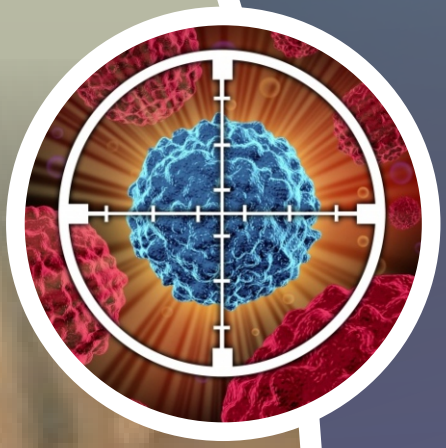
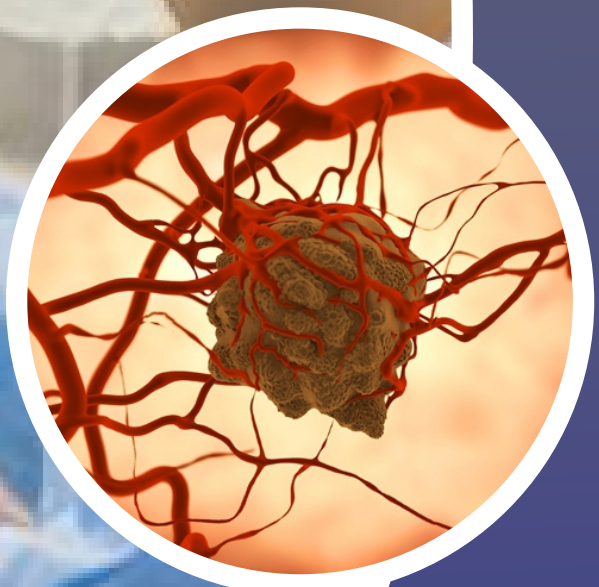
Indian Association for Cancer Research

NEWSLETTER





Volume 1 - Issue 1 June - 2021

IACR NEWS LETTER - EDITORIAL BOARD

From the Editors' desk…

Dear IACR family members,
We are glad to mention that IACR decided to re-instate the newsletter post the hiatus, with the motive of keeping our members (especially, the young scientists) well versed with cutting-edge and latest developments in cancer research. We have planned to publish two issues of "IACR Newsletter" in 2021 with sole purpose of disseminating information about IACR's activities and the latest scientific developments. We are happy to bring to you this first edition of the IACR newsletter.

The current situation of the pandemic which has left devastation across the globe and the major impact of the second wave faced by India has left all of us saddened and tongue-tied. On a positive note, we witnessed the world's fastest development of a vaccine, where India played the protagonist. Thus, the world has seen a glimpse of the potential that India harbours. With this, it may be the beginning for our scientists to leave their mark on the globe. For this it is imperative for the scientific community of our country to be updated regarding the current trends and future aspects for application research, which will help our successors to widen their horizons. We also require transparent communication for collaborative work which will strengthen our researches and result in better scientific interventions.

We hope that this edition is value adding to all the readers and that there will be active contribution from spectrum of academia, researchers in the following editions to come.

IACR Newsletter - Editorial Board

We are thankful to all the Presidents of IACR for leading the association

Message from the President's desk

Pandemics are not unfamiliar to the world and the human race has been combating challenges ever since the first pandemic break out. The first known pandemic seems to have been a typhoid fever, dating back to 430 BC, during the Peloponnesian war. We are now battling the Coronavirus Disease 2019 (COVID -19) (Pandemics That Changed History). The first case was reported in late 2019, in Wuhan, China and what unfolded later was a swift spread of the disease all over the world except for a few rare places. World Health Organization (WHO) declared COVID 19 as a pandemic in March 11, 2020 after its dissemination across 114 countries infecting millions. COVID 19 pandemic bears a gigantic impact on untold realms of human life, literally as it padlocked the world altogether. WHO and various government agencies have been finding swift mechanisms to restrain the spread of the virus. COVID 19 outbreak had led to an instantaneous deadlock all over the world. The COVID-19 pandemic has resulted in formidable challenges to patients with cancer as well as clinicians and researchers The research laboratories and other academic research institutions moved forward with a detailed slow pace due to the lock down, quarantining measure, working in shifts and deficient supplies, all of which critically impacted cancer research as a whole ***(COVID-19 Challenges Basic Researchers).***

In case of clinical trials pertaining to Cancer drugs, regulatory agencies such as the US Food and Drug Administration, European Medicines Agency, and the UK Medicines and Healthcare products Regulatory Agency issued guidelines to warrant the safety of trial participants, to conserve compliance with good clinical practice, and diminish the hazards to trial integrity. FDA made clear that the patients' welfare should endure to be at the forefront of all contemplations put forth by them ***(FDA guidance on conduct of clinical trials of medical products during COVID-19 public health)***. Hitches have been observed in numerous areas such as the recruitment of staff and volunteers for the clinical trials and the follow up of trial subjects after the particular intercession. Approximately 1440 phase 1–4 oncology trials were launched in 91 countries, among these, 1249 were started in the years before the pandemic, but the number radically reduced to 191 since COVID-19 hit. A survey piloted by the American Society of Clinical Oncology (ASCO) in July, 2020 observed that clinical trials had been paused or priorities deviated. To reanimate and lead clinical research back, ASCO published a Road to Recovery report, which designated five goals, conjointly designing more pragmatic and efficient trials, abbreviating regulatory burden, and improving accessibility. According to Aoife Regan, head of clinical research at Cancer Research UK (London, UK), 95% of cancer trials were impeded at the arise of the pandemic in early 2020 ***(Wilkinson E, 2021)***. A study report has revealed that oncology clinical trial has perceived a suave progress in china comparatively with a formidable growth rate ***(Wu DW et al, 2020)***. However, a glimmer of hope for cancer patients amidst covid 19 pandemic issues is that US FDA approved Trodelvy (sacituzumab govitecan-hziy) for the treatment of adult patients with triple-negative breast cancer, pralsetinib, lurbinectedin, selpercatinib, capmatinib for the treatment of lung cancer, naxitamab (Danyelz) for high risk neuroblastoma and many more in 2020 **(Novel Drug Approvals for 2020, FDA).**

Drug repurposing strategy has been employed to combat COVID-19 and unpredictably several anticancer drugs have been deliberated for repurposing. The drugs which are considered for this essentially hinder signal transduction pathways and bioenergetics ***(Ciliberto, G et al 2020)***. Cancer researchers all over the world contributed receptiveness to gauge out conceivable solution for battling COVID-19 by partially deviating their research focus to evaluate the potential of anti-neoplastic drugs against SARS-CoV-2, El-Deiry, a cancer biologist, now explores the role of TRAIL signaling in the immune-mediated clearance of SARS-CoV-2 infections. Similar to El-Deiry, many researchers partly modulated their research to add for the enhanced treatment modalities for corona virus. A few studies have been conducted using the drugs such as Cervarix, Gardasil, Hepatitis B Vaccine, etc. Tocilizumab, a monoclonal antibody which blocks IL6 is in phase 3 clinical trial to treat COVID 19. Another drug named Lopinavir and ritonavir were being used for research to analyze its suitability for SARS Cov 2 ***(Cancer Labs Pivot to Battle COVID-19)***. Further research is also needed to determine whether the biological insights derived from the cancer research community can be translated into clinically effective treatments for all patients with COVID-19. Researchers from India also put forth several plausible anti-cancer drugs against COVID 19.

During this pandemic, cancer researchers confronted predicaments due to limited research funding and many of them stopped recruiting new researchers, vital propellants to the study programs and this shows no signs of easing out in the near future. Besides everything else, the stalling of funding has had a bearing on many important cancer research projects. Understanding the constraints, several governments including those of UK, USA, Australia and several other EU countries, did not withdraw their funding for biomedical research. Additionally, they supported them by prolonging deadlines for grant submissions. Unfortunately, in south-east Asian countries like India, where COVID-19 arrived in around March 2020 it's normally the time for the release of yearly installment for on-going project grants, and as most of the government or agency money has been disbursed into the management of the COVID-19 pandemic,

researchers might get either reduced or delayed in their next round of funding. Cancer Research UK, reduced research budget by 10% and postponed the fund for new projects ***(Kourie HR et al 2020)***. Researchers fear that months of lockdown may have a serious impact on the direction of the research project. In addition to the shift in focus of laboratory-based research and the effects on funding, cancer researchers have had their scientific investigation, home life, and professional interactions uprooted. In many cases, the ability to perform experiments was altogether halted as institutions and labs were shut down entirely (Colbert et al., 2020). Moreover, recipients of several prestigious scholarships like Newton-Bhabha ended up in trouble during this pandemic period. Apart from money, the other important entity which Research faculties, Postdocs, PhDs, Research Assistant, Technicians involved in cancer research are losing is their precious ***TIME***.

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Sweet Memories of 39th IACR @ RGCB

CAR-T Cell Gene Therapy for Cancer

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Gene Therapy

Gene Therapy is a unique treatment modality where manipulating Nucleic Acids (DNA/RNA) serves as a therapy. The nucleic acid is generally delivered via a viral or non-viral vector in vivo which then synthesizes the therapeutic protein. Today there are a large number of variations in the techniques with different genes, different modes of nucleic acid delivery including different viral vectors, used for Gene Therapy. Gene Therapy trials have been initiated since 1990. The first Gene Therapy clinical trial carried out in 1990, in ADA-deficient Severe Combined Immuno-Deficiency syndrome, in 2 girls was able to correct the ADA deficiency and the disease. Since then Gene Therapy for various diseases are in different phases of clinical trials.

World's first gene therapy drug to obtain a drug license from the State Food and Drug Administration of China in 2003, is Gendicine which is an adenoviral recombinant Ad-p53 gene therapy for head and neck squamous cell carcinoma. Gendicine consists of an adenoviral vector carrying wild type p53 tumour suppressor gene and is approved as adjuvant therapy along with radiation or chemotherapy. Oncorin, another product developed by Shanghai Sunway Biotech, China, is an oncolytic adenovirus that was approved by Chinese regulators in 2005 for the treatment of squamous cell carcinoma of head & neck and oesophagus.

A few therapies have recently been approved for cancer in the US, Europe and China. Imlygic is the first oncolytic vector to receive approval for the treatment of advanced melanoma by the US FDA and Europe. It is a Herpes Simplex Virus 1 vector optimised in several ways which replicates only in actively dividing tumour cells causing oncolysis. It therefore promotes an immune response against released tumour antigens, and this aspect is further enhanced through arming it with the GM-CSF gene.

Chimeric Antigen Receptor - T (CAR-T) Cell Therapy

Although a majority of gene therapy clinical trials are for cancer, so far only one of the therapies has shown great promise and will be tested in patients in India as well. The approach called as Chimeric Antigen Receptor (CAR) T Cell – CAR-T is a therapy which has successfully cured a few leukaemia patients in the West. In this therapy, the patient's own T cells or gene edited allogenic T cells are manipulated in vitro to express a cell surface chimeric antibody against a specific antigen on the tumour cells. CARs are proteins generated by the fusion of an antigen binding domain, which is an antibody-derived single-chain variable fragment (scFv), with the T cell receptor (TCR) signalling domain CD3ζ. The chimeric antigen receptor T cells are expanded in vitro and introduced back in the same patient. When the manipulated T cells are reinfused into the patient, they recognise the tumour cells and rapidly kill them.

CD19-targeted CARTs for B-ALL were the first CARTs which reported complete remission (CR) rates of 80-90% in relapsed or refractory B-cell acute lymphoblastic leukaemia (ALL), while response rates were 30-50% in chronic lymphocytic leukaemia (CLL) and NHL. The drug called Tisagenlecleucel (Kymriah), received approvals in the US FDA in 2017, and later in 2018 in the European Union, Canada, Switzerland, Australia, and Japan. Axicabtagene ciloleucel (Yescarta) was the second commercial CAR T cell therapy, approved for relapsed or refractory diffuse large B cell lymphoma (DLBCL) by the FDA as well as authorities in the EU, Canada and Switzerland.

Another approved CAR-T cell therapy is a genetically modified autologous T cell against the B Cell Maturation Antigen (BCMA) for the treatment of adult patients with relapsed or refractory multiple myeloma. It is composed of genetically modified, antigen-specific, autologous T cells reprogrammed to target cells that express BCMA through transduction with a lentiviral vector expressing a CAR targeting BCMA. The BCMA CAR is comprised of a murine extracellular single-chain variable fragment (scFv) specific for BCMA, a human CD8α hinge and transmembrane domain and the 4-1BB and CD3ζ chain T cell intracellular signalling domains. Antigen-specific activation results in CAR+ T cell proliferation, cytokine secretion, and lysis of BCMA-expressing cells.

In order to make the therapy affordable, City of Hope, a research and treatment centre for cancer, and CytoImmune Therapeautics have recently got worldwide exclusive license to make large numbers of fully functional natural killer (NK) cells derived from umbilical cord blood and compositions of CAR for targeting NK cells to tumors. CAR NK therapies are designed to harness the power of NK cells, from healthy donors, that are in turn "engineered" to aggressively treat patients with cancer while minimizing the side effects of treatment. City of Hope, a recognized leader in CAR T cell therapies for solid and blood cancers, has treated more than 600 patients since its CAR T research started in the late 1990s.

However, despite the clinical success, several aspects of CART treatment such as CD19- negative escape, Cytokine Release Storm, neurotoxicity, needed to be improved. The manufacture of autologous CART cells is time consuming, logistically difficult and expensive. Also the cost of this treatment was beyond the reach of common man in India. This led to the development of off-the-shelf allogenic CART cells prepared from healthy donors by a technique of gene editing.

Gene Editing Therapy

Majority of experimental gene therapy comprised of transferring

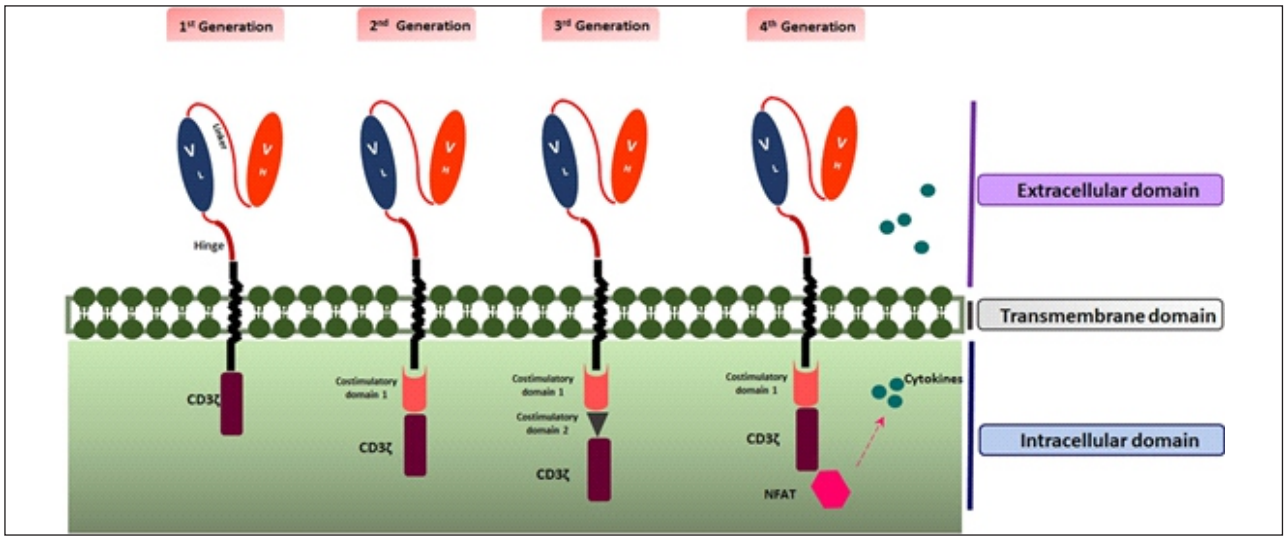

Fig 1. Chimeric antigen receptors (CARs) have a modular design consisting of an antigen binding domain, a hinge (spacer), a transmembrane domain and an intracellular signalling domain. The antigen-binding domain is usually a single-chain variable fragment (scFv) molecule derived from a monoclonal antibody (from mouse anti-human CD19 antibodies, for example, in the currently FDA-approved CAR T cell products). The intracellular signalling domain generally contains a T cell activation domain derived from the CD3ζ chain of the T cell receptor as well as co-stimulatory domains that often comprise immunoreceptor tyrosine-based activation motif-containing regions of CD28 or 4-1BB (also known as CD137 and TNFRSF9). CAR gene constructs can be further modified to engineer CAR T cells with expression of an 'armour' protein, which is typically a cell-surface or secreted immunomodulatory molecule that enhances T cell function or favourably modifies the tumour microenvironment. (Nature Reviews Clinical Oncology 2020, 17, 147)

genes through viral vectors such as Mouse Retroviral vectors, Lentiviral vectors, Adenoviral vectors or Adeno Associated Viral vectors where the transgene would either get randomly integrated in the host genome or remain extrachromosomal. However, with advances in the DNA technology, it is now possible to correct a gene defective by precisely correcting the mutation or inactivating the gene, by a technology called Gene Editing. Here a double stranded break is introduced at the exact required location via guide RNA which targets a nuclease to the exact site on the DNA strand. The double stranded break activates the DNA repair mechanism by which the breaks are repaired and during the process introduces the correct sequence. There are two main mechanisms for repairing double-strand breaks, non-homologous end joining (NHEJ) and homology-directed repair (HDR). HDR repairs DNA using a homologous template and is preferred for repairing a mutation or integrating genes for therapeutic purposes. The commonly used nucleases for gene editing are meganucleases, zinc-finger nucleases, transcription activator-like effector nucleases (TALEN), and CRISPR-associated nucleases CRISPER/Cas9). In 2020 the Nobel Prize in Chemistry was awarded to Emmanuelle Charpentier and Jennifer A. Doudna for the development of CRISPR/Cas9 gene editing tools for genome editing.

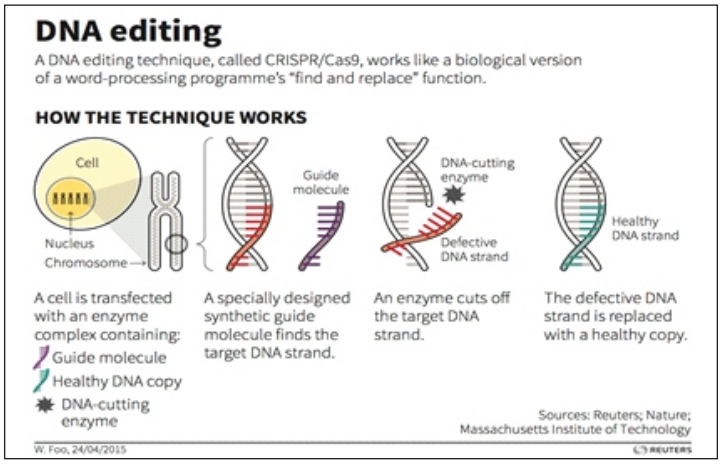

Fig. 2 Gene editing technique

The first successful gene-edited, allogenic CAR-T cell therapy was administered to a 3 month old girl, Lyala, suffering from B - Acute Lymphoblastic Leukaemia, who had failed all other avenues of treatment. There were a number of human CAR-T trials already underway where autologous T cells were armed with an antibody to CD19 expressed on the malignant B cells. However, in Lyala's case, she didn't have enough T-cells left to modify and infuse back into her body. Also, she was too small and too weak. However, allogenic CART cells would be a problem as endogenous T cell receptor (TCR) on allogenic T cells would recognise the alloantigens of the recipient and cause graft-versus-host disease. Also, HLA antigens expressed on the allogenic T cells would cause rejection of the donor cells. The endogenous TCR as well as the β2-microglobulin (B2M) genes for Major Histocompatibility Complex (MHC) class I would need to be disrupted in T cells.

A team led by Waseem Qasim of University College London had used gene editing to disable TCR and B2M gene in the donor cells so that the cells could be used in any individual. These cells were called Universal CART cells. UCART is the first therapeutic product line that is developed with the TALEN gene editing platform by a company Cellectis, to address unmet medical needs in oncology. UCART19 cells worked for Lyala and within weeks she was free from the disease. Other UCARTs are also being tested in clinical trials. UCART123 is a gene-edited T-cell, investigational drug that targets CD123, an antigen expressed at the surface of leukemic cells in acute myeloid leukaemia (AML). In a Phase I trial, the first dosing with UCART123 took place at MD Anderson Cancer Centre, USA in January 2020.

CAR-T Cell Therapy in India

Since Chimeric Antigen Receptor (CAR) T-cell therapy has shown remarkable results in treating haematological malignancy especially B-ALL, this novel therapy has caught the attention of many clinicians and scientists as well as funding bodies in India. Currently, the overall survival (OS) of paediatric B-Acute Lymphoblastic Leukaemia in India is around 70% of which 20-25% ALL patients relapse. Government Funding bodies including Biotechnology Industry Research Assistance Council (BIRAC), Department of Biotechnology as well as Indian Council for Medical Research recently sent out calls for submitting proposals on CAR-T cell technology. A large amount of funds have been made available for research and translation of CART technology in order to benefit patients in the country.

According to Rahul Purwar, ongoing research at IIT Bombay may pave the way for CAR T-cell therapy to become an affordable reality for cancer patients in India. Purwar of the Department of Biosciences and Bioengineering launched the startup ImmunoACT four years ago to address the unavailability of the therapy in India. CAR T-cell therapy is available in the US from pharmacological giants Novartis and Gilead, but the therapy costs almost Rs 3-4 crores. The researchers at IIT-B, in collaboration with clinicians from Tata Memorial Hospital, Mumbai have developed a therapy that will be much cheaper and would cost nearly Rs 15 lakhs.

A novel humanized anti-CD19 CAR-T cells has been designed by the IIT-B group. Ex vivo studies with these CAR-T cells generated from healthy donors and patients showed comparable anti-tumor activity and proliferation. They also demonstrated that these CART cells produced low levels of cytokines (IFN-g, TNF-a) upon antigen encounter and reduced the induction of IL-6 cytokine from monocytes, thereby addressing the problem of a cytokine storm (Dwivedi et al. Mol Cancer Ther 2021).

Bangalore based Immuneel Therapeutics, a company formed by Siddhartha Mukherjee, Kiran Mazumdar and Kush Parmar, has also entered the race to harness CAR T-cell technology and make it readily available in India. Immuneel will in-license the technologies and cut costs by streamlining the engineering and delivery process. So also there are other hospitals and industries including Tata Medical Centre, Kolkata, INTAS Pharmaceuticals, Ahmedabad, which are working on CART cell therapy. Hopefully this therapy will soon become an affordable reality for cancer patients in India.

Vaccines based on Gene Therapy

Although the present subject is cancer, it is pertinent to bring in the topic of DNA/RNA vaccines which are being administered all over the world today due to the pandemic. Viral vectors have been used in a majority of gene therapy clinical trials as well as in some of the approved cancer drugs based on gene therapy. Viral vectors such as adenoviruses, adeno-associated viruses, lentiviruses, can generate high levels of recombinant proteins. A large number of different viral vector expression systems have been utilized for targeting viral surface proteins and tumor-associated antigens. Currently at least 6 COVID19 vaccines are based on viral vectors which carry a gene for Spike protein of SARS-CoV-2 which then makes the protein against which the vaccinated subject makes antibodies. One of the 2 vaccines which is being administered in India is based on the Oxford-AstraZeneca vaccine for SARS-CoV-2, made by Serum Institute of India, called COVISHIELD. The vaccine is a replication deficient chimpanzee adenovirus vector containing the full length coding sequence of the SARS-CoV-2 Spike protein. Thus, adenoviral vectors and gene therapy have already become household words all over the world including in India due to the pandemic.

Gene Therapy for Cancer is finally seeing the light of the day in India and hopefully will be the magic cure for a large number of cancers.

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IACR Executive Committee Meeting – February - 2020

Poster Session @ 39th IACR - February- 2020

IACR Award Winning Essays – 2021

Prize	Name	Details
1st Prize	Deeptashree Nandi	Department of Biochemistry, University of Delhi South Campus
2st Prize	Sakshi Hardaha	Pondicherry University
3rd Prize	Sanchit Gandhi	Department of Genetics, University of Delhi, South campus

1.Viruses and Cancer Immune Therapy

Deeptashree Nandi

"We pass through this world but once. Few tragedies can be more extensive than the stunting of life, few injustices deeper than the denial of an opportunity to strive or even to hope, by a limit imposed from without, but falsely identified as lying within."- Stephen Jay Gould

Over the several billion years since the advent of humans on this planet, across the vast stretches of land inhabited by us and through the continuously transforming views on the lessons of life and evolution, the one truth that has stood its ground is that life always finds a way to continue. One might argue that even with the tremendous advances in science and technology, we are succumbing to numerous deadly diseases, no better exemplified than the ongoing pandemic. Now, let us slightly shift our perspective- let us look at the scenario from the viewpoint of the virus. The leap of faith taken by the virus when jumping from its conventional host to an entirely novel system is just another wonderful case of life finding its way, life evolving- except in this case, it is the life of the virus. A cancer cell is no different. To the cancer cell, we are the outsiders, trying to annihilate its existence while it simply wishes to find a suitable, warm niche to live in. Hence, it does what any living being would do when faced with a challenge- fight! It fights, it resists against whatever threatens its peaceful abode- radiation, chemotherapy, surgery and the list goes on. The trick, therefore, is to get the job done without intimidating it, without letting it strike back at the alien agents being thrown at it. The magicians who triumphed at this trick, James P. Allison and Tasaku Honjo, were awarded with the 2018 Nobel Prize in Physiology or Medicine for innovating a form of cancer therapy, taking advantage of the body's own immune regulation (1). The art of harnessing a patient's own immune system to improve cancer outcome had been used earlier by William B. Coley in the 19th century (2), followed by decades of extensive scientific investigation. This eventually substantiated the pivotal implications of modulating the host immune response for better prognosis of cancer patients.

"It is during our darkest moments that we must focus to see the light."-Aristotle Onassis

Cancer immune therapy, simply put, enhances the function and amount of tumor- infiltrating immune cells like lymphocytes and dendritic cells to elicit sufficient immune response for clearance of cancer cells with minimal autoimmune aftermath on healthy cells. The most popular treatment regime is based on immune-checkpoint inhibitors, which have revolutionized the therapeutic paradigm of many malignancies and established itself as a strong pillar for cancer treatment (3). However, the complex heterogeneity of the tumor microenvironment leads to varying patient outcomes and limits therapeutic efficacy. In particular, the tumor niche was found to actively mitigate the anti- tumor immunity. Hence, current endeavors are focused on bypassing tumor- related immune evasion. Finding ourselves at an impasse, our salvation surprisingly lay in an age- old adversary.

"The single biggest threat to man's continued dominance on the planet is the virus."-Joshua Lederberg

Our immune system has evolved to recognize an invasion, mostly initiated by pathogens, and respond accordingly with the sole aim of eliminating the alien attacker. Tumors, equally equipped with unmatched genius, flourish in the apparently hostile neighborhood of a healthy immune environment by acts of manipulation- lesser display of their antigens, paralysis of infiltrating immune cells and overall weakening of the immune response, thus allowing the tumor to stay hidden from the host immune assault. Nonetheless, such tumor cells have an attenuated ability to respond to viral infections relative to normal cells, thereby making them susceptible to destruction by viruses, which, we can uncannily design to leave healthy cells unscathed.

"An inefficient virus kills its host. A clever virus stays with it."-James Lovelock

Oncolytic viruses (OVs) have recently gained momentum as an invaluable candidate of the dynamically expanding cancer immune therapy, owing to their unique feature of tumor- targeted oncolysis (tumor cell infection and lysis) and their extraordinary ability to awaken the host innate and adaptive immune responses (4). OVs are replication competent viruses that can be genetically engineered at our will to come up with a safe yet powerful armamentarium to combat cancer. The inherent abnormalities of cancer cells regarding their stress response, signaling pathways and homeostasis make them more habitable for viral infection and label them for selective killing by OVs. There exist diverse molecular mechanisms underlying their selective cancer killing strategy but it frequently involves a defective antiviral response within the tumor. A multimodal regime of slaughter is carried out by OVs- virus- induced cytotoxicity, cell death due to interrupted

vasculature or cytotoxic immune effectors. Following their introduction, these viruses can simultaneously repress tumor-associated immune suppressive mechanisms while bolstering strong antigen- agnostic anti- cancer immunity. OVs are generally believed to induce immunogenic cell death (ICD), which can shape their ability to evoke an adaptive anti- tumor immune response, thus exacerbating their tumor- clearing functions. Viral infection promotes the release of a plethora of inflammatory molecules, including cytokines and chemokines, which attract a large quantity of immune cells to the tumors. Virus- mediated lysis of cancer cells also causes release of PAMPs that further intensify the anti- tumor immune activity (5). Finally, the secretion of tumor- associated antigens following tumor lysis leads to an adaptive immune response and antigen-specific T cell activation. Therefore, both the arms of host immune response- innate and adaptive are conjured by the OVs, implying their exceptional potential in eradicating tumors. These sophisticated qualities distinguish these agents from traditional therapeutics, such as tumor vaccines or immune adjuvants.

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less."- Marie Curie

The range of OV platform is vast, ranging from tiny RNA virus backbones- replicate faster and lyse tumor cells to release an enormous number of progenies to huge DNA virus backbones- slower to replicate but more area for genetic manipulation. The initial development of OVs dates back to the 1990s and more than one thousand cancer individuals have been successfully treated with intratumoral injection or intravenous infusion of this mode of therapy during clinical trials (6). The herpesvirus T-VEC was the first OV approved in 2015 by regulatory bodies in the United States and Europe for the treatment of advanced melanoma. The virus successfully encoded the granulocyte macrophage colony stimulation factor for the appropriate recruitment and subsequent activation of host immune cells within the tumor in addition to its native oncolytic properties (ClinicalTrials.gov: NCT00769704). Till date, viruses that have been safely administered in carcinoma patients encompass adenovirus, measles virus, reovirus, picornavirus, vaccinia virus and Newcastle disease virus. Mere flu- like symptoms and mild cytokine level fluctuations were reported as side effects, which effectively resolved within a day. Thereafter, multiple groups have demonstrated that application of OVs in conjunction with complimentary immunotherapies expedite tumor clearance; numerous clinical trials to evaluate the efficacy and safety of such combination modules are currently underway (7). Despite the unquestionable requirement of more potent and selective agents, amalgamation of such viruses that enable acute and specific disruption to tumors with efficient tumor suppressive immune- modulatory regimes may prove extremely beneficial. Choice of the optimal viral species, its efficient delivery, increasing its intra- tumoral infiltration, tackling antiviral immunity and the immunosuppressive nature of tumor niche are some serious drawbacks of OV therapy that demand immediate attention. For instance, a majority of patients harbors pre- existing antibodies against popularly used OVs, thus promptly antagonizing their immune effects. An initial host innate response to the administered OV also poses a similar crisis, thus highlighting the importance of the site and route of OV administration. Use of pharmacological molecules that block antiviral responses have been recently shown to circumvent such issues (6).

The stories of big wins are easily remembered- what's harder to find despite being undoubtedly more in number are the stories of losses. But the losses must happen if we are to find a breakthrough. A scientist must always be prepared to lose. The key, though, win or lose, is to never fail and the only way to fail is not to fight- lose the small hypotheses but never the battle, the battle to find a cure, to curtail the disease. Never let go, never give up, never run, never surrender- fight against the odds, fight against the deadly menace of cancer for life, human life, will miraculously find a way.

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2. Viruses and Cancer Immune Therapy

Sakshi Hardaha,
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There are many deadly diseases in the world but cancer has overtaken most of them in the past years. According to the World Health Organization (WHO), cancer is the second main cause of death in the whole world; it led to about 9.6 million deaths globally in 2018. The reason behind such a big number is that we till now know only the sources that lead to cancer but the main mechanism behind cancer in different organs remains hidden. Nevertheless, we are trying to fight this disease with various techniques like radiotherapy, chemotherapy, and immunotherapy. Though chemotherapy and radiotherapy are commonly used, immunotherapy serves as an additional way to achieve our goals in the field of cancer.

Immunotherapy is a technique targeting the immune system to fight against cancerous cells. Various immunotherapies are being practiced that include checkpoint inhibitors, monoclonal antibodies, T cell therapy, vaccines, and oncolytic viruses. Some of them work in preventing the growth of cancer cells, some in killing cancer cells while some in preventing metastasis (spreading of cancer in other body parts). Each therapy has its pros and cons. I herein focus on the use of viruses in immune therapy.

An oncolytic virus in literal terms means a virus that lyses cancer cells. We know that viral infections are one of the sources of cancer. According to WHO, such infections account for 25% of cancers in low- and middle-income countries. Then how can viruses be employed in curing cancer without harming the human body? The answer to this is that viruses are genetically engineered to restrict their replication inside the human body but granting them the ability to recognize specific tumors. But this does not mean that oncolytic viruses are not naturally occurring. In fact, the first use of viruses in curing tumors comes from 2600 bc when Egyptians used poultice on tumors that lead to the occurrence of viral infections that suppressed tumors.

The basic mechanism of working of an oncolytic virus is that they multiply within selective cancer cells leading to their damage or lysis. In this process, they release certain proteins in the tumor microenvironment which serves as a marker for immune cells to target the same cancer cells (containing the same proteins) throughout the body. In detail, oncolytic viruses target the immune system in the following way. Replication of viral genomes releases proteins like Pathogen Associated-Molecular Patterns (PAMPS) and Danger Associated-Molecular Patterns (DAMPS) that activate toll-like receptors in dendritic cells leading to their maturation. Dendritic cells that are professional antigen presenting cells, present viral antigens to immune cells like T cells. T cells can either kill cancer cells by the action of perforins or granzymes or activate B-cells. In turn, B cells come into play by T cells activating them or their BCRs (B- cell receptors) interacting with viral antigens. B cell release antibodies against viral antigens that promote Antibody Dependent Cell Mediated Cytotoxicity (ADCC) involving natural killer (NK) cells or phagocytosis involving mainly macrophages. This leads to the overall killing of cancer cells.

The oncolytic virus selects tumors on which it will specifically work on. This is achieved by several factors. Firstly, they interact with selective receptors present on tumor cells. Secondly, the high replicative property of tumor cells and mutations in them promote selective viral entry. Thirdly, they utilize faults in interferon signaling to gain entry into selective tissues. The tumor selectivity and potency of oncolytic virus can be artificially increased by genetically engineering them, using intramuscular injections, or by inserting specific gene sequences that differentially express microRNAs that interact with specific tumor receptors.

Everybody reacts to foreign particles differently that affect the efficacy of an oncolytic virus towards that specific individual. The efficacy of a virus is also affected by antiviral interferons and factors like hypoxia and acidic tumor microenvironment. Oncolytic viruses can be combined with other treatments of cancer like immunotherapy via checkpoint inhibitors to increase their efficacy. Nowadays, transgene insertion in oncolytic virus and modulation of tumor microenvironment enables other therapies to work synergistically with viral therapy. Transgenes inserted into oncolytic viruses to increase their efficacy include cytosine deaminase and thymidine kinase, granulocyte macrophage colony stimulating factor (GMCSF) cytokine, antibodies, and others. Certain modulations that increase the probability of successful entry of viruses in tumors include the addition of arginylglycylaspartic acid (RGD) peptides in the fiber knob.

In 2004, Rigvir, a picornavirus was the first approved oncolytic virus against melanoma. H101, an adenovirus was the second approved oncolytic virus that was allowed to be used in cancer treatment in China since 2005. But both of these lacked safety measures. In 2015, talimogene laherparepvec (T-vec), a modified Herpes Simplex Virus, was the first one to get approval by US Foods and Drug Administration for melanoma patients that can't be treated by any other methods. T-vec has led to an improvement in Durable Response Rate (DRR) by 16.3% in melanoma patients. Besides these, some oncolytic viruses are being investigated as effective agents for cancer immunotherapy. These include herpes virus, adenovirus, vaccinia virus, coxsackievirus, measles virus, poliovirus, retrovirus, and reovirus. Till the writing of this essay, oncolytic viruses under phase 1 trial for the

treatment of various cancers include M032, C134, MEDI5395, RP3, rQNestin34.5v.2, TBI-1401(HF10), pelareorep, AdAPT-001, RP1, M1-c6v1, ASP9801, TILT-123, CAdVEC, DNX-2440, Ad5-yCD/mutTKSR39rep-hIL12, Enadenotucirev, NG-641, NG-350A, REOLYSIN, Seneca Valley Virus and Ad/MG1-E6E7. Those that have completed phase 1 trials include TBI-1401, MV-CEA, GL-ONC1, DNX-2401, ONCOS-102, ICOVIR-5, VCN-01, and Colo-Ad1. Those under phase 2 trials include G207, TBio-6517, OH2, BT-001, HX008, Pexa-Vec, TG6002, LOAd703, ORCA-010, OBP-301, SynOV1.1 and ADV/HSV. CELYVIR, GL-ONC1, CG0070, HSV1716, CVA21, H-1PV, and delta-24-RGD oncolytic viruses have completed phase 2.

Oncolytic viruses though have promising uses but their safety remains a concern. There is a possibility of off-target effects, viral manipulations, and viral products leading to toxicity. Some oncolytic herpes viruses have shown retention of the gene that promotes their replication inside the host. This problem can however be solved by modulating the promoters involved in the replication of viral genomes like p53, E2F promoters.

Today, there is a need of exploring oncolytic viruses in cancer treatment to a broad spectrum. As cancer results in immunosuppression, enhancing immune response via oncolytic virus can be an effective treatment against cancer in near future. This can be achieved only if researchers devote their attention to oncolytic viruses in cancer immune therapy, which they are already doing. According to me, the potential of the coronavirus should also be explored in cancer immune therapy. Covaxine developed by Bharat Biotech in association with the Indian Council of Medical Research (ICMR) and National Institute of Virology (NIV) against COVID-19 is inactivated whole virus that works on the principle of suppression of viral replication inside the body but can trigger an immune response in the body. This is what we require in cancer immune therapy. Since this virus affects the cells of respiratory tracts and lungs, it might find potential in the treatment of lung cancer with effective genetic modulation. If so, this bane will be a boon for the world.

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Cultural Programme for IACR Family – February - 2020

3. Viruses and Cancer Immune Therapy

Sanchit Gandhi

Cancer is one of the leading causes of death globally. According to data published in *The Global Burden of Disease (GBD)*, nearly 10 million people died due to this disease in 2018 alone. As with many other diseases, the early-stage diagnosis and treatment of cancer is the standard practice. Before treating a cancer, it is prudent to assess the nature of cancer, the stage of the cancer, risks involved and preservation of normal function of the tissue/organ post-treatment.

Cancer is a genetic aberration-driven disease. During cellular division, there are ample opportunities for these genetic aberrations to occur, however, most of these are remedied by multifarious cellular agents. The major contributors in the development of cancer are mutations, amplifications and deletions in the tumor suppressor genes and oncogenes. Not all genetic aberrations provide the cells the survival advantage to transform into cancerous cells, only some called driver mutations are able to do so. Though the genome of a cell is at the core of all the metabolic activities, yet it is the coordination between heterogenous types of cells which can help fight against cancer. The immune system comes to the rescue, and performs tumor immune surveillance in order to identify as well as destroy the cancerous and/or pre-cancerous cells much before these can act as a stumbling block to the normal cellular activities. The moment the tumor immune surveillance fails, a tumor may develop despite the presence of comprehensive immune system. Cancer immunoediting helps resurrect the tumor variants which have learnt to evade the immune response only to be detected later at the level of clinical check-ups.

Despite the spiraling advancement in science and technology, the success rate of the current conventional treatment regime is either stagnating or inching up very slowly. Immunotherapy has come forward as a bright component of the treatment options in the prevention of cancer. Immunotherapy, as against the conventional options, is less aching for the patients, specific to tumor cells, and relatively less toxic. One of the first examples of successful immunotherapy dates back to the time of William B Coley, alias Father of Immunotherapy, who injected the streptococcal organisms into patients and observed shrinkage of the malignant tumors (Lippman et al, 2009). Right from that time, a plethora of facts, experimental results and hypotheses relating to immunotherapy have come forward. If one peruses the timeline of the development of immunotherapy, one can easily assess that several milestones have been crossed and many hindrances cleared off. The 2018 Nobel Prize in Physiology or Medicine for the discovery of cancer therapy by inhibition of negative immune regulation is the corroboration of the therapeutic potential that immunotherapy has, the hope 'to live' it would give to patients, accolades to many knowns and unknowns who have worked in this field in the past, encouragement for those working currently for further developments and excitement for future researchers and scientists.

Immunotherapy generally mediates the elicitation of immune response against the cancerous cells through the introduction of vaccines, antibodies, immune cells, cytokines and oncolytic viruses. Immunotherapy can be performed in two ways — active or passive immunotherapy; the former guides the immune system to fight by eliciting a response while the latter provides the patients with immune doses that are unfortunately absent in the patient's body. Up till this time, different approaches of immunotherapy have joined the ranks in the prevention of cancer — cancer vaccines, immunestimulatory agents, adoptive T-cell therapy (ACT) and immune checkpoint therapy (Lizée et al, 2012).

Cancer vaccines is a therapeutic agency of immunotherapy which consists of tumor antigens and elicits response from tumor-antigen specific helper T cells and/or CTLs and B cells, for example, rituximab targets cell-surface molecule CD20. Immunostimulatory agents, like adjuvants and cytokines, also pose a great potential in the treatment of cancer. Though immunostimulatory agents alone exhibit weak anti-tumor activity, it works well in combination with cancer vaccines.

In cases where the option of resection is unlikely, for example cancer at stage III or IV, the adoptive T-cell immunotherapy has come up as a holy grail. Also known as the cellular immunotherapy, it uses the T-cells of the immune system for cure of cancer. The robust and specific responses, ability to distinguish between healthy and cancerous cells, memory retaining capacity and swift movement to the site of the antigen — these properties of the T-cells substantiate the use of this therapy in cancer treatment. The approach in this therapy uses T-cells either from patient (autologous approach) or from healthy donor (allogeneic approach). T-cells are isolated and grown in sophisticated ex vivo culture and selected for reinfusion into the patient. The T-cells used are one of the three forms: tumor-infiltrating lymphocytes (TILs), T cell receptor (TCRs) T cells, and chimeric antigen receptor (CAR) T cells. The strategy of genetically redirecting and reprogramming T-cells with chimeric antigen receptors (CARs) has advanced to the level of clinical development for treatment of Acute Lymphoblastic Leukemia (ALL) and has also garnered positive response from the regulatory bodies. The use of disarmed vector systems such as murine gammaretroviruses and lentiviruses to stabilize the transgene expression has enhanced the durability of clinical responses in this therapy.

Immune checkpoint therapy is another important stone in the developing pillar of immunotherapy. This modality of

immunotherapy is different from others in the sense that instead of provoking immune response to eliminate the target tumor cells, it sacks the inhibitory pathways that hinder effective anti-tumor T-cell responses. The pioneers of immune checkpoint therapy, Dr. James P. Allison and Dr. Tasuku Honjo, were jointly awarded the 2018 Nobel Prize in Physiology or Medicine. The 'immune checkpoint inhibitors' agents targeting the CTLA-4 and PD1 have significantly impacted the outcomes for the betterment of cancer patients (Sharma & Allison, 2015).

While describing the immunotherapy, it is imperative to throw light upon the oncolytic viruses and its noteworthy benefits in the therapeutics. Oncolytic Viruses (OVs) are the natural or modified viruses which came in limelight due to its ability to infect and lyse cancer cells while avoiding normal cells. Currently, IMLYGIC (Talimogene laherparepvec), a weakened form of Herpes Simplex Virus Type I, is the only FDA approved prescription medication to treat melanoma, a type of skin cancer. Some of the other oncolytic viruses presently under different clinical stages of development are adenoviruses, lentiviruses, reoviruses and Newcastle disease viruses. The improvement in the understanding of the biology of viruses, genetics and molecular oncology has led to an increased interest in the integration of OVs to the immunotherapy (Hemminki et al, 2020).

While the existing developments in the immunotherapy are promising in terms of increased therapeutic interventions and reduced cytotoxicity, there are still many stumbling blocks left to be removed to cure all patients completely (Helmy et al, 2013). First, as we know that tumor antigens are identified before targeting, unluckily in many cases, the tumor antigens are different in individual tumors, thus posing practical difficulty in therapy. Second, the immune system while eliminating the cancerous and/or pre-cancerous cells helps in the positive selection of those tumor variants which in turn bypass immune identification and extermination. Third, another level of complexity is added while combining two types of immunotherapy or combining immunotherapy with conventional modalities of therapeutics. While the traditional methods are immunosuppressive, the immunotherapy is immunostimulatory. Fourth, though the initial responses to immunotherapy in the experimental data gave hope, yet the durability and persistence of the clinical successes are still far but approachable. Fifth, while there are enough experimental data that oncolytic viruses help the immune system to fight against tumor cells while preserving the normal cells, it is mandated that a standard regulatory supervision be met while using it for treatment.

Whatever the method of treatment be, the ulterior motive is to cure all patients of this devastating disease. The immunotherapy helps the immune system to retain its memory against cancers and attain permanent cure. As the understanding of the immune system would expand, it would not only help enhance the therapeutic benefits of immunotherapy but also open new windows to the domain of personalized treatment. Whether alone or in combination with the conventional therapies, it would be a great achievement to either eliminate the tumor completely or ascertain long-term control of the disease. It is sincerely looked forward and most sought after how immunotherapy would change the algorithm of therapeutics in future. Efforts to bring the immunotherapy from bench to bedside are still on and the success of it would be a treat to mankind.

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40th Annual Conference of Indian Association for Cancer Research (IACR-2021)

Institute of Life Sciences (ILS), Bhubaneswar organized the 40th Annual Conference of Indian Association for Cancer Research (IACR-2021) on 1st March 2021. This time due to the ongoing pandemic, the organizing committee conducted one day of webinar. The meeting began with a welcome address by Prof. M. Radhakrishna Pillai, President, IACR, followed by the welcome address by Padmashree Dr. Ajay Parida, Director, Institute of Life Sciences. It was an exciting opportunity for more than 300 research scholars/associates/clinicians and scientists to virtually attend, interact and join the discourse on outstanding research and development in the field of cancer biology.

In the morning session, five cancer researchers presented their research work that includes one international speaker and three national speakers. Prof. Pankaj Singh, Fred & Pamela Buffett Cancer Center, University of Nebraska Medical Centre, USA, explained how increased nucleotide pool support increased DNA damage repair in response to the genotoxic stress. Prof. Singh's explanations on how the enzymatic regulators of the nucleotide biosynthesis can improve response to chemotherapy and radiotherapy attracted a lot of discussions.

Dr. Abhijit De, Molecular Functional Imaging Laboratory, ACTREC, Tata Memorial Centre
Navi Mumbai, India gave a detailed account of development of therapeutics to target non-canonical STAT3 activation using 'PhosphoBRET' imaging sensor in triple negative breast cancer.
This talk was followed by the presentation by Dr. Murali Dharan Bashyam, Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad, India on the oncogenic potential of cytoplasmic ARID1B and how it abrogated in cancer by gain-of-function mechanisms.

Prof. Thangarajan Rajkumar, Cancer Institute (WIA), Chennai, India talked about Biomarkers for early diagnosis of breast cancer. This was followed by a detailed discussion on stage wise indicators of breast cancer.

One of the stalwart in cancer biology and head of the National Cancer Institute, India, Prof. G.K. Rath delivered the IACR Oration for 2021. He talked about the epidemiology and demography of several cancers. He also stressed on the need to develop programs that will ultimately lead to a product which will be beneficial to the patients. He also elaborated on the effort that the government has taken to build the National Cancer Institute, in Jhajjhar, Haryana.

These five presentations were followed by IACR General Body Meeting in which Dr. Priya Srinivas, Secretary, IACR presented the activities of IACR and Dr. Harikumar, Treasurer, IACR give an account of the proposed budget.

Afternoon session started with strategies to developing engineered anti-tumor T cells and CAR-engineered anti-tumor T cells and challenges in clinical development and its side effects which was explained by the pioneer in the field, Dr. Arvind Chhabra, Stem Cell Institute, Amity University, Gurugram, India.

Dr. Remy Pedeux, Scientist, Centre Eugène Marquis, Rennes, France explained ING2 and ING3 as new actors in the DNA damage response and repair and its importance in cancer.

Dr. Sagar Sengupta, National Institute of Immunology, New Delhi, India explained his experience in understanding the different functions of BLM and RECQL4 in the two subcellular compartments in tumour cells.

Dr. Priya Srinivas, Cancer Research Program, Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram, India showed how Pregnancy hormone, hCG can ignite tumor development in BRCA1 defective breast cancers.

Dr. Anguraj Sadanandam, The Institute of Cancer Research, London, United Kingdom explained how Immune heterogeneity in cancers accounts for hot to cold tumours that dictate their response to immunotherapy.

Dr. Soumen Chakraborty moderated the talks and discussions.

All the presenters came up online during their presentation and answered all the questions that were raised after their presentation. Various field of cancer biology was covered, that includes Genomics, DNA damage and response, Imaging, Immunotherapy, epidemiology, etc.

At the end, the name of awardees' of IACR Annual essay competition was declared. The webinar ended with a "Thank You" note from the organizing committee.

INDIAN ASSOCIATION FOR CANCER RESEARCH
(Soc. Reg. Act. 1860 Reg. No. Bom. 710 / 80 G.B.B.S.D)

Secretary's Report during the period March, 2020 - February, 2021

Secretary, IACR
Dr. Priya Srinivas
Rajiv Gandhi Centre for Biotechnology (RGCB),
Thiruvananthapuram 695 014, Kerala

Since its inception in 1980, Indian Association of Cancer Research (IACR) envision towards advancements in Cancer Research in India. IACR has contributed towards fostering research in cancer diagnosis, therapy and prevention to promoting cancer education and cancer awareness amongst the society.

40th Annual IACR meeting was originally decided to be organized by the Amity University, Noida, as announced during IACR Genral Body (GB) meeting on February, 6, 2020 at Thiruvananthapuram. Since the unprecedented situation of COVID-19 pandemic worsened, we realized that we will not be able to conduct IACR-2021 in person. After discussions through emails, Executive Committee (EC) accepted and approved the proposal by Professor B C Das to organize 41st annual conference of IACR (IACR-2022) at Amity University, Noida and to conduct IACR-2021as a one day online meeting.

In this connection, Professor Radhakrishna Pillai, President, IACR requested Dr. Ajay Parida, Director, Institute of Life Sciences (ILS), to conduct IACR-2021. On behalf of IACR EC, I thank the Organising team at ILS for organizing IACR 2021 on a very short notice.

Though the pandemic has slowed the pace of our research, we have been engaged in a number of activities for IACR. We have created a comprehensive website for IACR with updated details as well as several additional information. This new IACR website, iacr.in, gives the viewers a better picture of IACR in a global standard, in par with other international Societies. The updating of website is a continuous process and we seek information from the members for novel ideas on how we can improve our activities and reach so that we can effectively contribute to serve the society through this prestigious association. In this connection, we plan to include real time information on publications originating from Members, project / research / PDF / Faculty vacancies / opportunies in India, informations of local or regional meetings of Cancer Researchers, introducing Indian Cancer Researchers' with a short Biography on a monthly basis and personal experiences in fighting and winning the battle against cancer by the survivors.

We are happy that IACR Newsletter is restarted with the Editorial Team: Dr Prabhudas Patel, Professor & Head (Rtd) Cancer Biology Department, Gujarat Cancer & Research Institute (GCRI), Ahmedabad as Editor and Dr Mayank Singh, Department of Medical Oncology, All India Institute Of Medical Sciences (AIIMS), New Delhi and Dr. Anandha Mukherjee, Cancer Research Program, Rajiv Gandhi Centre for Biotechnology (RGCB), Thiruvananthapuram as Associate Editors. There will be two issues for the Newsletter in a year, which will be published on April 1st and October 2nd. Only soft copy will be published and the PDF will be uploaded in the website, iacr.in. The invitation for contributions to the Newsletter has already been posted in the IACR website.

Annual essay competition for 2021, for young post graduates and research fellows was successfully conducted. The call for essay competition was advertised in the IACR website (topic- 'Viruses and Cancer Immune Therapy'). Initially, each essay was screened for plagiarism and then evaluated. The awardees were chosen by a committee of 5 members. The Executive Committee has decided to increase the IACR essay competition prize money to Rs.5000/-, Rs.3000/- and Rs.2000/- for the 1st, 2nd and 3rd prize winners, respectively. The Executive Committee has also agreed to indicate the details of the increased prize money for various IACR Awards in the IACR website. The Prize money will be Rs. 5,000/- for the students' awards (Sitaram Joglekar Award, Mangala Bamane Award, Rajnikant Baxi Award and Rambhau Kulkarni Award) and Rs. 10,000/- for the Faculty's awards (Dr. Virendra Balkrishna Kamat Award and Ram Nath Hiralal Jaju Award). Since, the Award money has been increased; the awards have been renamed prefixing 'IACR'. Travel Grants will be given as per the eligibility criteria and Government of India norms to the winners. As this time the meeting is online, these Awards other than Annual Essay competition, will not be conducted this year.

The number of IACR life members has steadily risen, with a current strength of over 1000 life members, which includes more than 100 overseas members. For updating the Life Membership IDs of all its members, a flash note has been put up in the IACR website, requesting for any corrections in the contact details. We have updated this already and are still updating it. After receiving the request for change of contact details, we reconfirm their information by contacting them on telephone and through email. The IACR Secretariat for 2019 to 2021 is operating from RGCB, Thiruvananthapuram, Kerala. As the current EC's term will be ending in 2022, this year we have to hold elections for the new Office Bearers and this time it is West Zone's turn (2022-2025). For this, Dr. Chandra Prakash Prasad, Department of Medical Oncology, AIIMS, New Delhi has volunteered as Returing officer for conducting the Elections.

It is my sincere belief that this association will be further strengthened in the years to come. At last, I take this opportunity to express my sincere gratitude to you all for your whole-hearted co-operation and urge all IACR members to further strengthen our effort to better utilize our knowledge and resources of the country for developing more definitive ways of preventing and curing this dreadful disease, Cancer.

Thank you.
March 1st, 2021
Thiruvananthapuram

Dr. Priya Srinivas,
Secretary, Indian Association for Cancer Research.
Scientist F, Cancer Research Program,
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IACR Society Audit Report for the Financial Year 2020 - 2021

Treasurer
Dr. K B Harikumar
Rajiv Gandhi Centre for Biotechnology (RGCB),
Thiruvananthapuram 695 014, Kerala

This is the first audit report after the current committee took over the IACR leadership. The previous treasurer Dr.Chinmay Panda handed over all the documents to the new committee. The auditing was done by Manoj & Sajeev Chartered Accountants, Thiruvananthapuram. The three fixed deposits in Central bank of India were renewed for another year. The IACR2018 was organized in Kolkata and organizing secretariat after auditing transferred the balance amount in the conference account to IACR main account in Central bank of India ACTREC branch. The major contribution to IACR in the last FY was from Dr.Bharat and Mrs.Uma Aggarwal who donated $5000 towards establishing a travel grants for participants who will be attending the annual meetings of IACR.
The balance sheet for as on 31st March 2020 is given below

Treasurer's report during the period March, 2020 - February, 2021

INDIAN ASSOCIATION FOR CANCER RESEARCH TRUST CANCER RESEARCH INSTITUTE, PAREL, MUMBAI, 400012

BALANCE SHEET AS ON 31st MARCH 2020

LIABILITIES		AMOUNT	ASSETS		AMOUNT
Corpus Fund			**Fixed Assets**		
Balance as per accounts	12,86,258.54		Printer	3,685.00	
Add: Membership Fee	3,95,658.00	16,81,916.54	Less:- Depreciation	552.75	3,132.25
Other Earmarked Funds			Loan & Advances - as per last account		15,000.00
Sitaram Joglekar Prize Fund	5,001.00		Conference seed money		50,000.00
Rajnikant Baxi Prize Fund	5,000.00				
Dr. V K Kamat Prize Fund	15,800.00		Tax Deducted at Source (Schedule I)		2,31,128.00
Mr. Ramnath Jajoo Prize Fund	10,000.00				
Dr. Deo Prize Fund	39,044.00		**Cash and Bank Balance**		
Mangala Bamne Prize Fund	45,000.00		Fixed Deposits with Central Bank of India		
Technology transfer Fund	40,000.00		as per last accounts (Schedule II)	36,17,974.00	
Fund of Travel assitance	50,000.00		Add : Renewed with interest earned	2,19,325.00	38,37,299.00
Cancer Awarness Fund	20,000.00				
Spread of Cancer Research Fund	39,704.40		Central Bank of India (A/c No. 1797305724)	1,19,843.90	
Fund of IACR Newsletter	50,940.50		Canara Bank	9,52,311.77	
IACR Website Fund	14,000.00		HDFC Bank	4,976.53	
IACR Silver Jubilee Celen Fund	6,298.00		Cash in Hand	3,900.00	10,81,032.20
Dr. Rambhau Kulkarni Award	21,000.00	3,61,787.90			
Audit Fee Payable		23,600.00			
Reserves & Surplus					
Opening Balance	23,17,958.46				
Add: Excess of Income over Expenditure	8,32,328.55	31,50,287.01			
		52,17,591.45			**52,17,591.45**

UDIN: 21206626AAAACO1197
Vide our Audit Report of even dated
For Manoj & Sajeev
Chartered Accountants
FR No 008024S

Sajeev.R,FCA
(Partner)
M No 206626

Date: 12-02-2021
Place: Trivandrum

MANOJ & SAJEEV * CHARTERED ACCOUNTANTS * TRIVANDRUM

OBITUARY

Dr. Gouri Shankar Bhattacharyya, an eminent Medical Oncologist, IACR- Executive Committee Member, (east zone) has succumbed to Covid-19. Heartfelt condolences to the bereaved family.


INDIAN ASSOCIATION FOR CANCER RESEARCH
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