Indo-U.S. Science & Technology Forum

Connect

Newsletter of IUSSTF

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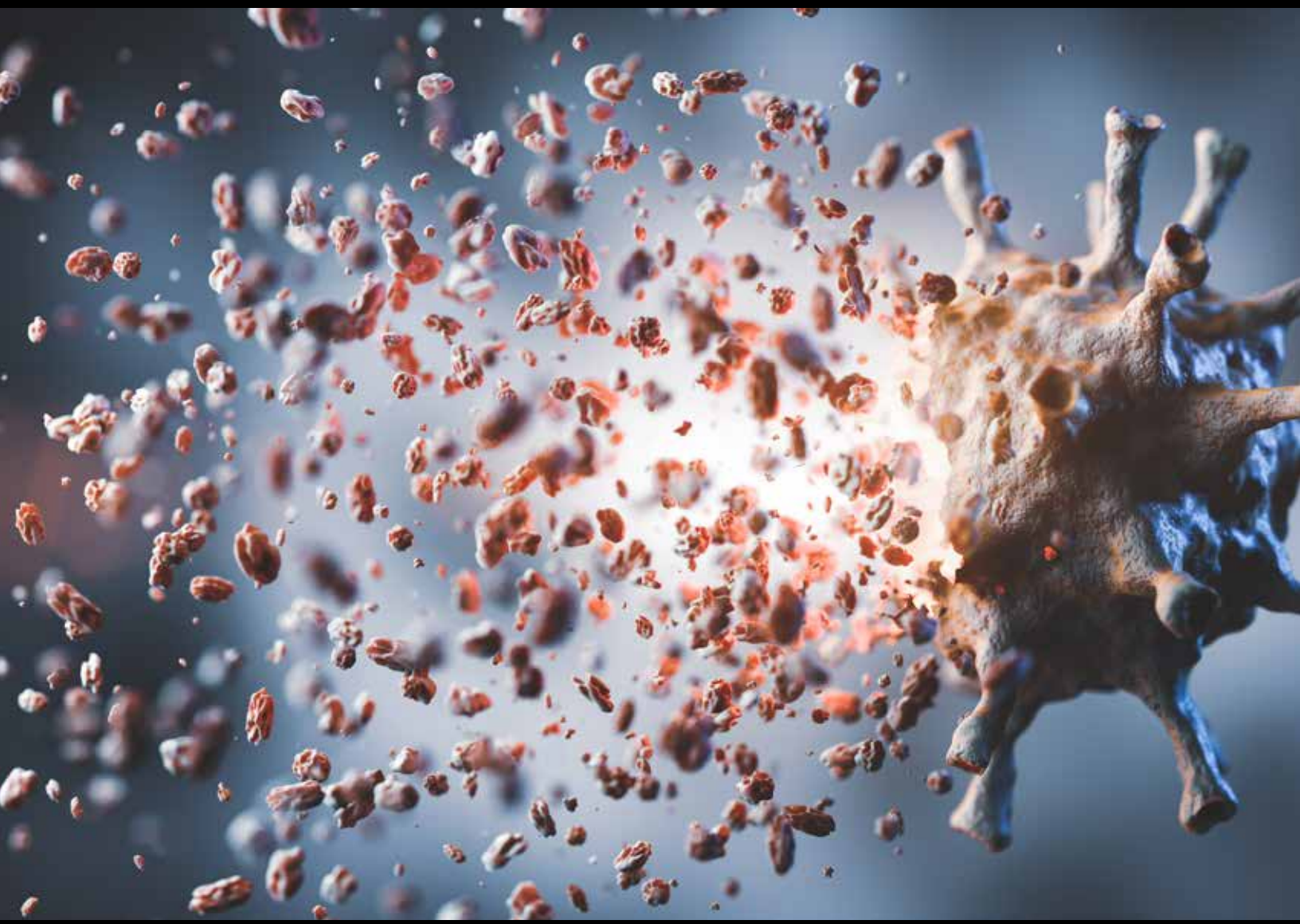

IUSSTF
Indo-US Science and Technology Forum

U.S.-India Collaborations in Research and Innovation

Battling the Pandemic

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Cover Photo : Kill, remove and eliminate coronavirus. Corona virus breaking up into pieces. ***Source*** : shutterstock

From the **Editor-in-Chief**

As the search for a COVID-19 vaccine shifts into high gear with several promising candidates moving into Phase III Trials, it is important to remember that this race for a "cure" is not a sprint but a marathon. Scientists and public health experts agree that a multi-pronged, long-term strategy is key to addressing this global pandemic. In addition to vaccine development, there are other important research and technology challenges related to COVID-19, including the development of new diagnostic tools, therapeutics, devices, AI-enabled tools for repurposing of drugs, and systems for monitoring, diagnosis, vaccine deployment, and public outreach.

Recognizing the critical role of Science, Engineering, and Technology in finding solutions to these challenges, IUSSTF announced two new COVID-19 initiatives in April 2020. The goal of the **COVID-19 Indo-U.S. Virtual Networks** Call was to facilitate partnerships between teams of Indian and U.S. scientists and engineers currently engaged in COVID-related research, leveraging existing infrastructure on both sides to further advance and accelerate the research. The **United States–India Science & Technology Endowment Fund** (USISTEF) issued a Call for Proposals under the category of **COVID-19 Ignition Grants**, encouraging out-of-the-box, innovative, entrepreneurial initiatives grounded in sound science and engineering research and with the potential for commercial viability.

The response to these calls was overwhelming with over 500 applications from binational teams. After a rigorous multi-stage review process that included experts from both countries, IUSSTF and USISTEF recently announced awards to eight teams under the COVID-19 Indo-U.S. Virtual Networks Call and eleven teams under the COVID-19 Ignition Grants Call.

This issue of CONNECT introduces you to these outstanding teams of researchers and entrepreneurs and provides a brief overview of the cutting-edge research and technology they are pursuing. We wish these teams the very best and look forward to sharing their success stories in future issues of CONNECT!

The COVID-19 calls highlight IUSSTF's ability to respond rapidly to global challenges, creating new collaborative opportunities for US and Indian scientists. We continue to look for ways to proactively engage the S&T communities by identifying "leading edge areas" including AI, that are high-priority for both nations.

I leave you with a quote from Henry Ford, the American industrialist: "*Coming together is a beginning. Keeping together is progress. Working together is success.*"

Until we meet again, please stay safe and practice social distancing!

Dr. Nandini Kannan
Executive Director, IUSSTF

Indo-U.S. Virtual Networks for COVID-19

TOGETHER WE FIGHT COVID

As the world battles the COVID-19 pandemic, Science, Engineering, and Technology will play a critical role in finding solutions to this and other emerging global challenges. In support of the efforts of the medical and scientific community, the Indo-U.S. Science and Technology Forum (IUSSTF) announced a Call for Proposals for COVID-19 Indo-U.S. Virtual Networks in April 2020.

The intent of the Call was to harness the combined expertise of the Indian and U.S. Science & Technology communities, facilitate partnerships between teams of Indian and U.S. scientists and engineers currently engaged in COVID-related research, and leverage existing infrastructure from both countries to further advance the research and accelerate progress.

Following a rigorous binational peer-review process, the Indo-US Science and Technology Forum announced awards to eight binational teams, representing leading researchers from top Indian and U.S. Institutions. These eight teams will be pursuing cutting-edge research in areas that include studies on pathogenesis and disease management in COVID-19, antiviral coatings, immune modulation, tracking SARS CoV-2 in wastewater, disease detection mechanisms, reverse genetics strategies, and drug repurposing.

Congratulating the teams, the Co-Chairs of the bilateral IUSSTF highlighted the importance of the US-India partnership.

Global challenges call for global collaborations and partnerships, a shared vision bringing together the best and brightest scientists, engineers, and entrepreneurs to work together to find solutions, not only to address the current pandemic, but also for the challenges that lie ahead.

The mission of IUSSTF is to act as a catalyst to promote long-term scientific collaborations between India and the United States through partnerships amongst individual scientists, scientific institutions and the scientific community at large.

Professor Ashutosh Sharma
Secretary, Dept. of Science and Technology, Govt. of India and Indian Co-Chair, IUSSTF

"An overwhelming response in a short time to the special call on COVID-19 demonstrates a wide spectrum of cooperation between India and USA from the basic studies on the behavior of SARS-Cov-2 virus to its transmission to diagnostics and therapeutic approaches. Our existing strong cooperation in S&T on health, energy, artificial intelligence etc. also continues to bring value and attests to the importance of Indo-US collaborations in providing compelling solutions."

Dr. Jonathan Margolis
Deputy Assistant Secretary for Science, Space and Health, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State, and U.S. Co-Chair, IUSSTF

"We are pleased that the United States and India were able to quickly mobilize, through IUSSTF, to support jointly developed innovations to fight COVID-19. Our people and economies both rely on science and technology to identify tools to address the pressing challenges of the current pandemic."

Dr. Nandini Kannan
Executive Director IUSSTF

"Through the sharing of expertise across scientific communities and geographic boundaries, the Indo-US Virtual networks will enable breakthroughs, leading to the development of innovative and transformative solutions to combat this pandemic."

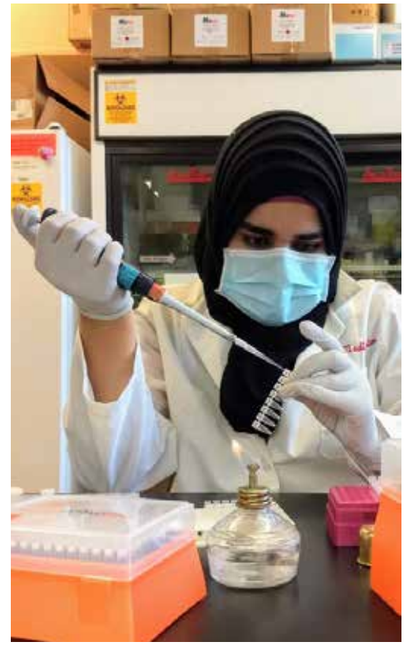
We present a glimpse into these eight binational projects

REAL TIME HIGH-THROUGHPUT COST-EFFECTIVE SEQUENCING PLATFORM FOR 2019-nCOV DETECTION AND GENOTYPING

Rajesh Pandey
CSIR-Institute of Genomics and Integrative Biology, Delhi

Sarath Chandra Janga
Indiana University, Indianapolis

Due to rapidly evolving nature of coronaviruses, their identification has become increasingly challenging. Hence, there is an urgent need to generate new diagnostic tests that combine scale, speed, sensitivity (3S) and generation of data that can be used to inform surveillance, public health strategy, and vaccine design. The team proposes to combine an efficient, novel and high-throughput RNA isolation method, accompanied with pooled and high-throughput barcoded Nanopore sequencing of swab samples and develop automated computational pipelines to facilitate detection of SARS-CoV2 from samples. This will result in a real-time scalable diagnostic platform for simultaneous detection and mapping of specific strains using a cost-effective benchtop sequencer facilitating rapid diagnostics for front line workers.

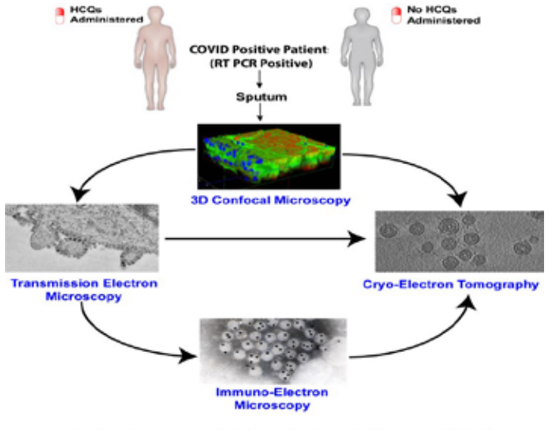


COVID19 testing via nanopore sequencing

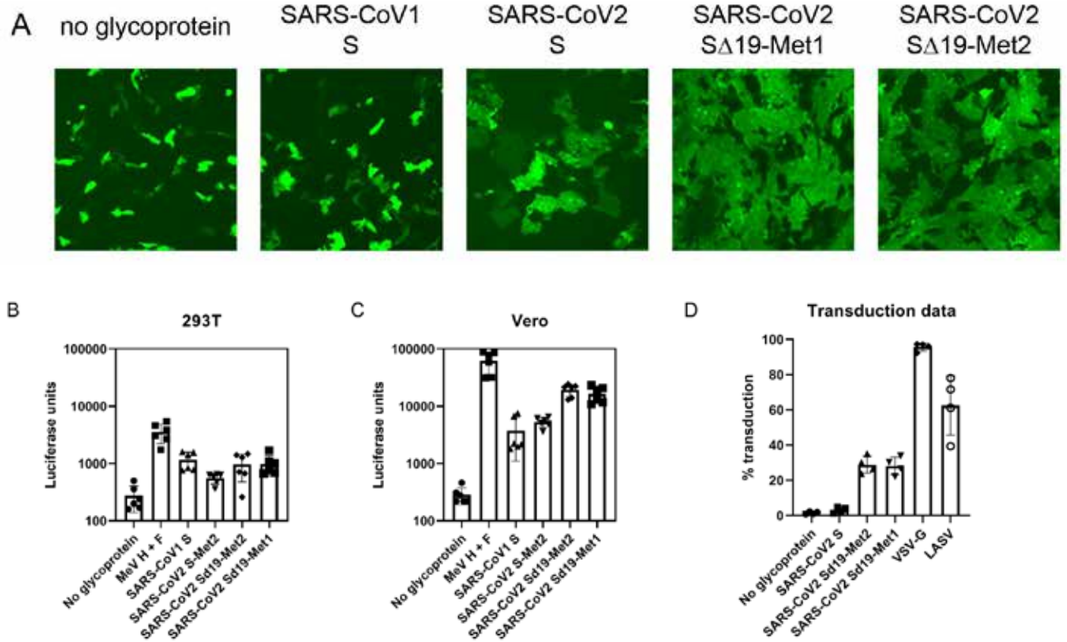
ELECTRON MICROSCOPY STUDY TO EXPLORE THE EFFECTIVENESS OF HCQS ON COVID-19 DISEASE FROM *EX VIVO* PATIENT SAMPLES

Subhash Chandra Yadav
All India Institute of Medical Science (AIIMS), New Delhi

Wah Chiu
Stanford University, Stanford



This AIIMS-Stanford team has proposed to investigate the role of Hydroxychloroquine (HCQS) by exploring the significant alteration in cellular infectivity and multiplication of SARS-CoV-2 at different stages of the COVID-19 disease. The Indian group at AIIMS, New Delhi would be responsible for patient samples, RT-PCR (Real-time polymerase chain reaction) quantification, 3D-confocal, Transmission Electron Microscope (TEM) and IEM imaging for cellular interaction, internalization, multiplication, and release. The exploration of molecular level interaction of coronavirus and cellular receptors would be carried out at Stanford University by cryo-EM and cryo-ET coupled with image reconstruction. The collaborative work may provide the complete overview of the effect of HCQS in the control of SARS-CoV-2 from ***ex vivo*** patient samples.●



Functional characterization of various S-constructs: (A) Synctia produced by SARS-CoV-2-S constructs in Vero E6 cells co-transfected with a GFP plasmid to visualize cell-to-cell fusion. Quantification of fusion using a luciferase complementation assay in(B) 293T or (C) Vero E6 cells. (D) Transduction efficiency in Vero E6 cells of ppVSV-GFP particles coated in the indicated glycoprotein.

BSL-3 lab at the University of Georgia, Athens. This India-U.S. research collaboration is unique as researchers from both countries complement intellectual and infrastructure expertise required for this work. Successful execution of proposed research will provide insight for timely targeted treatment of COVID-19 patients; and will further strengthen translational research and academic ties between the two countries.●

Jyotsna Agarwal
Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow

Ankita Garg
University of Georgia, Athens

LYMPHOPENIA IN COVID-19: IMPLICATION IN PATHOGENESIS AND DISEASE MANAGEMENT

Management of COVID-19 patients is a challenge for physicians since pathogenesis remains less ill-defined. Significance of the proposed research is in combining clinical and mechanistic/translational approach to understand factors responsible for immune cell death. Clinical parameters of COVID-19 patients will be assessed at COVID-19 hospital and diagnostic BSL-2 laboratory in Ram Manohar Lohia Institute of Medical Sciences, Lucknow; whereas mechanistic/translational work will be undertaken in

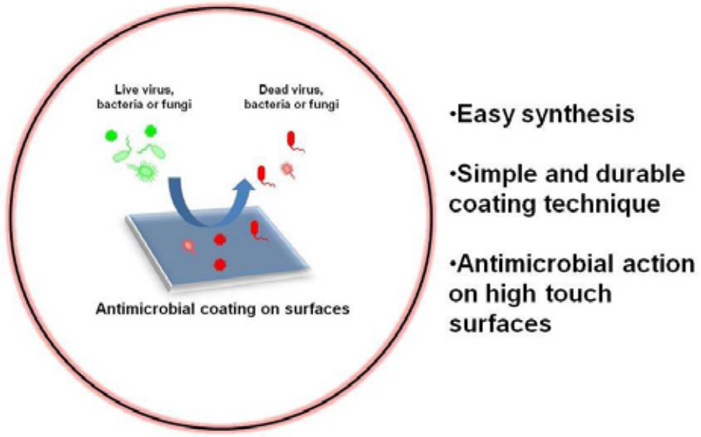
Facility to carry out the proposed research

DEVELOPMENT OF ANTIVIRAL COATINGS TO PREVENT THE TRANSMISSION OF SARS-CoV-2 VIRUSES

Jayanta Haldar
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru

Shiv Pillai
Ragon Institute of MGH, MIT and Harvard, Cambridge

The SARS-CoV-2 pandemic has once again highlighted the dire need for antimicrobial surfaces to break the chain of transmission of droplet-borne viral diseases. However, the global market is currently devoid of antimicrobial coating materials applicable to surfaces commonly encountered in everyday life. The team's goal is to develop a one-step, permanent, robust, antiviral coating for daily encountered surfaces such as door-handles, railings, seat covers, switches, credit cards, ID cards and even currency notes. Spray or brush coating of these



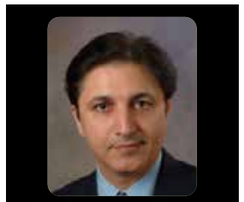
- Easy synthesis
- Simple and durable coating technique
- Antimicrobial action on high touch surfaces

compounds from their organo-solution on polyethylene or polypropylene-based transparent flexible sheets can render them antiviral. A wide range of surfaces (polyethylene, polypropylene, polyurethane, metallic surfaces etc.) coated with these compounds will be investigated against SARS-CoV-2.

Optimum concentration of the compound for effective killing of SARS-CoV-2 will be investigated. Development of coating techniques and meticulous investigation of their virucidal activity through the proposed collaboration could lead to antimicrobial coating candidates with a promise to thwart the current pandemic and many more in future.●

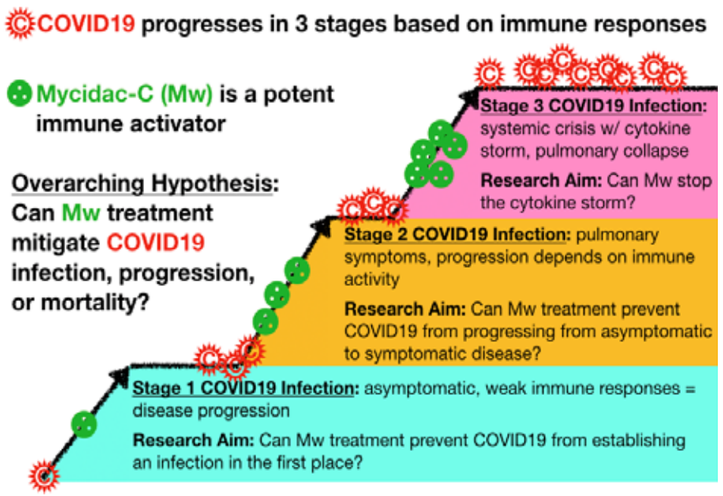
MITIGATING COVID19 INFECTION AND PROGRESSION VIA INNATE IMMUNE MODULATION

Suparno Chakrabarti
Dharamshila Narayana Superspeciality Hospital, New Delhi



Sanjay V. Malhotra
Oregon Health & Science University, Portland

The COVID-19 disease causes asymptomatic, contagious weakening of immune activity, leading to fever, dysapnea and in many cases immune exhaustion, pulmonary collapse and severe cytokine storm often leading to death. These patterns suggest that boosting immune activity can prevent disease progression. Mycidac-C (Mw), a potent immune stimulant used for cancer treatment in India, also demonstrated significant inhibition of cytokine storm in gram negative sepsis with ~2X greater survival. With these similarities of disease pathologies in both conditions, the team hypothesizes that Mw treatment will decrease COVID infection and progression. This hypothesis will be established through the two specific aims of the study, i.e. (1) Dose-exposure effect of Mw mechanism against COVID, and (ii) Therapeutic index of Mw treatment in COVID ***in vivo***.



The global spread of COVID19 pandemic has caused serious health and economic burden worldwide. The successful completion of these studies will enrich the existing knowledge base and provide foundation for Mw-based new therapy to combat COVID-19 disease.●

Sandhya Shrivastava
Bhavan's Research Center (Microbiology), Mumbai

Joan Rose
Michigan State University, East Lansing

OCCURRENCE AND PERSISTENCE OF SARS-COV-2 (COVID-19) ALONG WITH KNOWN BIOLOGICAL INDICATORS IN WASTE WATERS OF MUMBAI CITY

Understanding the fate of SARS- CoV-2 through the different stages of wastewater treatment and the safety of treated waters to be discharged in the environment is required from epidemiological perspective. The team aims to study developing competency and methodology for sampling, effective recovery and detection of SARS-CoV-2 to: 1) Understand its incidence and persistence in Mumbai City wastewaters; 2) Evaluate RNA bacteriophages as a suitable biological indicator for SARS-CoV-2 in surveillance studies and assessment of wastewater treatment efficacy; and 3) Assess wastewater associated virus data as a reliable epidemiological tool to link the presence of virus with community infection and public health. Successful evaluations would generate knowledge-based insights or guidelines for wastewater surveillance. This will build capability for wastewater analysis for RNA virus which can be used by authorities in surveillance and treatment programs thereby generating a network of trainings and workshops in bacteriophage based wastewater assessments.

Both teams would jointly analyse the data and attempt to develop statistical approaches for epidemiological correlations. The collaboration would lead to competency and method development, good quality publication(s) and a roadmap for future wastewater surveillance and treatment efficacy studies for comprehensive evaluation of both public and environmental health status.●

Sampling at MSU and PCR Testing at MSU

LEVERAGING REVERSE GENETICS STRATEGIES TO STUDY STRUCTURE-FUNCTION INTERPLAY OF VIRUS HOST ATTACHMENT SPIKE PROTEIN TO DESIGN THERAPIES FOR COVID-19

Jayasri Das Sarma
Indian Institute of Science Education and Research Kolkata, Nadia

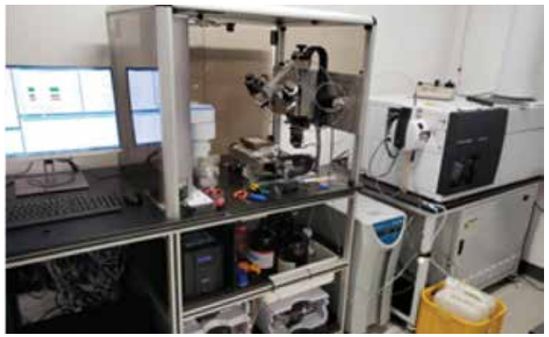
Maria Nagel
University of Colorado School of Medicine, Aurora

The COVID-19 pandemic presents the most significant public health crisis to occur in ages. This project is led by Dr. Jayasri Das Sarma in India and Dr. Maria Nagel in the US, supported by a team of seven co-investigators with long-standing collaborations in coronavirus research. SARS-CoV-2 is a beta-coronavirus, responsible for the highly contagious COVID-19. Coronavirus spike gene, that mediates infectivity and RdRp gene that regulates viral replication are the key regulators of SARS-CoV-2 infectivity. This team's strategy combines novel murine coronavirus expressing the SARS-CoV-2 spike and RdRp genes coupled with humanized ACE-2 expressing mice to screen pharmacologic agents [e.g. ***Azadirachta indica*** (Neem) extract] in a system that is translatable to clinical settings. They will assess the inflammatory effects of COVID-19 on lung, liver, kidney, and Central Nervous System (CNS). The project also leverages state-of-the-art molecular techniques, including computational modelling of spike and RdRp protein structure and a reporter assay for virus fusogenicity and spread. This system does not require high-level containment, providing a high throughput method to identify drug candidates that will be validated using SARS-CoV-2 in a BSL3 facility.●

Shantikumar V. Nair
Amrita Centre for Nanosciences and Molecular Medicine, Kochi

Mohit Jain
University of California San Diego, La Jolla

ESTABLISHMENT OF AN INDO-US MOLECULAR BIOMARKER KNOWLEDGE NETWORK FOR COVID-19



This team's focus is on discovery of molecular biomarkers of COVID-19 with respect to internal and external exposure factors called exposomes that can provide early warning for COVID-19 susceptibility and severity, as well as targets for therapeutic modalities. The approach includes: 1) Biochemical profiling of patients for molecules such as, inflammatory markers, cytokines, proteins, metabolites and toxins using mass spectrometry; 2) Clinical evaluation of the patients to quantify severity levels; 3) Derivation of data-driven biomarker-suggestive correlation between the molecules and severity quantization; 4) Integration into Electronic Medical Records (EMR) Hospital Information Systems for inclusion into standardized clinical patient consultation protocols; and 5) Building capacity in India for robotic arm mass-spectrometry for ultra-high throughput testing of Bio-Monitoring microsamples. UC San Diego has built a robotic high throughput mass-spec for exposome determination. Amrita will do sequential and concurrent investigation of patient samples and vitals (through wearables and remote monitoring), with overall objective of identifying suspected Early Warning Severity Biomarkers (EWSB) in the exposome. Stanford will develop machine learning algorithms for confirming or controverting EWSB suspects and track clinical trajectory of each patient.●

BILATERAL INDO-U.S. WEBINAR ON COVID BIOLOGY

AUGUST 16-19, 2020

Jayasri Das Sarma
IISER Kolkata

Kenneth Shindler
University of Pennsylvania

Debnath Pal
IISc Bengaluru

Randall Cohrs
University of Colorado

The "**Bilateral INDO-U.S. webinar on COVID-19**" was a follow-up of the earlier bilateral Indo-U.S. symposium held in 2019 entitled, "***New insights in the inflammation, immunity and pathobiology of Diseases***". This special webinar was organised under the banner of IUSSTF on the research and educational dimensions of the Corona Virus Disease 2019 (COVID-19) pandemic. The pandemic caused by SARS-CoV-2 has already caused widespread infection and significant mortality across the globe. With no immediate therapies available today, it is of prime importance to develop rapid novel therapeutic strategies, which require a thorough understanding of the pathogenesis of the disease mechanisms. The mounting number of human coronaviruses (H-CoV) that have emerged from zoonotic transmission in recent decades also demand design of therapies that have the potential to treat standard features of common coronavirus pathogenesis, including COVID-19. Designing therapies against common pathogens will not only be of immense help during the current situation, but also when new coronaviruses emerge in the future.

SARS-CoV-2 is related to the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) and Middle Eastern Respiratory Syndrome coronavirus (MERS-CoV) genome sequence and in pathology. These two older sister strains of the β-coronavirus family have been studied extensively. Most coronaviruses contain highly conserved sets of genes, with significant sequence homology in key regions suggesting critical functions that may provide substantial therapeutic targets. This Indo-U.S. Webinar on COVID Biology was organized to provide a platform to learn from the experts working in the broad topics such as a) Emergence of Human β-Coronaviruses with particular emphasis on SARS- CoV2 Origins, Evolution & Modelling; b) Clinical and Molecular Virology of SARS-CoV-2, c) SARS-CoV-2 Pathogenesis and Host response/Antivirals and d) SARS-CoV-2 Pathogenesis: Insights from other β-Coronaviruses, tested on different experimental models.

This webinar hosted distinguished speakers who have been working on coronavirus for decades as well as the ones who have recently joined this field to help battle this disease. Speaking at the inaugural, Professor **Sourav Pal,** the Director of IISER-Kolkata highlighted the importance of inter-disciplinary research and the ability to innovate. He lauded IUSSTF for promoting joint activities between India and US that would lead to innovation and entrepreneurship through the application of science and technology. **Dr. Nandini Kannan,** Executive Director of IUSSTF emphasized on the critical role of collaborations, across disciplinary and geographic boundaries, in addressing scientific and industrial growth of the society. She presented an overview of the IUSSTF portfolio – how it plays the role of a catalyst to nurture and promote long-term scientific collaborations between India and the U.S. through partnerships amongst individual scientists, scientific institutions and the scientific community at large. The webinar began with a plenary talk by **Dr. Kathryn Holmes** (University of Colorado Health Sciences Center, Denver) on "Overview of the early history, biology, and structure of coronaviruses".

The sessions were attended by more than 1200 participants from all over the world. While many participants were graduate and undergraduate students and faculty members in the field of virology, a large number of participants from other professions got to hear the talks that were simultaneously translated into six different languages from across the world. This webinar was a need of the hour to spread awareness regarding COVID-19 amongst humans. The collaborators agreed and concluded that it is important to combine their expertise, and make efforts to establish a state-of-the-art research facility for working with infectious biology pathogens in India.●

COVID-19 Ignition Grants

FLATTENING THE CURVE

As countries battle the COVID-19 pandemic, innovations in Science, Engineering, and Technology will play a critical role in finding solutions to this global challenge. For example, new vaccines, devices, diagnostic tools, information systems, and strategies will help countries manage and deploy resources to combat COVID-19 pandemic. In keeping with its mission and vision, the U.S.–India Science & Technology Endowment Fund (USISTEF) announced a call for proposals under the category of COVID-19 Ignition Grants in April 2020. The intent was to support promising joint U.S.-India entrepreneurial initiatives that address the development and implementation of new technologies, tools, and systems to address COVID-19 related challenges, including monitoring, diagnosis, health and safety, public outreach, information, and communications.

After a rigorous binational review process, USISTEF announced awards to 11 bilateral teams, proposing out-of-the-box, innovative ideas that address the COVID-19 challenge. These teams will be working on solutions that include novel early diagnostic tests, antiviral therapy, drug repurposing, ventilator research, disinfection machines, and sensor-based symptom tracking.

> **A strong response in a short time for co-development and commercialization of COVID-19 technologies and products demonstrates a wide spectrum of cooperation between India and the U.S. This partnership extends from the basic studies on the behavior of SARS-Cov-2 virus to its transmission to diagnostics and therapeutic approaches. Our existing strong cooperation in S&T on health, energy, artificial intelligence etc. also continues to bring value and attests to the importance of Indo-U.S. collaborations in providing compelling solutions.**

Professor Ashutosh Sharma
Secretary, Dept. of Science and Technology
Govt. of India and Indian Co-Chair, IUSSTF

> **The U.S. Government is pleased to partner with the Government of India's Department of Science and Technology to provide initial financing to almost a dozen promising technologies, chosen from over 400 proposals, which seek to help the world in its global fight against COVID-19. This is just one area where American and Indian ingenuity are working together to serve our peoples and the broader international community.**

Ambassador Kenneth I. Juster
U.S. Ambassador to India

AWARDEES | IGNITION STAGE I

DEVELOPMENT OF ANTISENSE MORPHOLINO (PMO)-BASED ANTIVIRAL THERAPY

Surajit Sinha
Indian Association for the Cultivation of Science, Jadavpur

Yanjin Zhang
University of Maryland College Park

Morpholino testing against other viruses has demonstrated a high efficiency in inhibiting viral replication. The project aims to develop antisense morpholino oligomer-based therapies against SARS-CoV-2. The genomic RNA of SARS-CoV-2, specifically the conserved regions, will be targeted to inhibit the viral replication. Antisense morpholinos will be synthesized using solid support synthesis method and will be conjugated with a delivery vehicle called *internal guanidinium cellular transporter (IGT)* for the effective delivery of the oligomer. The lead Indian partner has developed a technology for the synthesis and delivery method of morpholino, while the U.S. lead will bring in experience in PMO testing against several types of viruses. The Indian Industry partner will work to scale-up morpholino production for future commercialization.

Suresh Chandra Singh
Patanjali Pharma Pvt. Ltd.
Mumbai

Piyush K Jain
University of Florida
Gainesville

DEVELOPMENT AND VALIDATION OF A CRISPR-BASED RAPID AND AFFORDABLE KIT FOR EARLY DIAGNOSIS

There is an urgent need for engineering rapid and reliable technologies for testing COVID-19. The team proposes to develop a prototype to detect SARS-CoV-2 by combining the loop-mediated isothermal amplification with an engineered CRISPR/Cas12a technology to achieve detection of SARS-CoV-2 genomic RNA with high specificity and sensitivity. By combining with a lateral flow assay, the entire workflow can be conducted using an inexpensive heat block without requiring large capital equipment. The overall goal of this collaboration is to provide an affordable and accurate diagnosis for COVID-19.

DEVELOPMENT OF A DIAGNOSTIC TEST USING MULTIPLEX IN SOLUTION PROTEIN ARRAY (MISPA)

Sanjeeva Srivastava
Indian Institute of Technology-Bombay

Joshua Labaer
Arizona State University, Tempe

Many types of serology assays have been developed for SARS-CoV-2. However, the one-antigen-one-patient-at-a-time approaches provide very limited information and are slow, time consuming, and low throughput. To this end, the team is working on a high-throughput multiplex in solution serological assay (MISPA) that allows measuring antibody responses against the entire proteome of SARS-CoV-2 for many patients in a single test. With an expanded dynamic range and increased signal-to-noise ratio, it is expected that MISPA assay would detect both weak and strong antibody responses. The team will probe the entire proteome of SARS-CoV-2 to understand the comprehensive antibody profile on many patients in a high-throughput manner.

DEVELOPMENT AND SCREENING OF DRUG OR ZINC NANOPARTICLE CONJUGATED SYNTHETIC NANO-BODIES ("SYBODIES")

Suresh Poosala
OncoseekBio Pvt Ltd.
Hyderabad

Avery August
College of Veterinary Medicine
Cornell University, Ithaca

The high transmissibility of SARS- CoV-2, combined with a lack of population immunity and prevalence of severe clinical outcomes, urges the rapid development of effective therapeutic countermeasures. The team proposes to create a therapeutic by developing neutralizing novel antibodies (unique class of synthetic antigen-binding fragments) directed against the receptor-binding domain and other epitopes of the Spike protein of SARS-CoV-2, bind it to drug/Zn nanoparticle conjugates (ADCs), which would release the drug of choice at the site of action. Such a novel potential therapeutic entity would administered by nasal inhalation (nebulizer), as a treatment and prophylactic, so that hospital visits are prevented and it can easily be administered at home.

IVERMECTIN FOR TREATING COVID-19

Sadhana Sathaye
Institute of Chemical Technology
Mumbai

Kamalesh K. Rao
Lifescient, Inc.
San Francisco

Lifescient, Inc., and Institute of Chemical Technology (ICT) Mumbai are proposing an inhalable combination formulation of FDA approved medications - ivermectin and theophylline. This formulation can be delivered directly via a nebulizer to the lung epithelial cells of the COVID-19 patient both in the hospital and at home. Ivermectin, an antiparasiticide has shown significant antiviral activity against COVID-19 virus. Theophylline, a bronchodilator used to treat asthma is known to reduce inflammation and improve respiration. The formulation will address the pathology of acute respiratory distress syndrome, reduce mortality and associated morbidity in COVID-19 patients. Targeted delivery into the lungs will minimize systemic exposure with better therapeutic outcome.

AWARDEES | IGNITION STAGE II

REDUCING MORTALITY DUE WITH A SIMPLE, NON-ELECTRIC PRESSURE VENTILATOR

V Sashi Kumar
Phoenix Medical Systems
Chennai

Stephen John
Advanced Innovative Medical
Technologies, LLC, Ann Arbor

NeoVent delivers non-electric, visually intuitive, non-invasive positive pressure ventilation to support patients in respiratory distress. With this, clinicians can support patient oxygenation and ventilation through independently controlling the upper level of pressure, lower level of pressure and cycles per minute. The patent-pending, award-winning technology is non-electric, non-invasive, easy to setup and operate and costs less than 1/10th the cost of conventional ventilators.

WEARABLE SENSOR TO MONITOR AND TRACK COVID-19 LIKE SIGNS AND SYMPTOMS

Vaidy Narayanan
Bionic Yantra, Bengaluru

Arun Jayaraman
Northwestern University
Evanston

Molecular testing (RT-PCR) is the current gold-standard for diagnosing COVID-19, but test availability and response time still do not meet the required demand. The team aims to investigate the use of soft-wearables to develop a rapid-screening tool for diagnosing COVID-19 infections. They will leverage on the availability of a new class of skin-mounted devices, which conform to the body and can non-invasively record high resolution data on temperature, cardiac, respiratory and physical activity. The physiological signals data will be used to train an algorithm for assessing the risk of an individual presenting symptoms suggestive of a COVID-19 infection.

ENCEESPRAY – AN ELECTROSTATIC DISINFECTION MACHINE COMPRISING OF ELECTROSTATIC SPRAYER AND ELECTRO HYPO GENERATOR

Abhijeet Gan
Rite Water Solutions (I) Pvt. Ltd.,
Nagpur

Manoj K Patel
Central Scientific Instruments
Organization, Chandigarh

ENCEESPRAY is an Electrostatic Disinfection Machine comprising of electrostatic spraying unit and onsite disinfectant generator. Electrostatic disinfection is one of the most efficient and effective methods to apply the disinfectant and sanitizing agents to living and non-living surfaces. It offers a favourable approach to increase spray deposition to hidden areas with reduced usages of chemicals and natural resources. The onsite disinfectant generator produces disinfectant solution by electrolysis of salt solution thereby making it most cost-effective and environmental friendly disinfectant. ENCEESPRAY produces charged droplets of disinfectant in the range of 10-20 µm thereby ensuring 360 degree coverage of all surfaced, best suited for disinfection of microbes. The project aims to test, validate and introduce various models of electrostatic disinfection machines.

A NON-INVASIVE HIGH FREQUENCY NASAL CANNULA VENTILATION

Prasad Muddam
Heamac Healthcare Pvt. Ltd.
Indian Institute of Technology Hyderabad

Morarji Peesay
MedStar Georgetown University Hospital, Washington DC

The team's Innovation High-Frequency Nasal Cannula (HIFINC) is a vibratory, high frequency, non-invasive ventilation for COVID conditions. This device is affordable, portable, and long-lasting and reusable. The team is repurposing this patent-pending technology to match the requirements of the COVID associated respiratory issues such as ARDS, Pneumonia etc. The device will contain variable volume and frequency adjustments addressing neonatal/paediatric and adult ventilation. As it is low-cost, non-invasive technology, it can be adapted to major resource constrained settings; the automated design modifications will enable even low-skilled staff to operate with ease. Technology acts gentle on lungs while providing maximum gas exchange.

A RAPID POINT-OF-CARE FIBER-OPTIC BIOSENSOR (P-FAB) DEVICE

V.V. Raghavendra Sai
Indian Institute of Technology-Madras

Himanshu Bhatia
Ricovr Healthcare Inc., Princeton

This collaborative research project is set to simplify and expedite COVID-19 testing while making the cost of such an activity attainable for a broader range of usage. The plasmonic fiberoptic absorbance biosensor (P-FAB) technology is a point-of-care (PoC) device with a unique disposable fiber optic cartridge technology to detect SARS-CoV-2 antigens and virus particles directly in saliva (with minimal sample pre-processing). This fast, non-invasive device simplifies the collection and analysis of samples via an inventive wash-free single-step processing.

DEVELOPMENT OF MONOCLONAL ANTIBODY THERAPEUTICS

Maloy Ghosh
Zumutor Biologics Private Limited, Bengaluru

Shiladitya Sengupta
Brigham and Women's Hospital, Harvard Medical School, Cambridge

The team aims to develop monoclonal antibody therapeutics against spike protein of the SARS-CoV-2 from unique and versatile human antibody libraries. The project proposes a combination of antibody library screening technology and *in silico* approach to identify and validate novel monoclonal therapeutic antibodies. Additionally, they aim to develop novel monoclonal antibodies to counter appearance of mutated viral strains using *in silico* approach. As it is understood the COVID-19 disease will continue over years with appearance of mutated virus strains, this approach will provide a sustained therapeutic solution against the SARS-CoV-2 infection over a longer period of time.

IIT BOMBAY STUDENTS DISCOVER ASTEROID

IIT Bombay students Kunal Deshmukh and Kritti Sharma, working on a research project, discovered an SUV-sized asteroid soaring just 2950 km above the surface of Earth. The duo discovered the object using data from the robotic Zwicky Transient Facility (ZTF) in California. Designated 2020 QG, it is the closest known asteroid to fly by Earth without impacting the planet.

Kritti Sharma
IIT Bombay

Kunal Deshmukh
IIT Bombay

Sunday, 16th August was Kritti Sharma's third day on a research project to search for Near Earth Asteroids. She and Kunal Deshmukh were analysing ZTF data on Sunday afternoon, they reported five "streaks" in the data as potential asteroids. Little did they know that one of them was a record-breaking asteroid! "*The data looked like all other Near Earth Asteroids we have seen so far*", said Kunal – a final year student in the department of Metallurgy and Materials Science at IIT Bombay. After the ZTF team reported their finding to the International Astronomical Union Minor Planet Center, several telescopes followed up to learn more about the asteroid's size and orbit, proving that it had passed very close to Earth. Kritti was overjoyed: "*Helping make a discovery like this, so early in my research project, is beyond what I had ever imagined!*" said the third year undergraduate student of IIT Bombay's Department of Mechanical Engineering. Their advisor, Prof. Varun Bhalerao, is very proud. He said, "*It is wonderful to see these students coming from diverse backgrounds and contributing to astrophysics research. We are very excited about our next phase: studying such objects with the robotic GROWTH-India Telescope at Hanle, Ladakh*".

ZTF, which is funded by the National Science Foundation (NSF) and other collaborators, scans the entire northern sky every three nights in search of supernovas, erupting stars, and other objects that otherwise change or move in the sky. As part of a NASA-funded program, ZTF team members search for near-Earth asteroids. When these space rocks speed across the sky, they leave streaks in the ZTF images. Each night, machine-learning programs automatically sort through about 100,000 images in search of these streaks, and then narrow down the best asteroid candidates to be followed up by humans. This results in about 1,000 images that team members and students sort through by eye every day.

Asteroid 2020 QG was identified by Kunal Deshmukh, a student at the Indian Institute of Technology Bombay. Deshmukh had been scanning that day's images along with Kritti Sharma, also at the Indian Institute of Technology Bombay, and Chen-Yen Hsu at National Central University in Taiwan.

GROWTH-India is a partnership between the Indian Institute of Astrophysics, Bangalore and the Indian Institute of Technology Bombay, with support from the Indo-US Science and Technology Forum (IUSSTF) and the Science and Engineering Research Board (SERB) of the Department of Science and Technology (DST), Government of India (https://sites.google.com/view/growthindia/). It is a part of the international **GROWTH (Global Relay of Observatories Watching Transients Happen)** collaboration. Caltech's ZTF is funded by the NSF and an international collaboration of partners. Additional support comes from the Heising-Simons Foundation and from Caltech. ZTF data are processed and archived by Infrared Processing & Analysis Center (IPAC). NASA supports ZTF's search for near-Earth objects through the Near-Earth Object Observations program.

The full press release is available at
https://www.star-iitb.in/home/closest-asteroid

Indo-U.S. Virtual Networked Center for

CELLULAR REPROGRAMMING IN REGENERATIVE MEDICINE

INDIAN TEAM

Sujata Mohanty[*], MV Padma[*], Tapan K Gandhi[#]
[*]All India Institute of Medical Sciences, New Delhi, [#]Indian Institute of Technology, Delhi

Chandan K Sen[*], Prabir K Patra[#]
[*]Indiana University, Indianapolis, [#]University of Bridgeport, Connecticut

U.S. TEAM

Cellular reprogramming has revolutionized the field of regenerative medicine through its immense potential in tissue repair and regeneration. Recent advancements have opened new avenues demonstrating the applicability of this breakthrough technology for translational purposes. Thus, to meet the rising needs of a country like India, this collaboration between India and the United States has been established for finding new treatment approaches using Stem Cells and reprogramming strategies.

Sujata Mohanty
Stem Cell Facility, AIIMS

Chandan K Sen
Indiana University, Indianapolis

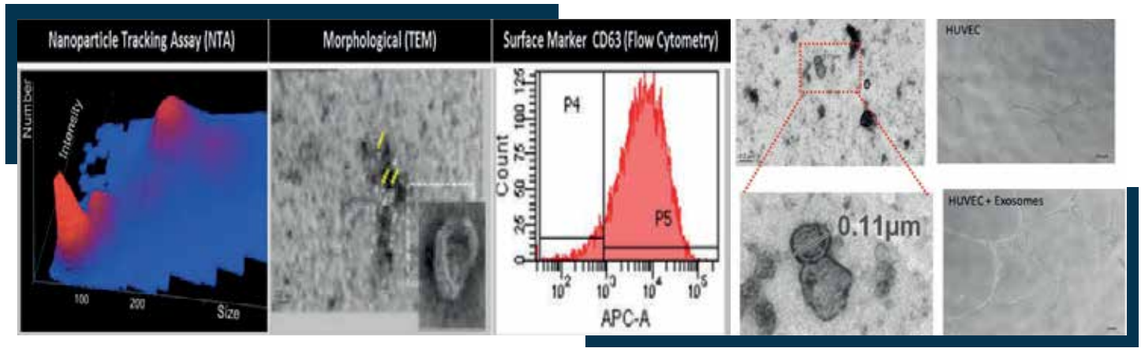
Introduction

Regenerative medicine has captured the attention of the scientific community worldwide and has shown promising results in treating, alleviating, and healing many diseases. It is a diverse and rapidly growing field employing core expertise from vast areas including biologists, engineers and clinicians. This has brought the attention on a developing country like India where research and development in the area of regenerative medicine is heavily promoted together with innovations and business development initiatives.

Lack of efficient and appropriate treatment strategies for tissue or organ damage and degeneration has resulted in an increased rate of mortality and morbidity. Amongst these, the most common and crucial organs which needs utmost attention are skin, brain and heart related disorders. Stem Cells-based cellular reprogramming and regenerative medicine has made significant progress towards regenerating or replacing these damaged or lost tissues. However, several challenges and limitations still exist, specifically in a country like India which includes low cost of the product, highly effective technologies and access to patients of remote areas with local resources. In order to address such challenges, a beginning was made with a collaboration between the U.S. and India to bring new advanced technologies and implement them to Indian patients for improving their health. The IUSSTF supported Joint Virtual

TNT Chip and Encased gold-coated electrode (Neon Tips) for in-vivo transfection of nucleic acids for cellular reprogramming

Indo-U.S. Virtual Network team interacting with Dr. V.G. Somani, Drug Controller General of India (DCGI).



Stem Cell derived nanovesicles called exosomes characterization for size, morphology and surface marker expression. Exosomes shows enhanced angiogenesis property in in-vitro study model using Human Umbilical Vein Endothelial Cells (HUVEC).

Dr. Chandan Sen giving a talk at AIIMS

Networked Center for Cellular Reprogramming in Regenerative Medicine, brings together scientists with different expertise and allows sharing of resources among the pioneering institutes of the two nations, namely All India Institute of Medical Sciences (AIIMS) and Indian Institute of Technology (IIT) Delhi (India); and Indiana University and University of Bridgeport (USA). The Joint Center employs three different approaches, , (i) on-site reprogramming of the cells into specialized cell types like fibroblasts, melanocytes and keratinocytes, using breakthrough technology of tissue nano- transfection (TNT). (ii) miRNA-based stem cell derived extracellular vesicles-based reprogramming for in-vivo wound healing and (iii) development of functionalized 3D scaffold system for generation of functional neurons and cardiomyocytes using Graphene based nanomaterials.

Tissue-Nano Transfection And Cellular Reprogramming

Under the leadership of eminent scientist, Dr Chandan Sen from Indiana University, USA, a non-invasive nanochip device has been developed for cellular reprogramming that could regenerate and restore injured cells or tissues. This technology of TNT works simply by first loading the specific reprogramming factors onto the chip, placing it over the damaged skin and following a small electrical current which drives the reprogramming factors through cell membranes and into cells. The entire process of TNT is finished in milliseconds. Preliminary pre-clinical studies have been completed at USA and further human trials will be conducted soon.

Exosomes: A Rising Star in Regenerative Medicine

Next, an impressive work on the verge of accomplishment is the use of Exosomes as cell-free therapeutic nanovesicles in regenerative medicine. Stem cells and its derivatives like exosomes are the most recent and emerging branch of medical science. Dr Sujata Mohanty from AIIMS, New Delhi has been working in this area of research since a very long time and hassuccessfully established stem cell-based therapy in India for some of the diseases along with her team of clinicians. Her group is working in the field of cell free therapeutic approaches using exosomes. With this joint collaboration, the Center's primary aim is to target wound healing where TNT technology developed in USA will be used by Indian scientists and young researchers for its applications in delivering these stem cell derived therapeutic exosomes in vivo at the site of injury; thereby, establishing the powerful exosomes-based therapy in regenerative medicine through various pre-clinical studies.

Through this joint platform, the Center also aims for the development of exosome-based products for hitting hard the wound care market. They are exploring other technologies under this IUSSTF umbrella for further modification of exosome surface and its therapeutic cargo for loading various drugs for targeted delivery and healing. A visit, by Dr Chandan Sen, Indiana University earlier this year, gave an opportunity to young and budding Indian researchers to learn and gain knowledge from his experience and breakthrough technology. Brainstorming meetings and several rounds of discussions are regularly being conducted for establishing these new innovative technologies and their applications with primary focus on skin and later targeting more complex organs like brain and heart.

Dr. Chandan Sen interacting with the researchers

Furthermore, these bio-inspired devices and nano-vesicles as therapeutic tools with low cost of manufacturing will have promising future in the field of regenerative medicine. In this regard, the team has met with Dr. V.G. Somani, Drug Controller General of India (DCGI) for discussing the regulatory guidelines for bringing these technologies for translation healthcare purposes and establishing opportunities for young minds in both the nations. ●

JCERDC-UIASSIST WORKSHOP

The Annual Bilateral meeting to highlight the accomplishments of the ***UI-ASSIST: U.S.-India collAborative for smart diStribution System wIth Storage (UIASSIST)*** project was held on July 21-24, 2020. The virtual meeting included workshops, a series of technical talks, an overview of the progress made under each of the 11 themes by the U. S. and India leads, and a discussion of next steps.

UI-ASSIST is co-led by the Indian Institute of Technology, Kanpur and Washington State University, Pullman. The project was awarded in September 2017 under the Indo-U.S. Joint Clean Energy Research & Development Centre program (JCERDC), implemented and administered by the binational Indo-U.S. Science and Technology Forum (IUSSTF). The project seeks to address critical issues related to the adoption and deployment of smart grid concepts along with Distributed Energy Resources (DERs) including storage in the distribution network for its efficient and reliable operation. The Department of Science and Technology, Govt. of India (DST) and the U.S. Department of Energy (DOE) have each allocated $1.5 million (INR10.2 crores) annually for the consortium over 5 years. This is a unique project bringing together researchers from academia, national laboratories, industry, and private companies as well as policy experts and utility regulators.

Representatives from DST, IUSSTF, and DOE participated in the workshop along with advisory board members from both India and the U.S. who provided constructive feedback and suggestions. Key recommendations include the development of white papers addressing implementation, regulation, and policy implications, and closer engagement with utility companies and regulators. ●

ArmAble: An Interactive Arm Training Rehabilitation Device

GAME-BASED PHYSIOTHERAPY

In India, stroke affects approximately 1.8 million individuals annually. Stroke causes an economic burden of more than $34 billion in the U.S. annually and more in India. Almost 80% of these individuals suffer from disability of the arm. Disability of the arm is experienced by individuals with other movement disorders as well. This immensely affects the quality of life, independence, and employment of the individual.

In practice today, the average time for a physical therapy session per day is about 45 minutes. Research in neuroplasticity suggests that at least 400-600 repetitions per day may lead to cortical reorganization. In India, the current therapist to patient ratio is 1:31000, which makes it impossible for therapists to spend the expected time to reach the required repetitions. Other factors such as lack of physical therapist-patient time, monotonous and burdensome therapy, lack of objective assessment, lack of independent rehabilitation procedures, and expensive rehab-robots also contribute to the current therapy scenario. The current scenario is denying people a chance to recover and get back to their normal life.

Habib Ali, the founder of BeAble Health, observed these issues in the Indian context during his Fellowship in Healthcare Entrepreneurship program at CfHE – IIT Hyderabad. A deeper dive, which involved interactions with patients, therapistsand doctors, threw light on the current scenario and further research showed the same was happening in most parts of the world. A need for intensive and engaging rehabilitation therapy for individuals with upper extremity motor deficits both at the clinic and at home was identified and further validated. To minimize the burden on the therapists without compromising on the quality of therapy and ensuring access to effective rehabilitation, ***ArmAble*** was conceived.

ArmAble is a cost-effective game-based rehabilitation device that allows for intensive, interactive, and engaging unilateral and bilateral therapy with a full range of motion (ROM) with appropriate multi-sensory biofeedback, and tracking capabilities. ***ArmAble*** is a manual, patient-driven device. The immersive games developed exclusively for arm therapy makes rehabilitation engaging and fun. Patients engage in therapy using the immersive games which lead to an increased number of repetition. The high number of repetitions augment the recovery of the arm function. The team ensured the capability of tele-rehabilitation so that it enables therapists to set goals and monitor progress remotely. ***ArmAble*** is designed to be used at the medical centers and also at home. ***ArmAble*** caters to the needs of a wide range of neuro & musculoskeletal disorders of the upper limb, such as traumatic Brain Injury (TBI), Spinal Cord Injury (SCI), and even for patients post a fracture.

While the concepts work, the team needed a more robust and scientifically proven methodology to promote neuroplasticity and recovery. BeAble Health joined hands with Dr.Ramana Vinjamuri, Director of Sensorimotor Control Laboratory at Stevens Institute of Technology, NJ, USA

Dr. Ramana with his expertise in BCI, biomimetic prosthetics, and rehabilitation is laying the framework and proving the scientific methodology that promotes neuroplasticity in patients using ***ArmAble***. This partnership allows them to research improving neuroplasticity and recovery by adopting biomimetic patterns, which are derived from the EEG based neurofeedback paradigm.

Habib Ali
BeAble Health Pvt Ltd.,
Center for Healthcare Entrepreneurship
Indian Institute of Technology
Hyderabad, INDIA

Ramana Kumar Vinjamuri
Department of Biomedical Engineering
Stevens Institute of Technology
New Jersey, USA

ArmAble has received appreciation from doctors, physiotherapists, and patients. The team's goal is to have this device in medical centers, clinics, rehabilitation centers, and at the patient's home.

BeAble Health constantly innovates through design & technology to help doctors and patients achieve higher efficiency of rehabilitation through immersive and engaging games and by objectively measuring the outcomes. They aim to make rehabilitation accessible, effective, data-driven, interactive & fun. This drives themto create an ecosystem of connecting devices. This ecosystem of connected devices connects patients to their therapy and/ therapists ensuring that the recovery process is relaxed and fun, thereby completing the continuum of care.

Commercialization of Advanced Multi-layer Wound Dressing for Accelerated Healing and Infection Prevention of Indian Diabetic Foot Patients

ADVANCED WOUNDCARE FOR DIABETICS

Rapidly changing lifestyle choices are significantly increasing the number of adults living with diabetes from 464 million worldwide today, to an estimated 700 million by the year 2045. Over time, high blood sugar and other conditions arising from diabetes can damage nerves, often leading to a loss of sensation in the foot.

Vijay Viswanathan
MV Hospital for Diabetes and Prof M. Viswanathan Diabetes Research Centre, Chennai, INDIA

Ashwinraj Karthikeyan
InMEDBio LLC,
Neenah, USA

Poor management of diabetes results in microvascular and microvascular complications. For those who have a difficult time feeling pain, repetitive pressure at the bottom of the foot may lead to an open sore that often develops into what is commonly known as a diabetic foot ulcer (DFU).

This condition can be crippling to many patients, who are left to rely on traditional treatment dressings that are cumbersome to manage, require frequent changes, and costly over time. We've noticed the severity and frequency of these cases soaring in India, where there are an estimated 82 million adults with diabetes, resulting in over 3.3 million annual diabetic foot ulcer cases. The lifetime risk of a diabetic patient in India developing a foot ulcer can be as high as 25%. It is the most common reason for hospitalization of diabetic patients (about 30%) and accounts to about 20% of the total health-care costs, more than all other diabetic complications.

This piqued our team's curiosity, and we decided to take a closer look. Over a two year period, we surveyed and interviewed over 1500 medical professionals, industry experts, diabetologists, and patients to better understand the problem facing adults with DFUs in India. Indian DFU patients are bedridden for months and require a permanent caretaker to dress the wound and tend to their daily needs, resulting in financial strain for their family. If the wound is infected, or requires an amputation, patients will lose self-mobility, and may not be able to resume work, especially for those in labor-intensive jobs, such as farmers or construction workers. Current tactics in India to treat DFUs involve combining simple gauzes with multiple ointments along with limited surgical debridement. Such rudimentary products and procedures only provide temporary pain relief, leads to low patient compliance, and often results in long-term infections and amputations. We discovered that an affordable solution, one that worked with existing health practices and infrastructure, was needed.

Using our initial findings as a starting point, we spent over a year and a half testing new material combinations based on the most critical patient needs we discovered from our research. After developing over 600 prototypes, we found a solution that addressed what we've coined as the critical ABCs, or the three most important criteria for wound healing: Accelerate healing, Block infections, and Comfort the wound. By using the ABC's as a baseline, we invented ***Phoenix-Aid:*** a 5-layer wound care dressing that is affordable, easy to use, and lasts longer than traditional gauze, all while satisfying the ABCs. Our product safely absorbs large amounts of exudate, and maintains a moist and oxygenated environment for accelerated healing, while protecting the wound from external pathogens

InMedBio Team with Dr. Vijay

through active and passive methods.

With support from the U.S.-India Science and Technology Endowment Fund (USISTEF) administered by the Indo-U.S. Science and Technology Forum (IUSSTF), InMEDBio, LLC and M.V. Hospital for Diabetes are collaborating to strengthen the capability of ***Phoenix-Aid*** into a viable product that can reach both rural and urban populations in India. InMEDBio is led by Ashwinraj Karthikeyan, the Founder and CEO, and M.V. Hospital is run by Dr. Vijay Visnawathan, Head & Chief Diabetologist.

The joint effort has currently completed one of five milestones, which are planned over the grant duration of 30 months. The goal of the first milestone was to establish an understanding of the core patients that will eventually serve as the customer base for ***Phoenix-Aid***. An 85-patient study was administered to investigate the current standard of care patients receive for diabetic foot ulcers in South India, and how it varies based on socio-economic needs. The study assessed the patients' comfortability and satisfaction with current dressings, affordability, self-care, and life-style conditions. Data was also collected on external factors impacting healing outcomes, to better understand costs associated with travel to clinics, caretaker costs, and income loss due to inability to work for extended periods of time. The results revealed that most patients (80%) have their wound dressings changed frequently by either a family member or relative. Only a small percentage of patients changed dressings on their own (11%). The majority of patients are dissatisfied with the low degree of durability and comfortability of current dressings, complaining about leakage (23.4%) and heaviness (27.6%) of the material used. Patients are seeking a less cumbersome product which they can self-manage without constantly relying on clinical visits for subsequent dressing changes.

Our overarching goal is to reduce the progression of the wound by 50% for low grade ulcers, as well as infections and amputations by 50% for high grade ulcers. Including follow-ups, recurrence, and caretaker costs, patients in India can spend several years' salary on DFU treatment. Over the years, as the science of wound care has advanced, the cost of quality wound care has climbed as well. A staggering reason patients continue to use traditional gauze while risking possible infection and amputation is most times because of price. These escalating costs have placed quality wound care out of the reach for many individuals. Without quality wound care, a diabetic foot ulcer advances and can all too often can lead to a devastating and life changing series of events for not only patients, but caretakers who have to tend to the daily needs of the patient, resulting in financial strain for their family. Phoenix-Aid is unique because we are addressing the management of a diabetic foot ulcer at the point of prevention, which has the potential to effectively address the disparity between affordability and quality, and provide effective and affordable wound care for all.

With the ongoing COVID-19 pandemic, the world has witnessed just how drastic an infection can alter lives by the thousands due to sickness and loss of work. With COVID-19 forcing isolation and disrupting health services, the need for medical technologies such as ***Phoenix-Aid*** that aims to prevent infection spread between patients is more evident. InMEDBio and M.V. Hospital for Diabetes are leading the charge to address a global problem. We are interested in expanding the study beyond Chennai to include a broader background of patients with varying ulcers, recurrence rates, and socio-economic needs in other cities, including Bangalore, Coimbatore, and Delhi, as well as suburbs and rural villages in South India. We are focused on developing a first-of-its-kind dressing, to reduce the number of DFU patients with serious infections, and amputations in developing markets, starting with India.

Giving Wings to Talent

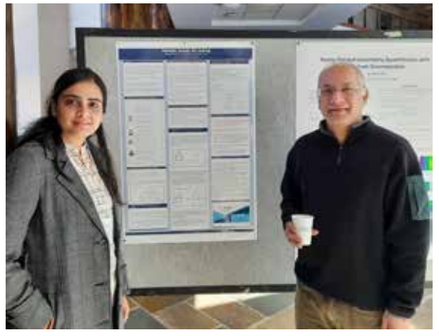
To address the need for human resource development and capacity building in science and technology, IUSSTF is committed to nurture contacts between scientists and students from India and the United States. It has been unambiguously demonstrated that providing students and young scientists with an exposure to cutting-edge scientific research experiences at a formative stage not only broadens their intellectual horizons but also leads to increased engagements in scientific and technological research careers. In this section of Connect, we share with you the experiences of some of our bright, young Interns and Fellows in their own words!

Indo-U.S. Fellowship for Women in STEMM (WISTEMM)

Arti Pandey
Department of Mathematics
Indian Institute of Technology Ropar

I am thankful to the Indo-U.S. Science and Technology Forum (IUSSTF) for selecting me under the Indo-U.S. Fellowship for Women in STEMM (WISTEMM) program. As part of the program, I got an opportunity to visit the School of Mathematics, Georgia Institute of Technology, Atlanta for a duration of three months to collaborate with Prof. Prasad Tetali. It has been a wonderful opportunity for me to experience a different culture of research. We worked on designing approximation algorithms for Combinatorial Optimization problems. Specifically, we worked on the problem of re-ranking the web pages to minimize the effort of users in finding their relevant web pages during the web-based search. As I am in the early stage of my research career, the Indo-U.S. WISTEMM fellowship helped me to advance my research canvas. In my opinion, this fellowship is a life-changing opportunity for collaborative research..

I believe the WISTEMM grant is a terrific opportunity to support women's research activities in STEMM fields particularly in mathematics and engineering where the number of women continues to be disproportionately small – and I hope IUSSTF and other agencies continue to support such efforts and I hope to participate in more such collaborations in future. I also wish to state that the fellowship application procedure was smooth I am thankful to IUSSTF for always providing immediate response on all my queries. ●



Indo-U.S. Fellowship for Women in STEMM (WISTEMM)
Webpage: https://iusstf.org/program/indo-us-fellowship-for-women-in-stemm
E-mail: wistemm@indousstf.org

Bhaskara Advanced Solar Energy Fellowship (BHAVAN)

Amanda Thounaojam
Centre for Environmental Planning and Technology University (CEPT University)

During my Master's program at CEPT University on Building Energy Performance, my thesis was based on "Evaluation of a low-cost method of High Dynamic Range (HDR) photography for Daylight Assessment". The Indo-U.S. BHAVAN Internship Program 2019 provided me the opportunity to enhance my skills and knowledge on HDR imaging method. It was a great experience to work with Professor Kevin Van Den Wymelenberg at the Energy Studies in Buildings Laboratory (ESBL), University of Oregon. I got the opportunity to travel to Portland and attended the Build Health Consortium 2019, where I got to know a lot of projects done by the ESBL team. Under the guidance of Professor Kevin and Alen Mahic, I was engaged in Prototyping an HDRI sensor for facade controls and also in developing the software platform for processing sensor inputs and outputs. I also got hands-on experience in building a mock-up to test the sensors for the overall system. I was also involved in additional analysis of the existing HDR data set from the previous work done by Prof. Kevin. During the process, I was also part of a proposal writing in response to a U.S. DOE project.

During my six months stay in the U.S., I visited other cities including Seattle, Los Angeles, San Francisco and Berkeley – where I got the opportunity to visit the Lawrence Berkeley National Laboratory (LBNL). Professor Christian Kohler toured us to the FLEXLAB, the most advanced integrated building and grid technologies testbed. It has been a wonderful experience for me in terms of technical learning and cultural experience. Thank you IUSSTF! ●

BHAVAN Program
Webpage: https://iusstf.org/program/bhaskara-advanced-solar-energy-fellowship
E-mail: energy.fellowship@indousstf.org

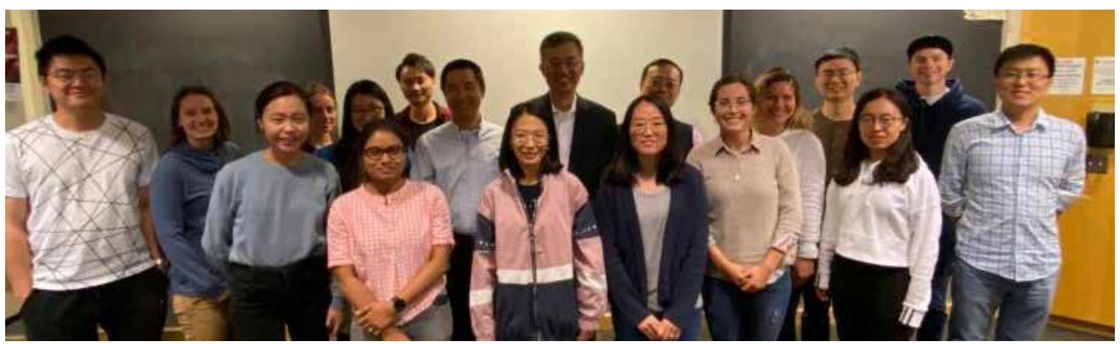
Bhaskara Advanced Solar Energy Fellowship (BHAVAN)

Saranya Anbarasu
Centre for Environmental Planning and Technology University (CEPT University)
Ahmedabad

Certainly, exchange research programs are always a gateway of opportunities, exposure and life experiences for graduate students like me, who are just marching towards the professional world. I am one of the fortunate students to peruse the BHAVAN internship program-2019, at the Sustainable building systems (SBS) lab, University of Colorado Boulder.

Increasing income and preference of comfort conditions has resulted in a quick increase in energy demand for space cooling, envisioning the huge need for alternative low energy cooling systems for Indian residences. My research under the guidance of **Dr. Wangda Zuo**, at the University of Colorado Boulder, focused on the ***development of validated next-generation simulation models of Direct evaporative cooling systems using equation-based modeling language – Modelica.*** This flexible object-oriented modeling approach could be easily replicated and can be combined with dynamic thermal models (DTM) to simulate the system performance with arbitrary topologies and controls. Modelica component libraries are constantly under development at Buildings, communities, and City scales. Alongside the research work, I did attend a few conferences, visit national labs, and meet the pioneers in the field of energy efficiency and sustainability. Finally, not to miss out on the silent everyday life in the university town and the adventurous weekends in the surrounding hills of Rocky Mountains.

My deepest gratitude to IUSSTF for giving me this great opportunity! My plans for choosing a research career has greatly evolved after the internship and would like to mention that I have been offered a funded Ph.D. position to join the SBS lab in the near future.



BHAVAN Program
Webpage: https://iusstf.org/program/bhaskara-advanced-solar-energy-fellowship
E-mail: energy.fellowship@indousstf.org

Khorana Program for Scholars

Cheshta Bhatia
Indian Institutes of Science Education and Research (IISER), Mohali

Securing the Khorana Program Scholarship has been the happiest moment of my life so far!

I chose to undertake my internship at the Center for Brain Science, Harvard University under the mentorship of Professor Aravinthan Samuel. Since I was a kid, I knew this was the best place to be at, but I had never, not even for a split-second thought that I would get the opportunity to work there! Harvard University is a beautiful place with lots of open green spaces, big old architectural buildings and some fun event happening every week.

During my stay, there were at least 2 seminars every week at the Center for Brain Science with each talk suggesting something that made me fall in love with my decision of keeping my curiosity alive and pursuing research all over again! I interacted with a lot of scientists during my stay in Harvard, and science was not just their job, it was their passion. When they described their work during our interaction, they had a different level of contentment which I can never stop admiring. There were days I worked 10-12 hours at a stretch in my lab and didn't feel tired at all. As Mark Twain correctly says, "Find a job you enjoy doing, and you will never have to work a day in your life." It was an experience of a lifetime to work in such a well-equipped lab, carrying out experiments and having thorough discussions with professors talking about ideas that made me brainstorm every single day.

Everyone in my lab came from a very different place. I developed close friendships with people from China, Germany, Japan, Korea, Russia and obviously the US!

Cambridge was the city of dreams for me, not too big to be overly populated, has that classic old feel to it and situated just 15 minutes away from Long Wharf (in Downtown Boston), where I spent many weekends just peacefully observing the Charles river. I describe Cambridge as the "Small Science Village" where every thought begins with Science and every conversation makes you think about something so deep. In Cambridge, whether a person is 5 or 65, everyone has their curiosity alive and this is what makes me fall in love with this city. Along with other fellows, I planned a trip to the very gorgeous Niagara Falls and explored Boston too.

Even now, when I meet people and tell them I am doing research, many don't understand it. But in the end, this is what makes me the happiest and as they say, it's all worth it if you are happy in the end. The only message I would like to give to all high school children is that never get influenced by what others tell you to be in life, find what makes you content and work hard to achieve it. There is no replacement for hard work and unless you love what you do, you can never give it your hundred percent.

Khorana Program for Scholars
Webpage: https://www.iusstf.org/program/khorana-program-for-scholars
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IUSSTF
Indo-US S&T Forum

Indo-US Science & Technology Forum

Who we are

The Indo-US Science and Technology Forum (IUSSTF), established under an agreement between the Governments of India and the United States of America, is an autonomous, not for profit society in India, co-funded and co-governed by both the governments. IUSSTF promotes and catalyzes Indo-US collaborations in science, technology, engineering, biomedical research and innovation through substantive interaction among government, academia and industry.

What we do

Foster excellence by capitalizing on the scientific and technological synergy
Disseminate information and create awareness through scientific exchanges
Build linkages through networking between academia and industry
Explore new frontiers by nurturing contact between young and mid-career scientists
Pave way to sustainable interactions and establish long term relationships
Encourage public-private partnership to inculcate elements of innovation and entrepreneurship

We support

Exciting and innovative collaborative programs cutting across disciplines and institutions

- Academia-Industry Connect Programs
- Advance Schools & Training Programs
- Bilateral Workshops & Symposia
- Flagship Events
- Knowledge R&D Networked Joint Centers
- Programs on Innovation and Entrepreneurship
- Public-Private Networked R&D Joint Centres
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1 March	31 January
Indo-US Public-Private Networked Centres & Indo-US Knowledge R&D Networked Centres	
Submission Deadline	31 August
Award Announcement	31 January

How to contact us?

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