundantly found in black tea in inhibiting carcinogen induced lung adenomas in A/J mice and oral cancer in hamsters is being tested. The Laboratory has demonstrated that administration of PBPs in drinking water throughout the carcinogen treatment period significantly decreases the multiplicity of tumors in both model systems in pre as well as post treatment settings.

Research

Research in this Laboratory has led to the identification of signatures associated with the progression of pre-invasive lesions to invasive OSCC and established candidate driver alterations unique to primary tumors with lymph node metastasis related to patient survival. Integrative analysis of genomic, transcriptomic and methylomic data revealed specific signature of differentially methylated promoter and gene copy associated with shorter survival. Validating targets with real time PCR based analysis revealed ANO1 (11q13.3), DVL1 (1p36.3) to be amplified in more than 90% of the cases. Association of these targets with survival will help establish prognostic biomarkers for shorter survival. Limited studies have explored clinically relevant biomarkers predictive of EGFR targeted therapy response which can guide treatment decisions in HPV negative HNSCC patients. A study from this Laboratory shows both prognostic and predictive significance of nuclear HIF1α expression. Analysis suggests that nuclear HIF1α expression is an independent negative prognostic factor in HPV negative HNSCC patients. Addition of nimotuzumab to CRT significantly improves the clinical outcomes in high HIF1α expressing patients. HIF1α status showed significant qualitative interaction with treatment effect. EGFR or pEGFR expression or EGFR gene copy number did not have any prognostic or predictive significance in these patients.Studies in this Laboratory

on the chemopreventive efficacy of polymeric black tea polyphenols (PBPs), abundantly found in black tea, have shown to inhibit carcinogen induced lung adenoma in A/J mice and oral tumors in hamsters. PBPs exhibit chemopreventive activity by modulation of xenobiotic metabolizing enzymes decreasing BPDE-DNA adducts (anti-initiation) and inhibition of carcinogen induced inflammation, cellular proliferation and induction of apoptosis possibly via modulation of signaling kinases (anti-promotion). Further, research from this Laboratory first demonstrated that administration of (1.5% 3%, 5% & 10%) PBPs in drinking water throughout the treatment period significantly decreased the multiplicity of macroscopic tumors as well as microscopic tumors.

Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Ms. Usha Patel was awarded the PhD degree in the report year. Presently- Ms. Mayuri Inchanalkar, Ms. Vaishnavi Nimbalkar Mr. Zaid Shaikh and Ms Rinal Chavda are working towards their doctoral theses. The Laboratory participates in the Centre's training program and during 2020, three trainees were accepted for their Master's dissertation, whilst two for experience.

Dutt Laboratory

Principal Investigator: Dr. Amit Dutt

Overview

The goal of the Dutt Laboratory is to understand the somatic genetics of human cancer and help develop the next generation of effective targeted therapies to improve treatment of cancer patients. This Laboratory specifically focuses on the genomic features of genetic alterations underlying oncogenesis and cancer progression in the lung, breast, cervical, gallbladder, head and neck, and other cancers. The major aspect of research involves:

Cancer Genomics: Using computational genomic approaches to uncover somatic genetic alterations in cancers develop computational tools such as HPVDetector, TMC-SNPdb, as a resource for the community.

Functional Genomics: The genome-discovery efforts are paired with biochemical and molecular experimental approaches, using tumor-derived cell lines and transgenic mouse models.

Pathogen Discovery: The group has developed a computational pipeline to detect pathogens in cancer and to explore a possible pathogenic basis for cancer.

Service

Participate in weekly Molecular Tumor Board to discuss and interpret the molecular reports of patients at the Medical Oncology department to help decide appropriate therapeutic regimen based on the underlying genetic alteration.

Research

Lung cancer: Unlike lung adenocarcinoma patients, there is no FDA-approved targeted-therapy likely to benefit lung squamous cell carcinoma patients. Research from this laboratory led to the first genetic landscape of alterations underlying 430 Indian lung squamous genomes and uncovered the prevalence of known targetable somatic alterations using next generation sequencing followed by validation using mass spectrometry. The in-depth profiling of genetic variations prevalent in Indian lung squamous tumors and identify *EGFR*, *PIK3CA*, *KRAS* as druggable targets and potential biomarkers in 16.5% patients, which could further extend the scope of ongoing clinical trials and guide in treatment decisions was presented.

In a separate study, a preclinical orthotopic NOD-SCID mouse model using luciferase tagged lung adenocarcinoma cells to model and extend trial implications of the recently conducted ADAURA trial was developed. Dosing treatment regimen of the two EGFR-TKIs on homing of luciferase tagged lung cancer cells in mice injected intravenously through the tail vein were compared. An efficient clearance of PC-9 lung cancer cells from the lungs of mice with daily and weekly osimertinib pre-treatment group compared to a partial effect in response to the erlotinib pre-treated group was recorded. This study revealed that low-dose once-a-week osimeritinib EGFR-TKI pre-treatment as a possible treatment option in delaying the onset of disease in patients as an adjuvant treatment post resection of early stage tumors or among patients with pre-disposition to *EGFR* mutant lung cancers harboring germline *EGFR* kinase domain mutations. The low-dose once-a-week osimertinib could potentially have several advantages over daily dosing, including lower toxicity, affordability, and ease of administration and delaying or preventing acquired resistance that remains to be explored.

Education

The Principal Investigator is a recognized guide for PhD in Life Sciences of the Homi Bhabha National Institute. Presently 6 students –Mr. Sanket Desai, Mr. Asim, Mr. Bhaskar Dharavath, Ms. Neelima Yadav, Mr. Suhail Ahmad, and Ms. Supriya Hait are working towards their doctoral theses.

Waghmare Laboratory

Principal Investigator: Dr Sanjeev Waghmare

Overview

The focus of this group is to unravel the molecular mechanisms that control both the adult stem cells and cancer stem-like cells regulation in human epithelial cancers. In particular, this group's effort is to elucidate the molecular signalling such as Wnt/Notch/Sonic-hedgehog etc., and others that regulate self-renewal and differentiation of stem cells. The group is using skin and human epithelial cancers such as head and neck cancer as experimental models. Thus, uncovering the molecular players that maintain cancer stem cells may pave a way for future clinical implications.

Research

Secretory phospholipase A_2 group-IIA (sPLA$_2$-IIA) catalyzes the sn-2 position of glycerophospholipids to yield fatty acids and lysophospholipids. sPLA$_2$-IIA is deregulated in various human cancers. Findings from this laboratory are that sPLA2-IIA knockdown in oral cancer cell lines showed decreased tumorigenic potential through c-Jun/JNK activation. Similarly, sPLA2-IIA knockdown in breast cancer cell lines also showed decreased tumorigenic potential.

SFRP1 (Secreted frizzled related protein),a Wntinhibitor is down regulated invarious human cancers. Cancer stem-like cells isolated from the Sfrp1 knock out tumors showed higher tumorigenic potential. Molecular profiling on cancer stem cells revealed up regulation of epithelial to mesenchymal transition (EMT) markers, Akt and also stem cell marker, Sox2. Importantly, inverse co-relation of Sfrp1 and Sox2 was observed in human oral and breast cancer patient samples.

Dab2 (Disabled-2 protein) is an adaptor protein and acts as a Wnt inhibitor. This group's finding showed that Dab2 knockout mice showed decreased cell proliferation and stem cells lose their stemness potential. Further, skin induced tumor using DMBA/TPA application in the Dab2 knock

out skin showed decreased proliferation of the cells and also the tumors do not progress into squamous cell carcinoma.

Oral cancer patients at an advanced stage have a poor clinical outcome. Cancer stem cells (CSCs) within the tumor escape chemo-radiotherapy leading to recurrence of disease post-treatment. This group is investigating the mechanisms involved in the maintenance of CSCs. The group developed the primary oral cancer cell lines from the advanced stage treatment naïve samples. Thus the ongoing studies would provide insight on the molecular mechanism underlying the maintenance of these cancer stem cells, which will be utilized to stratify responders and non-responders to chemotherapy.

Education

The Principal Investigator isrecognized as a guide for the Ph.D. degree in Life Sciences under the HBNI. Currently, five PhDstudents - Mr. Sushant Navrange, Ms. Sayoni Roy, Ms. Priyanka Joshi, Mr. Darshan Mehta and Ms. Sonal Negi are pursuing their doctoral training. The PI accepted three short term trainees and one dissertation trainee during the year. The group engages in weekly in-house presentations and journal club.

Ray Laboratory

Principal Investigator: Dr. Pritha Ray

Overview

The focus of the group is to delineate the key molecular signatures associated with acquirement of resistance and metastasis in Epithelial Ovarian Cancer (EOC) and Gastric Cancer (GC). Research findings in 2021 have led to a deeper understanding of the role of different mutants of P53 in autophagy, platinum resistance and PIK3CA signalling, role of autophagy in maintaining drug induced homeostasis in cancer stem cell population, delineation of temporal dynamics of Notch3 signaling in real time and role of protein-protein and protein-lipid interaction in conferring multi-drug resistance in platinum-resistant EOC cells. The effects of herbal compounds in sensitive and 5-FU resistant GC cells and the molecular association between wtp53/mp53 with HER2 expression and localization in GC cells and patients tissues are also being evaluated.

Research

Among the important observations of the ongoing studies, whole exon sequencing of nine HGSOC patients was performed and two new mutations along with a prevalent P72R SNP in p53 gene were identified. The study on autophagy and cancer stem cell suggests that active autophagic flux promotes differentiation of CSCs to Non-CSCs and existence of higher autophagy flux platinum-sensitive relapse patients derived cancer spheroids than chemo naive or platinum-resistant relapse patients. The detailed molecular mechanisms are being explored. The effects of various mp53 upon autophagy and ROS in ovarian cancer cells are also being studied. Using the in-house developed unique co-culture models of EOC cell-fibroblast/cancer associated fibroblast (heterotypic) and EOC cell-EOC cell (homotypic) linear activation of Notch3 pathway by differential level of Jagged-1 expression and its functional consequence on tumor cell properties has been demonstrated. Monitoring differential activation of Notch signalling in different subtypes of EOC from Indian patient cohort are in progress. In the gastric cancer project, an association between mp53 and HER2 localization in GC cells and tumor tissues and autophagic modulation by herbal compounds in sensitive and 5 FU resistant GC cells is observed which are being investigated at molecular levels. The dynamics of autophagy at different stages of chemoresistance, a metastatic model of orthotopic ovarian cancer models

and a study on BRET mediated evaluation of chemo resistance have been published in high – impact factor international journals.

Education

Currently six PhD students – Mr. Souvik Mukherjee, Mr. Pratham Phadte, Ms. Megha Mehrotra, Ms. Priti Shenoy, Mr. Sourav Chakraborty and Ms. Prerena Singh are working on their doctoral dissertation under the mentorship of the PI. Mr. Aniketh Bishnu and Mr. Abhilash Deo have successfully completed their doctoral program. Two students (Mr. Pratham and Ms. Megha) presented in the Cell Symposium (Virtual) on "Overcoming Therapy Resistance in Cancer" held in November. Two Students (Mr. Souvik and Ms. Priti) were awarded for their oral presentations in NRSM, 2021. The PI is actively involved in: teaching ACTREC course work, lectures for St-Xavier's (Mumbai), SB College (Kerala); an external thesis examiner for students of NCCS, IISER (Pune), Manipal Academy and BHU; Faculty performance evaluator for IIT, Mumbai and, is a member of doctoral committee for ACTREC (12), NIRRH and BARC Ph.D. students.

Shilpee Laboratory

Principal Investigator: Dr. Shilpee Dutt

Overview

This laboratory is working towards understanding the molecular mechanisms that govern radiation and chemo resistance in Glioblastoma and Leukemia. For this the laboratory has developed ,in vitro cellular models from primary patient samples and in vivo pre-clinical orthotopic mouse models that allows for systematic identification of signals and pathways that are relevant to resistance, thus providing the critical information necessary for therapeutic interventions. Collaborations with clinicians from Tata Memorial Hospital to explore the translational aspects of the discoveries from this Laboratory are ongoing.

Research

Therapy resistance is the longstanding fundamental problem in cancer therapeutics that is addressed in this laboratory. A significant body of work in Neuro-Oncology and leukemia has emerged from this laboratory, delineating molecular mechanisms of how the residual resistant cells and recurrent survive chemo and radio therapy, providing critical basic information for therapeutic interventions in Glioblastoma and leukemia.

In a landmark study, a non-canonical function of DUSP6 (Dual Specificity Phosphatase 6) was identified in the recurrent cells of GBM and that its inhibitor significantly increased disease-free survival in pre-clinical mouse models of recurrent GBM (***Journal of cell science 2021***). A study also identified that nuclear localization of p65 acts as molecular switch between reversible and permanent therapy induced senescence in GBM cells. Accordingly, the use of senotherapeutics coupled with p65 inhibitors induced permanent senescence in GBM (***Journal of cell science 2021***). Furthermore, also identified were novel interacting partners of 14-3-3ζ and shown that 14-3-3ζ acts as a negative regulator of therapy induced senescence and mitochondrial biogenesis in residual resistant cells and loss of which also radio-sensitizes GBM cells ***(Heliyon 2021).*** In parallel, collaborative studieshave identified that targeted drug synergy has the potential to intranasally deliver a high therapeutic dose of the chemotherapy agent (TMZ) and could serve as a platform for clinical application***(Nanoscale 2021)***. Additionally, a new gene signature that was associated with clinical and functional characteristics of subclasses of pancreatic head PDAC samples showing that patients with DM had significant downregulation

of pathways involved in cellular metabolism, hormone secretion and paucity of islet cell markers with no reduced survival compared with non-diabetics was identified ***(ANZ Surgery 2021***). A novel hypothesis of fusion and hybridization of normal cells from two different lineages to explain the origin of solid tumours has been presented***(Chinese clinical oncology 2021).*** The above-mentioned studies are being followed up in this laboratory for delineating the mechanistic and translational aspects of these findings.

Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Presently eight students(Jyothi Nair, Anagha Acharekar, Saket Vatsa Mishra, Tejashree Mahaddalkar, Madhura Ketkar, Debashmita Sarkar, Bhawna Singh and Archisman Banerjee) pursuing their doctoral thesis, 2 post-doctoral fellows(Dr. Atanu Ghorai [ACTREC)]and Dr. Saffiula Sayed Basha [DST-NPF]) and 2 trainees are working in the laboratory. The PI delivers lectures for the core course and electives, and marks the assignments. The laboratory conducts regular data presentation and journal clubs. Laboratory members presented their research findings as oral and poster at national and international conferences.

Nandini Laboratory

Principal Investigator: Dr. Nandini Verma

Overview

This laboratory is focused on understanding the molecular mechanisms underlying the aggressive behaviour and response to first-line therapeutic agents in Triple Negative Breast cancer (TNBC), which is a most prevalent malignancy among Indian women. TNBC is an aggressive breast cancer (BC) type that does not express the targetable estrogen and progesterone hormone-receptors, and human epidermal growth factor receptor-2, therefore, the clinical management of TNBC primarily relies on the cytotoxic chemotherapeutic agents. Though the response to chemotherapy is appreciable in TNBC as compared to hormone-positive BCs, unfortunately, more than 50% of patients are either refrectory to therapy or develop resistance and relapse within 2-5 years of treatment, resulting in a very poor prognosis. Since, till now there are no approved targeted therapies for TNBC, improvement in chemotherapy response and patient's outcome after treatment is one of the most desirable clinical prerequisites.

Research

Studies in different types of cancers have demonstrated that clinical resistance in primary and metastatic tumors evolves due to significant molecular reprograming during treatment, resulting in a drug-resistant cellular adaptive response. It has been demonstrated that this molecular reprograming not only involves re-orchestration of the cellular signaling pathways, but might also include alteration in epigenetic regulators, reprograming of cellular signalling, metabolic pathways and cross-talk of tumors with its microenvironment. Therefore, the focus in different research projects, is to systematically investigate how molecular and metabolic pathways, tumor secretome and epigenome reorchestrate in response to chemotherapeutics in responders and drug-resistant cellular populations. This approach is expected to uncover novel drug resistance mechanisms and specific therapeutic strategies to resensitize chemoresistant TNBC tumors to cytotoxic therapies and hence, can prevent tumor relapse. These studies objectively investigate the drug-resistance associated molecular reprograming in different TNBC subtypes by using clinically driven in-vitro and in-vivo model systems in 2-and 3-dimentional culture systems. To address these specific research questions subtype and drug-specific cellular experimental model systems have been developed and characterised phenotypically.

Education

The PI is an HBNI affiliated assistant professor since December 2020 and presently 2 Ph.D. students, Ms. Shagufa Shaikh and Mr. Deepak Sahni are working towards their doctoral theses. Four Master's dissertation students were accepted in this report year. The PI is a member of the academic committee at ACTREC and involved in the review, planning and execution of the annual academic activities; is a DC member for 2 Ph.D. students; participated in framing question paper for JRF entrance examination 2021, ACTREC; delivers lectures in Ph.D. course work modules at ACTREC; PI delivered 2 lectures in St. Xavier's College, Mumbai and participated in 1 national and 2 international conferences, one of which was an oral presentation.

De Laboratory

Principal Investigator: Dr. Abhijit De

Overview

Research in the De laboratory involves development and use of imaging methodologies suitable for estimating molecular functions *in vivo*. A wide spectrum of experimental medicine and novel concept therapeutics using non-invasive molecular imaging techniques in mice disease models are also being studied. The Laboratory has the mandate to acquire diverse translational experimental therapeutics *developed through research*. During this year the laboratory received one Indian patent granted and filed one new patent. The PI also served as Chairperson of PhD JRF program in Life science and Green Campus committee to promote institutional goals.

Research

The Laboratory worked on designing two molecular imaging sensors based on bioluminescence resonance energy transfer (BRET) principle, a core technology. The two sensors designed were (i) reporter gene based imaging sensor to measure STAT3 protein activation and (ii) a semi-synthetic sensor for in situ imaging Caspase-3 protease target enhancement. STAT3 is a transcriptional regulator that controls important oncogenic signaling cascades in BC. The characterization work on patient tumor tissue samples revealed the importance of phospho-serine post-translational modification as a measure of STAT3 activation in triple negative breast cancer (TNBC) subtype. In 2021, the PhosphoBRET sensor design and its application for TNBC cell line was completed, leading to a publication of the Indian patent filed. The Caspase-3 activation BRET sensor, developed in collaboration with IISER Pune was validated in cancer cells and a joint Indian patent application was filed.In another promising line, biocompatible gold nanospheres for photothermal therapy efficacy were tested. The material in use for this hyperthermia application was developed in collaboration with IITB, Mumbai. Triggered precision treatment of palpable tumors with accumulated nano-sized particles when briefly exposed to NIR laser irradiation confers excellent tumor tissue ablation while keeping the surrounding tissue safe. The efficacy of this fast, portable and cost-effective procedure against human drug-resistant and radio-resistant tumor was completed in mouse xenograft models of

multiple types. Additionally, full validation results of two novel organic NIR dye molecules with exceptional PTT efficacy have been completed and published. Additionally, in an on-going international bi-lateral project (DBT Indo-Russia), a novel humanized mushroom luciferase was developed as an optical reporter imaging reporter. Work is in progress to show its utility in multiplexed reporter imaging for cancer gene expression. In 2021, this laboratory published 8 articles in high impact factor journals and filed a new research patent application.

Education

The PI is affiliated to Homi Bhabha National Institute as a guide for Ph.D. degree in Life Sciences. In 2021, eight students- Sumit Mishra, Pranay Dey, Aaiyas Mujawar, Chetna Patnaik, Mansi Joshi and Shivali Mishra worked for their PhD thesis and one student, Arijit Mal completed the PhD degree. Dr. Swathi Raju, TMC Postdoctoral Fellow continued work for the laboratory. The group conducted weekly meetings to discuss results and review research in the field. The PI has actively served for three international and one national journal editorial board. In the report year the PI and students represented their work in multiple national and international conferences, and 2 students have received best presentation and poster awards.

Chilakapati Laboratory

Principal Investigator: Dr. Murali Krishna Chilakapati

Overview

Optical diagnostics, also often referred to as optical pathology, optical diagnosis, optical biopsy, spectral diagnosis, spectromics, describes applications of spectroscopic and/or optical based methods in disease diagnosis. Raman spectroscopy is one of the optical spectroscopy tools, been actively pursued for non-invasive, online clinical applications. Cancer a leading cause of death has been predicted to cause by the end of the year 2021, over 10 million deaths globally each year, with 70% deaths from the developing countries. The high mortality rate, is ascribed to limitations of conventional diagnostics. Hence the laboratory is pursuing in developing Raman based methods: (a) in vivo/in situ methods for routine screening and diagnosis; (b) minimally invasive microspectroscopy methods using body fluids and cell smears; (c) Synthesis, optical and photothermal characterization of metallic nanoparticles for biomedical applications; (d) Exploring Raman and Infrared spectroscopy for oral cancer diagnosis using serum and saliva; (e) Investigations on experimental carcinogenesis in animal models and (f) Exploration of non-invasive and rapid biophysical methods to analyse treatment induced cytotoxicity.

Research

The laboratory's in vivo Raman spectroscopy studies on oral cancer demonstrated stratification normal, premalignant, malignant conditions, also identified early events (cancer field effects and malignancy-related changes). Early identification of recurrence/ second primaries and validation studies are done along with exploring utility in disease free survival and other prognosis. Raman studies on brush-biopsies and sera demonstrated stratification of healthy subjects, habitual tobacco users', oral premalignant subjects and subjects prone to second tumour/recurrence. Presently focus is on classifying different premalignant conditions and recurrence. Protocols for salivary Raman spectroscopy and demonstrated stratification of healthy, habitués and tumour subjects have been developed. Further, studies are being carried out to stratify premalignant subjects. Serum Raman spectroscopy studies of hamster buccal pouch models are being done to evaluate utility of this minimal invasive tool in cancer applications and has demonstrated detection of early changes- by week 5^{th} in the 14-week carcinogenesis model. Raman maps of tissues show feasibility of identifying tumor ablative effects/margins of photothermal-therapy. Further, RS could successfully assess radioresistance,

chemoresistance, effect of CAP therapy, nanoparticle based targeted drug delivery and correlation between spectral and biomarkers. The Laboratory is also involved in other Raman applications such as COVID detection and trace analysis of pesticides. Chilakapati Laboratory has several collaborative programs globally; BARC (Mumbai, Vizag), IPR Ahmedabad, IITs (Mumbai, Kharagpur, Dharwad), Mumbai University, BHU, University of Eastern Finland (Finland), Swansea University(UK) and Shimane University (Japan).

Education

The PI is affiliated to Homi Bhabha National Institute as a guide for Ph.D. degree in Life Sciences. In 2021, three students-Priyanka Jadhav (SRF), Pachali Saha (JRF), Parikshit Patel (JRF) were working towards the Ph.D. degree. Besides these External PhD students; E Duckworth (Swansea University, UK), Sebin Ausgustine (IPR, Ahmedabad), Dimple Saikia (IIT, Dharwad), Ajinkya Anjikar (Shimane University, Japan) and External Post-Doctoral students; Dr. Kshama Pansare and Dr. Mahesh Sayni (IPR, Ahmedabad) were working in this laboratory. In the report year the laboratory accepted 2 trainees for research experience.

Kode Laboratory

Principal Investigator: Dr. Jyoti Kode

Overview

This Laboratory focuses on investigating; immune phenotype, soluble factors landscape and immune evasion in patients; understanding crosstalk of stem cell niche, immune cells, innate immune inflammasome pathway and mesenchymal stem cells in the tumor microenvironment in oral cancer and acute myeloid leukemia (AML).Immunomodulatory effects of ayurvedic formulations are being tested in one clinical trial on ovarian cancer patients; three studies on pre-clinical models of solid cancers/ leukemia and oral cancer. This Laboratory has identified CD26, an immunoregulatory-enzyme and few immune subtypes as prognostic biomarkers for Graft-versus-Host disease (GVHD) in stem cell transplant patients. CD26 inhibitor and two phytoextracts, showed interesting leads in reducing inflammasome–associated molecules in GVHD mice model.

Research

Animal model of Graft versus host disease was used to understand involvement of underlying immune mechanism. Cell-cell and cell-soluble factor interactions between immune cells, MSC and stem cell niche in AML have demonstrated involvement of NLRP3 innate immune pathway markers. Studies are underway to decipher role of NLRP3 pathway in AML blast survival. AML BM paraffin sections demonstrated increased damage associated pathway molecules which got reduced in remission phase of AML patients. Our studies on small molecule inhibitor 9a demonstrated that it exhibits anti-oral cancer activity through regulating the NLRP3 innate immune inflammasome pathway. Studies conducted using indigenously developed oral cancer cell line AW13516 showed 9a reduces expression of NLRP3 pathway and intermediates at protein and transcript level. In an ongoing phase II clinical trial to study of efficacy, toxicity and immunomodulatory effect of Carctol-S in high grade serous epithelial ovarian cancer (OC), first phase of study showed interesting leads that Carctol-S treatment of OC patients augmented immune effector cells and abrogated suppressive soluble mediators. Drug tolerability was acceptable among all patients and few patients even showed better clinical response. Our

studies on nanocomposite A_{ald}– AgNPs demonstrated that besides direct anti-cancer efficacy, A_{ald}–AgNPs also has immunomodulatory activity and safe towards healthy cells with no immunotoxicity. This study opens up new areas of research for chemists and biologists to use seaweed-derived polymers to develop nanocomposites for cancer therapeutics leading to better quality of life to patients.

Education

The Principal Investigator is a recognized guide for PhD Life Sciences of the Homi Bhabha National Institute. Ms Shruti Kandekar, Ms Manasi Nagare and Ms. Akhila George continued working on their Ph.D. dissertation in the report year. This Laboratory conducted three webinars for academicians, clinician researchers, college students and teachers. Nine trainees underwent training in the laboratory. Laboratory members participated in two national conferences.

Scientific Officer 'D': Dr. Sonam Mehrotra

Wellcome DBT – IA Intermediate Fellow

Overview

Dr. Mehrotra's research involves understanding mechanisms that regulate response to replication stress in cells. It specifically concerns investigating the proteins involved in stabilization and restarting of stalled replication forks using mammalian cell cultures and *Drosophila melanogaster* as model systems. Many components of homologous-recombination (HR) mediated DNA repair are crucial during replication-stress response where their functions are mechanistically distinct and remain poorly understood. This study focuses towards understanding the functions of a novel BRCA2 and CDKN1A interacting protein (BCCIP) during replication stress and its implications in tumorigenesis.

Research

Understanding replication stress and its implication in resistance to radiation therapy:This study aims to characterize novel functions of proteins involved in DNA repair pathways during replication stress. Specifically, the function of BCCIP, which associates with both BRCA2 and RAD51 to form a multi-protein complex required during homologous recombination-mediated DNA repair, has been investigated.Study of genome wide perturbations on a single molecular level using DNA fibre analysis, showed that down regulation of BCCIPβ isoform significantly increased stalled replication forks and reduced replication recovery after hydroxyurea induced replication stress. Since the replication recovery significantly improved upon MRE-11 inhibition, further suggested that BCCIPβ is required for preventing degradation of nascent DNA strands by exonucleases. Finally, by using a modified version of the proximity ligation assay, it was demonstrated that similar to RAD51, BCCIP protein is also recruited to replication forks that have been stalled for short periods of time. Therefore, these data show that in addition to its role during HR mediated DNA repair, BCCIP plays crucial roles during replication stress. Further investigations on how replication contributes to activation of innate immune response and development of resistance in cancer cells is ongoing. The key findings are that BCCIPβ is

required for protection of nascent DNA from MRE-11 like exonucleases. It is recruited to stalled replication forks and stabilizes them in response to short term replication stress.

Education

Dr. Mehrotra is jointly guiding a PhD student; Ms. Bhawana Singh, and has two Research Fellows on the project.

Scientific Officer 'D': Dr. Sejal Patwardhan

Overview

The research in Patwardhan laboratory is focused on multifactorial regulation of cancer exacerbation. By investigating the biochemical and biophysical cues encoded by tumor microenvironment the aim is to identify key regulators at the crossroads of cancer metastasis, therapy resistance and bystander effects in lung and breast cancer models. To accomplish this, a plethora of approaches covering proteomics, genomics, cell biology and cellular biophysics have been adopted. Intriguingly, the master molecular players identified from basic research are also tested in clinical scenarios to validate their translational candidature either as probable biomarker or therapeutic targets for betterment of cancer therapy

Research

Breast cancer progression is often featured by ECM stiffening due to excess deposition and crosslinking of collagen fibres. Cancer cells secrete surplus amounts of exosomes allowing fine-tuned exchange of signals. In this project the aim is to decipher the connection between ECM mechanics and exosome secretion and its consequences with respect to biophysical properties, motility and invasiveness of breast cancer cells. Employing collagen coated hydrogel scaffolds of varying stiffness, it was established that ECM stiffening promotes exosomes secretion in breast cancer cells. Blocking of exosome secretion with the use of pharmacological inhibitor GW4869 abrogated stiffness regulated cell spreading, motility and contractility in breast cancer cells. Reciprocally, exogenous addition of stiffness-modulated exosomes triggered EMT-like morphological alterations accompanied with drastic changes in adhesion and protrusion dynamics in exosomes-treated cells culminating in enhanced motility and invasion. Quantitative proteomic analysis followed by over representation analysis and interactome studies revealed enrichment of proteins involved in cell adhesion and cell motility in exosomes obtained from cells grown on stiff ECMs compared to soft ones. Subsequent analysis revealed thrombospondin-1 (THBS1) as a key regulator of observed effects by engaging focal adhesion kinase (FAK) and MMP9. Further, depleting exosomal THBS1 abrogated the effects, confirming central role of exosomal THBS1 in ECM-stiffening induced breast cancer motility and invasion. This study was published in Biomaterials (Patwardhan et al, Biomaterials, 2021, PMID: 34808560).

In another project, attempts to discern the influence of ECM dynamics on exosome biogenesis and trafficking were made. So far, the differential regulation of various ESCRT pathways in the exosome production have been probed. The molecular switch that allows preference of a particular ESCRT pathway over other in stiff ECM has been identified. A project to understand the effect of ECM-stiffness tuned exosomes in invasion coupled metabolic reprogramming of cancer cells has been initiated.

In parallel, contributions towards a collaborative project demonstrating MMP modulated differentiation of embryonic stem cells on engineered cell derived matrices were made, and is published in Biomaterials (Sthanam et al Biomaterials, 2021, PMID: 34871878)

Education

One PhD student (Mr. Shubham Jha) and two research fellows were working and three trainees were selected during the year 2021 in this Laboratory. The faculty delivered the core course lecture to the JRF 2021 batch and was featured for author's interview in Biovigyan, Biopatrika 2021 for "Exosomes: the stiffness-tuned nano-boosters of cancer progression.

Scientific Officer 'D': Dr. Sharath Chandra Arandkar

Overview

The main aim of this laboratory is to understand the tumour-stroma cellular interaction and their role in tumorigenesis in the tumour-microenvironment. Specifically, the focus is to understand one of the major stromal cell types, Cancer-Associated Fibroblasts (CAFs) and their interaction with tumour cells. The laboratory aims to understand the generation of CAFs in the tumour-microenvironment and identify the responsible extra & intracellular factors/signalling molecules in this process.

Research

To achieve these goals, various lung cancer cell lines and patient derived Cancer-Associated Fibroblasts from collaborators have been procured. RNA-sequencing and protein secretome data from NFs and CAFs using bioinformatics tools have been analyzed. The initial data generated in this laboratory suggest that various stromal secreted factors influence tumour cell migration. Analysis revealed that many secreted proteins were differentially expressed between normal vs tumour-associated stroma. Specifically, the laboratory identified IGFBP proteins express high in lung cancer-derived CAFs. Additionally, in collaboration with Prof. Oren's laboratory (from Weizmann Institute of Science), it was observed that the missense p53 mutations promote pro-fibrotic tumour microenvironment and inhibit the immune cells from eliminating the cancer cells in Pancreatic tumour (Published in PNAS, 2021 doi.org/10.1073/pnas.2025631118).

Education

In the report year, the Scientific Officer participated in; a three-day Cancer Conference in Frankfurt, "From Molecular Research to Mechanism-based Cancer Therapy" (Virtual Meeting) organized by a German cancer consortium between August 24th-26th, 2021 and an invited talk from the Seminar Series in molecular medicine organized by the Department of Biotechnology, AIIMS, New Delhi. The Scientific Officer is also involved in teaching the basics of TME and Cancer-Associated Fibroblasts for PhD course work at ACTREC.

Scientific Officer 'D': Dr. Rohan Khadilkar

Overview

Research in the laboratory focuses on understanding the effects of organismal ageing on the stem cell – niche micro-environment with *Drosophila* as a model organism, using the hematopoietic and intestinal stem cell system to answer this biological question. Utilizing the powerful genetic toolkits in *Drosophila*, the plan is to understand how stem cell properties and the cellular signalling landscape in their environment changes upon modulation of ageing. The laboratory is also interested in elucidating whether blood cells play a regulatory role in controlling cancer induced cachexia. The laboratory plans to model various cancers using the fly model.

Research

Two approaches have been used to understand the effect of ageing on the stem cell – niche micro-environment and stem cell homeostasis. The two approaches are by a) Accelerating ageing and b) Reversing ageing (anti-ageing). The immune pathways are genetically activated in flies by using genetic mutants that have constitutive activation of the Toll and Imd immune pathways. The observation is that upon chronic immune activation (chronic inflammation), there is induction of DNA damage in the hematopoietic organ in *Drosophila* marked with gamma-H2Ax foci. This is accompanied by a concomitant increase in blood cell differentiation notably of plasmatocyte and crystal cell differentiation. In the other approach, autophagy is activated which causes an anti-ageing effect by over-expressing Atg8 protein specifically in the hematopoietic progenitor cells resulting into a pro-stem cell self-renewal effect wherein the maintenance of stem cell homeostasis is reinforced. The plan is to mechanistically understand how the signalling landscape in the niche-stem cell ecosystem changes during ageing. This will be done by using various signalling reporters that will report about the activity status of the signalling pathways. Research focus is also on understanding whether blood cells are responsible for regulating cancer induced cachexia development.

Education

Presently one PhD student; Ms. Ujjayita Chowdhury, is working in this laboratory. Six trainees were selected during the year 2021 for post-graduate dissertation. Laboratory members participated with platform and poster presentations at the National Research Scholar's Meeting – ACTREC (2021) and Indian *Drosophila* Research Conference (InDRC) -2021.

Anti-Cancer Drug Screening Facility (ACDSF)

Officer-in-Charge: Dr. Jyoti Kode

Scientific Officer 'D': Dr. K Nirmal Kumar

The Anti-Cancer Drug Screening Facility (ACDSF) at ACTREC supports the efforts of anti-cancer drug development in India, with in vitro and in vivo drug screening assays that have been developed in-house. ACDSF has over 53 human tumor cell lines, 10 murine tumor models and 38 xenograft models for accomplishing drug screening. During the year 2021, 652 compounds were received from 80 clients, two corporate R&D and 78 academic organizations, from 11 states across India. Six hundred and twenty four compounds were tested for *in vitro* activity. Twenty-one *in vivo* studies have been carried out on 28 compounds which were examined for Chronic Toxicity Study (n=1), Maximum Tolerated Dose evaluation (n=7), tumor development study (n=2) and *in vivo* efficacy assays (n= 11).

Three cancer cells lines viz. AW13516, SiHa and MDA-MB-468 were successfully transfected with Luciferase reporter construct. Validation of these three luciferase (Luc) positive cell lines is in process. One subcutaneous xenograft was successfully developed and would be used

The OIC has received two research grants for conducting mechanistic studies to evaluate and validate the anti-cancer properties of Ayurveda formulations, an invited research proposal from R.R.A. Podar Central Ayurveda Research Institute (CARI), Mumbai (CCRAS, New Delhi).

BIOINFORMATICS AND COMPUTATIONAL BIOLOGY FACILITY

Officer-in-Charge: Dr. Prasanna Venkatraman

Scientific Officer: Mr. Nikhil Gadewal

The Bioinformatics and Computational Biology Facility provides infrastructural and technical support to scientists, and students to fulfil bioinformatics requirements in their projects. The major focus of the facility is multi-omics analysis of genes, genomes, trancriptomes, proteins, proteomes, metabolites, metabolomes and other macromolecules using advanced statistical techniques of data analytics like unsupervised and supervised machine/deep learning, graph theory based approaches to solve the basic problems of regression, classification, association mining etc. Additionally, provides the infrastructural and technical support for molecular docking and dynamics studies in structural bioinformatics area. The Facility is also involved in the development and the maintenance of the biological databases, web-servers and software fulfilling broad range of interests of the scientific community.

For molecular dynamics simulation studies the Facility is well equipped with two nVIDIA Tesla A40 GPU workstations. For NGS-data analysis an access to HPC cluster (3 compute nodes comprising 2TB RAM and 108 computing cores) is provided to various laboratories of the institute. Additionally, 2 workstations, 1 webserver and 7 PCs to meet the scientific demand of the users. Facility provided short term training (3-6 months) to 5 students of B.Tech and M.Sc. for their project dissertation. Every year the Centre also organises the training/workshop for college teachers and research scholars of Mumbai and nearby institutions. This year, due to the pandemic the workshop was not conducted. Facility will also be involved in conducting credit-course for PhD students of the institute in the area of multi-omics data analysis and programming for experimentalists.

BIOPHYSICS FACILITY

Officer- in-charge: Dr. Kakoli Bose

The ACTREC Biophysics Facility houses an extensive array of sophisticated instruments for *in vitro* molecular-scale characterization of biological macromolecules with accuracy and precision. The Facility provides services to various projects, enabling the characterization of the intrinsic properties of macromolecules and their assemblies (size, shape, folding, and stability) as well as of the interactions in which they are involved (stoichiometry, thermodynamic and kinetic parameters). The Facility is equipped with Jasco J-815 Circular Dichroism Spectropolarimeter, FluroLog -3 Modular Spectrofluorimeter, Dynamic Light Scattering (DLS) DynaPro Plate Reader II and Prometheus NT.48 nano Differential Scanning Fluorimetry (nanoDSF). Along with technically sound instrumentation, the Facility also provides, if required, expertise to assist users in experimental design and data interpretation. Subject to individual requirements, either an experiment is performed for the users or help is provided towards operating these instruments independently with minimal supervision. Training on Fluorescence Spectroscopy and Circular Dichroism is also being given to the in-house users from time to time. These services are also available for students, research scholars, and scientists from other academic institutions as well as industries on payment basis. During the year 2021, besides in-house users, Facility services were also used by investigators and students from different DAE units, departments of Mumbai and other Universities as well as R&D and private organizations extensively.

BIOREPOSITORY FACILITY

Officer-In-Charge: Dr. Poonam Gera

ACTREC Biorepository Facility collects, annotates, stores, and distributes biological samples to in-house researchers for duly approved research projects. The biospecimens are collected from the Operation Theatre, Frozen Room and Surgical Pathology as well as Breast OPD. After obtaining the ethical consent from patients an accrual of tissue samples from 770 cases has been done during 2021, with a majority of samples being Head and Neck tumors, followed by Breast tumors. Other tumor types included Gastrointestinal, Neurological, etc. For all the possible cases paired normal samples were also collected and cryopreserved. In addition 73 core biopsy samples were collected from Breast OPD. Cryopreserved tissue samples were provided to 7 Principal Investigators with approved projects. Total prospective distribution was 157 and retrospective distribution was 101 during 2021.

The OIC of this Facility with an expertise in Pathology is a Co-investigator on different Projects at ACTREC and has published research articles in peer reviewed journals.

COMMON FACILITIES

Officer-in-Charge: Dr. Sanjay Gupta

The Common Facility operation and maintenance offer supportive services to researchers at ACTREC. All the Facilities are well-equipped with high-end research equipment and are located on different floors and wings of Khanolkar Shodika. It has chemi-Doc machines, ultra-pure water purification systems, a radioactive handling room for 32P and 125I, bacterial culture hoods, ice-making devices, and multiple cold rooms. ACTREC procured four Hot Air Ovens, and two water purification systems (Raphile), through an Institutional fund to cater to the growing needs of researchers. Along with these, autoclaves and ovens in Laboratories of individual Research Groups are also maintained by the technicians of the Common Facility. All the major equipment under Common Facility is covered under an Annual Maintenance Contract. The Facility is committed to provide safe, sustainable, efficient, and reliable service.

COMMON INSTRUMENT ROOM (CIR)

Officer-in-Charge: Mr. Uday Dandekar

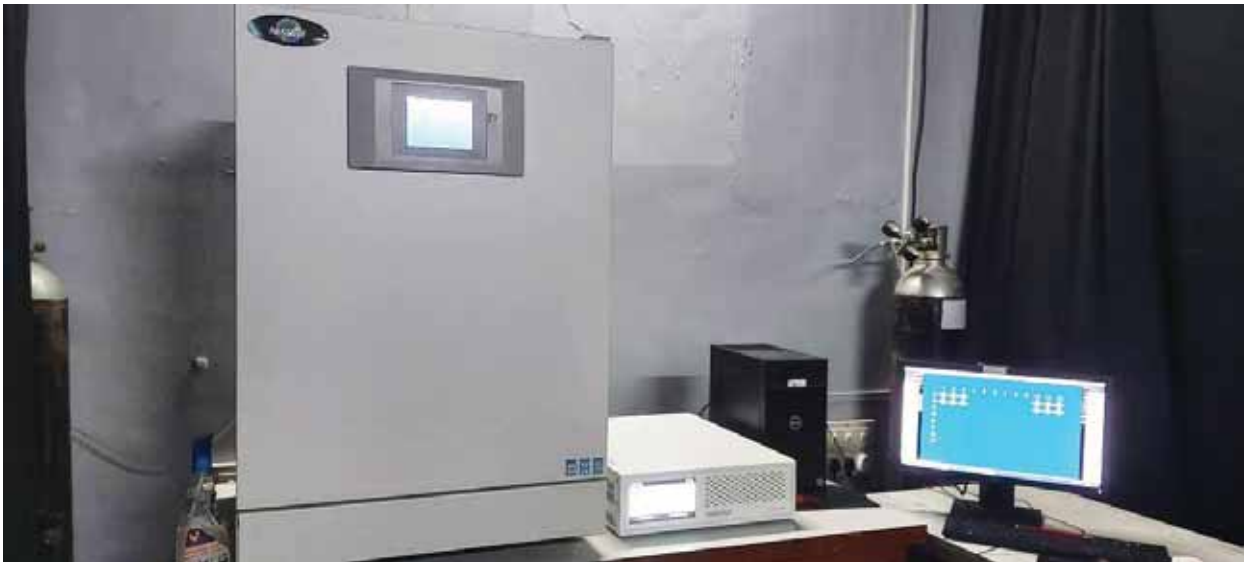
Over the past 44 years, the Institute has maintained a “Common Instrument Room” as a Facility housing vital scientific equipment that are routinely required by the Centre’s staff and students, to optimize their utilization and make them available round the clock on all days of the week - including holidays. The Facility also provides technical guidance and support to various research laboratories in the procurement and maintenance of their capital equipment. Technically qualified staff members attached to this Facility handle routine maintenance of all the equipment and render help to the end users, thus ensuring proper use of the equipment. Requisite spares for centrifuges, low temperature freezers, CO_2 incubators, etc. and consumables like centrifuge tubes, thermal paper rolls, etc. are procured on a regular basis and stored in stock in the facility to reduce downtime of the equipment. In all, 110 number of equipment are currently housed in this Facility. Equipment like UV-VIS Spectrophotometer, Ultra Low Temperature Freezers, Tissue Homogenizers, Biosafety Cabinets, Digital Anemometer, Gel Documentation System, were procured and installed.

DIGITAL IMAGING FACILITY

Officer-in-Charge: Dr. Murali Chilakapati

The ACTREC Digital Imaging facility (ADIF) is a state-of-the art Imaging Facility equipped with several advanced imaging platforms. At present, the facility comprises of the following microscopes: (1) LSM780 confocal microscope (Carl Zeiss), (2)Leica SP8 confocal microscope with STED super resolution system, (3) 3i Spinning Disk confocal microscope, (4)Axio Imager.Z1 upright microscope (Carl Zeiss), (5) Leica DMI600B microscope, inverted wide field microscope, (6)Nikon Ti Eclipse inverted wide field microscope, (7) Axiovert 200M inverted microscope and (8) the newly installed, Incucyte - Live Cell Analysis system with Incubation (Sartorius).

The Incucyte Live-Cell Analysis System is a real-time quantitative live-cell imaging and analysis platform (Image)that enables visualization and quantification of cell behavior over time, by automatically gathering and analyzing images around the clock within a standard laboratory incubator.



Incucyte Live-Cell Analysis System

The Facility provides microscopic acquisition, processing and analysis services for wide-field and the different confocal platforms listed above, to a total of 23 laboratories and around 60-70 users which include the ACTREC faculty, students and external users. Imaging of a variety of samples like adherent / non-adherent cells, tissues, tooth, skin, hair follicles etc. is done.

Analysis help is provided using different software, like LSM 5, ImageJ, Axiovision, Zen2008 and 2012, LAS AF, and Slidebook6. Training is imparted by the staff of the Facility, in basic and advanced light microscopy techniques, to in-house Faculty and students, as also demonstration and explanation of microscopes of the Facility, to students and visiting scientists from other institutions. The Facility remains busy throughout the year and the usage of Confocal Systems remains extremely high especially for the LSM780, Leica Sp8 systems.

DNA SEQUENCING FACILITY

Office-in-Charge: Dr. Pradnya Kowtal

The DNA Sequencing Facility has two automated DNA sequencers - an eight capillary Genetic Analyzer 3500 and a 48 capillary Genetic Analyzer 3730 from Applied Biosystems. Both these machines are used for DNA sequencing and fragment analysis. The machines are operated by one Scientific Assistant. The average turnaround time to give out data is one working day after receiving samples. During the year 2021, the Facility carried out 4574 sequencing and fragment analysis reactions. The Facility was used by researchers from ACTREC and other DAE institutes. Various research laboratories have used the Facility services to confirm cloning of gene inserts, shRNA and variants induced by site directed mutagenesis while diagnostic laboratories have analyzed variants in genes implicated in sporadic and inherited cancers.

ELECTRON MICROSCOPY FACILITY

Officer-in-charge: Dr. Sharada Sawant (January to September 2021)

Dr. Sorab Dalal (October to December 2021)

The theme of Electron MicroscopyFacility is to promote, support and initiate research and training in the applications of Transmission Electron Microscopy (TEM). This facility at ACTREC, **maintains** a JEOL JEM 1400Plus TEM that works at 80-120KV with 0.2 nm resolution and magnification up to X 12, 00, 000, suitable for biological, polymer, Nano gold and material science applications. This system has been commissioned along with 3D Tomography, EDS and STEM. The Facility carries out routine TEM sample preparation including fixation, resin block making (solid tissues, monolayer cell cultures and single cell suspension), semi-thin sectioning followed by ultrathin sectioning, staining, scanning and imaging. In addition, the Facility also provides service of special techniques such as, Negative staining and immuno-gold labeling.

During 2021, the Facility processed EM samples for 28 in-house users and 18 external users majorly from BARC, Reliance Life Sciences, TIFR, Hyderabad University and other educational Institutes from Mumbai and Pune. A total of 169 tissue and monolayer cell culture specimens were processed for araldite/epon blocks making. After polymerization, 397 blocks were cut for semi-thin sectioning to locate the area of interest and further 227 selected blocks were cut for ultrathin sectioning.A total of 441 grids were contrasted using uranyl acetate followed by lead citrate and scanned under EM and captured 17080 microphotographs at 120 kV. In addition, the Facility has processed 58 samples for negative staining and prepared 108 grids which further scanned and captured microphotographs. Moreover, quantitative analysis of EM data was done using iTEM software for 7 working groups. Furthermore, the interpretation of the obtained results on the basis of ultra-structural observations was done for all the users.

During the report period, demonstration of the Electron Microscope was given to students on educational visits and visitors from national and international institutes on various occasions. Also, lecture and demonstration was given to the JRF batch 2020-21.

FLOW CYTOMETRY FACILITY

Officer-in-Charge: Dr. Sanjeev Waghmare

The Flow Cytometry Facility is a centralized facility, used by researchers and clinicians from ACTREC in analyzing and sorting the cells in Flow based experiments. The Facility extends technical support to students in experiment and fluorochrome panel designing, interpretation of data, also provide advice in sample preparation and troubleshooting, whenever required. In 2021, the Facility was used by 87 scientists and students from 22 laboratories.

The Facility is equipped with: two analyzers; FACS Calibur (1 laser, 3 colors) and Attune NxT (4 lasers, 16 color), two Cell Sorters; FACS Aria-III (5 lasers, 18 colors) and FACS Aria-I (3 lasers, 11colors), which can perform 3-18 color analysis and up to 4 –way sorting. The analysis is done using software – FACS Diva, Cell Quest Pro, Flow Jo, Attune NxT, FCAP Array and Modfit.

The research applications carried out on routine basis include Surface and Intracellular staining like Immunophenotyping, DNA content studies- ploidy determination, Cell cycle analysis, S-phase detection by BrdU staining, Stem Cell Analysis- dermal stem cell analysis, Side cell population, Apoptosis studies, detection of mitochondrial membrane potential, detection of fluorescence proteins like GFP Turbo Red , functional assays like proliferation assay, oxidative burst analysis, intracellular cytokine analysis, cytometric bead array assay for detection of cytokines, 4-way live cell and single cell sorting.

The Facility also offers its services to investigators from other academic Institutes and private organization on payment basis. Demonstrations and training on request were conducted for visiting clinicians, scientists and students. The Facility organized a Hands-on Workshop on “Multicolor Analysis” on 16th – 17th December, 2021 in collaboration with ThermoFisher Scientific.

HISTOLOGY FACILITY

Scientific Officer 'H': Dr. Arvind Ingle

The Histology Facility provides to the Centre, services comprising of : (a) slides of unstained/ haematoxylin and eosin (H&E) stained histology sections of animal tissues including bone/ tumor samples, (b) logistic support for frozen sectioning of human/ animal tissues, and (c) blocks of multiple tissues by pecking method using a microarray machine. During 2021, the facility received 5455 tissue samples in fixative and 933 human and 1017 animal paraffin blocks, and post- processing, supplied 7171 stained and 20071 unstained slides to 17 research laboratories. In addition, 383 tissues were processed for cryo-sectioning, and 383 H&E stained and 1304 unstained slides were supplied to 9 research laboratories.

LABORATORY ANIMAL FACILITY (LAF)

Officer-in-Charge: Dr. Arvind Ingle

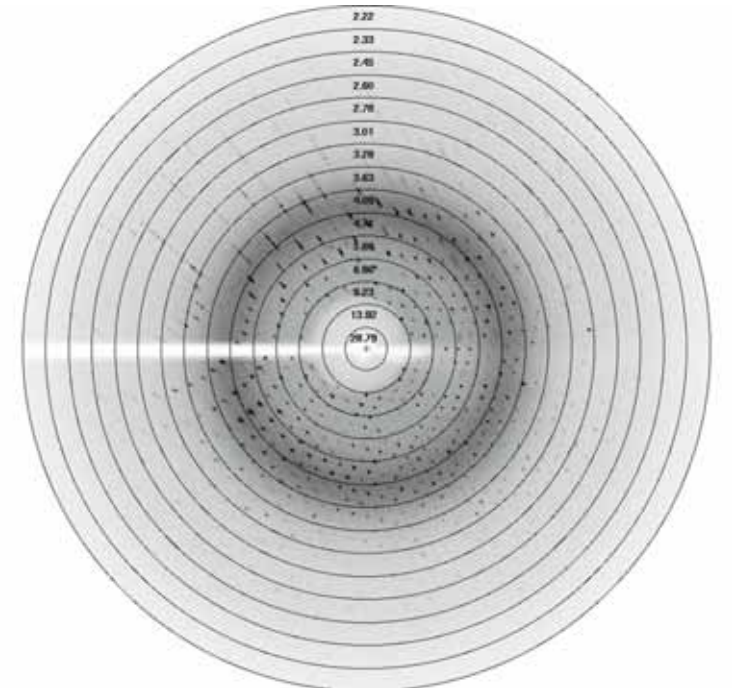
Scientific Officer 'E': Dr. Rahul Thorat

The Laboratory Animal Facility (LAF) aims to breed, maintain and supply laboratory animals to the research groups of the Centre. During the year 2021, LAF undertook planned breeding of 10 (normal strains), 1 (Nude), 1(SCID), 1 (hybrid), 50 (Transgenic/ Knock-Out strains/sub-strains) of mice, 1 rat and 1 hamster strain, and supplied normal (6896), Nude (57), NOD SCID (865) mice, 18 rats, 988 hamsters to 31 researchers against 107 IAEC-sanctioned research proposals. Towards quality control, LAF examined 221 stool/ animal samples and 840 food, water, pulses, bedding material and room air samples for routine microbiological testing, 539 hair/ stool/ cellophane samples for clinical-pathology, 34 samples for serological detection of 5 rodent pathogens from 15 strains, and carried out PCR-based tests for 12 infectious agents using 56 random samples from 15 different strains. For genetic purity, biochemical marker testing of 40 mice from 8 strains, and PCR based tests for 20 microsatellite markers on 20 DNA samples from 10 mice strains; 5 microsatellite markers on 2 DNA samples from 1 rat strain was done. Skin grafting of 32 mice of 8different strains and 4 rats of one strain was completed. Flow Cytometry was used to assess the T- and B-cell profile in 18 blood samples of Nude/ SCID mice, as also control BALB/c and Swiss mice. In the rodent germplasm freezing program, cryopreservation of rodent sperm and *in vitro* Fertilization (IVF) using these cryopreserved Spermatozoa has been achieved. Sperms were cryopreserved from 9 different mouse strains in 90 nos. of straws. In 2021, LAF supplied normal (8541), Nude (203), SCID (712) mice, 10 rats and 1215 hamsters as breeding nuclei/experimental animals to 20 CPCSEA registered Indian organizations, and provided microbiological monitoring services to 03 national organization. The senior faculty accepted 4 MSc students for dissertation in 2021. The senior faculty has been nominated as College Council of ICVP; Chairman, Education Committee, ICLAS, served as Editorial Board Member of Chinese and Korean Laboratory Animal Science Journals and has been selected as Diplomate, ICLAM by the Indian College of Laboratory Animal Medicine in 2021.

MACROMOLECULAR CRYSTALLOGRAPHY AND X-RAY DIFFRACTION FACILITY

Officer-in-Charge: Dr. Ashok K Varma

Macromolecular and X-ray diffraction Facility has acquired and maintains an excellent Microstar Microfocus Rotating Anode X-Ray Generator, High Brightness Multilayer Optics, and Imaging Plate Detector for X-Ray Diffraction and also robotics for crystallization. The Diffraction Facility is functional and provides support to users from ACTREC and other institutions since the year - 2012. Most of the users are well trained to operate the robotics. In the year- 2021, a total of 61 crystals were tested by ACTREC investigators. However, 7 complete data set were collected for structural analysis. The major users from ACTREC are Varma, Prasanna and Bose Laboratories. The workstations with the required software, installed in the Facility are used for data processing, structure solution and refinement. On the occasion of “Azadi Ka Amrit Mahotsav”, the Facility trained (virtual) faculty and research scholars from academic institutions of the country and also provided offline training to research scholars registered for PhD (HBNI).



X-ray diffraction pattern obtained from Facility-ACTREC

MASS SPECTROMETRY FACILITY

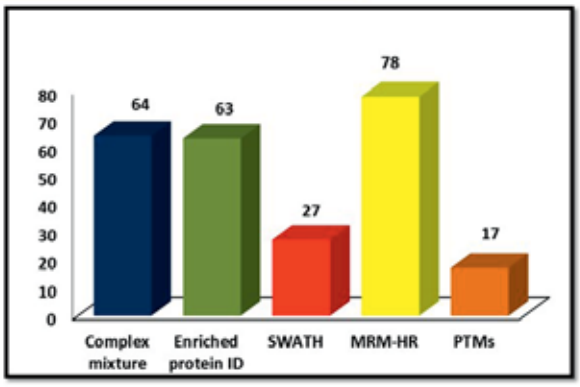
Officer-in-Charge: Dr. Rukmini Govekar

Scientific Officer 'D': Mr. Shashadhar Dolas

Mass spectrometry facility at ACTREC houses a Nano-LC (ABSCIEX, Eksigent)-ESI-Q-TOF (ABSCIEX, Triple TOF 5600 plus) mass spectrometer. Varied applications such as, profiling of complex protein mixtures (64 samples), identification of enriched proteins (63 samples), and label free quantification (SWATH analysis) complex protein samples (27 samples), MRM-HR targeted proteomics (78 samples) and for PTMs determination (17 samples) have been carried out on this platform. The Scientific Officer attached to the facility demonstrated the working of nLC-ESI-QTOF and data analysis to the JRF student's batch of year-2020 and batch of Year-2021 on January 5th 2021 and October 14th 2021 respectively. Demonstration was conducted on nLC-ESI- QTOF to the team of delegates from NAAC Committee on March 4th, 2021.

Mass Spectrometry Facility, ACTREC

nLC-ESI-Q-TOF, Model: 5600 Plus, SCIEX, USA



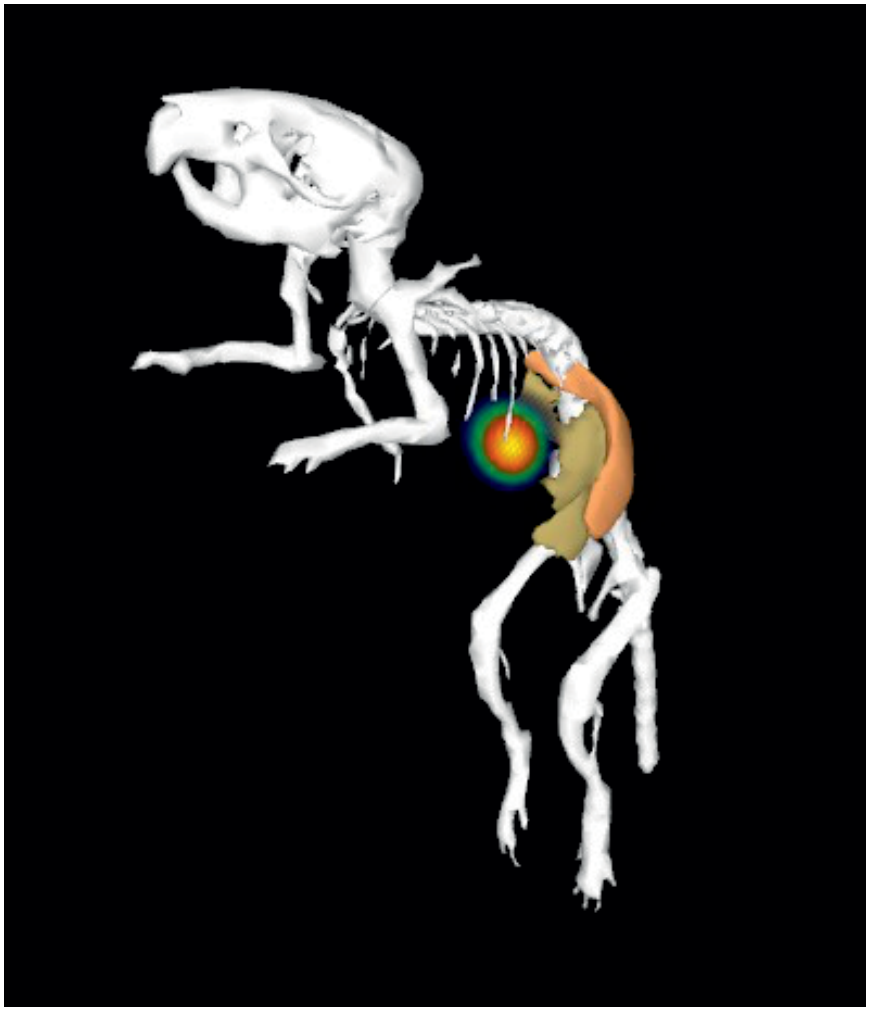
Sample Analyzed in Year 2021

MOLECULAR IMAGING FACILITY

Officer-in-Charge: Dr. Abhijit De

Established in 2013, Molecular Imaging (MI) core facility has completed 8 years successfully. The core provides extensive support to experimental evaluation of various facets in cancer biology, such as therapeutic delivery, treatment response, disease relapse, distant metastasis, material bio-distribution, autophagy and other research questions addressed. MI enables simultaneous visualization and quantitation of cellular processes at the molecular or genetic level in real-time, and has received world-wide recognition as a powerful tool for translating basic research findings to the clinic. Preclinical orthotopic xenograft models developed here are of important cancer types for human breast, brain, ovary, lung, pancreas and lymphomas. Besides the in-house investigators, faculty from institutions like IIT Bombay, IISER Pune and BARC benefitted using this facility and thus expanded the scope of interdisciplinary research for ACTREC investigators in finding solutions for cancers of their interests. Altogether, 17 PhD thesis students (5 students in 2021) have completed their degree by using data generated from this Facility.

The Facility has one IVIS Lumina II and one IVIS Spectrum imaging system. Other necessary infrastructure accessories like gas anesthesia systems,data back-up and computer terminals for imaging data analysis were added for optimal operation using intramural as well as extramural funding supports received by involved investigators. The installed systems offer fast scanning of multiple mice or rats emitting photonic signals such as bioluminescence, near-infrared fluorescence and Cerenkov luminescence. The systems have integrated heated stage required for maintaining body temperature of mice during non-invasive scanning procedure; fast scan performance for photon signals primarily in the range of 500–800 nm from tissue culture plates or tubes or from inside the live mice sources can be captured. The excitation/ emission filters accommodate majority fluorescent dyes or fluorescent proteins in the green to near-infrared spectral range. Other important features of IVIS Spectrum system is spectral unmixing and 3D single-view, diffuse tomographic reconstructions (DLIT and FLIT mode) capacity. To date, the data generated from this Facility has led to high impact publications in leading international journals and contributed in filing several Indian patents. The Facility regularly participates in educational visits organized by the institute.



3D-reconstructed projection view of a mice bearing bioluminescent orthotopic xenograft using human pancreatic cancer.

NEXT GENERATION SEQUENCING FACILITY

Officer-in-Charge: Dr Rajiv Sarin

Scientific Officer 'E': Dr Poonam Gera

The Next Generation Sequencing Facility at ACTREC undertakes comprehensive germline genetic analysis for inherited cancer predisposition using Next Generation Sequencing, Sanger Sequencing and MLPA. Comprehensive Germline NGS Genetic Testing services were started by this facility in May 2021. It is the only laboratory in any of the Indian Government institutions providing Comprehensive Germline NGS Genetic Testing services and serves as the National Referral Laboratory.

The 26 gene SOPHiA NGS germline panel was standardized and introduced as a NGS test in service mode. The libraries were prepared in-house and run on MiSeq machine in ACTREC. Sanger sequencing is offered as a service for 22 genes and MLPA for 10 genes. After initiating the genomics diagnostic services in May 2021, a total of 642 samples were tested for NGS multigene hereditary cancer panel and 157 cases by Sanger sequencing. The NGS failure rate was <%1, thereby reducing wastage and cost per test. The germline mutation spectrum in terms of the genes mutated and type of mutations in consecutive cases and the genotype – phenotype correlation data has been presented in genetics and oncology meetings and the knowledge shared has helped other laboratories to develop and validate their tests and in variant reclassification.

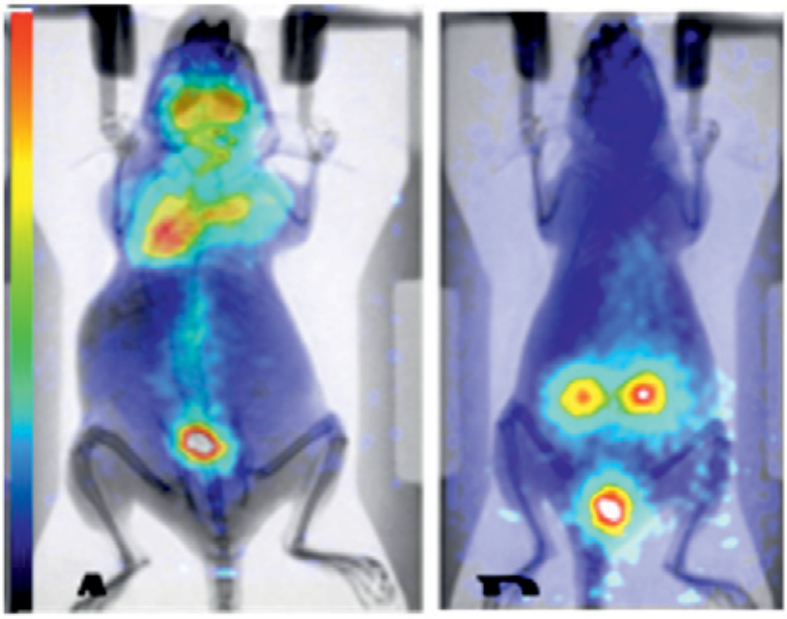
SMALL ANIMAL IMAGING FACILITY

Scientific Officer 'G': Dr. Pradip Chaudhari

Scientific Officer 'D': Dr. Kiran Bendale

The major research focus of this Facility is on preclinical animal imaging and research on radiopharmaceuticals. Various diagnostic radionuclides such as Technetium-99m, and Fluorine-18 complexes are evaluated for their utility in imaging and monitoring cancer xenografts in various mouse models. Several PET, SPECT and CT studies involving rodents are performed for research projects from ACTREC, other DAE units, academic institutes and pharmaceutical industries. The Facility is also involved in diagnosis and treatment of pet animals diagnosed with spontaneous cancers. These cases are being referred to animal oncology clinic for further management. During 2021 (Jan-Dec), 189 referral cases underwent major or minor surgeries, single or combination drug chemotherapy and radiation therapy or a combination, as per the clinical requirement. The biological specimens were preserved in the animal cancer bio-repository for comparative research. The small animal imaging facility is utilized for preclinical PET, SPECT and CT imaging by various basic and translational research scientists from within and outside ACTREC. In 2021 the Facility has included two new systems Beta-Eye for PET studies and Gamma-Eye for SPECT studies. Six studies; majority being proof-of-concept studies, normal tracer uptake studies and in vivo tumor uptake studies wherein the expertise is in designing imaging protocols, development of animal models, data quantitation and analysis, have been initiated. The research component in preclinical imaging is validation of xenograft mouse model using preclinical imaging modalities PET and SPECT. In 2021, Ga 68 labelled compound PET studies and lung metastasis imaging studies were conducted. The research focus of this Facility is to deliver complete cancer care for pet animals suffering from spontaneous cancer and develop focused research areas on comparative aspects of animal and human cancers. Animal cancer bio-repository maintains biological material, which is received during the course of diagnosis and treatment. Bio-repository has fresh frozen tissue, blood, formalin fixed tissue and FFPE tissue. These animals are seen as a suitable alternative model system because of closer proximity to humans. The Facility organized the 10th Hands-on Workshop on "In Vivo Preclinical Imaging and Drug Discovery" from December 21- 23, 2021. This Hybrid workshop was attended by 151 national and international delegates.

Two students were accepted for training by the OIC in 2021.



18F-FDG PET scan of mouse with lung metastasis imaged

Ga68-EDTA dynamic PET scan showing kidney uptake

CENTRE FOR CANCER EPIDEMIOLOGY (CCE)

Dr. Sudeep Gupta **(Director, ACTREC)**

Dr. Rajesh Dikshit **(Director, CCE)**

Dr. Pankaj Chaturvedi **(Deputy Director, CCE)**

Department of Preventive Oncology

Dr. Sharmila Pimple (OIC)

Dr. Gauravi Mishra

Dr. Subita Patil

Division of Medical Records & Cancer Registries

Dr. Atul Budukh (OIC)

Division of Hospital Based Cancer Registry and Patterns of Cancer Care

Dr. Amey Oak (OIC)

Dr. Sivaranjini. K

Division of Molecular Epidemiology & Population Genetics

Dr. Sharayu Mhatre (OIC)

Unit of Cancer Surveillance for Special Population (CSSP)

Dr. Ganesh B

Unit for Strengthening Cause of Death Data (USCOD)

Dr. Rajesh Dikshit

Dr. Pankaj Chaturvedi

DEPARTMENT OF PREVENTIVE ONCOLOGY

Medical Staff Members

Professor and Physician (OIC) : Dr. Sharmila Pimple
Professor and Physician: Dr. Gauravi Mishra
Associate Prof. & Physician: Dr. Subita Patil

Overview

Department of Preventive Oncology is a designated WHO Collaborating Centre for Cancer Prevention, Screening and Early Detection (IND 59), Region SEARO, since 2002 with five main thrust areas:

- **Information, Education and Communication (IEC):** Programmes for risk prevention, life style modification and improving health seeking behavior such as Tobacco & Alcohol Cessation towards early detection of common cancers in India.
- **Clinic and Community-based, Opportunistic-Screening:** Programmes for Screening of Common Cancers and risk assessment for High Risk cancers.
- **Health Manpower Development:** For supporting the cancer control programmes of the Centre and State Governments.
- **Advocacy, NGO-Training and Networking:** For Dissemination of cancer control activities
- **Research**: For developing newer methods and strategies for the prevention and early detection of common cancers in India.

COVID 19 Vaccination Centre: The department played pivotal role in implementation of

vaccination campaign in the fight against Covid-19 pandemic which Tata Memorial Hospital started. Tata Memorial Centre has started Government Vaccination Center on 23rd March 2021 for general population and its own Private Vaccination Center on 2nd June 2021 to vaccinate the TMH employees and their dependents, employees of various corporate companies and their family members and beneficiaries through Co-Win app. The beneficiaries were 78445 till 31st December, 2021.

Service

The Department conducts Preventive Oncology Hospital and Community Based Screening Clinics. A total of 7171 new patients were registered for Preventive Oncology services and an additional 6888 were registered for follow-up screening services. A total of 14059 individuals' availed Preventive Oncology screening services in the year 2021.

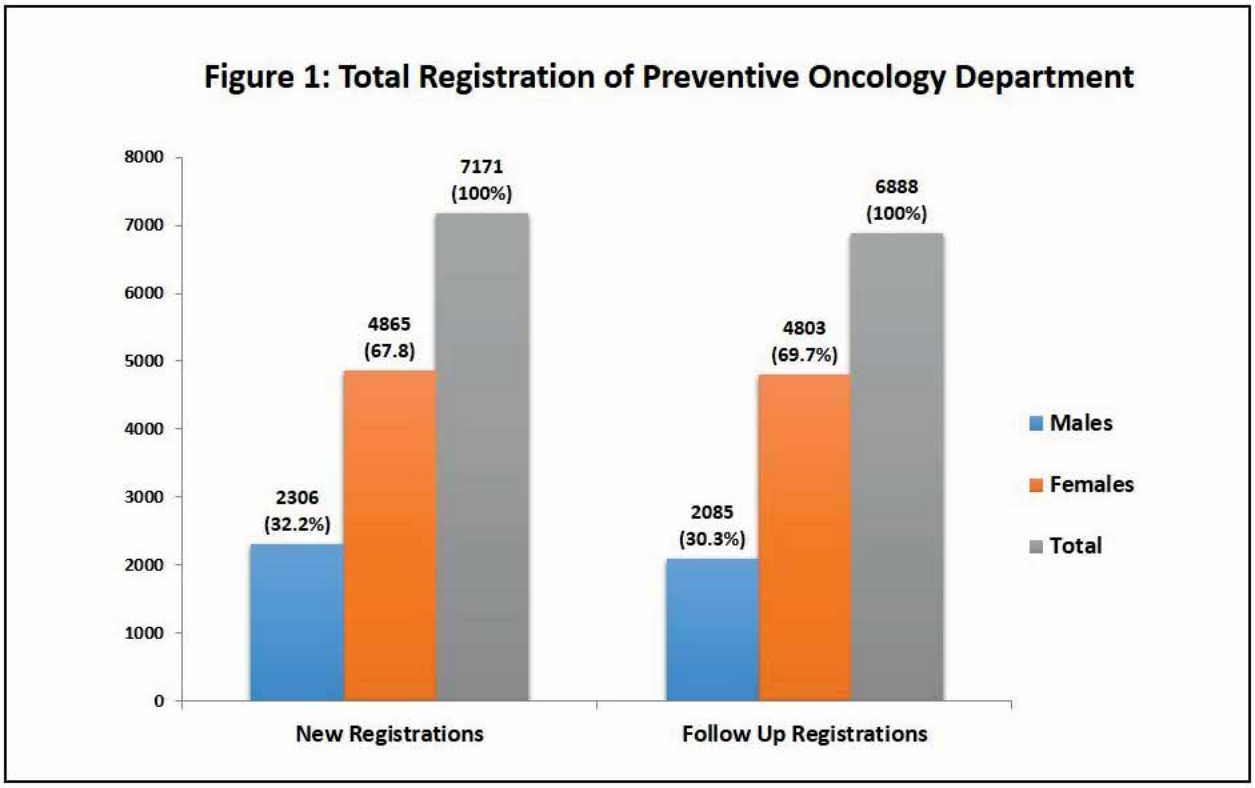


Figure 2: Total individuals screened for Oral, Breast and Cervical cancer in OPD for the year 2021

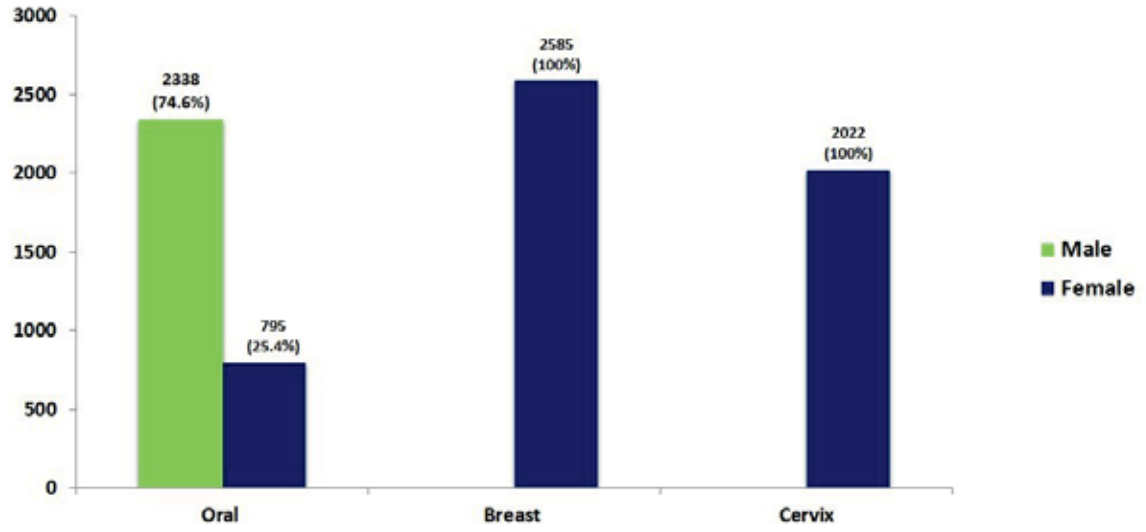
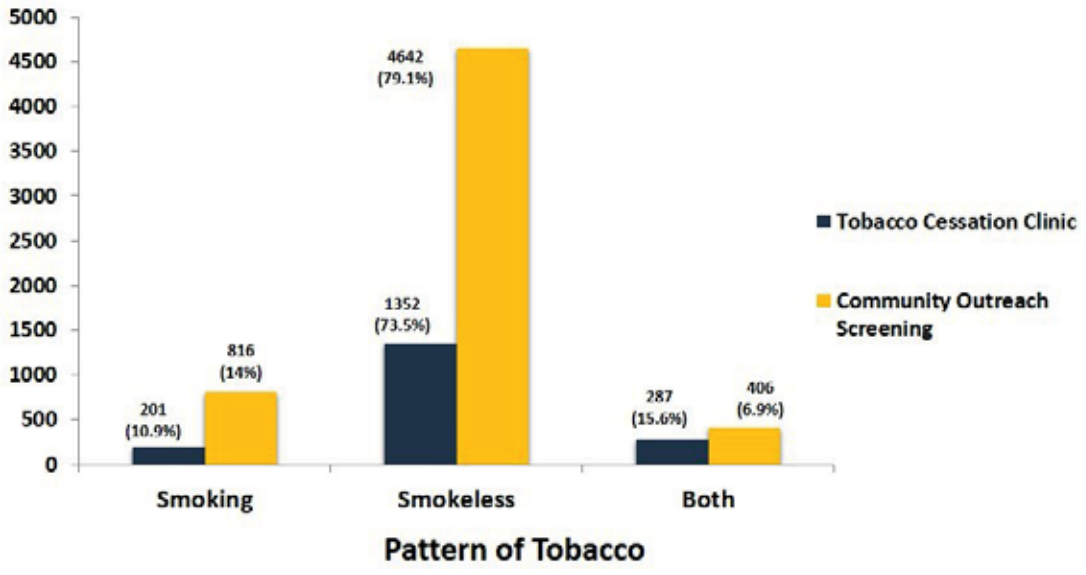


Figure 3: Distribution of tobacco consumed by the beneficiaries attending the Tobacco Cessation Clinic and Community Outreach.



Research

Research Projects: On-going and Completed during the year 2021

Sr. No.	IEC Project No.	Title of the Study
1	3450	Investigating Human Papillomavirus (HPV) Infection and HPV-associated Disease in Indian Men who have Sex with Men who are HIV-positive
2	3835	Prevention and Screening Innovation Project Toward Elimination of Cervical Cancer
3	3361	Primary screening of high risk HPV DNA by a low cost molecular HPV test for early detection of cervical precancers and cancers among women in urban and rural community of Maharashtra.
4	562	Randomised Trial of 2 Versus 3 Doses of HPV Vaccine in India
5	268	Molecular genetic analysis of clinically high risk oral leucoplakia to identify potentially high risk lesions.
6	1686	Acceptability and Validity of Self Sampling For High Risk HPV Detection Among Women In Maharashtra
7	3826	Women Empowerment-Cancer Awareness Nexus (WE-CAN): An Implementation Research Study of Cervical Cancer Prevention through HPV Self-Sampling and Education in India
8	3786	Preventing Cervical Cancer in India through self-sampling (PCCIS)
9	3374	Comparative performance evaluation of Artificial Intelligence (AI) based visual inspection test (AI_VIA) with Primary Health Worker administered VIA (PHW_VIA), HPV DNA test and cervical cytology to detect cervical pre-cancer lesions.
10	3051	A Phase-II/III, Partially Double-blind, Randomized, Active-controlled, Multicentric Study to Assess the Immunogenicity and Safety of SIIPL's qHPV Vaccine Administered Intramuscularly in Healthy Volunteers According to a Two-dose Schedule to Cohort 1 (Girls and Boys Aged 9-14 years) and a Three-dose Schedule to Cohort 2 (Women and Men Aged 15-26 years) as Compared to Merck's HPV6/11/16/18 vaccine (Gardasil®)
11	3231	Collaborative Action for control of Cancer and other Non-Communicable Diseases among Mumbai Police

12	1996-I	Early Detection of Common Cancers in women in India." (funded by RO1 grant of the NIH, USA; Grant # 5RO1 CA 074801-16)
13	3745	Training and Technical Validation of Automated Visual Evaluation (AVE) for Cervical Screening
14	3875	A retrospective cohort study on the prevalence and determinants of Human Papilloma Virus (HPV) infection and Cervical Intraepithelial Neoplasia (CIN) and comparative evaluation of visual inspection with acetic acid, cytology and HPV testing as screening methods to detect CIN among women living with HIV/AIDS (WLHA) in Mumbai, India.
15	3574	Living conditions, social determinants and experiences of COVID-19 infection among employees at a tertiary-referral cancer centre – A mixed methods study."
16	3447	A survey for knowledge and implementation of preventive steps for early cancer detection in women affiliated with Tata Memorial Centre

Education

A) Training programs / Workshops / CMEs conducted by Dept. of Preventive Oncology during the year 2021:

The Department of Preventive oncology conducted a total of 10 training programmes and trained 430 medical and paramedical workers on the cancer screening and awareness.

Sr. No.	Topic	Date	No. of delegates/ Participants
I)	**Annual Flagship Training Webinars:**		
	Webinar on Health Education & Promotion for Para Medical Personnel	February, June 2021	39
	Webinar on Principles and Practice of Cancer Prevention & Control	March, July 2021	37
	Webinars on Tobacco Control & Cessation	May - September 2021	49
II)	**Specialized Training Programs:**		
	A) Workshop on prevention and control of Common Cancers and Webinars Capacity Building:		
	Training programme on Early Detection & Prevention of Oral, Breast & Cervical Cancers" – Virtual webinar series twice in a week for Medical & Paramedical staff, Homi Bhabha Cancer Hospital & Research Centre, Muzaffarpur	12th May 2021 to August 2021	36
	Workshop on Cancer Prevention, Screening & Early Detection for Medical Officers of State Cancer Hospital Community Medicine Dept. & District Health Officials, Jalna, Aurangabad	29th October 2021	200
	B) Training programs for COVID 19 Awareness, Prevention and Control:		
	Webinar on COVID-19 Vaccines-current Scenario, Myths and Facts" for Medical Officers &Health Team of Police Hospitals and Police Dispensaries	February 2021	49
	TMH Administrative staff and Nursing staff	March, April 2021	20
III)	**Lectures & Guest lecturers conducted by Dept. of Preventive Oncology during the year Jan to Dec 2021:**		
	Details	**Date**	**Beneficiaries**

	• Primary Prevention: Guidelines for cancer detection, general measures, warning signs of cancer & screening of breast cancer	10/06/2021	15
	• Secondary Prevention: Early diagnosis and screening of cervical cancer & screening for oral cancer	15/06/2021	15
	• Role of oncology nurses in early detection and screening	16/06/ 2021	20
	• Health hazards and tobacco use, tobacco cessation & smoking and its hazards	17/06/2021	25
	• Types of common cancers & its prevalence, Early detection & prevention of oral, breast & cervix cancer	13/07/2021	08
	• Health hazards of tobacco & tobacco cessation	20/07/2021	08
	• Types of common cancers & its prevalence, Early detection & prevention of oral, breast & cervix cancer &Tobacco Cessation	26/08/2021	06
	Dr Sharmila Pimple, Invited Speaker:		
	1) "Preventive aspects of common cancers"	04/02/2021	51
	2) “Symposium on Risk Factors of Cancer”	22/02/2021	120
	3) “The Role of Public Health Law in Cancer Prevention”	12/05/2021	150
	4) “Update on HPV Vaccine”	24/08/2021	35
	5) “Diet Nutrition and Cancer: Role of youth in cancer prevention in India. Carcinogenesis Foundation (USA & INDIA)”	27/08/2021	200
	6) “Empowering Preventive Healthcare for Women – Engaging the Community in HPV Vaccination”	27/09/2021	65
	7) “Prevention_ Screening for oral Cavity Cancers”	09/10/2021	56
	8) Orientation program for PO set up at State Cancer Hospital, Aurangabad & Jalna	28/10/2021	200
	9) “Elimination of Cervical Cancer: From Research to Practice”	05/12/2021	180

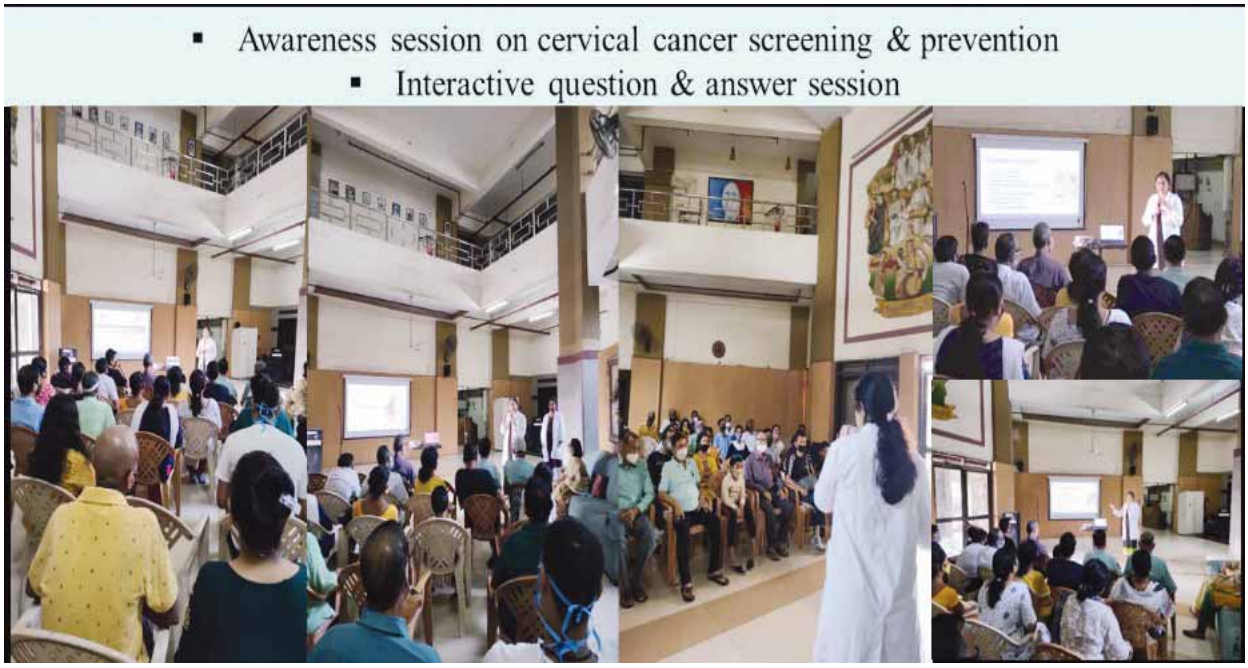
	10) Panelist on WCI Conference "Year In Review: Gynecological Cancer". Women's Cancer Initiative - Tata Memorial Hospital"	19/12/2021	250
	Dr Gauravi Mishra, Invited Speaker:		
	1) Expert for discussion on "Measures to control tobacco use in Rural set up" at Assam Cancer Care Foundation	23/06/2021	National Conference
	2) "Study of Cancers and Non-Communicable diseases among Police personnel in Mumbai, India"	18/07/2021	International Conference
	3) "Gynaecological malignancies"	29/07/2021	International Conference
	Dr Subita Patil, Invited Speaker:		
	1) Faculty "Medical Cause of Certification of Death (MCCD) E Learning Course" onOmnicuris , a joint collaboration of CCE, TMC & CDC Foundation, USA.	August 2021	36
	2) "Overview of screening , achievements & challenges for Dept. of Community Medicine, AFMC, Pune"	27/08/2021	14
	3) "Geriatric Infections & Management" during Certificate Course in Hospital Infection Control	06/10/2021	09
	4) National Virtual CME on "Prevention and Care of Breast Cancer", MPMMMCC, Varanasi.	20/10/2021	100
	5) International Forum on Cervical Cancer Elimination by Taylor's University, Malaysia as a Panellist & Speaker on "Screening & Prevention Strategies of Cervical Cancer Elimination in India"	13/11/2021	150
	6) State Level Virtual webinar "Importance of good quality COD data : Global Perspective and MCCD case examples" for Jalna & Aurangabad district, Maharashtra State.	30/11/2021	60
IV)	**Cancer awareness programs in the community / virtual mode to sensitize people about the causes and risk factor of common cancers and the need of screening to detect cancer at early stage**		

	Details	No. of organizations	Beneficiaries
	• Common cancer awareness programs in community / Cancer screening camps	354	4884
	• Common cancer awareness programs through webinars	22	1527
	• Cancer awareness through Radio talk	01	~1000
V)	**Observers / Trainees trained**	13	57

Glimpse of Various Activities Conducted by the Department of Preventive Oncology:

Capacity building training program at State Cancer Hospital Community Medicine Dept., Aurangabad & District Health Officials, Jalna.

Cancer Awareness Program at Assam Bhavan



Cancer awareness session for community women on eve of World Cancer Day 4th Feb 2021

Cancer awareness session in community on eve of International Women's Day 8th March 2021

Cancer awareness session on Health Hazards of Tobacco for community women on eve of World No Tobacco Day 31st May 2021

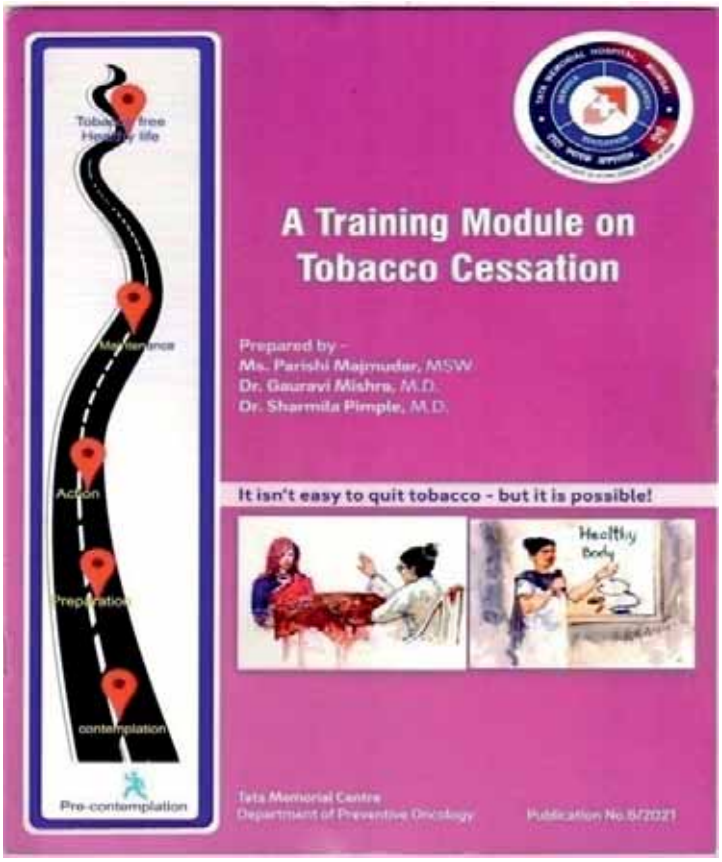
6) Conferences / Seminars:

I) A Press Conference was conducted on the eve of World Cancer Day, on 4th February 2021, in RD Choksi Auditorium, 2nd floor, Golden Jubilee Block, Tata Memorial Hospital. Theme for the same was "TOGETHER, WE CAN: TOGETHER, ALL OUR ACTIONS MATTER".

On this occasion India Post (Mumbai Region) released a special cover on 'World Cancer Day2021' in collaboration with the Tata Memorial Centre, Mumbai to create awareness on the cancer and help people to imply the preventive measures for the same.

II) Press conference was organized to release findings of the Clinical Breast Examination population based RCT research paper published in BMJ on 25/02/2021.

III) 'A Training Module on Tobacco Cessation' has been developed by Department of Preventive Oncology, on the occasion of World No Tobacco Day.


Tobacco free
Healthy life
Maintenance
Action
Preparation
contemplation
Pre-contemplation
A Training Module on
Tobacco Cessation
Prepared by -
Ms. Parishi Majmudar, MSW
Dr. Gauravi Mishra, M.D.
Dr. Sharmila Pimple, M.D.
It isn't easy to quit tobacco - but it is possible!
Healthy
Body
Tata Memorial Centre
Department of Preventive Oncology
Publication No.5/2021

DIVISION OF MEDICAL RECORDS AND CANCER REGISTRIES

Professor Epidemiology (Officer-in-Charge): Dr. Atul Budukh

Team of Medical Records and Cancer Registries

Overview

The section of Field Intervention and Cancer Surveillance was merged with the Department of Medical Records on 13th July 2021 and named as Division of Medical Records & Cancer Registries. The department is closely working with SERAO/WHO New Delhi as well as IARC/WHO, Lyon, France. The division provides technical support to the cancer registries in South-East Asia and regularly organizes cancer registration training programs for the South-East Asian region. The division also monitors the cancer burden through population-based cancer registries (PBCRs) in Punjab, Uttar Pradesh, Maharashtra, Andhra Pradesh and Bihar states of India. The division provides the Tobacco Quit Line service for the tobacco users who are willing to quit the tobacco habit. The division is also involved in the cancer prevention activities. The department is maintaining the medical records of TMH as well as regularly provide the services to patients regarding medical records.

The unit has played an important role in capacity building for cancer registries in India, Nepal, Bhutan, Sri Lanka, Myanmar, Timor-Leste and Indonesia.

Service

1. Tobacco Quit Line (TQL):

Tobacco Quit Line (TQL) centre provides effective counselling to the tobacco users and enables quitting tobacco through a toll-free number 1800-11-2356. In the year 2021, of the total registered 56,234 calls, 13,129 (23.3%) people were ready to quit tobacco and agreed to attend the regular follow-up calls. The counsellors made a total of 91,032 follow up calls, out of which 47,957 (52.7%) calls were attended by the clients. There were 2,916 (22.2%) quitters.

Activities conducted by the TQL Centre

- Regular Awareness visits to IPD and OPD of TMH and ACTREC
- Capacity building of state government staff of Tobacco Control Unit of several district of Maharashtra on “Tobacco Cessation Process and protocol of National Tobacco Quit Line Service”
- District-wise webinar for Tobacco counselors of Maharashtra state government.

2. Cancer registries under this unit:

Our unit is monitoring following population and hospital based cancer registries (PBCR and HBCR)

Sr No	Registry	State	Date of establishment	Population Covered	Report Status
1	Sangrur PBCR	Punjab	January 2013	1.7 Million	The annual report for the year 2017-2018 is ready.
2	Mansa PBCR	Punjab	April, 2013	0.8 Million	
3	Chandigarh PBCR	Chandigarh (Union Territory)	January 2013	1.0 Million	
4	SAS Nagar PBCR	Punjab	January 2013	1.0 Million	
5	Varanasi PBCR	Uttar Pradesh	April, 2017	3.7 Million	The annual report for the year 2018-2019 is ready.
6	Muzaffarpur PBCR	Bihar	October 2018	4.8 Million	The annual report for the year 2018 is ready.
7	Ratnagiri, PBCR	Maharashtra	February 2009	1.5 Million	2017-2018 Year report is under process.
8	Sindhudurg, PBCR	Maharashtra	2010	0.8 Million	2017-2018 year report is under process.
9	Vizag, PBCR	Andhra Pradesh	June 2014	4.2 million	2017-2018 year report is under process.
10	HBCH Sangrur	Punjab	September 2017	-	The annual report for the year 2019 is ready.
11	MPMMCC and HBCH Varanasi	Uttar Pradesh	October 2019	-	The annual report for the year 2018 is ready.

3. Technical backstop for strengthening population-based cancer registry (PBCR) in SEARO countries and building regional network for PBCR

An agreement for performance of work between SEARO WHO and CCE TMC was made to provide the technical backup for strengthening PBCR in five countries (Nepal, Bhutan, Myanmar, Sri Lanka and Timor-Leste). This unit regularly provides technical support to the cancer registries from these countries.

Education

Virtual training programs were conducted by the unit under IARC Regional Hub for Cancer registration. Due to COVID-19 pandemic, virtual cancer registration training programs were organized for the participants from India, Bhutan, Nepal, Sri Lanka, and Timor-Leste. The list is as follows:

Training programs conducted in the year 2021:

Sr. No.	Name of the training program	Date	Number of participants
1	Workshop on setting up a cancer registry (Participants from Sri Lanka, Nepal, Bhutan, AIIMS Bathinda, AIIMS Gorakhpur, IGIMS Patna)	22.02.2021 to 27.02.2021	55
2	Training on cancer registration and CanReg5 operation (For the medical record staff)	02.08.2021 to 07.08.2021	14
3	Virtual workshop on solving the CanReg5 related queries for Bhutan, Nepal, Timor-Leste, and Afghanistan participants	10.08.2021 to 12.08.2021	15
4	Workshop on setting up cancer registries (Participants from India and Sri Lanka)	04.10.2021 to 09.10.2021	83

Presentation in International meeting

1. A lecture on “Cancer Mortality Surveillance through Death Registrars” was delivered by Dr Atul Budukh on 12th November 2021 to the staff of the Colombo Cancer Registry.

2. Activities carried out by IARC regional hub Mumbai, India were presented by Dr Atul Budukh at the International Association of Cancer Registries conference held virtually from 12-14 October 2021.

3. Dr Atul Budukh was selected as a Master Trainer for the training programme to establish Pediatric Cancer Registries in Low- and Middle-Income Countries (LMICs). The course was virtually organized by International Agency for Research on Cancer, Lyon France for the period April to June 2021.

Research

1. To study the challenges in implementing the government funded health schemes for the treatment of cancer patients in Tata Memorial Centre, Mumbai

Our unit is studying the challenges in implementing health schemes for the cancer patients in Tata Memorial Centre (TMC). The objectives of the study are as follow:

- To study the challenges which are coming to the beneficiary while using the government-funded health schemes for the treatment of cancer patients in TMC, Mumbai.
- To study the challenges which are coming to the staff of Tata Memorial Centre while enrolling the patient into the government-funded health schemes and Philanthropic fund support for the treatment of cancer in TMC, Mumbai.
- To study the Out of Pocket Expenditure (OOPE) of the beneficiary who are taking cancer treatment under the government-funded health schemes in TMC, Mumbai.

We have interviewed 500 patients' relatives and we will publish the results soon.

2. A Situational Analysis of Childhood Cancer Care Services in India – Conducted by WHO and ICMR – National Centre for Disease Informatics and Research (NCDIR), MoHFW, India

The survey is aimed at to access the status of childhood cancer care services in India regarding availability, facility preparedness and capacity, Treatment-related practices and perceived barriers and facilitators in diagnosis and treating childhood cancers.

Our unit has worked as a coordinating unit- nodal hospital of Maharashtra state and have worked on further identification of a representative network of three to five cancer treating hospital (tertiary level) and two to three district/sub-district hospital (secondary level). The report has been published and is available on ICMR website.

3. Early detection program for oral, breast and cervical cancer in Sangrur district of Punjab state

The objective of this project is to observe the effect of health education, easy access to diagnosis and treatment on stage at presentation, completion of treatment and survival of breast, cervical and oral cancer. Under this project, more than 49,000 households have been visited and nearly 200,000 populations have been covered. Till now, 120 detection camps have been organised and 2,744 individuals have been screened. Out of these, 440 cases were screen positive and 23 precancerous cases were diagnosed and prevented. Moreover, a total of 65 cancer cases were detected including 39 breast, 14 cervix and 12 oral cases. These cases underwent treatment and were followed-up at Homi Bhabha Cancer, Sangrur, and Punjab state.

DIVISION OF HOSPITAL BASED CANCER REGISTRY AND PATTERNS OF CANCER CARE

Officer-in-Charge: Dr. Amey Oak

Medical Officer: Dr. Sivaranjini. K

Overview

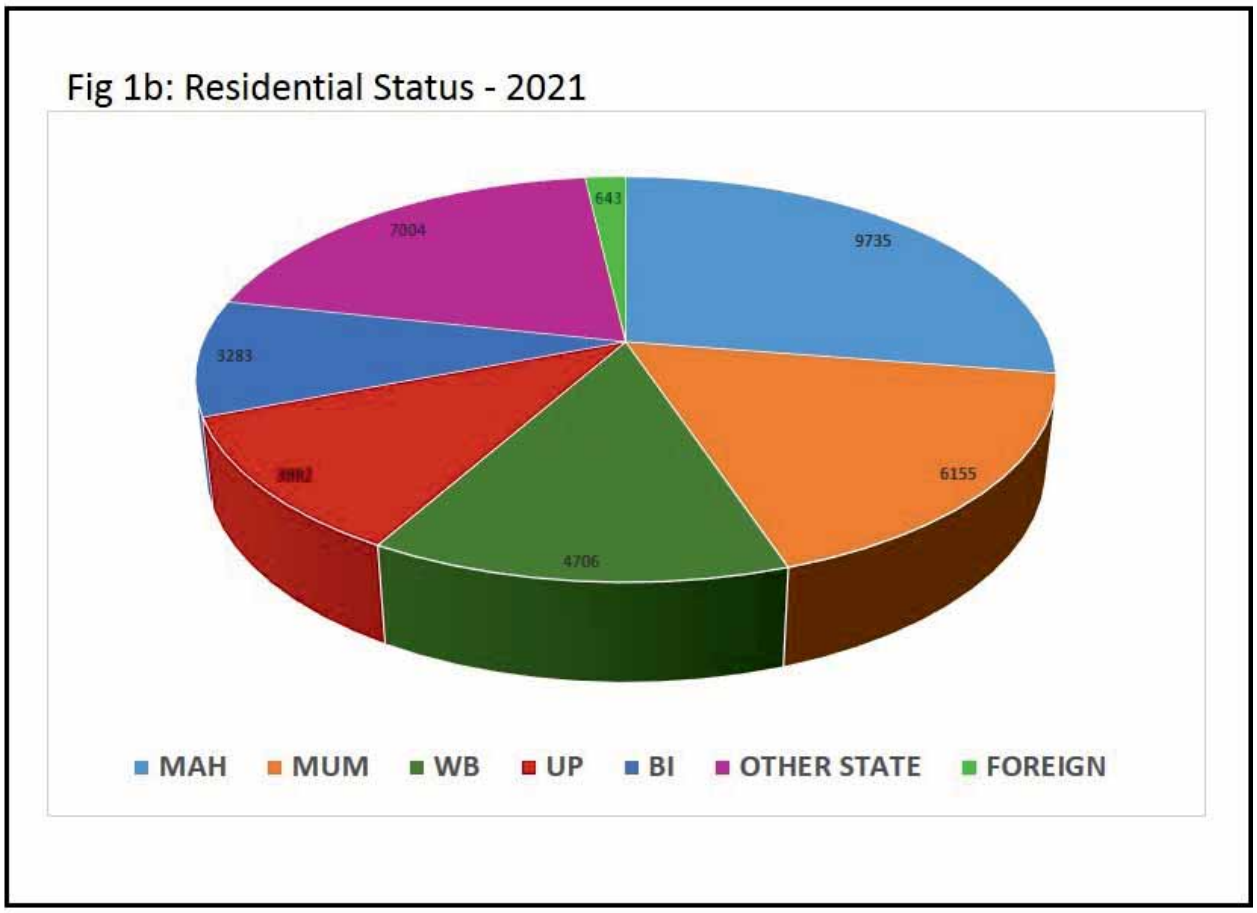
Our division has two major activities Hospital Based Cancer Registry (HBCR) and Patterns of Care & Survival Studies (POCSS). Historically, TMH had the hospital-based cancer registry functional since the inception of the hospital in 1941.HBCR has been operational in collaboration with NCDIR, ICMR since 1984. POCSS Survival and a follow-up study in collaboration with NCDIR, ICMR since 2006 for head and neck, breast, and cervix cancers later in 2019 started with hemato lymphoid malignancies, pediatric and other gynecological cancers. The board's aim is to provide Patient Care, Education, and Research.

Services

1. To generate reliable data on the magnitude and patterns of cancer care.
2. Participate in clinical research to evaluate therapy.
3. Doctors/ Clinicians for Research.
4. Contribute to active follow-up of the cancer patients.
5. Describes the length and quality of survival in relation to site, stage, and treatment.
6. Show time trends in the proportion of early to late stages at the time of diagnosis.
7. Develop human resources in cancer registration and epidemiology.
8. All case files registered prior to 2013 are scanned and linked with EMR, hence all patient care data is available all the time.
9. Training and Motivation to the staff.

Fig 1a : TMH Registrations 2021

Foreign = 643



Total TMH Registrations :

TMH Case-file Registrations : 35,408

Tele-Consultation : 3,319

Referral Registrations : 39,330

Preventive Oncology : 7,171

Total ACTREC Registrations :

ACTREC Case-file Registrations : 2,081

ACTREC Referral Registrations : 3,377

Activities

Hospital Based Cancer Registry (HBCR)

The HBCR contains demographic and clinical data of the patients registered in hospital. In 2018, 36,095 new cancer cases in TMH and 938 new cancer cases only in ACTREC are reported. In 2018, the leading site of cancer was Buccal mucosa among males and Breast cancer among females. The abstraction for the HBCR could be done during the Covid-19 period as Work from Home due the availability of the Online Electronic Records.

Patterns of Care & Survival Studies(POCSS)

The POCSS contains identifying, Demographic, Diagnostic, and Follow-Up Information, details of socio-economic status, family income, occupation, details of stage, details of cancer-directed treatment (CDT), and follow-up. To date, 25619 head & neck cancers, 18774 breast cancer, and 6532 cervix cancer are abstracted for analysis of outcomes (survival rates). Planning of expansion of POCSS Project by involving TMC Centers (HBCH Sangrur, HBCH Varanasi, and HBCH& RC Visakhapatnam). An in-house software has been developed to link POCSS with HBCR, PABR, CIS, ROIS, OT & MOIS modules which will facilitate direct entry from EMR to software, reduce the duplication of case abstraction and help in storage and retrieval of data.

Academic Programme, CCE

Hosting of Academic Programme, CCE weekly on every Friday which involves co-ordination with other TMC centers – TMH Mumbai, HBCH Sangrur, HBCH Varanasi, HBCH & RC Visakhapatnam, BBCI Guwahati. Due to covid-19, the academic programme is conducted via zoom sessions.

Table:1a TMH Hospital Cancer Registry – Leading Cancer 2018

Males						Females				
Rank in 2018	Site	Total	%	Rank in 2001		Rank in 2018	Site	Total	%	Rank in 2001
1	B.Mucosa	1988	9.5	3		1	F. Breast	3891	25.7	1
2	Leukemia	1812	8.7	1		2	Cervix	1393	9.2	2
3	Lung	1701	8.1	2		3	Gall Bladder	941	6.2	8
4	Ant. Tongue	993	4.7	7		4	Ovary	938	6.2	3
5	NHL	990	4.7	4		5	Leukemia	844	5.6	4
6	Prostate	829	4.0	>10		6	Lung	678	4.5	9
7	Stomach	781	3.7	10		7	Thyroid	486	3.2	10
8	Brain &CNS	637	3.0	>10		8	Endometrium	406	2.7	7
9	Oesophagus	634	3.0	5		9	NHL	401	2.6	6
10	Rectum	622	3.0	>10		10	Buccal Mucosa	389	2.6	>10
	All cases	20929	100.0				All cases	15166	100.0	

Table:1b ACTREC Hospital Cancer Registry – Leading Cancer 2018

Males					Females			
Rank	Site	Total	%		Rank	Site	Total	%
1	B. Mucosa	58	22		1	F. Breast	457	67.8
2	Ant. Tongue	30	11.4		2	Cervix	69	10.2
3	NHL	24	9.1		3	Ovary	22	3.3
4	Leukemia	22	8.3		4	Endometrium	14	2.1
5	Brain & CNS	18	6.8		5	B.Mucosa	11	1.6
	All cases	264	100.0			All cases	674	100.0

Fig: 2a Tata Memorial Hospital - Trends of Patients Registration and Cancer Cases 1941-2020

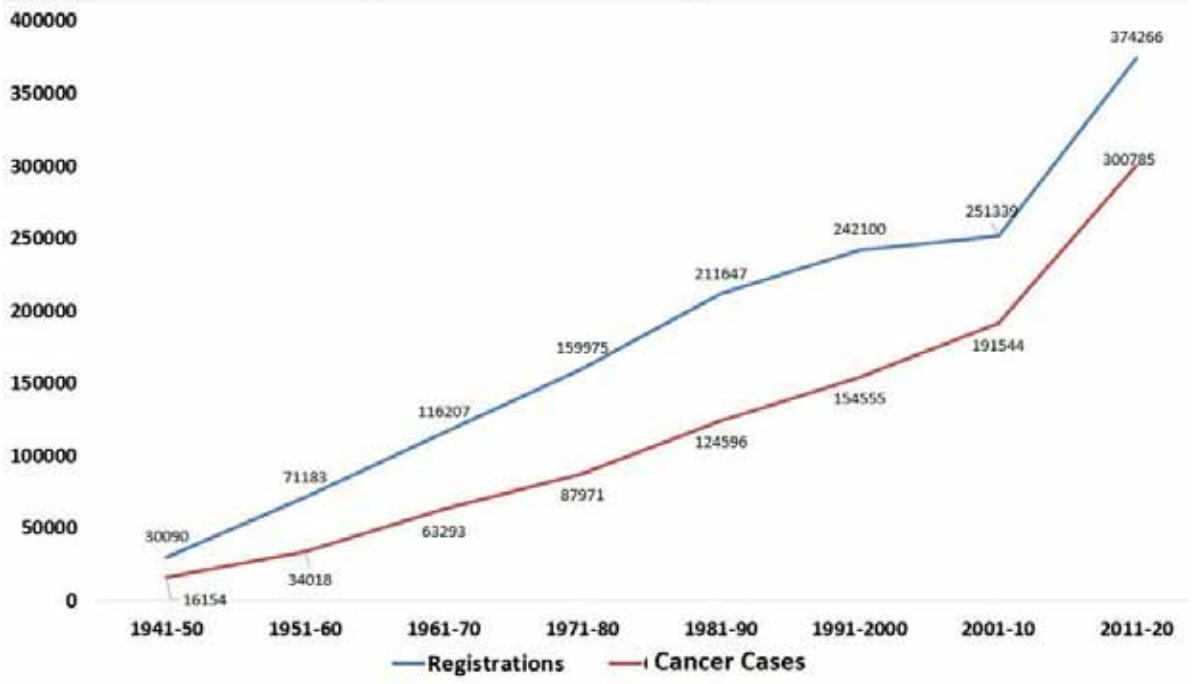
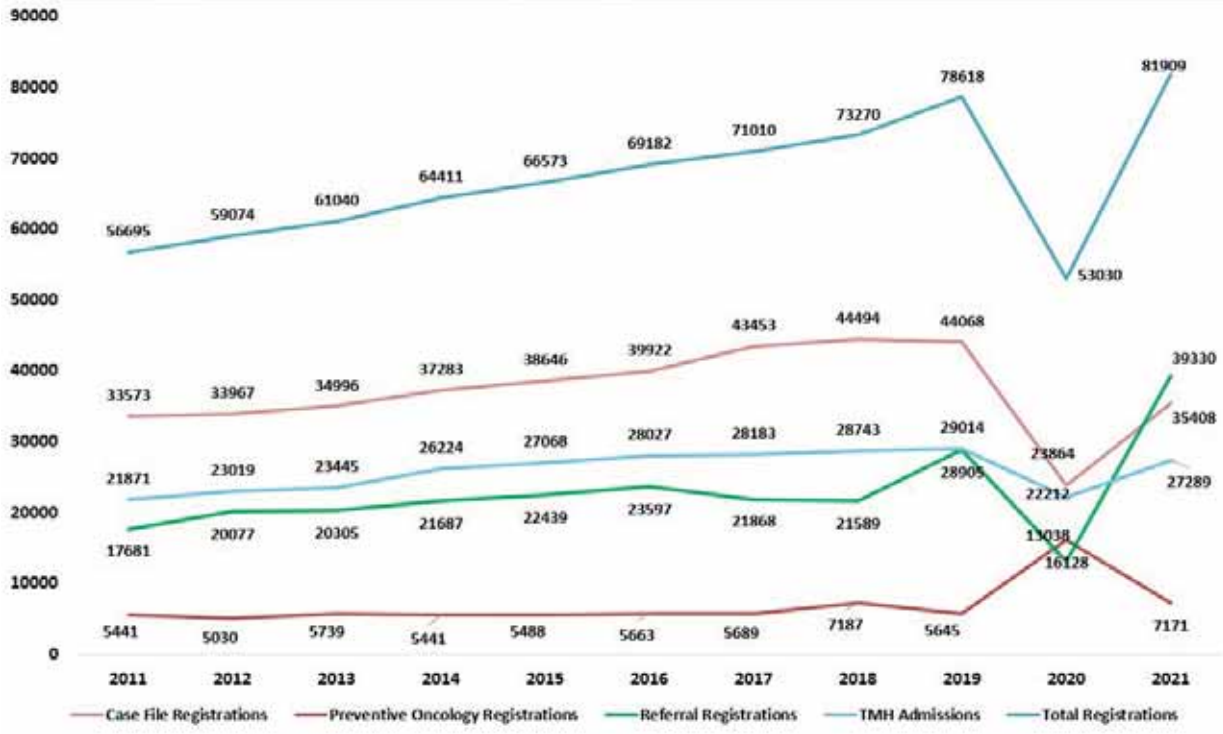
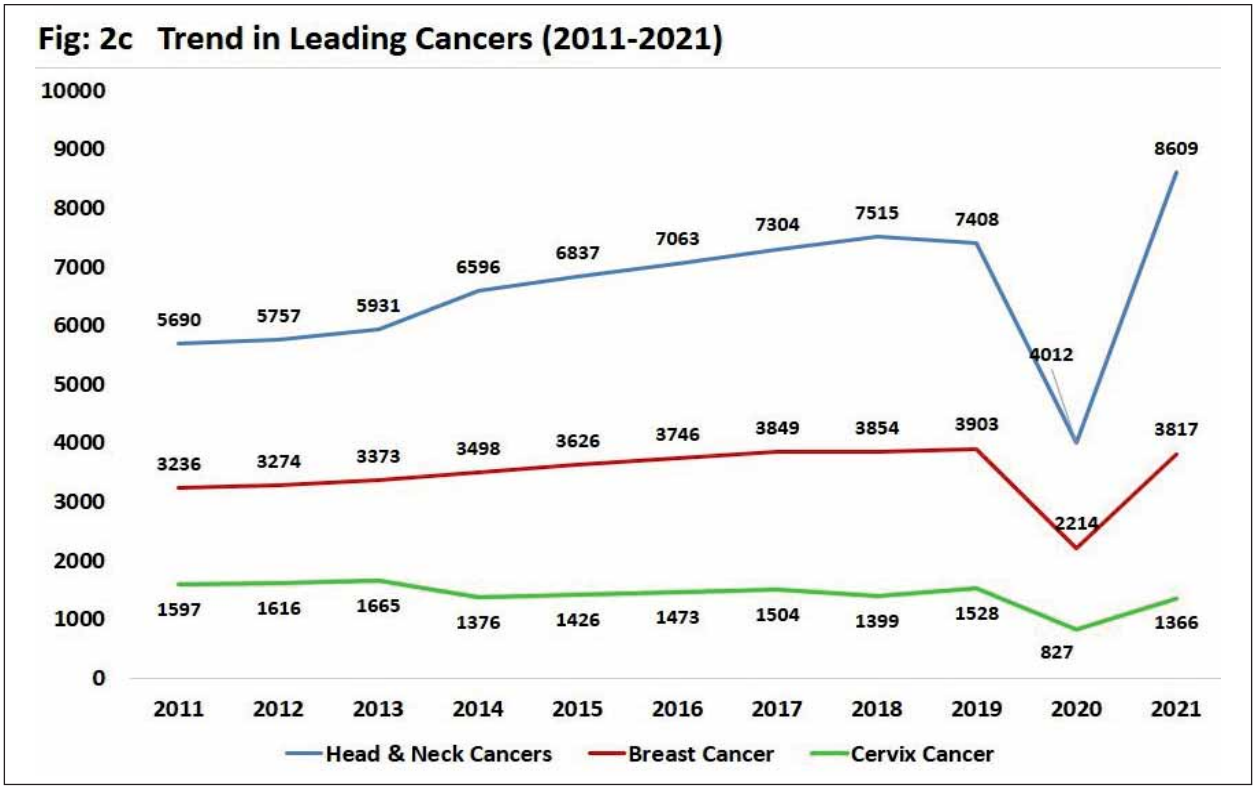


Fig: 2b Tata Memorial Hospital –Registrations and Admissions Trends





Leading cancer such as Head & Neck, Breast, and cervix cancer cases almost doubled in 2021 compared to 2020. There is an increasing trend in case registration from 2011 till 2021 except for in the year 2020 because of the Covid-19 pandemic.

Education& Training:

1. Participation as faculty in the launch of an e-learning course on 'Medical Certification of Cause of Death'(MCCD) on Omnicuris – Dr. Amey Oak- 06/08/2021. It is a joint collaboration of CCE, TMC & CDC Foundation, USA.
2. Participated as faculty in the training of Post Graduate Doctors of AFMC -Workshop conducted on 27th August 2021. - Dr.Amey Oak, Dr.Shalmali Chavan, Mrs. Sandhya Cheulkar.
3. Participated as faculty in training of medical officers of Jalna and Aurangabad District in 'Cause of Death' webinar on 30th Nov. 2021- Dr. Amey Oak, Dr. Sivaranjini K.
4. Conduction of Academic Programme, CCE weekly on every Friday from 24th Sept. 2021 – Dr. Amey Oak.
5. Presentation in Academic Programme CCE – 19TH Nov. 2021 – Dr. Sivaranjini K., Mrs. Sandhya Cheulkar

DIVISION OF MOLECULAR EPIDEMIOLOGY & POPULATION GENETICS

Scientific Officer 'E' (OIC): Dr. Sharayu Mhatre

Overview

The main goal of the section is to conduct research in the field of Molecular Epidemiology and Population Genetics. The main thrust is on accurate measurement of exposures and investigates life style, environmental and genetic risk factors for common cancer sites in India by using case control and longitudinal cohort study designs.

Research

- Established Cancer Epidemiology and Genetic network to undertake multicentric studies to identify lifestyle. Environmental and genetic risk factors of common cancer.
- Expanded longitudinal Cohort studies in Barshi to other centers (Varanasi, Guwahati, Sangrror and Mullanpur).
- Develop and established workflow and pipeline for large scale GWAS studies.
- Developed and established workflow and pipeline for Shotgun Mutagenomic studies.
- Developed and established workflow for Whole genome and targeted sequencing.

International Collaboration: Following collaboration was built with International organizations to conduct collaborative projects:

1. University of Oxford: The collaboration is built for teaching and exchange of students and faculty.
2. US – National Cancer Institute: The collaboration is built up with various units of NCI. An MOU has been developed to understand lifestyle and genetic risk factors of breast cancer under Confluence project of NCI.
3. University of Bristol: Collaboration is built up for exchange of staff and faculty.
4. International Agency for Research on Cancer: A collaborative agreement is made to identify Risk factors using mutational signatures.

5. University of Minnesota, USA: Collaboration is developed for exchange of faculty and regularly conducts CME. A project entitled “Biomarker phenotype of air pollution and cancer risk is being developed

On-going projects:

1. Lifestyle and genetic risk factors for gallbladder cancer: multicenter case control study.
2. Genome-Wide Association Study to Identify Role of Genetic Susceptibility in Buccal Mucosa Cancer.
3. Development of breast cancer risk prediction model using lifestyle factors and polygenic
4. risk score in Indian population.
5. Evaluating The Role of Genetic Susceptibility for Oropharynx Cancer in Indian Origin Population: a case-control study using the candidate gene approach.
6. Prevalence of Gallstone diseases in the regions with the high and low incidence of gallbladder cancer: current status and future perspective for gall bladder cancer prevention.
7. Development of Cohort Study to Identify and Evaluate Transition in Life Style and Risk Factor in Rural Population.
8. Role of water pollution in development of esophageal cancer: a case control stratified by high and low risk regions.
9. Air pollution exposure measurement and cancer risk in India (ApEx-India).
10. Obesity and non-communicable disease in India: an imaging study of 10,000 adults in Barshi.
11. To elucidate geographical differences in the incidence of gallbladder cancer by identifying etiologically distinct types of gallbladder cancer through the study of mutational signature.

DIVISION OF CANCER SURVEILLANCE FOR SPECIAL POPULATION (CSSP)

Project Coordinator: Dr. Ganesh B

Scientific Officer D: Dr. Rajshree Gaidhani

PART-I

TMC-NPP Network of Special Cancer Registries (Nuclear Power Plant Special Registries)

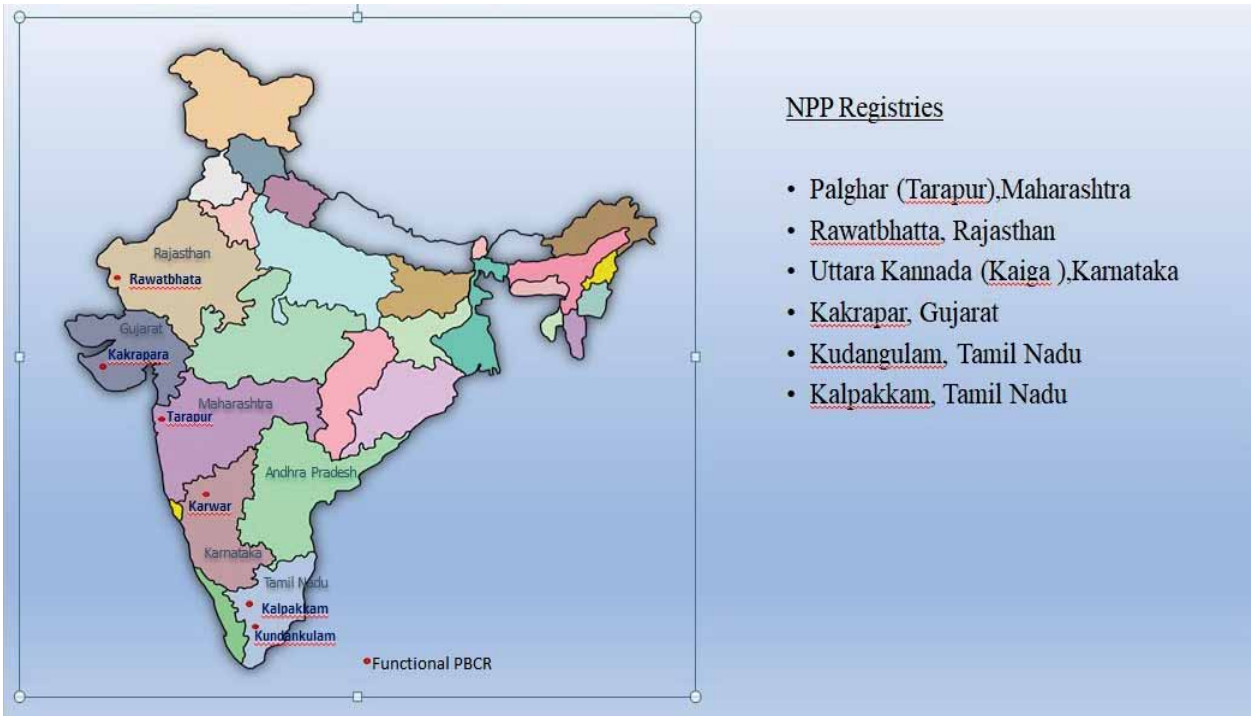
- TMC setup Population Cancer Registries (PBCR) in the Nuclear Power Plant Location as per the directive from DAE, since no data on cancer is available in these locations.
- The Cancer registry will enable to obtain the incidence/mortality rates and cancer burden in the population to study the trends and patterns of cancer over a period of time in the NPP areas.
- Conduct special studies for identifying risk factors / to initiate various health care facilities in the NPPs

Population Based Cancer Registries (PBCR)

First PBCR (Proposed setup in Ratnagiri NPP at Jaitapur), non-NPP location, setup in 2009, subsequently setup PBCRs in Sindhudurg (2010) and Visakhapatnam (2014). Subsequently 6 more PBCRs setup in Existing NPP locations

TMH Network of Cancer Registries in Nuclear Power Plant Areas

- NPP Registries
- Palghar (Tarapur), Maharashtra
- Rawatbhatta, Rajasthan
- Uttara Kannada (Kaiga), Karnataka
- Kakrapar, Gujarat
- Kudangulam, Tamil Nadu
- Kalpakkam, Tamil Nadu



PART-II

Division of Cancer Surveillance for Special Population (CSSP)

(Established July 2021)-CCE

Objectives of CSSP:

To setup and conduct studies on special population

- Special populations include special Registries, NPP cancer registries
  - ➢ Continue operations of present registries
  - ➢ Setup newer cancer registries in the upcoming NPP locations
- Undertake epidemiological health surveys in the NPP, as requested as per the MOU between TMC-NPCIL
- Any other studies as desired by TMC & CCE

To collect data for the Nuclear Power Plant registries

- To compare the outcomes with other non-NPP registries, National and International registries.
- The outcomes of the registry in NPP locations will be shared with DAE/NPCIL for needful
- To prepare and publish the registry reports

Summary- NPP Registries : 2017-18				
Registry name	Year	Estimated Population (in lacs)	ASR (per 100,000)	
			Male	Female
Palghar	2017-18	5	57.1	58.1
Rawatbhata	2017-18	1.6	48.6	47.8
Uttara Kannada	2017-18	4	68.1	62.3
Kakrapar	2017-18	5.02	67.1	28.7
Kalpakkam (2017)	2017	40	102.7	110.7
Kudangulam (2017)	2017	31	71.8	77.9

Review Meeting with Staff:

Online review meeting with. Kakrapar, Palghar, Rawatbhata and Uttarkannada registry held in November 2021.

Site visit and review meet with Rawatbhata Registry staff- October 2021

Site visit and review meet with Palghar Registry staff- August 2021

UNIT FOR STRENGTHENING CAUSE OF DEATH DATA (USCOD)

USCOD Leaders:

Dr. Rajesh Dikshit, Director, Centre for Cancer Epidemiology, Tata Memorial Centre

Dr. Pankaj Chaturvedi, Dy. Director, Centre for Cancer Epidemiology, Tata Memorial Centre

The Centre for Cancer Epidemiology (CCE) at the Tata Memorial Centre established the Unit for Strengthening Cause of Death Data (USCOD) on the 6th of August 2021. With the vision to support and advocate for best practices in improving quality of cause of death data, the unit has carried out key activities since its inception. The USCOD is carrying out instrumental educational resources and is creating capacity building in the quality of cause of death certification data in India. The unit is a reliable resource centre supporting capacity building in Medical Certification of Cause of Death (MCCD), ICD Coding, Automated Mortality Coding Software as per WHO and United Nations Statistics Division standards.

Overview of USCOD Activities

Sr No	Activity	Month
1	Launch of the Unit of Strengthening Cause of Death Data (USCOD)	August 2021
2	Launch of the Medical Certification of Cause of Death (MCCD) E-Learning Course on “Omnicuris”	August 2021
3	First launch of the unit’s website	November 2021
4	Launch of the USCOD Newsletter Volume 1	December 2021
5	Recruitment of new staff (liaison officer and country coordinator)	December 2021

Overview of Trainings Conducted by USCOD

Sr No	Training	Location	Month	No of Participants
1	MCCD training of state government doctors with Public Health Department, Maharashtra	Jalna & Aurangabad	November 2021	45
2	MCCD E-Learning Course	Omnicuris	August 2021 onwards	3500 enrolled

Sr. Admin. Officer		M.Y. Shaikh (Officiating-1.1.2021 to 4.03.2021) Mr. S.H. Jafri (From 5.03.2021 to 30.09.2021) M.Y. Shaikh (Officiating–30.09.2021 till 31.12.2021)
HRD	Dy. Admin. Officer (HRD)	Mrs. Shilpa Sardesai
	Jr. Admin. Officer (HRD-OS)	Mr. Devendra Pitale
Estate Management	Jr. Admin. Officer (EM)	Mr. Shyam Anavkar
Accounts	Dy. Controller Accounts	Mrs. Kamala Paidipati
	Dy. Accounts Officer	Mrs. Anuradha Narayanan
Purchase	Purchase Officer	Mr. Anandrao Kokare
Stores	Asst. Stores Officer	Mrs. Kanchana Gopalkrishnan
Engineering	OIC (ES)	Mr. Hrishikesh Kelkar
Security	Dy. C.S.O. (Gr. II)	Mr. Paul G. Pinto

Human Resource Development

Human Resource Developmentcarries out the functions of manpower planning, performance management, recruitment of staff (regular as well as temporary), training and development of employees, maintenance of discipline, etc. Ninety regular staff memberswere appointed during the year 2021 in different grades in Medical, Scientific, Technical and Administrative cadres, abiding to the reservation policies of the Government of India.

Twenty-two Junior Research Fellows were selected for the Ph.D. degree under the HBNI. Various staff under Technical, Non-Technical & Nursing Category were appointed on Contract to distribute the work load increase due to inflow of cancer patients at the Centre. At present 112 Technical, 139 Non-Technical & 52 Nursing staff, 42 Security Guard, 19 Horticulture Staff, 146 House Keeping Staff, 91 Miscellaneous and 91 Supportive Staff are working under outsourced contractor at ACTREC. One hundred and thirty staff personnel on various projects have also been recruited for assisting in research work. Appointment of Trainees was done for various courses at ACTREC - 7 ATMLT, 4 Cytogenetics Trainees, 3 BMT Nursing Fellows, 2 Onco-therapeutics Fellows, 5 Biostatistics Trainees, 08 Molecular Hematology Trainees and 6 Flow Cytometry Trainees.

The Department also takes care of Career Planning through merit based review and promotions of employees by holding yearly DPCof all the employees. Day to day administrative functions encompassed e-attendance control, maintenance of leave records, updating of staff records with regard to pay fixation/ re-fixation matters, settlement of personal claims, release of retirement/ terminal benefits maturing on superannuation/ death cases, and payment in time of staff, time to time performance appraisal/ monthly attendance reports, proper follow-up of matters/ decisions taken during various meetings, diplomatic and amicable handling and settling of inquiry matters.

The Computer Programmer has developed & implemented the HRD software/programs viz., new applications to generate offer letter, new web application such as online APAR and Quarterly Assessment Report of probationers. Improvised the existing developed and implemented software's/programs viz. FTS application to track file within same department, new LTC Special Package form and auto-generation of call letters.

Timely payment ofPRIS, update allowance to eligible employees, providing duplicate Service Book to staff, service verification of staff that have completed 18years of service, are other activities carried by HRD. Implementation of the Reservation Policy of the Govt. of India duly adopted by TMC in respect of SC/ ST/ OBC/ PWD/ Ex-Serviceman is carried out regularly and systematically, and all efforts have been made to ensure and achieve the prescribed percentage of reserved posts.

During 2021, 9 staff members attained superannuation and 1 staff retired voluntarily.

Estate Management

The General Administration's Estate Management (EM) is responsible for controlling and managing all the activities of Student's Hostel, Guest House, and Faculty Club. Apart from above, this section also handles various services related activities of staff and patient Canteens, Retreat Cafeteria, Housekeeping, Transportation, Horticulture, Pest Control Services, Photocopier Machines, Courier/ Post Services. Most of the Annual Maintenance Contract for the above services are also being looked after by Estate Management. Other ancillary services such as, billing of cancer registries, refilling of gas cylinders in laboratories / BMT / Patient Hostels are being taken care by Estate Management. Regular Housekeeping services of all the buildings inside ACTREC campus i.e. Khanolkar Shodhika, Paymaster Shodhika, Jussawalla Shodhika, Vasundhara Patient Hostel, Students Hostels (3 Nos.) Retreat, Faculty Club Guest House are being carried out to maintain cleanliness. Surrounding areas of the building campus, roads, footpaths, car-parking area, garden areas are also being regularly cleaned so that pleasant environment is maintained in the campus. Disposal of capital items / equipment, E-waste materials and local scrap materials are being taken care by Estate Management. The Centre takes pride in the large variety of flora on its campus through Horticulture. A garden covering more than 100 species of trees shrubs and climber and lawns at different locations in the campus are well maintained by professionally trained horticulture and team of gardeners. Medicinal shrubs have been planted in front of Bio Bank.

ACTREC and Kaivalyadham came together via an online Google Meet link to celebrate the Sixth International day of Yoga (IDY) on 21st June, 2021. About 60 people with its doctors, administrators & staff and family participated online which included yoga practitioners and non-practitioners.

An Ambulance donated by “Doctors for you” was inaugurated in the month of September, 2021.

As per Instructions of Government of India, the following days were observed during the year 2021 at ACTREC.

1. 26th January – Republic Day
2. 30th January - Observance of Silence (Martyrs’ Day)
3. 05th March – International Women’s Day

   During the COVID-19 pandemic, the Administration ensured that all Guideline & Standard Operating Procedures (SOPs) issued from time to time regarding COVID-19 were strictly adhered.
4. 21st May – Anti-Terrorism Day
5. 21st June – 27th June, 2021 International Yoga Day 2021
6. 30th June – World Blood Donor Day
7. 15th August - Independence Day
8. 20th August – Sadhbhavna Divas
9. 7th October – Inauguration ceremony of Asha Nivas.
10. October entire month – Blood/Platelet Donation
11. 26th October – Vigilance Awareness Week
12. 28th October – Breast Cancer Awareness Program
13. 29th October – Swatch Bharat Abhiyan
14. 2nd November – Rashtriya Ekta Diwas
15. 19th November – Inauguration ceremony of Medical Gas Manifold Room (Oxygen Plant)
16. 26th November – Samvidhan Diwas (Constitution Day) 2021

Some of the Memorandum of Understanding (MOU) undertaken by ACTREC are listed below

1. MOU between Jewelex India Pvt. Ltd, Sadbhav Foundation & ACTREC for complete renovation of the Vasundhara.
2. Recognition of Tata Memorial Centre, Mumbai, Maharashtra as a Scientific and Industrial Research Organization (SIRO) by the Department of Scientific and Industrial Research under the scheme on Recognition of Scientific and Industrial Research Organizations (SIROs), 1988.
3. MOU between Tata BlueScope Steel Private Limited & TMC, ACTREC. TBSPL is desirous of contribution INR 25, 00,000/- to TMC-ACTREC for utilization towards the benefit of the cancer patients belonging to Below Poverty Line (BPL) as part of its Corporate Social Responsibility (CSR) initiative.
4. MOU between TMC, ACTREC and Madhukanta Gunvant Sheth Charitable Trust (MGSCT). MGSCT donate a sum of Rs. 60, 00,000/-. Towards procurement of ana Endourology set (System) with the specific objective of providing subsidized treatment to patients having urinary bladder cancer and other urogenital cancers.
5. Mou between ACTREC and Sri Sathya Sai Sanjeevani Centre for Child Heart Care and Training in Pediatric Cardiac Skills.

Accounts Department

The main focus of the Finance and Accounts Department has been funds flow management by prudential and judicious budgetary controls and review of financial outflow. Maintenance of requisite documentation and other relevant records in conformity with the instructions issued by Department of Atomic Energy, Govt. of India was ensured. The Account Department is responsible for patient billing, receipting and settling of account of different categories of patient's i.e. smart card, cash paying, trust and company referred. The procurement of various supplies, materials and equipment's required for the Centre was undertaken by following prescribed purchase procedure. The department is also responsible for proper utilization of Plan and Non-Plan grants, submission of various report to DAE regarding utilization of funds and status of plan projects. During the year 2021, hospital and other income to the extent of Rs. 38.75 crore was generated.

In all, there were a total of 203 on-going projects at ACTREC during the year 2021. A sum of Rs 5.87 crore was received from governmental agencies such as DBT, DST, and ICMR to meet the expenditure of their on-going projects. In addition 11 new extramurally funded projects to the tune of Rs. 5.42 crore for an average three year period were sanctioned by the above mentioned funding agencies, of which Rs. 2.59 crore was received during the calendar year.

Purchase Section

Purchase department aims to provide efficient services to the entire Centre by way of arranging and delivering goods as per the approved quality and quantity within minimal supply time. All the procurement viz. indenting, comparative statements, appropriate approvals, generation of purchase orders, reminders etc. is done with the help of Material Management System (MMS), which is in-house software developed by our Information Technology (IT) Department. Implementation of MMS assisted in efficient functioning of procurement activities and obtaining the materials with ease. During the report year, Purchase Department floated 263 E-Tenders through Tenderwizards.com/DAE and CPP Portal to maintain more transparency in the procurement system and response from the vendors was satisfactory. This is also important and requisite protocols as per DAE and CVC norms. As per Rule 149 of GFR 2017, 288 purchase orders are being processed through GeM (Government e-marketplace).

During January - December 2021 procurement of the equipment(s) worth value of Rs.20.85 crores, consumables worth Rs.36.05 crores and contracts for the supply of Spares / Work order worth Rs20.37 crores and AMC worth Rs.8.30 crores have been procured/lined up by the department.

Stores Department

The function of the main stores, is to stock and support the day to day requirement of various wards / Out Patients units /CRI / CRC / CCE/ Hostel facilities and departments as and when required. The Stores receives all stock and non-stock consumables, spares and capital equipment except drugs and surgical goods. The Stores department handles routine receipt of stock, non-stock and capital Indents. The material is issued after receipt of goods, generation of GRIN and Inspection. Asset Records are maintained systematically. Annual and half yearly stock verification are conducted and support provided for asset verification and audits. In the Year 2021; total number of PSN generated were 7320, total number of GRIN generated were 8636 and the total number of Assets were 3643. All the work of Stores department is digital (Paperless) like receiving of Indents, generating PSNs through system and forwarding the same to the Purchase department. The Purchase Order copies are received in the system. Materials are also received through GeM procurement and the GeM protocol is followed for receipt of goods. The member of the inspection committee after satisfactory physical verification of materials, confirms GRIN inspection through system. Store Officer approves the GRIN online. Delivery note and confirmation of receipt of material are done through online procedure.

In the year 2021, the Stores department has expanded its ventures by establishing a new Asset Cell to carry out all the activities pertaining to assets, and updating records of all the assets located in the organization. The cell will look after the Asset Management System which includes physical and virtual transfer of the assets from one satellite unit to another unit and also within the organization. All departments can view the status of their assets, including AMC/ CMC status on the desk.

Engineering Services

Engineering Services at ACTREC one of the most promising department of the Centre is committed to provide round the clock support and optimization in the use of facilities pertaining to patient care, research and educational activities and make the everyday experiences of the patients, doctors, research scholars and of course fellow staff better. To ensure all this, the department truly depends on its pillars of strength which are hard work, perseverance, teamwork, ability to communicate effectively and attitude to deliver timely results. For the past few years the domain of work is no longer limited to operation and maintenance of various critical engineering systems, campus maintenance viz buildings, roads, water and sewer lines and other electrical & mechanical allied services but also includes active involvement in liasoning work with local government authorities for obtaining various NOCs and permissions, for the soon to commence project like the construction of Shantilal Shanghvi Paediatric Haematolymhpoid Cancer Centre, a STP including laying of campus wide sewer lines, WTP, 21 lakhs litres Underground water storage tank, Modular OT and ICU Facilities in newly constructed Solid Tumour building and out of campus projects like the recent BMT facility of HBCHRC, Vishakhapatnam and BBCI Guwahati and many more projects. Fortunately the department is supported and backed by 80 credible and competent permanent and contractual taskforce in capacities of Engineers, Jr. Engineers, Supervisors, technicians, plumbers, carpenters, electricians, AC operators, AC technicians, pump operators and auxiliary staffs who put their tireless efforts in solving the day to day problems and successfully achieved set targets. It is by this virtue that the Department is ever ready and confident to carry out duties assigned by the Management from time to time. The routine engineering work briefly includes the following: operation & maintenance of air-conditioning system with chilling plants, cooling towers, package units, water coolers, refrigerators, deep freezers, medical oxygen system, LPG distribution network, all mechanical and fabrication works; in house repair and maintenance of close to 500 window/split air conditioners; 33KV high tension switch gears, transformers, LT panels, lighting and power distribution, DG sets, cabling, lifts, communication and PA systems and patient calling system; maintenance of water supply, fire hydrant, sanitary and drainage

systems; civil work including all alterations, additions, masonry, plumbing, painting, carpentry, maintenance and revamping of buildings, road and compound wall of 60 acres campus; coordination with architects, planners for construction of new buildings in campus; distribution of liquid nitrogen on a regular basis to research laboratories; maintenance of laboratory equipment, furniture and various hospital utilities; planning and implementing the up gradation and replacement of facilities, carrying out preventive, corrective and deferred maintenance of buildings, making of short term and long term recommendations for financial allocation and budgeting and providing project management services as per requirement.

Security Section

Strict Access Control & regulation of Men, Material and Vehicles on the Campus maintained to ensure the Safety and Security of ACTREC Property, Personnel, Students & Patients, round the clock is the prime responsibility of this Section. To further strengthen the Security Force M/s Maharashtra Security Force Security Officials are deployed, to enhance the building & peripheral security measures at ACTREC. Imparting on the job training to the Security Staff has been a periodical exercise, so as to refresh the Security measures/aspects to combat with unforeseen situations and threat perceptions. Improvised Surveillance System has been inducted in the prevailing Security system, which covers the Building/Facilities, vital areas and Main Gate, to prevent unauthorized access and to detect objectionable activities in the campus. Work of improvised Fire alarm & detection system has been completed and work of firefighting system to tackle any kind of fire exigencies has been completed and is under process of Handing and Taking over. The Prime Motto is to have a fear free atmosphere in the ACTREC Campus. Security Audits of ACTREC are periodically carried out by the Subsidiary Intelligence Bureau, National Security Guard, State Intelligence Bureau and Maharashtra State Police Force-1. Certain additional security measures recommended by the above agencies are inducted in the prevailing security system to further strengthen the security measures.

During the pandemic Covid 19 special transport facility was provided to the staff from different rallying points to reach to the office without any hurdles, as the local transport were not functional. Security Section efficiently co-ordinated various activities related to Staff/patient medical exigencies in the Pandemic.

Vigilance Awareness Week was observed at ACTREC from 26th October to 1st November 2021. Dr. K. Venkatesham, IPS, (Director General of Police, Civil Defense & Home Guards, Maharashtra), was the Chief Guest at the function organized on the first day of the Vigilance

Week. Dr. K. Venkatesham shared his thoughts, emphasizing on the significance of self-reliance with integrity & spoke about the centralized grievance redressal mechanism that helped citizens to connect with the higher authorities during COVID-19 Pandemic with the theme **“Independent India@75:Self Reliance with Integrity” ("स्वतंत्र भारत@75: ईमानदारी के साथ आत्मनिर्भरता")**, as per the directives and Guidelines issued by Central Vigilance Commission, Govt. of India. The Program was attended by the dignitaries: Dr. Sudeep Gupta, Director, ACTREC; Dr. Rajesh Dikshit, Director, CCE; Dr. Navin Khattry, Dy. Director, CRC-ACTREC; Dr. Venkatraman Prasanna, Dy. Director, CRI-ACTREC; Dr. J. P. Agarwal, Chief Vigilance Officer, TMC and Mr. Johnson Lukose, Chief Security Officer, TMC.

Dr. Sudeep Gupta, Director ACTREC, took and read the pledge in English and Dr. Rajesh Dikshit, Director, CCE in Hindi, which was followed by the Staff/Students. The Intelligence Bureau team headed by Mr. Deepak Grover, Assistant Director, Intelligence Bureau and Ms Pushpalata Dighe, ADC, State Intelligence Department, visited for security audit of ACTREC premises on 01/12/2021.

INFORMATION TECHNOLOGY (IT)

IT Coordinator: Mr. Prasad Kanvinde

Officers: Mr. Padmakar Nagle

Mr. M. Sriram

Mr. Anand Jadhav

In fulfillment of its mandate, the IT department provides computational facility, infrastructure and support for information access, processing, printing, archiving and dissemination. ACTREC has a campus wide 1 Gbps LAN with copper/ fiber cable, embellished with ~600 LAN nodes, eight servers and is equipped with secured Wi-Fi network. The campus is connected to the Internet through a 1Gbps shared NKN information gateway with redundant 155Mbps Tata teleservices connectivity. A summation of the activities of IT department during 2021 is provided below.

Networking: Day-to-day support, upkeep, administration and maintenance of passive and active network components constitute vital networking activities. Support to the exponentially increased online meetings, conferences, webinars etc. was continued as the major task associated with the department in this extended pandemic year. The department has also established encrypted and most secured connectivity to its campus resources from the remote places with a data leakage prevention feature. The Department has awarded purchase order for the supply and installation of Active and passive components for upcoming HWCC building. Delivery has been obtained and installation is in process.

Hardware: Projected DPR for I.T upgradation at ACTREC was sanctioned by DAE. The department has initiated a tender process for major equipment like HCI server, wireless networking, Networking active components for RRU building, Desktop PCs, matching number of printers, Laptops, various peripheral devices, audio visual equipment etc. New Attendance readers/system was installed. The department also supported the major projects like HPC, digital pathology in finalization of the tender specifications, tender evaluation etc.

Software: Patient information processing at the centre is essentially online, multi-location and round-the-clock. In 2021, updates for PABR, DIS, RIS, ROIS, OT, Accounts, Pharmacy, and Stores & Purchase were made available. Software development/Customization for “Animal house facility” Facility booking software, was also taken up and successfully implemented. Software subscriptions for Microsoft office, antivirus software, and VMWARE /ARCSERVE backup software were also procured or renewed.

LIBRARY

Librarian: Dr. Satish Munnolli

The ACTREC Library, a learning resource centre of the Institute, is proactively engaged in acquiring, organizing and delivering scientific and clinical information to its fraternity and users. The Library provides scientific information services to its users to support and enhance the institute's research, patient care, and ongoing educational programs. In 2021, the Library subscribed to 72 journals in the cancer domain and allied areas to serve the user needs. With the new additions, the Library has a collection of 5909 books, 12595 bound volumes of journals, 651 theses, 3674 staff publications, 430 reports and 20 videos. ClinicalKey and UpToDate, two online clinical tools have been activated through NCG-TMC, cover information on clinical trials, drug monographs, guidelines, patient education materials, multimedia and others. Under the National Cancer Grid program, 27 online clinical journals have been enabled and Akshara - a 'discovery tool' has been activated for browsing with search options.

Online tools - 'Grammarly', an effective science communication tool and, 'RemotLog' – remote access facility to access subscribed full text journals for users from remote locations have been subscribed to enhance the research activities at the centre. The Library continues to maintain staff publication records and publishes weekly publications of the Centre through 'Science Sparks @ ACTREC', which has completed 11 years. Articles on request and plagiarism check reports are most availed services by scientific and student researchers community. The Library has also provided articles to other DAE unit libraries on inter library loan and to individual visitors. Services such as publication statistics, citations of publications, h-index, Impact Factor, authenticity of journals, journal quartiles, open access models, article processing charges, bibliographic services, reference and referral services are provided in anticipation and on demand throughout the year.

The Library follows a scientific approach to procure information requirements and select the most suitable and economical subscription models while subscribing to online journals and resources. The Library conducted information literacy programs for new students; a regular and popular program. Apart from user orientation for the fresher, one-on-one sessions on literature search techniques, strategies for identifying authentic information resources are organized. Several tools and techniques to understand Research metrics, Impact Factor, h-Index, bibliography management tools and plagiarism tools were organized by the Library. Many

individuals benefited by these services that focus mainly on the use of online tools and resources. In Academics, the library staff actively participated in several national and international conferences virtually. Librarian & Officer-In-Charge participated and delivered talks as an invited speaker in LISACON2021 events organized by LIS Academy, Bengaluru. The Scientific Assistant

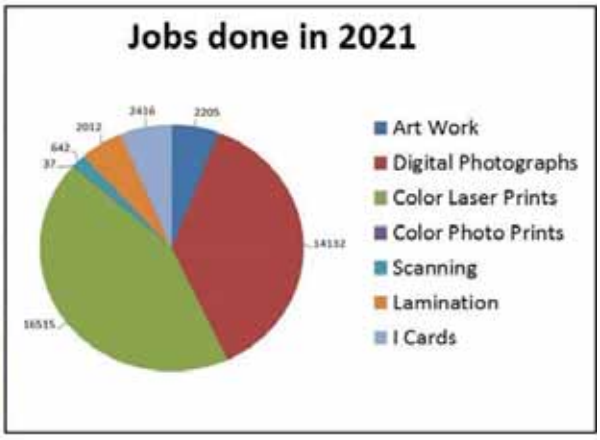
(Library staff) presented a paper at READIT2021 international conference organized by IGCAR, Kalpakkam, India.

PHOTOGRAPHY

Officer-in-Charge: Dr. Satish Munnolli

In-Charge: Mr. Shyam Chavan

The Photography section of ACTREC supports the scientific/medical staff and students in photo-recording their experimental studies, and poster/slide preparation for the effective communication of scientific investigations and results. The state-of-the-art facility has high-end digital cameras to record the images and to get visual clues to research activities. The photography section uses advanced desktop publishing software to design, print, and display brochures/flyers, banners, program schedules of conferences and workshops, certificates, and posters. The section provides other administrative requirements, viz., design of space layouts, murals, and signages for various departments and divisions in the new buildings on the campus. It handles the printing of letterheads, invitation cards, badges and identity cards for the security and administrative services. The section proactively takes photographs during the events organized by the departments, and functional groups, carefully archives all the images, and provides them for administrative purposes in print publications, audiovisual presentations, website, and management. The section assists users in handling the presentation equipment in the seminar/conference/meeting/board rooms and mini auditorium. In 2021, the facility provided photographic support for 63 events held at ACTREC (national and international events, workshops, conferences and other programs), including Artwork for CRI, CRC, CCE departments and Covid-19 pandemic situation with Digital photographs, Colour laser prints, Photo printing, lamination and scanning.



SCIENCE COMMUNICATION AND PROFESSIONAL EDUCATION (SCOPE) CELL

Officer-in-Charge: Dr. Satish Munnolli

The SCOPE cell has a mandate of managing two vital programs of ACTREC, namely, science communication and professional education.

Science Communication

The Cell has a major responsibility to maintain a close liaison with core infrastructure groups for support and smooth functioning of all scientific meetings and seminars at ACTREC. With close supervision, in-house seminars and meetings are handled by steno pool for venue bookings and the event information is disseminated by the Cell through emails and circulars. On account of the COVID-19 pandemic, many activities were held virtually and the Cell coordinated to set up the virtual scientific meetings. Alumni Meet (30th March 2021) and Day of Immunology (29 April 2021) were coordinated by the staff of SCoPE Cell.

Professional Education

The Centre's doctoral program is its prime academic activity. In support of the Centre's research projects, the Cell handled the absorption of JRF 2021 students under the doctoral programs. In collaboration with Tata Consultancy Services (TCS), an on-line entrance exam was conducted in 10 major cities of the country namely, Mumbai, Pune, Kolkata, Delhi NCR, Indore, Guwahati, Bangalore, Hyderabad, Varanasi and Chennai for selecting students for the research program. In coordination with the Academic Committee, the Cell team supported finalizing the JRF advertisement, call for projects, and pre-screening of applications against 21 projects. Overall, 2184 applications were received in the first round, out of which 2033 candidates appeared for the online exam. The applications were screened and filtered as per the set criteria through which 131 candidates were shortlisted for the interview. With the nationally eligible fellowships, 232 candidates applied in two rounds for direct interview. In all, 363 candidates appeared for the interview for 21 projects. On account of the COVID-19 pandemic, the interviews were conducted on 'Zoom' online platform.

The SCoPE Cell team coordinated for the smooth management of the academic coursework for the fresh batch of students, which involved schedule preparation, scheduling orientation and Laboratory visits, handling PI Laboratory choices, timely conduct of the core course/ elective

lectures and exams, seeking elective choices, Doctoral Committee formation, seminar presentations during the first year, correcting papers, collating marks and preparing final mark sheets/ transcripts. As per the Academic Committee guidelines, the Cell planned and conducted Friday Seminars for research scholars.

To support the Centre's educational program, the SCoPE Cell handled and managed the intake of Trainees in various laboratories in coordination with faculty. In 2021, 256 Trainees (109 for Master's dissertation, 98 for research experience, 4 for summer internship, 11 on collaborative projects, 33 observers and a research associate) were allocated to senior and mid-level faculty/ staff of the Centre. The Cell also provided logistic support to the students of Ramnarain Ruia College of Science and Arts, Mumbai, as a part of their academic tour program in November 2021.

Core Committees in ACTREC

ACTREC Apex Committee for Research and Academics (AACRA)

AACRA, which was established in April 2006, acts as the apex research and academics committee: to carry out the mandate given to ACTREC by the Scientific Advisory Committee, promote basic, interdisciplinary, translational and disease oriented research, recommend and coordinate measures for achieving excellence in research and academics.

Chairperson	Dr. Sudeep Gupta, Director, ACTREC
Member Secretary	Dr. Prasanna Venkatraman, Dy. Director, CRI-ACTREC
Members	Dr. Navin Khattry, Dy. Director, CRC-ACTREC
	Dr. Rajiv Sarin, SO 'H', PI Sarin Lab

Basic Sciences Research Group (BSRG)

BSRG is a forum of basic scientists at ACTREC where scientific issues related to academic and research programs, infrastructure development, organization of symposia and meetings, updates on research support facilities, opportunities for extramural and intramural funding support and related matters are discussed.

Chairperson	Dr. Sudeep Gupta, Director, ACTREC
Co-Chairperson	Dr. Navin Khattry, Deputy Director, CRC-ACTREC
Co-Chairperson	Dr. Prasanna Venkatraman, Deputyy Director, CRI – ACTREC
Member Secretary	Dr. Rohan Khadilkar, SO 'D'
Members	All Principal Investigators & Co-Investigators
	In-Charges of Facilities in CRI

Institutional Animal Ethics Committee (IAEC)

IAEC reviews the maintenance of the ACTREC laboratory animal facility as well as animal study proposals, and also advises the investigators to ensure optimal use of the animals as per the guidelines laid down by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Environment, Forests and Climate Change, Govt. of India. As per guidelines, both CPCSEA registration and IAEC is to be renewed and reconstituted every three years, and accordingly the IAEC of ACTREC has been reconstituted in 2015. The Laboratory Animal Facility of ACTREC itself is registered with the CPCSEA for breeding and conducting experiments on small laboratory animals, vide registration no. 65/GO/ReBi/S/1999/CPCSEA.

Chairperson	Dr. Sanjay Gupta, Scientific Officer 'G', ACTREC
Member Secretary	Dr. Arvind Ingle, In charge of Animal House Facility
Members	Dr. Sanjeev Waghmare, Scientific Officer 'F' ACTREC
	Dr. Shilpee Dutt, Scientific Officer 'F' ACTREC
	Dr. Rahul Thorat, Veterinarian, ACTREC
	Mr. Sharad Bhagat, Main Nominee (CPCSEA)
	Dr. Swapnil Bangar, Link Nominee (CPCSEA)
	Mr. Sameer Shaikh, Scientist from Outside the Institute
	Prof. Vishnu Thakare, Socially Aware Nominee

Institutional Biosafety Committee (IBSC)

IBSC serves as the nodal point for implementation of the biosafety guidelines for recombinant DNA research, their production and release into the environment, and setting up containment conditions for certain experiments as set by the Recombinant DNA Advisory Committee of DBT. Research projects involving the use or production of microorganisms or biologically active molecules that might cause a biohazard must be notified to the IBSC in the DBT-prescribed format. The IBSC permits genetic engineering activity on classified organisms only at places where such work should be performed. The committee members are empowered to subject the storage facility, work place, etc. to inspection.

Chairperson	Dr. Tanuja Teni, Scientific Officer 'G', ACTREC
Member Secretary	Dr. Sanjay Gupta, Scientific Officer 'G', ACTREC
DBT Nominee	Dr. T R Ganapathi, Head, Plant Cell Culture Technology, NABTD, BARC
Members	Dr. Manoj Mahimkar, Scientific Officer 'G', ACTREC- Internal Expert
	Dr. Shilpee Dutt, Scientific Officer 'F', ACTREC- Internal Expert
	Dr.Bhavani Shankar, BARC,Trombay- Outside Expert
	Dr.Vainav Patel, NIRRH - Outside Expert
	Dr. Shashank Ojha, CRC, ACTREC -Biosafety Officer

Institutional Radiation Safety Committee (IRSC)

IRSC is mandated to ensure that the guidelines of the Atomic Energy Regulatory Board for the use, storage, handling and disposal of radioactivity are followed in the respective areas by the designated officers, along with guidelines defined by IRSC. At ACTREC, radioactive sources are used for in-vitro assays, radiation treatment and radiodiagnosis procedures in clinical and preclinical setup. IRSC monitors the safe handling, use and disposal of radioactive sources, and occupation safety aspects while working in the radiation areas. The duration of this committee is up to March-2022.

Chairperson	Dr. Sudeep Gupta, Director, ACTREC
Member Secretary	Dr. Navin Khattry, Dy. Director CRC-ACTREC
Members	Sr. A.O. ACTREC
	Dr. Vedang Murthy, OIC, Dept. of Radiation Oncology, ACTREC
	Dr. Pradip Chaudhari, Scientific Officer 'G', CRI, ACTREC
	Dr. Swamidas Jamima, Medical Physicist 'E' CRC, ACTREC
	Ms. . Reena Devi, CRC, Medical Physicist 'E', CRC,ACTREC

Academic Committee

The Academic Committee oversees all matters pertaining to the JRF program and coordinates the academic coursework (core course and electives), JRF entrance exam paper setting, and ensures the smooth conduct of the course exams.

Chairperson	Dr. Abhijit De
Members	Dr. Rukmini Govekar
	Dr. Nandini Verma
	Dr. Sanjeev Waghmare
	Dr. Syed Hasan
	Dr.Shilpee Dutt
	Dr. Kakoli Bose

Internal Complaints Committee (ICC)

In pursuance of section 4 read with its applicable sub-clauses of the aforesaid act, the Internal Complaints Committee (ICC) at TMC-ACTREC is empowered to enquire into the complaints related to the sexual harassment of women at the workplace. The duration of this committee is up to March-2022.

Chairperson	Dr. Meera Achrekar, Prof. & Dy. Nursing Supdt, ACTREC
Members	Dr. Arvind Ingle, OIC Lab Animal Facility & Scientific Officer 'G', ACTREC
	Dr. Prafulla Parikh, Prof., General Medicine F, ACTREC
	Dr. Rukmini Govekar, Scientific Officer 'G', ACTREC
	Mrs. Bhagyashree Tillu, Medical Social Worker, ACTREC
	Mr. Devendra Pitale Jr. Administrative Officer, ACTREC
	Dr. Nasreen Rustomfram, Prof. & Chairperson, Centre for Life Long Learning, Tata Institute of Social Sciences, Mumbai - Outside expert

Anti-Ragging Committee

In May 2014, an Anti-Ragging Committee was constituted at ACTREC in terms of the decision taken by the Government of India, duly notified through the Homi Bhabha National Institute (HBNI) under whose affiliation the Centre conducts its Ph.D. program in Life Sciences. This committee looks into the matter of complaints of ragging at ACTREC. The duration of this committee is from April-2019 to March-2022.

Chairperson	Dr. Prasanna Venkatraman
Members	Dr. Amit Dutt
	Dr. Kakoli Bose
	Dr. Vikram Gota
	Dr. Ujjwala M. Warawdekar
Student Members	Mr. Joyel Christie
	Mr. Sanket Desai

Grievance Committee

Grievance Committee has been constituted to redress the grievances of all regular staff as well as of temporary staff, registrars and students working at ACTREC, TMC. The duration of this committee is from April-2019 to March-2022.

Chairperson	Dr. Arvind Ingle, Scientific Officer 'G'
Member Secretary	Dr. Vani Parmar, Professor and Surgeon 'G'
Member	Dr. Ashok Varma, Scientific Officer 'G'
Member	Dr. Preeti Chavan, Lab Manager-DS, SO'E'
Member	Mr. M. Y. Shaikh, AO [EM]
TMHWU Rep	Mr. J. K. Rane, technician 'G'
Student Members	Mr. Rohan Chaubal
	Ms. Sarika Tilwani

Students' Council of ACTREC (SCA)

In July 2013, the Centre constituted SCA for the PhD research scholars of ACTREC enrolled under HBNI. SCA organizes various student welfare and recreation (academic, sports and cultural) activities, and also acts as a 'liaison' between students and ACTREC faculty/ management for academic and non-academic issues - including grievances. The core committee consists of five members with no hierarchy. The committee includes one student from each batch up to the 5th year, which includes at least one hostel resident and one female candidate. Core committee members are selected on the basis of nominations from each batch and membership is for one year. SCA meetings are held twice a month and whenever needed.

Members

Mr. Siddharth Barua (SRF-Varma Laboratory)

Mr. Sanket Desai (SRF-Dutt Laboratory)

Ms. Neha Agrawal (SRF-Rukmini Laboratory)

Mr. Archisman Banerjee (JRF-Shilpee Laboratory)

Ms. Shivali Mishra (JRF-De Laboratory)

INSTITUTIONAL ETHICS COMMITTEE III

TMC IEC – III (ACTREC)

Member Secretary: Dr. Sudhir Nair

The TMC-ACTREC Institutional Ethics Committee (IEC-III) was established in December 2009 as per the ICMR and ICH- GCP guidelines for Ethics Committees, at ACTREC, TMC. The IEC-III, constituted by the Director, TMC under the authority vested upon him by the Governing Council of TMC, monitors projects carried out at ACTREC, TMC. The present committee is constituted for the term - 01st July 2020 to 30th June 2022. The committee has met 121 times in the past 12 years and 675 projects have been discussed till December 2021. The entire spectrum of studies involving human subjects including epidemiological studies, biological studies on human tissues, retrospective audits, pharmacokinetic studies and human clinical trials using drugs or additional invasive intervention had been discussed and approved by the committee.

The details of the members of IEC-III are as follows:

Sr. No.	Name & Position	Affiliation	Gender	Expertise
1.	Dr. Surekha Zingde Chairperson	Trustee, Indian Women Scientists' Association (IWSA), Former Deputy Director, CRI, Scientific Officer 'H'	Female	Basic Scientist
2.	Dr. Siby K. George, Member	Professor of Philosophy Department of Humanities & Social Sciences, Indian Institute of Technology Bombay, Powai, Mumbai - 400 076, India	Male	Philosopher
3.	Dr Sudhir Nair Member Secretary	Prof. Head and Neck Surgical Oncology, ACTREC., TMC	Male	Clinician (Surgical oncology)
4.	Dr. Sangita Sukumaran Member	Prof and Head, Department of Pharmacology, Terna Medical College Navi Mumbai, 400706	Female	Clinical Pharmacologist (Basic Medical Scientist)

Sr. No.	Name & Position	Affiliation	Gender	Expertise
5.	Mrs. Deepa Ramani Member	Ex-play group teacher, store and purchase in-charge, Zenith Spinners Ltd. Member of IC-SCR, ACTREC	Female	Layperson
6.	Mr Akil Hirani Member.	Head of the Transactions Practice and Managing Partner Majmudar & Partners, International Lawyers, India	Male	Legal Expert
7.	Dr. Punit Jain Member	Consultant Hematologist/ Hemato-Oncologist & Bone Marrow Transplant Physician, Apollo Hospitals, Belapur, Navi Mumbai Member of IC-SCR, ACTREC	Male	Clinician (Medical Oncology)
8.	Dr Uma Dangi Member	Consultant Medical Oncology Fortis Hospital, Mulund, Vashi and Kalyan	Female	Clinician (Medical Oncology)
9.	Dr. Tanuja Teni Member	Principal Investigator and Scientific Officer 'G' ACTREC, TMC	Female	Basic Scientist
10.	Dr Naveen Mummudi Member	Associate. Professor, Dept. of Radiation Oncology, ACTREC, TMC	Male	Clinician (Radiation Oncology)
11.	Dr. Reshma Ambulkar Member and DSMU Secretary	Professor, Dept. of Anaesthesia, Critical Care and Pain, ACTREC, TMC.	Female	Clinician (Anaesthetist and Intensivist)
12.	Dr. Shalaka Joshi. Member	Associate Professor, Dept. of Surgery, Tata Memorial Hospital, TMC.	Female	Clinician (Surgical oncology)
13.	Dr. Bhausaheb Bagal Member	Professor and Consultant, , Dept. of Medical Oncology, Tata Memorial Hospital, TMC	Male	Clinician (Medical Oncology)
14.	Dr. Nitin S Shetty. Member	Prof. Interventional Radiology Tata Memorial Hospital, TMC	Male	Clinician (Interventional Radiology)

Other staff members

Sr No	Name	Qualification	Job responsibilities
1	Ms. Kasturi Awatagiri	M.Sc	IEC Coordinator
2	Ms. Sajiri Tengshe	M.Pharm	IEC Coordinator
3	*Mrs Pallavi Deshpande	M. Sc	DSMU Co-ordinator
3	Mr. Umerahmed Khan	M.Sc	Admin Assistant
4	Mr. Lahu Bhoir	S.S.C	Office Attendant

*Mrs. Pallavi Dehshpande (M. Sc.): DSMU Co-ordinator joined from December 2021

Regulatory Registration:

- IEC is registered with CDSCO (Registration No. ECR/149/Inst/MH/2013/RR-19) on 09.12.2020 and it is valid up to 20th April 2024.
- IEC registered with Dept. of Health Research (DHR) (Registration: EC/NEW/INST/2020/934) on 28.08.2020.
- IEC III is also register with HHS and IORG No. IORG008037.
- Institution had a Federal Wide Assurance with Dept. of Health and Human Services (DHHS) through the Office for Human Research Protection (OHRP). The assurance no is FWA00025032 and is valid up to 16.12.2026.

IEC-III PERFORMANCE 2021

The committee conducted 12 full board and 1 expedited committee meetings in 2021 for meticulous scrupulous examination of the scientific and ethical contents of submitted projects, owing to which 129 new projects and 45 old projects from 2019-2020 were examined.

Table 1: Review type

Review type	2020	2021
Full Board	166	120
Expedited	08	06
Exempted	5	03
Total	**179**	**129**

Table 2: IEC decision on new projects (full board review)

Full board review	2020	2021
Approved	123	11
Approved with minor modification	27	68
Resubmit (major)	13	34
Not approved	0	0
Withdrawn by PI	1	0
Deferred	2	0
Under review process	0	7
Review exempted	2	3
Total	**168**	**123**

Table 3: IEC decision on expedited review projects

Expedited projects	2020	2021
Approved	7	6
Revision with minor modification	0	0
Revision with major modification	0	0
Not approved	1	0
Total	**8**	**6**

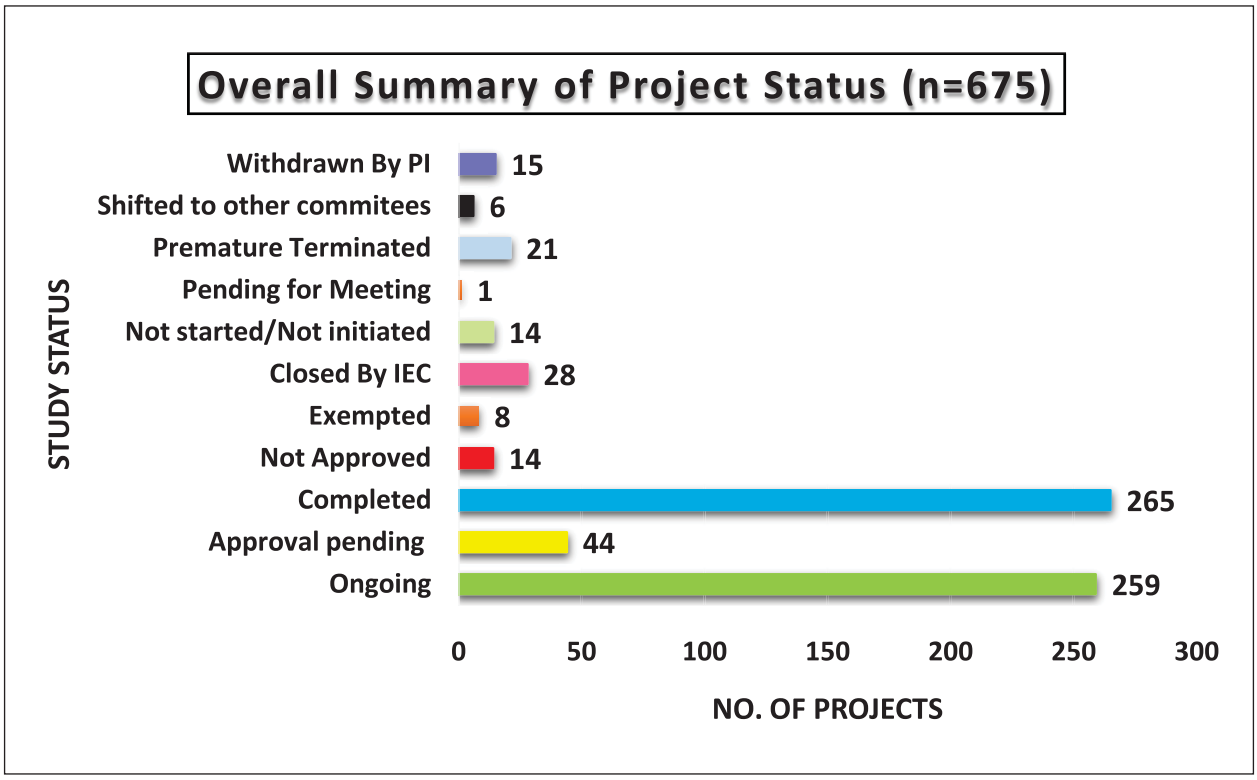
Table 4: IEC decision on (full board + Expedited) projects carried forward previous years (n=45)

Projects carried forward	2019 Full board	2020 Full board	Total
Approved	3	28	31
Resubmitted	0	03	03
Closed by IEC	0	02	02
Revision with minor modification	0	03	03
Withdrawn by PI	0	05	05
Exempted from review	0	0	0
Deferred	0	1	1
Total	**3**	**42**	**45**

Note: Carry forwarded projects: 07= 03 (major) +03 (minor) +1(Deferred)

Table 5: Summary of the source of funding

Source of funding	2020	2021
IM	11	14
EM	13	12
IM + EM	10	09
Pharma	0	01
Others	0	0
Non funded projects	145	93
Total	**179**	**129**



Achievements

- **Accreditation:**Institutional Ethics Committee III, Tata Memorial Centre has been assessed and found to comply with NABH Accreditation Standards for Ethics Committee (E.C) under clinical trial program. This certificate is valid subject to continued compliance with NABH Accredit.

- **Education: Training and Education for EC members:**

Sr no.	Training details	Training conducted by	Meeting Dated
1	a) Ethical Consideration in clinical research b) Biomedical study Monitoring c) Informed Consent Form d) Procedures and formalities involved in Multicentric studies e) Demonstration of online submission of new and revised projects to IEC	Durga Gadgil Vikram Gota, Sudhir Nair Kasturi Awatagiri	10.03.2021
2	a) Overview of SOPs	Dr Sudhir Nair Ms.Kasturi Awatagiri	21.05.2021

Future Steps: Reduction in carbon foot prints by going more paperless for all kinds of communications to and from the IEC.

RESEARCH PROJECTS APPROVED BY IEC III-2021

PI	Project Title
Dr. Abhishek Mahajan	Automated Pulmonary Nodule Detection (APND) in CT scans using deep convolutional neural networks.
Dr. Akshay Baheti	Machine learning in the determination of complete tumor response in patients with significant amount of mucin on MRI after neoadjuvant therapy.
Dr. Aliasgar Moiyadi	Validation of Indigenous Robotic Neurosurgical Image guidance system using Human Derived Imaging data.
Dr. Ameya Puranik	Prognostication of Lung Shunt Fraction, tumor to normal liver ratio (T/N ratio) and absorbed tumor radiation dose on 99m-Tc-MAA scintigraphy for survival in patients with BCLC stage C patients of HCC undergoing TARE using Y90 labeled spheres.
Dr. Amit Janu	Incidence of acute pulmonary embolism in patients referred for computed tomography pulmonary angiogram in radiology department of tertiary care cancer center.
Dr. Archi Agrawal	Diagnostic performance of 18F-FDG PET/CT in recurrent adenocarcinoma of gallbladder and its impact on post-recurrence survival.
Dr. Archi Agrawal	Retrospective analysis of the toxicity, QoL and efficacy of 177Lu PSMA therapy in metastatic castrate resistant prostate cancer patients.
Dr. Ashish Gulia	Oncological outcomes of clear cell chondrosarcoma.
Dr. Ashish Gulia	Oncological outcomes of primary fibula tumors.
Dr. Ashish Gulia	Oncologic and functional outcomes after excision of proximal femur primary bone tumors and hemiarthroplasty.
Dr. Ashwini Budrukkar	Patterns of failure in sinonasal cancers after curative intensity modulated radiation therapy.
Dr. Atanu Bhattacharjee	Joint Modeling of Longitudinal and time to event data with multiple imputation.
Dr. Atanu Bhattacharjee	Normal Activity Initation by using Artifical Intelligence Based Technology to Fight against COVID-19 in different hotspots of India.
Dr. Avanish Saklani	Novel use of the Bakri balloon to minimize empty pelvis syndrome following total pelvic exenteration.

PI	Project Title
Dr. Bhakti Trivedi	Incidence of Post-Operative Acute Kidney Injury following major abdominal surgeries in Paediatric populations (InAK).
Dr. Bhausaheb Bagal	A retrospective study to evaluate outcomes & prognostic factors in Primary CNS Lymphoma (PCNSL) patients treated with systematic therapy.
Dr. Bhausaheb Bagal	A prospective study to evaluate the role of PET-CT in response evaluation of patients of Primary CNS Lymphoma.
Dr. Bhausaheb Bagal	Minimal residual disease guided therapy in newly diagnosed multiple myeloma.
Dr. Chetan Dhamne	Clinical profile and outcomes of dengue infection in pediatric oncology patients: A retrospective study.
Dr. Debashish Chaudhary	Evaluation of Challenges faced by cancer patients in treatment completion at Homi Bhabha Cancer Hospital, Sangrur in lockdown period during Covid-19 pandemic.
Dr. Gaurav Narula	Exploring the role of indigenously developed Novel Humanized CD19-directed Chimeric Antigen Receptor (CAR)-1 (NH19CAR-1) modified T- Cells in the therapy of relapsed/ refractory B-cell Acute Lymphoblastic Leukemia- A First in Human Pilot Feasibility Study.
Dr. Gaurav Narula	Treatment of Pediatric B-Lymphoblastic Lymphoma (pB-LBL) using Modified BFM-90 Protocol: A retrospective study.
Dr. Girish Chinnaswamy	Prognostic variables and outcome of all histopathologically confirmed pediatric germ cell tumors diagnosed and treated over a decade (2009-2018).
Dr. Jigeeshu Divatia	To evaluate the characteristics and outcomes of cancer patients with coronavirus (Covid 19) admitted to the intensive care unit in a Tertiary Cancer Centre and identify risk factors that predict outcomes.
Dr. Jyoti Bajpai	The clinical utility and safety of Immune check point inhibitors (ICI) - Multicentric data from India.
Dr. Kakoli Bose	Characterizing Pathogenic Mutations of Procaspase-8 to uncover Apoptosis Regulation in cancer.
Dr. Kunal Gala	Retrospective analysis of diagnostic accuracy of image guided peritoneal/omental biopsy.
Dr. Kunal Gala	Retrospective study for diagnostic accuracy of percutaneous image guided pediatrics abdominal mass biopsy.

PI	Project Title
Dr. Lavanya G	Retrospective Analysis of Outcomes and Toxicities of Patients with Cervical Cancer treated with Computed tomography and Xray based Intracavitary brachytherapy.
Dr. Lingaraj Nayak	Diffuse large B-cell lymphoma in the elderly : Retrospective analysis from a single tertiary cancer center in India.
Dr. Mahendra Pal	Retrospective analysis to assess the pattern and preventive protocols used for uro-oncological day care procedures during the pandemic of COVID-19: an experience of a tertiary cancer care center.
Dr. Mahendra Pal	Retrospective analysis of clinical factors that influence the utility of Re staging TURBT in non-muscle invasive bladder cancer.
Dr. Mahendra Pal	A retrospective audit of clinical factors to assess their influence on geriatric patient in uro-oncology.
Dr. Mahesh Goel	Surgical outcomes of 1300 consecutive resections for suspected gallbladder cancers - Lessons learnt & way forward.
Dr. Manish Bhandare	Pathological N3 Stage (pN3/ypN3) Gastric Cancer: Outcomes, Prognostic Factors and Pattern of Recurrences after Curative Treatment.
Dr. Manju Sengar	Outcomes of Diffuse Large B Cell Lymphoma with Rituximab based therapy: An Institutional case series from Tata Memorial Centre.
Dr. Manjunath Nookala	A prospective study to develop and validate point of care devices for measuring the levels of commonly used drugs in Intensive Care Unit.
Dr. Manjunath Nookala	An online survey of clinical pharmacologists to study their roles and responsibilities.
Dr. Maya Prasad	Impact of Nutritional Status on Clinical Outcomes in Children with Cancer: A Retrospective Analysis.
Dr. Maya Prasad	Prognostic Factors and Outcomes in Children with Neuroblastoma treated with a Risk Stratified Protocol.
Dr. Maya Prasad	Prognostic Factors and Outcomes in Children with Wilms Tumour treated with a uniform Risk Stratified Protocol.
Dr. Meenakshi Singh	Generation and Characterization of third party donor derived AdV, CMV and EBV multivirus specific T cells for therapeutic intervention in patients undergoing Hematopoietic Stem Cell Transplantation.

PI	Project Title
Dr. Mukta Ramadwar	Clinical relevance of segmental chromosomal aberrations in patients with Neuroblastoma.
Dr. Nandini Menon	A retrospective review of the pattern of care of systemic therapy in head and neck cancer.
Dr. Navin Khattry	Interaction of Vitamin D Receptor gene polymorphism with HLA alleles and its correlation with immune modulation affecting graft outcomes and survival in HLA matched sibling allogeneic stem cell transplantation.
Dr. Nayana Amin	Perioperative outcomes of liver resection surgery in children - Experience from a tertiary cancer hospital.
Dr. Nayana Amin	A retrospective audit of airway management practices and perioperative outcomes in children with head and neck cancers.
Dr. Neha Mittal	A retrospective clinico-pathological review of Cribriform-Morular Variant of Papillary thyroid carcinoma.
Dr. Nehal Khanna	Retinoblastoma: A Retrospective Audit Of Practice And Outcomes In Tata Memorial Centre.
Dr. Nikhil Patkar	Detection of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is Influenced by the Type of Transport Medium: Implications for Diagnosis and Monitoring.
Dr. Nikhil Patkar	Metagenomics (mNGS) for the rapid identification of pathogenic organisms causing sepsis in adult patients of Acute Leukaemia (AL) including those undergoing bone marrow transplantation (BMT).
Dr. Nilesh Sable	Retrospective analysis of image guided adrenal biopsies conducted at tertiary care hospital.
Dr. Nilesh Sable	Pilot study in prediction of overall survival of metastatic RCC patients using CT texture analysis.
Dr. Nita Nair	Impact of lumpectomy for the diagnosis of primary tumour on disease free survival in women with operable breast cancer: An institutional audit.
Dr. Nita Nair	Prospective analysis of retrospective data on the impact of menopausal status and Chemotherapy induced peripheral neuropathy.
Dr. Nita Nair	DCIS in the Indian Scenario - A retrospective audit of palpable DCIS compared to operable breast cancer.
Dr. Nita Nair	A retrospective audit for margin assessment post Breast Conservation Surgery.

PI	Project Title
Dr. Nita Nair	Retrospective audit of synchronous and Metachronous breast cancer: single institution experience.
Dr. Nita Nair	A retrospective audit for feasibility of Breast Conservation Surgery in locally advanced breast cancer, Post Neoadjuvant Chemotherapy.
Dr. Nita Nair	Retrospective audit to assess the accuracy of intra-operative Frozen Section Analysis of Lymph Nodes in Low Axillary Sampling for Clinically Node Negative Breast Cancer.
Dr. Nita Nair	A retrospective audit of the management of N2b and N3 disease in women with breast cancer treated with surgery and radiotherapy or radiotherapy alone, post neo adjuvant therapy.
Dr. Nita Nair	Patterns Of Breast Cancer Management Across The Decades (The Panorama Study): A Single Center Retrospective Audit.
Dr. Nivedita Chakrabarty	Incidence of COVID-19 infection amongst the high risk versus low risk health care workers: An audit from a tertiary cancer care centre.
Dr. Parthiban Velayutham	A survey to investigate the use of Intraoperative nerve monitoring (IONM) during thyroid surgeries in India.
Dr. Poonam Joshi	A Prospective observational study to translate and validate the Shame and Stigma scale (SS scale) for head and neck cancers into Hindi and Marathi.
Dr. Poonam Joshi	A Prospective, observational study to translate and validate the Caregiver Oncology quality of life questionnaire (CarGOQoL) into Hindi and Marathi.
Dr. Poonam Joshi	Retrospective audit of rare malignant neoplasms of Larynx and Hypopharynx.
Dr. Poonam Joshi	A Retrospective Analysis Of Factors Affecting Drain Output In Postoperative Period In Oral Cavity Carcinoma.
Dr. Poonam Joshi	Correlation of clinico-radiological and histopathological findings in patients of advanced laryngeal & hypopharyngeal carcinoma.
Dr. Poonam Joshi	Retrospective audit of local flaps for oral cavity defects (ACTREC): Head and Neck Surgeons perspective.
Dr. Poonam Joshi	Retrospective study to evaluate clinicoradiological parameters determining segmental or marginal mandibulectomy for Tongue and FOM lesions.
Dr. Prabhat Bhargava	To study the outcome of Gastrointestinal tumour (GIST) in Tyrosine Kinase Inhibitor (TKI) era.

PI	Project Title
Dr. Prathamesh Pai	Multi-centric collaborative study to assess the outcomes of endoscopically-treated sinonasal malignancies.
Dr. Prathamesh Pai	International Collaborative Study on Patients with Sinonasal and Skull Base Malignancies.
Dr. Pratik Chandrani	Understanding the development of resistance to standard line of therapy in oral cancer
Dr. Pratik Chandrani	Identification and characterization of ethnic specific alterations in Indian cancer genome
Dr. Priyamvada Gupta	Patterns of failure in Ga68-PSMA PETCT at rising PSA post radical radiotherapy for Prostate Cancer.
Dr. Rajendra Badwe	Lymphatico-venous communications and rhythmic, respiratory pressure changes influence the incidence of metastatic disease at presentation in solid tumours.
Dr. Reshma Ambulkar	Retrospective Audit On Post-Operative Pain Management In Major Upper Gi Surgeries In Tertiary Care Cancer Hospital
Dr. Reshma Ambulkar	Clean-cut.
Dr. Richa Vaish	Role of revision surgery in post excision biopsy tongue cancers
Dr. Richa Vaish	Pattern and factors predicting lymph node metastasis and their impact on outcomes in salivary gland tumours.
Dr. Sachin Punatar	Pilot Study Of Leflunomide As First Line Therapy For Musculoskeletal GVHD.
Dr. Sachin Punatar	Analysis of predictive factors for benefit from the use of lenalidomide as a bridge to allogeneic transplant in acute myeloid leukemia.
Dr. Sachin Punatar	A study to assess the correlation between Tyrosine Kinase Inhibitor (TKI) related factors and Transplant associated Thrombotic Microangiopathy (TA-TMA) in patients with acute leukemias and CML who have undergone allogeneic stem cell transplant.
Dr. Santosh Menon	Retrospective review of tumors of paratestis and testicular adnexae.
Dr. Sarbani Ghosh Laskar	Audit of clinical outcomes of patients of de novo metastatic nasopharyngeal cancer treated with induction chemotherapy followed by radical doses of loco-regional treatment (concurrent radical chemo-radiotherapy) with or without local treatment of the metastatic disease at Tata Memorial Centre.

PI	Project Title
Dr. Sarbani Ghosh Laskar	Long-Term Outcomes, Toxicities And Social Challenges In Adolescents And Young Adults (AYA's) Treated With Chemo-Radiotherapy For Nasopharyngeal Carcinoma.
Dr. Shalaka Joshi	Retrospective analysis evaluating the effect of tumour/breast ratio (T/B) ratio in breast cancer prognosis.
Dr. Shalaka Joshi	The impact of COVID19 pandemic on the morbidity of breast cancer surgery of a tertiary cancer centre.
Dr. Shalaka Joshi	Determinants of pathological complete response to neoadjuvant chemotherapy in breast cancer.
Dr. Shalaka Joshi	Retrospective audit of the yield of Internal Mammary Lymph Node Dissection and literature review in the management of breast cancer.
Dr. Shalaka Joshi	Experimental pilot study to evaluate differences in cell cycle phase distribution and establish dormancy signature in patients on sequential vs concurrent chemo-endocrine therapy in the neoadjuvant setting in hormone receptor positive and HER2 negative non-metastatic breast cancer. (Trans-CONSEQuenCE)
Dr. Shalaka Joshi	Metastatic lobular carcinoma of the male breast masquerading as a pancreatic head mass, a diagnostic dilemma- rare case and literature review
Dr. Shashank Ojha	Analysis of donor safety and product quality in apheresis granulocyte collection.
Dr. Shiva Kumar Thiagarajan	Swallowing Outcomes In Patients Undergoing Surgery For Tongue Cancers: A Retrospective Analysis.
Dr. Shiva Kumar Thiagarajan	Parotid fistula: an underrecognized and underreported preventable complication following surgery for oral cancer.
Dr. Shylasree T S	CHemotherapy Associated Menstrual dysfunction Study (CHAMS).
Dr. Sudeep Gupta	SERS-Nanoprobes/ SERS Chip platforms for Multiplexed Diagnosis of Breast Cancer Biomarkers in Tumor Tissue Samples.
Dr. Sudeep Gupta	Cost-effectiveness Analysis & Value-Based Pricing for Anti-Cancer Drugs: Implications for Patients, Industry, Insurer and Regulator
Dr. Sudeep Gupta	Retrospective observational study to determine factors influencing outcome in patients with Human Epidermal Growth Factor Receptor

PI	Project Title
	2 positive breast cancers who receive neoadjuvant chemotherapy
Dr. Sudeep Gupta	Proteogenomic characterization of Triple Negative Breast Cancer (TNBC Moonshot).
Dr. Sudeep Gupta	Proteogenomic characterization of Cervical Cancer (CACervix Moonshot).
Dr. Sudeep Gupta	A retrospective study to assess the effectiveness of Covid-19 vaccination and incidence of SARS-COV-2 reinfection in healthcare and frontline workers working in a tertiary cancer centre of India.
Dr. Sudhir V. Nair	Retrospective Audit of Marginal Mandibulectomies for Squamous cell Carcinoma of the Oral Cavity.
Dr. Sujata Lall	Delftia acidovorans: report of an unusual pathogen from an adenocarcinoma lung patient with pleural effusion.
Dr. Sujay Srinivas	Retrospective study to analyze the outcomes and prognostic factors of Anal canal cancers.
Dr. Sumeet Mirgh	A Retrospective Institutional analysis of Clinical Characteristics and Outcomes of Hospitalized patients with COVID-19.
Dr. Supriya Chopra	Developing clinical high efficiency platforms for individualised treatment through integration of advanced radiation technology, quantitative imaging and molecular biology and machine learning for treatment of cervix cancer.
Dr. Supriya Chopra	Evaluation of radiation dose-response relationship of pelvic and para-aortic nodes and clinical outcomes in Locally-Advanced Cervical Cancer.
Dr. Suryatapa Saha	Evaluation of Intra Operative Transfusion Indicators in Surgical Oncology Patients in a Tertiary Care Oncology Centre.
Dr. Suyash Kulkarni	Retrospective evaluation of the clinical outcome in patients with vertebral metastases undergoing combined treatment of ablation with vertebroplasty.
Dr. Syed Hasan	Development of CRISPR based highly sensitive and point-of-care diagnostic assay for acute promyelocytic leukemia.
Dr. Tejpal Gupta	Solitary Fibrous Tumor/Hemangiopericytoma of the intracranial meninges (SoFT study).

PI	Project Title
Dr. Vasundhara Patil	Ct Imaging Evaluation Of Hepatoblastoma: Pre And Post Neoadjuvent Chemotherapy And Correlation With Clinical, Pathological And Surgical Findings.
Dr. Vedang Murthy	Adaptive Radiotherapy (ART) in bladder preservation: A Retrospective analysis.
Dr. Vedang Murthy	FDG PET-CT based risk adapted Radiotherapy vs Observation for post chemotherapy residual mass in advanced Seminoma: A Prospective Randomised Controlled Trial (PROSem).
Dr. Vedang Murthy	Hypo fractionated Radiotherapy related Enteritis in Carcinoma Prostate (RECAP).
Dr. Venkatesh Rangarajan	Utility of FDG PET/CT in non-adeno and non-squamous uterocervical and pelvic cancers.
Dr. Vijay Patil	A randomized controlled study comparing tyrosine kinase inhibitor versus tyrosine kinase inhibitor with intrathecal methotrexate in leptomeningeal carcinomatosis in driver mutated non-small cell lung carcinoma.
Dr. Vikram Gota	Safety and Antibody Kinetics of the ChAdOx1 nCoV-19 vaccine in Indian Adults.
Dr. Vikram Gota	Comparison of Glomerular Filtration Rate Estimating Equations in Indian Geriatric Cancer Patients: A Single Centre Observational Study.
Dr. Vikram Gota	Comparison of PSA response in generic versus innovator (ZytigaTM) abiraterone in metastatic CRPC: A retrospective analysis.
Dr. Vivek Bhat	Assessment of In -vitro susceptibility of Staphylococcus aureus and Enterococcus fecalis to levonadifloxacin.

DSMU- III, ACTREC

Member Secretary: Dr. Reshma Ambulkar

The Data Safety Monitoring Unit (DSMU), a unit of the IEC-III at Tata Memorial Centre is responsible for monitoring of patient safety during the course of the study in a manner that ensures the scientific and ethical integrity of the study. The DSMU comprises of an intensivist, basic scientists, medical oncologists, surgical oncologists and radiation oncologists. The members of the DSMU are trained in causality assessment as per WHO criteria and routinely implement the criteria in assessing the relatedness of adverse events.

The composition of the current DSMU (1st July 2020 to 30th June 2022) is given below:

Sr No.	Names	Affiliation	Gender	Expertise
1	Dr. Reshma Ambulkar, Member Secretary (IEC-III Member)	Professor &Anaesthetist 'F', Dept. Of Anaesthesia, Critical Care & Pain, Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)&Tata Memorial Hospital, TMC.	Female	Clinician (Anaesthetist & Intensivist)
2	Dr. Sachin Punatar, Member- Joint Secretary	Assistant Professor &Medical Oncology 'E', Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)	Male	Clinician (Medical Oncology)
3	Dr. Ashok Varma, Member	Scientific Officer 'G', Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)	Male	Basic Scientist
4	Dr. Vikram Gota Member	Associate Professor &Clinical pharmacologist 'F', Department Of Clinical Pharmacology, Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)	Male	Basic Medical Scientist (Clinical-Pharmacologist)
5	Dr. Purvi Thakkar, Member	Assistant Professor 'E', Consultant Surgeon, Tata Memorial Hospital, TMC	Female	Clinician (Surgical Oncology)

6	Dr. Anant Gokarn, Member	Asst. Professor, Medical Oncology (Adult HL) Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)	Male	Clinician (Medical Oncology)
7	Dr. Madhavi Desai, Member	Associate Professor &Anaesthetist F, Dept. Of Anaesthesia, Critical Care & Pain, Tata Memorial Hospital, TMC	Female	Clinician (Anaesthetist & Intensivist)
8	Dr. Syed Hasan, Member	Scientific Officer E, Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)	Male	Basic Scientist
9	Dr. Sharayu Mhatre, Member	Scientific Officer D, CCE, Advanced Centre For Treatment, Research & Education In Cancer (ACTREC)	Female	Basic Scientist (Epidemiologist)

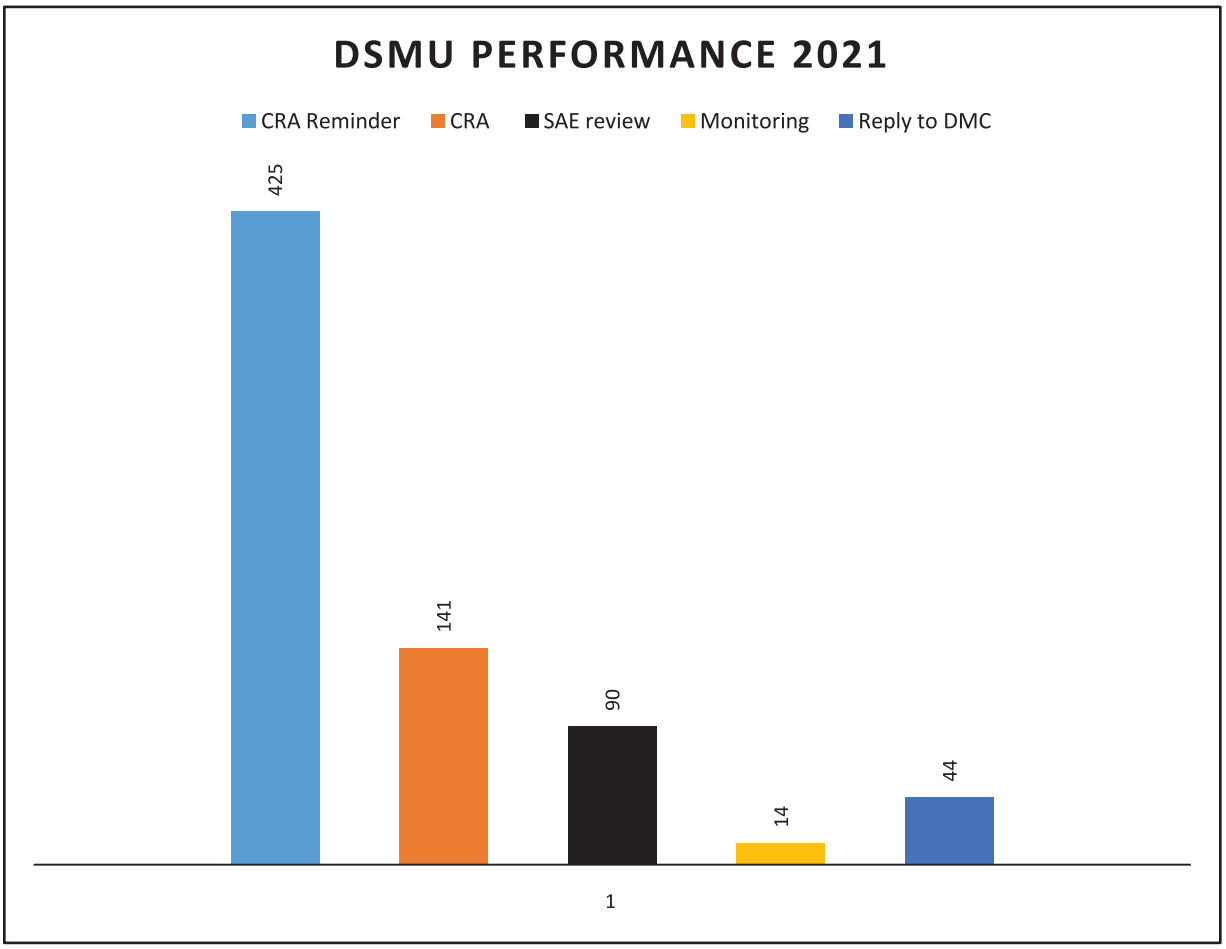
The important responsibilities of the committee:

- Review of Serious Adverse Event reports (SAEs).
- Monitoring of overall progress of institutional (investigator initiated) trials and for cause monitoring of other trials as requested by the IEC.
- Initial review of Continue Review Application/ Annual Status reports.
- Review of Site Monitoring Report

DSMU activities (2021)

The DSMU conducted 12 meetings (Due to COVID pandemic, 12 were conducted virtually through zoom and Skype mode)during 2021, and the minutes were forwarded to IEC for further action. Besides the scheduled monthly meetings and review of SAEs reported on all the studies, SAEs on regulatory trials were evaluated continuously (to meet the 30 days' timeline) on email by a group of four members consisting of the two lead discussants and Member Secretary of DSMU and IEC. The committee conducted 14 site monitoring visits, reviewed 90 SAE reports from 12 projects (54 events) and sent 425 reminders to PIs for Continue Review Application submission as required. A detailed initial review of 109 Continue Review Applications (CRA) was done by DSMU Member Secretary and comments from the DSMU were forwarded to the IEC for further action. At every IEC meeting, the DSMU Member Secretary or representative of

the DSMU presented the minutes of DSMU meeting to IEC for further action. Eight monitoring reports were discussed in the full board (Two Reply to DSMU will be carried forward to 2022 for further decision)and based on IEC comments, recommendation and query letters were issued to PIs. A total of 44 replies were reviewed by DSMU and their comments were forwarded to IEC.



Activities:

- Maintaining and updating a database for internal SAEs occurring at ACTREC that help in following up on significant events that have occurred on the trial.

Education is one of the three mandates of ACTREC, and the on campus environment is strongly supportive of Academics. The Centre's educational endeavors include: (a) its Ph.D. program that accepts research scholars from across the country through an online written examination followed by interview to conduct doctoral research, (b) its training program that accepts undergraduate and postgraduate students from colleges and universities from within and outside India, (c) its organization of local, national and international Conferences, Symposia, Workshops and Training Courses in the biological/ life sciences as well as CMEs and CNEs on various disciplines within oncology, (d) its conduct of research seminars delivered by visiting national/ international scientists and clinicians, (e) its acceptance of educational visits from college/ university students from across the country, and conduct of an Open Day at the Centre to showcase some of its research facilities, and (f) conduct of a National Research Scholars Meet by its research scholars. The Centre also conducts a public outreach program to create cancer awareness. Faculty and staff members are encouraged to attend CMEs, CNEs, workshops and training courses and to present their findings at national/ international conferences. The academic fervor on campus is strengthened by the regular in-house data presentations and journal clubs conducted by basic and clinical scientists.

Doctoral Program

The Academic and Training Program Office, chaired by Dr. Sorab Dalal, oversees the Ph.D. (Life Sciences) program at ACTREC, which is affiliated to the Homi Bhabha National Institute (HBNI) - a deemed university established in 2006 under the aegis of the University Grants Commission and covers all the constituent units of the Department of Atomic Energy, Government of India. The Program Office maintains a close liaison with HBNI to resolve any queries, conducts the students' annual doctoral committee (DC) meetings and ensures that at least four DC meetings are held during their tenure, collates documentation of these meetings, and submits the reports to HBNI. The Office also handles the pre-synopsis documentation, submits synopses and theses (spiral bound/ final bound) to HBNI, corresponds with external examiners and HBNI, conducts the open viva voce, and submits final reports to HBNI. The Academic Committee of ACTREC oversees the smooth running of the JRF-ACTREC entrance examination and doctoral program with support from SCOPE Cell and Steno-pool for student intake and academic

coursework, from ACTREC Administration for enrolment and fellowship matters, and from the Program Office for HBNI matters.

Between January and December 2021, a total of 108 graduate students were working towards the Ph.D. degree in Life Sciences at ACTREC; these included 21 JRF 2021 batch students who joined in August 2021 (see photograph below).

From L-R (Boys) : Mr. Aniket Chowdhury, Mr. Deepak Sahni, Mr. Akash Maity, Mr. Parikshit Jayantibhai Patel, Mr. Rudransh Singh, Mr. Kavikumar A. K., Mr. Shubham Jha, Mr. Ashish Kumar Panda
From L-R (Girls) : Ms. Prerna Singh, Ms. Aishwarya J., Ms. Sulagna Rath, Ms. Sakshi Sadanand Anchan, Ms. Shagufa Aram Ehtesham Shaikh, Ms. Dnyanada Sadanand Ghadi, Ms. Panchali Saha, Ms. Flevia Anthony Susairaj, Ms. Parul Sachdeva, Ms. Vasudha Dwivedi, Ms. Ghanapriya Devi Yengkhom, Ms. Akhila George, Ms. Ujjayita Chowdhury

Award of the Ph.D. Degree in Life Sciences (HBNI)

During the year 2021, 14 students completed research towards their doctoral dissertation and were awarded the Ph.D. degree (see the tabulation that follows).

No.	Date	Thesis title with Ph.D. students details
1	January 4, 2021	**Investigating the Role of IGF-1R Signalling in Development and Maintenance of Chemoresistance in Ovarian Carcinoma** Mr. Ajit Dhadve, ACTREC-SRF, Ray Lab
2	January 6, 2021	**Genome wide approaches characterise novel genetic elements causing cancer** Mr. Trupti Togar, ACTREC-SRF, Dutt Lab
3	January 12, 2021	**Creation of novel photochangable fluorescent protein through directed evolution** Mr. Pravin Marathe, ACTREC-SRF, Bhattacharyya Lab
4	February 4, 2021	**Phosphoacetylation of histones during cellular transformation in mammalian cells** Mr. Ramchandra Amnekar, ACTREC-SRF, Gupta Lab
5	March 9, 2021	**Molecular mechanism underlying the effect of miRNA expression on medulloblastoma cell behavior** Mr. Harish Bharambe, ACTREC-SRF, Shirsat Lab
6	May 10, 2021	**Assessing the Role of Activins / Inhibins in Human Oral Cancers** Ms. Dhanashree Mundhe, UGC-SRF, Teni Lab
7	May 17, 2021	**Elucidating the Role of Clusterin in Human Oral Cancers** Ms. Rajashree Kadam, ACTREC-SRF, Teni Lab
8	May 25, 2021	**Role of IGF1R in Ovarian Cancer Metastasis** Mr. Abhilash Nitin Deo, ACTREC-SRF, Ray Lab
9	July 23, 2021	**Biogenesis, Dynamics and Functions of cargo vesicles in early secretory pathway and in extracellular milieu** Ms. Sudeshna Roy Chowdhury, ACTREC-SRF, Bhattacharyya Lab
10	August 5, 2021	**Analysis of HPV, EGFR and Hypoxia Markers and Their Association with Clinical Outcome in Subjects with Locally Advanced Squamous Cell Carcinoma of Head and Neck** Ms. Usha Patel, CSIR-SRF, Mahimkar Lab
11	August 10, 2021	**A study on understanding the modulation in MAPK/ERK and PI3KCA/Akt signaling during acquirement of drug resistance** Mr. Aniketh Bishnu, ACTREC-SRF, Ray Lab

12	October 22, 2021	**Studies on role of EpCAM modulation during acquirement of radiation resistance in breast cancer cells** Mr. Arijit Mal, ACTREC-SRF, De Lab
13	November 8, 2021	**Understanding the crosstalk of mesenchymal stem cells and gamma delta T cells in the tumor microenviroment** Ms. Shalini K S, ACTREC-SRF, Chiplunkar Lab
14	December 15, 2021	**Role of epigenetic modifiers in pathogenesis of medulloblastoma** Mr. Akash Deogharkar, ACTREC-SRF, Shirsat Lab

Training Program

ACTREC's training program encompasses (a) undergraduate/ graduate students seeking to work on small projects for their Bachelor's/ Master's dissertation, (b) individuals who have completed studies and wish to gain research experience, (c) undergraduate students who come as summer trainees during their college break, and (d) students of colleges/ universities or staff of hospitals who pay short visits as observers to learn specific techniques. ACTREC's training program had 222 participants during 2021, of which 109 trainees worked towards their MSc dissertation, 11 were on collaborative projects, 98 trainees came for research experience, 33 were observers, 1 was a Research Associate and 4 were summer trainees. The trainees worked under the close supervision of senior or mid-level scientists, clinicians and other officers.

Advanced Training Course in Medical Laboratory Technology

The Advanced Training Course in Medical Laboratory Technology (AMLT), conducted jointly by Dr. Preeti Chavan, Dr. Vivek Bhat and Dr. Shashank Ojha who are in charge of the diagnostic laboratories of ACTREC, is designed to provide both theoretical knowledge and practical training leading to advanced specialization in various medical laboratory technologies. Coursework is designed in such a way that, at the end of the course, the student is able to work as a skilled technologist under the supervision of consultants in an accredited laboratory attached to a hospital or in a small, independently functioning laboratory carrying out advanced tests with effective quality control and provide patients with reliable reports. The duration of the course is one year, and the course is followed by a bond period of one year. The AMLT course was started at ACTREC in November 2015 and the first batch comprising of two students completed their coursework in November 2016 and served the bond period until November 2017. In 2021, the report year, four students were registered and undergoing training for the

AMLT course Using state-of-the art instrumentation such as automated analyzers and advanced technologies, the AMLT students receive hands-on training in Hematology (CBC, coagulation, cytochemistry, manual differential count and body fluid cell count), Clinical Biochemistry (routine biochemistry, tumor marker/ drug assays, and calibration of tests), Microbiology (bacteriology, mycology, clinical microbiology, serology and media preparation), Histopathology (sample accession, grossing, tissue processing, embedding, trimming/ cutting, staining and submission of stained slides, frozen section and immunohistochemistry) and Transfusion Medicine (medical screening of blood/ platelet donors, outdoor blood camps, apheresis, blood component separation, transfusion transmitted infection testing, blood grouping, cross-matching, antibody titration as well as procedures for hematopoietic stem cell transplant). They also participate in academic activities, and receive training in the implementation, interpretation and documentation for internal quality control programs, as well as the external quality assurance programs of these departments.

Educational Visits

To provide an exposure to students, ACTREC facilitates the educational program tours of various institutes. The educational visits begin with an overview of research and clinical activities of ACTREC followed by visits to various departments and facilities of the Centre.

From the end of March 2020, the Centre did not encourage visits due to the world-wide pandemic of COVID-19. The staff and students were strictly following the pandemic protocol and the Centre was adhering to all the rules and regulations laid down for combating the pandemic. The pandemic protocol continued into the year 2021, as there were several infection waves and it was important to curtail and contain the spread of the disease.

Towards the end of the year 2021, when it was safer with more than a 100 crore adult individuals vaccinated against the novel Coronavirus in the country, ACTREC opened up for educational visits. However, only one visit of a batch comprising of 9 students and 2 faculty members from Ramnarain Ruia College of Science and Arts, Matunga, Mumbai, was arranged in the month of November 2021. So, effectively only one educational visit to ACTREC was arranged in the report year.

CLINICAL RESEARCH SECRETARIAT-ACTREC

Officer-In-Charge: Dr. Jayant Sastri Goda

Data Manager 'F': Mrs. Sadhana Kannan

Overview

Clinical Research Secretariat (CRS) has been given a mandate to provide clinical and basic researchers at ACTREC a high level support for research activities including research methods, operations, training and education. The Secretariat's vision is to become a vital cog in the wheel for clinical research at Tata Memorial Centre so as to uphold it's pre-eminence as a frontier institute for cancer research in India.

Service

The CRS at ACTREC provided scientific and technical inputs needed to support basic and clinical research investigators spanning the range of activities from protocol development to manuscript publication. It has also been actively supporting phase II and III clinical trials, which are single or multi-centric, through services such as randomisation (20 trials- TMH & ACTREC), CRF development, electronic data capture, clinical data management through REDCap and statistical analysis

Research

The lead statistician carried out advanced statistical analysis in the area of systematic reviews and meta-analysis which contributed to high impact publications. The CRS staff contributed significantly and featured as co-authors in 20 publications in the year 2021. The CRS recently got a NBM BIRACS grant of Rs. 138 lakhs for capacity building and doing various projects in the field of new device /drug development. Under this project, an electronic registry for capturing data on solid tumours was created at CRS which will be used to make a registry for 11 centres across the country.

Education

The CRS has been involved in teaching biostatistics for the doctoral students of life sciences, MSc Nursing students of the ACTREC/TMH and the junior residents of Radiation Oncology of

TMH. A post graduate diploma course in Biostatistics has been started during the year 2020-21. Four students have been trained on the Module-Statistical methods in clinical research for a period of six months. The lead statistician, Mrs Sadhana Kannan is doing a doctorate in health sciences. On-the job training was also imparted to junior statisticians of CRS-TMH. Biostatistics training is being imparted weekly to 11 centres under BIRAC project. CRS statisticians have given lectures and attended various webinars, training workshops in clinical research methodology held at various places across the country.The lead statistician has been deputed as faculty at Australia and Asia specific Clinical Oncology Research Development (ACORD) and AAzpire protocol development workshop conducted virtually and hybrid mode. The CRS is also conducting PANACEA clinical research and data analytics webinar in the virtual mode.

Some of the key quality indicators are listed below:

Type of services	Number
Statistical consultation for study design	80
Consultations for data analysis	165
Randomization services for clinical trials	24
Data management services- Developing eCRF for clinical trials	10

Open Day 2021

Open Day at ACTREC is an eagerly awaited event for undergraduate and graduate science students from colleges in and around Mumbai. The tradition of showcasing research activities and infrastructure facilities was initiated in 1995 by the then Cancer Research Institute (CRI) located in Parel, Mumbai and is continued after the institute transformed and moved to Kharghar, Navi Mumbai with the new name of, 'ACTREC'. This event is organized by the SCOPE Cell of ACTREC as a two-day episode in the first week of December every year, with invitations sent out to students from nearby colleges, and with the sole purpose of exposure to the work in research laboratories and an encouragement to curious minds to pursue careers in scientific research. Both the research wings of the Centre - CRI and CRC, actively participate in ACTREC's Open Day.

This event could not be held in the year 2021 owing to several uncertainties of the infection waves of the COVID-19 pandemic. It was difficult for the organizers to plan and execute a smooth and safe event, so it was not held in the report year.

17th National Research Scholars Meet (NRSM 2021)

National Research Scholars' Meet is an annual event organized solely by the research scholar fraternity of ACTREC with the motto "By the students, for the students". In the report year owing to the pandemic, NRSM was a hybrid conference hosted on the 9th and 10th of December, 2021 offline at the Auditorium in Khanolkar Shodika, ACTREC, as well as online through Zoom, with speakers and participants joining at the venue and on the Zoom interface. The conference spanning two days encouraged young and enthusiastic minds across the country to utilize this platform for sharing their innovative ideas and research work as well as gain scientific insights. NRSM receives wide participation from Masters and Graduate students from both basic and clinical sciences.

In 2021, NRSM completed its 17th year with the theme, "Metamorphosis Evolved approaches to contemporary biological challenges". With this theme the aim was to address the ever-

changing outlook towards life sciences, research and medicine. The conference touched upon subjects like species evolution, evolution of basic and translational research and technological advances towards answering the contemporary challenges in biology through approaches like Artificial Intelligence.

NRSM 2021 was graced by Padmabhushan and Padmashree awardee Dr. T. Ramasami, former Secretary, Ministry of Science and Technology & Distinguished Professor of Eminence, Anna University, Chennai, who shared with us pearls of wisdom and left us with the advice to inculcate good scientific communication and collaboration into our scientific training and practices.

Keynotes were delivered by eminent scientists such as Dr. L. S. Shashidhara (Dean, Ashoka University), Dr. Uma Ramakrishnan (NCBS, Bangalore), Dr. Debojyoti Chakroborty (CSIR-IGIB, Delhi), Dr. Karishma Kaushik (Savitribai Phule Pune University) & Dr. Collins Assisi (ISSER, Pune) who gave us a snippet into their lifework and shared with us the advancements in their field.

Taking into consideration that the upcoming decade will be detrimental for the path life on Earth takes, this year's conference attempted to address the cardinal concern of "Climate Change" through a thought-provoking panel discussion. Our panellists were Prof. N. H.

Rabindranath (IISC, Bangalore) and Dr. Samir Damare (NIO, Goa) who gave a realistic view of the change we need to bring in the way climate data is studied and handled. The panel also brought to light certain hurdles in the way of studying climate change that require creative solutions which could impact the effectiveness of mitigative measures.

In an attempt to Go Green & sustainable, we reduced our usage of paper and provided softcopies of the abstract books. We even made it a point to use biodegradable food containers to reduce the plastic waste and substituted the use of plastic folders with cloth.

As a first, all abstracts submitted this year have been published in the Indian Journal of Medical and Paediatric Oncology (IJMPO). For which we received approximately 60 abstracts from faculty and students hailing from institutes all across the country. The conference also serves as a platform to showcase and promote the creative side of the scientific community and hence hosted the scientific quiz and “Creative corner”, an event for showcasing participants’ talent in photography, painting, and poetry as well as a “Cultural Evening” where art coalesces with science.

CONFERENCES, WORKSHOPS, SEMINARS, EBMs & CMEs

Conferences, Workshops, Seminars, EBMs & CMEs		
No	**Date**	**Details**
1	March 10-12, 2021	**Bioinformatics Webinar & Workshop On theme " From Biology to Omics"** **Organizers :**Dr.Ashok K Varma, ACTREC Dr.Rukmini Govekar, ACTREC Dr.Jyoti Kode –ACTREC
2	March 10, 2021	**Workshop on Biomedical Research Ethics** Organised by TMC-Institutional Ethics Committee-III (IEC-III), ACTREC
3	March 30, 2021	**ACTREC Alumni Association, Third Annual Meet 2021** Organizer : Dr. Jyoti Kode, ACTREC Event Coordinator : Dr. Ojaswini Upasani, ACTREC
4	April 29, 2021	**Day of Immunology 2021** Webinar Symposium on **Taming the Beast of Inflammation: COVID-19** Organizer : Dr. Jyoti Kode, ACTREC Event Coordinator : Dr. Ojaswini Upasani, ACTREC
5	September 3, 2021	**HBNI-On-line Course on Emerging Trends in Biophysics** **Applications of mass spectrometry for structure determination and protein interaction** **Dr. Prasanna Venkatraman,**Dy. Director, Cancer Research Institute, ACTREC, TMC, Navi Mumbai
6	October 20-23, 2021	**13th Annual Meeting of Proteomics Society of India and International Conference (OMICS-2021-Virtual Conference)** **Prof Matthias Mann,** Max Planck Institute of Biochemistry, Munich-Martinsried **Dr Shankha Satpathy,** Broad Institute, Massachusetts **Dr Amit Kumar Mondal,** Indian Institute of Science Education and Research, Kolkata **Dr Kausik Chakraborty,** CSIR-Institute of Genomics and Integrative Biology, New Delhi **Dr Siddhesh Kamat,** Indian Institute of Science Education and Research, Pune **Dr Subhra Chakraborty,** National Institute of Plant Genome Research, Delhi **Prof Angus Lamond,** University of Dundee, United Kingdom **Prof Michael Snyder,** Stanford University, California **Dr Maya Zachut,** Volcani Center, Rishon Lezion

		Dr Vinay Kumar Nandicoori, CSIR-Centre for Cellular and Molecular Biology, Hyderabad **Dr Shantanu Sengupta,** CSIR-Institute of Genomics and Integrative Biology, New Delhi **Prof John Yates III,** The Scripps Research Institute, La Jolla **Dr Juergen Cox,** Max Planck Institute of Biochemistry, Munich-Martinsried **Prof Jyoti Choudhary,** The Institute of Cancer Research, London **Dr Rakesh Mishra,** Tata Institute for Genetics and Society, Bengaluru & CSIR-Centre for Cellular and Molecular Biology, Hyderabad
7	23 October – 19 December, 2021	**UCC-IUP Gene Editing Certificate Course** **Online Certificate Course on Gene Editing Tools in Medicine & Biotechnology**
8	October 28, 2021	**Breast Cancer Awareness Program 2021** **With Early detection there is HOPE** Seminar on **"Self-evaluation for early detection and preventive measures for breast cancer"** Talks on **"treatment options and research advances in Breast Cancer"** Panel Discussion on **"Common questions in Breast cancer diagnosis, treatment and research"**
9	November 29, 2021	**Lecture Series: HUMANITIES AND ETHICS IN MEDICINE** A Collaboration between Tata Memorial Centre, Mumbai and King's College London **"Intersections between Humanities and Medicine"** **Prof. Neil Vickers,** Co-Director of the Centre for Humanities and Health Professor of English Literature & the Medical Humanities
10	December 9-10, 2021	**17th NRSM 2021**
11	December 16-17, 2021	**Multicolor Flow Cytometry Analysis Hands-on-Training Workshop** Organizer – Dr. Sanjeev Waghmare, Flow Cytometry Facility
12	December 21-23, 2021	**10th Annual Workshop focusing on Advancements in Preclinical Imaging Research, Drug Development and Cancer Research** Organizer – Dr. P. R. Chaudhari, Comparative Oncology Program & Small Animal Imaging Facility

Webinars		
No	**Date**	**Details**
13	January 16, 2021	**Indo-American Mini-Symposium 'Cancer Therapy Resistance Mini-Symposium' [Virtual]** **Lipocalin2 expression promotes tumor progression and therapy resistance by inhibiting ferroptosis.** **Dr. Sorab Dalal,** PhD, ACTREC, Tata Memorial Center **Stage specific therapeutic intervention to deter platinum-taxol resistance.** **Mr. Aniket Bishnu**, ACTREC, Tata Memorial Center
14	January 20, 2021	**HBNI Webinar** **Role of Genetic biomarkers for avoidance of prostatic surgery** **Dr. Rajvir Dahiya,**Professor Emeritus and Director, Urology Research Center, Department of Urology, Veterans Affairs Medical Center, University of California, San Fransisco, USA **Understanding Intellectual Property Rights** **Dr. Arun Srivastava,**Secretary, Atomic Energy Commission & Head, Institutional Collaboration & Programs Division, DAE
15	February 11, 2021	**Indo-American Cancer Consortium Faculty and Trainee Seminar Series** **Strategies for Early Detection and Disease Monitoring of HPV-Associated Cancers from Liquid Biopsy.** **Rama Rao Damerla,** PhD, Assistant Professor, Department of Medical Genetics, Kasturba Medical College, Manipal Academy of Higher Education **Role of tumor suppressors Par-4 and p53 in obesity.** **Nathalia Araujo,** PhD Candidate, Markey Cancer Center
16	March 11, 2021	**Indo-American Cancer Consortium Faculty and Trainee Seminar Series** **The oncogenic function of mutant p53 revisited** **Susanta Roychoudhury,** PhD, Chief, Basic Research, Saroj Gupta Cancer Centre and Research, Kolkata, West Bengal, India **Nanomechanicalinsight of pancreatic cancer cell membrane during receptor mediated endocytosis of targeted gold nanoparticles**

		Tanmay Kulkarni, PhD, Research Fellow, Department of Biochemistry and Molecular Biology, Mayo Clinic Cancer Center, Jacksonville, FL
17	March 25, 2021	**Indo-American Cancer Consortium Faculty and Trainee Seminar Series** **Metarrestin: discovery, mechanism and efficacy in cancer metastasis models** **Juan Jose Marugan,** PhD, Group Leader, Early Translation Branch, National Center for Advancing Translational Sciences, National Institutes of Health, Rockville, MD, USA.
18	April 8, 2021	**Indo-American Cancer Consortium Faculty and Trainee Seminar Series** **Vaccines for the Treatment and Prevention of Cancer** **Keith Knutson**, Professor of Immunology, Mayo Clinic, Jacksonville, Florida **Synthetic T-cell Therapy for Pediatric Cancer** **Stephen Gottschalk,** MD, Chair, Dept. of Bone Marrow Transplantation & Cellular Therapy, St. Jude Children's Research Hospital, Memphis, TN
19	April 22, 2021	**Indo-American Cancer Consortium Virtual Seminar** **Genomic Drivers of Oral Cancer and Proximal Metastasis** **Dr. Partha P Majumder**, PhD, Distinguished Professor, National Institute of Biomedical Genomics & Emeritus Professor, Indian Statistical Institute, INDIA
20	May 13, 2021	**Indo-American Cancer Consortium Faculty and Trainee Seminar Series** **Determining precision medicine opportunities for non-small cell lung cancer** **Christine Brainson,** PhD, Assistant Professor, Toxicology and Cancer Biology, University of Kentucky, Markey Cancer Center **Targeting Postpartum Breast Cancer** **W. Joshua Ogony,** PhD, Research Fellow, Department of Cancer Biology, Mayo Clinic Cancer Center Jacksonville, Florida
21	May 27, 2021	**Indo-American Cancer Consortium: Cancer Proteogenomics**

		Mini-Symposium **Proteomic Approaches for Cancer Research** **Keshava Prasad,** PhD, Professor and Deputy Director at Yenopoya University, Mangalore, India
22	May 28, 2021	**Indo-American Cancer Consortium: Cancer Proteogenomics Mini-Symposium** **Proteogenomics of Lung Cancer** **Ramaswamy Govindan,** MD, Anheuser Busch Endowed Chair in Medical Oncology, Professor of Medicine, Washington University School of Medicine, St Louis, MO, USA*
23	June 24, 2021	**Indo American Cancer Consortium Guest Lecture Series - Virtual Seminar** **The Research Landscape in Myeloma** **Dr. Nikhil C. Munshi,** MD, Professor and Kraft Family Chair, Harvard Medical School and Dana-Farber Cancer Institute, Director, Basic and Correlative Science& Associate Director, Jerome Lipper Myeloma Center at Dana Farber Cancer Institute
24	July 8, 2021	**Faculty and Trainee Seminar Series - Global Cancer Consortium** *(Formerly Indo-American Cancer Consortium)* **Targeted Therapy in Cancer: Aiming for the Bull's-Eye** Dr. Krishnendu Pal, Assistant Professor, Department of Biochemistry and Molecular Biology Mayo Clinic College of Medicine and Science Jacksonville, Florida **Repurposing of Antiviral Drugs Targeting Lysine Demethylase 5B (KDM5B) Oncogene in Breast Cancer** Ms. Jose Anmi, PhD Research Scholar, Department of Pharmacy Practice, Manipal College of Pharmaceutical Sciences Manipal Academy of Higher Education Manipal, India
25	July 9, 2021	**HBNI Webinar** **Talking about Cancer: Prevention, Early Detection, Diagnosis and Treatment** 1. Dr. S. D. Banavali, Director (Academics)and Head, Dept. of Medical Oncology, TMC 2. Dr. Gauravi Mishra, Dept. of Preventive Oncology, TMC
26	July 22, 2021	**Global Cancer Consortium-Cancer Epigenetics Mini-Symposium** **SWI/SNF (BAF) chromatin remodeling complex mutations in**

		cancer: mechanisms and vulnerabilities **Dr. Charles W. M. Roberts,** Executive Vice President, Director, Comprehensive Cancer Center & Director, Molecular Oncology Division, St Jude Children's Research Hospital, Memphis Tennessee **Epigenetics of Cellular Context: Role of the Integrin α6β4** **Dr. Kathleen L. O'Connor**, Professor, Department of Molecular and Cellular Biochemistry, Associate Director of Cancer Education and Mentoring, Markey Cancer Center, Lexington Kentucky
27	July 29, 2021	**HBNI Webinar** **Focus, Learn, Apply, Grow and Enjoy** Dr. A. Velumani, Creator, Thyrocare
28	August 12, 2021	**Global Cancer Consortium - Faculty and Trainee Seminar Series** **Dissecting the Molecular Connection between Hormone Receptor and Aneuploidy in Breast Cancer** **Somsubhra Nath**, PhD,Scientist, Department of Basic and Translational Research Saroj Gupta Cancer Centre and Research Institute, India **Aberrant glycogen metabolism contributes to non-small cell lung cancer tumorigenesis** **Lindsey Conroy,** PhD,Postdoctoral Fellow, Markey Cancer Center, University of Kentucky, USA
29	August 19, 2021	**Webinar on Humanized Mice & Applications in Healthcare Research** Organizer : **Dr. Jyoti Kode,** ACTREC Event Coordinator : **Dr. Ojaswini Upasani,** ACTREC
30	August 23, 2021	**HBNI Student Webinar** **Academia-Industry Transition: Harnessing your Expertise in a Start-up** **Dr. Nikhil Sangith,** Chief Scientific Officer (CSO), Xact Diagnotek Private Limited, UIC Bioincubator, Anna University & HBNI Alumni
31	August 26, 2021	**Global Cancer Consortium - Virtual Seminar** **Discuss current translational research projects in his laboratory** **John A. Copland,** III, Ph.D. Professor of Cancer Biology, Mayo Clinic Cancer Center, Jacksonville, Florida

32	August 27, 2021	**Proteomics Society, India (PSI)-Monthly online webinar VI** **The Road towards Decoding Protein Interaction Networks in Cancer Cells and Strategies for Intervention** **Dr. Prasanna Venkatraman,** Dy. Director, Cancer Research Institute, ACTREC, TMC, Navi Mumbai **Dr. Abhijit Chakrabarti,** Senior Professor, Saha Institute of Nuclear Physics, Kolkata (Session Moderator)
33	September 9, 2021	**Global Cancer Consortium - Faculty and Trainee Seminar Series** **Role of DNA Methylation Regulated Genes in Cervical Cancer** **Shama PrasadaKabekkodu,** PhD, Associate Professor, Department of Cell and Molecular Biology, ManipalSchool of Life Sciences, ManipalAcademy of Higher Education, India **MiR-204 and MiR-592: Crucial Players in MedulloblastomaBiology** **Raikamal Paul,** Senior Research Fellow, Advanced Centre for Treatment, Research and Education in Cancer, Tata Memorial Center, India
34	September 16, 2021	**HBNI Student Webinar** **"From Idea to commercially viable product - various stages and the role of anchor customer"** **Dr. Rachna Dave,** Founder & CEO of MicroGo India
35	September 23, 2021	**Global Cancer Consortium - Virtual Seminar** **"Targeting the Achilles' Heel -Inducing Epigenetic Repression of Telomerase Reactivation in Aggressive Glioblastoma"** **Dr. Shantanu Chowdhury,** Professor, Academy of Scientific and Innovative Research Head, Functional and Integrative Biology. CSIR-Institute of Genomics and Integrative Biology, New Delhi, India
36	September 24, 2021	**PROTEOMICS SOCIETY, INDIA (PSI): MONTHLY ONLINE WEBINAR- VII** **"Structure, function and modulation of G Protein-Coupled Receptors"** Dr. Arun Shukla, Joy Gill, Chair Professor, Dept. of Biological Sciences & Bioengineering, IIT Kanpur (SPEAKER) **Dr. Suman Kundu,** Professor, Dept. of Biochemistry & Director, University of Delhi, South Campus (SESSION MODERATOR)

37	September 24, 2021	**Azadi ka Amrit Mahotsav – HBNI Eminent Lecture Series** **India's energy security in a carbon constrained world** **Dr. Anil Kakodkar,** AICTE Distinguished Chair Professor, Chairman, Rajiv Gandhi Science & Technology Commission & Former Chairman, Atomic Energy Commission
38	September 27, 2021	**AZADI KA AMRIT MAHOTSAV - WEBINAR** **Recent Advances in Cancer Research and Treatment : Conventional and Herbal Methods** **Dr. Ashok K Varma-** ACTREC-TMC, Navi-Mumbai **Dr. Hui Tag: -**Rajiv Gandhi University, Arunachal Pradesh **Dr. Satish Kumar:** Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha
39	October 1, 2021	**Global Cancer Consortium Community Outreach Series** "**Population-Based Integrative Translational Cancer Research**" **Dr. Upender Manne,** MS, PhD, Professor, Departments of Pathology, Surgery and Epidemiology Director, Translational Anatomic Pathology Section Co-Director, UAB Tissue Biorepository, O'Neal Comprehensive Cancer Center, University of Alabama at Birmingham, AL, USA
40	October 4, 2021	**AZADI KA AMRIT MAHOTSAV - WEBINAR** **"The weak hydrogen bond: From crystal engineering to virtual screening**" **Prof. Gautam R. Desiraju,** Professor Indian Institute of Science, Bangalore and University of Hyderabad
41	October 27, 2021	**Global Cancer Consortium - Mini Symposium** **"Extracellular Vesicles in Cancer"** **Lucia Languino,** PhD, Co-chair, Thomas Jefferson University, Philadelphia, PA, USA **Michael Graner,** PhD, Co-chair, University of Colorado, Aurora, CO, USA **Suresh Mathivanan,** PhD, La Trobe University, Melbourne, Australia **Janusz Rak,** MD, PhD, McGill University, Montreal, Canada **Clotilde Théry,** PhD, Institut Curie, Paris, France **Kenneth Witwer,** PhD, John Hopkins University, Baltimore, MD,

		USA
42	October 29, 2021	**Global Cancer Consortium Community Outreach Seminar Series** "**Tobacco retail marketing assessments as a tool for tobacco control and health equity**" **Dr. ShyanikaW. Rose**, **PhD, MA**, Assistant Professor, Department of Behavioral Science, College of Medicine and Markey Cancer Center, University of Kentucky, Lexington, KY, USA
43	November 11, 2021	**Global Cancer Consortium - Guest Lecture Series** **"Lung Cancer – Progress and Prospects"** **Ralph Goldman Zinner, MD**, Director, Thoracic Oncology Program, Division of Medical Oncology, Department of Internal Medicine, University of Kentucky, Markey Cancer Center, Lexington, Kentucky, USA
44	November 25, 2021	**HBNI Webinar** **Stronger Public-Private Partnerships for India to achieve Global Leadership** **Dr. Ajit Sapre**, Group President, Reliance Technology Group
45	December 2-4, 2021	**1st Annual Virtual Global Cancer Conference** **Cancer Immunology / Immunotherapy Session** **Keith Knutsen**,PhD, Professor, Mayo Clinic, Jacksonville, Florida, USA **(Session Chair)** **Paulina Velasquez**,MD, Assistant Professor, St. Jude Children's Hospital, Comprehensive Cancer Center, Memphis, Tennessee, USA **Subbarao Bondada**,PhD,Professor, Markey Cancer Center, University of Kentucky, Lexington, Kentucky, USA **Andrew D. Weinberg**,PhD,Judith A. Hartman Endowed Chair, Earle A. Chiles Research Institute, Providence Cancer Institute, Portland, Oregon **Dirk Jager**,MD, Medical Director, National Center for Tumor Diseases, Head, Medical Oncology, Heidelberg University Hospital, Head, Clinical Unit, German Cancer Research Center, Heidelberg, Germany **Peter Schmid**,FRCP, MD, PhD,Chair, Cancer Medicine, Barts Cancer Institute, Queen Mary University of London, London, United Kingdom

		1st Annual Virtual Global Cancer Conference **Precision Medicine** **Jill Kolesar**, PharmD, Professor, and Director, Precision Clinic, Markey Cancer Center, University of Kentucky, Lexington, Kentucky, USA **(Session Chair)** **Mark Burkard**, MD, PhD, Professor, Hematology/Oncology, University of Wisconsin-Madison, Wisconsin, USA **Susanne Arnold, MD,** Professor and Associate Director, Markey Cancer Center, University of Kentucky, Lexington, Kentucky, USA **Shridar Ganeshan, MD, PhD,** Professor and Associate Director, for Translational Science, Chief, Molecular Oncology, Rutgers Cancer Institute of New Jersey, USA **Lorna Rodriguez, MD, PhD,** Professor, Gynecologic Oncology, City of Hope, Comprehensive Cancer Center, Duarte, California, USA
		1st Annual Virtual Global Cancer Conference **Cancer Stem Cells** **Derek Radisky,** PhD, Professor and Chair, Cancer Biology, Mayo Clinic,Jacksonville, Florida, USA **(Session Chair)** **Nai Yang Fu,** PhD,Assistant Professor, Duke-NUS Medical School, Singapore **Sanjeev Waghmare,** PhD, Scientist, Tata Memorial Center, Navi Mumba, India **Marilene Hohmuth Lopes,** PhD,Associate Professor, Cell and Developmental Biology, University of São Paulo, São Paulo, Brazil **Verline Justilien,** PhD, Assistant Professor, Center for Biomedical Discovery, Mayo Clinic, Jacksonville, USA **Tianyan Gao,** PhD, Professor and Interim Chair, Molecular and Cellular Biochemistry, Markey Cancer Center, University of Kentucky, Lexington, Kentucky USA **Tessy Thomas Maliekal,** PhD, Scientist, Rajiv Gandhi Centre for Biotechnology, Kerala, India
46	December 28, 2021	**HBNI Webinar** **Title -Saga of Heavy Water Production in India** **Shri. Surendra Sharma**, Former Chairman & Chief Executive, Heavy Water Board

Virtual and Actual Expert Talks		
No	**Date**	**Details**
1	February 10, 2021	**Applications of Mathematics in Cryptography** **Dr. R. Balasubramanian,** Former Director, Institute of Mathematical Sciences
2	May 27, 2021 June 3, 2021 June 10, 2021	**ICC Committee conduct Awareness Session** **TOPIC: Staff Sensitization Program on "Prevention of Sexual Harassment"** Faculty: Dr. Nasreen Rustomfram Dr. Meera Achrekar, ACTREC
3	August 27, 2021	**Webinar Commemorating 'Youth Against Cancer' Month** "**HEALTHY YOUTH, HEALTHY SOCIETY**" By Carcinogenesis Foundation (USA & India) http://www.carcinogenesis.org to participate youth in and promote cancer awareness and prevention activities.
4	September 6, 2021	**HBNI Teacher's Day 2021** **"Teaching is the one profession that creates all other professions"** **Prof. V. Ramgopal Rao,** Director, Indian Institute of Technology, Delhi

Guest Seminars		
No	**Date**	**Details**
1	April 7, 2021	**Role of Radiation and Nanotechnology in Basic and Applied Research** Prof. Sudhir Kapoor,Ex Associate Director, Chemistry Group (D), Bhabha Atomic Research Centre
2	May 18, 2021	**Non-coding RNAs: Regulators of development and cancer** Dr. Vijay Akhade,Michael Smith Foundation Fellow, BC Cancer Research Centre, Vancouver, Canada

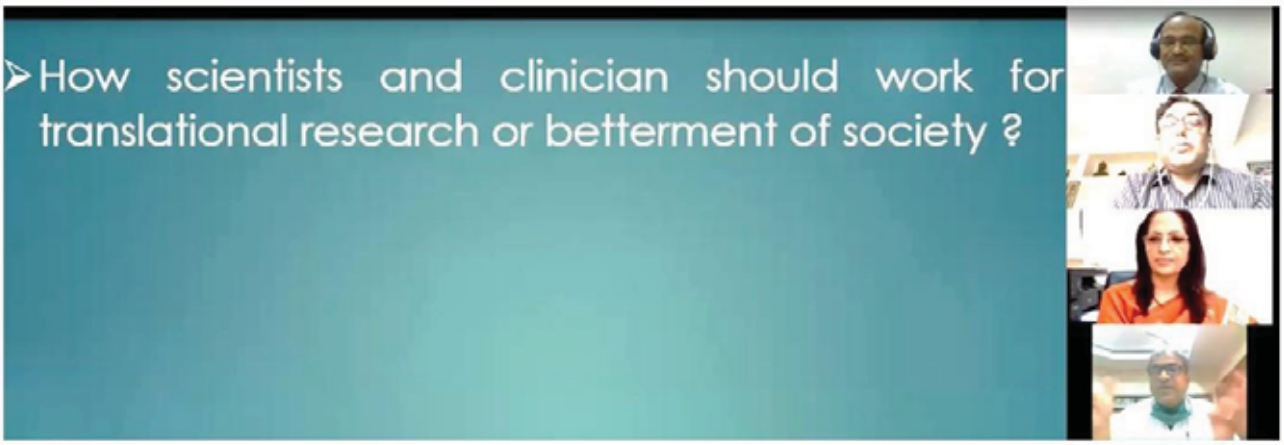
General Seminars		
No	**Date**	**Details**
1	August 9, 2021	**Hidden layers in the pathology of COVID-19 and prediction of delta variant** Dr. Prasanna Venkatraman, Principal Investigator & Deputy Director, CRI-ACTREC

Bioinformatics Webinar/ Workshop (From Biology to Omics)

Organizers: Dr. Ashok Varma, ACTREC

Dr. Rukmini Govekar

Dr. Jyoti Kode

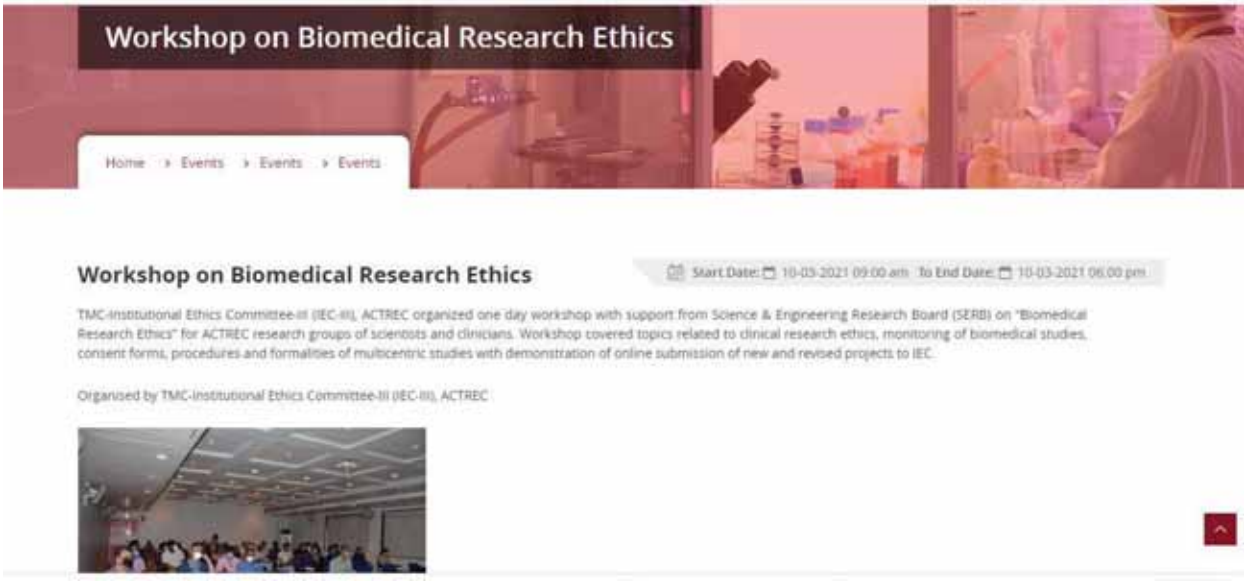


The Bioinformatics Centre-ACTREC conducted a 3 –day on-line lecture cum training workshop from March 10-12, 2021. Three investigators; Dr. Ashok K Varma, Dr. Rukmini Govekar and Dr. Jyoti Kode jointly organised the webinar on the theme “From Biology to Omics”. A total of 205 participants including professors, lecturers and students were active participants of the webinar. Director- ACTREC, Dr Sudeep Gupta, gracefully chaired the inauguration session. The lectures were from eminent scientists with expertise in Structural Bioinformatics, Molecular modelling & dynamics, Inhibitor Design, Mass -Spectrometry based clinical Proteomics, Proteomic data Analysis and Bioinformatics in Immunoinformatics. The in-house speakers were Dr. Ashok K Varma, Dr. Rukmini Govekar, Dr. Jyoti Kode , Dr Meenakshi Singh and the experts from other institutions of the country were Prof. Pravindra Kumar, Indian Institute of Technology, Roorkee; Prof. Evans Coutinho, Bombay College of Pharmacy, Mumbai; Prof. Shubhra Ghosh Dastidar, Bose Institute, Kolkata; Dr. Urmila Kulkarni, Savitribai Phule University, Pune; Dr. Vijay Kumar Goel, Jawaharlal Nehru University, New Delhi; Dr. Ajit Datar, Advisor to Shimadzu Analytical India Pvt. Ltd, Mumbai; Dr Bhakti Basu, BARC, Mumbai ; Dr. Satyajeet Khare, Symbiosis School of Biological Sciences, Pune; Dr. Sharmistha Dey All India Institute Of Medical Sciences, New Delhi; Dr Naren Joshi , Ex-ACTREC, Navi-Mumbai; Dr Sudhirdas Prayaga,

Antibody Therapeutics, NJ, USA Prayaga Scientific, Kochi, India; The panel discussions were on the topics: Scientists and Clinician Preceptorship for Translational Research; Starting academic-industry cross-talk; scope for big idea & opportunity; How to improve science education and research for discovery and Innovation. Prof T. P. Singh, AIIMS Delhi chaired the Concluding Session of the meeting.

Workshop: Biomedical Research Ethics

Organizers: IEC (III) ACTREC



The TMC-Institutional Ethics Committee-III (IEC-III), ACTREC organized a one-day workshop on March 10th 2021 at ACTREC with support from the Science & Engineering Research Board (SERB) on “Biomedical Research Ethics” for ACTREC research groups of scientists and clinicians. The workshop covered topics related to clinical research ethics, monitoring of biomedical studies, consent forms, procedures and formalities of multicentric studies with demonstration of online submission of new and revised projects to the IEC.

Webinar: International Immunology Day

Organizers: Kode Lab, Tumor Immunology & Immunotherapy Group, ACTREC

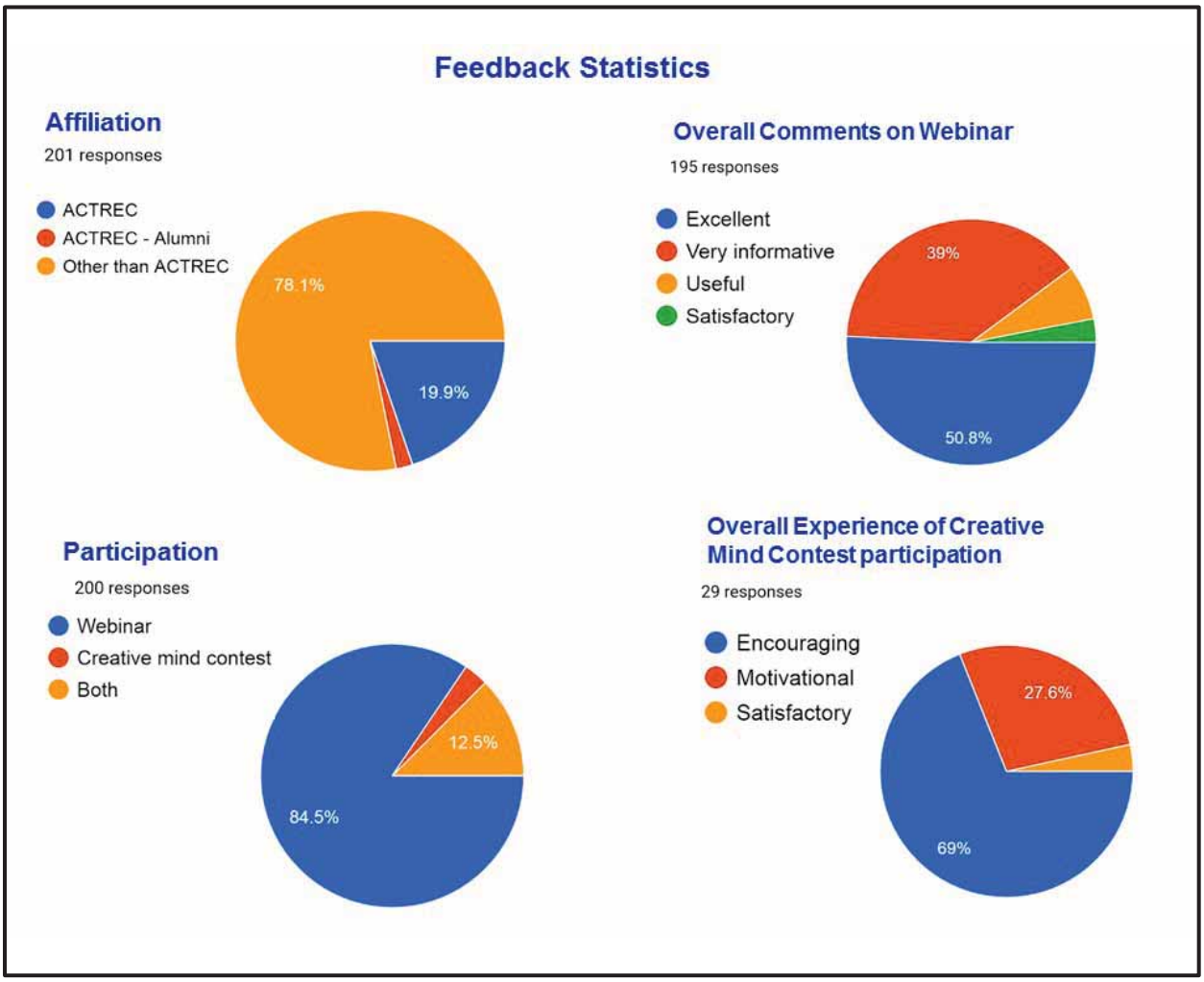
The 'Day of Immunology' 2021 ACTREC-MIG was conducted at ACTREC on 29th April, 2021, as a webinar to celebrate the International Immunology Day. This event had 473 registered participants and a total of 194 participants (connections) including speakers/ panelists virtually present/ online. Participants (201) also provided a feedback and their views on topics covered and level of understanding of talks and panel discussion and also their interest in attending such activities in future. The feedback with statistics details showed that overall the event was well-received. The event was inaugurated by Dr Sudeep Gupta, Director, ACTREC, followed by a

speech from Dr. Prasanna Venkatraman, Event Chairperson and Deputy Director, CRI-ACTREC. She spoke about the 'Day of Immunology' being a global celebration on this day. Dr. Jyoti Kode, Event Organizer spoke in capacity of EC Member of Mumbai Immunology Group (MIG) and described activities of MIG being conducted for college students and teachers for spreading the awareness of topics in immunology. The first scientific talk of the event was by Dr Jyoti Kode on "COVID-19 Vaccines: Taming the Beast of Immunity" which covered basics of immunity, vaccines and inflammation. Dr Preeti Chavan delivered the next talk on Covid Patient laboratory assessment to aid in clinical management, prognosis, prevention aspects, and laboratory biosafety and hospital infection control. Dr Amit Dutt covered genomics and informatics of Covid-19 virus and also described application of Raman spectroscopy for diagnostics of Covid 19, using genomic tools. Mr Nikhil Gadewal demonstrated work on molecular modeling of virus and host proteins with phytochemicals and described Molecular Dynamics simulations basics and applications of Schrodinger Software. Later Dr. N. Srikanth, Additional DG CCRAS spoke on policies of AYUSH Ministry in conducting clinical trials for treatment of COVID-19 using ayurvedic formulations and AYUSH-64 protocol.

The Panel Discussion covered questions on COVID diagnostics, logistics, government policies, biochemistry markers, seroconversion and vaccine efficacy results and comments from medical experts in the field. Dr Vikram Gota moderated the session. Dr Pankaj Chaturvedi chaired the session and provided final comments on each segment. Eminent panelists were Dr. Manisha Madkaikar, Dr. Alka Nerurkar, Dr. Anant Gokarn, Dr. Prashant Tembhare and Dr. Shripad Taklikar. Dr. BCS Rao covered experience from clinical trials involving AYUSH protocols while Dr. Rajesh Shah covered experience using homeopathy medicines. The 'Event' supporters included Mumbai Immunology Group, Indian Immunology Society, ACTREC Alumni Association, Rubbu Biologic Incorporation, Biosimilia Pvt. Ltd., Gennova Biopharmaceuticals Ltd. and Merck Life Science Pvt. Ltd. As a part of campaign for Immunology Day celebrations, the CREATIVE MIND CONTEST was conducted for ACTREC staff, students, and all ACTREC Alumni members, in the category of poetry, slogans, photos, sketches, paintings, videos/short films and rangoli. Fifty-three entries were received from ACTREC from 13 departments and 16 contestants. Similarly, 23 entries from ACTREC Alumni Association members included 9 ACTREC departments, 12 contestants and 2 ex-ACTREC Alumni life members.

Contest entries were judged by review committee members; Dr. Dhanalaxmi Shetty, Mr. Shyam Chavan, Ms. Shamal Vetale, Ms. Trupti Pradhan, Ms. Vaishali Kailaje, Mr. Archisman Banerjee

and Ms. Supriya Hait. Final entries were selected by the Covid Task Force review committee that consisted of Dr. Preeti Chavan, Dr. Meera Achrekar and Dr. Chittal Naresh. Winners were felicitated by Dr Sudeep Gupta, Director, ACTREC, Dr Navin Khattry, Deputy Director, CRC-ACTREC, Dr Tanuja Teni, Vice-President, ACTREC Alumni Association, Dr Preeti Chavan, Dr Manoj Mahimkar, Dr Vikram Gota and Dr Jyoti Kode. Dr Nirmal Kumar, Mr Naythan Dcunha, Ms Priyanka Patil, Ms Pallavi, Ms Arti Patil and Mr Archismann helped enthusiastically in financial, administrative matters and conducting the event.



Ambulkar,Reshma

- Conducted: SAFE OR Workshop at TMH, as an initiative to improve safety of surgery and anaesthesia.

Banerjee, Trishita

- Best Art and Craft Award: 'Title- Faces', 17th National Research Scholars Meet, ACTREC, Navi Mumbai; December 9-10, 2021.

Chilkapati, Murali

- Admitted: Fellow of the Royal Society of Chemistry (698683); May 11, 2021.
- Elected: Council Member, The International Society for Clinical Spectroscopy; October, 2021.

Dutta, Deepshiskha

- Prime Minister's Fellowship: to pursue Doctoral Research,Science& Engineering Research Board (SERB), Government of India; November 2021.

Gaur, Tarang

- Best (Oral presentation): 'Novel CDK-7 inhibitor suppresses transcription of oncogenes and enhances Venetoclax mediated apoptosis in Acute Myeloid Leukemia', 17th National Research Scholars Meet(NRSM) ACTREC, Navi Mumbai : December 9-10, 2021

Gupta, Sanjay

- Member, Project Monitoring Committee: 'NSM Platform for Genomics and Drug Discovery' Centre for Development of Advanced Computing, a Scientific Society under Ministry of Electronics and Information Technology, Government of India.
- Executive committee member (West Zone): Indian Association of Cancer Research, India.
- Associate Editor, JOURNAL OF INTEGRATED–OMICS: A Methodological Journal.
- Associate Editor, Journal of Radiation and Cancer Research.
- Editorial Board Member, Journal of Clinical Epigenetics.

Gupta, Sudeep

- Chairperson: ICMR –STW(Standard Treatment Workflows) Breast Cancer Committee
- President: ISMPO (Indian Society of Medical and Pediatric Oncology)

Joshi, Mansi

- Best Oral Presentation Award: 'Multiplexed STAT3-phosphoBRET sensor for ready distinction between canonical vs. non-canonical PTM mediated pathway activation in cancer cell', 17th National Research Scholars Meet (NRSM), ACTREC, Navi Mumbai December 9-10, 2021.

Ketkar, Madhura

- Best Oral Presentation: 'GCN5 and ER stress are novel targets for senotherapy in glioblastoma', 12th Annual Conference of Indian Society of Neuro-Oncology (ISNO), Christian Medical College, Vellore: April 15-17, 2021.

Khadilkar, Rohan

- Awarded: SERB (Science and Engineering Research Board) Start up Research Grant – 2021.
- Awarded: Re-entry fellowship Department of Biotechnology's Ramalingaswami– 2021.
- Awarded (Post-doctoral application from the Laboratory) : SERB (Science and Engineering Research Board) National Post-doctoral Research Fellowship – 2021

Kode, Jyoti

- Patent Filed: ICAR-Directorate of Medicinal and Aromatic Plants Research, Boriavi-387310, Anand, Gujarat (India) - Dr. Satyanshu Kumar, Dr. Jyoti Kode, Dr. Raghuraj Singh.
- Recognized: Associate Professor in Life Sciences by Homi Bhabha National University, Mumbai. August, 2021.
- Recognized: "Outstanding Editorial Board Member" , 'World Journal of Stem Cells' by Baishideng Publishing Group (BPG) Inc., USA**,** May, 2021
- Secretary: ACTREC Alumni Association, 2019-22.

Kothekar, Amol

- Examiner: ISCCM critical care ultrasound fellowship.

Kulkarni Rucha

- Dr. Lalith Kumar Chaganti Memorial Award (Best Poster): 'Investigating the Molecular Basis of c-FLIP/Calmodulin Interaction for Modulating Apoptosis', 17th National Research Scholars Meet (NRSM), ACTREC, Navi Mumbai, December 9-10, 2021.

Mishra, Saket

- Carl Storm International Diversity Fellowship Award: 'DNA Protein Kinase (DNA-PKcs) mediated transcriptional regulation of TOP2β drives chemoresistance in leukemia', Gordon Research Conference 2021.
- Competitive DMM Conference Travel Grant: 'DNA Protein Kinase (DNA-PKcs) mediated transcriptional regulation of TOP2β drives chemoresistance in leukemia'; 'The Company of Biologists'.

Mittra, Indraneel

- 7th Dr. R S Rao Oration: 'Personal Reflections on Medicine, Science and Philosophy', 17th Annual Surgical Oncology Workshop 'ONCOSURG 2021', Tata Memorial Hospital, TMC, Mumbai, November 20, 2021.

Mukherjee, Souvik

- Dr. Rajiv Kalraiya Memorial Award (Best Oral Presentation): ' The Differential Interplay of the Notch-3/Jag-1 Axis Modulates Disease Progression in Epithelial Ovarian Cancer', 17th NRSM (National Research Scholars' Meet), ACTREC-TMC, Navi Mumbai, December 9-10, 2021.

Nagaraju, P

- Second Prize (Quiz Competition): 45th National Conference of Indian Society of Blood Transfusion and Immunohematology, Virtual, by ISBTI, Tamil Nadu, February 2021.

Patil, Ankita

- First prize: Essay Competition on "Indian Women breaking myths", Independence Day Celebrations, ACTREC-TMC, Navi Mumbai, August 15, 2021.

Parui Aasna

- Professor Gilbert J Fowler Award of Excellence (Oral Presentation): 'Allosteric Regulation of Serine Protease HtrA2', 98th Foundation Day celebration and national seminar by Indian Chemical Society, Kolkata May 9, 2021.

Patnaik Chetna

- NASI Swarna Jayanti Puraskar (Best Paper Presentation-Biological Sciences): 'Diffuse light imaging tomography (DLIT) for assessment of gold-coated solid-lipid nanoparticles mediated photothermal therapy efficacy in murine cancer model', 91st Annual Session and Symposium (online) on 'Interphase between Biological and Physical Sciences towards Atmanirbhar Bharat', National Academy of Sciences, India, 4-6 December 2021.

Poladia, Pratik

- First Prize (Oral Presentation): 'Analysis of Sample Rejection in the Pre-Analytical Stage at an Oncology Centre', 3rd Indo Oncology Summit, Virtual Presentation, September 25, 2021.

Pradhan, Trupti

- Best Poetry Award: 'Covid-19 and Life', 'Creative Mind Contest' ,'International Day of Immunology 2021', ACTREC-TMC, Navi Mumbai, March 30, 2021.

Sarkar, Debashmita

- Best ePoster: 'GBM cells survive genotoxic stress via GCN5 mediated modulation of DNA Double Strand Break Repair', 12th Annual Conference of Indian Society of Neuro-Oncology (ISNO), Christian Medical College, Vellore: April 15-17, 2021.

Shenoy, Priti

- Deputy Director award (Best Oral Presentation): 'Investigating the Molecular Association between p53 and HER2 Expression in Gastric Cancer', 17th National Research Scholars' Meet(NRSM), ACTREC-TMC, Navi Mumbai, December 9-10, 2021

Shetty, Dhanashree

- Recognized: PhD Guide and Assistant Professor in Medical and Health Sciences by HBNI in 2021.

- Association of Molecular Pathologists (AMP) - International annual membership grant (Membership ID- 1362100) for 2021.
- International Technologist in Cytogenetics by ASCP (American Society for Clinical Pathology), Board of certification (BOC) (2021-2024).

Varma, Ashok

- Organizer, Webinar/workshop: 'Biology to Omics', March 10-12, 2021,registered participants- 205.
- Organizer, Webinar/workshop: 'Protein Purification, Crystallization & Structure Determination', August 6, 2021,registered participants-170.
- Organizer, Webinar/workshop: 'Recent Advances in Cancer Research and Treatment: Conventional and Herbal Methods', September 27, 2021, registered participants- 175.
- Organizer, Webinar/workshop: 'Integrated Genomics and Proteomics Approach for Cancer Research', December 4, 2021, registered participants-650.

Waghmare, Sanjeev

- Member: Biosafety Committee, BARC, Mumbai.
- Member: Committee for Stem Cell Research and Therapy, NIRRH, Parel, Mumbai.
- Member: Institutional Ethics Committee, National Burns Centre, Navi Mumbai.
- Member: Committee for Stem Cell Research and Therapy, Himedia, Mumbai.

International

1. Anand D, Yashashwi K, Kumar N, Rane S, Gann PH, Sethi A (2021). Weakly supervised learning on unannotated hematoxylin and eosin stained slides predicts BRAF mutation in thyroid cancer with high accuracy. Journal of Pathology.255(3):232-242 PMID: 34346511
2. Anand S, Chatterjee A, Gupta T, Panda P, Moiyadi A, Epari S, Patil V, Krishnatry R, Goda JS, Jalali R (2021). Upfront therapy of aggressive/high-risk low-grade glioma: Single institution outcome analysis of temozolomide-based radio-chemotherapy and adjuvant chemotherapy. World Neurosurgery.154: e176-e184 PMID: 34245877.
3. Augustine S, Sooraj KP, Pachchigar V, CM Krishna, Ranjan M (2021). SERS based detection of Dichlorvos pesticide using silver nanoparticles arrays: Influence of array wavelength/amplitude. Applied Surface Science. 544: 148878
4. Bajpai J, Simha V, Shylasree TS, Sarin R, Pathak R, Popat P, Mokal S, Dandekar S, Ghosh J, Nair N, Gulia S, Rath S, Joshi S, Wadasadawala T, Sheth T, Parmar V, Banavali SD, Badwe RA, Gupta S (2021). Pregnancy associated breast cancer (PABC): Report from a gestational cancer registry from a tertiary cancer care centre, India. Breast. 56: 88-95. PMID: 33640524
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7. Balla MMS, Patwardhan S, Melwani PK, Purwar P, Kumar A, Pramesh CS, Laskar S, Pandey BN (2021). Prognosis of metastasis based on age and serum analytes after follow-up of non-metastatic lung cancer patients. Translational Oncology. 14(1): 100933. PMID: 33188981
8. Barreto SG, Gardi N, Dutt S (2021). Birth of a solid organ cancer-the cell fusion hypothesis presented with pancreatic cancer as a model: a narrative review. Chinease Clinical Oncology. 10(5):45. PMID: 34670374.
9. Baumann BC, Zaghloul MS, Sargos P, Murthy V (2021). Adjuvant and neoadjuvant radiation therapy for locally advanced Bladder cancer. Clinical Oncology. (R Coll Radiol) 33(6): 391-399. PMID: 33972025
10. Bhagatram J, Krishamurthy MN, Awase A, Joshi A,Patil V, Noronha V, Prabhash K, Gota V(2021). Validation of a novel causality assessment scale for adverse events in non-small

cell lung carcinoma patients treated with platinum and pemetrexed doublet chemotherapy. Therapeutic Advances in Drug Safety. PMID 33628419

11. Bhardwaj P, Goda JS, Pai V, Chaudhari P, Mohanty B, Pai T, Vishwakarma K, Thorat R, Wadasadawala T, Banerjee R (2021). Ultrasound augments on-demand breast tumor radiosensitization and apoptosis through a tri-responsive combinatorial delivery theranostic platform. Nanoscale. 13(40): 17077-17092. PMID: 34622906
12. Bhat V, Chavan P, Bhat P, Khattry N (2021). COVID-19-positive health-care workers in an oncology setup: Considerations for return to work. International Journal of Health and Allied Sciences. 10(3): 249-251.
13. Bhati M, Balakrishna G, Joshi K, Bhattacharya K, Bal M, Ghosh Laskar S, Sinha S, Joshi A, Joshi P, Nair S (2021). Fibromatoses of head and neck: Case series and literature review. Rambam Maimonides Medical Journal. 12(3): e0022. PMID: 34270403
14. Bhatia A, Victora CG, Beckfield J, Budukh A, Krieger N (2021). "Registries are not only a tool for data collection, they are for action": Cancer registration and gaps in data for health equity in six population-based registries in India. International Journal of Cancer. 148 (9): 2171-2183. PMID: 33186475.
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– Jonah Lehrer

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