



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



**Annual Report
2019 - 2020**

Advanced Centre For Treatment, Research & Education In Cancer Navi Mumbai





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Message from Director, ACTREC



The Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) started as the basic research unit of Tata Memorial Centre (TMC) in its erstwhile avatar of Cancer Research Institute (CRI) many decades ago and was located in the vicinity of Tata Memorial Hospital until 2003. ACTREC is now located in a sprawling campus in Navi Mumbai and is also the location of Centre for Cancer Epidemiology.

The core focus of ACTREC remains basic and translational research and is facilitated by the collocation of basic scientists, well equipped laboratories, and clinicians running a high quality clinical cancer facility. The research output of ACTREC has improved in quality over the years and reflects this collaboration. Most of the scientists and clinicians are recipients of extramural funding for their research and service projects, many have received national and international awards, and many continue to contribute to national research and clinical policy.

ACTREC is expanding, with ongoing construction of specialised clinical facilities that will transform it into a large cancer hospital. This, and continuing support to research, is a challenging task in the current environment. We remain committed, with the support of Department of Atomic Energy, to successfully accomplish the ongoing transition. Our medical and paramedical staff have risen to the occasion in the ongoing pandemic with exceptional dedication to duty, which has enabled us to continue operations despite the challenges.

Can we, at present, peer into the next 20 years and foresee what the future has in store for us? This is not an empty exercise, nor merely academic, because to be able to foresee is to be forewarned and to be able to chart an intelligent course as we navigate the future. TMC has always set high standards for itself and largely lived up to them. However, we will have to adapt as we encounter new contexts, both scientific and social. One of the pillars of our eminence has been the ability to conduct research that has impacted the care of cancer patients in the Indian and global settings.

Time is now ripe when ACTREC needs to evolve and be able to embrace the transformational cancer research that has been happening in the recent past around the world. Basic and translational research has become a high technology team effort with requirements of sophisticated infrastructure and highly specialised teams of biological scientists. Platform technological

advances in many disciplines will play an important role in our ability to conduct cutting edge research in the near future. However, technology is not an end in itself – it is a means to an end. While striving to create the best possible infrastructure we intend to keep our vision focussed on new ideas and implement them in the development of new treatments for cancer patients. Above all, such treatments should be affordable and available to one and all in India.

The Annual Report chronicles the activities and efforts of ACTREC community in the preceding year. We hope that you will find this Report useful and we look forward to constructive feedback.



Dr. Sudeep Gupta
Director
ACTREC



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



The Centre for Cancer Epidemiology (CCE) is in rapid evolution since inception of its building in ACTREC Campus in 2015. The main mandate of CCE is to identify cancer burden, identify risk factors to explain differences in geographical variation in cancer using technologically advanced tools to measure exposure, understand genetic heterogeneity at population level and its interaction with various exposures and develop and evaluate new methods for Screening of common cancer. The programme for skill development and capacity building to develop manpower to undertake these unique task has been developed in the form of PhD and MPH programmes as well as by conducting short courses and workshops. The centre is also helping neighbouring countries to develop Cancer Registration and Epidemiological studies.

CCE is one of the few centres globally focusing on Cancer Registration, Molecular Epidemiology and Screening. The close interaction of CCE with TMH and ACTREC, ensures that insights gained through Epidemiological research get translated to clinics and identified risk factors can be further evaluated to confirm the causation and understand mechanism of action.

Tata Memorial Centre, on one hand, is developing technologically advanced centres to treat cancer effectively and on the other hand ensuring prevention of cancer by strengthening epidemiological research and its rural outreach programmes. The centre has already created research platforms which includes long term longitudinal studies with facilities for automated bio-bank to store more than 3 million samples. It is hoped that epidemiological research will identify India specific solutions for prevention of cancer.

Dr. Rajesh Dixit,
Director

Centre for Cancer Epidemiology (CCE), ACTREC



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



Cancer is emerging as a complex public health challenge that continues to grow menacingly. Indian Council of Medical Research (ICMR) and National Centre for Disease Informatics & Research (NCDIR), based on current trends, estimated that incidence of cancer is 13.9 lakhs in 2020 and will increase to 15.7 lakhs by 2025. This rise is causally linked to increase in the life expectancy, demographic transitions and the effects of tobacco, alcohol and other risk factors. The commonest sites for cancer among men are the mouth, lungs, esophagus and stomach. In women, it is the cancer of cervix and breast. As per the latest ICMR release, a significant increase in the incidence rates of breast cancers in women, and lung and head & neck cancers in both men and women was observed in most of the registries, however, a declining trend was seen in most of the registries for cancer of the cervix.

Globally, cancer accounts for more deaths than AIDS, malaria and tuberculosis combined. According to the World Economic Forum (WEF), “Cancer is among one of the three greatest risks to the global economy, due to escalating cost of care, threat to productivity from death and disability, and the effects of costs on household impoverishment.”

On September 19, 2011, heads of 117 countries gathered at the United Nations, New York to discuss the control of non-communicable diseases. The UN resolution adopted 3 evidence-based strategies to tackle the rising burden of NCDs – control of tobacco, unsafe use of alcohol and obesity.

As per the second Global Adult Tobacco Survey (GATS) released in 2016 by the Ministry of Health and Family Welfare, India has demonstrated 6% absolute decrease in tobacco consumption compared to first GATS 2010. With 26 crore adult Indians still using tobacco, it is estimated that nearly one third of them will die prematurely as a result of tobacco use. What is noteworthy is that predominant form of tobacco consumption in India is Smokeless tobacco along with Areca nut. This habit is responsible for a high burden of oral cancer, especially among youths. While smokeless tobacco is a well known carcinogen and regulated under by law, areca nut is considered to be safe by most. Areca nut or betel nut is an addictive psycho-stimulant substance apart from being a class 1 carcinogen. Another important carcinogen commonly used in our society is Alcohol. As per the International Agency for Research on Cancer, Alcohol is a confirmed cancer causing substance. It is causally related to cancers of the mouth,

oropharynx, liver, esophagus and breast. The risk becomes much higher when tobacco is consumed along with alcohol. Its consumption leads to actions that result in unintentional injury and deaths, such as traffic accidents, fall and occupational injury. This alone account for about one-third of the 1.8 million deaths. Just like tobacco, these negative economic consequences of alcohol abuse are more pronounced in impoverished nations.

Obesity is associated with increased risks of cancers of esophagus, pancreas, colon, rectum, breast, endometrium and so on. One study, using NCI Surveillance, Epidemiology, and End Results data, estimated that in the United States, about 34,000 new cases of cancer in men (4 per cent) and 50,500 in women (7 per cent) were due to obesity. As per one estimate “If every adult reduced their BMI by 1 per cent (approximately 1 kg for an average adult), it would prevent about 100,000 new cases of cancer.”

Department of Preventive Oncology, Center for Cancer Epidemiology has been constantly working on evidence based strategies of prevention and early detection of cancers. This involves cutting edge research, capacity building workshops, advocacy, implementation research, partnership with government / NGOs etc. Center for cancer Epidemiology has now its foot prints in 6 upcoming cancer hospitals all across India – Sangrur, Mullanpur, Varanasi, Guwahati, Muzaffarpur and Vizag. This is in addition to our presence in several locations around the nuclear reactors for the purpose of special registries. This gives us a huge opportunity to reduce the burden of common cancers through primary prevention. The current researches involving risk identification and stratification using genetic approaches is likely to make significant contribution to the understanding of cancer causation and behavior. With a team of wonderful faculty, research staff and administrative team Center for Cancer Epidemiology is committed to fulfill the vision and mission of Tata Memorial Center.



Dr. Pankaj Chaturvedi

Dy. Director

Centre for Cancer Epidemiology (CCE), ACTREC



Message from Deputy Director, CRC (ACTREC)



The Clinical Research Centre wing which is also the hospital division of ACTREC was commissioned in 2005. In last 15 years, there has been an exponential increase in the footfall of patients at ACTREC. From a 50 bedded hospital in 2005, it is now a 130 bedded hospital that treats more than 10,000 patients yearly. While initially all patients referred to ACTREC were from Tata Memorial Hospital (TMH), in recent years, direct registration happens for all patients who reside in Navi Mumbai and Raigad district. Several of the Disease Management Groups (DMGs) notably Breast, Head and Neck, Gastrointestinal, Genito-urinary, Gynaecological and Adult and Paediatric Haematolymphoid groups function from ACTREC. In 2019-2020, Bone & Soft tissue DMG has also started treating patients at ACTREC. In order to improve patient care, the Operation Theatres (OTs) and ICU were renovated to carve out 5 OTs from the existing 4 OTs and 13 ICU beds from existing 7 beds respectively. This renovation was possible due to generous grant from Morgan & Stanley. The renovation of OTs and ICU was completed in the first quarter of 2019.

The hospital wing of ACTREC is at the cusp of major expansion. In next 3 years, it will add additional 810 beds by the commissioning of 3 major buildings: First to complete will be the Women and Children Cancer Centre by March 2021, then the Radiological Research Unit by December 2021 and finally the Shantilal Sanghvi Paediatric Haematolymphoid Cancer Centre which will deal with both paediatric and adult haematological cancers. This building is being funded by generous grant from Sun Pharma and Pratham Enterprises and the excavation work for it will start soon.

A major achievement in 2019-2020 for ACTREC was installations of the cyclotron and 3 gantries for the Proton Therapy Centre. In next one year, this centre will start treating deserving patients with highly précised proton beams, making us the first government institute in India to do so.

The commitment and dedication of our staff will ensure that the expansion envisaged at ACTREC for patient care will happen smoothly over the next few years so as to serve our patients with highest standards of care.

Dr. Navin Khattry

Deputy Director, Clinical Research Centre
ACTREC



Message from Deputy Director, CRI (ACTREC)



Proceedings at the Cancer Research Institute, Annual report, ACTREC 2019

It is time! Yet another year has gone by and here is the treatise of what happened in the past year. Annual report provides the much needed bird's eye view on the overall progress of the Institute. Carefully crafted, it is an album of snap shots of events that are bygone to be extracted time to time as part of the memory lane or as an evidence for some of the important landmarks and achievements.

ACTREC 2019 Annual report is housed in a significantly different context—it has its own distinct identity! First edition of its new avatar has followed more or less the traditional configuration. We will be rendering the report with different colors in the years to come. Cancer Research Institute (CRI) as part of this new bold look should be able to project its scientific moments, advances, breakthroughs in a more elaborate and captivating manner. Other academic activities and celebrations will be engraved in a distinctive style.

In 2019, CRI saw several of our faculty winning prestigious accolades, awards and transforming into innovators. Our senior PhD students won the HBNI best thesis award, and the juniors prestigious National and International fellowships! Principal Investigators have made significant contributions in the area of basic science resulting in 42 research papers and 5 review articles in leading Journals. A book, several book chapters and a conference proceedings add further credence to the work. And the crowning glory of 2019 has been the student interviews that appeared in the Journal of Cell Science. The staff at CRI have marked their contribution by winning awards in conferences and emerging as champions in photography, sports, and fine arts.

Our colleagues, friends, and staff from CRC and CCE have carved their own niche in different domains adding to the proud moments at ACTREC.

My heartiest Congratulations and Best Wishes to all of you.

Focusing on a brighter and glorious future for ACTREC,

Yours

Prasanna Venkatraman
Deputy Director, CRI, ACTREC



Overview

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 better 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 2019, there were 232 on-going projects at ACTREC; 219 of these projects received financial support of Rs 4.92 crores from governmental agencies such as DBT, DST, ICMR, etc. In addition, 13 new extramurally funded projects were sanctioned Rs.2.51 crores and all of it has been received for the calendar year. Research carried out by faculty of the Centre resulted in 155 total publications in the year 2019, of which 117 were in reputed international journals, 17 in widely circulated Indian journals, 14 were book chapters and 1, a book. The total publications also included 1 volume and 5 articles of Conference Proceedings. Besides these in 2019,

a research invention also culminated into a US patent. During 2019, 39 regular staff members were appointed in different grades in Medical, Scientific, Technical and Administrative cadres, adhering to the reservation policies of the Government of India, while seven employees superannuated, one employee voluntarily retired.

Several important TMC projects located in the ACTREC campus made good progress during 2019. These include Women's and Children and Hematolymphoid Hospital, National HADRON Therapy Unit, Radiological Research Unit and a patient hostel called Asha Niwas. These are expected to be completed and commissioned in 2020.

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 more than 120 beds including 88 ward beds, 13 ICU and Recovery beds, six Bone marrow transplant beds and 16 Day care beds. In early 2019, the renovated OT-ICU complex fully funded through corporate CSR was inaugurated and made functional. An increase of operation theatres to 5 and ICU beds to 13 from the existing 4 and 7 respectively was achieved with major upgrades of infrastructure which comprised of a dedicated AHU for air conditioning with HEPA filter and laminar flow, exclusive patient hold area, patient counseling room, improved facilities and contemporary finishing, compliant to

accreditation norms. New equipment including OT lights, OT tables, Pendant and electrocautery were installed in the renovated facility. An Anatomy laboratory was commissioned in January 2019 after procuring a clearance under the Maharashtra Anatomy Act (1948). This new facility will be utilized for surgical skill enhancement workshops and development of new surgical techniques using human cadavers. A Robotic Neuronavigation Testing Laboratory, which is a collaborative venture with Bhabha Atomic Research Centre (BARC), Mumbai was made ready to accept trials since June 2019, and will conduct rehearsals and trial runs on Phantoms for qualification, evaluation and validation of Neurosurgical suite developed by BARC for patient use. In 2019, the ACTREC Diagnostic laboratories appeared for NABL reassessment with revised scope and were granted continued accreditation from May 2019 for a period of 2 years. The year 2019 also witnessed an important milestone in cancer therapy. A CAR T-cell therapy centre was inaugurated in November 2019 and is a cGMP facility with Biosafety Level 2 contained area plus two HEPA filtered rooms, ISO 7 and ISO 8. This facility/centre is a first of its kind, in the country completely dedicated for the clinical manufacturing of CAR T cells and conducting Phase I/II clinical trials on patients and will offer Cellular therapies for specific indications. Some other important achievements during 2019 were, relocation of the HLA lab, a part of transfusion medicine at the Tata Memorial Hospital at Parel, Mumbai to ACTREC as an independent Transplant Immunology and Immunogenetics laboratory and facility with enhanced scope, particularly useful

for bone marrow transplant cases; Commissioning of a Dialysis facility in December 2019, where a new dialysis unit was installed within the ICU to transform it to a complete facility for acute care of sick patients; the IEC-III [Institutional Ethics Committee –III] at ACTREC was reaccredited by NABH in March 2019 and SIDCER in November 2019. Patient registration at ACTREC has seen significant and steady increase. The total new registrations have increased from 7155 in 2018 to 18293 in 2019.

ACTREC has always advocated and strived towards patient safety, and in congruence, the WHO declared 'World patient Safety Day' was celebrated on 17th September 2019 with expert faculty presentation on Safety in Hospitals at ACTREC. The event is earmarked by weeklong safety awareness activities (12th to 18th September 2019) for patients and staff which include safety rounds, Poster/ poem/article writing competition for patients and slogan writing competition for staff. Orientation and awareness campaigns were also held at various locations of the centres.

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. The Bone Marrow Transplant unit shifted to ACTREC in November 2007, since then, ~800 autologous/ allogeneic transplants have been performed with 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. Solid tumor unit is routinely administering chemotherapy in neoadjuvant, adjuvant and palliative setting since 2006. The department of **Radiation Oncology** at ACTREC fulfills the Centre's mandate of high-quality service, education, and research (clinical and translational) in collaboration with colleagues from TMH and scientists from Cancer Research Institute (CRI). The group generates high-quality evidence for the use of advanced radiotherapy technology (IMRT, IGRT, SBRT) in cancers of various sites including brain, head-neck, breast, cervix, genito-urinary tract and hematolymphoid malignancies. The **Department of Surgical Oncology** has been providing continued care to a wide range of cancer patients through in-patient care as well as outpatient clinics. The breast and head and neck services conducts regular OPDs through the week and offers all major and minor surgical procedures including reconstruction. The department has initiated consolidation of the ACTREC head and neck services under a dedicated surgical unit located in ACTREC to provide comprehensive care for patients treated at ACTREC. Besides easing patient wait times at Tata Memorial Hospital, it has benefitted patients from the Raigad and other interior districts of Maharashtra. A dedicated clinic for speech and swallow therapy is now functional on all Thursdays. The breast service initiated the setting up of a 3D printing lab to print customized silicone breast implant prototypes in collaboration with Indian Institute of Science, Bangalore. The neurosurgical services offer outpatient clinics twice a week and run two major ORs in a week.

In 2019, their focus has been on awake-surgeries, done with detailed peri-operative neuropsychological testing along with the use of adjuncts like monitoring, ultrasound and neuro-navigation. The GI services have expanded its activities in 2019 with regular performance of minimally invasive laparoscopic surgery and other complex surgeries like excentration. **Anesthesia, Critical Care and Pain Management** services are provided by the Department of Anesthesiology, Critical Care and Pain of TMC (TMH and ACTREC). These include five permanent staff members and twelve senior residents from ACTREC as well as full-time consultants and residents from TMH. The department provides Anesthesia services at four major operation theatres and three peripheral locations + Pre-Anesthesia Check-up Clinic, Critical Care services at the 13 bedded ICU plus 3 bedded PACU + CPR team, and Acute Pain Services. The **Department of Radiodiagnosis** is well-equipped and provides diagnostic imaging services that include computed radiography (CR), ultrasonography (USG), Color Doppler, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Mammography (MG) with Digital Breast Tomosynthesis (DBT) and Interventional radiology (IR). The CT machine is used for performing diagnostic scans and the machine is in addition shared with Nuclear Medicine department for PET-CT and Radiotherapy (RT) department for treatment planning. In the MRI service, all routine scans across all body systems are carried out and MRI under General Anesthesia is exclusively available for patients from pediatric services and adults who require it. In addition, advanced MR imaging including perfusion imaging, diffusion weighted imaging, MR angiography, diffusion

tractography (diffusion tensor imaging) and functional MR imaging are also performed. MRI scans are also used for RT planning. USG and CT examination of animals are also done as a part of approved animal research projects. Some of the new initiatives are; a dedicated OPD to evaluate patients referred for Interventional Radiology, availability of technicians 24 X 7 to provide emergency services, and image guided FNAC/ biopsy procedures for tissue diagnosis. The **Transfusion Medicine Department**, consistently strives to maintain high quality standards in provision of 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), Hemato-lymphoid, pediatric and surgical oncology units. It also caters to the blood component requirements of patients admitted in other hospitals in Navi Mumbai. The **Nursing Department**, strives to provide patient-centric, quality nursing care, keeping in mind at all times the patients' needs, comfort and dignity. The main focus is on implementation of patient safety goals, continuing education, and research. New initiatives during 2019 were online daycare appointments, online data collection of patient satisfaction with nursing care, health education material for patients undergoing chemotherapy and online census collection. Various hands on training workshops were organized. Emphasis has always been on the all-round development of nursing staff. Nurses are deputed for national and international conferences. The Nursing Department has initiated its journey towards Nursing Excellence certification. The **Cancer Cytogenetics Department** is a well-equipped

laboratory that provides comprehensive diagnostic testing [Conventional Karyotyping (CK) and Fluorescence In-situ hybridization (FISH) studies] for all hematolymphoid malignancies both in-house and referrals. Cytogenetics is a mandatory investigation and is performed at baseline and at successive follow ups thereby helping in diagnosis, classifying patients into different risk groups, guiding clinicians in deciding treatment and monitoring response. The department is NABL (National Accreditation Board for Laboratories) accredited and participates in External Quality Assessment program (EQAS) with College of American Pathologist (CAP). The **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 lab has one pathology consultant, two senior residents and two junior residents (by rotation). The 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 processor, automated stainer, cryostat and 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 **Composite Laboratory** is NABL accredited and provides 24 hours' services to the hospital and consists of three sections: sample collection area, hematology, and biochemistry (routine

biochemistry and immunoassay). The laboratory also processes murine and canine blood samples for research purposes and conducts a one year advanced training course in Medical Laboratory Technology since November 2015. The **Hematopathology Laboratory** provides services for the diagnosis of hematological malignancies, monitoring of patients while on therapy for all malignancies and preoperative & postoperative hematological workup of surgical patients. The laboratory executes Minimal Residual Disease testing and post treatment monitoring of patients of Chronic Myeloid Leukemia, B cell Acute Lymphoblastic leukemia in children, T cell Acute Lymphoblastic Leukemia, Acute Myeloid leukemia and Multiple Myeloma. The laboratory offers Next Generation sequencing facilities for identifying unknown fusions in hematological malignancies; these fusions can be targeted with specific drugs for optimal treatment of patients. The **Microbiology Laboratory** provides patient services for processing and reporting of bacteriology, serology, mycobacteriology, mycology and other clinical microbiological samples at ACTREC. Sterility testing for Blood Bank services, environmental surveillance, infection control services and waste management support is also carried out by the Laboratory. The **Clinical Pharmacology** group at ACTREC aims at developing new drugs for radioprotection, and pharmacokinetics (PK) driven optimization of drugs. In addition, the group provides critical support and expertise necessary to effectively conduct early-phase clinical trials in oncology. The laboratory also partakes in training personnel and developing capacity in the field of cancer pharmacology, biostatistics and clinical research operations. The **Clinical Scientist Laboratory** group endeavors 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. Clinician scientist laboratory (CSL) employs a bedside - to bench - to bedside approach wherein, research questions formulated from clinical observations are addressed in the laboratory settings using pre-clinical assays; with an ultimate aim to develop tailored therapeutic strategies. The **Translational Research Laboratory** at ACTREC was the first to discover the biological role of cell free chromatin (cfCh) particles that are released from the billions of cells that die in the body every day. Research from this laboratory demonstrated that cfCh particles can illegitimately integrate into healthy cells, damage their DNA and induce apoptotic and inflammatory responses. Further, the laboratory proposed that cfCh induced cellular damage and inflammation is the underlying cause of ageing and degenerative disorders. Cell free chromatin particles, released from dying cancer cells or those that circulate in blood can transform healthy cells and may be the underlying cause of cancer. Work from this laboratory showed that cfCh released from dying host cells are the primary cause of chemotherapy toxicity, radiation induced bystander effect and sepsis. The **Radiobiology and clinical biology 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. The laboratory is working in the field of developing newer formulations of radiation modifiers, besides repositioning drugs for radiation modification. It is actively conducting translational aspects of clinical trials.

In the **Cancer Research Institute**, research projects encompassing basic and applied research on cancer are being conducted by the following thematic groups – Biomolecular Structure, Function and Alterations; Cell and Tumor Biology; Carcinogenesis, Genome Biology and Precision Medicine; Therapy Resistance and Stem Cell Biology; Tumor Immunology and Immunotherapy; Cancer Theranostics and Clinical Pharmacology; Animal Oncology.

In the **Biomolecular Structure, Function and Alterations** group, Dr. Prasanna's team focuses on protein–protein interactions which determine signaling and regulatory networks that orchestrate cellular responses. Mapping the molecular details of individual PPIs and characterizing the hot spot sides of interaction, Exploiting them for the design and evolution of inhibitors, Structure guided construction of first neighbourhood sub networks, Inferring function and regulation through domain motif interaction, Expanding the networks by expression analysis and APMS derived PPI, Deriving context specific pathways that can be described by edge level metrics are some of the key areas of research. Dr. Bose's team studies the 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 anti apoptotic c-FLIP and calmodulin, and the Bcl2 family proteins and their interacting partners. Moreover, findings have led into application-based translation research that includes enzymes involved in metabolic reprogramming (PKM1 and PKM2) and their role in altering cancer signaling pathways. Dr Varma's

laboratory is actively involved in exploring the genomics, proteomics, structure biology and bioinformatics based approaches to perform translational research. Functional evaluation and folding pattern of cancer causing mutations from cohort of patients in different genes such as BRCA1/2, PML-RARA are being fully explored. The group is collaborating with different national and international laboratories to identify association of different genes with breast cancer. A proteomics project using mass spectrometry based technique has identified number of potential predictive and prognostic biomarkers in Head and Neck Squamous Cell Carcinoma treated with radiotherapy. Dr. Govekar's team is interested in understanding the molecular alterations associated with resistance to tyrosine kinase inhibitors in the Blast Crisis phase of Chronic Myeloid Leukemia to identify potential therapeutic targets. From the proteomic and genomic analysis of cell lines representing blast crisis, both sensitive and resistant to TKIs, a novel mechanism for TKI resistance has been put forth. Observations indicate that molecular alterations specific to resistant phenotype drive the BCR/ABL pathway by activating proteins downstream of BCR/ABL. Studies in this laboratory demonstrate that a key protein which modulates BCR/ABL pathway to induce resistance to imatinib belongs to the MAPK family. Inhibitor of this protein is presently in phase III clinical trial for a different medical condition and thus its repurposing to treat TKI-resistant CML can be explored. In the **Cell and Tumor Biology** group, Dr. Teni's team strives to gain insights into the molecular basis of oral and cervical tumorigenesis, currently pathways that stabilize mutant p53- one of which is its interaction with deubiquitinating enzymes.

To determine the underlying molecular mechanisms of therapy resistance, the validation of TCTP protein in established radioresistant oral cancer cell lines is ongoing. Studies; to establish HPV positive and HPV negative cervical cancer chemo-radiotherapy resistant cell lines have been initiated, to decipher the role of Mcl-1 and its interacting partners and that of CLU in oral tumorigenesis are ongoing, to understand the regulation of Activin A in oral cancer cells and its functional implications are also underway. Dr. Dalal's team focuses on the regulation of cellular pathways by 14-3-3-proteins and identifying pathways downstream of a loss of desmosome function that contribute to neoplastic progression. This work has determined that LCN2 might be a potential therapeutic target in multiple solid tumors. The secreted protein LCN2 confers radio and chemo resistance to cells in vitro and in vivo and that inhibiting LCN2 function can inhibit tumor growth and reverse therapy resistance. Work from the laboratory has identified mechanisms by which 14-3-3-ligand complexes form and dissociate, and how the 14-3-3 proteins regulate centrosome duplication. Dr. Bhattacharyya's team examines vesicular trafficking and intracellular organelle biogenesis and dynamics. Organelles' size and shapes are greatly altered in cancer and such alteration is a hallmark of cancerous cells. Using basic cell biological approach along with advanced microscopic techniques, attempts are being made to understand the underlying mechanisms that govern the size control mechanism of Golgi nucleus and nucleolus. Yeast and cell lines and cultured neurons are being used as model systems to understand the ultra-structures of ER and Golgi, and a research interest to develop

novel tools and forms for different forms of microscopy. Dr. Hasan's research focus is to understand the signaling between anti-apoptotic proteins and cyclin dependent kinases and combining their targeted actions for the improved therapeutic strategies to overcome apoptotic resistance in leukemia. This laboratory is collaborating with a biotech based organization and an US institution to address the targeted approaches in leukemia. Monitoring of minimal residual disease (MRD) by molecular markers, identification of miRNA-mRNA network in AML and characterization of high-risk acute promyelocytic leukemia are other research aspects of the laboratory. Dr. Warawdekar aims to understand the contribution of intercellular communication for antineoplastic therapeutic efficacy and studies have been towards development of a functional assay to validate gap junction communication as well as identifying Connexin types in breast and lung cancer. Current work involves an analysis for expression and protein levels of Connexins, cell surface and ECM proteins; in cell lines and primary specimens from breast and lung tumors. In the **Carcinogenesis, Genome Biology and Precision Medicine** group, Dr. Shirsat's team's efforts are towards understanding molecular mechanisms in brain tumors particularly Medulloblastoma, a highly malignant pediatric brain tumor that consists of four molecular subgroups namely WNT, SHH, Group 3 and Group 4. These four subgroups differ in their expression profile including the microRNA profile. MiR-193a is almost exclusively expressed in the WNT subgroup tumors. MiR-193a was found to be induced by the MYC oncogene, a crucial downstream target of the WNT signaling. MYC is expressed in the WNT and Group 3

subgroup tumors. MiR-193a was identified as a small molecule having therapeutic potential in the treatment of MYC amplified medulloblastomas. MiR-592 was found to target DEPTOR, a negative regulator of mTOR kinases. The AKT kinase activity was downregulated by MiR-592 in a feedback inhibitory pathway, an observation consistent with the indolent nature of the Group 4 tumors. Dr Mahimkar focuses on understanding the genetic basis of tobacco-related cancers by studying genomic alterations at the level of copy number across the genome, and identifying genes/ gene clusters underlying the altered genomic loci. Signatures associated with the 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 found. In parallel studies, the chemopreventive efficacy of polymeric black tea polyphenols (PBPs), abundantly present in black tea in inhibiting carcinogen induced lung adenomas in A/J mice and oral cancer in hamsters is being tested. For the first time this 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. Dr Gupta's team examines the importance of histones in providing complexity to eukaryotic genome, roles in defining nucleosome organization, contribution in genomic instability and regulation of gene expression in different pathophysiological states like stress, resistance and cancer. Identification of histone-signatures within the genome will help in better understanding of their role in development of cancer and will provide usage of

epigenetic marks and specific epi-drugs for diagnosis and therapeutic purposes, respectively, for better management of cancer. Dr. Amit Dutt's team focuses on the somatic genetics of human cancer and aims to develop Next Generation effective targeted therapies for cancer. A major focus has been on the genomic features of genetic alterations underlying oncogenesis and cancer progression in lung, breast, cervical, gall bladder, and head-neck cancers. The three major foci of research are cancer genomics, functional genomics and pathogen discovery. Advanced sequencing methodologies followed by functional validation are being used to identify novel cancer dependencies, therapeutic strategies and biomarkers. Dr. Sarin's team aims to understand the molecular basis of inherited and somatic cancers, and develop translational algorithms through molecular biology and functional genomics. These questions are being addressed with the help of a large cohort of families with inherited cancer syndromes, a BRCA-GEL case control study, a TMC International sarcoma kindred case control study, and an International Cancer Genome Consortium project covering gingivo-buccal squamous cell carcinoma patients. The **Therapy Resistance and Stem Cell Biology** Group comprises of four teams. Dr. Waghmare's team aims to delineate molecular and cellular mechanisms controlling adult stem cell and cancer stem-like cell regulation in human epithelial cancers. Developmental signaling pathways such as Wnt/Notch/Sonic-hedgehog regulate stem cell renewal and differentiation. The group is investigating these aspects using mouse skin model and human epithelial cancers such as head-neck cancer as experimental models. Recently, the group has developed

primary head and neck oral cancer cell lines from advanced stage treatment naive patients from an Indian cohort providing a valuable resource to understand the molecular mechanism that would be useful in cancer therapeutics. Dr. Shilpee Dutt's team aims to understand the molecular mechanisms that govern radiation/ chemo resistance in cancer using glioblastoma and leukemia as model systems. *In vitro* cellular models from primary patient samples and *in vivo* pre-clinical orthotopic mouse models have been developed that allow for systematic identification of signals and pathways relevant to resistance, which could provide critical information for use in therapeutic intervention. The focus of Dr. Ray's team is to delineate the key molecular signatures associated with acquisition of resistance and metastasis in Epithelial Ovarian Cancer. Research findings have led to a deeper understanding of the transcriptional regulation of IGF1R by co-operative interaction of RUNX1 and FOXO3a, role of ERK1/2 kinase on autophagy flux during chemoresistance and in cancer stem cell population, delineation of temporal dynamics of Notch3 signaling in real time, identifying the molecular players involved in lung metastasis of chemoresistant cells in an orthotopic mouse tumor model and synthetic lethal effect of mutant P53 and PIK3CA inhibition during acquisition of chemoresistance. Dr. Nandini Verma focuses on understanding the molecular mechanisms underlying the response and resistance to first-line chemotherapeutic agents in the Triple Negative Breast cancer (TNBC), highly prevalent among Indian women during the last decade. TNBC is aggressive and lacks expression of targetable receptors like estrogen and progesterone hormone-receptors, and human

epidermal growth factor receptor-2, with the clinical management of TNBC dependent solely on the cytotoxic chemotherapeutic agents. TNBC responds better to chemotherapy as compared to hormone-positive breast cancers, however, a large number of patients are either intrinsically unresponsive or develop resistance and relapse within 3-5 years of treatment, resulting in very poor prognosis. As 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 which need to be addressed. Dr. Chiplunkar's team in the **Tumour Immunology and Immunotherapy** group focuses on understanding the mechanism that regulates tumor directed cytotoxicity under hypoxia and energy metabolism of $\gamma\delta$ T cells in oral and pancreatic tumors, exploring the spectrum of exhaustion markers and functional role of $\gamma\delta$ T cells in colorectal cancer and unraveling the cross-talk between mesenchymal stem cells (MSC) from oral/pancreatic tumors and acute myeloid leukemia (AML) to understand immune evasion and chemoresistance in these malignancies. The group has initiated a phase II trial to study efficacy, toxicity and immunomodulatory effect of Carctol-S in high grade serous epithelial ovarian cancer at first serological relapse. In the **Cancer Theranostics and Clinical Pharmacology** group, Dr. De's team uses molecular imaging for real-time visualization and quantitative measurement of cellular physiological processes. The team aims to develop and apply molecular imaging methodologies to test experimental medicine and novel therapeutics in model systems using non-invasive molecular imaging techniques. The mandate of this group is translating diverse

experimental therapeutics developed through research. Dr. Chilakapati's team is actively pursuing the development of Raman spectroscopy based methods for routine *in vivo/in situ* screening and diagnosis, and as a minimally invasive micro spectroscopic method to screen body fluids and cell smears. Other research areas include the synthesis, optical and photothermal characterization of metallic nanoparticles for biomedical applications, exploring ¹H NMR, Raman and infrared spectroscopy for oral cancer diagnosis using saliva, and experimental carcinogenesis in animal models.

Many components of homologous-recombination mediated DNA repair, such as BRCA2 and RAD51, are involved in response to replication-stress, but their functions are mechanistically different in both the pathways. The **Wellcome DBT IA Intermediate Fellow** Dr. Mehrotra has been investigating the role of the novel cancer associated gene - BRCA2 and CDKN1A Interacting Protein (BCCIP), in the prevention of replication stress using mammalian cell cultures and *Drosophila melanogaster* as model systems. This knowledge will be etiologically important for BCCIP deficient cancers. With this study important insights regarding the role of replication stress in tumorigenesis and resistance to radiation therapy will be provided.

The **Centre for Cancer Epidemiology** has been operational in the ACTREC campus since the year 2015, with the vision to fulfill the need of population based research and to promote epidemiological as well as public health research in India. The absolute goals are; to build a program to identify cancer burden, causation and prevention strategies; build a platform to conduct large scale cutting edge epidemiological studies

with accurate exposure measurement to identify risk factors; build capabilities to conduct population genetic studies; and to develop manpower for cancer surveillance, epidemiology and molecular epidemiological studies. The Centre has been organized into six departments or sections and is governed by Dr. Rajesh Dikshit as Director and Dr. Pankaj Chaturvedi as Deputy Director.

The **Department of Medical Records & Cancer Registry** is one of the six and important departments of the Centre, with Dr. Ganesh B. at the helm. This department provides case files to patients for therapy protocols and treatment follow-up. It also provides case files to doctors/clinicians for research and other activities. Some of the important on-going projects are; Patterns of Care & Survival Studies, Hospital Based Cancer Registry, TMC-DAE Network of Cancer Registries, Health Check-up Programs – Service & Research, Tobacco Survey Program. The **Department of Preventive Oncology** headed by Dr. Sharmila Pimple, is a designated WHO Collaborating Centre for Cancer Prevention, Screening and Early Detection and has five thrust areas; Information, Education and Communication which encompasses programs for risk prevention, life style modification and improving health seeking behavior towards early detection of common cancers in India; Clinic and Community-based, Opportunistic-Screening which includes programs 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. The section of **Field Intervention and Cancer Surveillance** with Dr. Atul Budukh (OIC) provides technical support and conducts cancer registration training program for the cancer registries in India as well as South East Asia. It is instrumental in providing service and being the Tobacco Quit Line Centre to tobacco consumers willing to quit the habit. Some of the on-going projects are on early detection for oral, breast and cervical cancer in Sangrur district, Punjab; oral cancer screening in Ratnagiri, Maharashtra; population based cancer registries in North India and hospital based cancer registry of Sangrur and Varanasi. The section of **Molecular Epidemiology and Population Genetics** with Dr. Sharayu Mhatre (OIC), conducts research in the field of Molecular Epidemiology and Population Genetics with the main thrust on accurate measurement of exposures and investigations of life style, understanding environmental and genetic risk factors for common cancer sites in India with the use of case control and longitudinal cohort study designs. Several on-going projects of the section address lifestyle factors, genetic susceptibility and geographical differences in the incidence and development of certain common cancers affecting the Indian population. The section of **Biostatistics** was formed at the end 2018 with Dr. Sanjay Talole as the Officer-in-charge. Some of the services offered by this section encompass; statistical consultation to TMC clinicians & researchers through CRS in TMH, statistical plan for analysis, data organization, randomisation for clinical trials and sample size estimation. Further, an orientation program for post graduate students of TMC, M.Sc. Nursing, short courses on Biostatistics for TMC researchers, Modules for PhD students, workshop and training programs on Biostatistics are conducted by this section.

Academics

ACTREC continued its emphasis and focus on its academic programs, prime amongst which is the 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 2019, a total of 111 graduate students were working towards the Ph.D. degree in Life Sciences at ACTREC; these included 14 JRF 2019 batch students who joined in August 2019. Under the short term and summer training program, a total of 251 trainees worked in close supervision of the Centre's faculty during the year. In 2019, the Centre organized 33 local/ national/ international conferences, symposia, workshops, training programs, etc., beginning with the DBT-BTIS (NER) Workshop in January and ending with the Free Ostomy Camp in December. In May 2019, the Centre conducted its annual Science & Society Oration and also organized the Nurses' Day oration. During the course of the year, the Centre hosted 17 national/ international experts who delivered research seminars on a variety of topics in the life sciences and cancer. 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 27th and November 2nd in this year. The Centre conducts Yoga sessions as a part of the staff welfare activity and organized cancer awareness programs aimed at the general public and educational/ support/ entertainment programs for cancer patients and their caregivers in 2019.



ACTREC Annual Events

Science & Society Oration 2019



Shri. Palagummi Sainath, Journalist and Reporter of rural India, Ramon Magsaysay awardee, a senior fellow of Tri Continental Institute for Social Research and the founder editor of the People's Archive of Rural India, was invited to deliver the Science & Society Oration 2019 at ACTREC on 17th May, 2019. Dr. Sudeep Gupta, Director, ACTREC extended warm greetings to the eminent guest. Dr. Prasanna Venkatraman, Deputy Director, CRI, delivered the welcome address and introduced the distinguished guest, who was described as the 'Rock Star of Journalism', to the audience comprising of clinicians, scientists, staff and students of ACTREC.

In his oration entitled, "The Agrarian Crisis and Inequality", a subject that few in the audience would have encountered in their literary sojourn over the years, Shri. Sainath initiated with the definitions of Agrarian, Agriculture and Rural and brought out the importance of Agrarian, which reflects occupations and livelihoods that are supported by agriculture. He also pointed out that the Census of India has no specific definition of "Rural" which is loosely described as "not urban". He went on to describe that even though 833 million of the population speaking a humungous number of 780 living languages, of which 7 are spoken by more than 50 million people and 3

more than 80 million people, reside in the “not urban” realm, the Census of India has no formal definition of “rural”. Further he added that agriculture and agrarian was considered the same, though the farmer; the main cultivator is less than 8% of the population which represents about 95 million people, the Government of India describes that the occupation of 55% of the Indian population is Agriculture. However even if all the sections, like the main cultivator, marginal cultivator, full-time laborer, marginal laborer are included it will amount to only 24%. Occupations like the weaver, potter, carpenter which are supported by the farmers and agriculture, constituting the agrarian, would in totality amount to 55% of the nation’s population. This is the vulnerable section of society and is directly affected by the farmer’s monetary status, as the first market for their produce is the farming community. Further traditionally, the farmer pays off these supporting communities in both cash and the crop produce, thus ensuring food and grain supply. Implications of this are far reaching and thus, if the farming economy leans towards failure, the other occupations which are entrenched in the agricultural economy are devastated. This was one of the aspects of the ‘agrarian crisis’ that was so clearly explained to the audience, which probably is beyond understanding and far removed from reality for most of us. The other aspect of the agrarian crisis that Shri. Sainath articulated was that about every aspect of agriculture being “out of control of the farmer” and, the control of Seeds, Fertilizers, Pesticides, is done by a government body. He described the crisis as, ‘the corporate hijack of agriculture’, ‘the commercialization of agriculture’. Despite these innumerable problems

faced by the farming community, the spirit, the ethos and the humane attitude of farming community is evergreen, and he described the incidence of March 2018 when in Maharashtra 40,000 to 50,000 farmers marched for their demands, a distance of 180km from Nasik to Mumbai to ‘gherao’ the Maharashtra Vidhan Sabha, wherein the final 15km was done in silence from midnight to dawn to reach Azad Maidan, as the children of Mumbai were to write their board examinations in the morning and, they did not want them to be hassled or delayed to get to their examination centres. It seemed after this that a forum, ‘Nation for Farmers’ was created and there were a lot of people from different strata of society that came forward to help these poor farmers; doctors, businessmen, house-wives and residents of Mumbai.

While concluding, Mr. Sainath expressed his disappointment that the report of the Swaminathan Commission on Indian Agriculture first published in 2004, as yet, even after 15 years, had not been discussed in the session of the Indian Parliament. This report is detailed on the Water crisis, Credit crisis, Labor crisis, R& D crisis, Rights of; Dalit farmers, Adivasi farmers and Women farmers, all of which need attention to address and find a solution to the agrarian crisis.

At the end of the talk, there were several questions from the audience; on the role of industrialization on agrarian crisis, devastation by natural calamities and climate change, global warming, shifting of river courses and water crisis. Mr. Sainath was thanked profusely and felicitated with the ‘oration plaque’. The event ended with a ‘vote of thanks’ from Dr. Prasanna, Deputy Director CRI, ACTREC.

ACTREC Annual Day 2019

The ACTREC Annual Day for the year 2019 was celebrated with much fanfare on 12th April 2019, for employees and their family members, contract staff as well as patients, in the premises of ACTREC. The Program began with partaking of snacks, followed by a speech of ACTREC Director, Dr. Sudeep Gupta. He addressed the staff and their families with a warm welcome highlighting on the journey traversed by ACTREC till date, and the progress made by the organization with the use of innovations and cutting edge technology. On completion of his speech, the director and other senior staff members felicitated employees that had completed 30 years of diligent and dedicated service to the organization.

The program included exquisite cultural events such as songs, dances and skits which were

presented by the employees of ACTREC and a Standup Comedy show by a Bollywood artiste, Mr. Johnny Rawat.

The staff and guests were treated to a wonderful dinner after which they dispersed for the day in the arranged transport.

International Yoga Day

International Yoga Day was celebrated at ACTREC on 21st June 2019. Yoga a human welfare activity has been initiated since the past 3 years in ACTREC for patients and staff members. On this day, both practitioners and non – practitioners of yoga performed the asanas and felt greatly motivated by this session.

ACTREC has yoga trainers / instructors visit ACTREC thrice a week to conduct yoga sessions for patients voluntarily. These yoga sessions





follow the tradition of Ashtanga yoga through a 1 hr. 45 min protocol designed by senior yoga therapist Dr. Rashmi Manjunath. The concept of integrating yoga as a complementary therapy to ease stress and anxiety of cancer patients and their attendants has proven beneficial and gained popularity amongst the patients undergoing treatment at ACTREC.

The Patients eager to follow yoga are requested to obtain consent from their treating Doctor and allowed to participate in the yoga sessions. However, patients who are not permitted are made to relax on a chair and observe the others practicing yoga. These sessions have been able to initiate over 1500 individuals to this effective practice of yoga during the last 3 years. Many have understood the benefits of practicing yoga and are very positive about this activity.

Special yoga sessions for the staff and students have been conducted once a month by Ms. Naina from Kaivalyadham. The staff and students have had sessions on Yog Nidra, Laughter yoga, Desk top yoga which have benefited them immensely.

Sports Events



The Nature and Culture Club of ACTREC organized sports activities such as the Annual ACTREC Premier League Cricket Matches, Football, Badminton, Athletics, Carom and Chess competitions.

Cancer Awareness Programs 2019

Cancer is one of the leading causes of death in our country. It is commonly known now, that cancer can be prevented by modifying lifestyle or minimizing exposure to risk factors. Most cancers can be treated when detected in the early stages. The Tata Memorial Centre lays a lot of emphasis on prevention of cancer. Keeping this in mind, ACTREC had started its Cancer Awareness Program in 2012 under the leadership of Dr. Meera Achrekar, Deputy Nursing Superintendent, ACTREC. Through CAP, the Centre has been reaching out to the masses when requests are



received from multi-national and government organizations, housing societies, schools and colleges to disseminate basic information and knowledge about the disease cancer. Generally a team comprising of a lead clinician to deliver the talk on cancer, a scientist, Dr. Achrekar with a small team of nurses has been delegated for this responsibility. Over the past years, a series of talks have been delivered on cancer prevention and early detection of breast, cervical, oral and inherited cancers. A large number of people have benefited from these CAP events held locally in Mumbai and Navi Mumbai. Some of the sessions focus on breast self-examination and clinical breast examination by an accompanying medical team. Referral notes to the Preventive Oncology department of the Tata Memorial Hospital are provided to beneficiaries if they seek cancer screening due to a family history or if a suspicious lump is detected during clinical breast examination.

During the year 2019, the ACTREC's CAP reached out to 699 beneficiaries, through eight lecture series conducted in response to requests from various organizations.

SN	Month	Requesting Organization; Site of CAP	Beneficiaries
01	11 Jan 2019	B. P. Petroleum, Kharghar	55
02	14 Feb 2019	Radcliffe School, Kharghar	30
03	24 Feb 2019	Navi Mumbai Bible Fellowship	19
04	05 Mar 2019	Schlumberger Oil & Gas Exploration Service, Nerul	15
05	11 Mar 2019	Morgan Stanley	256
06	31 May 2019	ACTREC Workers Union	125
07	31 July 2019	Shree Rama Dasa Universal Society Medical Mission, Badlapur	80
08	31 July 2019	Pillai College of Arts, Commerce & Science, New Panvel	119

General Seminars

During 2019, a few beneficial and informative seminars on topics of general interest to all the ACTREC employees were organized by General Administration. The details are given below:

26 February	Demonstration of Turnitin – Originality check software (Plagiarism) Mr. Amit Pal, Turnitin
31 May	World No Tobacco Day “Oral Cancer” Dr. Vedang Murthy, Professor, Radiation oncologist, TMC
18 October	Awareness Workshop - Prime Minister’s Fellowship Scheme for Doctoral Research Become a PM Fellow: Put your talent to work with an organization that needs it Dr. Sunita Singh, Federation of Indian Chambers of Commerce & Industry (FICCI)



Augmentation of Resources

Renovated OT – ICU complex

The renovated OT – ICU complex was inaugurated on 8th January 2019.



Anatomy Lab

Commissioned in January 2019, obtained clearance from Maharashtra Anatomy Act 1948.



Robotic Neuronavigation testing Laboratory

A collaborative venture with BARC, for trial runs on Phantoms for qualification, evaluation and validation of Neurosurgical suite developed by BARC for patient use. The facility was ready to accept trials from June 2019.



CAR T- Cell Therapy Centre

A cGMP facility, Biosafety level 2 contained area with two HEPA filtered rooms, ISO 7 and ISO 8 was inaugurated on 18th November 2019. This facility will be a first of its kind centre, in the country dedicated specially for the clinical manufacturing of CAR-T cells and conducting Phase I/II clinical trials on patients, and will offer Cellular therapies for specific indications.



Transplant Immunology and Immunogenetics Lab

The HLA laboratory, a part of Transfusion Medicine at TMH has been relocated to ACTREC as a stand-alone facility with enhanced scope, particularly useful for Bone marrow transplant cases.



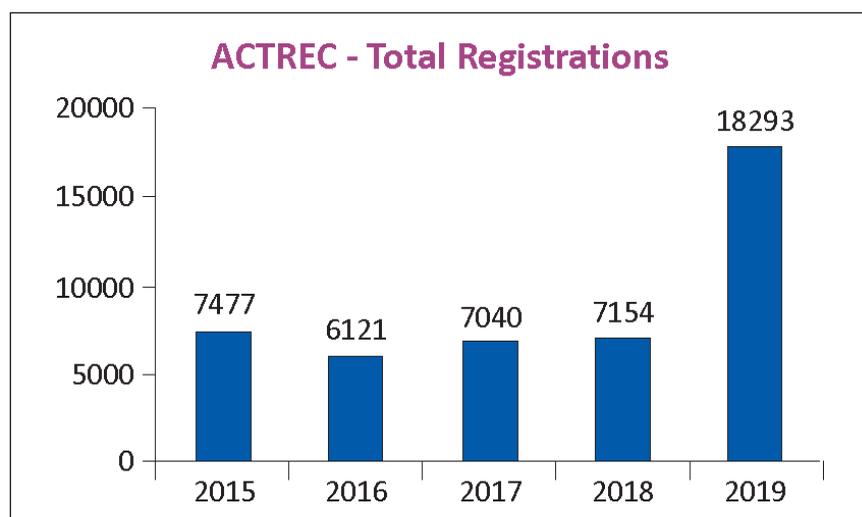
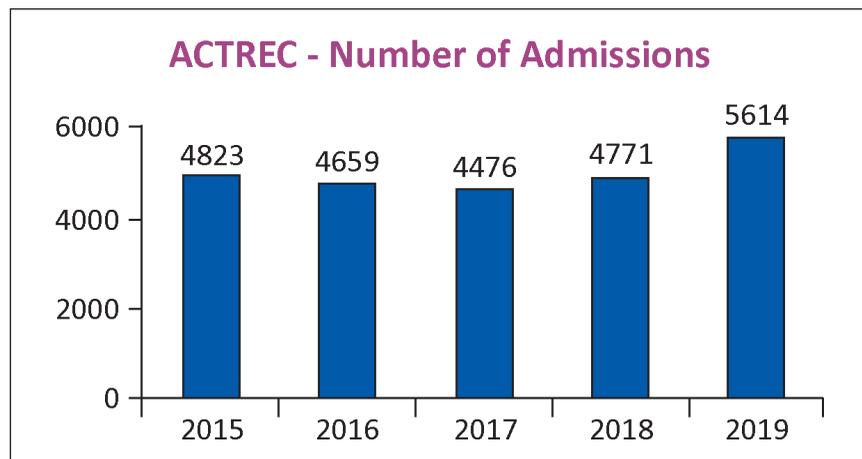
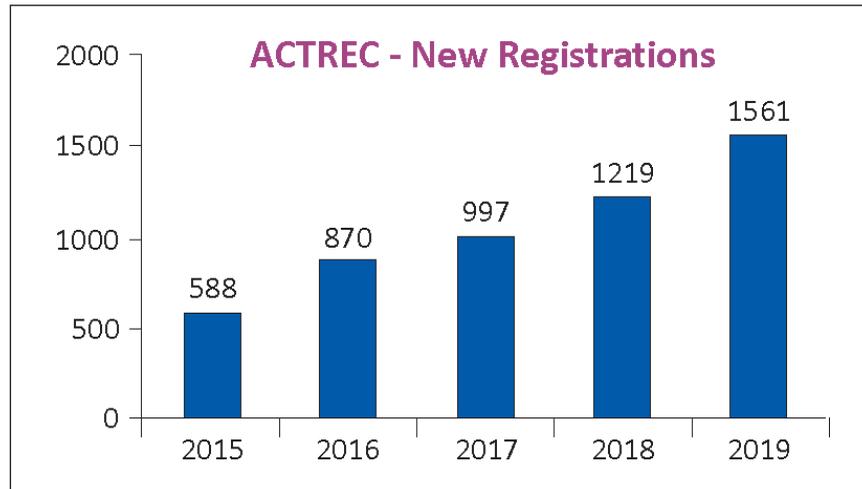
Dialysis Facility

A new dialysis unit has been installed within the ICU in December 2019, to perform haemodialysis for patients undergoing intensive management.





Trends





Performance Statistics

	2018	2019
General New Patient Registrations– (1)	5697	13344
Private New Patient Registrations–(2)	1458	4949
Total New Patients – Total (1+2) – (3)	7155	18293
Patient Referrals for Investigations – (4)	563	1064
Patients Referred for Consultation (Expert Opinion) – (5)	80	182
Preventive Oncology Patients – (6)	SNA	SNA
Total Patient Registrations (3+4+5+6)	7798	19539
INPATIENT SERVICES		
No. of Admissions	4771	5614
Average Length of Stay (Days)	4.98	5.05
Bed Occupancy %	67	81
SURGICAL ONCOLOGY		
Major Operative Procedures	1528	2506
Minor Operative Procedures	1522	1563
Robotic Surgery	SNA	SNA
MEDICAL ONCOLOGY		
Day Care- General	20181	22383
Day Care- Private	3501	4028
No. of Bone Marrow Transplants	62	58
DIGESTIVE DISEASES AND CLINICAL NUTRITION		
Endoscopies	12	18
Nutrition Clinic	SNA	SNA
ANAESTHESIOLOGY, CRITICAL CARE & PAIN		
Number of ICU Admissions	1822	2675
Patients in Recovery Ward	1533	2500
Pain Clinic	141	768
RADIATION ONCOLOGY		
External Beam Therapy	1094	1186
Brachytherapy	409	325
Treatment Planning / Beam Modification	1803	1660

	2018	2019
IMAGING SERVICES		
Conventional Radiography	2789	3170
Ultrasound / Color Doppler	1600	2080
Mammography	1381	1566
C.T. Scan (Diagnostic)	2875	6743
C.T. Scan (for Radiotherapy Planning)	1369	1450
M.R.I Scan	3396	3763
Interventional Radiology	1964	1441
Bone Densitometry	SNA	SNA
NUCLEAR MEDICINE		
PET-CT Scan	1748	2882
SPECT-CT Scan	SNA	SNA
C.T. Scan (Diagnostic)	SNA	SNA
High Dose Therapy	SNA	SNA
GENERAL MEDICINE		
ECG	2955	3693
Echo Cardiography	1823	1814
Pulmonary Function Tests	SNA	SNA
LABORATORY DIAGNOSTICS		
Pathology - Histopathology + IHC + Frozen Section	9329	14433
Biochemistry	56340	66045
Cytopathology	356	SNA
Molecular Pathology	SNA	SNA
Microbiology	14064	18004
Hematopathology	54697	61082
Cytogenetics	12058	30980
FLOW CYTOMETRY & MOLECULAR HEMATOPATHOLOGY		
Bone Marrow Aspiration Morphology	7811	7610
Flow Cytometric Immunophenotyping	7706	7973
Molecular Hematopathology	8263	9900

	2018	2019
TRANSFUSION MEDICINE		
Blood Components Prepared [Whole Blood + packed Red Cells + Platelets (RDP)+ Fresh Frozen Plasma + Cryoprecipitate + Factor VIII Deficient Plasma]	3837	4864
Single Donor Platelets (SDP) prepared	1060	1118
Specialized Procedures (Irradiation of blood Products+ Granulocyte Harvest + Therapeutic Leukapheresis + Therapeutic Plasma Exchange)	4719	4788
Laboratory Investigations [Blood Grouping +Cross matching+ Antibody Detection]	10713	14169
HLA LAB		
HLA Typing		
Antibody Screening	SNA SNA	SNA SNA
OTHER CLINICAL SERVICES		
Catheter Clinic		
Stoma Clinic	SNA	SNA
Occupational Therapy	SNA	SNA
Physiotherapy	SNA	SNA
Speech Therapy	6855	11268
Psychiatry and Clinical Psychology	SNA SNA	SNA SNA
DENTAL SERVICES		
General Dentistry		
Prosthetics Services	2562	4999
SNA	145	
TISSUE BANK		
Allografts Produced	SNA	SNA
PALLIATIVE MEDICINE		
No. of Patients	SNA	SNA
Home Care Visits	SNA	SNA

	2018	2019
MEDICAL SOCIAL SERVICES		
No of Beneficiaries for Financial support	94	127
No of Beneficiaries for Accommodation	2700	3143
EDUCATION		
Residents & Others	50	49
Fellows	13	7
Medical Observers	0	0
Nursing Trainees	0	2
Paramedical Students	0	0
Medical Physicists trainees	4	2
Medical Laboratory Trainees	4	3
RESEARCH PROFILE		
Extramural Projects	127	130
Pharmaceutical Company Sponsored	0	0
Intramural +Extramural Projects	251	232
Institutional Intramural Projects Nil Funding	79	81
Postgraduate Student Thesis (Dissertation)	0	0
PUBLICATIONS		
International	120	118
National	19	23
Book Chapters	5	14
CONFERENCES / WORKSHOPS / SEMINARS	41	57

Wherever applicable, mention:

DNA: Data Not Available.

NA: Not Applicable

SNA: Services Not Available

CLINICAL RESEARCH CENTRE

Dr. Sudeep Gupta (Director, ACTREC)

Dr. H. K. V. Narayan (Dy. Director, ACTREC)

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

Anesthesiology, Critical Care & Pain

Dr. Reshma Ambulkar
Dr. Bhakti Trivedi (OIC)
Dr. Amol Kothekar
Dr. Malini Joshi
Dr. Raghu Thota

Cancer Cytogenetics

Dr. Dhanlaxmi Shetty (OIC)
Ms. Hemani Jain

Cancer Genetics

Dr. Rajiv Sarin

Clinical Pharmacology

Dr. Vikram Gota
Dr. Manjunath Nookala

Clinical Research Secretariat, ACTREC

Dr. Jayant Goda Shastri
Mrs. Sadhana Kannan

General Medicine

Dr. Prafulla Parikh

Hematopathology

Dr. Subramanian Ganeshan (OIC)
Dr. Nikhil Patkar (Clinician Scientist)
Dr. Prashant Tembhare (Clinician Scientist)
Dr. Ashok Kumar
Mr. Y. Badrinath
Dr. Shruti Chaudhary
Mrs. Swapnali K. Joshi

Clinical Scientist Laboratory

Dr. Sudeep Gupta

Medical Administration

Dr. Prashant Bhat (Medical Suptdt)
Mrs. Chital Naresh

Medical Physics

Dr. Jamema SV
Ms. Reena Phurailatpam

Medical Oncology

Dr. Sudeep Gupta
Dr. Navin Khattry
Dr. Manju Sengar
Dr. Amit Joshi (OIC)
Dr. Jaya Ghosh
Dr. Tushar Vora
Dr. Hasmukh Jain

Microbiology & Composite Lab

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

Nursing

Dr. Meera Achrekar (Dy. Nursing Supdt)
Ms. Anjali Rawat (Asst. Nursing Supdt)

Pathology

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

Radiation Oncology

Dr. Tejpal Gupta (OIC)
Dr. Vedang Murthy
Dr. Supriya Sastri
Dr. Jayant Sastri Goda (Clinician Scientist)
Dr. Tabassum Wadasadawala

Radiodiagnosis

Dr. Seema Kembhavi
Dr. Amit Kumar Janu

Surgical Oncology

Dr. Vani Parmar
Dr. MS Qureshi
Dr. Aliasgar Moiyadi
Dr. Vinaykant Shankhdhar
Dr. Sudhir Nair (Clinician Scientist) (OIC)
Dr. Deepa Nair
Dr. Prakash Shetty
Dr. Parthiban Velayutham

Transfusion Medicine

Dr. Shashank Ojha (OIC)
Dr. Minal Poojary
Mrs. Manda Kamble

Translational Research Laboratory

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



Anesthesiology, Critical Care and Pain Department

Officer-in-Charge : Dr Bhakti Trivedi

Anesthesiologists : Dr. Reshma Ambulkar, Dr. Raghu Thota, Dr. Malini Joshi

Intensivist : Dr. Amol Kothekar

Overview

Anesthesia, Critical Care and Pain Management services are provided by the Department of Anesthesiology, Critical Care and Pain of TMC (TMH and ACTREC). These include five 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 2019 provided its value towards Anesthesia for up to 5 OTs; Major OT, Interventional Radiology, MRI, Radiotherapy operation theatre and the Pre anesthesia check-up clinic. The department also administers Critical Care for a 7-bedded ICU plus a 3-bedded PACU with a CPR team and renders Acute Pain services. A formal Pain team is formed comprising of Anesthesia consultant, resident & nurse who round the wards taking care of the post-operative and chronic pain patients. During 2019, the department provided Anesthesia services for 2496 major OT procedures, 356 procedures in the Radiotherapy OT, 395 MRI, 332 Interventional Radiology procedures and 1809 new + follow-up Pre Anesthesia check-ups, Critical care services for 2380 Recovery room admissions,

287 ICU admissions (88 of which were ventilated) and 8 ICU admissions for procedures, as well as 768 Acute Pain Services.

Research

Faculty members were engaged in over 60 clinical studies (on-going) and 21 (completed) during 2019. These include, a prospective study to evaluate the use of surveillance venous ultrasonography to detect incidence of deep venous thrombosis in perioperative period in cancer patients undergoing neurosurgery and, an ultrasonographic analysis of gastric volume in patients posted for elective gastrointestinal surgeries (PI, Dr. Ambulkar); a single-arm prospective interventional study to assess the feasibility and efficacy of single-shot erector spinae block in patients undergoing video-assisted lung resection surgery, a prospective observational study to assess the incidence and risk factors for postoperative pulmonary complications in head and neck cancer surgery patients, and a study of the utility of Surgical Apgar score in predicting post-operative complications after Whipple Procedure in pancreatic cancer patients (PI, Dr. Thota); a

prospective peri-operative audit of outcomes after endoscopic procedures to drain pancreatobiliary obstruction in a tertiary cancer institute, a study on the effect of frailty on post-operative outcomes In major abdominal surgeries In a tertiary cancer institute, accuracy of cardiac output measurement using electrical cardiometry and arterial pressure based cardiac output methods in patients undergoing major surgeries under general anaesthesia (PI, Dr. Joshi); a prospective observational study of anaesthesia practices in brain tumour surgeries in paediatric population with neurophysiological monitoring in a tertiary care centre(PI, Dr. Trivedi). Project discussion meetings are held at regular intervals where investigators discuss planned projects in the department before submission to the IRB. Members of the department serve on the Institutional Ethics Committee and the Data and Safety Monitoring Sub-committee.

Education

The department conducted the annual Anesthesia Review Course (ARC) for post-graduate students, a three-day course attended by more than 300 students each year, in April 2019. The department also organized the “Difficult Airway Conference” in December 2019. The Critical Care division held an annual two-day pre-conference workshop and 2 day conference on hemodynamic monitoring (THEMATICC) which was attended by several intensivists from all over India. The Pain division organized an annual two-day conference – “Education in Cancer Pain (ECAP)”.The department also organized a 2 day course (BRITE) for the intensive care trainee in February 2019. Members of the department have been invited as faculty at several national and international conferences in 2019.



Cancer Cytogenetics Department

Officer-in-Charge : Dr. Dhanlaxmi Shetty

Scientific Officer : Ms. Hemani Jain

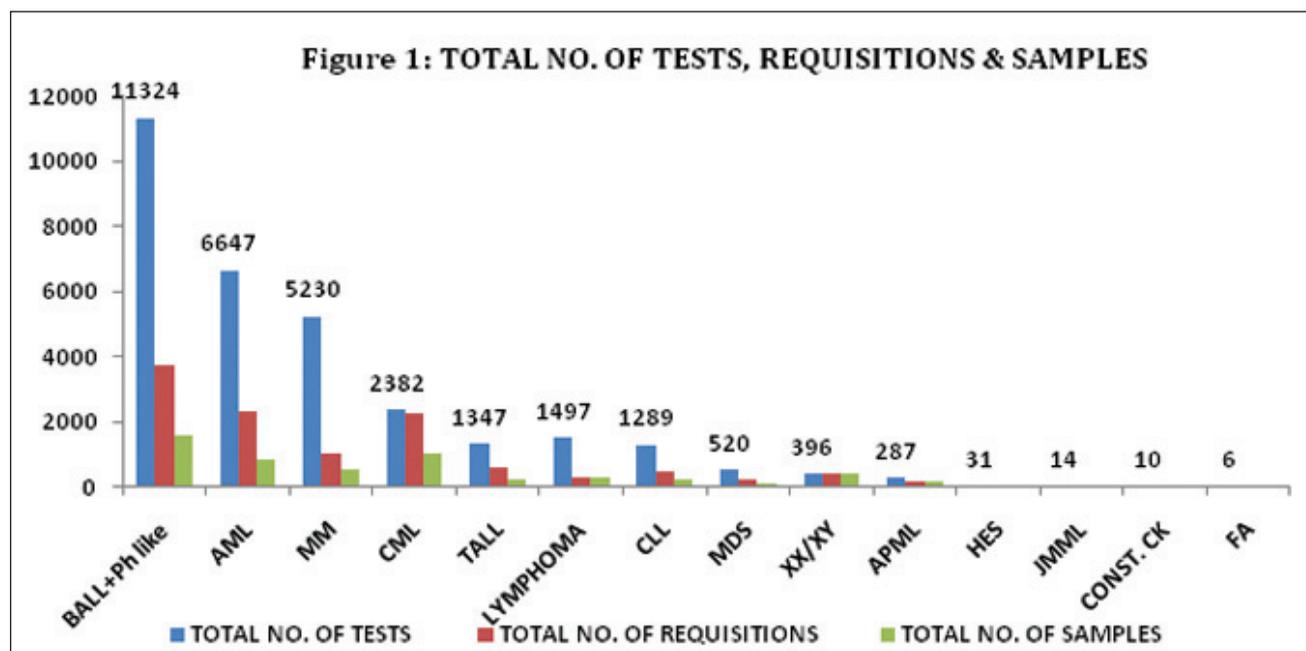
Overview

The Cancer Cytogenetics Department at ACTREC is a well-equipped laboratory that provides comprehensive diagnostic testing [Conventional Karyotyping (CK) and Fluorescence In-situ hybridization (FISH) studies] for all hematolymphoid malignancies both in-house and referrals. Cytogenetics is a mandatory investigation and is performed at baseline and at successive follow ups thereby helping in diagnosis, classifying patients into different risk groups, guiding clinicians in deciding treatment

and monitoring response. The department is NABL (National Accreditation Board for Laboratories) accredited and participates in External Quality Assessment program (EQAS) with College of American Pathologist (CAP).

Service

In 2019, we received 5420 bone marrow/peripheral blood specimens, with 11,567 requests for conventional karyotyping and FISH tests. The department performed 30,980 tests, (comprehensive FISH panels consisting of 4-12



markers in hematolymphoid malignancies- AML, APL, B-ALL, T-ALL, MDS, CML, CLL, Lymphoma, MM, chimerism studies in sex mismatch post-BMT patients; conventional karyotyping in AML, MDS, CML; ploidy analysis in ALL; constitutional karyotyping and breakage studies in Fanconi Anemia/Aplastic Anemia) (Fig 1). Karyotyping was performed on various cell lines for CRI laboratories.

Research

Cancer Cytogenetics Department has been a part of the ICICLe project (Collaborative, multi-centric, national trial for newly diagnosed patients with acute lymphoblastic leukemia) since 2014. Ongoing research comprises of a phase II study for evaluating efficacy of Bortezomib and Rituximab in newly diagnosed adolescent and adult CD20 positive Philadelphia (Ph) negative precursor B-cell acute lymphoblastic leukemia, profile and outcomes of Acute Megakaryoblastic leukaemia (AMKL) in children. Work on a rare pediatric malignancy and post-marketing phase 4 study to evaluate safety, tolerability, and efficacy of Kyprolis® (Carfilzomib) in Indian patients with relapsed or refractory Multiple Myeloma is ongoing as a part of a prospective, open-label, non-comparative, multicentre study.

Education

The department staff presented 8 oral presentations in 3 national conferences and 2 posters in National and International conferences. Two staff members were trained in ISO15189:2012 Quality Management System & Internal Audit Training Course. The OIC was certified as an Associate Genetic Counselor (2019-2021) by Board of Genetic Counseling (BGC), India and also registered as Clinical Laboratory Geneticist (ErCLG) (2019-2024) from the European Board of Medical Genetics (EBMG). The staff participated in external NABL audit held in April 2019 and internal audit conducted in November 2019. Six M.Sc. students were given intensive training in FISH and Karyotyping techniques as part of the Advanced Cancer Cytogenetic training course of six months with an additional six months internship. Cytogenetics and general laboratory culture orientation was provided to 40 consultants/ registrars from Medical Oncology and other pathologists. Three international observers were trained in Cytogenetics for a period of 3 months. Twenty nine national delegates and 5 international delegates participated in a two and a half days lecture series cum workshop on 'Applications of Cytogenetic Techniques in Diagnostics' organized by the department in August 2019. Eminent faculty were invited to deliver talks in their specialized field and the delegates were given "Hands - On" training in laboratory techniques.



Clinical Pharmacology Group

Officer-in-Charge : Dr. Vikram Gota

Scientific Officer : Dr. Manjunath Nookala

Overview

The clinical research efforts of this group are aimed at developing new drugs for radioprotection and pharmacokinetics (PK) driven optimization of drugs. In addition, the group provides critical support and expertise necessary to effectively conduct early-phase clinical trials in oncology. The laboratory also partakes in training personnel and developing capacity in the field of cancer pharmacology, biostatistics and clinical research operations.

Service

This laboratory offers therapeutic drug monitoring (TDM) services for voriconazole, posaconazole, mycophenolate mofetil and L-asparaginase. More than 2500 samples [voriconazole (1125), posaconazole (1407), MMF (11) and L-asparaginase (03)] were reported for drug levels in 2019, benefitting more than 700 patients undergoing treatment for acute leukemias and BMT. Presently expansion of the TDM capacity is ongoing, through the installation of two more HPLC instruments, in this facility.

Research

Notable contributions in the field of research include the development of two novel radioprotectors – Chlorophyllin (CHL) and Diseleno dipropionic acid (DSePA). While phase I clinical trials of CHL was initiated in healthy volunteers, the preclinical development of DSePA in collaboration with BARC has been concluded. Further, a single-center bioequivalence study of PEG-asparaginase manufactured by an Indian biotech company, the results of which were submitted to the DCGI in early 2019, has also been completed. Three graduate students in the department are also working on the development of phytopharmaceuticals for the prophylaxis of graft versus host disease (GVHD). The laboratory received recognition as the Centre for Advanced Research and Excellence (CARE) by the ICMR. The multi-crore grant entails capacity building in the country for PK-PD modeling, TDM and make-in-India novel formulations for use in childhood cancers. An Indian patent was filed in collaboration with a Bangalore based firm this year for a novel liquid formulation of 6-mercaptopurine.

Education

Dr. Gota 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 and Mr. Girish Panigrahi are presently working on their doctoral theses. The laboratory continues to offer Fellowship in Oncotherapeutics which attracted a number of applications in 2019. In addition, M.Sc. clinical research participants are trained in clinical research methodologies during their regular rotation posting as well as during their internship. A number of M.Sc. and M. Pharm students also benefitted from doing their internship in this laboratory. The faculty (both) participated in international (2) and national (5) conferences in 2019.



Composite Laboratory

Officer-in-Charge : Dr. Preeti Chavan

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. The laboratory has been working on one IEC approved project and two audits. One research paper was published by the faculty in 2019. 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 and methotrexate) and immunoassay for TFT). In 2019, Sirolimus drug assay, 24 hour urine protein

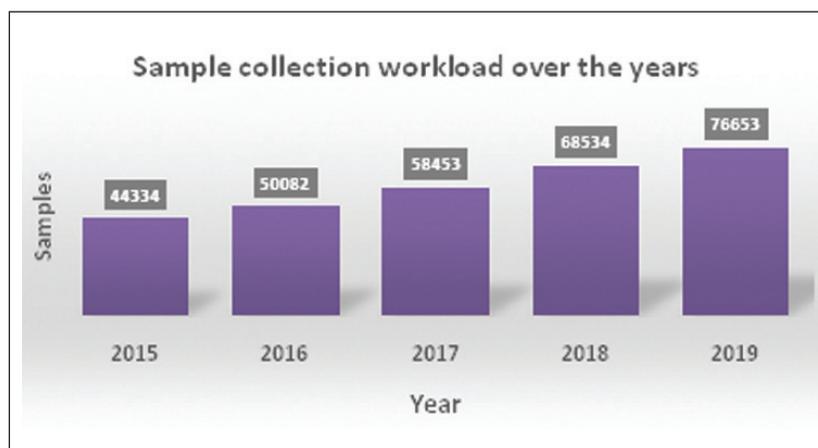
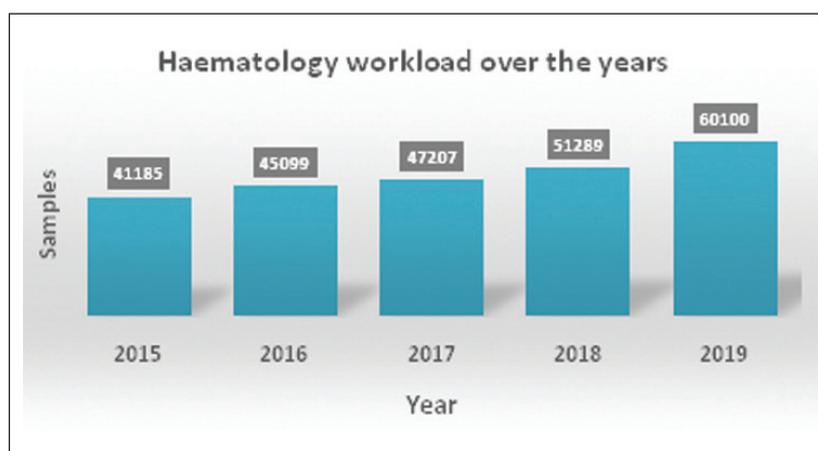
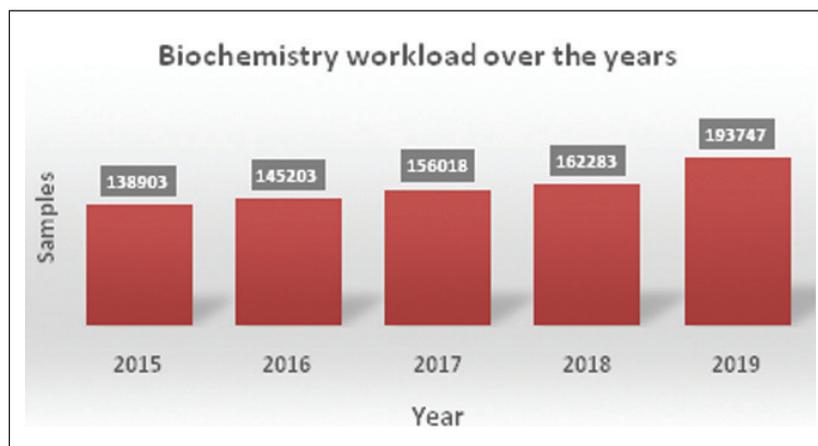
estimation and β -2 microglobulin estimation were initiated in the laboratory. The laboratory performed 185403 tests for routine biochemistry, 8344 immunoassays, 60100 tests for hematology and 76653 patient blood collections in sample collection area during the year 2019.

Research

An IEC-approved study, on determining select biochemical reference intervals in Indian voluntary blood donors was completed in 2019 (PI, Dr Chavan). Presently, the laboratory is involved in two audits, of which the first is assessment of the correlation between hyponatremia and SIADH in oncology patients and, the second is determination of the correlation of NLR/PLR ratio, CRP, PCT, and ANC with presence of infection.

Education

Training sessions on sample collection and interpretation of laboratory values were conducted for ACTREC nurses. The laboratory also accepted three trainees in 2019 for dissertation projects. Four students enrolled for advanced training course in Medical Laboratory Technology.





Clinician Scientist Laboratory

- Clinicians** : Dr. Rajendra Badwe, Dr. Sudeep Gupta, Dr. Kumar Prabhash, Dr. Nita Nair, Dr. Shalaka Joshi
- Scientists** : Dr. Anuradha Choughule, Dr. Sejal Patwardhan

Overview

The prime focus of this group 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. Clinician scientist laboratory (CSL) employs a bedside - to bench - to bedside approach wherein, research questions formulated from clinical observations are addressed in the laboratory settings using pre-clinical assays; with an ultimate aim to develop tailored therapeutic strategies.

Research

This laboratory has made substantial progress in the following research activities.

Hypoxia in cancer metastasis: With transcriptomic analysis, the modulation of pathways involved in stress, stemness, metastasis, wound healing, inflammation and immune responses in breast cancer tissues during surgical intervention have been confirmed. These findings were recapitulated in a larger cohort of patients projecting AP-1 as one of the key regulator. On

similar lines, in a study employing an *in-vitro* hypoxia mimicking model, the expression/ activation status of AP-1 family members in breast cancer cells exposed to short/long term hypoxia has been studied. The next target will be to probe the role of AP-1 members in hypoxia-induced metastasis using *in-vivo* mouse model.

Clonal evolution of tumor: The longitudinally collected samples from triple negative breast cancer (TNBC) patients were subjected to a multi-omics analysis (Whole exome sequencing, microarray SNP data and transcriptome sequencing), followed by robust bioinformatics analysis. This investigation unfolded clonal architecture and their evolution in TNBC tumors probably responsible for the metastatic spread / therapeutic resistance with significant therapeutic implications. The study is being concluded and will be communicated soon in a scientific journal.

Non-invasive assays for treatment monitoring: Acquiring of biopsies of breast cancer patients undergoing neo-adjuvant chemotherapy before the start of therapy, and at the time of surgical resection, along with sampling blood prior to each

cycle of chemotherapy has been effected. Cell free DNA (cfDNA) from these samples, have been isolated and are now being subjected to sequencing based assays to identify patterns of mutations as a surrogate marker for tumor burden.

Therapy resistant breast cancer: In this Virtual National Cancer Institute (VNCI) study, with a holistic approach (fig. 1) an attempt to understand mechanisms of endocrine therapy resistance in breast cancer patients is undertaken.

Seventy-one patients in the resistant cohort and 97 patients in the sensitive cohort have been recruited. Multi-omics data has been generated and analyzed for these patients. Certain early leads have been obtained which need to be further validated.

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. During the year 4 trainees were selected for their Master’s dissertation and laboratory experience. Students and project fellows participated as tutors and instructors in the Cancer Informatics workshop [TMC Tata Trusts and Kings College London] and the International Cancer Genome Consortium (ICGC) during the months of November and December 2019. The faculty and students attended International conferences during the report year.

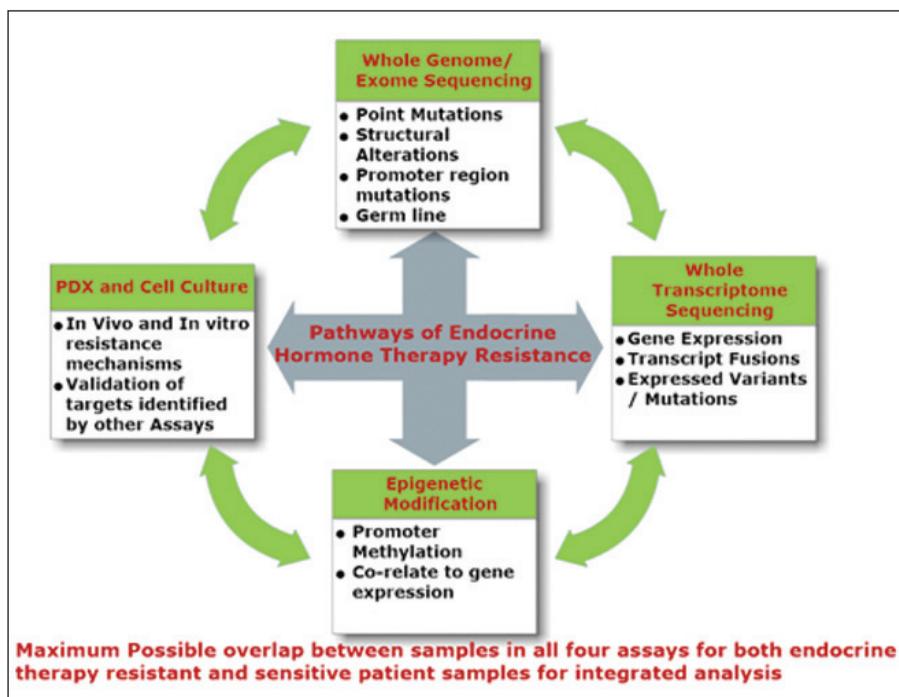


Fig. 1 Schematic representation of data integration strategy



Hematopathology Laboratory

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

Haematopathologist : Dr. Sumeet Gujral

Clinician Scientists : Dr. Nikhil Patkar, Dr. Prashant Tembhare

Scientific Officers : Dr. Ashok Kumar, Mr Y. Badrinath, Dr. Shruti Choudhary, Mrs. Swapnali Joshi

Overview

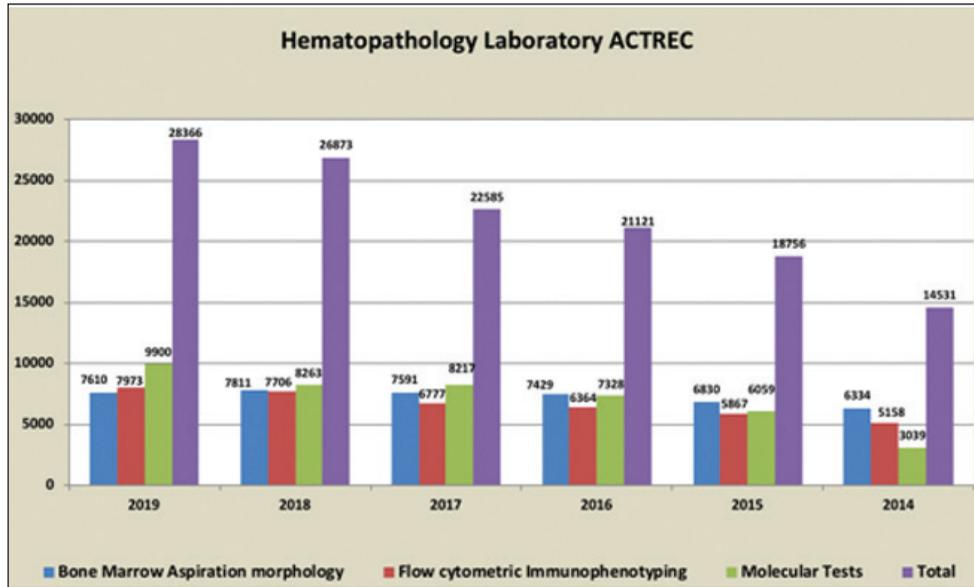
Hematopathology Laboratory is a service laboratory for the diagnosis and sub classification of hematological malignancies as well as monitoring of patients while on therapy for all malignancies. The laboratory uses morphology, flow cytometry and molecular techniques for diagnosis. The laboratory does Minimal Residual Disease testing and post treatment monitoring of patients of 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 laboratory offers Next Generation sequencing facilities for identifying unknown fusions in hematological malignancies; these fusions can be targeted with specific drugs for optimal treatment of patients.

Service

During 2019, this laboratory performed a total of 28366 specialized tests for hemato-oncology,

which included 7610 bone marrow aspirate morphology, 7973 flow cytometric immunophenotyping, 5500 cytochemistry tests, 2883 body fluids for cell count and morphology and 9900 molecular tests. Lab services include detection of MRD for acute leukemia and multiple myeloma up to a sensitivity of detecting 1 cell in 100,000 cells and involvement of hematolymphoid malignancies in cerebrospinal fluid and other rare sites. The laboratory does post-allogeneic stem cell transplant monitoring for chimerism, and molecular testing for diagnosis, subtyping and monitoring of hematolymphoid malignancies. In 2019, this laboratory provided molecular diagnostics service to a total of 9900 patients - these encompassed RQ-PCR for BCR-ABL (5056), BCR-ABL transcript identification (433), ABL kinase domain mutation studies (469), RQ-PCR for PML RARA (393), IGH or TCR gene for clonality (09), B-RAF V600E(08),MYD88 L265P detection (16) and chimerism testing by STR markers for bone marrow transplantation (1984), Next Gen Sequencing Assay (1532). This laboratory serves as a country-wide referral Laboratory for Hematolymphoid malignancies.

The following are the total number of tests done in this laboratory in the year 2019.



Research

Faculty members are engaged in several research projects involving Comprehensive profiling of Gene mutations in Acute Myeloid leukemia and their influence in outcome, the search for newer markers for use in Minimal residual disease (MRD) and its value in Clinical management in Indian context. The faculty is also engaged in projects addressing the use of Artificial Intelligence algorithms in improving the risk stratification for management of observed gene mutations in Acute Myeloid Leukemia, 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 for pathologists and technicians, a 2-year post MD Hematopathology Fellowship program, and a 6-month advanced training program in Oncology for pathologists (2 trainees in 2019). Advanced training courses in Hematology, Flow Cytometry (3 trainees in 2019) and Molecular Hematology(3 trainees in 2019) are also conducted for technologists. In 2019, 50 M.D. Pathologists from various parts of the country came as observers for training in morphology, cytochemistry and flow cytometry. In 2019, four CMEs and Workshops in Hematopathology and Cytometry were conducted by the lab in ACTREC and TMH. In addition, the lab shares its knowledge and expertise with the medical community of the country.



Medical Administration

Medical Superintendent : Dr. Prashant Bhat

Quality Manager : Ms. Chital Naresh

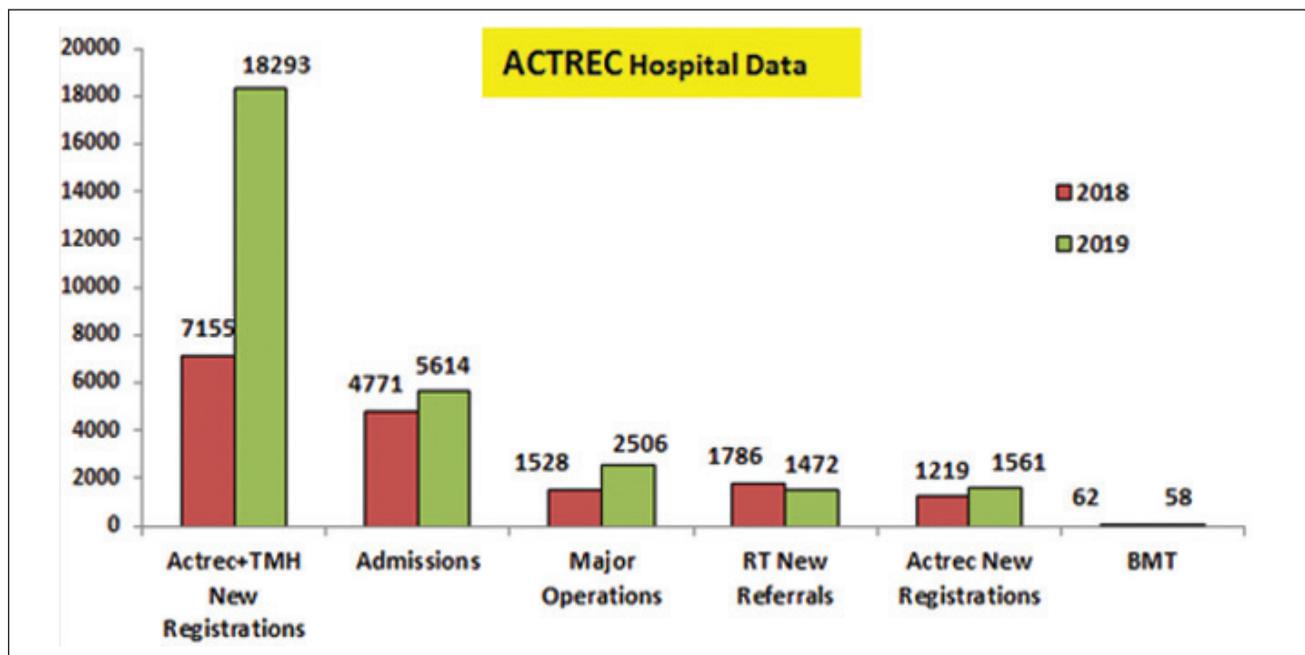
Overview

Medical Administration manages the outpatient, inpatient, diagnostic, clinical and support services including the patient hostel 'Vasundhara'. The department supports in-house general medicine for the management of medical co-morbidities and super-specialty consultation through honorary specialists. Allied clinical services which include dietetic and patient nutrition, physiotherapy and medical social work and support services associated with patient care are coordinated from the MS office. ACTREC pharmacy along with material management of drugs and surgical supplies and procurement of capital equipment for CRC are managed by Medical Administration. Department has facilitated government schemes MJPJAY and AYUSHMAN BHARAT Yojana at ACTREC to aid the economically deprived patients for their cancer treatment. The CSR support for various infrastructure development, equipment donation and monetary donation to various patient welfare funds were liaised and coordinated from this office. Patient activities organized by NGO's and voluntary organizations are also facilitated by Medical administration.

Service

- A total of 18293 cases have been registered during the year 2019. Among which 1561 new cases were registered directly at ACTREC. During the year the total number of registrations have increased phenomenally (increase of 60.8%) and the direct ACTREC registration have shown an increase of 15.6%. Besides these 1246 Referral Cards for specialty investigations/ expert opinion were registered in 2019.
- The OPD at ACTREC has shown significant increase with average number of out-patients per day at 452 in 2019 (417 in 2018). The number of patients treated in Daycare has also shown an increase of 10%.
- The OT – ICU renovated complex was made functional from January 2019. The new state of the art complex has now an additional operation theatre (increased from 4 to 5 OT's) and increase in ICU beds from 7 to 13. The renovation project and its commissioning are coordinated by Medical administration.

- Anatomy laboratory has been commissioned in January 2019, after obtaining clearance under Maharashtra Anatomy act 1948 coordinated by MS office. The new facility will be utilised for surgical skill enhancement workshops and development of new surgical techniques by using human cadavers.
- NABL has re-accredited ACTREC diagnostic laboratories on 20th May 2019 valid until 19th May 2021. The accreditation program of the diagnostic labs is coordinated by Medical administration.
- Organized Patient Safety week from 12th to 18th September 2019 with safety awareness campaigns and various patient safety themed activities including poster, slogan and writing articles competition in Hindi, Marathi and English. WHO declared World Patient Safety Day was celebrated on 17th September 2019 with expert faculty presentations on safety in hospitals for patient and staff.
- Coordinated relocation and operationalizing of Transplant Immunology and Immunogenetics Laboratory from TMH to ACTREC.
- Medical administration coordinated establishment of the dialysis facility in the ICU which is functional from December 2019.
- Initiatives were taken to streamline purchasing process of surgical consumables by liaising with TMH and fixation of rates and entering into rate contracts.
- Dr. PC Bhat along with Dr. Sudeep Gupta, Director, ACTREC visited the HBCH and MPMCC units at Varanasi between 9th and 13th December 2019 to review the systems in these newly commissioned hospitals so as to recommend improvement and to extend cooperation from ACTREC for its development.



Education

The MS - Dr. Prashant Bhat, is a visiting faculty for the EPGDHA hospital management program of the Tata Institute of Social Sciences, Mumbai, and supervised the internship of MHA students in 2019. The MS and his staff on behalf of NABH (National Accreditation Board for Hospitals &

Health care Organizations) have actively participated as NABH assessors for assessments of several prominent hospitals in the country. The MS as well as members of the department participated in an international conference and presented their work.



Medical Oncology Department

Officer-in-Charge : Dr. Amit Joshi

Medical Oncologists : Dr. Sudeep Gupta, Dr. Kumar Prabhash, Dr. Navin Khattry, Dr. Manju Sengar, Dr. Jaya Ghosh, Dr. Bhausaheb Bagal, Dr. Tushar Vora, Dr. Hasmukh Jain, Dr. Anant Gokarn, Dr. Sachin Punatar, Dr. Avinash Bonda, Dr. Lingaraj Nayak

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, ~800 autologous/ allogeneic transplants have been performed with 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. Solid tumor unit is routinely administering chemotherapy in neoadjuvant, adjuvant and palliative setting since 2006.

Service

Bone Marrow Transplantation and Adult Hematolymphoid Unit: In 2019, 58 transplants (24 allogeneic, 34 autologous) were performed in ACTREC. Around 14,000 outpatient visits took place in BMT and adult hematolymphoid unit this year at an average of ~1300 visits per month, and ~200 new referrals (non-TMH) were registered. The unit routinely performs matched unrelated donor transplant using HLA matched stem cells from international/national unrelated donor

registries, unrelated cord transplants, and the most challenging - haploidentical transplants for patients who do not have a fully matched related/ unrelated donor. ACTREC is one of the largest centers doing these haploidentical transplants; around 72 transplants have been performed over the past 6 years, with ~50% overall survival. In the 17-bed leukemia/ lymphoma ward around 1000 inpatient admissions took place.

Adult Solid Tumor Unit: In 2019, 17677 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 treated by the unit at ACTREC. The seven inpatient beds dedicated to solid tumors had 403 in-patient admissions. Around 300 new patient registrations in solid tumors took place in 2019.

Pediatric Oncology Unit: In the pediatric oncology OPD and 5 bed inpatient services, around 5000 outpatient visits took place in 2019 and with the five inpatient beds around 400 patients were admitted. Around 1600 OPD procedures including ascitic tapping, bone marrow aspiration, intrathecal methotrexate, endoscopy and pleural

fluid tapping were performed in procedure room situated in leukemia ward. Around 26102 day care services (chemotherapy + emergency managements + hydrations) were undertaken in 2019. In the report year, we were able to initiate gastrointestinal endoscopies in ACTREC, which is a joint collaboration of medical oncology and medical gastrointestinal services.

Research

Faculty members of the department are involved in several investigator initiated and sponsored clinical trials as well as collaborative research projects, both in the hematolymphoid and solid tumor units.

Education

The department of Medical Oncology at ACTREC has an active educational program, which encompasses daily academic sessions pertaining to 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

Overview

The Microbiology Laboratory is involved in patient service, academics and research. Patient services include processing and reporting of bacteriology, serology, mycobacteriology, molecular microbiology, mycology and other clinical microbiological samples at ACTREC. Sterility testing for Blood Bank services, environmental surveillance, infection control services and waste management support is also provided by the laboratory. The department staff is also involved in research projects leading to scientific publications. Educational activities include teaching students of MD microbiology, JRFs, nursing department, TMC laboratory staff & the advanced training course in medical laboratory technology (ATMLT) course.

Service

The Microbiology Laboratory provided the following patient related & hospital services at ACTREC. A total number of 24191 samples were processed in the laboratory for the period Jan 2019- Dec 2019. These include Bacteriology cultures for Blood (5663), CSF/Body fluids (135),

Drain Fluids (373), Pus (57), urine (784), feces (1237), swabs (991), Respiratory samples (266), & others (436). Serology: HBsAg (1695), HIV (1629), HCV (1676), anti HBc total (475), anti HBc IgM (466), PCT (1480), RMA (627), Dengue (805), & others (275). Clinical microbiology testing for urine (1341), faeces (568), Clostridium difficile (366) & Rota/Adeno/Noro/Astro virus detection (361), Mycobacteriology (Acid Fast Staining- 99), Mycology (136) (Identification of fungi in clinical material and susceptibility testing and special staining, routine fungal Culture) tests were also performed. Sterility testing for Blood Bank services: PBSC (227), SDP (1136), RDP (29), PCS (616), FFP (61), RDP (41) PCS (27), Cryo ppt (12), others (34) & environmental surveillance for OT/ ICU/ Brachytherapy/ BMT units/CCE & water testing. Infection control services and waste management support is provided by the laboratory.

Research

The department is involved in three ongoing research projects, two of which are IEC approved. Research led to 3 publications (National & International) in 2019.

Education

The OIC and staff is involved in teaching students of MD Microbiology, nursing department, TMC laboratory staff & housekeeping staff and project /dissertations for MSc students. The Advanced training course in Medical Laboratory Technology is conducted and coordinated by the department. The staff participated/ presented papers in 5 National/ International Conferences during 2019.



Nursing Department

Deputy Nursing Superintendent: Dr. Meera Achrekar

Assistant Nursing Superintendent: Ms. Anjali Rawat

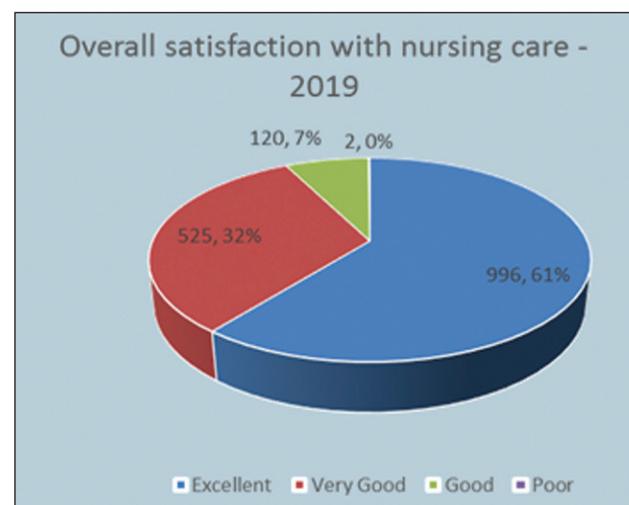
Overview

The Nursing department at ACTREC, strives to provide patient-centric, quality nursing care, keeping in mind at all times the patients' needs, comfort and dignity. The main focus is on implementation of patient safety goals, continuing education, and research. New initiatives during 2019 were online daycare appointments, online data collection of patient satisfaction with nursing care, health education material for patients undergoing chemotherapy and online census collection. Two students enrolled for one year fellowship program in Bone Marrow Transplant Nursing. Various hands on training workshops were organized. Emphasis is placed on the all-round development of nursing staff. Nurses are deputed for National (19) and international (9) conferences. The Nursing Department has initiated its journey towards Nursing Excellence certification

Service

The emphasis in 2019 was on continuous quality improvement, and the department reinforced safety goals to ensure a safe environment for the patient. Six nurses joined permanent position in

2019. New Standard Operating Procedures were added to bring about uniformity in nursing practice. Uninterrupted monitoring of patients and use of standard protocols helped to maintain the hospital acquired pressure ulcer rate (2019 - 0.2%) below 2% and fall rate (2019 - 0.05%) below 2%. New admissions to day care were 354 with a total of 26324 sittings, 1563 patients underwent minor procedures and 2506 major surgeries were undertaken. Fifty eight patients underwent hematopoietic stem cell transplant: 34 autologous, 24 allogeneic, 5 haploidentical and 3 was from a matched unrelated donor. Complications were handled with expert medical and nursing care. Patients provided a positive



feedback about the care received. When asked about overall satisfaction with nursing care, around 93% of patients expressed very good and above. In the year 2019, 152 PICC were inserted, and the nurse-led PICC clinics showed good clinical outcomes.

Research

Various audits for medication safety, nursing assessments, VAP, thrombophlebitis were carried out, and the complications associated with them showed a decreasing trend. Short research projects were undertaken. The research findings were presented in international conferences.

Education

Members of the department attended in-house CNEs and national/ international conferences. Under the continuing education program, the department conducted a 2-day hands-on training workshop on 'Central venous access device (CVAD): care and maintenance', which saw wide participation from various states of India. CNE was organised on care and maintenance of CVAD, ECG, Stoma care, Chemotherapy preparation and administration. The nurses underwent a certification program in pressure ulcer prevention and management and Abhilasha (soft skill training program). Nurses attended certification program for palliative care (2) and CVAD (1). The department took seven nurses for BMT observer ship. Eight institutions visited the department as part of their educational visit. Around 480 participants benefitted from the Cancer Awareness program conducted by ACTREC.



Pathology Laboratory

Officer-in-Charge : Dr. Sridhar Epari

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

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 lab has one pathology consultant, two senior residents and two junior residents (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 processor, automated stainer, cryostat and 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 lab, which is accredited by NABL. In the year 2019, the laboratory processed around 4373 histopathology specimens (i.e. 41330 paraffin blocks) and 2968

frozen sections on 1171 cases. The laboratory has over 49 antibodies standardized for IHC and performed around 7093 IHC tests in 2402 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 investigator or co-investigator 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. Tabassum Wadasadawala
Dr. Supriya Sastri

Overview

The radiobiology and clinical biology 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. The laboratory is working in the field of developing newer formulations of radiation modifiers, besides repositioning drugs for radiation modification. It is actively conducting translational aspects of clinical trials.

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. Besides this, hydrogel and intranasal formulations of temozolamide in

orthotopic GBM models is attempted. 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 the results published in a reputed free radical journal (FRBM). This laboratory in collaboration with Manipal University is co-developing targeted delivery of ligand loaded iron oxide nanoparticle to human glioma in mouse xenograft model. In collaboration with IIT Mumbai, the lab is co-developing a liposomal formulation of temozolamide for intracavitary delivery into the tumour cavity and also 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).

Education

The Radiation Oncologists associated with the laboratory actively train MSc biotechnology students in molecular biology pertaining to radiobiology. The Laboratory has trained 2 PhD students in handling radiation based experiments. One post-doctoral research associate undergoing training completed the tenure in 2019.



Radiodiagnosis Department

Officer-in-Charge : Dr. Nitin Shetty

Medical Officer : Dr. Seema Kembhavi
Dr. Amit Kumar Janu

Overview

The department is well-equipped to provide all the diagnostic imaging services required for patients at ACTREC. These include computed radiography (CR), ultrasonography (USG), Color Doppler, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Mammography (MG) with Digital Breast Tomosynthesis (DBT) and Interventional radiology (IR). The CT machine is used for performing diagnostic scans and the machine is in addition shared with Nuclear Medicine department for PET-CT and Radiotherapy (RT) department for treatment planning. In the MRI service, all routine scans across all body systems are carried out and MRI under General Anesthesia is exclusively available for patients from pediatric services and adults who require it. In addition, advanced MR imaging including perfusion imaging, diffusion weighted imaging, MR angiography, diffusion tractography (diffusion tensor imaging) and functional MR imaging are also performed. MRI scans are also used for RT planning. All these services are provided to ACTREC based patients on priority and then extended to TMH patients, to make the best use of available time slots on the machines.

Emergency services such as urgent radiography, sonography, Doppler studies and CT are available round the clock. Besides these, USG and CT examination of animals are also done as a part of approved animal research projects. To support these activities besides the regular staff, 3 Senior and 5 Junior Registrars from TMC are posted on monthly rotation. The senior registrars in Radiodiagnosis and Interventional Radiology (IR) work as residential doctors for the department. Some of the new initiatives are; a dedicated OPD to evaluate patients referred for Interventional Radiology, availability of technicians 24 X 7 to provide emergency services, Image guided FNAC/ biopsy procedures for tissue diagnosis.

On ACTREC open day 2019, departmental technicians and resident doctors participated and demonstrated MRI departmental functioning and clinical application of MRI to various college students.

Service

During the report period, a total of 3170 CR investigations (2411 routine and 759 portables, average of 264 X-rays/month), 2080 USG/ Color

Doppler (average of 173 scans/month), 6743 Diagnostic CT scans (average of 562 patients/month), 1450 Radiotherapy planning CT scans (average 120 patients/month), 3763 MRI (average of 313 patients/month) and 1566 MGs (average 130/month) were performed. In addition, IR performed 1441 various procedures (average of 120 patients /month).

Research

Faculty members of the department are involved in clinical research projects as PIs and also promote the research of other clinical colleagues by providing support in imaging services. In one such project, members are involved in pre-clinical research, pertaining to development of ultrasound triggered drug delivery system in small animal models.

Education

The Officer-in-Charge and other members of the department participated and presented their research findings at several national/international conferences in 2019. The departmental staff participated in conducting the 8th hands-on workshop by the department of Small Animal Imaging Facility (SAIF) on 'Preclinical Imaging and Drug Discovery, jointly with Indian College of Nuclear Medicine.



Radiation Oncology Department

- Officer-in-Charge** : Dr. Vedang Murthy
- Radiation Oncologists** : Dr. Tejpal Gupta, Dr. Supriya Sastri, Dr. Jayant Sastri Goda,
Dr. Tabassum Wadasadawala
- Medical Physicists** : Dr. SV Jamema, Ms. Reena Phurailatpam

Overview

The department of Radiation Oncology at ACTREC fulfills the Centre's mandate of high-quality service, education, and research (clinical and translational) in collaboration with colleagues from TMH and scientists from Cancer Research Institute (CRI). The group generates high-quality evidence for the use of advanced radiotherapy technology (IMRT, IGRT, SBRT) in cancers of various sites including brain, head-neck, breast, cervix, genito-urinary tract and hematolymphoid malignancies.

Service

A total of 1148 patients were treated with external beam radiotherapy and 667 brachytherapy procedures/treatments were performed at ACTREC in 2019. In the report year, there was about a 7.5% increase in the number of patients treated despite the increase in the number of complex procedures.

Research

A number of ongoing trials include randomized controlled trials comparing moderate hypofractionation versus extreme hypofractionation

in prostate cancer, addition of nelfinavir to standard chemoradiation in locally advanced cervical cancer, and two trials of post-operative adjuvant radiotherapy versus observation in early stage oral and breast cancer are ongoing at ACTREC. Ongoing studies in cancers of various sites including brain, head-neck, breast, cervix and genito-urinary tract, and hemato-lymphoid malignancies were continued during the year. The use of complex and high-precision techniques either to escalate dose to the target volumes and/or reduce irradiation of surrounding normal critical structure has considerably increased in the last couple of years resulting in improved therapeutic index. Ongoing projects related to treatment planning include automated planning using deep learning, Automated Plan Evaluation and Deformable Dose accumulation for various sites such as Cervix, Prostate, Head-Neck and Breast cancer

Education

The department of Radiation Oncology of TMC has a training program for students pursuing MD in Radiation Oncology under the Homi Bhabha National Institute. Annually, 16 students enroll

and are on rotation at ACTREC (3-month posting) as a part of the program. The department has also initiated a teaching course for radiation oncology residents under the aegis of the Indian College of Radiation Oncology (ICRO). Staffs members routinely participate in virtual tumor boards (VTB) organized through the National Cancer Grid (NCG) and extend their expertise for site-based discussion on digital platform 'Chart rounds India'. The department also runs diploma course for medical physics and radiotherapy technologists.



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. Shalaka Joshi, Dr. Garvit Chitkara, Dr. Poorvi Thakkar, Dr. Poonam Joshi, Dr. Vikas Singh, Dr. Avinash Saklani, Dr. Ashwin deSouza, Dr. Vikram Chaudhari, Dr. Manish Bhandare, Dr. Gagan Prakash, Dr. Mahendra Pal, Dr. Amita Maheshwari, Dr. Shylashree, Dr. Ashish Gulia, Dr. Prakash Nayak

Neurophysiologist : Dr. Parthiban Velayutham

Overview

The Department of Surgical Oncology has been providing continued care to a wide range of cancer patients through in-patient care as well as outpatient clinics. The breast and head and neck services conducts regular OPDs through the week and offers all major and minor surgical procedures including reconstruction. The department has initiated consolidation of the ACTREC head and neck services under a dedicated surgical unit located in ACTREC to provide comprehensive care for patients treated at ACTREC. Besides easing patient wait times at Tata Memorial Hospital, it has benefitted patients from the Raigad and other interior districts of Maharashtra. A dedicated clinic for speech and swallow therapy is now functional on all Thursdays. The breast service initiated the setting up of a 3D printing lab to print customized silicone breast implant prototypes in collaboration with Indian Institute of Science, Bangalore.

The operation theatre complex underwent complete renovation in 2018, and the service runs five regular operating theatres daily and two every Saturday. The neurosurgical services offer outpatient clinics twice a week and run two major ORs in a week. In 2019, their focus has been on awake-surgeries, done with detailed peri-operative neuropsychological testing along with the use of adjuncts like monitoring, ultrasound and neuro-navigation. The GI services have expanded its activities in 2019 with regular performance of minimally invasive laparoscopic surgery and other complex surgeries like excentration. The BST service has one major OT on all Fridays.

Service

Besides attending patients referred from Tata Memorial Hospital, the breast and head and neck services registered 613 and 504 new cases respectively. Despite disruption in service due to

interruption in regular water supply from CIDCO, 2506 major procedures and 440 minor procedures (Total : 2946) have been performed in 2019. The total DMG wise procedures carried out are; Breast (728), Head and Neck (706), GI (670), Uro (349), Neuro (147), Gynae-Oncology (178), and BST (99). The breast (6834) and head and neck (4918) together had 11,752 OPD consultations.

Research

The faculty members participate in DMG coordinated projects with scientists at ACTREC, their counterparts at TMH and collaborators from other institutes such as IIT-B and BARC. The

division of plastic surgery has obtained required permissions to start an anatomy dissection laboratory at ACTREC. The head and neck service is coordinating a multicentre clinical trial on Adjuvant Radiotherapy in early stage oral cancers which till date has the highest funding from the National Cancer Grid.

Education

Departmental faculty members are associated in various capacities in national and international bodies/ associations and presented their clinical research findings in numerous national/ international conferences and workshops during the year 2019.

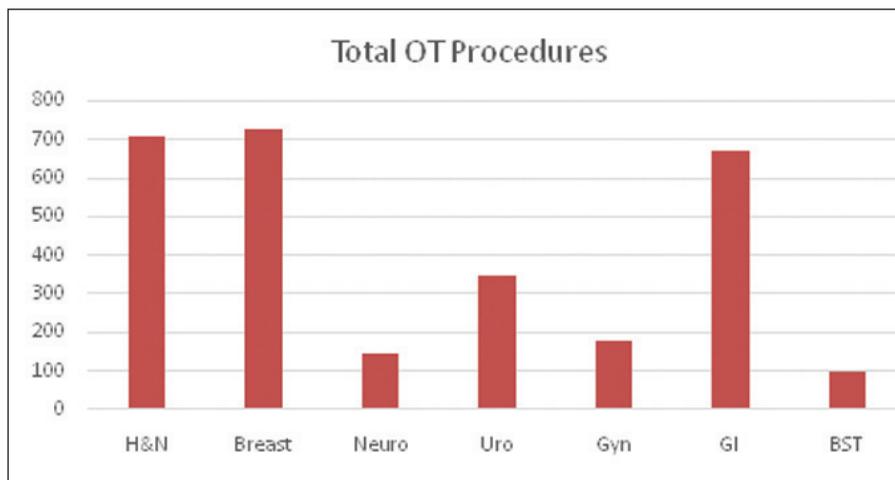


Fig1: DMG wise number of surgeries in ACTREC 2019

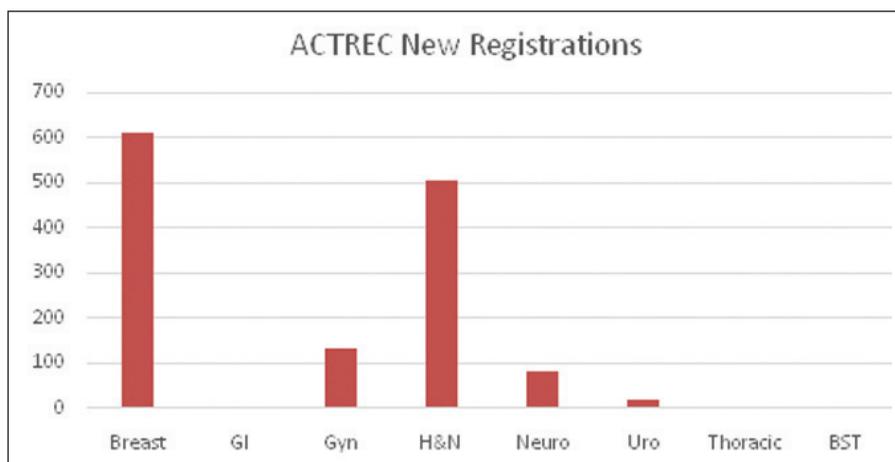


Fig2: DMG wise number of new registrations in ACTREC 2019



Transfusion Medicine Department

Officer-in-charge : Dr. Shashank Ojha

Blood Bank Officer: Dr. Minal Poojary

Scientific Officers : Dr. Sumathi Hiregoudar, Mrs. Manda Kamble

Overview

The Transfusion Medicine Department, consistently strives to maintain high quality standards in provision of 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), Hemato-lymphoid, pediatric and surgical oncology units. It also caters to the blood component requirements of patients admitted in other hospitals in Navi Mumbai.

Service

The services offered by this department include blood donation and apheresis including plateletpheresis, granulocytapheresis, 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 for BMT patients from hospitals (ACTREC and Lokmanya Tilak, Sion), cryopreservation and storage, leukodepletion and gamma irradiation of blood components.

During the period from January to December 2019, the department collected a total of 2753 blood units, prepared 4864 blood components, and issued 4931 blood components. In addition, 1118 plateletpheresis and 137 leukapheresis (95 PBSC, 41 granulocyte concentrates and 1 therapeutic leukapheresis) procedures were performed. Under specialized blood components, 1767 units were leucodepleted and 1827 gamma irradiated. Blood grouping and cross-matching was done on 5729 and 8440 blood samples respectively, shown in figure below. The department also organized 44 outdoor blood donation and 5 platelet donation awareness camps. The department routinely participates in various EQAS programs like Indian Red Cross society EQAS, BEQAS-Jaipur and KEM EQAS.

Research

Faculty members of this department are involved in three on-going projects in collaboration with other departments at ACTREC and TMH. These are, 'a preclinical study to evaluate the efficacy of scfv-CD28-CD3 α CAR T-Cells manufactured from healthy volunteers and patients with

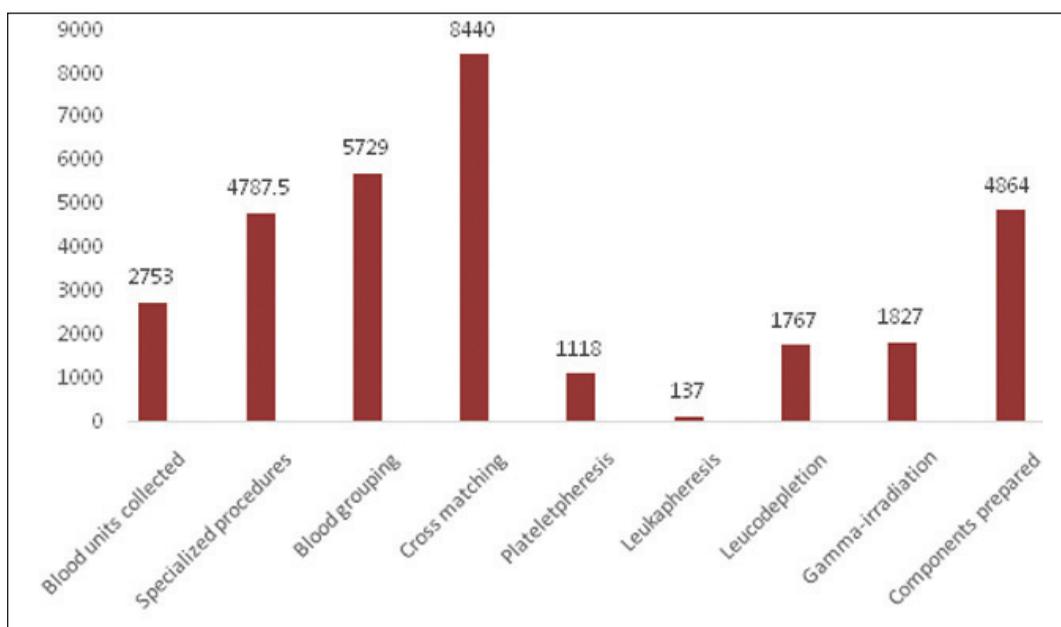


Figure: DTM data-2019

relapsed/ refractory acute lymphoblastic leukemia in *ex vivo* setting' (Co-Investigators: Dr. Shashank Ojha and Dr. Minal Poojary), 'Exploring the role of indigenously developed Chimeric Antigen Receptor(CAR) modified T- cells in the therapy of relapsed/ refractory B-cell Acute Lymphoblastic Leukemia ineligible for Stem Cell Transplantation- 1st stage of a multi-stage project' and 'Determination of select biochemical reference intervals in Indian voluntary blood donors'(Co-Investigators: Dr. Shashank Ojha and Dr. Minal Poojary).

Education

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



Translational Research Laboratory

PI : Prof. Indraneel Mittra
Dr Ernest Borges Chair in Translational Research

Scientific Officers : Dr. Ranjan Basak, Dr. Raguram GV, Dr. Kavita Pal

Overview

The Translational Research laboratory was the first to discover the biological role of cell free chromatin (cfCh) particles that are released from the billions of cells that die in the body every day. Research from this laboratory demonstrated that cfCh particles can illegitimately integrate into healthy cells, damage their DNA and induce apoptotic and inflammatory responses. Further, the laboratory has proposed that cfCh induced cellular damage and inflammation is the underlying cause of ageing and degenerative disorders. Cell free chromatin particles, released from dying cancer cells or those that circulate in blood can transform susceptible cells and may be the underlying cause of cancer. Work from this laboratory showed that cfCh released from dying host cells are the primary cause of chemotherapy toxicity, radiation induced bystander effect and sepsis.

Service

Findings from this laboratory led to the discovery that a combination of the plant polyphenol Resveratrol and Copper can degrade the DNA component of cfCh thereby inactivating it. The following clinical trials of R-Cu are being conducted in patients in TMH:

1. A Study to assess the effect of Resveratrol-Copper (R-Cu) on inflammatory cytokines in multiple myeloma patients undergoing autologous peripheral blood stem- cell transplantation. [IRB project no. 222]
2. A Study to assess the effect of Resveratrol-Copper (R-Cu) on inflammatory cytokines in blood and tumour tissue of patients with operable stage IV squamous cell carcinoma of buccal mucosa. [IRB project no.236]
3. A phase II single arm prospective study to assess the efficacy of Resveratrol- Copper (R-Cu) in ameliorating chemotherapy related toxicity in patients receiving palliative chemotherapy for advanced stage IV inoperable gastric cancer. [IRB project no.3236]

Research

Research from this group has shown that cfCh is a key agent that up-regulates all known hallmarks of cancer including immune checkpoints in various cells *in vivo*. Furthermore, intra-venous injection of cfCh isolated from cancer patients can up-regulate cancer hallmarks *in vivo* in mice. Also, discovered that cfCh are the key regulators of immune checkpoints in lymphocytes. Activation of immune checkpoints can be abrogated by cfCh inactivating agents' namely anti-histone antibody complexed nanoparticles, DNase I and R-Cu. The above findings have clear therapeutic potentials in treatment of cancer.

Research from this laboratory shows that cfCh may be the key agent in ageing. In mice administered oral R-Cu for one year, led to retardation of all biomarkers of ageing and neuro-degeneration including prevention of telomere attrition. Immunization of mice with histone H4 led to development of high titres of anti- H4 antibodies in serum also retarded ageing parameters by their ability to inactivate cfCh. This holds promise in the development of a vaccine against ageing.

Education

In 2019, the laboratory took 3 trainees from various universities, who worked towards their M.Sc. dissertation projects.

CLINICAL RESEARCH INSTITUTE

Dr. Sudeep Gupta (Director, ACTREC)
Dr. Prasanna Venkatraman (Deputy Director)

Basic Research Team

- **Dr. Dibyendu Bhattacharyya**
- **Dr. Kakoli Bose**
- Dr. Pradip Chaudhari
- **Dr. Murali Krishna Chilakapati**
- **Dr. Shubhada Chiplunkar**
- **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. Jyoti Kode
- Dr. Pradnya Kowtal
- **Dr. Manoj Mahimkar**
- Dr. Sonam Mehrotra
- Dr. Sejal Patwardhan
- **Dr. Pritha Ray**
- **Dr. Rajiv Sarin**
- Dr. Sharada Sawant
- **Dr. Neelam Shirsat**
- **Dr. Tanuja Teni**
- Dr. Rahul Thorat
- **Dr. Ashok Varma**
- **Dr. Nalini Verma**
- **Dr. Prasanna Venkatraman**
- **Dr. Sanjeev Waghmare**
- Dr. Ujjwala Warawdekar

Principal Investigators (PIs) are shown in bold



Biomolecular Structure, Function and Alteration Group

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 anti apoptotic c-FLIP and calmodulin, and the Bcl2 family proteins and their interacting partners. Moreover, the group has entered into application-based translation research that includes enzymes involved in metabolic reprogramming (PKM1 and PKM2) and their role in altering cancer signaling pathways.

Research

The highlights of the research findings in 2019 include delivering first-hand information on human HtrA4 and its interaction with anti-apoptotic XIAP thus implicating its involvement in the apoptotic pathway. The group has made several important discoveries such as identification of classical binding site and allosteric behaviour of HtrA3, a trimeric PDZ bearing pro-apoptotic serine protease, which is involved in various diseases including cancer and pre-eclampsia. For the first time using

computational modeling, biochemical, functional enzymology and spectroscopic tools, the group dissected the structural architecture of HAX-1, a mitochondrial anti-apoptotic protein as well as delineated its interaction with one of its pro-apoptotic partner, HtrA2. Currently, the group is working toward understanding the mechanism of Pyruvate kinase isoform 2 (PKM) and its association with cancer progression.

Education

The Principal Investigator is recognized as a guide for the Ph.D. (Life Sciences) degree of the Homi Bhabha National Institute. Currently seven graduate students - Ms. Saujanya Acharya, Mr. K. Raghupathi, Ms. Rashmi Puja, Ms. Aasna Parui, Ms. Sucheta Chopra, Ms. Rucha Kulkarni and Mr. Shubham Deshmukh, are working on their doctoral dissertation. Dr. Ajay Wagh has defended his PhD thesis in November, 2019. Ten trainees were taken up during 2019 for Master's dissertation and one for experience. Lab members meet once a week for data and journal club presentations. The faculty and students presented their research findings at three international conferences/ meetings held in Austria, Germany and USA.

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 is to expose the Achilles heel in cancer. **Current activities include;** Mapping the molecular details of individual PPIs and characterizing the hot spot sides of interaction, Exploiting them for the design and evolution of inhibitors, Structure guided construction of first neighbourhood sub networks, Inferring function and regulation through domain motif interaction, Expanding the networks by expression analysis and APMS derived PPI, Deriving context specific pathways that can be described by edge level metrics.

Research

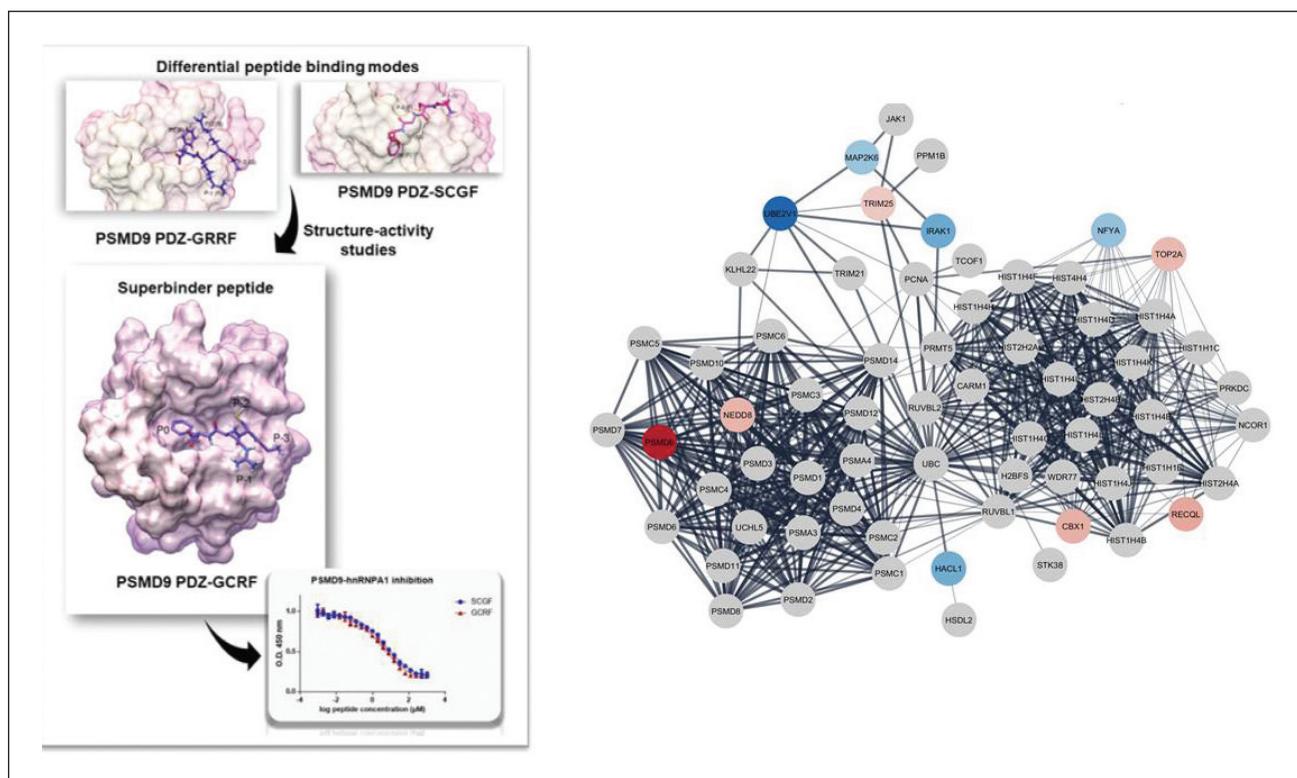
New findings include a) experimental evidence for the role of PSMD10 in exosome biogenesis and its potential relevance in migration of cancer cells; b) the expression of mitochondrial biogenesis markers in MCF7 cells modulated by levels of PSMD9; c) structural homology based design strategy to convert PSMD10 as an alternate super repressor of NFkB degradation; d) interpreting protein interaction between PSMD9 and hnRNPA1 using principle underlying thermodynamics of domain unfolding; e) establishing a relationship between PSMD9 ribosome levels and p53; f) in depth characterization of conformational changes in 14-3-3 upon ligand or ATP binding; g) PSMD9 knock out MCF7 cells show increased accumulation of ubiquitinated proteins combined with a higher tendency for G1/S phase arrest and apoptosis g) In collaboration with IIT Mumbai a constraint based solver was developed to analyze gene expression data to map signaling pathways and identify critical nodes along the path. This year saw several key publications from this laboratory.

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. Students from this laboratory have participated in national and international conferences. Ms. Priyanka Bagdiya bagged the prestigious SPM CSIR award.

Administration

As the deputy Director CRI, PI has made several policies that have made a difference in reducing the lead time in purchase of materials and consumables that directly affect research; ensured that SOPs are in place for providing UC and SE for projects; stream lined online processes that are transparent and allow real time monitoring of the indent processes; actively participated in making a new website for ACTREC; prepared comprehensive projects for consumables, equipments and animal imaging facility for CRI all of which has the in-principle approval of the PSE.



Varma Laboratory

Principal Investigator: Dr. Ashok Varma

Overview

Varma laboratory is actively involved in exploring the genomics, proteomics, structure biology and bioinformatics based approaches to perform translational research. Functional evaluation and folding pattern of cancer causing mutations from cohort of patients in different genes such as BRCA1/2, PML-RARA are being fully explored. The group is collaborating with different national and international laboratories to identify association of different genes with breast cancer. Furthermore, a serious attempt has been made to get the National Network Project (NNP) from Department of Biotechnology (DBT) by involving investigators across the country. Different domains of BRCA1/2, PML-RARA, have been expressed, purified and compared with the folding behavior of mutant protein. The conclusion made by this laboratory is that, most of the pathogenic mutations have different folding pattern than the native protein. Another interesting serum proteomics project using mass spectrometry based technique has identified number of potential proteomics based predictive and prognostic biomarkers in Head and Neck Squamous Cell Carcinoma treated with radiotherapy.

Research

The laboratory is actively engaged in different interdisciplinary projects. In-silico, genomics based approach have been applied to categorize the pathogenicity cancer causing mutations identified in BRCA1/2, PML-RARA, EPH genes. Furthermore, different domains have been expressed, purified and functionally characterized, to evaluate the folding pattern at native and mutant condition. Quantitative and qualitative Protein-Protein Interactions (PPIs) have been studied to explore the function associated to PPIs. The predisposing role of different mutations from Indian and Russian population has been explored along with the USP39 gene. An excellent proteomics study on the topic, "Proteomics studies of a set of predictive and prognostic protein biomarkers in head and neck squamous cell carcinoma" has been carried out by this group. The protocol to deplete highly abundant protein for mass spectrometry study has been standardized. Furthermore, few signature proteins have been identified from HNSCC patients at different time point of radiotherapy.

Education

The Principal Investigator is actively supervising projects of seven PhD students- Ms. Suchita Dubey, Ms. Lipi Das, Mr. Mudassar Ali Khan, Mr. Siddharth Barua, Ms. Neha Mishra, Mr. Shubhashish Chakraborty and Ms. Vaishnvee Chikhale, registered under the Life Sciences

program of the Homi Bhabha National Institute. Trainees for graduate and post-graduate dissertation were selected in this laboratory during 2019. The PI is actively engaged in education and training program of the academic faculty from North-East Region/Other parts of the country, fully supported by Department of Biotechnology –Government of India (DBT-GOI).

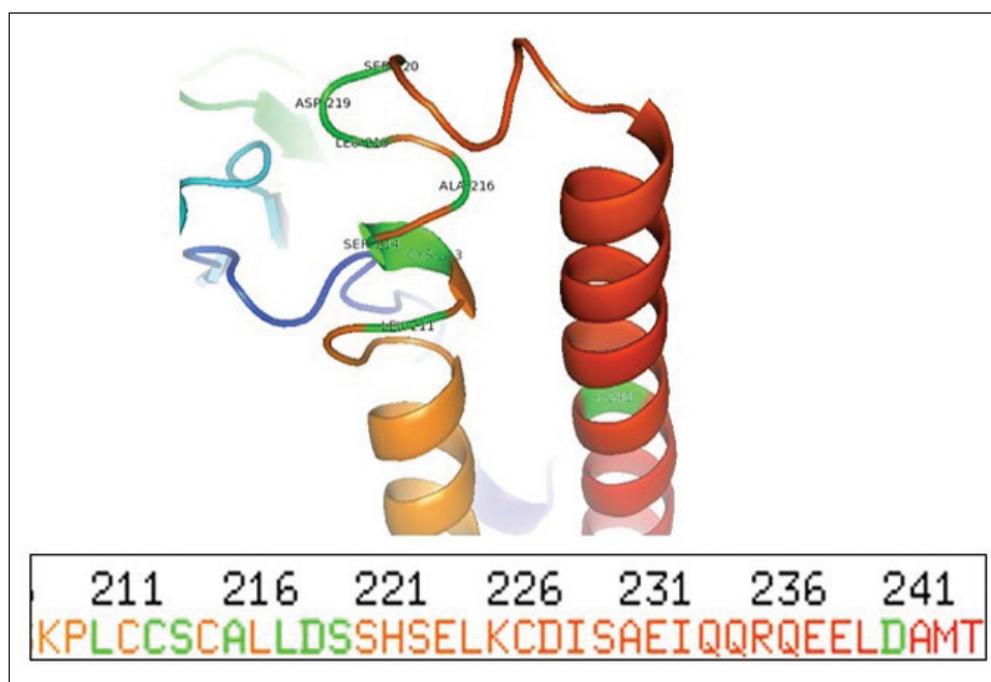


Figure: Model structure of mutational hot-spot PML -B2 box domain

Rukmini Laboratory

Principal Investigator: Dr. Rukmini Govekar

Overview

Tyrosine kinase inhibitors (TKIs) effectively control chronic myeloid leukemia (CML) in the initial chronic phase (CP) in about 90% patients. However, resistance to TKIs occurs in the remaining patients who progress to the terminal phase of Blast Crisis (BC). Unresponsiveness to TKIs observed in about 80% of BC patients is attributed to activation of BCR/ABL independent pathways which now drive the disease. This laboratory is interested in understanding the molecular alterations associated with resistance to tyrosine kinase inhibitors in BC in order to identify potential therapeutic targets. From the proteomic and genomic analysis of cell lines representing blast crisis carried out in this laboratory, both sensitive and resistant to TKIs, a novel mechanism for TKI resistance has been put forth. Observations indicate that molecular alterations specific to resistant phenotype drive the BCR/ABL pathway by activating proteins downstream of BCR/ABL. Thus even though BCR/ABL is inhibited by TKIs the pathway is active, causing resistance to TKIs.

Research

K562, KCL22 and KU812 cells represent blast crisis of CML and are sensitive to imatinib. Mass spectrometry based (nLC-ESI-Q-TOF) labeled and label-free quantitative proteomic analysis of K562 cells was carried out in the presence and absence of imatinib at a dose that inhibited BCR/ABL activity without affecting cell viability. Differentially expressed proteins between the comparison groups were further analyzed by bioinformatic tools to understand the functional links between the differentiator proteins as well as their connection with Abl. This has provided in depth dissection of BCR/Abl pathway. Similar analysis of imatinib-sensitive K562 cells and those made resistant to imatinib indicated that many of the BCR/ABL pathway components were altered in resistant cells. Further, proteins which do not belong to BCR/Abl pathway which were differentially expressed in resistant cells modulated one of the components of BCR/ABL pathway so that the pathway remained active even if BCR/Abl activity was inhibited by imatinib. Studies in this laboratory demonstrate that a key

protein which modulates BCR/ABL pathway to induce resistance to imatinib belongs to the MAPK family. Inhibitor of this protein is presently in phase III clinical trial for a different medical condition and thus its repurposing to treat TKI-resistant CML can be explored.

Genomic analysis has identified molecular alterations associated with resistance. The identified pathway is known to modulate the MAPK protein identified in the proteomic analysis. Together the proteomic and genomic analysis have delineated several novel molecular alterations associated with TKI resistant which have therapeutic potential.

Education

The Principal Investigator is a recognized PhD Life Sciences mentor of the Homi Bhabha National Institute. Presently four graduate students – Ms. Mythreyi Narasimhan, Mr. Rahul Mojindra, Mr. Manish Bhat and Ms. Neha Agarwal are working towards their doctoral degree. In 2019, four trainees worked in this laboratory.



Cell and Tumor Biology Group

Teni Laboratory

Principal Investigator: Dr. Tanuja Teni

Overview

To gain insights into the molecular basis of oral and cervical tumorigenesis, currently pathways that stabilize mutant p53- one of which is its interaction with deubiquitinating enzymes are being explored. To determine the underlying molecular mechanisms of therapy resistance, the validation of TCTP protein in established radioresistant oral cancer cell lines is ongoing. Further, studies to establish HPV positive and HPV negative cervical cancer chemo-radiotherapy resistant cell lines have also been initiated. Studies to decipher the role of Mcl-1 and its interacting partners and that of CLU in oral tumorigenesis are ongoing. Studies to understand the regulation of Activin A in oral cancer cells and its functional implications are also underway.

Research

Studies from this laboratory, demonstrated that treatment with WP1130, an inhibitor of USP9X leads to a dose and time-dependent decrease in levels of Mcl-1 and mutant p53 in OSCC cells. Further, demonstrated that mutant p53 interacts with deubiquitinase USP9X in mutant p53 expressing cancer cell lines. siRNA mediated TCTP

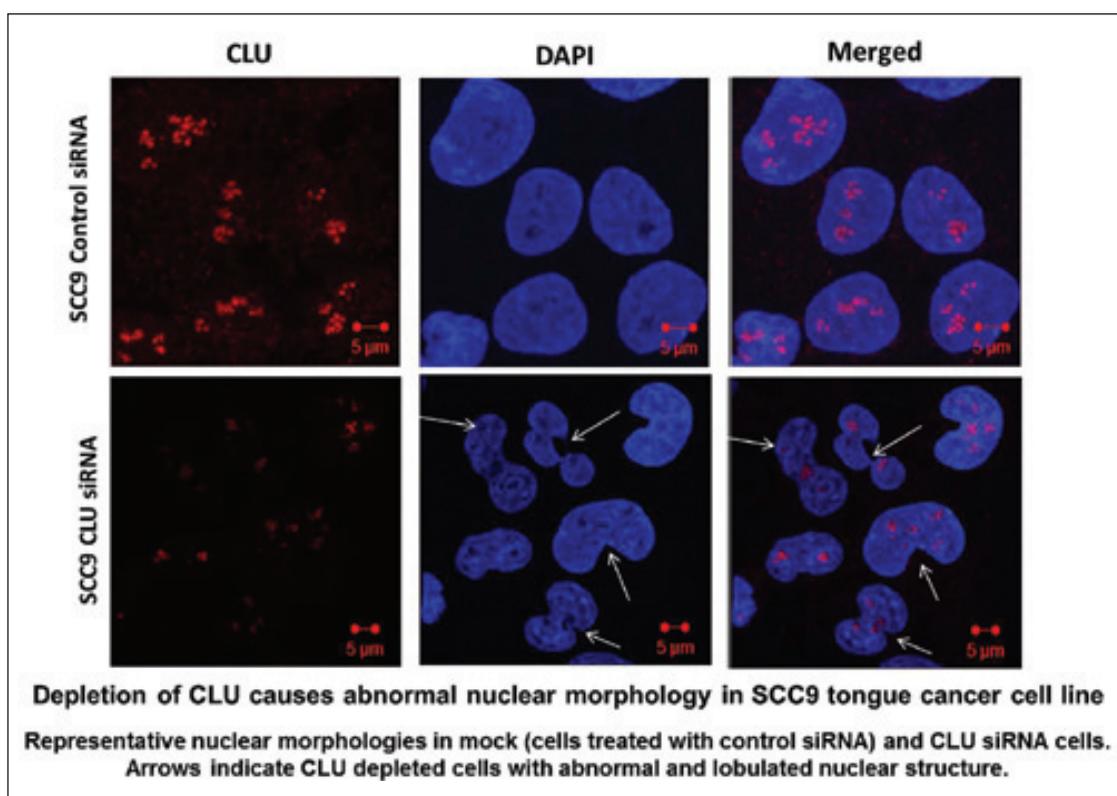
knockdown in SCC029B 70 Gy cells resulted in significant reduction of mitochondrial proteins namely VDAC, PHB, COX IV and DRP1 in radioresistant oral cancer cells as compared to control cells. Characterization of chemo-radiotherapy treated cells showed gradual increased proliferative capacity in response to cisplatin and clonogenic survival ability, ultra-structural changes like increase in cell & nuclear size, mitochondrial fusion, enlargement and disorganization of Golgi stacking and increased expression of resistance associated markers as compared to parental cells. Treatment of the OSCC cells with Maritoclax, resulted in a dose dependent accumulation of LC3BII and p62, indicating Mcl-1 inhibition. In collaboration with ICT, Mumbai, 40 compounds have been designed and synthesized, of which, 2 small molecules Bcl-2/Mcl-1 dual inhibitors showed good activity in OSCC cells. RNase A treatment resulted in the translocation of CLU from the nucleolus to the nucleoplasm, suggesting possible direct or indirect interaction of CLU with ribonucleolar proteins. Interestingly, post CLU knockdown, the nucleolar and nuclear morphologies exhibited significant alterations (figure). This laboratory also

demonstrated using IHC, over expression of Activin A in oral tumors and its negative correlation with p63 expression in samples. Tumors overexpressing Activin A exhibited significant association with advanced tumor stage, positive lymph nodes & poor overall & recurrence-free survival.

Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Presently six students – Ms. Rajashree Kadam, Ms. Dhanashree Mundhe,

Mr. Abhay Uthale, Ms. Dipti Sharma, Mr. Swapnil Oak and Ms. Reshma Reddy are working on their doctoral theses. In 2019, eight trainees worked in the Laboratory for master’s dissertation and research experience. Besides these, six students from dental colleges were assigned to the laboratory, as observers for two days. The Laboratory also has an in-house program of data presentations and Journal club, held every week. Faculty and students of the Laboratory attended one international and 3 national conferences and presented their research findings as oral or poster presentations.





Cell and Tumor Biology Group

Sorab Laboratory

Principal Investigator: Dr. Sorab Dalal

Overview

The laboratory focuses on the regulation of cellular pathways by 14-3-3-proteins and identifying pathways downstream of a loss of desmosome function that contribute to neoplastic progression. This work has determined that LCN2 might be a potential therapeutic target in multiple solid tumors. The secreted protein LCN2 confers radio and chemo resistance to cells in vitro and in vivo and that inhibiting LCN2 function can inhibit tumor growth and reverse therapy resistance. Work from the laboratory has identified mechanisms by which 14-3-3-ligand complexes form and dissociate, and how the 14-3-3 proteins regulate centrosome duplication.

Research

Previous work from this laboratory demonstrated that loss of 14-3-3 ϵ and 14-3-3 γ resulted in an increase in centrosome duplication. In collaboration with Prasanna, we have identified conserved acidic residues in the 14-3-3 peptide-binding groove that regulate ligand binding. Surprisingly, mutation of these residues in 14-3-3 γ or 14-3-3 ϵ has very different effects on centrosome duplication. In addition, loss of

14-3-3 ϵ results in multi-polar mitoses resulting in cell death while a loss of 14-3-3 γ results in centrosome clustering leading to a pseudo-bipolar mitosis leading to cellular transformation. The mechanisms underlying this difference are being explored as the conversion of a pseudo-bipolar mitosis to a multipolar mitosis is an effective way of killing tumor cells.

Plakophilin3 loss leads to increased neoplastic progression and metastasis due to an increase in the expression of the secreted siderophore binding protein, LCN2. The increase in LCN2 levels is required for the increase in radio and chemo resistance observed upon plakophilin3 loss both in vitro and in vivo. Similarly, just expression of LCN2 can drive chemoresistance in vivo. In addition, an analysis of tumor samples from patients with multiple solid tumors shows that most of these tumor types have elevated LCN2 expression. In colon cancer samples, at least 70% of the cases studied show an increase in LCN2 expression. Studies to determine whether LCN2 levels correlate with the response to therapy in locally advanced rectal cancer and TNBC are being initiated. In collaboration with a company, a potential therapeutic agent has been developed

and a patent application submitted to DBT. Further, this laboratory has demonstrated that targeted disruption of plakophilin3 in the colon leads to accelerated disease progression in an APC^{min} mouse, leading to a prolapsed rectum and that this might be associated with an increase in LCN2 expression.

Education:

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute and seven students-

Ms Arunabha Bose, Ms Sarika Tilwani, Ms Nazia Chaudhary, Mr Amol Lonare, Ms Bhagyashree, Ms Monika Jaiswal and Ms Rinki Doloï worked on their doctoral theses during 2019. Ms. Bose completed and defended the thesis in September 2019. Eight trainees worked in the laboratory in 2019; 5 for Master's dissertation and, 3 for experience. Lab members participated in weekly in-house seminars and journal club, and presented their research findings at three conferences/ meetings during 2019.





Cell and Tumor Biology Group

Bhattacharyya Laboratory

Principal Investigator: Dr. Dibyendu Bhattacharyya

Overview

The focus of work in Bhattacharyya lab is on vesicular trafficking and intracellular organelle biogenesis and dynamics. Organelles' size and shapes are greatly altered in cancer and such alteration is a hallmark of cancerous cells. Using basic cell biological approach along with advanced microscopic techniques, attempts are being made to understand the underlying mechanisms that govern the size control mechanism of Golgi nucleus and nucleolus. Yeast and cell lines and cultured neurons are being used as model systems to understand the ultra-structures of ER and Golgi. The laboratory also has a research focus to develop novel tools and forms for different forms of microscopy.

Research

Presently ongoing studies are on ultrastructure organization of several organelles including Golgi, ER, Nucleus, nucleolus and mitochondria's. Previous work in this laboratory has shown that the GTPase ARFI and several other factors including the oncogene homolog VPs74 are capable of controlling Golgi size by altering cisternal maturation kinetics. The important roles of nuclear import for size control of nucleus and nucleolus of human cells have been discovered.

Studies done in this laboratory have shown recently, that ER arrival of COPI vesicles via ER arrival sites (ERAS) is associated ER exit sites. This laboratory has discovered that GRIP domain Golgin mediate Golgi stacking which is regulated by Arl-GTPase cascade switch. Work on exosome uptake in human cells and organelle dynamics and inter-organelle contact sites in neurons, as well as, optimizing photo changeable fluorescent proteins such as mEos3, essential for super resolution microscopy is in progress.

Education

The Principal Investigator is a recognized guide for Ph.D. in the Life Sciences of Homi Bhabha National Institute. Presently, five Ph.D. students- Mr. Praveen Marathe, Ms. Sudeshna Roychowdhury, Ms. Naini Chakraborty, Ms. Shreyosi Chatterjee and Ms. Roma Dahara are working towards their doctoral theses. Dr Madhura Bhave, Dr. Abira Ganguly, Dr. Bhawik Kumar Jain and Dr. Prasanna Iyer are lab alumni and are presently pursuing postdoctoral studies in reputed research laboratories in the United States of America. All the lab members participated in weekly data presentation sessions, and presented their work findings at four local/national conferences in 2019.



Cell and Tumor Biology Group - Other Projects

Scientific Officer 'F': Dr. Ujjwala Warawdekar

Overview

Gap junctions have been implicated to assist in the antineoplastic (cytotoxicity and induced apoptosis) effect of chemical drugs, pro-drug activation therapy and radiotherapy. This facilitation by the gap junction intercellular communication is by virtue of the presence of the family of proteins called Connexins. The structural traits of these proteins lead to formation of channels which restricts the passage of molecules to a particular size, reported to be less than 1kD and at the same time enabling communication between cells. Some Connexin proteins are not expressed by all cell types and there is specificity of a Connexin type expression to particular tissue types. Gap junction function reported to be reduced in different malignancies could be contributing to the compromised efficacy observed in chemotherapy and radiotherapy regimens. Efforts in this laboratory are towards unravelling the involvement of Connexins in effective therapy. Studies in this laboratory have been towards development of a functional assay to validate gap junction communication [Figure shown below] and identifying Connexin types in breast and lung cancer.

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. Connexin 43, 32 and 26 proteins were assayed by immunostaining and RT-PCR in breast and lung cancer. 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. A novel observation was the nuclear localization of Connexin 32 in tissue biopsies, which is comparable with the cell line observations and merits further study. The change in expression pattern from the membrane to the cytoplasm and the nucleus, originates or results from tumorigenesis needs to be studied.

Education

Engaging in the Centre's academic and training program, participating to acquire new skills, in workshops and speaking at a conference have

been some of the academic activities. Four trainees for Master's dissertation were accepted; two each, in the first and second half, of 2019.

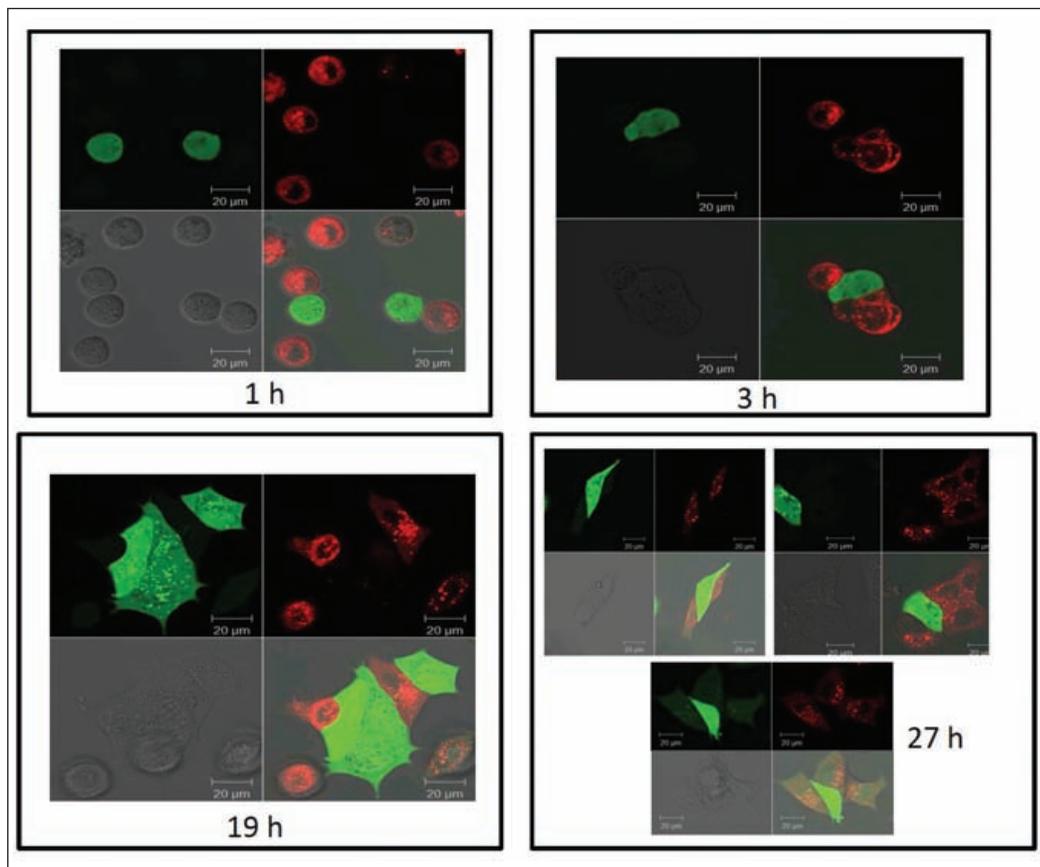


Figure: Evaluation of Gap Junction Communication using live cell imaging in the breast cancer cell line BT474, at different time points.



Cell and Tumor Biology Group - Other Projects

Scientific Officer 'E': Dr Syed Hasan

Overview

The major focus of this laboratory is to understand the signaling between anti-apoptotic proteins and cyclin dependent kinases and combining their targeted actions for the improved therapeutic strategies to overcome apoptotic resistance in leukemia. This laboratory is collaborating with a biotech based organization – Aurigene Drug Discovery and Development Technologies Bangalore and Prof Marina Konopleva at MD Anderson Cancer Centre, Houston, USA, to address the targeted approaches in leukemia. Monitoring of minimal residual disease (MRD) by molecular markers, identification of miRNA-mRNA network in AML and characterization of high-risk acute promyelocytic leukemia are other research aspects of the laboratory.

Research

The survival of acute myeloid leukemia (AML) blasts is dependent on the mitochondrial apoptotic pathway involving BCL-2 family of proteins. Most of the agents, regardless of their categorization as 'cytotoxic' or 'targeted' ultimately function by activating the

mitochondrial apoptotic pathway. 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. There are other on-going projects including multidisciplinary approach to evaluate the pathogenicity of missense mutations causing hereditary breast cancer (funded by Department of Science and Technology). In this project the functional consequences of pathogenic mutations of breast cancer using genome editing tools such as CRISPR-Cas9 are being evaluated. A recent study from this laboratory on miRNA-mRNA profiling reveals prognostic impact of *SMC1A* expression in *NPM1* mutated acute myeloid leukemia. 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 APLs, however, high risk group patients (white blood cell counts >10000/ml) 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. Studies on the molecular & functional characteristics of high risk APL using patients' samples, cell lines and orthotopic mouse models of APL are planned.

Education

The Scientific Officer is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute. Presently, Ms. Tarang Gaur and Ms. Deepshikha Dutta are working towards their doctoral theses. During 2019, group members presented research findings at three national conferences. Four trainees were accepted in the laboratory in 2019.



Carcinogenesis, Genome Biology, and Precision Medicine Group

Shirsat Laboratory

Principal Investigator: Dr. Neelam Shirsat

Overview

MYC oncogene is deregulated in at least 50% of all cancers. It is often associated with the most aggressive cancers. MYC is the most desirable but highly challenging target. MiR-193a was identified as a small molecule having therapeutic potential in the treatment of MYC amplified medulloblastomas. MiR-592 was found to target DEPTOR, a negative regulator of mTOR kinases.

The AKT kinase activity was downregulated by MiR-592 in a feedback inhibitory pathway, an observation consistent with the indolent nature of the Group 4 tumors.

Research

Medulloblastoma is a highly malignant pediatric brain tumor that consists of four molecular subgroups namely WNT, SHH, Group 3 and Group 4. These four subgroups differ in their expression profile including the microRNA profile. MiR-193a is almost exclusively expressed in the WNT subgroup tumors. MiR-193a was found to be induced by the MYC oncogene, a crucial downstream target of the WNT signaling. MYC is expressed in the WNT and Group 3 subgroup

tumors. The CpG island in the miR-193a promoter region, however, was found to be methylated in the Group 3 medulloblastomas. Expression of miR-193a in the MYC overexpressing Group 3 cell lines was found to inhibit growth, increase radiation sensitivity and suppress tumorigenicity. The WNT subgroup tumors have an excellent long term survival of over 95% while the Group 3 tumors have a five-year survival of less than 50%. Lack of miR-193a expression in the Group 3 tumors could contribute to their poor survival. MiR-193a expression resulted in inhibition of the oncogenic activity of MYC and thus, has a therapeutic potential in the treatment of not only Group 3 medulloblastomas but possibly other MYC expressing aggressive cancers as well.

MiR-592 expression was found to target DEPTOR and thereby increase the activity of the mTORC1 as well as the mTORC2 kinase. Overactivation of the mTORC1 kinase, however, was found to result in down regulation of the AKT kinase activity in a feedback inhibitory loop. AKT is a central player upstream of several oncogenic pathways. Expression of miR-592, therefore, resulted in growth inhibition of the medulloblastoma cells accompanied by upregulation of several

neuronal-differentiation related genes (Fig. 1). Thus, miR-592 appears to play a role in the pathogenesis of the Group 4 medulloblastomas by upregulating mTOR kinase activities but at the same downregulating AKT kinase activity contributing to the indolent nature of the Group 4 medulloblastomas.

Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Five students -Ms Shalaka Masurkar, Ms Raikamal Paul, Mr Harish

Bharambe, Mr Akash Deogharkar, and Ms Purna Bapat worked on their theses in 2019. Dr. Annada Joshi is a post-doctoral fellow in the laboratory. Students in the group participated in four conferences in 2019, and Mr Harish Bharambe bagged the Best Oral Presentation award at the Annual Convention of the Indian Association for Cancer Research. The laboratory organized a five-day workshop attended by 60 college students and teachers, on “Advanced Molecular Biology Techniques and Bioinformatics” from 22nd to 26th July 2019. The PI has filed a patent on “Biomarker Panel for the detection of Prostate Cancer”.

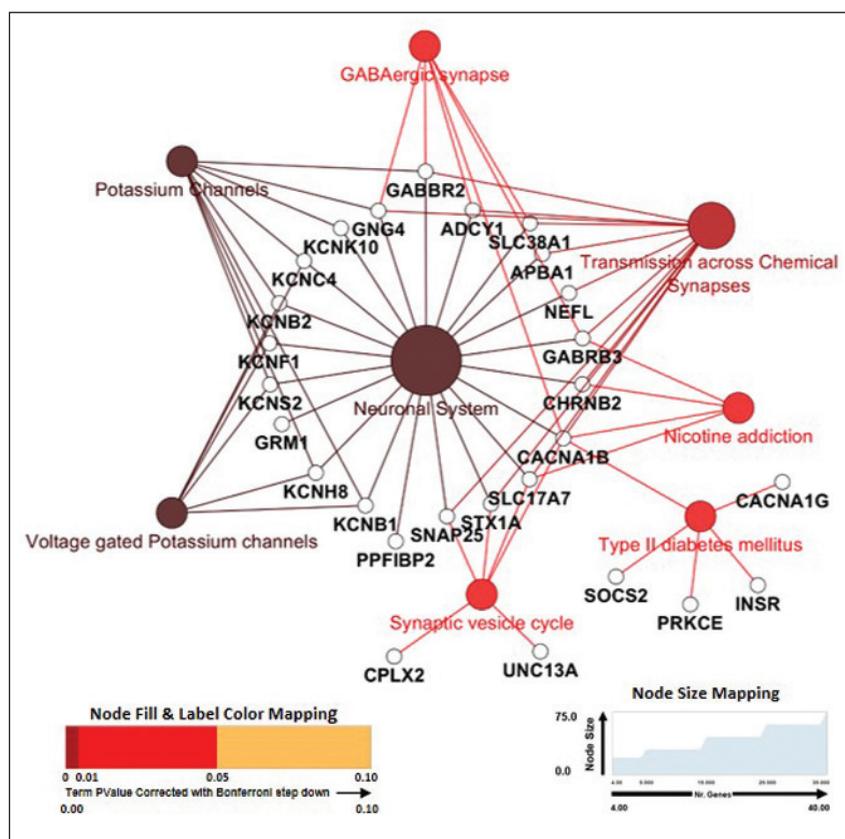


Figure 1. Protein-protein interaction network analysis of the genes significantly upregulated upon miR-592 expression in the Group 3 medulloblastoma cells shows upregulation of neuronal differentiation related genes and negative feedback signaling (Type II diabetes mellitus).

Sarin Laboratory

Principal Investigator: Dr. Rajiv Sarin

Co-Investigator: Dr. Pradnya Kowtal

Overview

This group aims to understand the molecular basis of inherited and somatic cancers, and develop translational algorithms through molecular biology and functional genomics. These questions are addressed through: A) Large cohort of over 8500 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 500 osteosarcoma cases / matched controls enrolled from TMC; D) International Cancer Genome Consortium (ICGC) project covering 450 Gingivo-Buccal SCC patients with full clinico-pathological annotation, follow up and somatic / germline NGS analysis and functional studies.

Service

The group runs a Cancer Genetics Clinic to provide genetic counselling to the families enrolled at ACTREC and TMH. During 2019 the clinic enrolled 1510 new hereditary cancer families and conducted counselling for ~2200 previously and newly enrolled families. Follow up counselling and

risk management guidance was provided to ~3300 new and previously enrolled families. Clinically relevant genetic test reports were issued to 495 individuals. The laboratory had participated in the External Quality Assessment (EQA) scheme 2018 of European Molecular Genetics Quality Network (EMQN) and was awarded a satisfactory score in 2019.

Research

In inherited cancer syndromes, the group performed genetic analyses of mutational hotspot or full gene using Sanger sequencing or NGS and MLPA of various cancer predisposition genes. The International Agency for Research on Cancer (IARC) TP53 Database is a molecular epidemiology resource that compiles TP53 gene variations identified in human populations and tumour samples. Ninety two families with germline TP53 gene mutations and with Li - Fraumeni Syndrome that were identified in this laboratory were deposited in the (IARC) database (R20, July 2019). Genotype phenotype correlation of variants in mismatch repair genes and RET proto oncogene was undertaken. Under the other ICGC (O-ICGC) project 4 primary cell lines were established from glioblastoma.

Education

The Principal Investigator is a recognised guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute. One doctoral student – Kaustav Das is working on his thesis. Mr Moquitul Haque was awarded his PhD degree in 2019, while two other PhD students – Ms Vasudha Mishra and Ms Anuja Lipsa submitted their theses for award of doctoral degree. The group provided training to 21 students - 9 for Master's dissertation and 12 for work experience in cancer genetics counselling. The laboratory conducts an active weekly academic program in which the updates

in laboratory work, seminal and interesting research papers are presented. Three parallel workshops and a one day conference was organised and hosted; the “5th Indian Cancer Genetics Conference and Workshop” ICGCW 2019, during 11-15 December 2019. The workshops imparted hands on training in 1) Genetic Counselling 2) Molecular Genetics and NGS multigene panel analysis and, 3) Tissue culture and functional analysis, had 65 participants overall and the one day conference was attended by 150 delegates from all over the country.

Gupta Laboratory

Principal Investigator: Dr. Sanjay Gupta

Overview

Epigenetic mechanisms like post-translational modifications of histones, incorporation of histone variants and isoforms, and DNA methylation play an important role in genome plasticity by allowing the cellular environment to define gene expression, phenotype of an organism and diseases. On-going work in this laboratory is focussed on understanding the

importance of histones in providing complexity to eukaryotic genome, roles in defining nucleosome organization, contribution in genomic instability and regulation of gene expression in different pathophysiological states like stress, resistance, cancer. Therefore, identification of histone-signatures within the genome will help in better understanding of their role in development of cancer. This will provide

usage of epigenetic marks and specific epi-drugs for diagnosis and therapeutic purposes, respectively, in better management of cancer.

Research

Studies in this laboratory have shown high HDAC activity- low HAT activity, compact chromatin architecture and altered histone phosphorylation in radio-resistant breast cancer cells and gastric cancer tumor tissues. This suggests that there is an epigenetic variation in HDAC activity across human tumor samples and during radio-resistance. This highlights the importance

of patient stratification for HDAC inhibitor based treatment in combination with chemotherapeutic drugs for better clinical outcome. Further, ongoing research of the group demonstrates differential kinetics of histone H3 Serine 10 phosphorylation and K9/K14 acetylation posttranslational modification in G2/M phase of cell cycle in response to ionizing radiation induced DNA damage. Additionally, the group has identified alterations in histone acetyltransferases in cisplatin-resistant liver cancer cells, in an *in vitro* and *in vivo* model. The group's ongoing research suggests differential

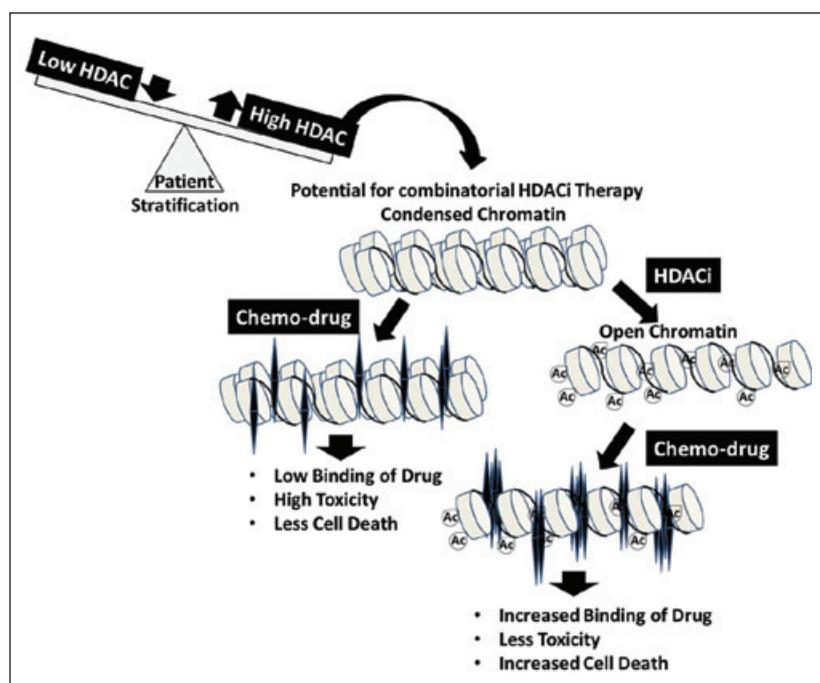


Figure: Model depicting stratification of patients with high histone deacetylase activity/level for histone deacetylase inhibitor therapy. A prior treatment of HDAC inhibitor would relax the condensed chromatin of stratified patient group, making more accessible and increased interaction of chemotherapeutic drugs to chromatin compared to only first-line chemo-drug treatment. This would enhance cell kill at lower drug concentrations with probable less side-effects and toxicity. HDAC: Histone deacetylase; HAT: Histone acetyl transferase.

tissue, lineage and cancer type specific expression of histone H2A and H3 genes. The group has recently shown an increase in histone HIST2H2AC and HIST2H3A/C isoforms in various human cancer cell lines and human tumor samples compared to normal counterparts. In continuation, the upregulation of specific histone gene expression is associated with changes in the level of specific transcription factors in cancer. Overall, results from this laboratory demonstrate that the transcript abundance of specific histone isoforms has an important role in regulation of tumor growth. Presently, group is also focused on studying the stem-loop binding protein in regulation of 3' tail of canonical histone mRNAs, and how hypoxia and hypoxic environment during re-oxygenation influence chromatin dynamics and associated proteins involved in histone modification and DNA methylation.

Education

The Principal Investigator is a mentor for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Presently, eight students – Ms. Asmita Sharda, Mr. Ramchandra Amnekar, Mr. Sanket Shah, Mr. Mudasir Rashid, Ms. Tripti Verma, Mr. Abhiram Natu, Ms. Sukanya Rauniyar and Ms. Anjali Singh 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.

Mahimkar Laboratory

Principal Investigator: Dr. Manoj Mahimkar

Overview

Mahimkar laboratory focuses on understanding the genetic basis of tobacco-related cancers by studying genomic alterations at the level of copy number across the genome, and identifying genes/ gene clusters underlying the altered genomic loci. Signatures associated with the 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 found. In parallel studies, the chemopreventive efficacy of polymeric black tea polyphenols (PBPs), abundantly present in black tea in inhibiting carcinogen induced lung adenomas in A/J mice and oral cancer in hamsters is being tested. This laboratory has for the first time demonstrated that administration of PBPs in drinking water throughout the carcinogen treatment period significantly decreases the multiplicity of tumors in both model systems.

Research

Cancer progresses through the accumulation of genetic and epigenetic changes, ultimately resulting in gross genomic instability. 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. Currently screening of the samples for global DNA methylation is on-going. Integrative analysis of genomic, transcriptomic and methylomic data revealed specific signature of differentially methylated promoter and gene copy associated with shorter survival. Completed analysis reveals clinically relevant targets for validation; successful validation of these 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. Studies

in our laboratory have shown that HNSCC patients expressing high HIF1a, low CD44v, low CD98 or low ALDH1A1 expression will benefit from EGFR targeted nimotuzumab therapy along with cisplatin-radiation compared to cisplatin-radiation alone.

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. 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. 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).

Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Presently- Ms. Usha Patel, Ms. Mayuri Inchanalkar, Ms. Vaishnavi Nimbalkar and Mr Zaid Shaikh are working towards their doctoral theses. The lab participates in the Centre's training program and, during 2019; three trainees were accepted for their Master's dissertation, four for experience, while four observers from the Yenepoya Dental College did a short stint in the lab.

Dutt Laboratory

Principal Investigator: Dr. Amit Dutt

Overview

The goal of 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. The group specifically focuses on the genomic features of genetic alterations underlying oncogenesis and cancer progression in the lung, breast, cervical, gallbladder, head and neck, and others 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 is involved in exploring a possible pathogenic basis for cancer.

Research

Basic research: In a recent study, the group performed a pooled shRNA screen against 906 human kinase genes in an oral cancer cell line. The genes depleted in the screen were ranked based on ROAST analysis and integrated with copy number alteration and gene expression data using an integrative scoring system 'DepRanker' to identify *AURKB* and *TK1* as essential for oral cancer cell proliferation. Additionally, the group described a genetic model describing a dual-phase regulation downstream to progesterone treatment to regulate the expression of a *Serum- and Glucocorticoid-regulated Kinase* gene 1, *SGK1*: predominantly driven as a direct transcriptional target, in PR-positive breast cancer cells; and, down-regulation of *miR-29a* and *miR-101-1* targeting *SGK1* with relatively distinct effect in PR-negative intricate convergence breast cells in response to progesterone leading to the activation of a tumor metastasis suppressor gene, *NDRG1*, via a set of AP-1 network genes that inactivates AKT1, ERK1/2 and EGFR kinases, impeding the invasion and migration of breast cancer cells.

Tool development: The group has developed a data integration and scoring system 'DepRanker' which uses the output of shRNA screen analysis packages (like ROAST, RIGER and Chimera) and integrates with other genomics datasets to compute an integration score known as ranked impact score (RIS) for each gene. In addition, the group developed ClinOme – an automated and easy to use graphical user interface (GUI) based cancer genomics analysis and therapeutic reporting tool leveraging the artificial-intelligence (AI) based algorithms combined with best practices of genomics data analysis pipelines for discovery and reporting of therapeutically relevant alterations.

Education

The Principal Investigator is a recognized guide for the Ph.D. course in Life Sciences of the Homi Bhabha National Institute. Presently eight research scholars –Ms. Trupti Togar, Mr. Sanket Desai, Mr. Asim, Mr. Bhaskar Dharavath, Ms. Neelima Yadav, Mr. Suhail Ahmad, Ms. Supriya Hait, and Mr. Aniket Sawant are working towards their doctoral theses. During 2019, the lab presented their research findings as invited oral presentations at 3 international and ~30 national meetings.



Therapy Resistance and Stem Cell Biology Group

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 cancers. This group studies the molecular signalling pathways such as Wnt/Notch/Sonic-hedgehog etc. and others that regulate self-renewal and differentiation of stem cells. The group is investigating these aspects using skin model and human epithelial cancers such as head and neck cancer as experimental models. Unravelling genes that are involved in the maintenance of cancer stem cells would pave ways for future clinical implications. Recently, this group developed the primary head and neck oral cancer cell lines from advanced stage treatment naive patients of Indian patients providing a valuable resource to understand the molecular mechanism that would be useful in cancer therapeutics.

Research

Secretory phospholipase A₂ group-IIA (sPLA₂-IIA) catalyzes the sn-2 position of glycerophospholipids to yield fatty acids and lysophospholipids. SPLA2-IIA is deregulated in various

human cancers. In transgenic mice over expressing sPLA2-IIA for the first time revealed depletion of hair follicle stem cells pool mediated through enhanced activation of c-Jun. Further, sPLA2-IIA knockdown in oral cancer cell lines showed decreased tumorigenic potential.

SFRP1 (Secreted frizzled related protein); a Wnt inhibitor is down regulated in various human cancers. *In silico* analysis in this laboratory, showed down regulation of Sfrp1 is associated with overall poor survival in various cancers. Cancer stem-like cells isolated from the Sfrp1 knock out tumors showed higher tumorigenic potential. Molecular profiling revealed up regulation of epithelial to mesenchymal transition (EMT) markers and also stem cell marker, Sox2,

Another Wnt inhibitor, Dab2 (Disabled-2 protein) is down regulated in various human cancers. This group's finding suggests that Dab2 knockout mice showed defect in the cell proliferation. In addition, these stem cells lose their stem-ness characteristics.

Oral cancer patient (60-80%) diagnosed at an advanced stage has a poor clinical outcome. Despite the isolation of cancer stem cells, there

is a lack of knowledge on their regulatory mechanisms. This group has developed primary oral cancer cell lines from the advanced stage treatment naïve samples. Further, this group has isolated CD44+/ALDH+ cancer stem-like cells (CSCs) from oral cancer cell lines and characterized them *in vitro* and *in vivo*. On-going studies would provide insight on the molecular mechanism underlying the maintenance of these cancer stem cells. The molecular signatures obtained will be utilized to stratify chemotherapy responders and non-responders for better clinical intervention.

Education

The Principal Investigator is recognized as a guide for the Ph.D. degree in Life Sciences under the HBNI. Currently, six PhD students - Mr. Raghava R Sunkara, Mr. Sushant Navrange, Ms. Sayoni Roy, Ms. Priyanka Joshi, Mr. Harsh Ashar and Mr. Darshan Mehta are pursuing their doctoral training. The PI accepted three research trainees during the year. The group engages in weekly in-house presentations and journal club. The PI and his students presented their research findings at an international conference in USA in July 2019.

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. Research findings in 2019 have led to deeper understanding of the transcriptional regulation of IGF1R by co-operative interaction of RUNX1 and FOXO3a, role of ERK1/2 kinase on autophagy flux during chemoresistance and in cancer stem cell population, delineation of temporal dynamics of Notch3 signaling in real time, identifying the

molecular players involved in lung metastasis of chemoresistant cells in an orthotopic mouse tumor model and synthetic lethal effect of mutant P53 and PIK3CA inhibition during acquirement of chemoresistance. Research on understanding the molecular signature in Indian gastric cancer patients has been initiated this year.

Research

To continue studies initiated in this laboratory on the role of ERK1/2 kinase in promotion of autophagy flux at the onset of resistance, a

unique autophagy sensor (mTFL-p62), to enable real time monitoring of autophagy flux from live cells to living organisms has been developed. Using tumor xenograft model, the dynamics of autophagy flux during combinatorial treatment of platinum-taxol and U0126 (ERK inhibitor)/ Chloroquine by non-invasive optical imaging has been monitored. This is the first report of non-invasive monitoring of autophagy kinetics in preclinical mouse model (manuscript under preparation). Understanding and measurement of autophagy dynamics in cancer stem cells is also in progress. The manuscript on co-operative interplay between FOXO3a and RUNX1 resulting in up-regulated IGF1R transcription at the onset of resistance is currently under review in BBA-Molecular Basis of disease. In 2019, a unique Notch3 sensor was developed, which monitored Notch3 activation dynamics in real time from cancer cell-fibroblast co-culture system. Also, analysis of Notch3 activation status retrospectively, in different subtypes of EOC is in progress. In other projects, investigations are ongoing on the underlying molecular cues of lung metastasis by the late resistant cells in orthotopic tumour xenograft mouse model and the synthetic lethal effect of PIK3CA inhibition in mutant P53

background in platinum resistant and platinum sensitive relapsed patients. The collaborative effort to evaluate Folic Acid receptor targeted nanoparticles in ovarian cancer cells with Dr. P. Vavia; ICT has been published in AAPS Pharm Sci Tech in 2019.

Education

Currently seven Ph. D students – Mr Ajit Dhadve, Mr Aniketh Bishnu, Mr Abhilash Deo, Mr Souvik Mukherjee, Mr Pratham Phadte, Ms Megha Mehrotra and Ms Priti Shenoy are working on their doctoral dissertation under the mentorship of the PI. In 2019, four trainees were accepted in the laboratory. The group has an active in-house data presentation program. Members also presented their work at national/ international conferences. Mr Aniketh Bishnu received the prestigious award for best oral presentation in 43rd All Indian Cell Biology conference (IISER Mohali, December, 2019). The PI is actively involved in teaching for the ACTREC course work, served as external thesis examiner for students from IISC and IIT-Mumbai and, is a member of doctoral committee for ACTREC (12) and NIRRH 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. The group 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 relevant to resistance, thus providing the critical information necessary for therapeutic interventions. The PI collaborates with clinicians from TMH to explore the translational aspects of the discoveries in the laboratory.

Research

Attempts are being made in this laboratory to address the fundamental issue of therapy resistance in cancer using Glioblastoma and Leukemia as model systems. For this, recapitulations of the clinical scenario of glioma resistance in cellular model developed from naïve primary GBM patient samples, and in preclinical orthotopic mouse model have been made. These models have allowed capture of inherently Resistant Residual (RR) cells which are cause for recurrence in GBM, for an understanding of their

survival mechanisms. Subsequent to radiation, residual disease cells upregulate surface proteins leading to homotypic cell fusions forming multinucleated and giant cells (MNGCs) that are transiently senescent, correlate with the poor prognosis of GBM patients and resume growth to form aggressive recurrent tumors. Additionally, NHEJ repair and proteasome pathway play a crucial role in the survival of MNGCs. This is the first report demonstrating the existence and captured residual resistant cells of GBM and, delineated molecular pathways used by residual cells to sustain survival and recur. Using cellular models of leukemia resistance, the dependency of early drug resistant cells on DNA double strand break repair (DSBR) mechanism acquired during the onset of resistance has been unraveled. GCN5 was shown to be up regulated and correlate significantly with poor patient survival in MRD-positive AML patient, however, late drug resistant cells evolve to acquire multiple mechanisms of resistance. Accordingly, clinical utility of ATM kinase and GCN5 inhibitors in effectively eliminating leukemic resistant cells only during early but not late stages of drug resistance was demonstrated. Additionally, CytoPred: a 7 gene pair matrix that can prognosticate leukemia

patients with high sensitivity and specificity was identified.

Education

The Principal Investigator is recognized as a PhD guide in Life Sciences of the Homi Bhabha National Institute. Presently seven students – Ms. Jyothi Nair, Ms. Anagha Acharekar, Mr. Saket Vatsa Mishra, Ms. Tejashree Mahaddalkar, Ms. Madhura Ketkar, Ms. Debashmita Sarkar and Mr. Archisman Banerjee, are working towards their doctoral theses. One student - Ms. Jacinth

Rajendra was awarded the PhD degree in 2019. The laboratory has two postdoctoral fellows- Dr. Atanu Ghorai (ACTREC post doc fellow) and Dr. Safi Sayed (DST-NPF post-doctoral fellow). Eight students were accepted as trainees in 2019. The PI delivers lectures for the core course and electives, and marks the assignments. The laboratory conducts regular data presentation and journal clubs. Lab members presented their research findings at national and international conferences. Together, students and the PI have attended 11 conferences in 2019 (10 oral and 1 poster presentations).

Nandini Laboratory

Principal Investigator: Dr. Nandini Verma

Overview

This laboratory is interested in the molecular mechanisms underlying the response and resistance to first-line chemotherapeutic agents in a distinct breast cancer (BC) type called Triple Negative Breast cancer (TNBC), which has become highly prevalent among Indian women during the last decade. TNBC is an aggressive BC type that lacks expression of targetable receptors like 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. TNBC responds better to chemotherapy as compared to hormone-positive BCs, however, a large number of patients are either intrinsically unresponsive or develop resistance and relapse within 3-5 years of treatment, resulting in very poor prognosis. Since, till now there are no approved targeted therapies for TNBC, therefore, 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 a significant molecular reprogramming during treatment resulting in a drug-resistant cellular adaptive response. It has been proposed that this molecular reprogramming not only involves re-orchestration of the cellular signaling pathways, but also might induce alteration in epigenetic regulators in the tumors and its interaction with tumor microenvironment (fig. 1). Therefore, systematically investigating the molecular and epigenetic landscapes in tumor cells and profiling the tumor secretome can potentially unmask novel drug resistance mechanisms and specific therapeutic strategies to re-sensitize chemoresistant TNBC tumors to cytotoxic therapies and prevent tumor relapse. In light of this hypothesis, this study objectively investigates the drug-resistance associated molecular reprogramming in different TNBC subtypes by analysing the proteomics and transcriptomic landscapes, epigenetic regulators and tumor secretome in a systematic manner using clinically

driven in-vitro and in-vivo model systems. As an initial approach toward these research objectives the basic research setup including equipment, experimental model system and reagents was under procurement during 2019.

Education

The PI regularly participates in the weekly academic student lectures, and monthly BSRG PI meetings in the Institute. The PI was involved in the academic evaluation of research work presentation seminars of Ph.D. students from JRF-2018-2019 batch, 2019 at ACTREC. The PI actively participated in framing of the question paper for the JRF NET 2019 examination of ACTREC and has also evaluated the presented posters in the National Research Scholars Meet in Life Sciences (NRSM)-2019 held at ACTREC, from Dec 5-6, 2019. The PI has been enrolled to conduct lectures in two elective modules in the Ph.D. course work at ACTREC in the upcoming sessions. In December, 2019 the PI was invited for participation in a symposium on Breast Cancer in India: Trends, Environmental Exposures and Clinical Implications organised by the Columbia Global Centre in Mumbai.

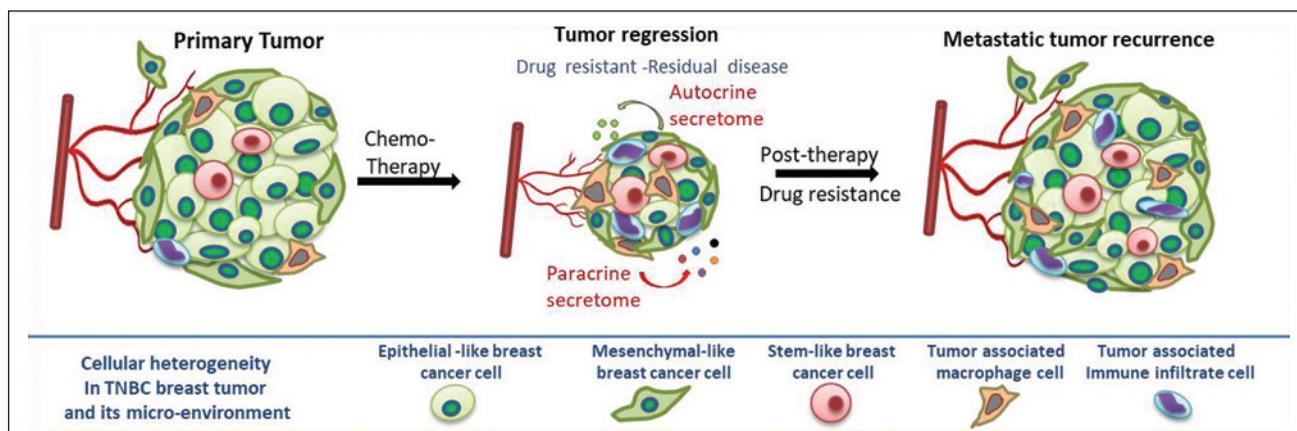


Figure 1. Schematic representation of the potential role of molecular, epigenetic and tumor secretome factors in drug resistance and tumor relapse in TNBC.



Cancer Theranostics and Clinical Pharmacology Group

De Laboratory

Principal Investigator: Dr. Abhijit De

Overview

Research in this laboratory involves development and use of imaging methodologies suitable for judging molecular functions directly from live cell environment and preclinical mouse models of cancer. A wide spectrum of experimental medicine and novel concept therapeutics in model systems using non-invasive molecular imaging techniques are tested. The mandate is to translate diverse experimental therapeutics developed through research.

Research

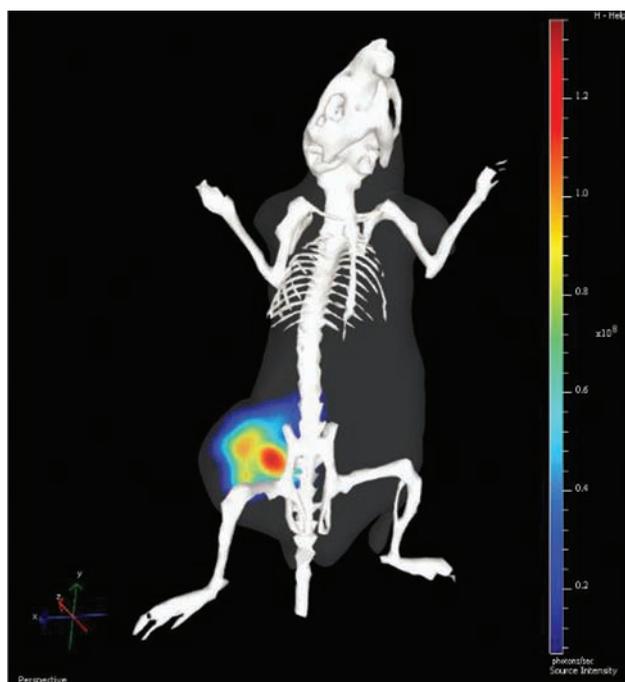
Since inception, this laboratory continues to develop an understanding on how natural over-expression of human sodium iodide symporter (hNIS) gene can be used for therapeutic benefit in breast cancer (BC). A major challenge for translation of hNIS-based radio-iodine therapy in BC is due to its presence as a cytoplasmic protein in cancer cells, thus limiting the scope of iodine accumulation for therapeutic use. In 2019, challenging this disparity of hNIS expression, novel role of several glycosylation enzymes have been identified. Of these, specific role of mannosidase enzymes in N-glycosylation

processing of human NIS was revealed, published in 2019 in the prestigious Journal of Cell Science.

This laboratory also works on designing molecular sensors for imaging STAT3 activation. STAT3 regulates important cancer related signaling cascades in BC cells. Significant progress in validating this molecular sensor which is based on optical reporter imaging satisfying resonance energy transfer principle and an application for an Indian patent has been made. Characterization of patient tumor tissue samples to reveal the importance of phospho-serine post-translational modification as a measure of STAT3 activation in triple negative breast cancer (TNBC) subtype has also been made in 2019.

Another promising line with exceptional potentials of clinical application, in collaboration with faculty at IIT, Mumbai, is the testing of biocompatible gold nanospheres for photothermal therapy efficacy using molecular imaging. Localized, triggered treatment of palpable tumors with accumulated nano-sized particles when exposed to a brief NIR laser irradiation confers excellent tumor tissue ablation while keeping the surrounding tissue safe. The

efficacy of this fast and cost-effective procedure against human drug-resistant and radio-resistant tumor cells in a preclinical setting has been completed. Experiments to judge the precision of this treatment using Raman spectroscopy have also been initiated in 2019. In addition, the ongoing international bi-lateral project (DBT Indo-Russia) on the utility of a novel mushroom luciferase as a new imaging reporter progressed in 2019.



Education

The Principal Investigator is affiliated to Homi Bhabha National Institute as a guide for Ph.D. degree in Life Sciences. In 2019, eight students- Ms. Shalini Dimri, Mr. Arijit Mal, Ms. Maitreyi Rathod, Mr. Sumit Mishra, Mr. Pranay Dey , Mr. Aaiyas Abdulhamid Mujawar, Ms. Chetna Patnaik and Ms. Mansi Joshi were working towards the Ph.D. degree. The faculty accepted four students for their Master's dissertation. PhD students from various collaborators' laboratories also visited to work in this lab. The group routinely meets twice a week to discuss new results and review published research in the field. The PI is actively serving for three international journal editorial boards. The PI and students have represented their work in national and international conferences, and the students have received best oral (1) and best poster (2) presentation awards in 2019.

Chilakapati Laboratory

Principal Investigator: Dr. Murali Krishna Chilakapati

Overview

Cancer is a leading cause of death accounting for around 8 million cases worldwide. It is predicted that by the end of the year 2020, over 10 million people would die each year globally, of cancer, with 70% deaths from the developing countries. The high mortality rate, attributable to late detection and recurrences, is ascribed to limitations of conventional diagnostics. Screening and early detection can improve overall cancer management and lower morbidity and higher disease-free survival rates. As present methods are invasive and prone to subjective errors; it is pertinent to develop sensitive and non-invasive methods. Raman spectroscopy been actively pursued for non-invasive, online clinical applications. The lab is actively pursuing development of Raman-based methods for : (a) Development of in vivo/in situ methods for routine screening and diagnosis; (b) Development of minimally invasive micro spectroscopy using body fluids and cell smears; (c) Exploring ^1H NMR, Raman and Infrared spectroscopy for oral cancer diagnosis using saliva; and (e) Investigations on experimental carcinogenesis in animal models.

Research

Chilakapati laboratory has been actively pursuing non-invasive and minimally invasive applications of Raman spectroscopy in cancer. Raman mapping of cells and tissue section for in depth understanding is another area of interest.

Non-invasive applications: The group's studies on oral cancer reveal that Raman spectroscopy is capable of classifying normal, premalignant and malignant, and can also identify cancer field effects and malignancy-related changes. Raman spectroscopy in early identification of recurrence/second primary is demonstrated and validation studies are being carried out. Presently utility of Raman spectroscopy in prognosis applications is being explored.

Minimally invasive applications: Studies on cell smears (brush biopsies) and sera demonstrated classification of healthy subjects, habitual tobacco users, and oral premalignant subjects and subjects that are prone to second tumours/recurrence. Presently these findings, especially classifying different premalignant conditions and identification of recurrence are being evaluated.

Besides, saliva based classification of healthy and pathological conditions, standardization of sample preparation protocols, and further studies to classify habitués and tumor subjects based on preliminary findings is in progress.

Animal models: Further studies on micro tumors, attributable to mechanical irritation in control hamster buccal pouch, using Raman, histopathology and molecular markers is being pursued. Serum Raman investigations are being carried out to understand spectral profiles at different time point during carcinogenesis. Studies suggest classification of sera of control and DMBA-treated-tumor-bearing-animals. Further studies are on to understand classification/misclassification among control (vehicle-treated and subjected-to- mechanical-irritation) groups and with tumor-bearing-animals.

Raman mapping: Raman maps of cells and tissues are being carried out for understanding at organelle or layer level.

Collaborative projects are pursued actively with BARC, Bombay; BARC, Vishakhapatnam; IPR, Ahmedabad; IIT, Mumbai and IIT, Kharagpur. Several International collaborations are on-going with groups in Finland, England and Japan.

Education

The lab also participated in the Centre's training programs and accepted 7 trainees for research experience. Lab members attended two workshops, 1 international and 3 national conferences in the year 2019.



Tumour Immunology and Immunotherapy Group

Chiplunkar Laboratory

Principal Investigator: Dr. Shubhada Chiplunkar

Co-Investigator: Dr. Jyoti Kode

Overview

The focus of this laboratory is on investigating immune dysfunctions in patients, understanding the crosstalk of immune cells, mesenchymal stem cells and suppressor cells in the tumor microenvironment; and development of immunotherapeutic strategies using gamma delta T cells ($\gamma\delta$ T cells). In oral and pancreatic tumors, the mechanism that regulates tumor directed cytotoxicity under hypoxia and energy metabolism of $\gamma\delta$ T cells was investigated. The spectrum of exhaustion markers and functional role of $\gamma\delta$ T cells were studied in colorectal cancer. Cross-talk between mesenchymal stem cells (MSC) from oral/pancreatic tumors and acute myeloid leukemia (AML) were studied to understand immune evasion and chemoresistance in these malignancies. A phase II trial was initiated to study efficacy, toxicity and immunomodulatory effect of Carctol-S in high grade serous epithelial ovarian cancer at first serological relapse.

Research

The focus is on understanding how tumor microenvironment in oral and pancreatic tumors affects effector functions of $\gamma\delta$ T cells. Hypoxia exposed $\gamma\delta$ T cells favor EMT through secretion of proinflammatory cytokines inducing immune evasion and metastasis. Hypoxia reduced the calcium efflux and expression of degranulation marker CD107a in $\gamma\delta$ T cells which explains the decreased anti-tumor cytotoxicity of $\gamma\delta$ T cells in the tumor. Hypoxia exposed $\gamma\delta$ T cells differentiate to a pro-tumorigenic $\gamma\delta$ T17 phenotype. Studies demonstrated that metabolic requirement of $\gamma\delta$ T cells varies with specific effector function. Pharmacological inhibition of EZH2, a histone methyl transferase, decreased anti-tumor cytotoxic potential of $\gamma\delta$ T cells through epigenetic regulation of Perforin and Granzyme B. Mesenchymal stem cells from oral tumors contributed to immune evasion, mediated by TLR3 activation, through secretion of indoleamine 2, 3-dioxygenase and prostaglandin E2. Aurora

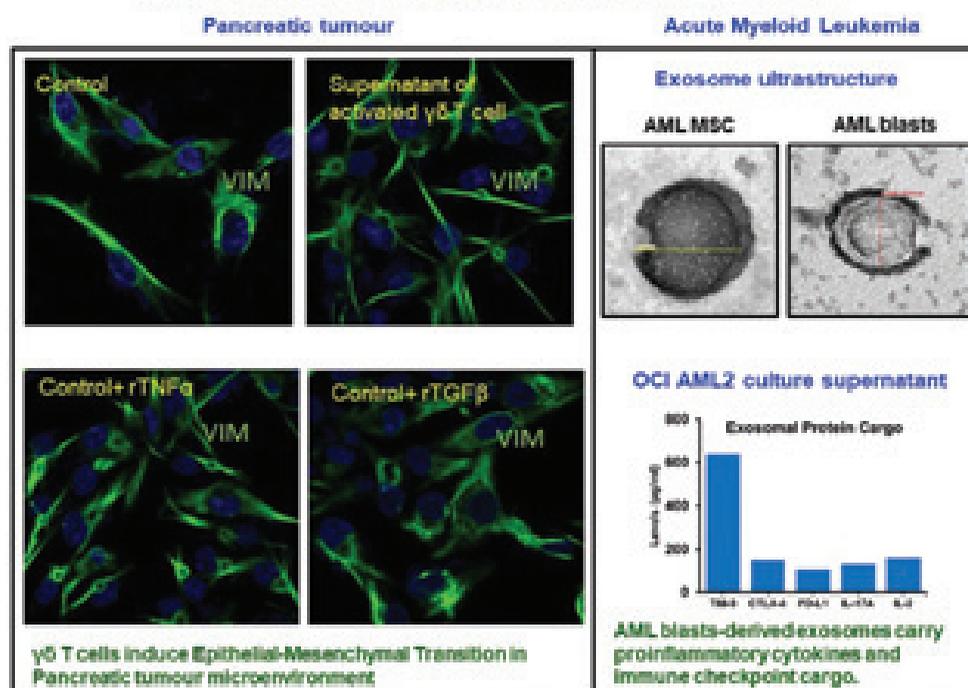
kinase pathway was up regulated in AML MSC, AML blasts and AML cell line. AurK pathway inhibitor was found to affect cytoskeletal, mitochondrial and nuclear integrity. Exosomes isolated from culture supernatants of AML blasts and AML MSC showed distinct ultrastructural morphology and cytokines/ immune checkpoint markers. Compared to MSS high colorectal cancer patients MSI patients showed increased Regulatory T cell infiltration in the tumors, $\gamma\delta$ T17 phenotype was increased in MSS tumors. Immunosuppressor adenosine was found to be increased in donor stem cell harvest samples post G-CSF treatment while immune checkpoints (CTLA-4, PD-1 & PD-L1) decreased compared to healthy blood plasma. Preliminary data from a randomized clinical trial showed lymphocytes from oral cancer patients with low T cell subset frequency, low proliferative response and

decreased expression of activation markers at the end of radiotherapy, exhibited improvement after treatment with ayurvedic formulations.

Education

The Principal Investigator (PI) and the Co-Investigator (Co-I) are recognized guides for PhD Life Sciences of the Homi Bhabha National Institute. Mr Sajad Bhat received PhD degree, while Ms. Shalini KS continued working on her Ph.D. dissertation with the PI. Ms. Shruti Kandekar, Ms. Manasi Nagare and Mr. Naythan Dcunha are working on their Ph.D. dissertation with the Co-I. Dr. Rushikesh Patil is a DST-INSPIRE faculty with the PI. The faculty of the Laboratory conducted MIG Lecture series for college students and teachers at BARC. Five trainees undertook training and Lab members participated in seven international and twenty national conferences.

Immunosuppressive Pathways in Tumour Microenvironment





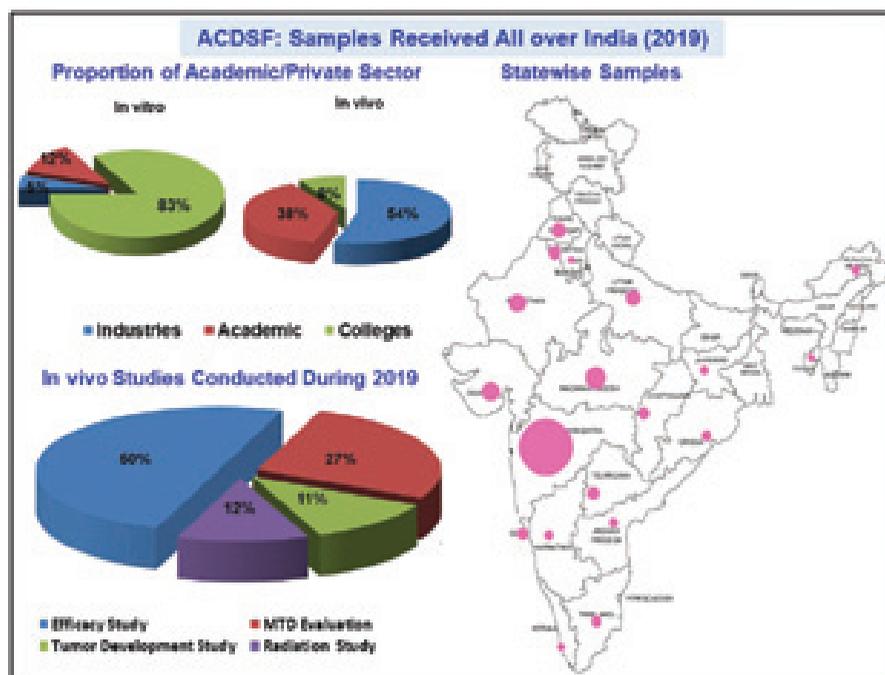
CRI - Research Support Facilities

Anti-Cancer Drug Screening Facility (ACDSF)

Officer-in-Charge: Dr. Jyoti Kode

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 carrying out drug screening. During the year 2019, 1654 compounds were received from 150 clients including five corporate R&D organizations from more than 10 states across India. Compounds tested were, 1587 in number,

for their *in vitro* activity. Twenty-six *in vivo* studies have been carried out on 67 compounds which were examined for MTD (n=7), tumor development study (n=3), *in vivo* efficacy assays (n= 16) and drug-radiation combination therapy-based efficacy assays (n=3). Two new xenografts (thigh models) namely HOP-62 (Lung) and AW13516 (Oral) were developed to be used as model system for radiation-based drug testing assays. The radioprotector from BARC/DAE was found efficacious against A549 xenograft growth



in immunodeficient mice model individually and also in combination with radiation therapy experiments. In vitro drug/ cell-based drug testing assay against cytotoxicity of MDA-MB-231 Luc+ cells was standardized using Optical imaging system. In a collaborative study, effect of marine

plants extracts (active on AML xenograft) was tested on OCI-AML-2 cells by transmission electron microscopy. The extract was reported to be cytotoxic to cancer cells through nuclear, cytoplasmic and mitochondrial disintegration.

Bioinformatics Facility

Officer-in-Charge: Dr. Ashok Varma

Scientific Officer: Mr. Nikhil Gadewal

With the support from ACTREC and DBT, the bioinformatics facility has established expertise in the area of molecular modelling, NGS, microarray data analysis and database development. So-far, the facility is working in close collaboration with in-house scientists and clinicians for better basic and translational research. Majority of the projects are in the area of molecular modelling and dynamics which answer the queries of different groups working on cancer biology. The team of scientists working in the centre has a vision to help cancer patients by identifying different genomics and proteomics biomarkers. Every year, the centre organizes seminar/workshop targeting academic

institutions and industry to help them in understanding the basic aspects of bioinformatics. This year this facility provided three-day lectures cum hands- on- training workshop during February 20-22, 2019 on the theme “Molecular profiling to therapeutic target identification”. Total 22 candidates participated in the workshop including Professors/lecturers/ research scholars from different cities of India like Mumbai, Surat, Chennai and Kanpur. On all three days, the afternoon session was for hands-on-training which covered proteomics data analysis, molecular modelling and dynamics, next-generation sequence analysis of exome data, biological databases and sequence analysis. The

facility also trains scientists from North-East region for the improvement of teaching and research in their home intuitions. The hardware and software available in the facility is as tabulated below.

Hardware	Software
One- nVIDIA GPU workstation	BIOVIA Discovery studio software
Five- workstations	Freeware software for docking
Eight- PCs	

Biophysics Facility

Scientific Officer 'F': 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 BIAcore T200 for automated surface plasmon resonance (SPR).

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 2019, besides in-house users, facility services were also used by investigators and students from different departments of Mumbai University extensively.

Biorepository Facility

Officer-In-Charge: Dr Poonam Gera

ACTREC Biorepository is a facility to collect, annotate, store and distribute biological samples to in-house researchers under a specified mechanism for IEC approved research projects. The bio-specimens are collected from the operation theatres, frozen room and surgical pathology as well as the breast OPD. In the year 2019, with due consent from patients, tissue samples from 731 cases were procured. Majority of these samples were from head and neck tumours, followed by breast tumors, gastrointestinal, neurological, tongue, ovary, kidney and other tissue types. The paired adjacent normal samples were also collected and stored, wherever possible. In addition, 103 core biopsy samples were collected from the breast

OPD. This year cryopreserved tissue samples were provided to eleven principal investigators depending on various IEC approved protocols at the Tata Memorial Centre. The Biorepository had initiated an in-house quality check of cryo preserved tissue samples. The OIC is a pathologist and a co- investigator on eleven projects which requires expertise in evaluation and review of haematoxylin and eosin stained and immunohistochemistry slides. The OIC was a part of an organizing team of the 5th Indian Cancer Genetics Conference and Workshop held in ACTREC during December 2019. During the year, five trainees were taken for their Master's dissertation and experience.

Common Facilities

Officer-in-Charge: Dr Sanjay Gupta

The common facility operation and maintenance offers supportive services like Chemi-doc machine, ultra-pure water purification system, radioactive handling room for ^{32}P and ^{125}I , bacterial culture hoods, ice making machines and cold room facility to all the research groups. All the facilities are well-equipped with high-end research equipment and are located on multiple floors and separate wings of Khanolkar Shodika. ACTREC added two new water purification

systems (Rephile Bioscience Ltd.) in 2018 and two Chemi-doc machines (Biorad model) in 2019 to cater to the growing needs of researchers in the institution. Along with these, autoclaves and oven in different research groups are also maintained by common facility technicians. All the major equipment under common facility is covered under an Annual Maintenance Contract and the purpose is to provide safe, sustainable, efficient, and reliable facilities.

Common Instrument Room (CIR)

Officer-in-Charge: Mr. Uday Dandekar

Over the past 42 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. During 2019, equipment

like Real Time PCR machines, Refrigerated Centrifuges, Chemiluminescence Gel Documentation System, Refrigerated Water Bath, and Refrigerators were procured and installed in the CIR.

Digital Imaging Facility

Officer-in-Charge: Dr. Dibyendu Bhattacharyya

The ACTREC Digital Imaging facility (ADIF) is a state of the art imaging facility housing several advanced imaging platforms. At present, the facility boasts of the following instrumentation: (1) Multiphoton confocal LSM780 microscope, (2) 3i Mariana spinning disk confocal microscope, (3) Leica SP8 confocal microscope with STED super resolution system, (4) Leica DMI600B microscope - from Bhattacharyya lab, (5) Nikon Ti Eclipse wide

field microscope (6) Axio Imager.Z1, and (7) Axiovert 200M. The facility provides microscopic acquisition and analysis services for wide-field and the different confocal platforms listed above, to the ACTREC faculty and students as well as to outsider users. The facility remains busy throughout the year and usage of confocal systems remains extremely high especially for the multiphoton system and Leica Sp8 system.

DNA Sequencing Facility

Officer-in- Charge: Dr. Pradnya Kowtal

During 2019, the DNA sequencing facility at ACTREC was used by researchers from ACTREC as well as from other institutes. Investigators use the facility to analyze sequences of genes implicated in sporadic and inherited cancers for research and diagnosis. Sequencing for confirmation of cloned inserts, site directed mutagenesis and shRNA was also done.

The DNA sequencing facility has two automated DNA sequencers, an eight capillary 3500 and a forty - eight capillary Genetic analyzer 3730 from Applied Biosystems. Both the sequencers are used for DNA sequencing, fragment analysis and

single nucleotide polymorphism analysis. The machines are operated by two scientific assistants. The average turnaround time to give out data is one working day after receiving samples. The facility had carried out about 10,000 sequencing and fragment analysis reactions in the current year.

DNA Sequencing facility demonstrated principle of Sanger sequencing and working of the facility to the under graduate and post graduate students participating in Open Day 2019, several other visitors throughout the year and extended its support to Genomics based workshops.

Electron Microscopy Facility

Officer-in-charge: Dr. Sharada Sawant

The theme of this facility 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 X12,00,000, suitable for biological, polymer, nanogold and material science applications. This system has been commissioned along with 3D Tomography, EDS and STEM. The facility carries out 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 2019, the facility processed EM samples for 29 working groups from ACTREC and 3 working groups from BARC Mumbai/CDRI Delhi. A total of 189 tissue and monolayer cell culture specimens were prepared for araldite/epon blocks making, 321 specimens for semi-thin sectioning, followed by ultrathin sectioning of 236 specimens and further 354 grids contrasted using uranyl acetate and lead citrate. Four hundred and

fifty nine grids were scanned under EM and over 15900 microphotographs were captured at 120 KV. In addition to this, the facility has also processed 32 samples for negative staining and 41 grids for immune-gold labeling. Further quantitative analysis of EM data was done using iTEM software for 15 working groups. Moreover, the interpretation of the obtained results on the basis of ultrastructural observations was done for all the users.

During the report period, demonstration of the EM was given to students on educational visits on 6 different occasions. Lecture and demonstration on EM was given to JRF academic batch of 2018-19. EM demonstration was also given to the visitors from national/international institutes at 3 different occasions.

Flow Cytometry Facility

Officer-in-Charge: Dr. Shubhada Chiplunkar

The Flow Cytometry facility is a core facility, provides support to the Principal Investigators and students from ACTREC for the Flow Cytometry related work. Besides sample acquisitions and Cell sorting methods, facility extends technical support in experiment designing, data analysis and interpretation as well as development of Flow Cytometry based techniques.

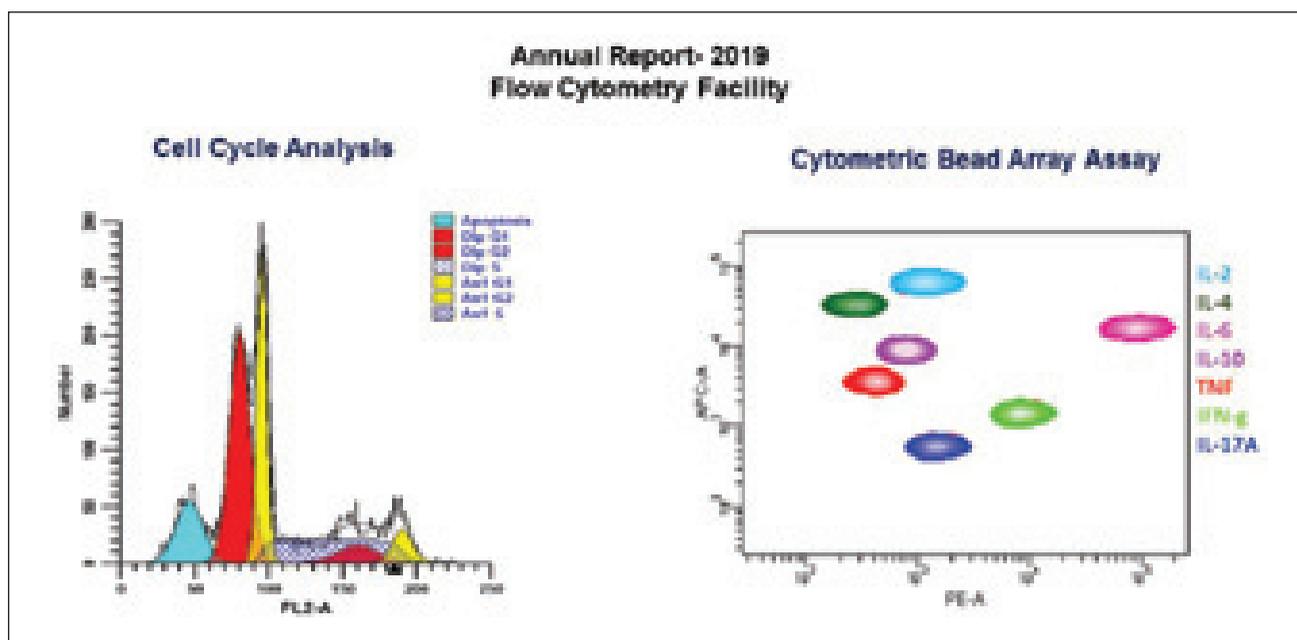
The facility is equipped with 4 flow cytometers – FACS Calibur, Attune NxT, FACSAria-III, FACSAria-I, which can perform 3-18 color analysis and up to 4 –way sorting. The analysis is done using softwares - FACSDiva, CellQuest Pro, FlowJo, FCS Express, Attune NxT, FCAP Array and Modfit.

In 2019, the facility was used by 70 scientists and students from ACTREC (from 17 laboratories). A

wide range of research applications carried out on regular basis including immunophenotyping with fluorescence tagged antibodies (up to 16 colors), DNA content determination and cell cycle analysis, S-phase detection by BrdU staining, apoptosis studies, detection of mitochondrial membrane potential, stem cell analysis - side cell population, dermal stem cell analysis, detection of fluorescence proteins like GFP, functional and biochemical assays like proliferation assay, intracellular calcium influx, 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 organizations on payment basis. Demonstrations and training were conducted for visiting clinicians, scientists and students on request. In April 2019, Mr. Ravindrakumar Joshi, SA 'B' received training in high dimensional data analysis at a two-day workshop held at ICMR-National Institute for Research in Reproductive Health (NIRRH).



Histology Facility

Scientific Officer 'G': Dr. Arvind Ingle

The Histology facility provides the following services to the Centre: (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 2019, the facility

received 3858 tissue samples in fixative and 399 human paraffin blocks and, after processing, supplied 5194 stained and 13939 unstained slides to 21 research laboratories. In addition, 1136 tissues were processed for cryo-sectioning, and 1136 H&E stained and 2835 unstained slides were supplied to 10 research laboratories.

Laboratory Animal Facility (LAF)

Officer-in-Charge: Dr. Arvind Ingle

Scientific Officer 'D': Dr. Rahul Thorat

The main objective of the Laboratory Animal Facility (LAF) is to breed, maintain and supply laboratory animals to the research groups of the institute. During the year 2019, LAF undertook planned breeding of 10 normal strains of mice, one each Nude and SCID mice, one hybrid strain, 47 Transgenic/ Knock-Out mice strains/sub-strains, one strain of rat and one hamster strain, and supplied 3910 normal mice, 518 Nude mice,

1553 NOD SCID mice, 285 rats, 202 hamsters to 26 researchers against 92 IAEC-sanctioned research proposals. Towards quality control, LAF examined 98 stool/ animal samples and 359 food, water, pulses, bedding material and room air samples for routine microbiological testing, 445 hair/ stool/ cellophane samples for clinical-pathology, 62 samples for serological detection of seven rodent pathogens from 19 strains, and

carried out PCR-based tests for 11 infectious agents using 60 random samples from these 16 strains. For checking genetic purity, LAF undertook biochemical marker testing of 44 mice from seven strains, and PCR based tests for 19 microsatellite markers on 40 DNA samples from 11 mouse strains. LAF undertook skin grafting of 24 mice of 6 different strains. LAF used Flow Cytometry to assess the T- and B-cell profile in 33 blood samples of Nude/ SCID mice, as also control BALB/c and Swiss mice. As a part of its embryo freezing program, LAF collected 377 embryos at

the 8-cell to morula stage from 93 mice of 5 strains and froze the embryos in 27 cryo-vials under liquid nitrogen. During the report period, LAF also supplied 16308 normal mice, 330 nude mice, 337 SCID mice, 365 rats and 2 hamsters as breeding nuclei/ experimental animals to 23 CPCSEA registered outside Indian organizations, and provided genetic monitoring services to three outside organization. The senior faculty participated in three international conferences and, accepted seven observers in 2019.

Macromolecular Crystallography and X-Ray Diffraction Facility

Officer-in-Charge: Dr. Ashok K Varma

Macromolecular crystallography and X-ray diffraction facility –ACTREC is actively involved in helping scientists from TMC-ACTREC in crystallization of different proteins. Facility is well equipped with crystallization unit, and compact diffractometer comprising (1) Microstar-Microfocus Rotating Anode, (2) Integrated computer controller motorized Image Plate detector and (3) computers for data processing and crystal structure determination of proteins for macromolecular structure biology. Facility also supports young scholars to crystallize the protein

of interest and visualize it under microscope. This facility has been set-up and commissioned in ACTREC, in the year 2012. At present, three groups are actively accessing the facility. The facility trains faculty from local institutions by organizing short-term training programs. The Facility also trains scientists from North-Eastern region and other underserved regions of the country through funds provided by Department of Biotechnology-Government of India (DBT-GOI) and contributes towards molding skillful scientists in India.

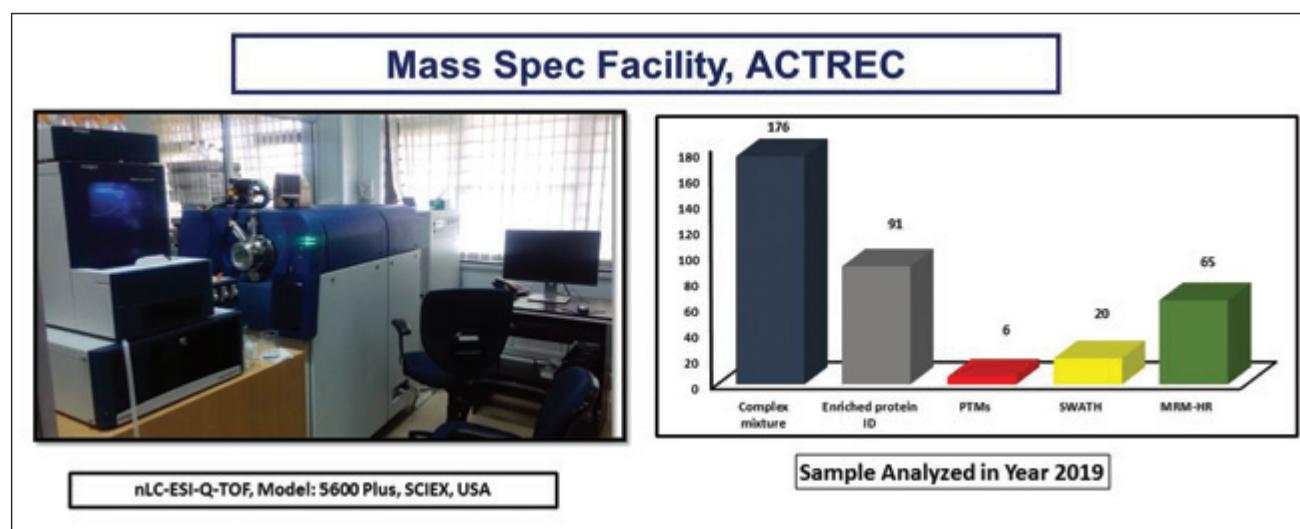
Mass Spectrometry Facility

Officer-in-Charge: Dr. Rukmini Govekar

Scientific Officer: 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 (176 samples), identification of enriched proteins (91 samples), label free quantification (SWATH analysis) complex protein samples (20), MRM-HR targeted proteomics (65 samples) and PTMs determination (6 samples) have been carried out on this platform. The scientific officer attached to the facility demonstrated the working of nLC-ESI-QTOF and MALDI-TOF-TOF on several occasions in the year 2019. Visiting HBNI delegates, Vice Chancellor & Dean of various HBNI

institutes, were shown around the facility on January 18th, 2019. Training was imparted to students and faculty members from K J Somaiya College, Mumbai (January 23rd, 2019), participants from the NER training program held at ACTREC (January 30th, 2019), students and faculty of NB Mehta Science College, Bordi (September 13th, 2019) and the JRF ACTREC 2019 Batch (November 11th, 2019). A lecture was delivered on February 20th 2019, by the scientific officer during the NER training program, on 'Methods Used in Sample Preparation for Proteome Profiling and Quantification by Mass Spectrometry'.



Molecular Imaging Facility

Officer-in-Charge: Dr. Abhijit De

Molecular imaging 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 value addition for translating basic research findings to the clinic. This facility has been successfully operating at ACTREC for the past six years, providing research support for the scientific community. The facility received one IVIS Lumina II (Perkin Elmer, USA) sponsored by DBT project in 2013 and, later added with one IVIS Spectrum imaging system in 2014. Other necessary infrastructure accessories like back up data server, computer terminals for imaging data analysis and gas anesthesia systems were added for optimal operation using various extramural funding support to ACTREC investigators. The installed systems offer fast scanning of multiple mice or rats emitting photonic signals such as bioluminescence, near-infrared fluorescence and Cerenkov luminescence.

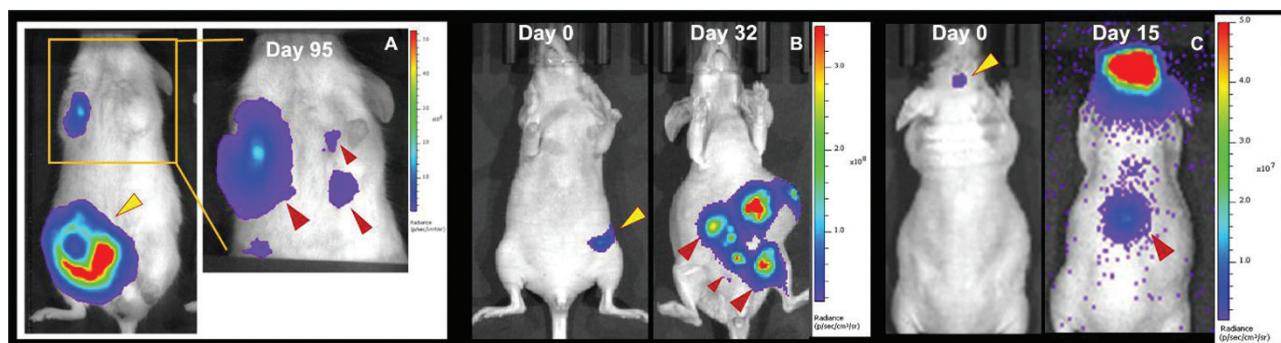
Salient features of the systems installed in this facility include: high-performance, user-friendly acquisition and fully software-controlled image capture; data back-up storage server linked through ACTREC LAN to enable onsite and remote

image analysis. The systems have integrated heated stage and accessories for isoflurane based gas anesthesia needed for the non-invasive scanning procedure; fast scan performance for photon signals primarily in the range of 500–900 nm from tissue culture plates, tubes or mice sources can be captured. The excitation/ emission filters accommodate majority fluorescent dyes or fluorescent proteins in the green to far-red spectral range. Spectral imaging options using band pass optical filters can distinguish reporters with different wavelengths emitting from the same animal. An important feature of IVIS Spectrum system is the laser scanner for 3D surface topography to develop a single-view, diffuse tomographic reconstructions (DLIT and FLIT mode).

Several laboratories in ACTREC and faculty from institutions like IIT Bombay, BARC and others are reaping the benefits of using this facility for their respective investigations and expanding the scope of interdisciplinary approach to find solutions for various cancer situations through experimentation. So far, this user-friendly facility has helped users in developing preclinical orthotopic xenograft models in important disease

types like cancers of the human breast, brain, lung, pancreas and ovary. Students and researchers are using these animal models to investigate on cancer biology aspects, such as therapeutic delivery, treatment response, disease relapse, distant metastasis, material distribution,

autophagy etc. The data generated from this facility has led to over fifteen publications in leading international journals and contributed to generating multiple Indian patents as well. The facility also took part in educational visits organized by the institute during 2019.



Images of distant metastatic spreads (red arrowheads) from orthotopic primary xenograft (yellow arrowhead) in cases of human radioresistance breast cancer (A), chemoresistant ovarian cancer (B) and glioblastoma multiforme (C).

Next Generation Sequencing Facility

Chairperson: Dr Rajiv Sarin

The Next Generation Sequencing (NGS) facility at ACTREC has a HiSeq 1500 from Illumina. The facility extended help to scientists from BARC for preparations of exome and transcriptome libraries. During 2019, the NGS facility provided

support for workshops organized by Principal Investigators (PI). Demonstration and functioning of the facility and machines was explained to visiting students, faculty and other visitors referred by ACTREC administration and SCOPE cell.

Small Animal Imaging Facility

Scientific Officer 'G': Dr. Pradip Chaudhari

Overview: 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 mouse models. Several PET, SPECT and CT studies with rodents are performed for projects from ACTREC, other DAE units, academic institutes and pharmaceutical industries. The facility is also committed to diagnosis and treatment of pet animals suffering from spontaneous cancers and, these are referred to the animal oncology clinic for further management. During 2019, 170 referral cases underwent surgeries, single or combination chemotherapy or radiation therapy, as per the clinical requirement. The bio-specimens were preserved in animal bio-repository for comparative research.

Service: In 2019, nine studies- majority of these projects, proof-of-concept studies, normal tracer uptake studies and in vivo tumor uptake studies were executed. For this activity designing imaging protocols, development of animal models, data quantitation and analysis is carried out by the expertise available in the facility

Research: The research component in preclinical imaging is validation of liver and brain orthotopic models using preclinical imaging modalities PET and CT respectively. In 2019, imaging protocols for ex vivo bone imaging and analysis utilizing high resolution microCT have been developed by this facility. The other goal is to initiate a complete cancer care program for pet animals suffering from spontaneous cancer and develop research areas on comparative aspects of animal and human cancers. Animal cancer bio-repository maintains biological material, received during the course of diagnosis and treatment. The bio-repository preserves fresh frozen tissue, blood, formalin fixed tissue and FFPE tissue. Figure below shows ¹⁸F-FDG uptake in xenograft tumor model.

Education: The facility organized the ACTREC-DBT-NER workshop on, 'Preclinical Imaging' funded by DBT-GOI, for the North East Region students and faculty, from January 11- 18, 2019. The facility also conducted the ACTREC-ICNM 8th 3-day hands-on workshop, on "In Vivo Preclinical Imaging and Drug Discovery from December 9- 11, 2019. The Scientific officer was selected as an ad hoc Specialist by AAALAC (The Association

for Assessment and Accreditation of Laboratory Animal Care) International, USA, to promote the humane treatment of animals in science through

voluntary accreditation and assessment programs. Five students were accepted for training by the Scientific Officer in 2019.

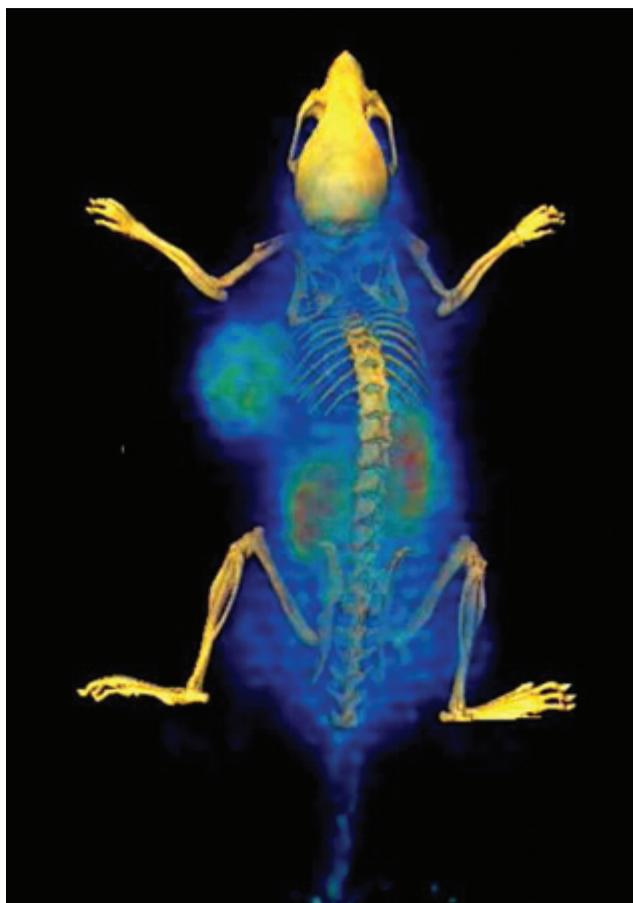


Figure: 18F-FDG uptake in xenograft tumor model

Dr. Sudeep Gupta (Director, ACTREC)

Dr. Rajesh Dikshit (Director, CCE)

Dr. Pankaj Chaturvedi (Deputy Director, CCE)

Department Of Medical Records & Cancer Registry

Dr. Ganesh B. (Head)

Department Of Preventive Oncology

Dr. Sharmila Pimple (OIC)

Dr. Gauravi Mishra

Dr. Subita Patil

Field Intervention and Cancer Surveillance

Dr. Atul Budukh (OIC)

Molecular Epidemiology & Population Genetics

Dr. Sharayu Mhatre (OIC)

Biostatistics

Mr Sanjay Talole (OIC)



Department of Medical Records & Cancer Registry

Head: Dr. Ganesh B.

Service

The department provides case files to

- Patients for Treatment and Follow-up.
- Doctors/ Clinicians for Research.
- As per the TMC Policy of Retention of Medical Records, all case-files registered prior to 2013 are scanned and linked with EMR.

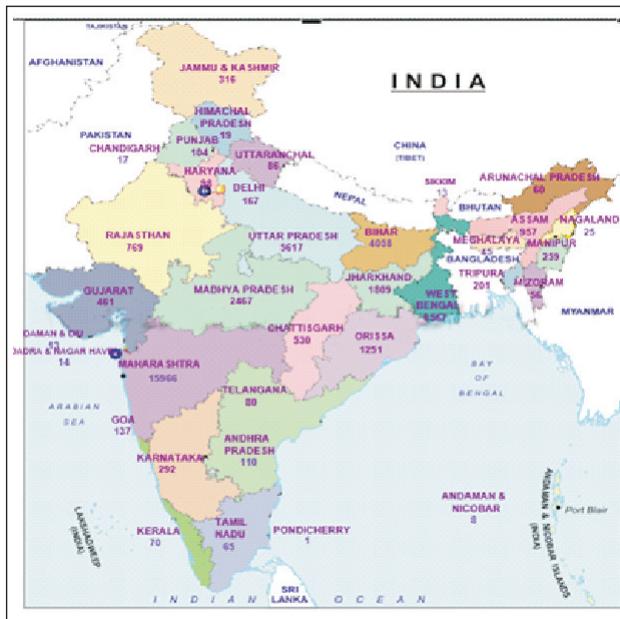


Fig.1a:TMH Registrations – 2019

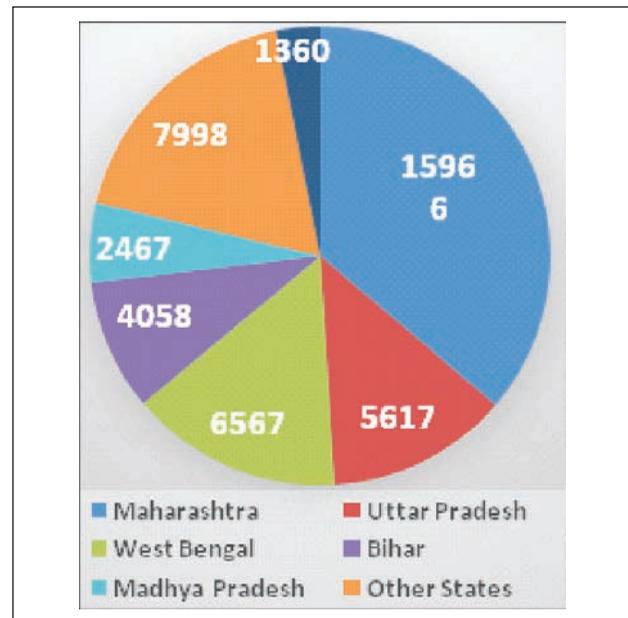


Fig:1b Residential Status - 2019

TMH Case-file Registrations	: 44,068
Referral Registrations	: 28,905
Preventive Oncology	: 5,645
Total TMH Registrations	: 78,618
ACTREC Case-file Registrations	: 1,561
ACTREC Referral Registrations	: 1,181

Research

Below listed are some of the on-going projects

1. Patterns of Care & Survival Studies(POCSS)
 2. Hospital Based Cancer Registry(HBCR)
 3. Special TMC-DAE Projects -TMC-DAE Network of Cancer Registries: Population Based Cancer Registries (PBCR) near the Nuclear Power Plant locations, Tarapur, Karwar, Rawatbhata, Kakrapar, and in Ratnagiri, Sindhudurg, Visakhapatnam, Kalpakkam and Kudankulam were setup.
 4. Health Check-up Programs – Service & Research: The Kaiga health check-up for the radius of 0-16kms was completed and the report of was submitted to Director, TMC and DAE Chairman. The Kota health survey report will be shortly compiled.
 5. Tobacco Survey Program: The Tobacco survey is on-going in talukas of southern India; Supa, Ankola, Yellapur and Karwar. A population of 90,000 have been completed of the 4, 00,000 total population.
-



Department of Preventive Oncology

Professor and Physician & OIC : Dr. Sharmila Pimple

Professor and Physician: Dr. Gauravi Mishra

Physician: Dr. Subita Patil

Overview

The 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 behaviour 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.

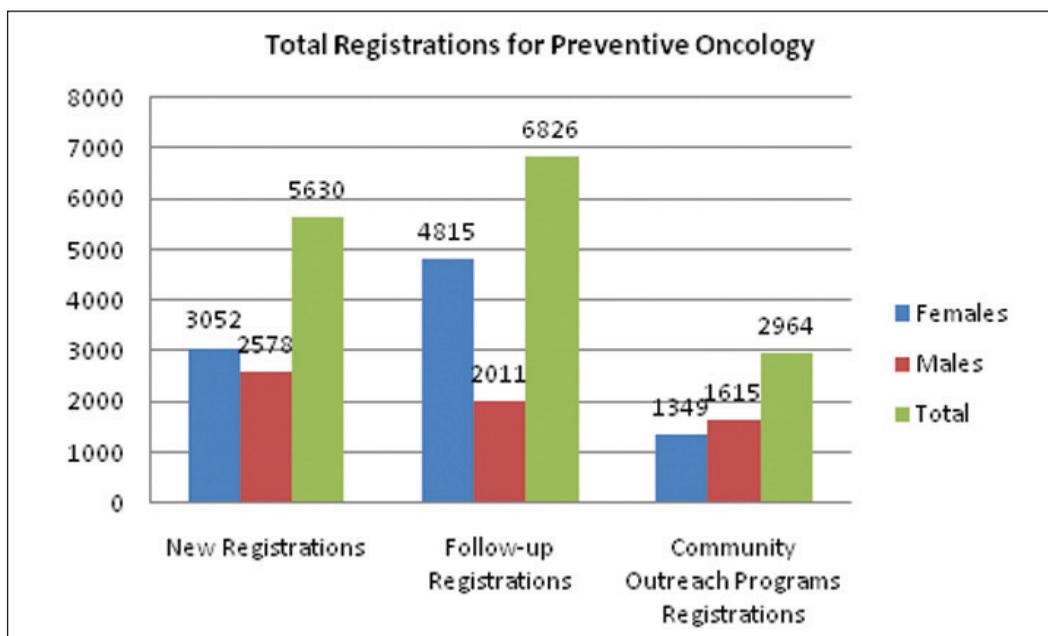
Advocacy, NGO-Training and Networking: For Dissemination of cancer control activities

Research: for developing newer methods and strategies for the prevention and early detection of common cancers in India.

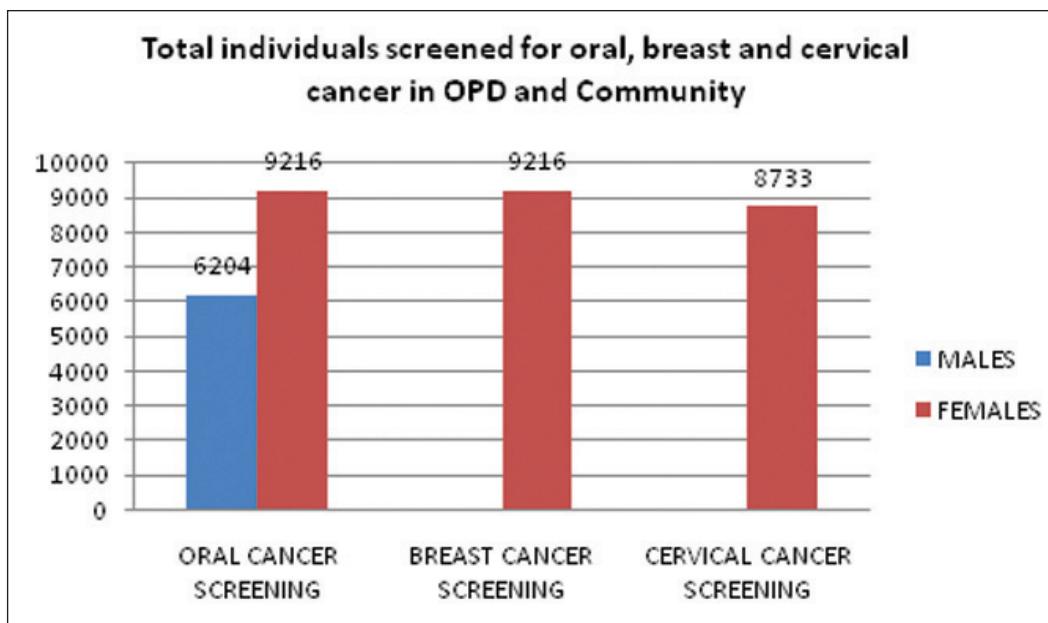
Service

The Department conducts Preventive Oncology Hospital and Community Based Screening Clinics. A total of 5630 new patients were registered for Preventive Oncology services and an additional 6826 were registered for follow-up screening services. A total of 12456 individuals (7867 women & 4589 men) availed Preventive Oncology screening services in 2019. In addition to which another 2964 individuals (1615 men and 1349 women) were screened for common cancers in the community.

Total Registrations for Preventive Oncology screening services

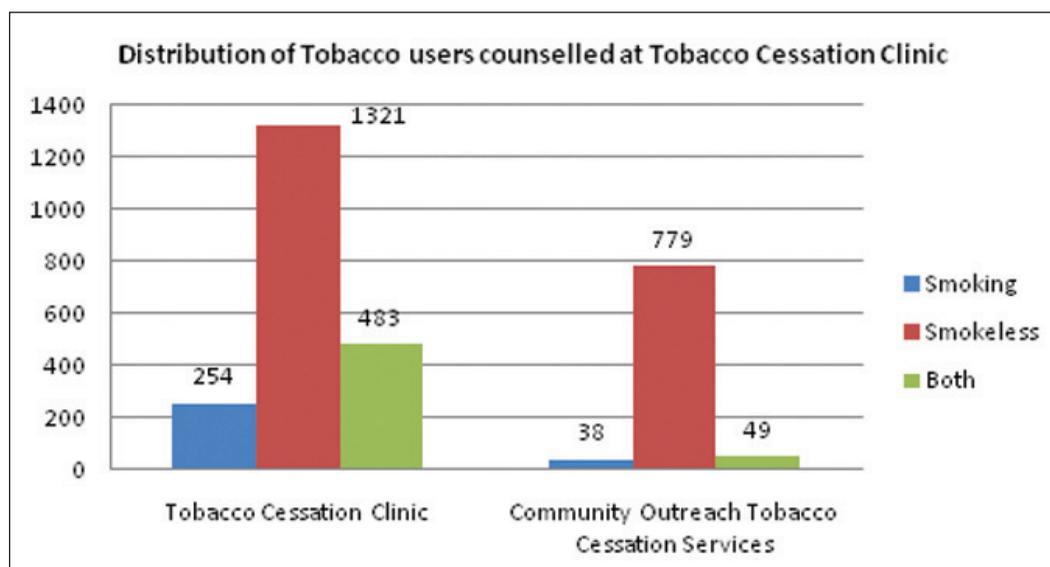


Total individuals screened for oral, breast and cervical cancer in OPD and Community



Tobacco Cessation Services

Distribution of Tobacco users counselled at Tobacco Cessation Clinic and Community screening services



Research

On-going Research Trials:

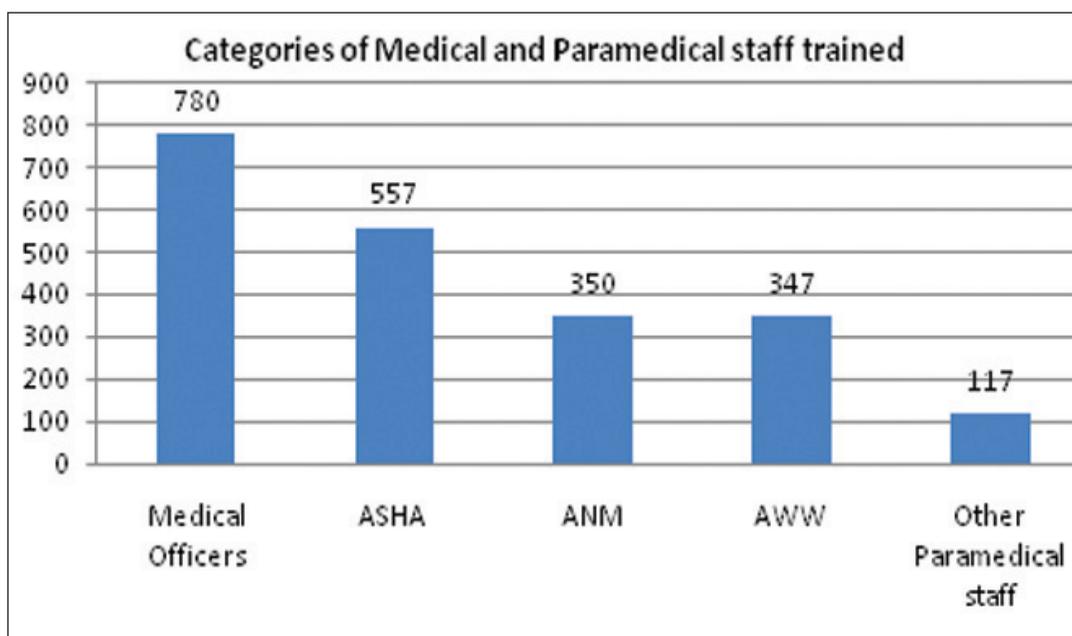
1. "Collaborative Action for control of Cancer and other Non-Communicable Diseases among Mumbai Police"
2. "Early Detection of Common Cancers in women in India." (funded by RO1 grant of the NIH, USA; Grant # 5RO1 CA 074801-16)
3. "A Phase-II/III, Partially Double-blind, Randomized, Active-controlled, Multicentric Study to Assess the Immunogenicity and Safety of SIPL'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®)."
4. "Development and Non Inferiority Evaluation of a portable trans vaginal digital colposcope with smart phone interface for single visit cervix cancer screening in low resource settings"
5. "Comparative Evaluation of Efficacy of Different Methods of Tobacco Cessation Interventions among BEST Employees in Mumbai: A Randomized Controlled Trial."
6. "Randomized trial of 2 versus 3 doses of HPV vaccine in India"

Education

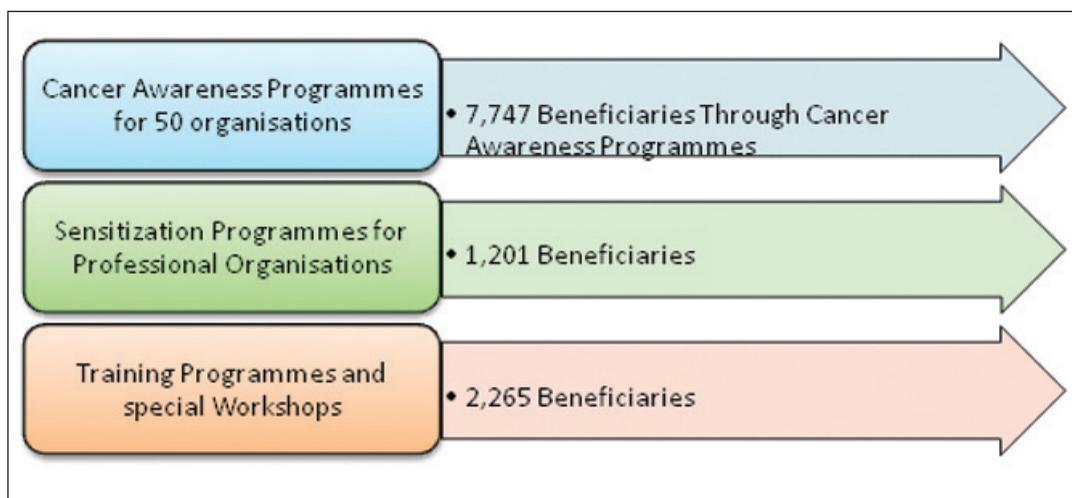
Capacity Building Programmes:

Sr.No.	Topic	Month	No. of delegates / participants
I)	Annual Flagship Training Workshops:		
	1) Workshop on Health Education & Promotion	January 2019	14
	2) Workshop on Health Education & Promotion	June 2019	15
	3) Workshop on Principles and Practice of Cancer Prevention & Control, Mumbai	March 2019	28
	4) Workshop on Principles and Practice of Cancer Prevention & Control, Mumbai	July 2019	18
	5) Workshop on Tobacco Control & Cessation	May 2019	27
	6) Workshop on Tobacco Control & Cessation	August 2019	18
II)	Specialized Training Courses:		
	A) CME for Medical Doctors and Health Team of Police Hospital and Dispensaries		
	1) Prevention and Control of Common Cancers	January 2019	28
	2) Principles of Management of Common Pre-Cancers & Cancers	February 2019	25
	3) Principles of Management of Common Pre-Cancers & Cancers	February 2019	38
	4) Principles of Management of Addiction to Tobacco & Alcohol	February 2019	24
	5) Principles of Management of Addiction to Tobacco & Alcohol	March 2019	35
	6) Principles of Management of Diabetes, Obesity and Hypertension	September, 2019	34
	7) Palliative Care	October, 2019	28
	8) Occupational Hazards, Role of Genetics, Physiotherapy and Police Project Initiation and Implementation	October, 2019	81

Sr.No.	Topic	Month	No. of delegates / participants
	B) Training program to participants of KEVAT- a Patient Navigation Course organized by TMH	November & December 2019	27
	C) Workshop on Prevention and Control of common cancers and Capacity Building		
	1) Training at Chandrapur for Medical Officers, Accredited Social Health Activists (ASHAs), Auxillary Nurse Midwives (ANM), AnganWadi Workers (AWW)	February 2019	818
	2) Sensitization program for Program officers, Senior Medical Officers, Asst Medical Officers, Dental Surgeons, Rural Medical Officers, HMO, RBSKAMO Muktsar, Punjab. AND Training for Auxiliary Nurses and Midwifery, Community Health Officers, Multipurpose Workers, Staff Nurses; ASHA & ASHA Facilitators; AWW & their Supervisors at Muktsar.	March 2019	363
	3) Training at Mansa for Medical Officers, ASHAs, ANM, AWW.	November, 2019	418
	4) Training for Medical officers & paramedical staff at HBCH, Sangrur.	November, 2019	20
	5) Training for Medical Officers of Gadchiroli district	December, 2019	150
	6) Training workshop on “Population based screening program for Non-communicable diseases control and prevention and training workshop on VIA/VILI technique” for Auxillary Nurse Midwives at Chiplun, Raigad, Palghar, Thane district.	Oct-Dec 2019	56



The following chart shows the summary of the cancer awareness programmes and sensitization programmes conducted by the Department of Preventive Oncology.





Section of Field Intervention and Cancer Surveillance

Assistant Professor and OIC: Dr. Atul Budukh

Overview

- To provide technical support and conduct cancer registration training program for the cancer registries in India, South East Asia.
- To provide Tobacco Quit Line Service for the tobacco consumers who are willing to quit the tobacco habit.

Service

On-going Project

- Tobacco Quit Line Centre, CCE, Mumbai

Research

On-going Projects

- Early Detection programme for oral, breast and cervical cancer in Sangrur district
- Oral Cancer Screening Project Ratnagiri District
- Population Based Cancer Registry at Sangrur, Mansa, Chandigarh, SAS Nagar, Varanasi, Muzaffarpur.
- Hospital Based Cancer Registry, Sangrur, Varanasi

Education

Sr. No.	Name of the training program/ workshop	Course Date	No. of participants
1	Advance Cancer Registration Course for Yangon registry	11 th Mar 2019 to 16 th Mar 2019	2
2	Course on analysis of cancer registry data and report writing – PBCR Bhutan	5 th Aug 2019 to 9 th Aug 2019	3
3	Course on analysis of cancer registry data and report writing – PBCR Nepal	13 th Sep 2019 to 24 th Sep 2019	6
4	Cancer Registration Course for Timor-Leste registry	30 th Sep 2019 to 5 th Oct 2019	3
5	Course on analysis of cancer registry data and report writing – PBCR Colombo, Sri Lanka	14 th Oct 2019 to 18 th Oct 2019	4
6	Course on setting up cancer registry (Amritsar, Lucknow, Alandi, Varanasi and Mumbai participants)	16 th Dec 2019 to 21 st Dec 2019	22

Dr. Atul Budukh was invited by WHO, Timor-Leste for consultation regarding the establishment of

a population based cancer registry in Timor-Leste. He visited Timor-Leste on 28th to 31st May 2019.



Course in cancer registration for participants from Kathmandu Cancer registry, Nepal held at CCE during September 13-24, 2019



Early detection program for oral, breast and cervical cancer, Sangrur district Project team



Section of Molecular Epidemiology & Population Genetics

Officer-in-Charge: 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. .

Section Activity:

Organised the symposium “Building up bio sample-based prospective cohorts in India” on 22–23 March 2019. : Symposium was attended by renowned Scientists including Sir Rory Collins, Elisabete Weiderpass, Sarah Lewington, Caroline Relton, Paul Brennan, Prabhat Jha, Isabelle Soerjomataram, Jeanine Genkinger , Ben Lacey and Ranjan Yagnik. The symposium stressed upon expansion of Indian Study for Healthy Adults (ISHA) to other centres so as to capture heterogeneity in Indian population to identify India specific risk factors.



Inauguration of automated Bio-Bank:
Dr. Elisabete Weiderpass, Director IARC, inaugurated the first automated Bio-Bank in India which can store upto 3 million samples at -80c.

The bio bank will be used to store bio-samples collected for large scale observational studies with lifestyle and environmental exposure data. The samples will be used for Research and Treatment Innovation.



Chairman and secretary DAE Shri K N Vyas visited at CCE Bio-Bank on 17th June 2019

Research

On-going projects

1. Lifestyle and genetic risk factors for gallbladder cancer: multicentre 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 risk score in Indian population.
 4. Evaluating The Role Of Genetic Susceptibility For Oropharynx Cancer In Indian Origin Population: a case-control study using the candidate gene approach.
 5. Prevalence of Gallstone diseases in the regions with the high and low incidence of gallbladder cancer: current status and future perspective for gallbladder cancer prevention.
 6. Development of Cohort Study To Identify And Evaluate Transition In Life Style And Risk Factor In Rural Population.
 7. Obesity and non-communicable disease in India: an imaging study of 10,000 adults in the Indian Study of Healthy Ageing (ISHA cohort study).
 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. To elucidate geographical differences in the incidence of gallbladder cancer by identifying etiologically distinct types of gallbladder cancer through the study of mutational signature.
-



Section of Biostatistics

Officer-in-Charge: Mr Sanjay Talole

Assistant Professor: Dr. Atanu Bhattacharjee

Overview

The Section of Biostatistics was formed in the end of the year 2018. The orientation program for post graduate students of TMC, M.Sc. Nursing, short courses on Biostatistics for TMC researchers, Modules for PhD students, Workshop and training programs on Biostatistics are arranged by this section.

Service

Statistical consultation to TMC clinicians & researchers through CRS in TMH, Statistical plan for analysis, Data organization, Randomisation for clinical trials, sample size estimation etc.

Research

Collaboration for analysis of Cancer data collected through Cancer Registries, Use of Open Source data for projections, Statistical review of the study projects for IRB, Descriptive and Exploratory

Statistics on Cancer, Study on geographical variation of the Cancers, Developing novel tools for analysis of data for epidemiological studies and clinical trials, Collaboration with clinicians and other researchers in TMC for Retrospective and Prospective studies, Collaborative study with Outside TMC

Education

- Workshop on Computational Biostatistics & Survival Analysis was conducted in collaboration with Institute of Applied Statistics, ICMR, and University of Michigan Rogel Cancer Center on 23rd & 24th Dec 2019. Total 54 participants benefitted across India & Bangladesh.
- The one year post graduate diploma in Biostatistics was started in collaboration with ACTREC and four students were enrolled during this year.



Workshop on Computational Biostatistics & Survival Analysis

The below listed are the major research areas on which departments/sections of CCE are working:

Research head	Concept	Current status	Future
1 Novel methods for early detection / Screening a. Artificial Intelligence	Using images and artificial intelligence software, the attempt will be to get information on lesions which require screening and further diagnostic work up.	Artificial intelligence evaluation of cervical cancer lesions in collaboration with NCI	Expand this for diagnosis of Oral Cancer.
b. Develop risk prediction models	Using lifestyle and Polygenic risk score develop models which can identify individuals at high risk of cancer for screening and thereby reducing load of screening.	Developing risk prediction models for breast cancer	Expand it for oral and gall bladder cancer.

Research head	Concept	Current status	Future
2. Establishing longitudinal cohorts (Biobanks) for open access research platform to identify lifestyle, genetic and dietary factors and new biomarkers	Indian population is unique with heterogeneity in life style, dietary patterns and genetic profile. Need to understand Indian specific factors in disease prevention (all NCDs). Further, this approach will help to develop new biomarkers in disease causation.	Logitudinal Cohort study (Biobank) developed in Barshi/TMH	Expand this to Varanasi, Guwahati
3. Technology development for exposure assessment and performing Hi-throughput assay to measure biological effects.	Need to measure exposure accurately (like Pollution, Physical activity, diet etc) so that biological effects can be predicted with confidence. This will require developing low cost technology to detect exposure in large scale setting. The biological effect of exposure in terms of genetic mutations, epigenetic changes and disease development will require use of Hi-throughput assay.	<ul style="list-style-type: none"> a. Developing monitors to measure pollution in collaboration with IIT Kanpur. b. Looking for effect of pollution in terms of epigenetic changes and lung cancer development. c. Looking for mutational profile for different exposures in gall bladder cancer. 	This has to be a continuous process which will lead to the discovery of new risk factors (both genetic and lifestyle).
Assessing cancer burden and mortality	Need to study time trends in cancer incidence and mortality to see the effectiveness of Government programmes and treatment	Developed cancer registry and studied time trends. Developed Verbal Autopsy methods to assess national mortality.	

Education and Training at the CCE

Five students received PhD degree in year 2019.

Following visitors delivered seminar /visited CCE for delivering seminars /discussing collaboration.

1. Dr. P.C. Gupta
2. Dr. Anil Chaturvedi, US-NCI.
3. Professor Caroline Relton, Bristol University
4. Professor George Davey Smith, Bristol University.



Felicitation of Dr. P. C. Gupta, invited speaker for Academic Program at CCE

ADMINISTRATIVE & CORE INFRASTRUCTURE GROUPS

Sr. Admin. Officer		Mr. U. V. Mote
Estate Management	Admin. Officer	Mr. M. Y. Shaikh
	Dy. Admin. Officer	Mr. V. V. Pimpalkhare (Superannuated on 31/03/2019)
	Jr. Admin. Officer	Mr. Vinod Kumar Singh
HRD	Jr. Admin. Officer	Mrs. Shilpa Sardesai
Accounts	DCA, ACTREC	Mr. Vihar Y. Pawar (till 29/11/2019)
	Dy. Accounts Officer	Mrs. Anuradha Narayanan (Joined on 15/11/2019)
Purchase	Jr. Purchase Officer	Mr. A. Y. Patole
Stores	Asstt. Stores Officer	Mrs. Kanchana Gopalkrishnan
Engineering	OIC (ES)	Mr. P.B. Baburaj (till 31/01/2019) Mr. Hrishikesh Kelkar (from 12/02/2019)
Security	Dy. C.S.O. (Gr. II)	Mr. R. M. Chavan

Administration Department

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. The section also manages various services related activities; staff and patient canteens, Retreat cafeteria, housekeeping, transportation, horticulture, pest control services, photocopier machines and courier/ post services. Most of the Annual Maintenance Contract for the above services is also the duty of the Estate Management. Besides this other ancillary services such as, billing of cancer registries, refilling of gas cylinders in laboratories / BMT / Patient Hostels is taken care by the Estate Management. Other major responsibilities of the Estate Management is overseeing and managing the regular housekeeping services of all the buildings within the ACTREC campus, [Khanolkar Shodhika, Paymaster Shodhika, Jussawalla Shodhika, Vasundhara Patient Hostel, Students Hostels (3) Retreat, Faculty Club Guest House] and the areas surrounding the campus [roads, footpaths, car-parking, garden] for cleanliness and neatness to maintain a pleasant environment within the campus. The disposal of capital items/equipment, E-waste and scrap material is undertaken by the EM section. The Centre takes pride in a large variety of flora on its campus, which is possible by the practice of Horticulture. The campus is well maintained by professionally trained horticulturists and team of gardeners and boasts of more than 100 species of trees, shrubs and climbers, with lawns at different locations.

Medicinal shrubs also have been planted at the entrance of the Bio Bank.

Following MoU's were signed in 2019 for the benefit of cancer patients.

1. MOU between St. Jude India Childcare Centres and ACTREC has been undertaken on the 20th May 2019 for the next ten years for providing child patient accommodation along with one of their family members.
2. MOU between 'Leaf N Light' and ACTREC has been undertaken on 9th November, 2019 for a further period of 1 year to run small Organic Garden at ACTREC.

During the year 2019, under 'Science & Society Oration' a Seminar was organized for ACTREC employees, on 17th May, 2019 at ACTREC, wherein renowned speaker Shri. Palagummi Sainath (*Journalist & Reporter, Founder Editor – People's Archive of Rural India, Chennai*) delivered a talk on **"The agrarian crisis and inequality"**.

As per Instructions of Government of India, the following days were observed during the year 2019 at ACTREC

1. Republic Day -26th January
2. Martyr's Day - 30th January
3. Anti-Terrorism Day - 21st May
4. 124th Birth Anniversary of Prof. Vasant Ramji Khanolkar, - 12th April
5. International Yoga Day - 21st June
6. Independence Day - 15th August
7. Sadhbhavna Diwas - 20th August
8. Hindi Diwas & Pakhwara – 14 to 28th September

9. Mahatama Gandhi Jayanti and Bharat Swachh Abhiyan - 2nd October
10. Vigilance Awareness Week – As per dates declared by the CVC
11. Observance of Fire Service Week - 14 to 20th April

Power Grid Corporation of India has donated to ACTREC the following:

- 1) Golf Cart (2 Nos.)
- 2) Two SUV's i.e. Toyota Innova Cars.
- 3) One 54 seater Bus for patient's movements from TMH-ACTREC-TMH

Human Resource Development

This section works towards manpower planning, performance management, recruitment of staff (regular as well as temporary), training and development of employees, and maintenance of discipline. In 2019, thirty-nine regular staff members were appointed in different grades in Medical, Scientific, Technical and Administrative cadres, adhering to the reservation policies of the Government of India. For the academic year 2019, 14 Junior Research Fellows were selected for Ph.D. Various staff under Technical, Non-Technical & Nursing Category were appointed on contract to distribute the work load increase due to a higher inflow of cancer patients at the Centre. At present 60 Technical, 91 Non-Technical & 56 Nursing staff, 33 Security Guard, 20 Horticulture Staff, 194 House Keeping Staff, and 68 Miscellaneous Staff are working under outsourced contractor at ACTREC. Besides this, staff members [115] on various projects have also been recruited for assisting in research work and

trainees appointed for various courses at ACTREC (08) ATMLT, (06) Cytogenetics Trainee, (02) BMT Nursing Fellow and (01) Onco-therapeutics Fellow, (04) Biostatistics Trainee and (01) Foreign Trainee.

The department also takes care of Career Planning through merit based review and promotions of employees by holding yearly DPC of all the employees. In the year 2019, 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 becoming due 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. It has provided timely welfare measures and facilities necessary for maintaining an excellent working atmosphere, imparted training by deputing 5 staff within and outside Mumbai.

In 2019, the computer programmer has developed & implemented the HRD software/ programs, improvised the existing, developed and implemented software's/programs for calculation of qualifying service and auto generation of certificate, paper tracking system exclusively for Administration department list of retiring employees, and a year wise, category wise, employee list record. Further, developed and integrated the report of "Details of Employee at a Glance" in PIS program and provided the inputs for development of Recruitment Module.

Timely payment of PRIS, update allowance to eligible employees, providing duplicate Service Book to staff, service verification of staff that have completed 18 years 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 2019, 7 staff members achieved superannuation and 1 staff retired voluntarily.

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 accounts 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 reports to DAE regarding utilization of funds and status of plan projects. During the year 2019, hospital and other income to the extent of Rs.24.79 Crores has been generated.

In all, there were a total of 232 on-going projects at ACTREC during the year 2019. A sum of Rs. 2.62 Crore was received from governmental agencies such as DBT, DST, and ICMR etc. to meet the expenditure of their on-going projects. In addition, 13 new extramurally funded projects to the tune of Rs. 7.32 crore for an average three years period were sanctioned by the above mentioned funding agencies, of which Rs. 2.51 crore were received during the calendar year. A Utilization request portal has also been developed in 2019.

Purchase Department

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 and reminders are done with the help of Material Management System (MMS), which is an 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 year 2019, Purchase Department floated 76 E-Tenders through Tenderwizards.com/DAE 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, 55 purchase orders are being processed through GeM (Government e-marketplace).

During 2019, procurement of the equipment(s) worth value of Rs.7.10 crores, consumables worth Rs.26.63 crores and contracts for the supply of Spares / AMC worth Rs.7.51 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 consumable and capital equipment except for 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 for asset verification and audits is provided.

In the Year 2019

1. Total number of PSN generated : 9096
2. Total number of GRIN generated : 6920
3. Total number of Assets : 975

The Stores department has achieved paperless system. All jobs are carried out online, like receiving of indents, generating PSNs through system and forwarding the same to Purchase department. Purchase Order copies are received online. The member of the inspection committee after satisfactory physical verification of materials confirms GRIN inspection online. Store Officer approves the GRIN online. Delivery note and

confirmation of receipt of material are done through online procedure. Asset Numbers and Installation Reports are generated online.

Stores with the support of IT department are in the pipeline of online asset transfer program from one satellite unit to another. All departments can view their own assets online at one click. Asset number is linked to view the status of the AMC and CMC of the equipment.

Engineering Services

The mandate of the Engineering department at ACTREC is to maintain and manage all the facilities under its jurisdiction and to ensure the safety of patients and staff. The key engineering works include the following: (1) Air conditioning system with chilling plants, cooling towers, package units, water coolers, refrigerators, deep freezers, medical oxygen system, LPG distribution network, mechanical and fabrication works; (2) In-house repair and maintenance of close to 500 window/ split air conditioners; (3) 33 KV high tension switch gears, transformers, LT panels, lighting and power distribution, DG sets, cabling, lifts, communication and PA system and a patient calling system; (4) Maintenance of water supply and fire hydrant systems, as well as sanitary and drainage systems; (5) Civil works including all alterations, additions, masonry, plumbing, painting, carpentry, maintenance of buildings, roads, and compound wall of the 60 acre campus; (6) Co-ordination with Architects/ Planners for construction of 5 new buildings on the campus; (7) Liaison work with local bodies for obtaining various NOCs and permissions; (8) Distribution of liquid nitrogen on a regular basis to research labs; (9) Maintenance of laboratory equipment, furniture and various

hospital utilities; (10) Planning and implementing the up-gradation/ replacement of facilities, carrying out preventive, corrective and deferred maintenance of the buildings, making short-term and long-term recommendations for financial allocation. A system to register the complaints along with emergency number is provided to minimize time in attending the problems. Department has also opted for billing software system & moving towards complete online solutions.

Further to conserve electricity, a remarkable cut down in Power consumption was achieved by maintaining the power factor, replacing existing florescent light fittings by LED lights. Modification in the existing HVAC systems, replacement of old MEP equipment with newer technology & energy efficient equipment, has been undertaken in phased manner.

In addition to the above work, the Engineering department had undertaken major renovation work to upgrade the infrastructure to meet current and future needs. Various new projects to take infrastructure to next level are planned in immediate future. Section is working towards optimal water management by constructing STP and WTP. New construction/facilities will be taken over by the section for further operation & maintenance. Section operates/functions with a total staff of 65 permanent & contract together.

Security Section

The new building structure at Main Gate has become functional and improvised access control measures have been inducted for strict Access Control of Men, Material and Vehicles. On the

campus, 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 periodic 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 & to detect objectionable activities in the campus. Work of improvised Fire alarm & detection system has been completed and work of firefighting system is on the verge of completion to tackle any kind of fire exigencies. The Prime Motto is to have a fear free atmosphere at ACTREC Campus. Security Audits of ACTREC is 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.

The department organized the Vigilance Awareness Week, observed at ACTREC from 28th October to 2nd November 2019. Mr. Vinayak P. Apte, I.P.S., I.G. (Security), DAE, was the Chief Guest at the function, who shared his thoughts and expertise on “Integrity- A way of life (ईमानदारी -एक जीवन शैली)”. Ceremonial parades were performed on the eve of Republic Day and

Independence Day by the Security Staff of ACTREC. Proper liaison is maintained with the local Police, RTO, CIDCO, Municipal authorities, and other outside agencies. Security Section also efficiently manages the Centre's Departmental

Transport activities, viz. efficient running of the shuttle bus services, Doctor's run Vehicle, Patient related transport facilities, condemnation of old vehicles, obtaining RTO permits and licenses for newly procured vehicles.





Information Technology

IT Coordinator : Mr. Prasad Kanvinde
Officers : Mr. Padmakar Nagle, Mr. M. Sriram, Mr. Anand Jadhav,
Ms. Shraddha Kesarkar, Mr. Amol Khade

In fulfillment of its mandate, 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 50Mbps Reliance connectivity. A brief description of the activities of the IT department during 2019 follows.

Networking: Day-to-day support, upkeep, administration and maintenance of passive and active network components constitute vital networking activities. The Centre has scaled up network back bone connectivity on 20Gbps. Perimeter firewalls with 10G interface were deployed and configured in HA mode for redundancy purpose. The Centre has also been equipped with state-of-art, latest wireless network devices on new standards with 600Mbps bandwidth and It is also being planned to scale up this bandwidth to 1.2 Gbps 802.11ac standards. The department has also established

the wired network connectivity to newly constructed Archival building.

Hardware: Installation and migration of newly procured IBM Domino mailing solution, Installation and commissioning of 350TB of Scale out NAS storage system and successful allotment of quota based shared storage space to various clinical and research laboratories, successful installation and commissioning of Audio-visual equipment for Board room in CCE. ACTREC has recently revamped and published its organization website. A successful installation and commissioning of HPC system and making it available to all the end users of ACTREC and TMC were executed. Procurement of PCs and matching accessories are the other procurements of the year.

Software: Patient information processing at the centre is essentially online, multi-location and round-the-clock. In 2019, updates for PABR, DIS, RIS, ROIS, OT, Accounts, Pharmacy, store & Purchase were made available. Development of ACTREC RC software where indenter is raising the indent of the various variants of generic item code

and generating PO was a major achievement. All these programs were developed in line with institute mandate of paperless online transactions and if required to make seamless

transactions on the remote server of TMH. Engineering project/ARC work order etc are the major achievements under the software category.



Library

Librarian : Dr. Satish Munnolli

The ACTREC library is a resource centre of scientific information, proactively engaged in acquiring, organizing and delivering scientific and clinical information to its users. The library provides services to its users to support and enhance the research, patient care, and on-going educational programs of the institute. During 2019, the library has subscribed to 80 journals in cancer and allied areas to serve the user needs. The library has a collection of 5886 books, 12595 bound volumes of journals, 626 theses, 3470 staff publications, 419 reports and 20 videos. Unlimited access to ScienceDirect under the DAE - Elsevier consortium provided over 2500 scientific, technical and medical journals. ClinicalKey and UpToDate - two online clinical resources activated through TMC, cover clinical trials, drug monographs, guidelines, patient education materials, multimedia and others. Under the National Cancer Grid program, 27 online clinical journals were enabled on campus wide access. To provide seamless access to online resources on a single platform J-Gate Plus has been subscribed. EzProxy has been subscribed to facilitate remote access to subscribed contents.

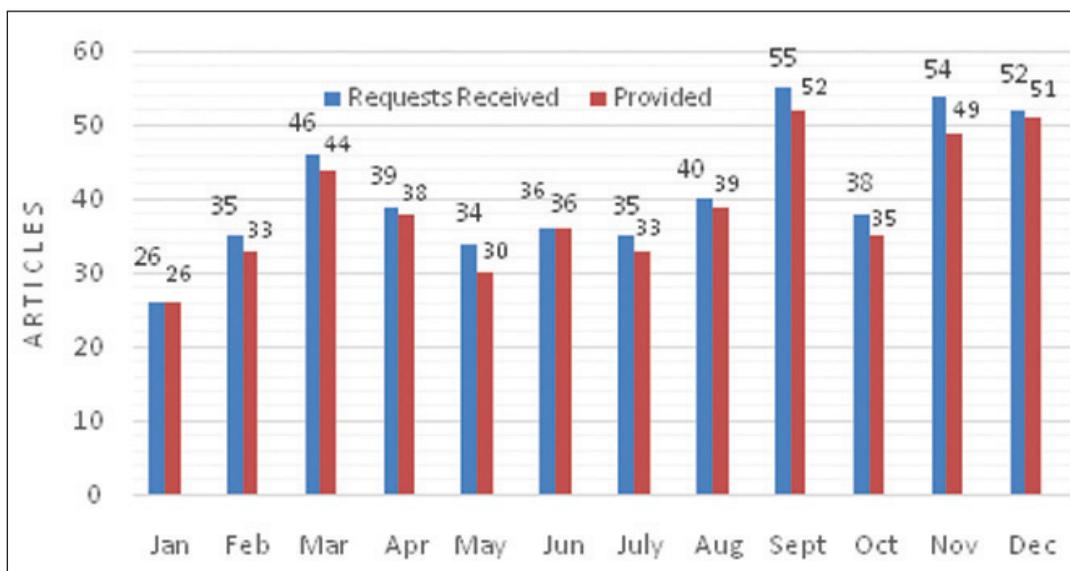
The library has enabled trial access to 'QuinSight' online search platform during the reporting year. As a quality check measure of scientific submissions, similarity check online tool - Turnitin has been activated. The library continues to maintain staff publications records, and publishes the weekly publications of the Centre through 'Science Sparks @ ACTREC'. Services such as publication statistics, citations of publications, h-index, Impact Factor, authenticity of journals, open access models and APC, bibliographic services, reference and referral services are provided in anticipation and on demand throughout the year. Articles on request are one of its most availed services, through which the library has provided 466 articles against 490 requests during 2019. It has also provided 87 documents to government affiliated libraries and individual visitors.

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; this is a

regular and popular program. Apart from users' orientation, one-on-one discussions on literature search techniques, identification of authentic information resources, group discussions on search strategies, research metrics, Impact Factor, h-Index, bibliography management tools and Turnitin are organized by the library; 84 individuals were benefited by the services that focus mainly on the use of online tools and resources. Special sessions on nursing information resources, review of literature, and

search strategies were conducted for nursing students as a part of their curriculum.

As an academic program, the library organized a one day workshop on – Academic Integrity in Research: Tools and Techniques and two-day national conference on – Scholarly Communication and Scientometrics in the month of November 2019 and published the conference proceedings volume. The library staff participated and presented 4 papers in 3 national conferences and published 1 paper in national journal.



Article requests received and provided during 2019



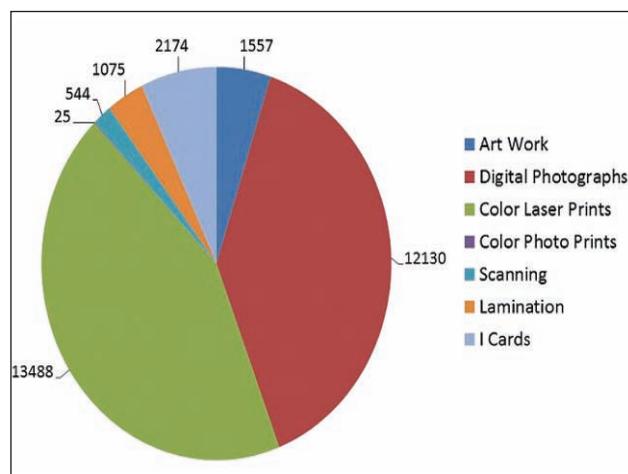
Photography

Officer-In-Charge: Dr. Satish Munnolli

In-Charge: Mr. Shyam Chavan

Photography section of ACTREC provides support to the scientific / medical staff and students towards photo-recording of their experimental studies and results. The state-of-the-art facility has high end digital cameras to record the images & to get visual clues to research activities. Using the advanced desk top publishing software, this section handles design, printing and display of announcement brochures/flyers, banners, programs, letterheads, invitation cards, envelopes, badges, certificates, posters, workshop protocols / abstract books and others for the scientific meetings viz., conferences, workshops as well as cultural events organized at ACTREC. The section also assists in the preparation of poster / slide presentations for scientific users' community, and handles printing of identity cards for the security and administrative services. The section takes photographs of the campus, functional groups, and infrastructure of the Centre, carefully archives all the images, and provides them for use in the Centre's print publications, audiovisual presentations, website and management for administrative and presentation purpose. The section assists users in handling the presentation equipment in the seminar / conference / meeting

/ board rooms and mini auditorium. During 2019, the facility provided photographic support for 63 events held at ACTREC (national and international events, workshops, conferences & other programs) including Art work for CRI, CRC and CCE departments with Digital photographs, color laser prints, Photo printing, lamination and scanning.



Type of work provided in 2019



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 maintained a close liaison with core infrastructure groups of the centre for support and functioning of all the scientific and other meetings and seminars at ACTREC, and closely supervised over the steno pool's handling of venue bookings and dissemination of information about in-house seminars and meetings through emails/circulars. Staff of the Cell handled routine maintenance and updates of Principle Investigators' webpages, conference webpages, as well as JRF intake related uploads and routine uploads of tenders and advertisements on to the centre's website. On 20th November 2019, the new website of ACTREC (bilingual) with six applications was launched by the TMC - Director, comply Security audit, STQC certification, Quality check, GIGW (Guidelines for Indian Government Website) norms and SSL certification.

Professional Education:

The Centre's doctoral program is its prime academic endeavor. In support of the Centre's

doctoral program, the Cell efficiently handled the intake of JRF 2019 students for the doctoral program. In collaboration with TCS, online entrance exam was conducted at 6 major cities of the country – New Delhi, Indore, Kolkata, Chennai, Mumbai and Pune for the preliminary selection of students for the research program. With the coordination of the Academic Committee, staff of the Cell was involved in finalization of the Advertisement for JRF call against 14 projects, and pre-screening of applications with support from the Steno Pool. Overall, 1312 applications were received in the first round and 107 applications in the 2nd round. The applications were filtered as per the set criteria, coordinated with TCS for conducting the online exam, declaration of final results and conducting interviews, up to the final selection of JRF students. Staff of the SCOPE Cell also ensured the smooth conduct of the academic coursework for the fresh batch of students, involving schedule preparation, conduct of orientation and laboratory visits, handling PI lab choices, timely conduct of the core course/ elective lectures and exams, seeking elective choices, Doctoral Committee formation, 1st year seminar presentation, correcting papers, collating

marks and preparing final mark sheets/ transcripts. Based on guidelines from the Academic Committee, the SCOPE Cell planned and conducted Friday Seminars for research scholars at ACTREC.

In support of the Centre's training program, Staff handled the Trainees intake procedures, and provided all the backing for smooth training in students' select lab and handled the activities till the end of training program. In 2019, 251 Trainees (96 dissertation trainees, 72 experience trainees, 34 summer trainees, 44 observers, 4 collaborative trainees and 1 Research Associate trainee) were allocated to senior and mid-level faculty/ staff of the Centre.

During 2019, the Cell also provided logistics for four educational visits for students from different colleges, institutes and universities as a part of their academic tour program. The groups were LTMT Fellowship students (August 2019), N.B. Mehta Science College, Bordi (September 2019), DAE's All India Essay Contest Finalists (October 2019) and Government College of Arts, Science and Commerce, Khandola, Goa (December 2019). The cell, supported by the ACTREC events committee, coordinated and conducted the Centre's Open Day (November 28-29, 2019) that drew ~ 490 students and 32 accompanying faculty from 29 colleges / research institutions of Mumbai and Navi Mumbai.





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. HKV Narayan, Dy. Director, ACTREC
Members	Dr. Navin Khattry, Dy. Director, CRC-ACTREC Dr. Prasanna Venkatraman, Dy. Director, CRI-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, Dy Director, CRC-ACTREC
Co-Chairperson	Dr. Prasanna Venkatraman, Dy Director, CRI – ACTREC
Member Secretary	Dr. Tanuja Teni, SO 'G'
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. Shubhada Chiplunkar, Director, ACTREC
Member Secretary	Dr. Arvind Ingle
Members	Dr. Neelam Shirsat Dr. Sanjeev Waghmare Dr. Rahul Thorat 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. Shubhada Chiplunkar, Director, ACTREC
Member Secretary	Dr. Manoj Mahimkar, Basic Scientist
Members	Dr. Sanjay Gupta, Internal Expert Dr. Pritha Ray, Internal Expert Dr. Sanjeev Waghmare, Internal Expert Dr. Shashank Ojha, Biosafety Officer Dr. Shubha Tole, TIFR - DBT Nominee Dr. Geetanjali Sachdeva, NIRRH - Outside Expert

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.

Chairperson	Dr. Sudeep Gupta, Director, ACTREC
Member Secretary	Dr. Navin Khattry, Dy. Director CRC-ACTREC
Members	Mr. U. V. Mote, Sr. A.O. ACTREC Dr. Vedang Murthy, OIC, Dept. of Radiation Oncology, ACTREC Dr. Pradip Chaudhari, CRI, ACTREC Dr. Swamidas Jamima, CRC, ACTREC Ms. Reena Devi, 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.

Convener	Dr. Sorab Dalal
Members	Dr. Rukmini Govekar Dr. Sanjay Gupta Dr. Prasanna Venkatraman Dr. Ashok Varma Dr. Abhijit De Dr. Shilpee Dutt

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.

Chairperson	Dr. Meera Achrekar, Prof. & Dy. Nursing Supdt, ACTREC
Members	Dr. Arvind Ingle, OIC Lab Animal Facility & Scientific Officer 'G', ACTREC Dr. Prafulla Parikh, Asst. Prof., General Medicine, ACTREC Dr. Rukmini Govekar, Scientific Officer 'F', ACTREC Mrs. Bhagyashree Tillu, Medical Social Worker, ACTREC Mr. VK Singh, Jr. Administrative Officer (EM), 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.

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 Committees

Grievance Committees have been constituted to redress the grievances of all regular staff as well as of temporary staff, registrars and students working at ACTREC, TMC.

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

- Ms. Amogh Auti (Sarin Lab)
- Mr. Aiyas Mujawar (De Lab)
- Mr. Siddharth Barua (Varma Lab)
- Mr. Sanket Desai (Dutt Lab)
- Mr. Akash Deogharkar (Shirsat Lab)



Institutional Ethics Committee III

TMC IEC – III (ACTREC)

Member Secretary: Dr. Prafulla Parikh

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 **1st April 2018 to 31st March 2020**.

The committee has met 98 times in the past 11 years and 379 projects have been discussed till December 2019. 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.	IEC-III Registration No. ECR/149/Inst/MH/2013/ RR-19	Affiliation	Gender	Expertise
1.	Dr. Rita Mulherkar Chairperson	Former Scientist, Genetic Engineering Unit, ACTREC	Female	Basic Scientist Basic Medical Scientist
2.	Dr. Nirmala Jambhekar Co-Chairperson	Former Professor & Head of the Department of Pathology at Tata Memorial Hospital	Female	Clinician (Pathology, Basic Medical Scientist)
3.	Dr Prafulla Parikh Member Secretary	Assistant Professor, General Medicine 'F' ACTREC	Female	Physician

Sr. No.	IEC-III Registration No. ECR/149/Inst/MH/2013/ RR-19	Affiliation	Gender	Expertise
4.	Dr. Padmaja Marathe Member	Prof.(Additional), Dept of Pharmacology and Therapeutics, Seth GS Medical College and KEM Hospital, Parel, Mumbai 400 012	Female	Clinical Pharmacologist (Basic Medical Scientist)
5.	Mrs. Deepa Ramani Member	Ex-play group teacher, store and purchase in-charge	Female	Layperson
6.	Mrs. Lakshmi. R. Member	Co-ordinator, Sanjeevani life beyond cancer, Mumbai. Trust	Female	NGO Representative
7.	Dr. B.B. Singh Member	Advocate, Mumbai High Court	Male	Legal Expert
8.	Dr. Tanuja Teni Member	Principal Investigator, Scientific Officer 'G', ACTREC	Female	Basic Scientist
9.	Dr. Supriya Chopra Member	Professor, Radiation Oncologist 'F', ACTREC, TMC	Female	Radiation Oncologist
10.	Dr. Reshma Ambulkar Member and DSMU Member Secretary	Professor, Anesthetist 'F', Dept. of Anesthesia, ACTREC, TMC	Female	Anesthetist
11.	Dr. Amita Maheshwari Member	Professor, Gynaecologic Oncologist, Dept. Of Gynaecologic Oncology, Tata Memorial Hospital, TMC.	Female	Surgeon
12.	Dr. Punit Jain Member	Consultant Hematologist/ Hemato-Oncologist & Bone Marrow Transplant Physician, Apollo Hospitals, Belapur, Navi Mumbai	Male	Clinician (Medical Oncology)
13.	Dr. Shilpee Dutt Member,	Principal Investigator, Scientific Officer 'F', ACTREC	Female	Basic Scientist
14.	Dr. Bhausheb Bagal Member	Associate Professor, Dept. of Medical Oncology, Tata Memorial Hospital, TMC.	Male	Medical Oncologist

Other staff members

Sr. No	Name and Designation
1	Ms. Kasturi Awatagiri, Clinical Trial/IEC Coordinator
2	Mr. Bhavesh Bandekar, DSMU Coordinator
3	Ms. Nilam Sawant, Administrative Assistant

Regulatory Registration:

- TMC IEC-III was re-registered with DCGI under Rule 122DD vide registration no. **ECR/149/Inst/MH/2013/RR-19** on 21st April 2019 and it is valid up to 20th April 2024.
- 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.

IEC-III Performance 2019

The committee conducted 12 full board committee meetings in 2019 for meticulous scrupulous examination of the scientific and ethical contents of submitted projects, owing to which 63 new projects and 08 old projects from 2018-2019 were examined.

Table 1: Review type

Review type	2018	2019
Full Board	24	37
Expedited	6	26
Exempted	0	0
Total	30	63

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

Full board review	2018	2019
Approved	14	20
Approved with modification	1	8
Resubmit	7	7
Not approved	2	1
Withdrawn by PI	0	0
Deferred	0	1
Under review process	0	0
Review exempted	0	0
Total	24	37

Table 3: IEC decision on expedited review projects

Expedited projects	2018	2019
Approved	6	20
Revision with minor modification	0	4
Revision with major modification	0	2
Total	6	26

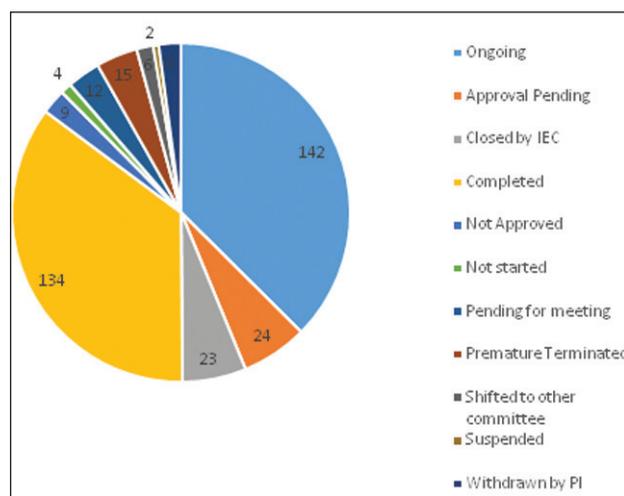
Table 4: IEC decision on projects carried forward previous years

Projects carried forward	2018	2019
Approved	9	4
Resubmitted	0	1
Closed by IEC	0	1
Revision with minor modification	0	1
Withdrawn by PI	0	1
Exempted from review	0	0
Total	9	8

Table 5: Summary of the source of funding

Source of funding	2018	2019
IM	6	13
EM	7	2
IM + EM	7	5
Pharma	1	0
Others	0	0
Non-funded projects	9	43
Total	30	63

Overall summary of project status (n= 379)



Achievements

- **Accreditation:** IEC III has been resurveyed by SIDCERFERCAP (International agency) and NABH in 2019.

Education

- Expedited Review of submitted Protocol/ documents SOP 4b (Version 5.0 03rd Oct 2018)
- ICF Review
- Key changes in New Drugs and Clinical Trial Rules 2019
- Academic Clinical Trial
- IEC SOPs training

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

Principal Investigator (PI)	Project Title
Dr. Abhishek Mahajan	Retrospective Audit of the Deep Inferior Epigastric Artery Perforator (DIEP) Flap Imaging With CT Angiography in Breast Reconstruction.
Dr. Abhishek Mahajan	Second Opinion Interpretations by Specialty Radiologists in Head and Neck Oncology and its Impact On Clinical Management.
Dr. Amita Maheshwari	Diagnostic Performance of Magnetic Resonance Imaging in patients with Operable Cervical cancer: a Retrospective Study
Dr. Bharat Rekhi	Clinicopathologic features of a Series of Pleomorphic Liposarcomas from a Tertiary Cancer Referral Center in India
Dr. Bharat Rekhi	Clinicopathological features, including immunohistochemical and molecular landscape of select liposarcomas from a tertiary referral center in India.
Dr. Bhausahab Bagal	Phase 2 Study To Evaluate The Efficacy Of Lenalidomide Maintenance In Primary Cns Lymphoma
Dr. Bhausahab Bagal	Real World Indian Experience With Pomalidomide In Relapsed Refractory Multiple Myeloma - A Retrospective Study
Dr. Gaurav Narula	Exploring the role of indigenously developed Chimeric Antigen Receptor (CAR) modified T- Cells in the therapy of relapsed/refractory B-cell Acute Lymphoblastic Leukemia ineligible for Stem Cell Transplantation- 2nd Stage of a Multi-stage Project
Dr. Hasmukh Jain	Outcomes in adolescent and young adult acute lymphoblastic leukemia- a multicenter retrospective study.
Dr. Hasmukh Jain	Sequential treatment of Arsenic Trioxide followed by All Trans Retinoic acid with anthracyclines in Acute Promyelocytic Leukemia- Retrospective analysis
Dr. Jamema Valpapuram	Automated IMRT/VMAT Treatment Planning solutions for Common disease sites in Radiotherapy.
Dr. Jyoti Kode	Study of stem cell niche favoring immune evasion and maintenance of leukemia supportive microenvironment in Acute Myeloid Leukemia

Principal Investigator (PI)	Project Title
Dr. Kedar Deodhar	Morphological spectrum and clinicopathological correlation in Appendiceal mucinous neoplasms and Pseudomyxoma peritonei: Retrospective histopathology review of cases seen at our institution between Jan 2012-June 2019
Dr. Lingaraj Nayak	Hodgkin lymphoma in adolescent and young adults(AYA) : Retrospective analysis from a single tertiary cancer center in India.
Dr. Maya Prasad	A retrospective study to gather a gender specific reference data for mid arm circumference of pediatric cancer patients of developing country for assessment of malnutrition
Dr. Meenakshi Singh	Impact of HLA typing resolution on donor selection and transplant outcomes in matched Allogeneic Hematopoietic Stem Cell Transplantation.
Dr. Mukta Ramadwar	Histomorphological spectrum of INI 1 deficient tumours.
Dr. Munita Bal	A clinicopathologic study of Anaplastic Thyroid Carcinoma
Dr. Nehal Khanna	Outcomes of Radiotherapy for High Risk Neuroblastoma
Dr. Nilesh Sable	A retrospective analysis to estimate diagnostic accuracy of PIRADS v2 in identifying clinically significant adenocarcinoma prostate in patients having undergone multiparametric MRI and biopsy, in a tertiary cancer referral institute
Dr. Nilesh Sable	Response assessment of TKI therapy in Metastatic RCC
Dr. Nitin Shetty	To evaluate the role of interventional radiology (IR) in the management of post Whipple's complications
Dr. Prasanna Venkatraman	Insights into the role of an oncoprotein PSMD10 in regulating TNF- α ; induced NF-kB activation and cell death
Dr. Prasanna Venkatraman	Per residue contribution of EEVD decamers in Gankyrin interaction - A strategy to improve EEVD inhibiting ability.
Dr. Pritha Ray	Investigating key molecular signatures in Indian cohort of Gastric Cancer patients – a pilot study
Dr. Priti Desai	An audit of cryoprecipitate transfusion practices in a tertiary care oncology centre

Principal Investigator (PI)	Project Title
Dr. Rajiv Kumar	Performance assessment of a portable Whole Slide Imaging (WSI) system versus dynamic non-robotic tele-pathology system for intraoperative frozen section diagnosis
Dr. Rajiv Sarin	Dosimetric Audit of Breast cancer patients treated with postmastectomy Radiotherapy at a Tertiary cancer centre.
Dr. Santosh Menon	To compare and identify discrepancies in referral vs In-house diagnostic pathology reports in patients referred for urothelial Carcinoma and its Impact on Management
Dr. Shailesh Shrikhande	Preoperative Albumin-Globulin Ratio (AGR) in Patients Undergoing Pancreato-duodenectomy: Predictor of Perioperative Morbidity or Prognosticator of Long Term Outcomes?
Dr. Shilpee Dutt	Understanding molecular mechanisms of therapy resistance in glioblastoma using pre-clinical orthotopic mouse model
Dr. Shiva Kumar Thiagarajan	Importance and implications of MRI findings of oral tongue squamous cell carcinoma (OTSCC) on staging and prognosis.
Dr. Sneha Shah	Role of dynamic risk stratification of differentiated thyroid carcinoma in pediatric population.
Dr. Sridhar Epari	Epithelioid glioblastoma: Correlation of BRAFV600E mutation with histomorphological features
Dr. Sumitra Bakshi	Role of gabapentinoids in post-operative pain management in thoracic surgeries: a propensity case- matched audit.
Dr. Syed Hasan	Genetic and functional characterization of high risk acute promyelocytic leukemia
Dr. Tanuja Teni	Evaluating the Role of Activins / Inhibins & their Regulation by p53 / p63 in Migration & Invasion of Oral Cancer Cells
Dr. Tanuja Teni	Evaluating the tumor suppressor role of Clusterin and the functional impact of its novel nucleolar localization in oral cancers.
Dr. Tejpal Gupta	Glioblastoma in the Elderly: adjuvant therapy outcomes (Elderado study)
Dr. Tejpal Gupta	Salvage Therapeutic Re-irradiation In Progressive/Recurrent Ependymoma (STRIPE)

Principal Investigator (PI)	Project Title
Dr. Tushar Vora	Survival Outcomes with non-dose dense chemotherapy for Ewing Sarcoma - a retrospective analysis
Dr. Vedang Murthy	Retrospective Analysis of Outcomes in Patients of Prostate Cancer treated with Stereotactic Body Radiation Therapy
Dr. Venkatesh Rangarajan	Clinical and radiological outcomes of curatively treated non-metastatic colorectal cancers when 18F-FDG PET-CT is negative in a scenario of rising CEA
Dr. Vikram Gota	A randomized controlled trial of therapeutic monitoring-based dosing strategy versus standard dosing strategy of sunitinib in metastatic renal cell carcinoma



Data Safety Monitoring Unit DSMU- III, ACTREC

Member Secretary: Dr. Reshma Ambulkar

The Data Safety Monitoring Unit (DSMU) is 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 April 2018 to 31st March 2020) is given below:

Sr. No.	Names	Affiliation	Gender	Expertise
1	Dr. Reshma Ambulkar, Member Secretary	Professor, Dept. of Anaesthesia, Critical Care and Pain, ACTREC.	Female	Clinician
2	Dr. Jayant Goda, Joint Secretary	Professor, Dept. of Radiation Oncology, ACTREC	Male	Clinician Scientist
3	Dr. Vikram Gota, Member	Associate Professor and Scientific Officer 'F', Dept. of Clinical Pharmacology, ACTREC	Male	Clinical Pharmacologist
4	Dr. Jyoti Kode, Member	Scientific Officer 'F', Chiplunkar Lab, ACTREC	Female	Basic Scientist
5	Dr. Shalaka Joshi, Member	Associate Professor, Dept. of Surgical Oncology, Tata Memorial Hospital, Parel, Mumbai 400012.	Female	Surgeon
6	Dr. Sachin Punatar, Member	Assistant Professor, Dept. of Medical Oncology, Tata Memorial Hospital, TMC.	Male	Clinician
7	Dr. Malini Joshi, Member	Professor, Dept. of Anaesthesia, Critical Care and Pain, ACTREC	Female	Clinician

Sr. No.	Names	Affiliation	Gender	Expertise
8	Dr. Vijay Patil, Member	Associate Professor, Dept. of Medical Oncology, Tata Memorial Hospital, TMC	Male	Clinician
9	Dr. Amit Dutt, Member	Scientific Officer 'F', ACTREC	Male	Basic Scientist
10	Dr. Ashok Varma, Member	Scientific Officer 'F', ACTREC	Male	Basic Scientist

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

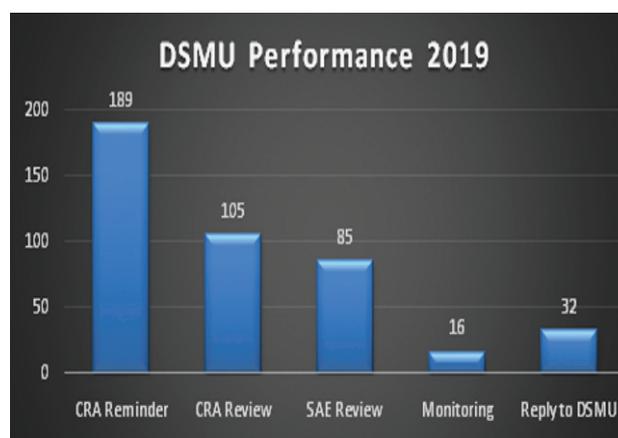
DSMU activities (2019)

The DSMU conducted 12 meetings during 2019, 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 16 site monitoring visits, 85 SAE reports reviewed and sent 189 reminders to PIs for Continue Review Application submission as required. A detailed initial review of 105 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 present the minutes of DSMU meeting to IEC for further action. Sixteen monitoring reports were discussed in the full board and based on IEC comments, recommendation and query letters were issued to PIs. In all, 32 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.

Academics at ACTREC

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. S V Chiplunkar, 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.



During 2019, 111 graduate students were enrolled into the Centre's Ph.D. program; these

included the new batch of 14 students of the JRF 2019 batch (see previous page photograph).

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

During the year 2019, 6 students completed research towards their doctoral dissertation and were awarded the Ph.D. degree (see the tabulation that follows).

Sr. No.	Name of the student	Thesis title
1	Mr. Bhawik Kumar Jain Dr. Dibyendu Bhattacharyya	Study to investigate the mechanism that controls cisternal stacking in Golgi apparatus.
2	Ms. Jacinth Dr. Shilpee Dutt	Understanding therapy resistance in Glioblastoma using proteomics approach.
3	Ms. Prasanna Iyer Dr. Dibyendu Bhattacharyya	Investigating possible role of a Golgi resident PtdIns4P effector, an oncogenic homolog in Golgi size control mechanism.
4	Mr. Sajad Bhat Dr. S. V. Chiplunkar	Epigenetic regulation and anti-tumor effector Functions of Gamma Delta ($\gamma\delta$) T cells.
5	Mr. Moqitul Haque Dr. Rajiv Sarin	Molecular pathways in the origin of diverse tumors in individuals with germline TP53 mutation (Li Fraumeni Syndrome).
6	Ms. Arunabha Bose Dr. Sorab Dalal	Regulation of centrosome duplication by 14-3-3 proteins and its consequences for regulating neoplastic progression

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 251 participants during 2019, of which 96 trainees worked for their dissertation, 4 were on collaborative projects, 72 trainees came for research experience, 44 were observers, 1 was Research Associates and 34 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 find 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. Presently the fourth batch of AMLT comprising of three students is undergoing training, and started coursework in January 2019. 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.

During 2019, four educational visits were arranged. Eleven LTMT Fellowship students from various parts of the country visited the facilities of the centre in August 2019. As a part of their academic tour of research institutes, a group of 30 students along with the faculty from the Department of Biotechnology, N.B. Mehta Science College, Bordi, visited ACTREC in

September 2019. Every year, finalists of 'DAE's All India Essay Competition' tour ACTREC and in October 2019, 37 students visited different departments and facilities. In December 2019, 27

students and 5 faculty members from Government College of Arts, Science and Commerce, Khandola, Goa, visited the Microbiology department at ACTREC.





Clinical Research Secretariat -ACTREC

Officer-In-Charge: Dr. Jayant Sastri Goda

Data Manager 'E': Mrs. Sadhana Kannan

Overview

Clinical Research Secretariat (CRS) has a mandate to provide clinical and basic researchers at ACTREC, support for research activities including research methods, operations, training and education. The vision is to become a vital cog in the wheel for clinical research at Tata Memorial Centre and to uphold its 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.

Key quality indicators

Service provided	Number of studies	Status
Statistical consultation for design of the studies	75	Completed
Consultations for sample size estimations	25	Completed
Consultations for data analysis	120	Completed
Studies in which CRS is taking part in randomization of subjects	22	On- going
Studies in which CRS is taking part in data management	6	On-going

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 14 publications in the year 2019.

Education

The CRS has been involved in teaching biostatistics to the doctoral students of Life Sciences, M.Sc. Nursing students of the TMC and

the junior residents of Radiation Oncology of TMH. In 2019, a post-graduate diploma course in Biostatistics has been started. Four students [Life Sciences] were trained for a period of 6 months on the Module-Statistical methods in clinical research. The lead statistician (Mrs Sadhana Kannan) is pursuing Ph.D. in Health Sciences. On-the job training was also imparted to junior statisticians of CRS-TMH. Two students (IIPS & MIT, Manipal) pursuing their M.Sc. Biostatistics underwent internship for a period of three months. One staff from Indian Cancer Society was also offered one month training at CRS during the year 2019.

Open Day 2019



In 2019, ACTREC's Open Day was organized between 28th and 29th November. In these two days, over 490 students along with 32 faculty members from 29 science degree colleges from Mumbai and Navi Mumbai visited ACTREC. The students and faculty got an exposure to functioning of the state-of-the-art research laboratories and sophisticated clinical facilities along with the orientation on research and career opportunities in Life Sciences. The program

included an introductory talk about the overview and research activities of the centre followed by visits to six research laboratories of CRI and two clinical facilities of CRC, where cancer research, diagnosis and treatment modalities were demonstrated with experiments. The visiting college groups benefited from the Open Day and dispersed with clear ideas about the functioning of a Centre that executes research, treatment and education programs in Cancer.

15th National Research Scholars Meet (NRSM 2019)



The 15th National Research Scholars Meet was held at ACTREC between 5th and 6th December 2019. The students of ACTREC who organize this event every year with flair and enthusiasm bring the best of speakers from across the country and sometimes internationally. To name a few, eminent scientists from different institutes who have graced the NRSM hall of fame over these years are- Padma Bhushan, Prof. P. Balaram (Director, IISC), Prof. Satyajit Mayor (Director, NCBS), Prof. M. G. Deo (Vice President, Moving Academy of Medicine and Biomedicine), Prof. Rajesh Gokhale (Director, IGIB), Prof. Jayanth Udgaonkar (IISER, Pune) and many more.

In 2019, our esteemed Chief Guest was **Padma Vibhushan, Prof. Jayant Narlikar** (IUCAA Pune), and the other eminent speakers were Shanthi Swaroop Bhatnagar Awardee Prof. Niyaz Ahmed (ICDDR), Prof. Ganesh Nagaraju (IISc), Prof. Thangarajan Rajkumar (WIA, Adyar), Prof. Umesh Varshney (IISc), Prof. Sathees Raghavan (IISc), Prof. Gautam Basu (Bose Institute, Kolkata) and Dr. Camilla Rodrigues (Consultant Microbiologist, Hinduja Hospital).



For the 15th NRSM meeting, the organizers had chosen a provocative theme- “**Need of the hour: To seek New Doors or Knock the ones in sight**”. The aim was to induce a healthy debate on an important issue that affects students directly or indirectly: a) should the scientific community work on novel thought-provoking ideas out of sheer curiosity, an aspect that laid the foundation for modern science or b) should they delve deeper into well-studied concepts which have the tendency to open up new dimensions and overturn accepted norms? For a developing country like India where unique vision is necessary for policy-making that affects all the stakeholders especially the students, a healthy debate which highlights the importance of both aspects of science is indeed the need of the hour! While it is natural to expect that the money invested in research funding is well spent and new discoveries are made that has a ready impact on society, can all academic institutes where research activities are primarily harnessed by young students be indirectly burdened with such pressure? Whether willingness to focus directly

on human health be prioritized over the issue of whether we truly understand what we 'know', a wisdom necessary to tackle all complex human diseases?

The meet began with a welcome address by Director ACTREC, Dr. Sudeep Gupta, and Guest of honor Prof. P.R. Vasudeva Rao (Vice-Chancellor, HBNI). Subsequently, the abstract book was released by the Director, Guest of honor, Deputy Director-CRC, [Dr. Navin Khattry] and Deputy Director-CRI [Dr. Prasanna Venkatraman].

The series of lectures started with the Chief Guest, Prof. Jayant Narlikar who delivered an excellent talk explaining the way astrophysics expanded to involve astrochemistry and that later included astrobiology and the future search for extraterrestrial life. The plenary speaker, Prof. Umesh Varshney from IISc spoke about the role of initiator tRNA in the regulation of ribosome maturation. There was a special talk by Prof. Gautam Basu from Bose Institute, Kolkata who spoke about the role of Art in Science.

NRSM 2019 featured stimulating oral and poster presentations by research scholars and post-docs from all over India. The highlights included; a pre-conference workshop on Science Communication (SciComm101) by India Alliance to hone the science communication skills of the participants, "Creative corner, an event for showcasing participants' talent in photography, painting, and poetry, and a musical evening that enthralled the participants followed by a banquet dinner.

There was a panel discussion on the provocative theme of the meet and the panelists were; basic scientists, clinicians, alumni, and researchers who shared their views on the two important aspects of the theme. The two-day conference ended with the valedictory function with a summary by the Deputy Director, Dr. Prasanna Venkatraman, distribution of awards to the winners of the creative corner, oral and poster presentation and a vote of thanks by the organizers. The 15th NRSM proved to be a successful event, aimed to enhance communication among research scholars, scientists and clinicians to ultimately benefit society as a whole.



Conferences, Workshops & Seminars at ACTREC

7 January - 22 February	DBT-BTIS (NER) Workshop Organizer: Dr. Ashok Varma, ACTREC
11-13 January	7 th Annual MPAI Conference Organizer: Dr. Amit Dutt, ACTREC
9 February	Patient Navigation Program – KEVAT lecture Mr. Pranay Kadam
26 February	GCP Workshop Dr. Vikram Gota, ACTREC
1-2 March	EBM Conference Dr. Nikhil Patkar, ACTREC
28 March	CNE for Nurses Dr. Meera Achrekar, ACTREC
24 April	Training Programme on Conducting Systematic Literature Review Workshop Dr. Meera Achrekar, ACTREC
11 – 12 May	Indian Myeloma Congress 2019 Conference Dr. Navin Khattry, Dy. Director, CRC, ACTREC
23 May	JASCAP DAY Dr. Navin Khattry, Dy. Director, CRC, ACTREC
7 June	TMC – BARC conclave
16 July	Clinical Pharmacology Symposium Dr. Vikram Gota, ACTREC
17-19 July	The 11 th PAGIN Workshop 2019 Dr. Vikram Gota, ACTREC
22-26 July	Workshop on “Advanced Molecular Biology Techniques and Bioinformatics” Dr. Neelam Shirsat, ACTREC
26-27 July	5 th meeting of the SRG Expert Committee Dr. Amit Dutt, ACTREC

3 August	CNE for Nurses Dr. Meera Achrekar, ACTREC
24 August	CNE for Nurses Dr. Meera Achrekar, ACTREC
15 Sept	Mumbai ACORD 1-day Concept Development Workshop Dr. Navin Khattry, Dy. Director, CRC, ACTREC
21 Sept	CNE for Nurses Dr. Meera Achrekar, ACTREC
27 – 28 Sept	DST SERB Biomedical & Health Science (BHS) 2 nd PAC Meeting Dr. Rajiv Sarin, PI Sarin Lab
17 – 18 Oct	CME Dr. Prashant Tembhare, ACTREC
19 Oct	CNE for Nurses Dr. Meera Achrekar, ACTREC
31 Oct – 2 Nov	2nd UK-India Cancer Bioinformatics Workshop along with Dr. Anita Grigoriadis group, King's College London, UK Dr. Amit Dutt, PI Dutt Lab
13 Nov	CME by BioRad Dr. Preeti Chavan, OIC, Composite Lab
21 – 23 Nov	'8th National Conference on Scholarly Communication and Scientometrics' (IOS 2019) Dr. Satish Munnoli, OIC, Library & Scope Cell, ACTREC
23 Nov	CNE for Nurses Dr. Meera Achrekar, ACTREC
28 – 29 Nov	Open Day
29 Nov	Medico Legal Workshop Dr. Prashant Bhat, Medical Superintendent, ACTREC
30 Nov - 1 Dec	15 th Annual Surgical Oncology Workshop – Oncosurg 2019", Live Relay from Prof. R.D.Choksi Auditorium, Tata Memorial Hospital Dr. Ashwin Desouza, Associate Professor & Organizing Secretary, Oncosurg 2019
5 – 6 Dec	15th National Research Scholars' Meet (NRSM)
9 – 10 Dec	In vivo Preclinical Imaging and Drug Discovery Workshop Dr. Pradip Chaudhari, PI Small Animal Imaging Facility, ACTREC

11 – 15 Dec	ICGCW2019 Conference Dr. Rajiv Sarin, PI Sarin Lab, ACTREC
14 Dec	CNE for Nurses Dr. Meera Achrekar, DNS, ACTREC
28 Dec	Free Ostomy Camp Dr. Meera Achrekar, DNS, ACTREC

Special Events/Orations

4 February	Program organized on occasion of World Cancer Day Ms. Bhagyashree, MSW, ACTREC
11-16 February	Nursing Staff to conduct competition Dr. Meera Achrekar, ANS
9 May	TNAI to celebrate Nurses Day Dr. Meera Achrekar, DNS
14 May	Nurses' Day Oration 2019 "Cancer Immunotherapy: Opportunities and challenges" Dr. Meera Achrekar, DNS
17 May	Science and Society Orations : "The agrarian crisis and inequality" Shri Palagummi Sainath, Journalist and Reporter, Founder Editor – People's Archive of Rural India, Chennai
14 June	Cycle rally and world blood donor day program at ACTREC Dr. Shashank Ojha, Associate Professor & OIC, Department of Transfusion Medicine
17 Sept	Patient Safety Day at ACTREC Dr. Preeti Chavan, OIC, Composite Laboratory

Guest Seminars

11 January	Modeling treatment resistance in breast cancer Dr. Prasanna G. Alluri, Assistant Professor, Harold C. Simmons Comprehensive Cancer Center, UT Southwestern Medical Center at Dallas, US
11 February	Kinase Inhibitors; Major drugs for the 21 st century Prof. Philip Cohen, Professor of Enzymology and Co-Director of the Division of Signal Transduction Therapy (DSTT), University of Dundee, UK

18 February	<p>17p deletion: a therapeutic vulnerability for high-risk multiple myeloma patients Dr. Ram K. Singh, Post-Doctoral Fellow, Lymphoma and Myeloma Department, MD Anderson Cancer Centre, Houston, Texas, USA</p>
1 April	<p>Cullin4B-Ring E3 ubiquitin ligase regulates T cell expansion and function Dr. Asif Amin Dar, Post-Doctoral Research Fellow, Division of Protective Immunity, The Children's Hospital of Philadelphia, University of Pennsylvania, USA</p>
3 May	<p>The 2018 Nobel Prize: T cell costimulation and anti-tumor therapy Dr. Dipankar Nandi, Senior Scientist, Indian Institute of Science, Bangalore</p>
13 May	<p>Genomics and artificial intelligence Dr. Denis Bauer, Research Scientist, CSIRO Bioinformatics, Australia</p>
14 May	<p>Translational Genomics in B cell malignancies Dr. Samir Sunil Parekh, Associate Professor, Hematology-Oncology & Oncological Sciences, Icahn School of Medicine at Mount Sinai, Hess Center for Science and Medicine, New York</p>
2 August	<p>A Primer to The Cancer Genome Atlas (TCGA) Dr. Srikant Verma, Domain Team Lead, LABS, Persistent Systems, Pune and Dr. Santosh Dixit, Senior Scientist, Centre for Translational Cancer Research, Pune (CTCR, a joint initiative of Prashanti Cancer Care and IISER, Pune)</p>
19 August	<p>Epigenetics in cancer, disease and phenotype Dr. Aniruddha Chatterjee, Department of Pathology, Dunedin School of Medicine University of Otago, New Zealand</p>
22 August	<p>Picturing the future of healthcare through molecular imaging Dr. Sanhita Sinharay, Research Instructor/post-doc fellow, Cancer Systems Imaging, Univ. Texas MD Anderson Cancer Centre, USA & Visiting Scientist (in collaboration with MD Anderson), University of Tubingen, Werner Siemens Imaging Center, Germany.</p>
13 Sept	<p>Development of Activity-based Reporter Gene Technology (AbRGT) for Imaging of Protease Activity with an Exquisite Specificity in a Single Live Cell Dr. Sandanaraj S. Britto, IISER, Pune.</p>
27 Sept	<p>"Life-death decisions in cells & tissues: A mechanistic perspective" Prof. B. J. Rao, Indian Institute of Science Education & Research, Tirupati</p>

1 October	The Spatial Biology Revolution: development of spatially resolved technologies with unlimited multiplexing of RNA and Proteins for biobanked (FFPE) tissue samples (Digital Spatial Profiling, DSP) - Through Skype, Auditorium, 13th floor, Homi Bhabha Block, TMH, Parel Dr. Joseph Beecham, SVP, Nanostring USA
3 October	“When and Where to Divide to Conquer: Personalised Cancer Therapy using Integrative Biology Approach” Dr. Anguraj Sadanandam, Team Leader, Institute of Cancer Research (ICR), Royal Marsden Hospital (Honorary Appointment), London, UK
1 November	Clinical Next Generation Sequencing and its application in precision medicine Dr. Aditya Phatak, Director – PierianDx, Pune
17 Dec	“ Genetic interaction between BRCA1 and FANCM in stalled replication fork repair ” Dr. Arvind Panday, AACR Postdoctoral Fellow, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Center for Life Science, 3 Blackfan Circle, Boston, MA 02215
18 Dec	“Epigenetic changes: the navigator for cancer driver mutations” Dr. Hariharan Easwaran, Assistant Professor, The Sidney Kimmel Comprehensive Cancer Center, The Johns Hopkins University School of Medicine, US



Conference Reports

Workshop on Bioinformatics

Organizer: Dr. Ashok Varma, ACTREC



The Bioinformatics centre at ACTREC is partly supported by Department of Biotechnology – Government of India (DBT-GOI). In 2019, the Centre organized three-day lectures cum hands-on- training workshop on February 20-22, 2019 targeting academic faculty/research scholars and industry participants. The theme of the workshop was “Molecular profiling to therapeutic target identification”. Total 22 candidates participated in the workshop including Professors / lecturers and PhD students from Mumbai, Surat, Chennai and Kanpur. During the inaugural session, Dr

Varma informed the participants of the vision of DBT and TMC-ACTREC. He further elaborated that the purpose of this workshop was to provide training to professionals who could use this training and improve on the teaching and research in their home institution. The lectures were from scientists with expertise on basic bioinformatics, structural bioinformatics, molecular modeling and dynamics, next generation sequence analysis, and proteomics. The workshop was inaugurated by Prof. Rajesh Dikshit- Director, Centre for Epidemiology-Tata

Memorial Centre. The eminent invited speakers for the workshops were Dr. Geetanjali Sachdeva-NIIRH, Mumbai, Dr. Sangeeta Sawant, Pune University, Pune; Dr. Ajit Datar- Adjunct Professor, Khalsa College and Advisor, Shimadzu Analytical India Pvt. Ltd., whereas the in-house faculty were Dr. Ashok Varma coordinator Bioinformatics centre, Rukmini Govekar , co-coordinator, Dr. Amit Dutt, Dr. Neelam Shirsat, Dr. Pradnya Kowtal, Mr. Shashi Dolas and Mr. Nikhil Gadewal. All the

lectures were very informative to participants. On all three days, the morning session was for theoretical lectures and afternoon session was for hands-on-training on proteomics data analysis, molecular modeling and dynamics, next-generation sequence analysis of exome data, biological databases. We made sure that each participant gets an opportunity to perform the experiments. The workshop ended with concluding remark and distribution of certificates.

Training Program [North-East Region, India]

Organizer: Dr. Ashok Varma, ACTREC



The DBT funded “A DBT Biotechnology / Bioinformatics Training -Centre For Teachers & Research Scholars From The North-Eastern

Region And Other Underserved Regions Of India” organized two modules of training program. The first program was on module “Gene Cloning,

Protein Biochemistry, Structural Biology & Bioinformatics” on date January 21st – February 1st , 2019 for faculty & February 4th - February 15th for research scholars . This module of training programs was coordinated by Dr Ashok Varma, Principal Investigator, Varma lab and Coordinator DBT NER training program. In the 1st –module of training program, each participant have performed the gene cloning of different genes, and furthermore validated their product by DNA sequences. During protein purification, the participants used GST and Ni-NTA affinity chromatography to purify the protein from crude extract of bacterial system. Finally participants purified the protein using FPLC size exclusion chromatography, and learned the purification techniques to their best. Crystallization of the protein using sitting and hanging drop methods were performed by each participants. The participants themselves picked the crystal that they crystallized for X-ray diffraction analysis. One image of data was collected to provide training for indexing. Interpretation of the diffraction pattern obtained from crystal, and methods to solve the protein structure were also taught to

them. Further training on molecular replacement and refinement methods were also imparted. The participants were acquainted fully with different major equipment’s such as X-ray diffractometer, FPLC. Faculty and research scholars covering most of the states of north -eastern region and other regions actively participated in the program. The teaching level for faculty was such that, they would benefit and perform better research and teaching in their home institutions. The separate training for research scholars were provided considering different level of understanding of subjects. In addition to training module, participants got an access to other facility also to explore the knowledge on state of art facility available in ACTREC. The overall goal of this training is to help faculty/research scholars’ participants in developing new research project and also improve teaching. This is a unique training program supported by DBT to build skilled faculty/scientists in the country. The participants had sufficient opportunities to interact with other ACTREC faculty for future collaboration.



Hands-on Workshop on ‘Advanced Molecular Biology Techniques and Bioinformatics’

Organizer: Dr. Neelam Shirsat, ACTREC



A five-day hands-on workshop on “Advanced Molecular Biology Techniques and Bioinformatics” was held at ACTREC from 22nd - 26th July 2019. Dr. Neelam Shirsat and her laboratory personnel organized the workshop. The faculty included Dr. Ujjwala Warawdekar, Shirsat lab staff, and students.

The workshop included training in Good Laboratory Practices and Bioinformatics analysis. Bioinformatics comprised of; analysis of DNA sequence data, introduction to large databases like NCBI, ENSEMBLE, homology search, primer designing, restriction mapping, generating a map of vector & construct, analysis of DNA sequencing data obtained from Sanger sequencing, introduction to the Next-Gen Sequencing

technology and designing guide RNA for CRISPR mediated knock-out. Each of the participant was individually tutored and carried out the exercises in bioinformatics.

During the five days each participant personally performed a complete cloning experiment beginning with the preparation of genomic DNA, PCR amplification of the gene of interest, restriction digestion of the PCR product, its ligation to the vector, transformation of the ligation reaction into competent bacterial cells and finally extraction of the plasmid DNA construct that is the PCR insert cloned in the plasmid vector. The entire cloning experiment was performed successfully by almost all participants. Each participant also extracted RNA

from cultured cells and quantified it by nanodrop analysis and checked the quality of extracted RNA by agarose gel electrophoresis. All the participants were given a detailed protocol handbook.

Students and teachers from various colleges across the country, including Pharmacy colleges,

Veterinary colleges, and Medical colleges, participated in the workshop. A total of sixty-two participants; 13 assistant professors, 12 Ph. D. scholars, 13 post-graduate students, 21 B.Sc. students, two clinicians, and a couple of scientific assistants received the training. The workshop was an immensely satisfying experience for both the faculty and the participants.

Hands on Workshop on 'In vivo Preclinical Imaging and Drug Discovery'

Organizer: Dr. Pradip Chaudhari, ACTREC



A three day hands-on workshop on “In Vivo Preclinical Imaging and Drug Discovery” was held at ACTREC, during 9th to 11th December, 2019. The purpose of this workshop was to provide an insight to the drug development process and utility of non-invasive preclinical imaging

modalities in the discovery of new drug for clinical application. Twenty participants from all over the country, representing various pharmacy colleges, academic universities, R&D organizations of government and pharmaceutical industry, attended the workshop. The workshop was

inaugurated by Dr. Kurt Jacobson, Preclinical Division, Bruker Biospin Corporation followed by lectures by experts from Bruker, Visual Sonics, Fusifilm, Sonosite and Bio Emission Tech Sol. Day one of the workshop began with an overview, given by various speakers, of translational imaging modalities followed by demonstrations on animal handling, preparation of animals for imaging and administration of radiopharmaceuticals. On the second day a webinar was organized, where in Andrew Praagh from Spectral Instruments Imaging, Dr. Ruud Ramakers and Dr. Kim Braeckman from MI Labs, Germany gave details on advances in preclinical imaging modalities and oncology applications. Eminent speakers from pharmaceutical industry (BASF, SAFORD Inc) gave

in depth detailed talks on drug discovery and preclinical toxicology. There were demonstrations on image acquisition, processing and analysis using software such as PMOD, AMIRA and MicroView. On the final day there were webinars and talks on preclinical MRI, transgenic mouse models, animal ethics, radiation safety and regulatory issues and advanced image processing software. For this workshop participation from a total of twelve national and seven international faculty (Germany, Spain, Netherlands and Singapore), who delivered talks/webinars on various aspects of translational imaging and drug discovery was accomplished. All participants were given feedback forms to know the scope for further improvement for future events. The workshop ended with the valedictory function.



Staff Achievements

Acharekar, Anagha

- Best Oral Presentation Award: 'Differential mechanoresponsiveness of recurrent glioblastoma cells on softer substrate is the key to target them specifically', 15th National Research Scholars Meet (NRSM), ACTREC, Navi Mumbai, December 5-6, 2019.

Ambulkar, Reshma

- Local coordinator and Faculty for the SAFE OR Workshop to improve safety of surgery and anesthesia conducted in collaboration with LIFEBOX (4 international faculty) Tata Memorial Hospital, November 26-27, 2019.
- Anesthesia Consents in English, Marathi, Hindi and Bengali languages.

Bagdiya, Priyanka

- SPM CSIR award.

Banerjee, Archisman

- Best Photography: 'Monsoon Clouds', 15th National Research Scholars Meet (NRSM), ACTREC, Navi Mumbai, December 5-6, 2019.

Bharambe, Harish

- ROCHE scholar in Training, Best Oral Presentation Award: 'MiR-204 acts as a tumor suppressor and risk stratification marker in medulloblastoma', 38th Annual Convention of the Indian Association for Cancer Research, Chandigarh, March 1-3, 2019.

Bhattacharjee, Atanu

- Fellow of Royal Statistical Society, United Kingdom.

Bishnu, Aniketh

- Prof. V.C. Shah Prize for Best Paper Presentation: 'Hyper activated ERK1/2 kinase drives autophagy to promote survival of ovarian cancer cells at the onset of chemoresistance', XLIII All India Cell Biology Conference, IISER (Mohali), December 19-21, 2019.

Chaudhari, Pradip

- Member: Institutional Animal Ethics Committee- Dr. D.Y. Patil Medical College, Nerul, Navi Mumbai, Bharati Vidyapeeth College of Pharmacy, C.B.D. Belapur, Navi-Mumbai, Sa-FORD (A Division of Sharon Bio-Medicine Ltd.), Navi Mumbai.

Chilkapati, Murali Krishna

- Elected fellow of Maharashtra Academy of Sciences and Telangana Academy of Sciences.

Chiplunkar, Shubhada

- Chairperson: Institutional Committee for Stem Cell Research, National Institute for Research in Reproductive Health, Mumbai, 2015 onwards.
- Chairperson: Board of Studies (Life Sciences) HBNI, 2017-2020.

- Chairperson: Ad-hoc Board of Studies in Applied Biology, University of Mumbai, 2015 – 2020.
- President: Mumbai Immunology Group, 2018-2021.
- President: The Immuno-Oncology Society of India 2018 onwards.
- Member: Board of Governors , NIPER, Ahmedabad, 2018-2020.
- Member: Research Advisory Committee, NITTE University, Mangalore, May 2018-2020.
- Member: Academic Board of UM-DAE Centre for Excellence in Basic Sciences, Mumbai, May 2018 (3 Years).
- Member: RAP SAC , National Institute of Immunology, New Delhi, 2017 onwards.
- Member: Scientific Advisory Committee, National Institute of Biomedical Genomics (NIBMG), Kalyani, West Bengal, 2018-2021.
- Member: Scientific Advisory Committee for Systems Medicine Cluster Program (SyMeC), Kalyani, West Bengal, 2017 – 2020.
- Member: Expert Committee of Drugs and Pharmaceuticals Research Programme (DPRP), Department of Science and Technology, New Delhi, 2017-2020.
- Member: Department of Biotechnology Governing Board for the International Cancer Genome Project, 2017-2020.
- Chairperson and Member: Organizing and Scientific Committee at the 1st Immuno-Oncology India Congress I-OSICON 2019 on 'Immunotherapies in Cancer: Challenges in translating from bench to bedside', Tata

Memorial Hospital, Mumbai, March 15-17, 2019.

- Chairperson and Member, Organizing and Scientific Committee at the IMMUNOCON 2019 46th Annual conference of Indian Immunology Society, on at DAE Convention Centre, Anushakti Nagar, Mumbai, November 14-16, 2019.
- Chairperson, Mumbai Immunology Group- Lecture Series' at TSH, Anushakti Nagar, Mumbai. November 13, 2019.

Dalal, Sorab

- Member: Editorial board, Journal of Biosciences.
- Member: Editorial board, PLoS One.
- Member: Editorial board, Current Science.

Dcunha, Naythan

- FIMSA Bursary Award (Poster): "Study of stem cell niche favoring immune evasion and maintenance of leukemia supportive microenvironment in Acute Myeloid Leukemia", "Basic and Advanced Translational Immunology Course by IUIS-IIS-FIMSA", Rajasthan University of Healthy Sciences, Jaipur, October 12-16, 2019.

Dimri, Shalini

- Best Oral Presentation Award: 'A novel 'Phospho-STAT3 BRET' molecular sensor reveals non-canonical activation of STAT3 signaling in breast cancer', 7th Annual MPAAI (Molecular Pathology Association of India) Meeting , ACTREC, Navi Mumbai, January 12-13, 2019.

Deshpande, Nilesh

- First prize for Oral presentation: 'Novel markers- CD148, CD180 and CD200 in the differential diagnosis of B cell Non Hodgkins lymphoma involving peripheral blood and Bone marrow', 42nd annual conference of Mumbai Hematology, Mumbai, March 16-17, 2019.

Dutt, Shilpee

- Awarded Janaki Ammal- National Women Bioscientist Award 2019 (Young Category) from Department of Biotechnology, Government of India.
- Executive committee member of All India Congress of Genetics and Genomics (AICGG).

Gupta, Sanjay

- Member: Project Monitoring Committee for 'NSM Platform for Genomics and Drug Discovery', Centre for Development of Advanced Computing.
- Member: Editorial Board, Journal of Clinical Epigenetics.
- Editor: Associate, JOURNAL OF INTEGRATED-OMICS: A Methodological Journal.
- Editor: Associate, Journal of Radiation and Cancer Research.

Gujral, Sumeet

- Member of Technical committee of National Accreditation board for Testing and Calibration laboratories (NABL) in Medical testing.
- Member of drafting committee for NABL 112 standards document in hematology.

- Committee for ICMR Standard Operating Procedures (SOP's) on "Immunophenotyping of Hematolymphoid Neoplasms".
- Editorial Board of "Clinical Cytometry, Part B".
- Editorial Board of "Indian Journal of Cancer".
- Editorial Board of "Indian Journal of Pathology and Microbiology".
- Editorial Board of "National Journal of Basic Medical Sciences".

Ingle, Arvind

- President: Laboratory Animal Scientists' Association (LASA), India, 2019-22.
- Board Member: International Council for Laboratory Animal Science, 2019.
- Fellow: Indian Association of Veterinary Pathologists (FIAVP), 2019.
- Editor: Journal of Laboratory Animal Science, 2019.

Kode, Jyoti

- Secretary: ACTREC Alumni Association, 2019-22.
- Invited Member: Organizing and Scientific Committee at the IMMUNOCON 2019 46th Annual conference of Indian Immunology Society, on at DAE Convention Centre, Anushakti Nagar, Mumbai, November 14-16, 2019.
- Member: Organizing Committee, Mumbai Immunology Group-Lecture Series' at TSH, Anushakti Nagar, Mumbai, November 13, 2019.

- Invited Member: Board of Studies meeting for Microbiology at Sophia College (Autonomous), March 23, August 10, 2019.

Mahaddalkar, Tejashree

- Best Painting: 'Accept yourself as you were designed', 15th National Research Scholars Meet (NRSM), ACTREC, Navi Mumbai : December 5-6, 2019.

Mhatre, Sharayu

- International Innovation grant for young Scientist, ASCO.

Mishra, Sumit

- Best Poster Award: 'A Mechanistic Insight of Photothermal Therapy Potential in Treating Resistant Cancers', International Conference on Advances in Material Science and Applied Biology (AMSAB), SDSOS NMIMS, Mumbai, January 8-10, 2019.
- Best Poster Award: 'Photothermal Therapy, Preclinical Efficacy, Raman Microspectroscopy Based Precision Profiling and Mechanistic Insight in Treating Sensitive and Resistant Cancers', National Conference on Nano/Bio-Technology, JNU, New Delhi, December 19-21, 2019.

Munnolli, Satish

- General Secretary: Bombay Science Librarians' Association.

Ojha, Shashank

- NABH Blood bank assessor from the year 2019.

Patil, Rushikesh

- Best Oral Presentation Award and FIMSA Bursary Award: 'IL-17 producing gamma delta T cells are proangiogenic and associate with poor survival in gallbladder cancer patients', "Basic and Advanced Translational Immunology Course by IUIS-IIS-FIMSA", Rajasthan University of Healthy Sciences, Jaipur, October 12-16, 2019.

Sayed, Safi

- National Post-Doctoral Fellowship (NPDF) from Department of Science and Technology 1(DST), Govt. of India.

Sen, Subrata

- Team Captain: Winner's Trophy, in inter-institutional DAE Ellora Football tournament organized by Tata Memorial Hospital, 2019.

Subramanian, PG

- Lead assessor in NABL and member of Technical committee in hematology.
- Member of Editorial board of Pediatric Hemato-oncology Journal.
- President of Clinical of The cytometry society of India.

Sumathi, SH

- NABH Blood bank assessor from the year 2019.

Tembhare, Prashant

- Member of drafting committee for NABL 112 standards document in hematology.
- Member of committee for ICMR Standard Operating Procedures (SOP's) on "Immuno-

phenotyping of Hematolymphoid Neoplasms”.

- NABL assessor for hematology, flow cytometry & molecular laboratory.
- Secretary of the Cytometry Society of India.

Thota, Raghu

- Honored with the Guinness world certificate for my participation in checkered flag hosting for organ donation drive.

Waghmare, Sanjeev

- Member: Committee for Stem Cell Research, BARC, Mumbai.
- Member: Biosafety Committee, BARC, Mumbai.
- Member: Committee for Stem Cell Research and Therapy, NIRRH, Parel, Mumbai.
- Member: Committee for Stem Cell Research, NMIMS, School of Life Sciences, Mumbai.
- Member: Advisory Board, National Burns Centre, Navi Mumbai.
- Member: Committee for Stem Cell Research and Therapy, Himedia, Mumbai.





International

1. Acharya S, Dutta S, Chopra S, Bose K (2019) - Identification of a distal allosteric ligand binding pocket in HtrA3. *Biochemical and Biophysical Research Communications*. 516(4): 1130-1136. PMID: 31280864
2. Adamane SA, Mittal N, Teni T, Pawar S, Waghole R, Bal M (2019) - Human papillomavirus-related multiphenotypic sinonasal carcinoma with unique HPV type 52 association: A case report with review of literature. *Head and Neck Pathology*. 13(3): 331-338. PMID: 30259271
3. Alfonso V, Iaccarino L, Ottone T, Cicconi L, Lavorgna S, Divona M, Cairoli R, Cristiano A, Ciardi C, Travaglini S, Falconi G, Hasan SK, Venditti A, Arcese W, Voso MT, Lo-Coco F (2019) - Early and sensitive detection of PML-A216V mutation by droplet digital PCR in ATO-resistant acute promyelocytic leukemia. *Leukemia*. 33(6): 1527-1530. PMID: 30651632
4. Arora R, Rekhi B, Chandrani P, Krishna S, Dutt A (2019) - Merkel cell polyomavirus is implicated in a subset of Merkel cell carcinomas, in the Indian subcontinent. *Microbial Pathogenesis*. 137: 103778. PMID: 31600537
5. Bajpai J, Chandrasekharan A, Simha V, Mandal T, Shah K, Hingmare S, Rangarajan B, Shetty N, Vora T, Ghosh J, Rekhi B, Banavali S, Gupta S (2019) - Osteosarcoma journey over two decades in India: Small steps, big changes. *Pediatric Blood and Cancer*. 66(9): e27877. PMID: 31207015
6. Basu P, Muwonge R, Bhatla N, Nene BM, Joshi S, Esmey PO, Poli URR, Joshi G, Verma Y, Zomawia E, Shastri SS, Pimple S, Anantharaman D, Prabhu PR, Hingmire S, Sauvaget C, Lucas E, Pawlita M, Gheit T, Jayant K, Malvi SG, Siddiqi M, Michel A, Butt J, Sankaran S, Rameshwari Ammal Kannan TP, Varghese R, Divate U, Willhauck-Fleckenstein M, Waterboer T, Müller M, Sehr P, Vashist S, Mishra G, Jadhav R, Thorat R, Tommasino M, Pillai MR, Sankaranarayanan R Indian HPV vaccine study group (2019) - Two dose recommendation for Human Papillomavirus vaccine can be extended up to 18 years – updated evidence from Indian follow up cohort study. *Papillomavirus Research*. 7:75-81. PMID: 30711698.
7. Berger T, Seppenwoolde Y, Pötter R, Assenholt MS, Lindegaard SJ, Nout R, Leeuw A, Jürgenliemk-Schulz I, Tee Tan L, Georg D, Kirisits C, Dumas I, Nesvacil N, Swamidass J, Hudej R, Lowe G, Hellebust TP, Menon G, Fokdal L, Tanderup K (2019) - Importance of technique, target selection, contouring, dose prescription and dose-planning in external beam radiotherapy for cervix cancer: evolution of practice from EMBRACE-I to II. *International Journal of Radiation Oncology, Biology, Physics*. 104(4): 885-894. PMID: 30904706

8. Bharambe HS, Paul R, Panwalkar P, Jalali R, Sridhar E, Gupta T, Moiyadi A, Shetty P, Kazi S, Deogharkar A, Masurkar S, Yogi K, Kunder R, Gadewal N, Goel A, Goel N, Chinnaswamy G, Ramaswamy V, Shirsat NV (2019) - Downregulation of miR-204 expression defines a highly aggressive subset of Group 3/Group 4 medulloblastomas. *Acta Neuropathologica Communications*. 7(1): 52. PMID: 30944042.
9. Bhattacharjee A (2019) - Bayesian competing risks analysis without data stratification. *Clinical Epidemiology and Global Health*.
10. Bhattacharjee A, Budukh A, Dikshit R (2019)- Prostate cancer survival estimates: An application with piecewise hazard function derivation. *South Asian Journal of Cancer*. 8(3): 150-159. PMID: 31489286
11. Bhattacharjee A, Vishwakarma GK (2019)- Time-course data prediction for repeatedly measured gene expression. *International Journal of Biomathematics*.
12. Bishnu A, Sakpal A, Ghosh N, Choudhury P, Chaudhury K, Ray P (2019) - Long term treatment of metformin impedes development of chemoresistance by regulating cancer stem cell differentiation through Taurine generation in ovarian cancer cells. *International Journal of Biochemistry and Cell Biology*. 107: 116- 127. PMID: 30593952
13. Biswas NK, Das C, Das S, Maitra A, Nair S, Gupta T, D'Cruz AK, Sarin R, Majumder PP (2019) - Lymph node metastasis in oral cancer is strongly associated with chromosomal instability and DNA repair defects. *International Journal of Cancer*. 145(9): 2568-2579. PMID: 30924133
14. Chaganti LK, Dutta S, Kuppili RR, Mandal M, Bose K (2019) - Structural modeling and role of HAX-1 as a positive allosteric modulator of human serine protease HtrA2. *Biochemical Journal*. 476(20): 2965-2980. PMID: 31548268
15. Chakrabarti S, Singhavi HR, Bal M, Mair M, Malik A, Mahuvakar A, Singh A, Mathur R, Joshi P, Nair S, Nair D, Chaturvedi P (2019) - Intraoperative frozen section for detection of occult metastasis in clinically N0 neck does not improve outcome in oral cavity carcinomas. *European Archives of Oto-Rhino-Laryngology*. 276(8): 2325-2330. PMID: 31147769
16. Chandane P, Jori C, Chaudhari H, Bhapkar S, Deshmukh S, Jadhav U (2019) - Bioleaching of copper from large printed circuit boards for synthesis of organic-inorganic hybrid. *Environmental Science and Pollution Research*. PMID: 31858414
17. Chapagain S, Budukh A, Dangal G, Jha AK (2019) – Initiation of Population-based Cancer Registry in Nepal. *Journal of Nepal Health Research Council*. 17(3): I-II. PMID: 31735915
18. Chaugule SR, Sureshababu SK, Dakave S, CM Krishna, Chaudhari PR, Indap MM, Chiplunkar SV (2019) - Hexane fraction of *Turbo brunneus* inhibits intermediates of RANK-RANKL signaling pathway and prevent ovariectomy induced bone loss. *Frontiers in Endocrinology*. 10: 608. PMID: 31555218

19. Chauhan DS, Reddy BPK, Mishra SK, Prasad R, Dhanka M, Vats M, Ravichandran G, Poojari D, Mhatre O, De A, Srivastava R (2019) - A Comprehensive evaluation of degradable and cost effective plasmonic nanoshells for localized photothermolysis of cancer cells. *Langmuir*. 35(24): 7805-7815. PMID: 31090425
20. Chiplunkar SV, Gogoi D (2019) - The multifaceted role of notch signal in regulating T cell fate. *Immunology Letters*. 206: 59- 64. PMID: 30629981
21. Chopra S, Deodhar K, Pai V, Pant S, Rathod N, Goda JS, Sudhalkar N, Pandey P, Waghmare S, Engineer R, Mahantshetty U, Ghosh J, Gupta S, Shrivastava S. *Cancer Stem Cells, CD44, and Outcomes Following Chemoradiation in Locally Advanced Cervical Cancer: Results From a Prospective Study*. *International Journal of Radiation Oncology, Biology , Physics*. 103(1): 161-168. PMID: 30213750.
22. Chopra S, George K, Engineer R, Rajamanickam K, Nojin S, Joshi K, Swamidas J, Patkar S, Patil P, Ostwal V, Mehta S, Goel M (2019) - Stereotactic body radio therapy for inoperable hepatocellular cancers: Results from a clinical audit. *British Journal of Radiology*. 92(1101): 20181053. PMID: 31219706
23. Chopra S, Mittal P, Viswanathan A, Tharavichitkul E, Zubizarreta E, Nout RA, Yap ML, Grover S, Rodin D, Rai B, Gondhowiardjo S, Shrivastava SK (2019) - Global collaborations for cervical cancer: Can the East–West alliance facilitate treatment for all? *Clinical oncology (Royal College of Radiologists (Great Britain))*. 31(8): 529-538. PMID: 31229379
24. Chopra S, Shukla R, Budukh A, Shrivastava SK (2019) - External radiation and brachytherapy resource deficit for cervical cancer in India: Call to action for treatment of all. *Journal of Global Oncology*. PMID: 31166825
25. Chovatiya GL, Sunkara RR, Roy S, Godbole SR, Waghmare SK (2019) - Context-dependent effect of sPLA2-IIA induced proliferation on murine hair follicle stem cells and human epithelial cancer. *EBioMedicine*. 48: 364-376. PMID: 31521610
26. Das D, Ghosh S, Maitra A, Biswas NK, Panda CK, Roy B, Sarin R, Majumder PP (2019) – Epigenomic dysregulation-mediated alterations of key biological pathways and tumor immune evasion are hallmarks of gingivo-buccal oral cancer. *Clinical Epigenetics*. 11: 178. PMID: 31796082
27. Dasgupta A, Gupta T (2019) - MRI-based prediction of molecular subgrouping in medulloblastoma: Images speak louder than words. *Oncotarget*. 10(47): 4805-4807. PMID: 31523387
28. Dasgupta A, Gupta T (2019) - Radiogenomics in medulloblastoma: Can the human brain compete with artificial intelligence and machine learning? *AJNR. American Journal of Neuroradiology*. 40(5): E24-E25. PMID: 30975654
29. Dasgupta A, Gupta T, Pungavkar S, Shirsat N, Epari S, Chinnaswamy G, Mahajan A, Janu A, Moiyadi A, Kannan S, Krishnatry R, Goda JS, Jalali R (2019) - Nomograms based on pre-

- operative multi-parametric magnetic resonance imaging for prediction of molecular subgrouping in medulloblastoma: Results from a radiogenomics study of 111 Patients. *Neuro- Oncology*. 21(1): 115-124. PMID: 29846693
30. Dasgupta A, Gupta T, Sridhar E, Shirsat N, Krishnatry R, Goda JS, Chinnaswamy G, Jalali R (2019) - Pediatric patients with SHH medulloblastoma fail differently as compared With adults: Possible implications for treatment modifications. *Journal of Pediatric Hematology/Oncology*. 41(8): e499-e505, PMID: 30973484.
 31. Deo A, Chaudhury S, Kannan S, Rekhi B, Maheshwari A, Gupta S, Ray P (2019) - IGF1R predicts better survival in high-grade serous epithelial ovarian cancer patients and correlates with hCtr1 levels. *Biomarkers in Medicine*. 13(7): 511-521. PMID: 31140856
 32. Dey P, Rathod M, De A (2019) Targeting stem cells in the realm of drug-resistant breast cancer. *Breast Cancer (Dove Med Press)*. 11: 115-135. PMID: 30881110
 33. Dimri S, Arora R, Jasani A, De A (2019)- Dynamic monitoring of STAT3 activation in live cells using a novel STAT3 Phospho-BRET sensor. *American Journal of Nuclear Medicine and Molecular Imaging*. 9(6): 321-334.
 34. Elmore S, Grover S, Bourque J-M, Chopra S, Nyakabau A, Ntizimira C, Krakauer E, Balboni T, Gospodarowicz M, Rodin D (2019) - Global palliative radiotherapy: A framework to improve access in resource-constrained settings. *Annals of Palliative Medicine*. 8(3): 274-284. PMID: 30823841
 35. Gandhi KA, Goda JS, Gandhi VV, Sadanpurwala A, Jain VK, Joshi K, Epari S, Rane S, Mohanty B, Chaudhari P, Kembhavi S, Kunwar A, Gota V, Priyadarsini KI (2019) - Oral administration of 3,3'-diselenodipropionic acid prevents thoracic radiation induced pneumonitis in mice by suppressing NF-kB/IL-17/G-CSF/neutrophil axis. *Free Radical Biology and Medicine*.145: 8-19, PMID: 31521664
 36. Gawas NP, Navarange SS, Chovatiya GL, Chaturvedi P, Waghmare SK (2019) - Establishment and characterization of novel human oral squamous cell carcinoma cell lines from advanced stage tumors of buccal mucosa. *Oncology Reports*. 41(4): 2289-2298. PMID: 30816493
 37. Goda JS, Lewis SC, Laskar S, Kannan S, Khanna N, Jain H, Bagal B, Epari S (2019) - A phase III randomized controlled trial of radiation dose optimization in non Hodgkin lymphoma diffuse large B cell lymphoma (DOBL study): Study protocol and design. *Cancer Reports*.
 38. Gokarn A, Toshniwal A, Pathak A, Arora S, Bonda A, Punatar S, Nayak L, Dwivedi P, Bhat V, Biswas S, Kelkar R, Kannan S, Khattry N (2019) - Use of leflunomide for treatment of cytomegalovirus infection in recipients of allogeneic stem cell transplant. *Biology of Blood and Marrow Transplantation*. 25(9): 1832-1836. PMID: 31054984
 39. Goud BK, Shinde DD, Udupa DV, CM Krishna, Rao KD, Sahoo NK (2019) - Low cost digital holographic microscope for 3-D cell imaging by integrating smartphone and DVD optical head. *Optics and Lasers in Engineering*. 114: 1-6.

40. Gupta M, Chopra S, Kunder S, Dheera A, Sampathirao D, Engineer R, Ghosh J, Gurram L, Mahantshetty U, Gupta S, Shrivastava S (2019). Early toxicity and treatment outcomes of extended field-intensity modulated radiotherapy for cervical cancer patients with para-aortic nodal metastasis. *Ecancermedicalscience*. 13:957. PMID: 31645885;
41. Gupta M, Gupta T, Purandare M, Rangarajan V, Puranik A, Moiyadi A, Shetty P, Epari S, Sahay A, Mahajan A, Janu A, Bagal B, Menon H, Kannan S, Krishnatry R, Sastri G, Jalali R (2019) - Utility of flouro-deoxy-glucose positron emission tomography/computed tomography in the diagnostic and staging evaluation of patients with primary CNS lymphoma. *CNS Oncology*. 8(4): CNS46. . PMID: 31779471
42. Gupta S (2019) - Adjuvant chemotherapy in locally advanced cervical cancer: the ceiling remains unbroken. *Journal of Gynecologic Oncology*. 30(4):e97, PMID: 31140218
43. Gupta S, Gulia S, Kannan R, Rodrigues C, Dhareshwar J, Vora A(2019) - Nocardial endocarditis in native aortic valve with nocardial sepsis in a case of breast cancer. *BMJ Case Reports*. 12: e229370. PMID: 31300597
44. Gupta S, Nag S, Aggarwal S, Rauthan A, Warriar N. Maintenance therapy for recurrent epithelial ovarian cancer: current therapies and future perspectives - A review. *Journal of Ovarian Research*. 12(1): 103. PMID: 31685032
45. Gupta T, Achari R, Chatterjee A, Chen ZP, Mehta M, Bouffet E, Jalali R(2019) - Comparison of epidemiology and outcomes in neuro-oncology between the east and the west: Challenges and opportunities. *Clinical oncology (Royal College of Radiologists (Great Britain))*. 31(8):539-548, PMID: 31182288
46. Gupta T, Chatterjee A, Rangarajan V, Purandare N, Arya S, Murthy V, Budrukkar A, Ghosh-Laskar S, Agarwal JP(2019) - Evaluation of quantitative imaging parameters in head and neck squamous cell carcinoma. *Quarterly Journal of Nuclear Medicine and Molecular Imaging*. PMID: 31496204
47. Harish M, Kannan S, Puttagunta S, Pradhan M, Verma C, Venkatraman P (2019) - A novel determinant of PSMD9 PDZ binding guides the evolution of first generation of super binding peptides. *Biochemistry*. 58(32): 3422-3433, PMID: 31287951
48. Hole A, Bhujbal M, Bendale K, Kumar P, Gera P, CM Krishna, Chaudhari P (2019) - Preliminary study of canine oral cancer by Raman spectroscopy. *Proceedings of SPIE*. 10869, Optics and Biophotonics in Low-Resource Settings V, 1086917 (26 February 2019).
49. Hudlikar RR, Pai V, Kumar R, Thorat RA, Kannan S, Ingle AD, Maru GB, Mahimkar MB(2019) - Dose-related modulatory effects of polymeric black tea polyphenols (PBPs) on initiation and promotion events in B(a)P and NNK-induced lung carcinogenesis. *Nutrition and Cancer*. 71(3): 508-523. PMID: 30857437
50. Iyer P, Shrikhande SV, Ranjan M, Joshi A, Gardi N, Prasad R, Dharavath B, Thorat R, Salunkhe S, Sahoo B, Chandrani P, Kore H, Mohanty B, Chaudhari V, Choughule A, Kawle D, Chaudhari P, Ingle A, Banavali S, Gera P, Ramadwar MR, Prabhash K, Barreto SG, Dutt S, Dutt A (2019) - ERBB2 and KRAS alterations mediate response to EGFR

- inhibitors in early stage gallbladder cancer. *International Journal of Cancer*. 144(8): 2008-2019, PMID: 30304546
51. Jain BK, Dahara R, Bhattacharyya D (2019) - Golgin Pplmh1 mediates reversible cisternal stacking in Golgi apparatus of budding yeast *Pichia pastoris*. *Journal of Cell Science*. 2019. PMID: 31391238
 52. Jalali R, Goda JS (2019) - Proton beam therapy in pediatric brain tumor patients: Improved radiation delivery techniques improve neurocognitive outcomes. *Neuro-Oncology*. 21(7): 830-831. PMID: 31081892
 53. Jalali R, Maitre M, Gupta T, Goda JS, Shah N, Krishna U, Swamidas J, Kannan S, Dutta D, Sarin R. (2019) - Dose constraint model to predict neuroendocrine dysfunction in young patients with brain tumours: Data from a prospective study. *Practical Radiation Oncology*. 9(4):e362-e371. PMID: 30826479
 54. Jha P, Kumar D, Dikshit R, Budukh A, Begum R, Sati P, Kolpak P, Wen R, Raithatha SJ, Shah U, Li ZR, Aleksandrowicz L, Shah P, Piyasena K, McCormick TH, Gelband H, Clark SJ (2019) - Automated versus physician assignment of cause of death for verbal autopsies: Randomized trial of 9374 deaths in 117 villages in India. *BMC Medicine*. 17(1): 116. PMID: 31242925
 55. Kale T, Bendale K, Singh KK, Chaudhari P (2019) - Albumin based iohexol nanoparticles for computed tomography: An in vivo study. *Journal of Biomedical Nanotechnology*. 15(2): 236-247. PMID: 30596547
 56. Kaur E, Goda JS, Ghorai A, Salunkhe S, Shetty P, Moiyadi A, Sridhar E, Mahajan A, Jalali R, Dutt S (2019) - Molecular features unique to glioblastoma radiation resistant residual cells may affect patient outcome - A short report. *Cellular oncology (Dordrecht)*. 42(1): 107-116. PMID: 30361826
 57. Kuligina ES, Sokolenko AP, Bizin IV, Romanko AA, Zagorodnev KA, Anisimova MO, Krylova DD, Anisimova EI, Mantseva MA, Varma AK, Hasan SK, Ni V, Koloskov AV, Suspitsin EN, Venina AR, Aleksakhina SN, Sokolova TN, Milanoviæ AM, Schürmann P, Prokofyeva DS, Bermisheva MA, Khusnutdinova EK, Bogdanova N, Dörk T, Imyanitov EN (2019) - Exome sequencing study of Russian breast cancer patients suggests a predisposing role for USP39. *Breast Cancer Research and Treatment*. PMID: 31754952
 58. Kumar A, Drusbosky LM, Meacham A, Turcotte M, Bhargav P, Vasista S, Usmani S, Pampana A, Basu K, Tyagi A, Lala D, Rajagopalan S, Birajdar SC, Alam A, Ghosh Roy K, Abbasi T, Vali S, Sengar M, Chinnaswamy G, Shah BD, Cogle CR(2019) - Computational modeling of early T-cell precursor acute lymphoblastic leukemia (ETP-ALL) to identify personalized therapy using genomics. *Leukemia Research*. 78: 3-11. PMID: 30641417
 59. Kumar A, Mhatre S, Godbole S, Jha P, Dikshit R (2019) - Optimization of extraction of genomic DNA from archived dried blood spot (DBS): potential application in epidemiological research & bio banking. *Version 3. Gates Open Research*. 2: 57. PMID: 31815249

60. Kumar CS, Gadewal N, Choudhary R, Dasgupta D (2019) - Insights into the flexibility of the T3 loop and GTPase activating protein (GAP) domain of dimeric α and β tubulins from a molecular dynamics perspective. *Computational Biology and Chemistry*. 82: 37-43. PMID: 31255973
61. Kumar M, Bhattacharjee A, Sonker PK, Saroj A, Jain A (2019)- Parametric survival analysis using R: Illustration with lung cancer data. *Cancer Reports*.
62. Kumar P, Ingle A, CM Krishna (2019) - In vivo Raman spectroscopy: Monitoring cancer progression post carcinogen withdrawal. *Proceedings of SPIE*. 10853, *Optical Imaging, Therapeutics, and Advanced Technology in Head and Neck Surgery and Otolaryngology 2019*, 108530K (26 February 2019).
63. Kumar S, Jena L, Sahoo M, Mohod K, Varma AK (2019) - Effect of single amino acid mutations on C-terminal domain of breast cancer susceptible protein 1. *International Journal of Bioinformatics and Research Applications*. 15(4): 305-323.
64. Kummari R, Dutta S, Chaganti LK, Bose K (2019) - Discerning the mechanism of action of HtrA4: a serine protease implicated in the cell death pathway. *Biochemical Journal*. 476(10): 1445-1463. PMID: 31036715
65. Lipsa A, Kowtal P, Sarin R (2019) - Novel germline STK11 variants and breast cancer phenotype identified in an Indian cohort of Peutz-Jeghers syndrome. *Human Molecular Genetics*. 28(11): 1885-1893. PMID: 30689838
66. Mahantshetty U, Sturdza A, Pusha Naga CH, Berger D, Fortin I, Motisi L, Schmid MP, Aravindakshan D, Ghdi Y, Swamidas JV, Chopra S, Gurram L, Nescacil N, Kirisits C, Richard Pötter (2019) - Vienna-II ring applicator for distal parametrial/pelvic wall disease in cervical cancer brachytherapy: An experience from two institutions: Clinical feasibility and outcome. *Radiotherapy and Oncology*. 141: 123-129, 2019. PMID: 31495516
67. Maheshwari A, Gupta S, Prat J (2019) - A proposal for updating the staging of endometrial cancer. *International Journal of Gynaecology and Obstetrics*. 145(2): 245-252. PMID: 30776091
68. Malik A, Mishra A, Chopda P, Singhvi H, Nair S, Nair D, Laskar SG, Prabhash K, Agarwal JP, Chaturvedi P(2019) - Impact of age on elderly patients with oral cancer. *European Archives of Oto-Rhino-Laryngology*. 276(1): 223-231. PMID: 30402794
69. Malik A, Qayyumi BN, Mair M, Singhavi H, Mathur Y, Nair D, Ghosh-Laskar S, Agrawal JP, Prabash K, Chaturvedi P (2019- Outcome of patients following neo-adjuvant chemotherapy for unresectable cervical nodes in head and neck squamous cell carcinomas. *European Archives of Oto-Rhino-Laryngology*. 276(2):567-574. PMID: 30556102
70. Menon B, Bhattacharjee A, Basu S (2019) - Findings for differentiated thyroid carcinoma by α -Camera-Based and Uptake-Probe-Based methods in comparison with diagnostic radioiodine scanning. *Journal of Nuclear Medicine Technology*. 47(3): 238-242. PMID: 30413599

71. Mishra V, Kowtal P, Rane P, Sarin R (2019) - Genetic risk association of CDKN1A and RET gene SNPs with medullary thyroid carcinoma: Results from the largest MTC cohort and meta-analysis. *Cancer Medicine*. 8(13): 6151-6161. PMID: 31408923
72. Modi K, Dalvi S, Venkatraman P. Two negatively charged invariant residues influence ligand binding and conformational dynamics of 14-3-3 α . *FEBS Letters*. 2019.
73. Monpara J, Velga D, Verma T, Gupta S, Vavia P. Cationic cholesterol derivative efficiently delivers the genes: in silico and in vitro studies. *Drug Delivery and Translational Research*. 9(1): 106-122, 2019. PMID: 30132199
74. Murthy V (2019) - International consensus for advanced bladder cancer: An opportunity between the lines. *Annals of Oncology*. 30(11): 1688-1690. PMID: 31750878
75. Murthy V, Gupta P, Baruah K, Krishantriy R, Joshi A, Prbhasha K, Noronha V, Menon S, Pal M, Prakash G, Bakshi G(2019) - Adaptive radiotherapy for carcinoma of the urinary bladder: Long-term outcomes with dose escalation. *Clinical oncology (Royal College of Radiologists (Great Britain))*. 31(9): 646-652. PMID: 31301959
76. Murthy V, Johnny C, Huddart R (2019) - Positron Emission Tomography-positive post-chemotherapy seminoma masses: Time to reevaluate the role of radiotherapy? *Journal of Clinical Oncology*. 37(11): 937-938. PMID: 30811289
77. Murthy V, Sinha S, Kannan S, Datta D, Das R, Bakshi G, Prakash G, Krishnatry R (2019) - Safety of SBRT in post TURP prostate cancer patients: A propensity score matched pair analysis. *Practical Radiation Oncology*. 9(5): 347-353. PMID: 30978467
78. Nair NS, Parmar V, Badwe RA (2019) - Intent of surgery of the primary tumor in metastatic breast cancer remains palliative. *Breast Journal*. 25(2): 353 PMID: 30761690
79. Narasimhan M, Kannan S, Chawade A, Bhattacharjee A, Govekar R (2019) - Clinical biomarker discovery by SWATH-MS based label-free quantitative proteomics: impact of criteria for identification of differentiators and data normalization method. *Journal of Translational Medicine*. 17(1): 184. PMID: 31151397
80. Nemani T, Udawadia-Hegde A, Keni Karnavat P, Kashikar R, Epari S (2019) - CLIPPERS spectrum disorder: A rare pediatric neuroinflammatory condition. *Child Neurology Open*. 6: 2329048X19831096, 2019. PMID: 30873425
81. Page EC, Bancroft EK, Brook MN, Assel M, Hassan Al Battat M, Thomas S, Taylor N, Chamberlain A, Pope J, Raghallaigh HN, Evans DG, Rothwell J, Mahle L, Grindedal EMM, James P, Mascarenhas L, McKinley J, Side L, Thomas T, van Asperen C, Vasen H, Kiemeney LA, Ringelberg J, Jensen TD, Osther PJS, Helfand BT, Genova E, Oldenburg RA, Cybulski C, Wokolorczyk D, Ong KR, Huber C, Lam J, Taylor L, Salinas M, Feliubadaló L, Oosterwijk JC, van Zelst-Stams W, Cook J, Rosario DJ, Domchek S, Powers J, Buys S, O'Toole K, Ausems MGEM, Schmutzler RK), Rhiem K, Izatt L, Tripathi V, Teixeira MR, Cardoso M, Foulkes WD, Aprikian A, van

- Randeraad H, Davidson R, Longmuir M, Ruijs MWG, Helderma van den Enden ATJM, Adank M, Williams R, Andrews L, Murphy DG, Halliday D, Walker L, Liljegren A, Carlsson S, Azzabi A, Jobson I, Morton C, Shackleton K, Snape K, Hanson H, Harris M, Tischkowitz M, Taylor A, Kirk J, Susman R, Chen-Shtoyerman R, Spigelman A, Pachter N, Ahmed M, Ramon Y Cajal T, Zgajnar J, Brewer C, Gadea N, Brady AF, van Os T, Gallagher D, Johannsson O, Donaldson A, Barwell J, Nicolai N, Friedman E, Obeid E, Greenhalgh L, Murthy V, Copakova L, Saya S, McGrath J, Cooke P, Rønlund K, Richardson K, Henderson A, Teo SH, Arun B, Kast K, Dias A, Aaronson NK, Ardern-Jones A, Bangma CH, Castro E, Dearnaley D, Eccles DM, Tricker K, Eyfjord J, Falconer A, Foster C, Gronberg H, Hamdy FC, Stefansdottir V, Khoo V, Lindeman GJ, Lubinski J, Axcrone K, Mikropoulos C, Mitra A, Moynihan C, Rennert G, Suri M, Wilson P, Dudderidge T, IMPACT Study Collaborators, Offman J, Kote-Jarai Z, Vickers A, Lilja H, Eeles RA (2019) - Interim results from the IMPACT study: Evidence for prostate-specific antigen screening in BRCA2 mutation carriers. *European Urology*. 76(6): 831-842. PMID: 31537406
82. Pansare K, Gardi N, Kamat S, Dange P, Previn R, Gera P, Kowtal P, Amin K, Sarin R (2019) - Establishment and genomic characterization of gingivobuccal carcinoma cell lines with smokeless tobacco associated genetic alterations and oncogenic PIK3CA mutation. *Scientific Reports*. 9(1): 8272. PMID: 31164688
83. Pansare K, Pillai D, Parab S, Singh SR, Kannan S, Ludbe M, Hole A, Krishna CM, Gera P (2019) - Quality assessment of cryopreserved biospecimens reveals presence of intact biomolecules. *Journal of Biophotonics*. 12(12): e201960048. PMID: 31569303
84. Parab A, Mhatre S, Hake S, Kannan S, Pai P, Kane S, Joshi N (2019) - Identification of stably expressed genes for normalization of gene expression data in oral tumors: A preliminary analysis. *Oral Cancer*. 3: 49–58.
85. Parghane RV, Naik C, Talole S, Desmukh A, Chaukar D, Banerjee S, Basu S (2019) - Clinical utility of (177) Lu-DOTATATE PRRT in somatostatin receptor-positive metastatic medullary carcinoma of thyroid patients with assessment of efficacy, survival analysis, prognostic variables, and toxicity. *Head Neck*. PMID: 31755622
86. Patel D, Kharkar PS, Gandhi NS, Kaur E, Dutt S, Nandave M. Novel analogs of sulfasalazine as system xc⁻ antiporter inhibitors: Insights from the molecular modeling studies. *Drug Development Research*. 80(6):758-777. 2019. PMID: 31199023
87. Patel S, Rajora N, Kumar S, Sahu A, Kochar S, CM Krishna, Srivastava S (2019) - Rapid discrimination of malaria and dengue infected patients sera using Raman Spectroscopy. *Analytical Chemistry*. 91(11): 7054-7062. PMID: 31033270
88. Patil A, Singh V, Sukumar V, Shetty P, Moiyadi A (2019) - Comparison of outcomes of free hand 2D-ultrasound guided versus navigated 3D-ultrasound guided biopsy for supratentorial tumors: a single institution

- experience with 125 cases. *Ultrasonography*. 38(3): 255-263, PMID: 30779873
89. Patil VM, Chandrasekharan A, Vallathol DH, Malhotra M, Abhinav R, Agarwal P, Rajpurohit A, Tonse R, Bhattacharjee A, Jalali R.- Antiemetic prophylaxis with temozolomide: an audit from a tertiary care center. *Neuro-Oncology Practice*. 2019. 6(6):479-483. PMID: 31832218
 90. Patil VM, Joshi A, Noronha V, Agarwala V, Chougule A, Kanan S, Bhattacharjee A, Chandrasekharan A, Pande N, Simha V, Goud S, More S, Kumar R, Mahajan A, Janu A, Purandare N, Prabhash K (2019)- Randomized phase 3 open label study of quality of life of patients on Pemetrexed versus Erlotinib as maintenance therapy for advanced non squamous non EGFR mutated non small cell lung cancer. *Oncotarget*. 10(59): 6297-6307. PMID: 31695838
 91. Patil VM, Noronha V, Joshi A, Agarwal J, Ghosh-Laskar S, Budrukkar A, Murthy V, Gupta T, Mahimkar M, Juvekar S, Arya S, Mahajan A, Agarwal A, Purandare N, Rangarajan V, Balaji A, Chaudhari SV, Banavali S, Kannan S, Bhattacharjee A, D'Cruz AK, Chaturvedi P, Pai PS, Chaukar D, Pantvaidya G, Nair D, Nair S, Deshmukh A, Thiagarajan S, Mathrudev V, Manjrekar A, Dhumal S, Maske K, Bhelekar AS, Nawale K, Chandrasekharan A, Pande N, Goel A, Talreja V, Simha V, Srinivas S, Swami R, Vallathol DH, Dsouza H, Shrirangwar S, Turkar S, Abraham G, Thanky AH, Patel U, Pandey MK, Prabhash K (2019) - A randomized phase 3 trial comparing nimotuzumab plus cisplatin chemoradiotherapy versus cisplatin chemoradiotherapy alone in locally advanced head and neck cancer. *Cancer*. 125 (18): 3184-3197. PMID: 31150120.
 92. Patil VM, Noronha V, Joshi A, Dhumal S, Mahimkar M, Bhattacharjee A, Gota V, Pandey M, Menon N, Mahajan A, Sable N, Kumar S, Nawale K, Mukadam S, Solanki B, Das S, Simha V, Abraham G, Chandrasekharan A, Talreja V, D'souza H, Srinivas S, Kashyap L, Banavali S, Prabhash K (2019) - Phase I/II study of palliative triple metronomic chemotherapy in platinum-refractory/early-failure oral cancer. *Journal of Clinical Oncology*. 37(32): 3032-3041. PMID: 31539316
 93. Patkar N, Kakirde C, Bhanshe P, Joshi S, Chaudhary S, Yajamanam B, Ghogale S, Deshpande N, Tembhare P, Kadechkar S, Kannan S, Shetty D, Gokarn A, Punatar S, Bonda A, Nayak L, Jain H, Bagal B, Menon H, Sengar M, Hasan KS, Khattry N, Gujral S, Subramanian P (2019) - Utility of immunophenotypic measurable residual disease in adult acute myeloid leukemia – Real world context. *Frontiers in Oncology*. 9:450. PMID: 31263671
 94. Patkar N, Shaikh AF, Kakirde C, Nathany S, Ramesh H, Bhanshe P, Joshi S, Chaudhary S, Kannan S, Khizer SH, Chatterjee G, Tembhare P, Shetty D, Gokarn A, Punatkar S, Bonda A, Nayak L, Jain H, Khattry N, Bagal B, Sengar M, Gujral S, Subramanian P (2019) - A novel machine-learning-derived genetic score correlates with measurable residual disease and is highly predictive of outcome in acute

- myeloid leukemia with mutated NPM1. *Blood Cancer Journal*. 9(10): 79, PMID: 31575857
95. Pawar N, Panchal S, Kawle D, Gadgoli C, Maru G (2019) - Evaluation of genotoxic and modulatory effects of *Nyctanthes arbor-tristis* calyx extract and the isolated crocin in Ames' assay. *Natural Product Research*. 33(6): 884-888. PMID: 29224365
 96. Pimple SA, Mishra GA (2019)- Optimizing high risk HPV-based primary screening for cervical cancer in low- and middle-income countries: opportunities and challenges. *Minerva Ginecologica*. 71: 365-71. PMID: 31698891.
 97. Pimple SA, Mishra GA (2019)- Global strategies for cervical cancer prevention and screening. *Minerva Ginecologica* 71: 313-319. PMID: 30808155
 98. Pires N, Gota V, Gulia A, Hingorani L, Agarwal M, Puri A (2019) - Safety and pharmacokinetics of withaferin-A in advanced stage high grade osteosarcoma: A phase I trial. *Journal of Ayurveda and Integrative Medicine*. PMID: 30904387
 99. Prajapati MK, Bishnu A, Ray P, Vavia PR (2019) - Selectivity enhancement of paclitaxel liposome towards folate receptor-positive tumor cells by ligand number optimization approach. *AAPS PharmSciTech*. 20(8): 317. PMID: 31605252
 100. Qureshi SS, Kembhavi SA, Bhagat M, Kapadia T, Prasad M, Vora T, Chinnaswamy G, Ramadwar M, Laskar S, Khanna N, Baheti A, Shah S, Kurkure P, Talole S (2019) - Customized approach for upfront or delayed resection using radiological criteria in unilateral, nonmetastatic pediatric renal tumors: A prospective study. *Pediatric Blood and Cancer*. 66: Suppl 3: e27815. PMID: 31099132
 101. Raghuram GV, Chaudhary S, Johari S, Mitra I (2019) - Illegitimate and repeated genomic integration of cell-free chromatin in the aetiology of somatic mosaicism, ageing, chronic diseases and cancer. *Genes (Basel)*. 10(6): 407. PMID: 31142004
 102. Raphael MJ, Fundytus A, Hopman WM, Vanderpuye V, Seruga B, Lopes G, Hammad N, Sengar M, Brundage MD, Sullivan R, Booth CM (2019) - Medical oncology job satisfaction: Results of a global survey. *Seminars in Oncology*. 46(1): 73-82, PMID: 30685074
 103. Rathod M, Chatterjee S, Dutta S, Kalraiya R, Bhattacharya D, De A (2019) - Mannose glycosylation is an integral step for human NIS localization and function in breast cancer cells. *Journal of Cell Science*. PMID: 31455607
 104. Rohil Y, Shetty D, Jain H, Nayak LR (2019) - Isochromosome i(9)(q10): A Rare Chromosomal Aberration in B-cell Acute Lymphoblastic Leukemia. *Clinical Oncology: Case Reports*. 2: 2.
 105. Rohil Y, Shetty D, Narula G, Banavali SD (2019) - A novel case of ABL2 chromosomal rearrangement in high-risk B-cell acute lymphoblastic leukemia. *Journal of the Association of Genetic Technologist*. 45(2): 73-76, PMID: 31189154

106. Sahu A, Gera P, Malik A, Nair S, Chaturvedi P, CM Krishna (2019) - Raman exfoliative cytology for prognosis prediction in oral cancers: A proof of concept study. *Journal of Biophotonics*. 12(8): e20180033. PMID: 30719849
107. Sahu I, Nanaware P, Mane M, Mulla SW, Roy S, Venkatraman P (2019) – Role of a 19S Proteasome Subunit- PSMD10Gankyrin in Neurogenesis of Human Neuronal Progenitor Cells. *International Journal of Stem Cells*. 12(3): 463-473, PMID: 31474027
108. Sali AP, Chaubey V, Kodare D, Sahay A, Epari S (2019) - The rare phenomenon of loss of INI1 expression at recurrence/progression of primary central nervous system tumors: Report of 3 Cases. *International Journal of Surgical Pathology*. PMID: 31680589
109. Sawant S, Dongre H, Kanojia D, Jamghare S, Borges A, Vaidya M (2019) - Role of electron microscopy in early detection of altered epithelium during experimental oral carcinogenesis. *Microscopy and Microanalysis*. 25(6): 1367-1375. PMID: 30867083
110. Shah SG, Rashid M, Verma T, Ludbe M, Khade B, Gera PB, Gupta S (2019) - Establishing a correlation between RIN and A260/280 along with the multivariate evaluation of factors affecting the quality of RNA in cryopreserved cancer bio-specimen. *Cell and Tissue Banking*. 20(4): 489-499, PMID: 31444592
111. Shetty D, Talker E, Chaubal K, Bhat V, Narula G (2019) - dic(7;9)(p11.1;p11.1) and del(7)(q36) as a Primary Abnormality in Childhood B-cell Precursor ALL: A Case Report. *Journal of Association of the Genetic Technologists*. 45(3): 121-123, PMID: 31554744
112. Shetty D, Talker E, Sengar M, Subramanian PG (2019) - Isoderivative Chromosome 17 With Multiple Copies of RARA–PML fusions and Tp53 deletion in a rare case of APLM. *Hematology/Oncology and Stem Cell Therapy*. PMID: 30981688
113. Shetty D, Talker E, Yadav AK, Jain H, Mistri V, Chaubal K, Khattry N (2019) - Monosomy 20 as a sole cytogenetic abnormality in adult B-ALL. *Acta Scientific Cancer Biology*. 3(1): 14-16.
114. Shetty D, Usarathi R, Talker E, Jain H (2019) - Duplication of isoderivative Ph Chromosome with Tp53 deletion in a case of Imatinib resistant CML. *International Journal of Human Genetics*. 19 (2): 64-67.
115. Sikder S, Kumari S, Kumar M, Sen S, Bora Singhal N, Chellappan S, Godbole M, Chandrani P, Dutt A, Gopinath KS, Kundu TK (2019) - Chromatin protein PC4 is downregulated in breast cancer to promote disease progression: Implications of miR-29a. *Oncotarget*. 10: 6855-6869. PMID: 31839879
116. Singh A, Budukh A, Chaturvedi P, Dikshit R. (2019) – Systematic review on telephonic Quit line and its effects on smokeless tobacco. *International Journal of Non Communicable Diseases*.4: 65-72.
117. Singh S, Kumar M, Kumar S, Sen S, Upadhyay P, Bhattacharjee S, Naveen M, Tomar VS, Roy S, Dutt A, Kundu TK (2019) - The cancer-associated, gain-of-function TP53 variant

- P152Lp53 activates multiple signaling pathways implicated in tumorigenesis. *Journal of Biological Chemistry*. 294(38): 14081–14095.
118. Singh V, Borkar A, Moiyadi A, Shetty P (2019) - Tetraventricular atypical central neurocytoma. *World Neurosurgery*. 122: 454-457. PMID: 30439524
 119. Singhavi HR, Chakrabarti S, Singh A, Mair M, Bhattacharjee A, Shetty R, Qayyumi B, Pai A, Joshi P, Nair D, Nair S, Chaturvedi P (2019) - Comparison of the 7th and 8th edition AJCC classification system in oral cavity squamous cell cancers. *International Journal of Cancer*. PMID: 31583706.
 120. Srinivasan M, Chaturvedula A, Fossler MJ, Patil A, Gota V, Prabhash K (2019) - Population pharmacokinetics of pemetrexed in adult non-small cell lung cancer in Indian patients. *Journal of Clinical Pharmacology*. 59(9): 1216-1224, PMID: 30973978
 121. Sugoor P, Verma K, Chaturvedi A, Kannan S, Desouza A, Ostwal V, Engineer R, Saklani A (2019) - Robotic versus laparoscopic sphincter-preserving total mesorectal excision: A propensity case-matched analysis. *International Journal of Medical Robotics and Computer*. 15(1): e1965. PMID: 30318725
 122. Suman S, Parghane RV, Joshi A, Prabhash K, Bakshi G, Talole S, Banerjee S, Basu S (2019) - Therapeutic efficacy, Prognostic variables and Clinical Outcome of ¹⁷⁷Lu-PSMA-617 PRLT in Progressive mCRPC following multiple lines of treatment: prognostic implications of high FDG uptake on dual tracer PET-CT vis-à-vis Gleason Score in such cohort. *British Journal of Radiology*. 92(1104): 20190380. PMID: 31600089
 123. Swain M, Gupta T, Kannan S, Agarwal J (2019) - Cisplatin-based chemoradiotherapy trumps cetuximab-based bioradiotherapy in p16/HPV-positive oropharyngeal cancers. *European Archives of Otorhinolaryngol*. 276(7): 2111-2112. PMID: 31025112
 124. Swamidas J, Kirisits C, De Brabandere M, Hellebust TP, Siebert FA, Tanderup K (2019) - Image registration, contour propagation and dose accumulation of external beam and brachytherapy in gynecological radiotherapy. *Radiotherapy and Oncology*. PMID: 31564555
 125. Tan LT, Tanderup K, Kirisits C, de Leeuw A, Nout R, Duke S, Seppenwoolde Y, Nesvacil N, Georg D, Kirchheiner K, Fokdal L, Sturdza A, Schmid M, Swamidas J, Limbergen V E, Haie-Meder C, Mahantshetty U, Jürgenliemk-Schulz I, Lindegaard JC, Pötter R (2019) - Image-guided adaptive radiotherapy in cervical cancer. *Seminars in Radiation Oncology*. 29(3): 284-298, PMID: 31027645
 126. Taneja N, Gota V, Gurjar M, Singh KK. Development and validation of high-performance liquid chromatographic method for quantification of irinotecan and its active metabolite SN-38 in colon tumor bearing NOD/SCID mice plasma samples: Application to pharmacokinetic study. *Acta Chromatographica*. 31(3): 166-172, 2019.
 127. Varshney K, Epari S, Sahay A, Gupta T, Shetty P, Moiyadi A (2019) - Pigmented primary

- epithelial tumor of the sella: A report of an intriguing case. *Neuropathology*. 39(5): 378-381, PMID: 31373070
128. Varshney N, Som S, Chatterjee S, Sridhar S, Bhattacharyya D, Paul R, Sanyal K (2019) - Spatio-temporal regulation of nuclear division by Aurora B kinase Ipl1 in *Cryptococcus neoformans*. *PLoS Genetics*. 15(2): e1007959, PMID: 30763303
 129. Vora C, Gupta S (2019) - Targeted therapy in cervical cancer. *ESMO Open*. 3: e000462, PMID: 30997156
 130. Wadasadawala T, Sinha S, Parmar V, Verma S, Gaikar M, Kannan S, Mondal M, Pathak R, Jain U, Sarin R (2019) - Comparison of subjective, objective and patient-reported cosmetic outcomes between accelerated partial breast irradiation and whole breast radiotherapy: A prospective propensity score-matched pair analysis. *Breast Cancer*. PMID: 31512161
 131. Wadasadawala T, Sinha S, Verma S, Parmar V, Kannan S, Pathak R, Sarin R, Gaikar M (2019) - A prospective comparison of subjective and objective assessments of cosmetic outcomes following breast brachytherapy. *Journal of Contemporary Brachytherapy*. 11(3): 207-214, PMID: 31435427
 132. Warawdekar UM (2019) - An assay to assess gap junction communication in cell lines. *Journal of Biomolecular Techniques*. 30(1): 1-6. PMID: 30723387
 133. Zanwar S, Jain P, Gokarn A, Devadas SK, Punatar S, Khurana S, Bonda A, Pruthy R, Bhat V, Qureshi S, Khattry N (2019) - Antibiotic lock therapy for salvage of tunneled central venous catheters with catheter colonization and catheter-related bloodstream infection. *Transplant Infectious Disease*. 21(1): e13017. PMID: 30369006

National

1. Abraham G, Menon N, Patil VM, Joshi A, Prabhash K (2019). The efficacy of low-dose immunotherapy in head-and-neck cancer. *Cancer Research, Statistics and Treatment*. 2: 268-9.
2. Ahmed A, Thota RS, Bhatnagar S, Jain P, Ramanjulu R, Salins N, Chatterjee A, Bhattacharya D (2019) - The Indian society for study of pain, cancer pain special interest group guidelines on complementary therapies for cancer pain. *Indian Journal of Pain*. 33: Suppl S1:37-41.
3. Ahmed A, Thota RS, Chatterjee A, Jain P, Ramanjulu R, Bhatnagar S, Salins N, Bhattacharya D (2019) - The Indian Society for Study of Pain, Cancer Pain Special Interest Group guidelines on interventional management for cancer pain. *Indian Journal of Pain*. 33: Suppl S1: 42-8.
4. Awatagiri K, Gadgil D, Kannan S, Rane P, Bandekar B, Sawant N, Parikh P, Murthy V (2019) - Effect of a Planned Training Session on Good Clinical Practice Knowledge in Research Professionals: A Pilot Study. *Perspectives in Clinical Research*. 10(1): 20-25. PMID: 30834203
5. Bajpai J, Chiplunkar SV (2019) - Checkmate with checkpoint inhibitors: Hope and hype. *Indian Journal of Medical and Paediatric Oncology*. 40: 159-62.

6. Bhat V, Vira HJ, Shetty P, Gupta S (2019) – Myroides odoratus central nervous infection in a postneurosurgery patient. *Indian Journal of Medical and Paediatric Oncology*. 40: 291-3,
7. Desai BS, Dixit AS, Gota VS (2019) - Central Institutional Ethics Committee needed to facilitate timely review of multicenter clinical trials. *Journal of Postgraduate Medicine*. 65(2): 107-109. PMID: 30924443
8. Bose A, Dalal SN (2019) - 14-3-3 proteins mediate the localization of Centrin2 to centrosome. *Journal of Biosciences*. 44: 42. PMID: 31180055
9. Chatterjee A, Thota RS, Ramanjulu R, Ahmed A, Bhattacharya D, Salins N, Jain P, Bhatnagar S (2019) - The Indian Society for Study of Pain, Cancer Pain Special Interest Group (SIG) guidelines, for the diagnosis and assessment of cancer pain. *Indian Journal of Pain*. 33: Suppl S1: 1-10.
10. Chavan PD, Bhat V, Poladia PP, Tiwari MR, Naresh C (2019). Reduction in sample rejections at the preanalytical phase - Impact of training in a tertiary care oncology center. *Journal of Laboratory Physicians*. 11(3): 229-233.
11. Chaudhari S, Mittra I (2019) - Cell-free chromatin: A newly described mediator of systemic inflammation. *Journal of Biosciences*. 44: 32. PMID: 31180045
12. D'mello C, Srivastava S, Tiwari R, Chaudhari P, Sawant S, Vaidya MM (2019) - Multifaceted role of keratins in epithelial cell differentiation and transformation. *Journal of Biosciences*. 44: 33, PMID: 31180046
13. Dholam KP, Singh GP, Gurav SV, Shinde AA (2019) - An alternate method of fabrication of an obturator in a patient diagnosed with melanotic neuroectodermal tumor of infancy. *Indian Journal of Medical and Paediatric Oncology*. 40: Suppl S1: 148-51.
14. Jain H, Thorat J, Sengar M, Dubey A (2019) - Ponatinib: A drug review. *Cancer Research, Statistics and Treatment*. 2(2): 190-6.
15. Khanna D, Khargekar N, Budukh A. (2019) – Knowledge, attitude, and practice about cervical cancer and its screening among community healthcare workers of Varanasi district, Uttar Pradesh, India. *Journal of Family Medicine and Primary Care*. 8:1715-9. PMID: 31198742
16. Mahajan A, Vaidya T, Gupta A, Rane S, Gupta S (2019) - Artificial intelligence in healthcare in developing nations: The beginning of a transformative journey. *Cancer Research, Statistics and Treatment*. 2(2): 182-9.
17. Mathur R, Singhavi HR, Malik A, Nair S, Chaturvedi P (2019). Role of poor oral hygiene in causation of oral Cancer-a Review of Literature. *Indian Journal of Surgical Oncology*. 10(1): 184-195. PMID: 30948897.
18. Parmar V, Nair S, Thakkar P, Chitkara G(2019) - Molecular biology in the Breast Clinics— Current status and future perspectives. *Indian Journal of Surgical Oncology*.
19. Patil VM, Noronha V, Joshi A, Abhyankar A, Menon N, Banavali S, Gupta S, Prabhash K(2019) - Low doses in immunotherapy: Are they effective? *Cancer Research, Statistics and Treatment*. 2(1): 54-60.

20. Phadke PR, Mhatre SS, Budukh AM, Dikshit RP (2019) - Trends in gallbladder cancer incidence in the high- and low-risk regions of India. *Indian Journal of Medical and Paediatric Oncology*. 40: 90-3.
21. Pujar SM, Munnolli SS, Mundgod MB (2019) - Sharing economy and libraries: a challenge or an opportunity. *Annals of Library and Information Studies*. 66: 46-48.
22. Ramanjulu R, Thota RS, Ahmed A, Jain P, Salins N, Bhatnagar S, Chatterjee A, Bhattacharya D (2019) - The Indian Society for Study of Pain, Cancer Pain Special Interest Group guidelines on pharmacological management of cancer pain (Part I). *Indian Journal of Pain*. 33: Suppl S1:11-17.
23. Ramanjulu R, Thota RS, Ahmed A, Jain P, Bhatnagar S, Salins N, Chatterjee A, Bhattacharya D (2019). The Indian Society for Study of Pain, Cancer Pain Special Interest Group guidelines on pharmacological management of cancer pain (Part III). *Indian Journal of Pain*. 33: Suppl S1:30-36.
24. Salins N, Thota RS, Bhatnagar S, Ramanjulu R, Ahmed A, Jain P, Chatterjee A, Bhattacharya D (2019) - The Indian Society for Study of Pain, Cancer Pain Special Interest Group guidelines on palliative care aspects in cancer pain management. *Indian Journal of Pain* 33: Suppl S1: 49-53.
25. Sengar M, Fundytus A, Hopman WM, Malhotra H, Gupta S, Pramesh C S, Hammad N, Sullivan R, Vanderpuye V, Seruga B, Lopes G, Brundage MD, Booth CM (2019) - Medical oncology in India: Workload, infrastructure, and delivery of care. *Indian Journal of Medical and Paediatric Oncology*. 40: 121-7,
26. Shaikh S, Moiyadi A (2019) - Intraventricular tumors - A mixed bag. *Cancer Research Statistics and Treatment*. 2(2): 245-6.
27. Swamidas J, Rose J, Chopra S, Paul SN, Joshi K, Panda S, Ph R, Agarwal JP (2019) - . Implementation of a visual feedback system for motion management during radiation therapy. *Journal of Cancer Research and Therapeutics*.
28. Talreja VT, Noronha V, Patil VM, Joshi A, Prabhash K (2019). Desperate times, desperate measures: Low-dose nivolumab-induced remission in relapsed NSCLC. *Cancer Research, Statistics and Treatment*. 2: 266-7.
29. Thota RS, Ramanjulu R, Ahmed A, Jain P, Salins N, Bhatnagar S, Chatterjee A, Bhattacharya D (2019). The Indian Society for Study of Pain, Cancer Pain Special Interest Group guidelines on pharmacological management of cancer pain (Part II). *Indian Journal of Pain*. 33: Suppl S1:18-29.
30. Velayutham P, Cherian VT, Rajshekhar V, Babu KS (2019) - The effects of propofol and isoflurane on intraoperative motor evoked potentials during spinal cord tumour removal surgery - A prospective randomised trial. *Indian Journal of Anaesthesia*. 63(2): 92-9. PMID: 30814745
31. Verma A, Epari S, Bakiratharajan D, Sahay A, Goel N, Chinnaswamy G, Shetty P, Moiyadi A, Goel A, Gupta T, Jalali R (2019) - Primary pineal tumors - Unraveling histological challenges and certain clinical myths. *Neurology India*. 67(2): 491-502. PMID: 31085866

32. Verma A, Menon S, Rekhi B, Pai T, Maheshwari A, Ghosh J, Gupta S, Deodhar K (2019) - Utility of YWHAE fluorescent in-situ hybridisation in mesenchymal tumors of uterus- An initial experience from tertiary oncology centre in India. *Indian Journal of Cancer*. 56(4): 335-340, PMID: 31607703
33. Vira HJ, D'Souza H, Bhat V, Bonda A (2019) - Strongyloides stercoralis hyperinfection complicated by secondary infections in a case of transformed diffuse large B-cell lymphoma. *Indian Journal of Medical and Paediatric Oncology*.40: 144-6.

Book

1. Bose K, Chaudhari P. (Eds.) *Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach*. 1st ed. Singapore: Springer, 2019. (ISBN: 978-981-329-815-6)

Book Chapters

1. Bose A, Dalal SN. "Centrosome amplification and tumorigenesis: Cause or effect?" In: Kloc M. (Ed.) *The Golgi Apparatus and Centriole. Results and Problems in Cell Differentiation: Volume 67*. Cham: Springer, 2019. Pp. 413-440. (ISBN: 978-3-030-23173-6)
2. Tembhare PR, Gujral S, Krishnamurthy H. "Measurement of Predictive Cancer Biomarkers by Flow Cytometry." In: Badve S., Kumar G. (Eds) *Predictive Biomarkers in Oncology*. Switzerland: Springer, 2019. Pp. 119-129. (ISBN: 978-3-319-95227-7)
3. Ingle AD. "Alternatives and Refinement for Animal Experimentation in Cancer Research." In: Kojima H, Seidle T, Spielmann

- H. (Eds) *Alternatives to Animal Testing*. Singapore: Springer, 2019. Pp. 69-75. (ISBN: 978-981-13-2446-8)
4. Kumar P, CM Krishna. "Optical Techniques: Investigations in Oral Cancers. (2019) In: Panta P (Ed). *Oral Cancer Detection: Novel Strategies and Clinical Impact*. Switzerland: Springer International Publishing, 2019. Pp. 167-187. (ISBN: 978-3-319-61255-3)
5. Panta P, Chih-W, Kumar P, Tuan—Shu H, Sheng-Lung H, Kumar P, CM Krishna, Rao KD, John R. "Optical Coherence Tomography: Emerging In Vivo Optical Biopsy Technique for Oral Cancers." Panta P (Ed). *Oral Cancer Detection: Novel Strategies and Clinical Impact*. Switzerland: Springer International Publishing, 2019. Pp. 211-237. (ISBN: 978-3-319-61255-3)
6. Sharda A, Amnekar RV, Natu A, Sukanya, Gupta S. "Histone posttranslational modifications: Potential role in diagnosis, prognosis, and therapeutics of cancer." In: Sharma S (Ed.) *Prognostic Epigenetics. Vol.15, Translational Epigenetics*. London: Academic Press, 2019. Pp. 351-373. (ISBN: 978-0-12-814259-2)
7. Parui AL, Bose K. "Cancer Biology and Its Treatment Modalities: A Brief Historical Perspective." In: Bose K, Chaudhari P. (Eds.) *Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach*. Singapore: Springer, 2019. Pp. 1-11. (ISBN: 978-981-329-815-6)
8. Wagh AR, Bose K. "Apoptosis in Cancer Cell Signaling and Current Therapeutic Possibilities." In: Bose K, Chaudhari P. (Eds.) *Unravelling Cancer Signaling Pathways: A*

- Multidisciplinary Approach. Singapore: Springer, 2019. Pp.113-129. (ISBN: 978-981-329-815-6)
9. Mansuri MS, Mehrotra S. "Emerging Epigenetic Targets and Their Implications in Cancer Therapy." In: Bose K, Chaudhari P. (Eds.) Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach. Singapore: Springer, 2019. Pp. 157-188. (ISBN: 978-981-329-815-6)
 10. Dhumal A, Bendale K, Chaudhari P. "Preclinical Animal Models for Cancer Research and Drug Discovery." In: Bose K, Chaudhari P. (Eds.) Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach. Singapore: Springer, 2019. Pp. 229-254. (ISBN: 978-981-329-815-6)
 11. Doshi J, Dutta S, Bose K. "Analysing Cancer Signalling Pathways: A Structural Bioinformatics Approach." In: Bose K, Chaudhari P. (Eds.) Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach. Singapore: Springer, 2019. Pp. 271-293. (ISBN: 978-981-329-815-6)
 12. Zingde SM. "Proteomics for Cancer: Approaches and Challenges." In: Bose K, Chaudhari P. (Eds.) Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach. Singapore: Springer, 2019. Pp. 343-368. (ISBN: 978-981-329-815-6)
 13. Kumar P, Singh B, Chaudhari P, Jose J, Butler A, Prebble H, Moghiseh M and the MARS Collaboraion. "Preclinical Non-invasive Imaging in Cancer Research and Drug Discovery: An Overview." In: Bose K, Chaudhari P. (Eds.) Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach. Singapore: Springer, 2019. Pp. 419-469. (ISBN: 978-981-329-815-6)
 14. Bhatia DR, Rath S, Gupta S. "New Emerging Molecules in Cancer Research Which Hold Promise in Current Era." In: Bose K, Chaudhari P. (Eds.) Unravelling Cancer Signaling Pathways: A Multidisciplinary Approach. Singapore: Springer, 2019. Pp. 539-583. (ISBN: 978-981-329-815-6)
 15. Mishra GA, Pimple SA. "Prevention of Cancer." In: Sanchetee S (Ed) A Textbook of Clinical Oncology in the Indian Context. 2019, Vol I, Pp. 111-125.

Conference Volume

1. Munnolli SS, Mundgod MB, Pujar SM, Gawali PB, Savanur SK (Eds.) Proceedings of the 8th National Conference of Institute of Scientometrics on Scholarly Communication and Scientometrics. Navi Mumbai: ACTREC, 2019. (ISBN: 978-93-5391-919-1)

Articles Published in Conference Proceedings

1. Akshay S, Basu S, Chakraborty S, Sundararajan R, Venkatraman P. "Functional Significance Checking in Noisy Gene Regulatory Networks." In: Schiex T., de Givry S. (Eds) Principles and Practice of Constraint Programming. CP 2019. Lecture Notes in Computer Science, vol 11802. Cham: Springer, 2019. Pp. 767-785. (ISBN: 978-3-030-30047-0)
2. Pujar SM, Munnolli SS, Mundgod MB. "Google scholar as an alternate tool for citation analysis." In: Munnolli SS, Mundgod

- MB, Pujar SM, Gawali PB, Savanur SK (Eds.), Proceedings of the 8th National Conference of Institute of Scientometrics on Scholarly Communication and Scientometrics. Navi Mumbai: ACTREC, 2019. Pp. 19-25. (ISBN: 978-93-5391-919-1)
3. Raul MA, Munnolli SS. "Tools and techniques for enhancing the research impact: An overview." In: Munnolli SS, Mundgod MB, Pujar SM, Gawali PB, Savanur SK (Eds.) Proceedings of the 8th National Conference of Institute of Scientometrics on Scholarly Communication and Scientometrics. Navi Mumbai: ACTREC, 2019. Pp. 39-47. (ISBN: 978-93-5391-919-1)
 4. Gawali PB, Munnolli SS. "Scientometrics: Credit score challenges." In: Munnolli SS, Mundgod MB, Pujar SM, Gawali PB, Savanur SK (Eds.). Proceedings of the 8th National Conference of Institute of Scientometrics on Scholarly Communication and Scientometrics. Navi Mumbai: ACTREC, 2019. Pp. 195-197. (ISBN: 978-93-5391-919-1)
 5. Raul MA, Belapurkar SS, Patil AD, Munnolli SS. "Library, technology and services: Innovative approach for e-alert service in ACTREC." In: Shivram BS, Mulla KR, Byrappa A (Eds.) Proceedings of the 2nd LIS Academy National Conference on Innovations in Libraries Bangalore: LIS Academy, 2019. Pp. 185-193. (ISBN: 978-81-941320-0-4)

Other Publications

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