











FUNDING CMC RESEARCH FOR GLOBAL IMPACT

2015 ANNUAL REPORT



ear Friends,

Message from the Chair

Greetings from the Vellore CMC Foundation! As a grateful CMC alumna of the Batch of '69, I am humbled and honored to continue serving my alma mater as Chair of the Board of Directors.

This has been a productive and successful year, thanks to our President, Staff and Board. Our 2015 Audited Financial Statements show continued reduction in spending and growth in income (with thanks to our generous donors).

Our theme this year is Research at CMC, an area long championed by the Foundation. Inside you will read about two CMC projects that we have prioritized: Model Villages in the Jawadhi Hills and construction of an extraordinary Center of Excellence for Trauma Care, Training & Research. Both will offer rich opportunities for Research. The report also includes profiles of internationally-acclaimed CMC researcher Dr. Gagandeep (Cherry) Kang (Batch of '81), as well as world-renowned scientist Dr. Anindya Dutta (Batch of '75). Read about cutting edge use of mHealth technology for prenatal and infant care; a \$22 million grant for stem cell research; CMC's collaborative study of the human microbiome; and a bio-engineering approach to occupational therapy. We proudly support Cognitio, an all-India 3-day symposium held at CMC organized by and featuring student researchers. Cognitio's success can be credited to the late Dr. Shubhanker Mitra (Batch of '00), a talented faculty member whose untimely death inspired a new endowment in his memory for a research prize and for future Cognitio symposia.

I am grateful to our outstanding Research Committee, chaired by Dr. Philip Ninan (Batch of '69), that has thoughtfully shaped our strategy to fund and strengthen faculty and student research. Read more about them on page 14. CMC's priority is always to find low-cost yet effective innovations for resource-limited settings and we are proud to be part of this great work.

Enjoy the Annual Report and please continue your generous support of CMC through the Vellore CMC Foundation.

With warm regards,

Honorine Ward, MD

Chair

Board of Directors

Vellore CMC Foundation, Inc.

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Welcome



ear Friends and Supporters of CMC,

Thank you for your dedication and generosity to CMC. This is an exciting time both in Vellore and here at the Foundation. We have set rigorous goals for cost containment and income generation, both of which we met in 2015. The details in the 2015 Financial Statements are worthy of your time – as a donor you have an important role in our success.

CMC is at a watershed moment. Director Dr. Sunil Chandy has called for Consultation 2016 which is CMC's international strategic planning model exercised every 6-10 years. As we put this report to press, the Consultation is beginning. We hold everyone involved including our representatives, Chair Dr. Honorine Ward and Corporation member Dr. Anindya Dutta, in prayer as CMC's direction for the next decade is given shape.

In addition to this major planning initiative CMC is about to embark on the biggest hospital construction project ever undertaken in India! In nearby Kannigapuram within a few years, a state-of-the-art hospital for the "Super-Specialties" will open. The centerpiece of the Kannigapuram project right now is a Level I Trauma Center which will be built first; CMC will provide the most advanced medical services in South India, and in some aspects, all of India. This and the fascinating research project underway in the tribal Jawadhi Hills are the Foundation's major fund raising priorities currently.

We support CMC's commitment to leadership in global health. Research is the primary means of achieving such a formidable goal and as you will read in this report, CMC and the Foundation are working hand-in-hand to provide the conditions for excellence.

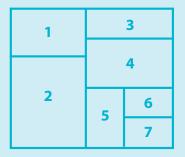
Sincerely,

Katherine D. Guenther

President

Vellore CMC Foundation, Inc.

FRONT COVER PHOTOS



1 CMC's pioneering bone marrow transplant team has cut costs by up to 80%, with results at par with the West.

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- 2 Pathologists work closely with clinicians and researchers in diagnosing and treating complex cases.
- 3 Community Health nurses visit remote hamlets bringing targeted low-cost care to the poor.
- 4 CMC's Main Hospital is a symbol of hope for patients and a center of excellence in clinical research.
- 5 Dr. Ida S. Scudder's persistence and imagination led to many breakthroughs in treatment and continues to inspire researchers at CMC today.
- 6 The new rotavirus vaccine for India is saving tens of thousands of lives every year and CMC scientist Gagandeep Kang was a leading contributor to its development.
- 7 Dr. Paul Brand (I) dedicated his life to leprosy victims, unlocking the mysteries of the disease and restoring dignity to thousands.

Two Foundation Funding Priorities in 2015: Project I - Model Villages in the Jawadhi Hills

The Vellore CMC Foundation's mission is to support advanced medical education and research in Vellore, and perpetuate the legacy of CMC's founder, Dr. Ida S. Scudder. Fund raising is aligned with the strategic goals of CMC in Vellore. In 2015 the two fund raising projects described in the next four pages were selected for special Foundation attention.



Careful measurements are taken and drawn with chalk to guide residents who are digging. Two leach pits will accommodate a typical family: when one is full (after approximately 5 years) the plumbing is connected to the other. Waste in the first pit will biodegrade over time and be recycled as fertilizer and fuel.



The village men, including the Ooran pitch in to unload the liners for the leach pits. Each one weighs approximately 250 lbs.



Before the foundation is laid the Ooran (leader, right) prepares gifts of thanksgiving and good fortune that are offered in a short prayer ritual.

The residents themselves perform all the physical work to prepare the Foundation for the 4"X 8" Bathroom structure and two underground leach pits.

Before long the first traditional Indian squat toilet is in place.

MODEL VILLAGES IN THE JAWADHI HILLS

Measuring the impact of integrated Sanitation, Hygiene, Clean Water and Comprehensive Social Services, introduced simultaneously, in one of the most remote and entrenched places in India.

CMC's Community Health & Development program (CHAD) has supported the most isolated and impoverished people in the region for over 30 years, including the people of the Jawadhi Hills. The Jawadhi Hills are situated almost 4,000 feet above and to the west of Vellore; they are the ancestral home of the Malayali (Malay Al-people of the Hills) tribal people. Families reside in hamlets of 20-40 huts each, some of which are far from the nearest road. With award-winning programs and a renowned team of medical and support staff, almost half of the 80,000 people living there have been afforded maternal & child healthcare, prevention and management of communicable and non-communicable diseases, and more.

Not one village or family in the Hills has running water or a toilet, and numerous other impediments to sustained health and prosperity stand in the way of achieving the most basic standards of healthy living for most people in the Jawadhi Hills.

To bring about deep and sustainable benefits for the Jawadhi Hills people CHAD is using Model Villages to test the effectiveness of multiple inter-related interventions - a kind of 360° approach (see box). This methodology is intended to raise the quality of health and community life in the chosen village and provide an example to people in surrounding villages to make similar changes. CHAD is supporting the development of up to four Model Villages. The first, in Koiloor, is well underway as of this printing. CHAD has committed, with support from the Foundation and the Friends of Vellore worldwide, to offer a coordinated group of innovations that are meant to bring sustainable quality-of-life improvements to the people living there. The isolation of these villages offers a unique opportunity to study the clinical and social impact of such change.

Clinically, many of the major health issues afflicting the Jawadhi Hills people stem from the lack of clean drinking water, toilets/hygiene, and waste disposal. The central elements driving clinical success in CHAD's project are: 1) full acceptance from residents to build and



CMC will be on site offering primary care, including free vaccinations for all the village children.

use toilets attached to their homes; 2) self-motivated education/community advocacy initiatives to reinforce the goal of 100% reduction in open defecation; 3) clean drinking water provided in a cost-effective way; 4) waste disposal systems designed and used consistently by residents.

Socially there are educational deficits, unemployment, alcoholism and a trend toward "distress migration," when families travel far from their homes to find seasonal farming or other day-labor work. In these cases children suffer loss of education and healthcare and are at risk of abuse. To address these issues model villages are offering training on income generation, sustainable agricultural methods and other skills that will keep families intact and at home year-round. Evening study centers help children improve their studies and learn about the importance of finishing school. Social groups address alcohol abuse, women's empowerment, self-advocacy; a children's parliament is being assembled in the first Model Village in 2016.

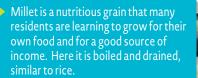
The goals of this project are:

- Reduction in Infant and Maternal Morbidity and Mortality
- Reduction in incidence of enteric diseases that cause malnutrition, stunting, etc.
- 100% adoption of clean water for cooking, washing, etc.
- 100% reduction in open defecation leading to improved sanitation and hygiene;
- Full immunization of children
- Increase in school attendance and academic milestones reached
- Increase in local employment that can support families (reduction in incidence of distress migration)
- Community leadership/advocacy will emerge as a strong benefit to all
- Increase in understanding of the risks of alcohol abuse/ abstinence from its use among residents

Read more about our progress and results at https://vellorecmc.org/Jawadhi-Hills



Evening study centers are critical to the goal of keeping children in school and building respect for education.







The first Model Village in Koiloor has hard-working and committed residents who regularly meet to assess progress, make adjustments and plan next steps.

What is a Model Village?

The Model Village design for the delivery of social services brings integrated initiatives to a community where a number of factors are impeding an otherwise attainable quality of life. Model Villages were successfully tested and expanded in India through the Central Government's Pradhanmantri Adarsh Gram Yojana project that began in 2009-10; there, comprehensive social and infrastructural benefits were made possible in villages where underserved people lived. The program demonstrated improvement in many socio-economic indicators across the spectrum as well as residents' feelings of dignity and community mindedness. One of the critical aspects of the Model Village execution is the strong participation of residents in planning and bringing about change.

Project II - A New Center of Excellence for Trauma Care, Training & Research



A LEVEL I TRAUMA CENTER

The most advanced center for treatment of traumatic brain and other injuries in South India.

According to the World Health Organization (WHO), road traffic accidents (RTA) are the leading cause of death for young people aged 5–29, especially in developing countries. India is responsible for the highest overall number of deaths due to RTA. CMC's Neurosurgery Department currently admits 40 to 50 head injury patients a month. Many other victims are seen in other departments or die before reaching the specialized help they need. Orthopedics sees an additional 140 trauma patients a month, at least 75% of which are RTA victims; others are injured in falls, industrial accidents, assaults, etc. This is just a hint at the actual need. India leads the world in RTAs. The State of Tamil Nadu, where Vellore is, has the second-highest rate of RTAs in India.

The "Golden Hour" of opportunity to save the life of a trauma victim is out of reach all over India because of the lack of access to the skilled care needed, poor roads, too few ambulances, and poverty.

CMC, as it has so many times in the last 116 years, is

expanding into a new area to meet a significant need in India. A 1500-bed hospital and trauma center is under construction in the village of Kannigapuram, just 12km from Vellore. As CMC's new Trauma Center is completed, the national highway between Chennai and Bangalore will have an exit for ambulances and patients leading directly into the new CMC facility.

The vast 80,000 square foot Trauma Center will have the most advanced imaging and surgical resources; a dedicated cardiac section with its own ambulance bays; and a new Trauma Team staff configuration that assures that every patient has a trauma specialist coordinating his/her treatment and recovery. CMC is sending surgeons to the US to be trained in this effective design. A new floor in the Rehabilitation Institute in Vellore is being built to accommodate the inevitable increase in complex cases. The Foundation has committed to lead major gift fund raising in the US. CMC remains committed to serve all, meaning the cost of care will be subsidized according to patient need. Visit https://vellorecmc.org/Kannigapurim to keep up with this new project.



CMC's Emergency Department currently receives all acute care cases including trauma victims. City traffic, poor response times from ambulances, and a shortage of beds to meet today's needs, make it very difficult to respond within the "Golden Hour."



The Trauma Center will have the most advanced imaging technology found in the region.



the Trauma Center.

The majority of traumadeaths occur in the pre-hospital period; the first 60 minutes after trauma have been named the "Golden Hour" for recovery.

CMC surgical residents and fellows are being trained in US trauma centers with support from Board member Dr. David Reines (second from left).

CMC is adding a new floor to its Rehabilitation Hospital in anticipation of additional patients from

CMC Researchers Seek Targeted & Low-Cost Solutions



Doctors have pregnant mothers read aloud the basics about pre-natal care. This gives them the chance to clear up any misunderstandings and work more closely with women who are illiterate.

CMC has contributed to medical discovery and advances in healthcare in India with its outstanding faculty, top educational programs and importantly, its commitment to research. By the 1940's when CMC was growing rapidly, leading scientists from around the world were visiting, lecturing, and helping to establish departments in which important medical advances would be made. Dr. Jonas Salk and Sir Alexander Fleming are just two of the great minds that visited CMC because of its leadership in research. Dr. Paul Brand, who at CMC unraveled the mysteries of leprosy and its treatment, spent years in Vellore through the 1960's training and inspiring students who went on to achieve many "firsts" at CMC.

Today CMC has a well-earned global reputation for research methods and solutions that are rooted in cutting-edge science and designed to work in under-resourced areas. Here is a look at two exciting examples of such projects in development at CMC.

INNOVATIONS IN mHEALTH

In the most remote corners of India, without cars, running water, nearby schools, or internet connectivity, one thing is almost ubiquitous: the mobile telephone. Public health leaders have quickly put "mHealth," the use of mobile phone technology to advance healthcare, in the center of the array of available tech-related healthcare delivery systems.

Typically mHealth makes use of text messages, voice messages, pictograms or automated calls. CMC-based telecommunications engineer **Sharon Pandian**, on behalf of the Antenatal and Infant Monitoring system (AIM) in CMC's Wellcome Trust Research Lab, sought a more advanced solution that would build trust and work around barriers like illiteracy, frequently-changing phone numbers, and the need to deliver more complex/medical information. AIM's goal with its mHealth application was to support pregnant women for antenatal care, postnatal care and immunizations, and to track any possible adverse reactions to vaccinations.

Over eight months in 2014, CMC partnered with the Rural Technology Business Incubator of the Indian Institute of Technology (Chennai) and Uniphore, a voice solutions company, to develop a pilot interactive voice response system that would work effectively in the Tamil language with people living in urban slums and rural villages. AIM tested the system's content, reliability and effectiveness with 800 women in 2015. Critical was its ability to establish trust through "stage-appropriate" delivery of messages, monitor use of free well-baby check-ups and immunization services, and respond to/

monitor women's reports of 'danger signals' in theirs or baby's health.

The strong results of the pilot study were presented to the government of Tamil Nadu and were so well received that AIM is now being discussed for potential integration with the existing Tamil Nadu governmental system for monitoring pregnancy and infancy under the Reproductive, Maternal, Newborn and Child Health (RMNCH) services of the National Health Mission (NHM).

Watch the Foundation website http://vellorecmc.org for updates.

This mother of three received mHealth messages twice a week from the interactive voice recognition communications that Sharon Pandian (seated) developed for AIM (Antenatal, Infant and Maternal Health). Since Mom cannot read she has been able to learn through this service when her baby's immunizations are due.



Ann David's adaptive computer games on the SITAR table are helping occupational therapy patients do better. Here a visitor to the Bioengineering Department gets an introduction.

A HIGH-TECH GAME TABLE IS MAKING OCCUPATIONAL THERAPY MORE FUN

Adaptive computer games are helping to re-train arm and hand functions.

Ann David, a Junior Research Fellow in the Bioengineering Dept. at CMC, under the guidance of Dr. Sivakumar Balasubramanian, has developed two adaptive computer games and intergrated them into an innovative workstation called SITAR (System for

Independent Task-oriented Assessment and Rehabilitation). The system facilitates independent and engaging rehabilitation therapy sessions for patients who have diminished function of their upper limbs.

SITAR was created in 2013 by The Robotics Group at Imperial College, London to "integrate low-cost instrumented objects that mimic the motions and manipulations used in everyday tasks."* Ms. David's premise is that adaptive computer games that are set in such a workstation, can give rehabilitation patients a new level of independence and engagement while stimulating movements that are therapeutic to strengthen the upper limbs. The system requires the patient to log in with a therapist and select a therapy plan for the session. After playing the game(s) the program provides a post-therapy analysis.

A preliminary trial using five patients yielded positive feedback from users. Multiple uses are being considered, including assessing the level of disability, assessing cognitive ability, tracking movement kinematics, etc. The Bioengineering Department at CMC is headed by **Dr. Suresh Devasahayam**; major research interests are in Physiological Measurement, Systems Modelling and Signal Processing, Medical Instrumentation and Rehabilitation Engineering. Apart from academic research, faculty is focused on the development and manufacture of affordable and useful technology for healthcare in India.

*http://www.ukieri.org/

CONSULTATION 2016 Investing in Research: the Bedrock upon which a Global CMC is built.

CMC's international strategic planning sessions are held every few years and involve faculty, alumni, leaders in healthcare and other related fields, etc. With tremendous growth and change imminent in Vellore, Consultation 2016 has great importance. In keeping with the Foundation's commitment to research, we have asked a distinguished alumnus, member of the Foundation's Corporation and Research Committee, Dr. Anindya Dutta, to attend and present the Foundation's vision for a renewed investment of time and resources in CMC's leadership in global health research. A short summary of Dr. Dutta's exciting work in cancer research follows.

DR. ANINDYA DUTTA An Esteemed Cancer Researcher and CMC Alumnus Representing the Foundation at Consultation 2016



Dr. Anindya Dutta, best outgoing student from the Batch of '75, is Professor and Chair, Biochemistry and Molecular Genetics at the University of Virginia, working at the heart of one of the 21st Century's most promising areas of cancer research: understanding cancer genomics. With the knowledge that chromosomal mutations are what cause cells to reproduce abnormally in cancer, the search for the origins of those mutations is where scientists believe many answers lie. With greater understanding of the genetics of certain cancers, targeted therapies have shown promise, as have related drugs that actually help the body's own immune system kill cancer cells.

In 2015 it was announced that an important discovery had been made in Dr. Dutta's lab at the University of Virginia identifying two new cancer-causing gene mutations. These mutations, known

to cause certain lung and prostate cancers, have characteristics that led Dr. Dutta's team to believe that they may respond to the drugs already being used successfully in breast cancers caused by the familiar BRCA gene mutations. In the announcement in *The Economic Times*, September 23, 2015, Dr. Dutta commented, "One of the biggest problems in cancer is that we hit everything with the same hammer, and consequently some cancers are responsive and others are not. Imagine if you could find the perfect hammer for the nail - the famous personalized therapy."

Dr. Dutta is an award winning scientist and professor, a member of the Foundation's Research Committee and Corporation. We thank him for his loyalty to CMC. Read more about his research at http://genome.bioch.virginia.edu.



Global Collaboration for Breakthrough Science CMC Faculty Partner with International Alumni and Leaders in Innovation

STUDYING THE HUMAN MICROBIOME

CMC faculty, international alumni & colleagues are collaborators.

Over the past decade there has been explosion of research on the human "microbiome"- the 100 trillion or so microbes or "bugs" that live in or on the human body. A healthy gut microbiome is essential to human health. Our understanding of the human microbiome and its role in health and disease has revolutionized medicine and nutrition. Alterations in the composition and function of the gut microbiome are associated with a wide range of disorders ranging from malnutrition and obesity to diabetes and asthma. CMC scientists led by Dr. Gagandeep Kang (Batch of '81), in collaboration with Foundation Board members Drs. Honorine Ward (Batch of '69) and Christine Wanke from Tufts University in Boston, are studying the gut microbiota in stunted children, obese mothers and their children and children with the 2 commonest gastrointestinal infections in Vellore-those caused by rotavirus and the parasite *Cryptosporidium*. In another study, these scientists together with Dr. Rita Isaac (Batch of '76) at RUHSA are studying

the gut microbiota of patients with HIV infection before and after treatment with antiretroviral drugs. Post doctoral fellows from Tufts and CMC working together on these studies are supported by training



CMC alumna Dr. Honorine Ward and Dr. Christine Wanke are research colleagues at Tufts University in Boston. They both have active collaborations with CMC in deciphering the human microbiome.

grants from the Fogarty International Center of the US National Institutes of Health. Next-generation sequencing and associated computational and bioinformatics analysis of the data has so far been done at Tufts. Recently, however, the Wellcome Trust Research Laboratory in the Division of Gastrointestinal Sciences at CMC has acquired a state-of-the art machine for the sequencing studies so CMC can conduct its own microbiome studies. The long-term goal of all these studies is to develop targeted microbiome-based interventions for the vulnerable populations that most need them.

DR. GAGANDEEP KANG

International Scientist Studying Causes and Cures for Diarrheal Diseases



Professor Gagandeep ("Cherry") Kang (Batch of '81) is a Professor of Microbiology, former Head of the Wellcome Trust Research Laboratory (WTRL) and Division of Gastrointestinal Sciences at CMC. She is currently on sabbatical leave from CMC to lead the Government's prestigious Translational Health Science and Technology Institute (THSTI) in Delhi.

Dr. Kang is best known for her comprehensive research on diarrheal disease that has led to important advances in Indian public health. Her WTRL field teams conduct community-based research with a focus on vaccines, enteric infections and nutrition in young children in the poorest urban and rural areas of Vellore. Working closely with CMC's related clinical practices Dr. Kang's research interests are supported and she is able to help provide comprehensive services to patients with enteric infections. Under her leadership more than 200 publications in national and international journals from the WTRL have been published in the past six years.

Dr. Kang's goal is "...to build committed individuals and teams to conduct research that is relevant to India or to resource-limited settings." She mentors the researchers who work with her and works with strong global collaborators including Tufts University, Boston; Baylor College of Medicine, Houston; Imperial College, London; Stanford University, Palo Alto; University of Virginia, Charlottesville; University of Liverpool, England; and the World Health Organization.

Dr. Kang's outstanding contributions to medical research have been recognized by the American Academy of Microbiology, where she is the only Indian woman elected to fellowship. She is a Fellow of the Indian Academy of Sciences, the National Academy of Sciences, the Indian National Science Academy and of the Royal College of Pathologists and of the Faculty of Public Health in the UK. Learn more about Dr. Kang's work at http://cmcwtrl.in



CMC'S CENTRE FOR STEM CELL RESEARCH

A \$22 million grant seeks new treatments for brain and blood disorders.

In a bold move to support stem cell research in India, the Department of Biotechnology (DBT), Government of India has called upon CMC's Centre for Stem Cell Research, a unit of inStem (CSCR), and three other top Indian institutes, to execute a project called 'Accelerating the application of Stem cell technology in Human Disease' (ASHD). The National Centre for Biological Sciences (NCBS), the Institute for Stem Cell and Regenerative Medicine (inStem) and the National Institute for Mental Health and Neurosciences (NIMHANS) make up a major collaborative with the CSCR, supported by a \$22 million grant over 5 years to use stem cells in research, diagnostics and therapeutics. The Program will also partner with the Centre for iPS Cell Research and Application (CiRA), Kyoto University, Japan, which is led by **Prof. Shinya Yamanaka**, a leading pioneer in stem cell technology.



Dr. Alok Srivastava

The ASHD program has two broad components which deal with human diseases of national importance. The first is a joint venture between inStem, NCBS and NIMHANS, involving the use of stem cells to study the genetic bases of mental illnesses (such as schizophrenia, bi-polar disease and attention deficit disorders); the second, led by CMC and CSCR, will address a large unmet need in India using novel approaches to study and treat some of the major hematological disorders.

The program at CMC / CSCR, called Novel Approaches to Hematological Disorders (NAHD), involves developing modern methods including gene therapy for hereditary blood disorders such as hemophilia, thalassemia and sickle cell disease, all of which are causes of major morbidity and mortality in India. In order to have maximum impact on hereditary hemoglobin diseases in the population at risk, this initiative combines these efforts with a community outreach program for the control of major hemoglobin disorders.

Dr. Alok Srivastava (Batch of '81) is coordinating the NAHD program. He has had major success in recent years using gene therapy in the major hemoglobin diseases as

well as bleeding disorders like hemophilia. Several clinical and laboratory departments from CMC are engaged in the program which will utilize the large patient base of NIMHANS and CMC to create a database of blood and body fluid samples. These samples will be analyzed by researchers in the program with the goal of eventually developing and testing targeted treatment techniques for brain and blood diseases.

The CSCR was sanctioned in December, 2005 and opened in 2007 – the first of its kind in India for translational stem cell research. It is a unique collaborative project between CMC and the DBT and became the translational research unit of inStem in 2011. Part of the Center's goal is to conduct early-phase clinical trials with stem cells processed within its own cGMP facility. It also supports various training programs for students and scientists.

The major translational research themes currently being pursued at CSCR

- Gene Therapy for hemophilia and major hemoglobin disorders, coordinated by Dr. Alok Srivastava (Batch of '76) and currently working on a project in collaboration with scientists at Emory University in Atlanta, the University of Florida, Gainesville including the Powell Gene Therapy Centre.
- Osteoarticular Regeneration, coordinated by Dr. Vrisha Madhuri (Batch of '76) and currently working in collaboration with University of Southern Denmark, University of Aarhus, Denmark Karolinska University
- Hospital, Stockholm, Sree Chitra Tirunal Institute for Medical Sciences & Technology, Trivandrum and Indian Institute of Technology, Kanpur in India.
- Cellular Reprogramming and its Applications Disease Modelling and Haplobanking, with Dr. Dolly Daniel (Batch of '83) and Dr. R. V. Shaji (PhD alumnus of CMC, 2001) coordinating the field and laboratory aspects of the effort. This highly technical work is described in detail on the Foundation Website and also in the CSCR's 2015 Annual Report. Please visit www.vellorecmc.org.

Funding Training & Research Fellowships in the US

Fellowships and Individual Professional Development Grants for Senior Faculty

One of the Foundation's longest-standing commitments to CMC is the funding of Senior Training

Fellowships (STF). Since the early 1990's doctors, nurses and allied health professionals have applied annually through a competitive selection process administered by CMC. Fellows can study worldwide; the Foundation funds those that take place in the US.

DR. JACHIN VELAVAN ('91)

Doctor of Family Medicine, Head of Distance Learning.

With funding from the Foundation, **Dr. Jachin Velavan** attended the FAIMER Institute in Philadelphia, PA to complete the International Fellowship in Medical Education. She was able to study the demographic profiles of doctors enrolled in the 2-Year Family Medicine Fellowship at CMC – a Distance Learning program that has grown rapidly and has the potential to transform the delivery of primary care medicine in rural India. With the data she has successfully promoted much-needed and less sought-after specialties like Family Medicine. A more exhaustive course-impact-evaluation was conducted after the Fellowship and those data not only strengthened the advocacy initiative, but brought about institutional policy changes in CMC's selection process, to encourage applicants from the critical northern states.



DR. ANNA PULIMOOD ('82)

Professor and Member of the Wellcome Trust Research Laboratory, Division of Gastrointestinal Sciences.



Dr. Anna Pulimood, a pathologist in gastroenterology, completed an STF in 2015 at the Brigham & Women's Hospital in Boston and the Children's Hospital of Philadelphia. In Boston she worked with **Dr. Robert Odze** (pictured), one of the top G.I. pathologists in the world and an expert in Inflammatory Bowel Disease (IBD), Gastroesophageal reflux disease and other G.I. inflammatory disorders, neoplasms and preneoplastic conditions with extensive publications in all these topics. There is currently no center in India where Dr. Pulimood's Boston experience could be found. With the benefit of her STF she observed complex conditions including preneoplastic changes in Barretts esophagus and in IBD colon, and serrated polyps of the colon. Dr. Pulimood has brought her knowledge back to her department at CMC and is launching a study on serrated polyps for publication.

AMALORPAVAMARI LUCAS

Professor, College of Nursing

Professor Lucas completed an STF at Massachusetts General Hospital in Boston, studying in the Apheresis Unit of Blood Transfusion Services. Apheresis is the isolation of specific blood cells through the use of a centrifuge machine that harvests the desired cells (e.g. plasma cells) and leaves the remaining cells in circulation. With this specialized study Ms. Lucas returned to CMC to start a nurse-led Apheresis Unit, including cryopreservation of stem cells. She also intends to conduct a research study using photopheresis in the treatment of Graft vs Host Disease (this is a photodynamic therapy in which blood is treated with a photosensitizing agent and subsequently irradiated).



Funding Student Research at CMC



Ensuring that Research is Part of Every Student's Experience

CMC has long required medical and nursing students to takeresearch commitments as part of their studies. Whether in the lab or the field, experience in research methods and critical thought have proven to be strong assets for young practitioners in all clinical settings.

COGNITIO: PROVIDING A PLATFORM FOR MEDICAL STUDENTS TO PRESENT THEIR WORK

The Students Association of CMC Vellore started **Cognitio** in 2013 to promote undergraduate research at CMC and throughout Indian medical colleges by providing a platform for medical students to present their work. Speakers from across the world have shared their experiences and inspired medical students, many sponsored by the Foundation.

Cognitio 2016 was attended by 270 students from CMC and visiting schools including AIIMS Delhi, AIIMS Bhopal, JIPMER, KMC Manipal and MOSC Kolenchery. Sessions included interactive workshops on methodology and study design; literature review; ethics in medical research. Keynote Addresses were given by Padma Shri Dr. Vijay Raghavan (Secretary of the Department of Biotechnology, Bangalore) and



Dr. Vijay Raghavan receiving a memento from Dr. Solomon at Cognitio 2016

Professor Sandhya S. Visweswariah (Department of Molecular Reproduction, Development and Genetics, Indian Institute of Science). Of the 16 oral presentations accepted at Cognitio 2016, CMC third-year students Harshdeep Acharya and Jivansha Dua were awarded highest honors for their study of **Oxygen Use in the Emergency Department**.

A CMC MEDICAL STUDENT STUDY IS PRESENTED IN PUNE

The Foundation's new \$50,000/year grant to CMC for student and junior faculty research paid the cost of Harshdeep and Jivansha, along with several other student researchers pictured above, to attend the prestigious Armed Forces Medical College research conference called "Illuminati" in Pune in August. There were nine teams from CMC, and three of those made it to the finals! Congratulations!

Oxygen Use in the Emergency Department: Project Summary

Harshdeep and Jivansha looked at the pattern of oxygen (O^2) use in CMC's Emergency Department (ED), the common reasons for initiation of O^2 therapy and its appropriateness; they also quantified the incremental medical expense passed on to patients after unnecessary use of oxygen. All patients who were administered O^2 in the ED (363) over a 3-week period in April 2016 were included in the study.

Oxygen administered without hypoxia (low blood oxygen levels) was defined as "inappropriate" and occurred in 35.8% of the cases. The medical cost analysis found that on average \$11 was passed on to the patient unnecessarily. In such an under-resourced setting this is a significant amount. Their findings were analyzed using the British Thoracic Society's (BTS) protocols for emergency oxygen (O^2) use issued in 2008 as the benchmark.

The students' plan is to follow-up after a period of proper protocol (based on BTS guidelines) is followed in the ED (in progress), analyzing the decrease in inappropriate oxygen therapy and the related cost-savings for patients.

Vellore CMC Foundation Research Committee

ith the leadership of its Chairman Dr. Philip Ninan (Batch of '69), the Vellore CMC Foundation Research Committee continues to successfully reshape our strategy to fund and strengthen faculty and student research. Begun by CMC's founder Dr. Ida S. Scudder, research has always been an integral part of the vision and mission of CMC, being the key to excellence in academic, clinical and transitional medicine. Here are brief profiles of the Chairman and Committee Members.



PHILIP THOPPIL NINAN, MD ('69), CHAIR

Dr. Ninan is Affiliate Professor of Psychiatry at East Carolina University and Chairman of eMindScience, a health-tech startup using mobile devices to selfmonitor anxiety and depression. Dr. Ninan is a clinical and translational researcher with over two decades of NIMH funding. He was also a pharmaceutical industry executive in Neuroscience.

He was a keynote speaker at Cognitio 2015 in Vellore. Dr. Ninan joined the Foundation Board in 2013; besides chairing the Research Committee he is a member of the Finance and Program Committees. He is from the CMC 1969 batch.



BOBBY CHERAYIL, MBBS ('74), MD (PEDIATRICS, '81)

Dr. Cherayil is a principal investigator at the Mucosal Immunology and Biology Research Center, Massachusetts General Hospital and Associate Professor of Pediatrics at Harvard Medical School. His lab studies the interactions between iron metabolism and the immune response. One of his

current interests is in the role played by iron metabolism in host-pathogen interactions. He received the gold medal for Best Outgoing Student in his batch at CMC. He has been on the faculty of CMC's vaccinology course (INDVAC) for 6 years, has served on the Board's Research Committee since 2014 and joined the Board in 2016.



ANINDYA DUTTA, MD ('75)

Dr. Dutta is the Harry F. Byrd Professor and Chair of Biochemistry and Molecular Genetics and Professor of Pathology at the University Of Virginia School Of Medicine. He was Best Outgoing Student of his batch. Following his training at CMC he received a PhD from Rockefeller University; he was a Postdoctoral Fellow at Cold Spring Harbor Laboratory

and completed a residency in Pathology at Brigham & Women's Hospital, Harvard Medical School. He was an Asst. and Assoc. Professor of Pathology at Brigham & Women's before moving to the University of Virginia. Dr. Dutta joined the Corporation and the Research Committee in 2014.



MARY GANGULI, MD ('68)

Dr. Ganguli is Professor of Psychiatry, Neurology, and Epidemiology at the University of Pittsburgh School of Medicine and Graduate School of Public Health at Pittsburgh. Her clinical and research interests are in the mental disorders of later life, particularly cognitive impairment and dementia. Since 1986 she has led four large epidemiological studies, three in

the US and one in India, looking for risk factors for cognitive impairment and dementia, funded by the National Institute on Aging (NIH). In 2003, she was a Visiting Professor at CMC Department of Psychiatry at the invitation of Professor KS Jacob. Also with Dr. Jacob, in 2007 she co-edited a special theme issue of International Psychogeriatrics focused on geriatric psychiatry in developing countries.



MEREDITH HAWKINS, MD

Dr. Hawkins is the Jack and Muriel Block Professor of Medicine and co-Director of the Diabetes Research and Training Center at the Albert Einstein College of Medicine in New York. She earned her M.D. from the University of Toronto and a Master of Science in Clinical Research Methods from the Albert Einstein College of Medicine. Dr. Hawkins' research interests include the effects of nutrient deficiency and excess on

insulin resistance, nutritional regulation of adipose tissue inflammation, and the regulation of hepatic glucose production in diabetes mellitus. She visits CMC regularly where she and her team collaborate with **Dr. Nihal Thomas** (Batch of '82) in the Dept. of Endocrinology. She joined the Board in 2013.



NISSI VARKI, MD ('68)

Dr. Varki is a Professor, Dept. of Pathology, at UC San Diego (CA). She is the Director of Histopathology Resources, Cancer and Mouse Histopathology. After her studies at CMC she completed her Residency Training at Creighton University in Omaha, NE. Dr. Varki's research interests include comparative histopathology, analysis of genetically altered mice, and of mouse models of human diseases including

cancer, inflammatory disorders and microbial infections. She attended the 2015 Annual Research Day at CMC Vellore. She has trained two CMC graduates when they were working on histopathology projects during their post-doctoral fellowships with **Dr. Ajit Varki** (Batch of '68). She has collaborated with **Dr. Susy Kurian**, (Batch of '68) Head of Department of Pathology at CMC, now retired. She joined the Research Committee in 2014.



CHRISTINE WANKE, MD

Dr. Wanke is Director, Nutrition and Infection Unit, Assoc. Chair and Professor, Dept. of Public Health and Community Medicine, Dept. of Medicine, Tufts University School of Medicine, Friedman School of Nutrition Science and Policy and is on the faculty of the Sackler School of Graduate Biomedical Sciences. She completed her training at Univ. of Wisconsin School of Medicine. Dr. Wanke's research interests

are in the intersection of nutritional compromise and infectious diseases, particularly diarrheal disease and growth faltering in children in the resource-limited world and in patients infected with HIV. She collaborates with Dr. Rita Isaac and Dr. Cherry Kang at CMC. She joined the Board in 2013, is Chair of the Nominating Committee and has served on the Research Committee since 2014.



HONORINE WARD, MD ('69), BOARD CHAIR

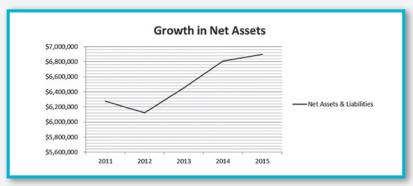
Dr. Ward is Professor in the Departments of Medicine and Public Health and Community Medicine at Tufts University School of Medicine, is on the faculty of the Immunology and Molecular Microbiology graduate programs at the Sackler School of Graduate Biomedical Sciences at Tufts and heads a research laboratory in the Division of Geographic Medicine

and Infectious Diseases at Tufts Medical Center. She has been instrumental in building strong partnerships with CMC in Research and Education. Dr. Ward works with Dr. Gagandeep Kang ('81) on NIH-funded projects studying the diarrheal parasite *Cryptosporidium*, the gut microbiome in childhood infectious diarrhea and malnutrition and with Dr. Rita Isaac ('76) on HIV infection. Dr. Ward joined the Board in 2008; she was a member of the Executive Committee as Member-at-Large in 2011, and was elected Chair of the Board of Directors in 2013.

2015 Financial Statements

STATEMENTS OF FINANCIAL POSITION For the Years Ended December 31, 2015 and December 31, 2014

	2015	2014
ASSETS		
Cash and cash equivalents	\$ \$483,772	\$ 401,188
Investments	6,271,776	6,123,516
Pledges receivable	75,030	216,057
Beneficial interest in trusts	18,756	20,478
Prepaid expenses and other	12,819	591
Property and equipment, net	35,501	46,101
TOTAL ASSETS	\$ 6,897,654	\$ 6,807,931
LIABILITIES		
Accounts payable and accrued expenses	\$ 246,941	\$ 238,577
TOTAL LIABILITIES	246,941	238,577
COMMITMENTS AND CONTINGENCIES		
NET ASSETS		
Unrestricted:		
Operating	227,064	174,327
Board designated	2,469,796	2,645,039
Total Unrestricted	2,696,860	2,819,366
Temporarily restricted	1,924,388	1,749,639
Permanently restricted	2,029,465	2,000,349
TOTAL NET ASSETS	6,650,713	6,569,354
TOTAL LIABILITIES AND NET ASSETS	\$ 6,897,654	\$ 6,807,931



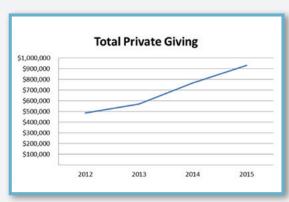
Prudent investment policy and reduced spending have supported steady growth.

STATEMENT OF ACTIVITIES For the Years Ended December 31, 2015 and December 31, 2014

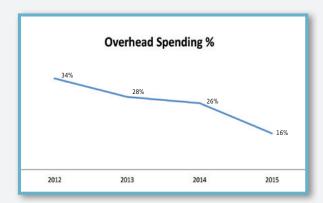
		FOR THE YEAR ENDED DECEMBER 31, 2015						FOR THE YEAR ENDED DECEMBER 31, 2014								
		tricted	Temporarily Restricted		Permanently Restricted		Tota	Total		Unrestricted		Temporarily Restricted		Permanently Restricted		Total
OPERATING SUPPORT AND REVENUE:				_					_							
Contributions																
Individuals	\$ 3	17,619	\$ 209,4	75	\$	29,116	\$ 556,	210	\$	88,759	\$ 60	01,973	\$	41,332	\$	732,064
Groups		6,761	-			-	6,	761		7,909		-		-		7,909
Foundations, corporations and trusts		160	182,4	75		_	182,	635		_		_		_		_
Institutional members	4	12,575	139,2	47		_	181,	822		26,396		_		_		26,396
	3	67,115	531,19	97	_	29,116	927,	428	-	123,064	6	01,973	_	41,332	-	766,369
Government grants	60	0,000	-			_	600,	000		93,037		_		-		93,037
Other revenue		60	-			-		60		766		-		-		766
Investment earnings																
appropriated for operations	29	4,240	-			-	294,	240		269,686		-		-		269,686
Net assets released from restrictions	36	59,836	(369,83	<u>(6)</u>	_				-	176,068	<u>(17</u>	6,068)	-		-	
TOTAL OPERATING SUPPORT AND REVENUE	1,63	31,251	_ 161,3	<u>61</u>	_	29,116	<u>1,821,</u>	728	_	662,621	_42	25,905	_	41,332		1,129,858
OPERATING EXPENSE:																
Program services:																
India	98	35,982	-			-	985,	982		228,295		-		-		228,295
USA	_30	01,028		_	_		_301,	028	_	426,597	_		_		_	426,597
Total program services	1,28	87,010		_	_		1,287,	010	-	654,892	_		-		-	654,892
Supporting services:																
Management and general	18	33,727	-			-	183,	727		142,671		-		-		142,671
Fundraising	4	4,532		_	_		44,	532	_	86,287			_		_	86,287
Total supporting services	_ 22	28,259		_	_		_228,	<u>259</u>	-	228,958	_		-		-	228,958
TOTAL OPERATING EXPENSES	1,51	15,269		_	_		1,515,	269	-	883,850	_		_		-	883,850
CHANGE IN NET ASSETS																
FROM OPERATIONS	11	15,982	161,3	61		29,116	306,	459	(221,229)	42	25,905		41,332		246,008
NON-OPERATING REVENUE:																
Other non-operating expenses		4,331)	-			-	(44,	331)		-		-		-		-
Investment activity		71,029	42,4			-	113,			398,642		93,401		-		592,043
Appropriations for operations	(26	5,186)	(29,05	<u> </u>	_		(294,2	240)	_(265,186)	(4,500)	-		_(269,686)
TOTAL NON-OPERATING REVENUE	(238	8,488)	13,38	88		-	(225,1	100)		133,456	18	38,901		-		322,357
CHANGE IN NET ASSETS	(122	2,506)	174,74	49		29,116	81,	359		(87,773)	61	14,806		41,332		568,365
Net assets - beginning of year	2,81	19,366	1,749,6	39	2,0	000,349	6,569,	354	2	2,907,139	1,13	34,833	1	,959,017	6	,000,989
NET ASSETS - END OF YEAR	\$ 2,69	6,860	\$ 1,924,38	88	\$ 2,0	029,465	\$ 6,650,	713	\$ 2	,819,366	\$ <u>1,74</u>	49,639	\$2 <u>,</u>	000,349	\$6	,569,354

STATEMENT OF FUNCTIONAL EXPENSES For the Years Ended December 31, 2015 and December 31, 2014

	Pro	Program Services			porting Servi			
	India	USA	Total Program Services	Management and General		Total Supporting Services	Total 2015	Total 2014
Salaries	_	\$ 146,835	\$ 146,835	\$ 67,224	\$ 25,390	\$ 92,614	\$ 239,449	\$ 306,691
Payroll taxes and employee benefits	-	42,645	42,645	19,542	7,381	26,923	69,568	109,625
Total Salaries and Related Costs		189,480	189,480	86,766	32,771	119,537	309,017	416,316
Grants	985,982		985,982	_	-	_	985,982	228,295
Travel	-	6,288	6,288	1,179	393	1,572	7,860	13,304
Occupancy	-	16,925	16,925	3,385	2,257	5,642	22,567	22,190
Telephone	-	3,622	3,622	1,811	604	2,415	6,037	4,515
Conferences and meetings	-	7,072	7,072	7,072	-	7,072	14,144	23,259
Data processing services	-	6,157	6,157	724	362	1,086	7,243	2,000
Professional fees	-	-	-	63,328	-	63,328	63,328	55,113
Equipment and office maintenance	_	2,933	2,933	1,467	489	1,956	4,889	13,138
Supplies	_	13,455	13,455	3,844	1,922	5,766	19,221	9,218
Insurance	_	_	_	5,551	_	5,551	5,551	6,458
Printing and								
fundraising fees	-	45,869	45,869	5,734	5,734	11,468	57,337	66,400
Depreciation	-	8,480	8,480	2,120	-	2,120	10,600	6,101
Other		747	747	746		746	1,493	17,543
TOTAL EXPENSES	\$985,982	\$ 301,028	\$ <u>1,287,010</u>	\$ 183,727	\$ 44,532	\$ 228,259	\$ <u>1,515,269</u>	\$ 883,850



Because of you we are growing and doing more for CMC!



To earn your trust and support we are making significant efforts to cut costs and show you where your money goes!

STATEMENT OF CASH FLOWS For the Years Ended December 31, 2015 and December 31, 2014

CASH FLOWS FROM OPERATING ACTIVITIES:	2015	2014
Cash received from contributors	\$ 1,068,455	\$ 733,222
Cash received from government grants	600,000	93,037
Investment return	132,660	132,835
Grants paid to Vellore	(985,982)	(363,842)
Cash received from other revenue	60	766
Payments for other expenses	(565,160)	(688,504)
· · · · · · · · · · · · · · · · · · ·	(0.00):00)	(000)200
Net Cash Used in Operating Activities	250,033	(92,486)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of investments		378,208
Purchases of investments	(167,449)	(178,806)
Net Cash Provided by Investing Activities	(167,449)	199,402
NET INCREASE IN CASH AND CASH EQUIVALENTS	82,584	106,916
Cash and cash equivalents - beginning of year	401,188	294,272
CASH AND CASH EQUIVALENTS - END OF YEAR	\$ 483,772	\$ 401,188
RECONCILIAITON OF CHANGE IN NET ASSETS TO NET CASH USED IN OPERATING ACTIVITIES		
Change in net assets	\$ 81,359	\$ 568,365
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation expense	10,600	6,101
Realized and unrealized gain on investments	19,189	(454,207)
Subtotal	111,148	120,259
Changes in assets and liabilities:		
Decrease (increase) in assets:		
Pledges receivable	141,027	(33,147)
Beneficial interest in trusts	1,722	7,641
Prepaid expenses and other	(12,228)	25,436
Increase (decrease) in liabilities:		
Accounts payable and accrued expenses	8,364	(212,675)
Net Cash Used in Operating Activities	\$ 250,033	(92,486)

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