SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY

THIRUVANANTHAPURAM - 695 011, KERALA

ANNUAL REPORT

2014-15

Annual Report
2014-15

Sree Chitra Tirunal Institute for
Medical Sciences and Technology
Trivandrum - 695 011

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SCTIMST

Contents

History

The origin of the Institute dates back to 1973 when the Royal Family of Travancore gifted a multistoried building for the people and Government of Kerala. Sri. P.N. Haskar, the then Deputy Chairman of the Planning Commission, inaugurated the Sree Chitra Tirunal Medical Center in 1976, when patient services including inpatient treatment got under way. The Biomedical Technology Wing followed soon at the Satelmond Palace, Poojapura, again a gift from the Royal Family, 11 km away from the Hospital Wing.

The concept of amalgamating medical sciences and technology within a single institutional framework was regarded sufficiently important by the Government of India to declare the center as an Institute of National Importance under the Department of Science and Technology by an Act of Parliament in 1980, and name it as Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum.

Dr. Manmohan Singh, the then Honorable Finance Minister, Government of India, laid the foundation stone of the third dimension of the Institute, the Achutha Menon Center for Health Science Studies (AMCHSS), on June 15, 1992. The AMCHSS was dedicated to the nation by Dr. Murali Manohar Joshi, the then Honorable Minister of Science and Technology and Human Resource Development, Government of India, on January 30, 2000.

Our Mission

- Promote research and development in biomedical engineering and technology
- Deliver high quality patient care in selected specialties and subspecialties
- Develop innovative postgraduate training programs in advanced medical specialties, and biomedical engineering and technology
- Participate in public health reforms through research, training and interventions

Our Vision

- Become a global leader in medical devices development, high quality patient care, and health science studies.


Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum

MESSAGE FROM THE PRESIDENT OF THE INSTITUTE

An Institute of National Importance under the Department of Science and Technology, Government of India, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, is unique in that it blends medical, engineering and public health sciences under a single institutional framework. As the President of the Institute, I am impressed by its significant contributions over the years in the realms of patient care, biomedical research and technology and public health. The year 2014-15 was no different and the institute continued to demonstrate its commitment in diverse spheres and developed new sub-specialty areas related to neonate and infant heart ailments and heart failure. The dedicated faculty kept up its tradition of publishing important research articles in first-rate national and international journals in the areas of clinical and basic research, health sciences and biomedical technology, and several patents were filed or sealed.

A notable achievement during the past year was the formulation and submission for approval of a detailed proposal to establish Technical Research Centre (TRC) for Biomedical Devices at SCTIMST. In addition, steps were initiated to set up of a Technology Business Incubator (TBI) for medical devices and a not-for profit society named SCTIMST-TIMed was formed. The hormone-releasing intrauterine device "Emily" that was developed jointly with industry partner HLL Lifecare Ltd and launched in the market in 2013 received good market acceptance and sales during the year.

The bone tissue engineering project, involving seeding of mesenchymal stem cells on bioactive ceramic scaffold, received approval from ICMR, facilitating the initiation of human clinical trials at CMC, Vellore. Central Drugs Standard Control Organization, CDSCO, Government of India, approved issuance of License for BioGraft HA New Ortho to the industry, which has taken the know-how for this hydroxyapatite-based bone graft material developed by the Institute.

Industry-supported projects such as fluoro-passivated and hydrogel-sealed vascular graft, development of paediatric and neonatal membrane oxygenators and arterial filters made progress. Product development projects, such as the cardiovascular stent, paediatric and neonatal membrane oxygenators, arterial filters, valve conduit with de-cellularized bovine pericardium, dispensable and biodegradable polymeric bone cement, and novel scaffold materials for tissue engineering were under different stages of development through the year. Biomaterials research continued on calcium sulphate bone cement, iron oxide nanoparticle probes, quantum dot conjugated single-walled carbon nanotubes, gene/drug co-delivery for anti-cancer therapy, hemostatic scaffold for chronic dermal wounds, bioengineered hybrid skin substitutes for burn wounds, smart dental composites,injectable hydrogel for cardiac tissue engineering, dural substitutes, skin tissue engineering and in vitro alternative test system development for ocular irritation.

In a world that is increasingly competitive, demanding and fast-paced, the institute can retain its position of pre-eminence only through perseverance and an abiding sense of direction that is in tune with its vision. I have no doubt that the institute has the inherent strength to fulfill its mandate and remain a model for other institutions. I extend my whole-hearted support to the Institute as it scales greater heights.

K M Chandrasekhar
President, SCTIMST

Director's Message

I am happy to state that the Institute took several major initiatives during the year 2014-2015, which are expected to yield long-term returns in the field of biomedical technology and device development. Thanks to the whole-hearted support and initiative of the Department of Science and Technology, Government of India, the Institute has been identified as the nodal center for the Technical Research Center for Biomedical Devices, which is one of the five Technical Research Centers being established in the country by the central government. The Department of Science and Technology has already released funds for the pre-implementation component of this major project, which is expected to attract funds to the tune of 100 crore rupees over the next 5 years. The program will give a fillip to the development of cardiovascular and neuro-prosthetic devices, hard tissue products for dental and orthopaedic application, biological and tissue-engineered products and in vitro diagnostics.

The Institute, with the support of the Department of Science and Technology, Government of India, and the Kerala State Industrial Development Corporation, Government of Kerala, has set up the SCTIMST- Technology Business Incubator for medical devices and biomaterials in the Biomedical Technology Wing campus. This facility will provide the right ecosystem and synergy with the necessary infrastructure, special laboratories, intellectual inputs, and consultancy for young entrepreneurs, start ups and small scale industries taking up biomedical product development. The highlight of the facility is availability of class 10000 and class 100 clean room work places for pilot manufacturing.

The new Engineering Block at the BMT Wing has facilitated augmentation of the infrastructure with addition of several precision equipments for the medical devices program. The Class100 GMP facility has become functional and has facilitated pilot manufacturing and scale up of Fibrin Sealant for medical application.

SreeChitraTirunal Institute for Medical Sciences & Technology, Trivandrum, along with HLL Lifecare Limited, won the National Innovation Award of the Ministry of Chemicals and Fertilizers, New Delhi, for developing and commercializing the intrauterine hormone releasing contraceptive device EMILY. The annual sales crossed Rupees 100 lakhs during the year. The Institute also started receiving the royalty for the product during the year.

Emily-intra uterine system andbio-ceramic products developed in the Biomedical Technology Wing were selected by ICMR as two of the 43 innovative products of the year and the products were selected for display at an innovation exhibition held at the Rashtrapathi Bhavan, New Delhi, as part of the Festival of Innovations during March 7-13, 2015.

A novel dental caries dissolving agent developed by SCTIMST and technology transferred to industry was successfully commercialised by Dr. Toms Laboratories, Calicut, during the year under the brand name `Dsolv'. The indigenous product is being sold at 1/3rd the price of the imported brand without compromising on quality and efficacy. The technology of 'fluoro-passivated and hydrogel sealed large diameter vascular graft' is currently being transferred to M/s. TTK Healthcare Ltd.

The product 'BioGraft HABG Active' for orthopedic application, manufactured by IFGL bio-ceramics based on technology transferred by the Institute, has been under consideration for manufacturing license approval by the Drug Controller General of India (DCGI). The company received DCGI clearance for the multi center trial for their product Biograft HABG.

Hospital patient care facility continues to be stretched for want of space and infrastructure facility with continuing increase in patient attendance both for outpatient and inpatient treatment. Commissioning of the 3 Tesla Magnetic Resonance Imaging facility is expected to be a major advancement in diagnostic and research capability, especially in the field of neurosciences. The installation of the Optical Coherence Tomography system for invasive coronary imaging has added precision and safety to the coronary interventional procedures. The Institute continues to maintain leadership role in therapeutic interventions for complex medical ailments including epilepsy surgery, deep brain stimulation implant, aortic root replacement surgery, endovascular repair of aortic aneurysms, infant neonate cardiac surgery, neonatal cardiac interventions, radiofrequency ablation for complex heart rhythm disorders and interventional treatment for intracranial artero venous malformations and vascular aneurysms.

The first batch of students was admitted to the MD Transfusion Medicine program in academic session 2015. Part time PhD in Public Health has been popular and 2 scholars enrolled for part time PhD in 2015.

The Institute's continued growth and its relevance to the people will largely depend on the quality of state-of-the-art, evidence-based health care facilities that we provide and the development and commercialization of affordable medical devices and products that reach the people. We have to strive hard, with resolve and renewed vigor, to meet the people's expectation. The uncompromising work culture of the institute staff is its strength and I implore all of you to continue to nurture and uphold these values as a service to our nation.

Dr. Jagan Mohan A. Tharakan

Highlights of the Year

- A detailed proposal to establish Technical Research Centre (TRC) for Biomedical Devices at SCTIMST was formulated and submitted for approval. The setting up of a Technology Business Incubator (TBI) for medical devices and biomaterials was initiated by formation of a not-for-profit society by name SCTIMST-TIMed.
- The hormone releasing intrauterine device "Emily" which was developed jointly with industry partner HLL Lifecare Ltd and launched in the market in 2013, received good market acceptance and sales during the year.
- Central Drugs Standard Control Organization, CDSCO, Govt. of India, approved issuance of License for BioGraft HA New Ortho to the industry which has taken the know-how for this Hydroxyapatite-based bone graft material developed by the Institute.
- Dr. Roy Joseph & Mr. C.V. Muraleedharan won the 4th National Award for Technology Innovation in Petrochemical & Downstream Plastics Processing Industry under the category of 'Polymers in Public Health Care' for their work on developing "Fluoropolymer Coated and Hydrogel Sealed Vascular Graft Implant".
- The bone tissue engineering project aimed at seeding of mesenchymal stem cells on bioactive ceramic scaffold received approval from ICMR, facilitating the initiation of human clinical trials at CMC, Vellore.
- Other projects which made progress in preclinical evaluation stage include fluoropolymer coated and hydrogel sealed large diameter vascular graft, cartilage tissue engineering, hemostatic scaffold using biodegradable polymer and biomimetic extracellular matrix components for healing of chronic dermal wounds.
- Industry-supported projects like fluoropassivated and hydrogel-sealed vascular graft, development of paediatric and neonatal membrane oxygenators and arterial filters made progress.
- The product development projects like cardiovascular stent, paediatric and Nenonatal membrane oxygenators and arterial filters, valve conduit with decellularised bovine pericardium, dispensable and biodegradable polymeric bone cement, mandibular advancement device, novel scaffold materials for tissue engineering of different tissue types, scaling up of fibrin glue, urinary tract infection test kit, In vitro pyrogen test kit etc are under various stage of development.
- The ISO 17025 accreditation from NABL for the calibration services was extended for two years and testing services from COFRAC, France, continued with successful COFRAC surveillance audit.
- Biomaterials research continued on calcium sulphate bone cement, iron oxide nanoparticle probes for organ specific molecular MR imaging, quantum dot conjugated single walled carbon nanotubes for imaging and therapy, gene/drug co-delivery for anticancer therapy, hemostatic scaffold using biodegradable polymer and biomimetic extracellular matrix components for healing of chronic dermal wounds, bioengineered hybrid skin substitutes for burn wounds , smart dental composites consisting of calcium containing resins and fillers, cost-effective non enzymatic methods in an easy to read out format for the detection of glucose in fluids such as blood, urine and tear, transforming growth factor, in vitro slice model for epilepsy, injectable hydrogel for cardiac tissue engineering, dural substitutes for cranial neurosurgery, cell sheet engineering, skin tissue engineering and in vitro alternative test system development for ocular irritation.

Her Excellency Sheila Dixit, Governor of Kerala, at the Annual Convocation 2014

Prof C N R Rao delivered the 2nd G Parthasarathi Oration on 11th November 2014

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Prize distribution in connection with National Science Day

Public Education Program (Aug 29, 2014)

Inaugural Address by Shri. Justice (Retd) P. Sathasivam, Hon'ble Governor of Kerala,
(Seated from left to right) Dr. K. Parameswaran, Dr. Muralidharan Nair, Dr. M. Sambasivan, Dr. D. Mohanlal, Dr. K. Rajasekharan Nair, Dr. Abraham Kuruvilla

Inaugural Address by Shri. V. S. Sivakumar, Minister for Health, Family Welfare and Devaswom, Government of Kerala
(Seated from left to right) Dr. Abraham Kuruvilla, Organising Secretary, Dr. N. Suresh Nair, Dean, Academic Affairs, Dr. Muralidharan Nair, Organising Chairman, Dr. Jagarmmohan A. Tharakan, Director, Brig. Samir Salunke, Station Commander, Trivandrum, Dr. C. Sarada, Medical Superintendent, Shri. O.S. Neelakantan Nair, Head, BMT Wing

Dr Sudhmaniamma S, Nursing Officer, receiving National Florence Nightingale Award 2014

National Conference on Comprehensive Nursing Management in Stroke-one step ahead

CME- on Basic concepts in Interventional Cardiology

Honourable Director, Dr Jagan Mohan Tharakan, inaugurating the awareness program conducted in the institute by the Comprehensive Care Center for Movement Disorders, in connection with the "World Parkinson's Day", 2014.

As a part of the "Festival of Innovation" organised by National Innovation Foundation during 7-13 March 2015, Indian Council for Medical Research (ICMR) organised a "Medical Science and Bio-Technology Innovations Exhibition" at Rashtrapati Bhavan, New Delhi. The Bioceramic products were displayed in this exhibition.

Indo-Danish Symposium on Musculoskeletal stem cells in tissue regeneration, 8-10 Feb 2015

Symposium speakers and participants at the Asian Sleep Research Society Congress, ASRS2014 at Kovalam, Kerala

Participants @ the workshop for Researchers "Tune & prune your research"

Dr Jaganmohan Tharakan, director SCTIMST inaugurated the World Health Day Seminar on Vector borne disease organized by the Public Health Students Forum of the AMCHSS. Dr K R Thankappan, Dr V Raman Kutty, Prof Jacob John, Dr AS Pradeepkumar, and PHS student representatives seen.

Awareness campaign on anti tobacco activities for workers of other states inaugurated by honorable Mayor of Thiruvananathapuram City Adv. K Chandrika on May 25, 2014.

Tobacco Control activities in Central Prison Trivandrum was inaugurated by Shri Suresh Gopi Film Star on May 28, 2015.

HOSPITAL WING

FROM THE MEDICAL SUPERINTENDENT

SCTIMST is a unique institution under the Department of Science and Technology that strives to blend Biomedical Technology, Medical Sciences with Public Health. The hospital functions as a tertiary reference centre for cardiac- and neurology–related diseases with support from Anesthesia and Radiology. We have been pioneers in many ways as we have enjoyed immense credibility due to diligent medical care in the most affordable way.

The efforts of the Medical Superintendent's office is to make the hospital run smoothly, reducing difficulties for patients accessing its services, the medical professionals and allied staff who deliver the services for the patients. Our challenge is to tackle an ever-increasing patient load, which often inundates our Out- patient and In-patient interfaces.

The Online payment gateway that was developed has made payments by patients for our services easier. It also eases the pressure on the Cash Counters. The advent of mobile applications for banking and credit card services in our country has made such services a must for our institution, reducing queues in front of counters and the burden on our staff manning such counters.

We are very happy to re-introduce the "Crèche" service for our staff. There is generational change happening in our institute and I find many young faces on our rolls. There are many parents amongst our staff who would be happy to work if their wards are taken care of well inside the campus. It relieves the need for arranging domestic care-givers and also avoids travel to such care-centers for the young parents who work at the institute.

We are on the cusp of a technology introduction – the 3T Magnetic Resonance Imaging machine. The necessary civil works are proceeding fast and the commissioning is to happen soon. As the first of its kind in the public sector in this part of the country, we are proud that we can extend its services to the poorest of the poor in our part of the world. Also, it is expected to reduce the burden on the current machine.

As you all know, our institute is in the process of a change, not just at the leadership level but also at other levels. One look at our office or any ward or lab would affirm this – lots of new faces. It is on these shoulders that the SCTIMST of the future rests! We continue to serve the poorest of the poor in a manner that they believe that government-run hospitals have not failed in delivering quality care combined with compassion.

Let us join hands to build the Chitra of the future!!

Medical Superintendent.

HOSPITAL ADMINISTRATION

Dr. SANKARKUMAR. R
MS, MCh
Medical Superintendent (Till 31.12.2014)

Dr. SARADA C
MD, DM
Medical Superintendent (from 01.01.2015)

Dr. S. K. JAWAHAR
MHA, DipNB (Health Admin), LLB
Deputy Medical Superintendent

Overview

The hospital provided service to patients in the specialties of Cardiology, Cardiac Surgery, Neurology, Neuro Surgery and Interventional Radiology. The details of the hospital Statistics indicate that there was a huge influx of patients for availing the services of the hospital. The increasing number of patients, inability of the hospital to improve infrastructure and provision of additional manpower, increasing awareness of patients and complexity of procedures and specialties posed a formidable challenge for the smooth functioning of the services. Bed occupancy reached an all time high rate of 94%.

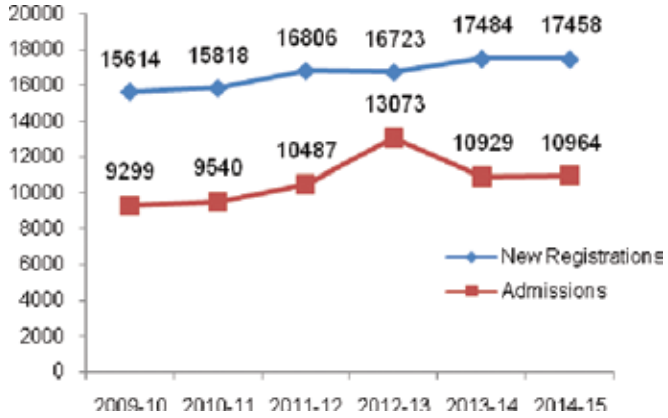
Routine Activities

During the year, various services in Cardiology, Neurology, Cardiac Surgery, Neuro Surgery and Imaging Sciences & Interventional Radiology registered 17458 new patients (Chart 1). A total of 10964 patients were admitted for treatment including surgical and interventional procedures (Chart 1). The number of admissions had increased during the year compared to the previous year.

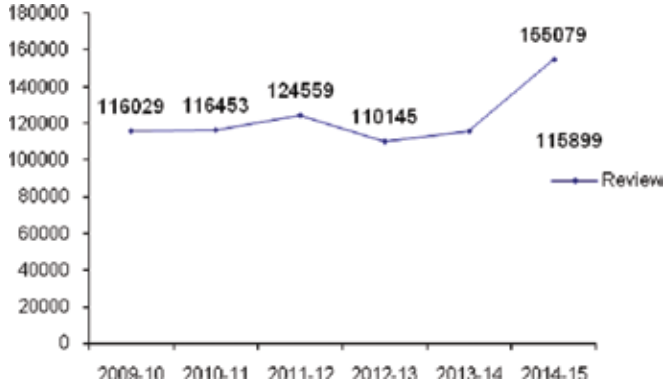
OPD services registered 155079 patients for review in various Departments, including specialty clinics (Chart 2).

4.32 % of the In patients were provided free treatment and 62.49% of the In patients were offered subsidized treatment based on their socio-economic background (Chart 3) The facilities available were optimally utilized for patient care, which is evident from the data related to bed turnover ie, 43 (same as previous year) (Chart 4) and the average length of stay remained the same for the last 4 years ie, 7 (Chart 5). The bed occupancy rate increased from 92.29% to 94.01%(Chart 6).

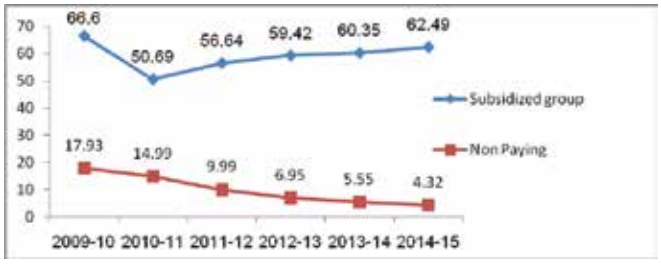
New Registrations & Admissions(Chart 1)



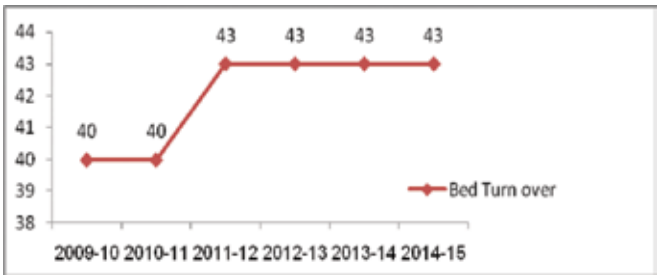
Follow up (Chart 2)



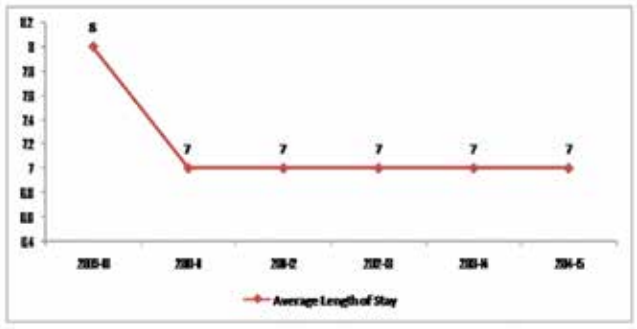
Free & Subsidized Treatment (Chart 3)



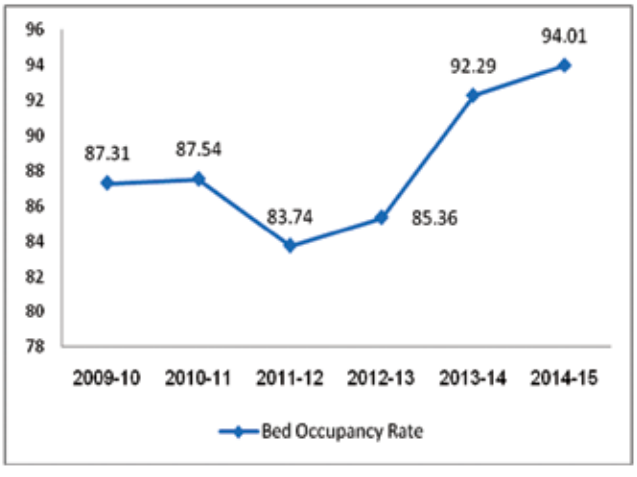
Bed Turn Over (Chart 4)



Average Length of Stay (Chart 5)



Bed Occupancy Rate (Chart 6)



1) New Initiatives

Facilitation of patient care financing

- The hospital facilitated financing of patients through various health schemes of the Government of Kerala, like Karunya Benevolent Fund, RSBY -CHIS Plus, Thalolam scheme for children and Rashtriya Bal Swasthya Karyakram (RBSK).
- Organ Donation
- The hospital contributed to the organ donation programme of the Government of Kerala operated through Kerala Network for Organ Sharing (KNOS). Donation of organs to various hospitals in the state was also facilitated (N=4).

Human Resource development

- Induction training and in-service training for various categories of staff were organized. The topics included Hospital services, Nursing services, Supporting services, Personnel & Conduct rules, Security, Housekeeping, Hospital Infection Control, and Bio Medical Waste Management.

Staff Welfare Programmes

- The crèche for the children of employees of the hospital was started on 9th April 2015
- A building to accommodate the hospital canteen & health club is under construction.

Infection Control Programme

- The infection Control unit regularly carried out surveillance activities in the hospital and facilitated the Infection Control activities. Hand hygiene day was observed on 5th May 2014 with video demonstration to promote hand hygiene and hospital visits for creating awareness of staff about hand hygiene.

2) Research programs and collaborative programs.- Details under Research Projects

3) Major equipment purchased during 2014-15 (above Rs 10.00 Lakhs)

- State-of-the art 3 Tesla MRI was installed in the Imageology complex and facility was modified to suit the requirements of clinical services, academic and research activities.

4) Workshops, Conferences and other major events organized by the department/staff.

Hand Hygiene Day was observed on 5th May 2014

The Institute observed the Swatch Bharat Initiative of the Government of India by a holding a function on the hospital lawns on 2nd October 2015. All senior officials, including the Director, Medical Superintendent and about 200 staff members were present. On the occasion, the staff affirmed their commitment to a "Clean India" and Clean Campus through a pledge. Subsequently. the staff got involved in cleaning the campus.

- Information Education Communication (IEC) activities
- Dr. S.K. Jawahar participated in a programme on the Hospital Service of SCTIMST.

Dr. S.K. Jawahar had the following additional assignments during the year.

Teaching Faculty- M tech students

- The M tech students were given a module on Hospital Administration and they were oriented to the Hospital Services.
- Guest Faculty of Kerala State Institute of Health & Family Welfare, Government of Kerala for Administrative and Management training to the Medical Officers of Kerala Health services.
- Faculty for MPH programme conducted by SCTIMST.
- Visiting faculty to the MHA Programme(CDC), University of Kerala.
- Guide to the MHA students from University of Kerala.

Tele-Education

1. To transmit CME Programmes organized at Medical Colleges, Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST) and Regional Cancer Centre (RCC) to doctors present in various hospitals of the state
2. To generate CME programmes in Medical Colleges tailored to the needs of doctors in secondary and primary referral centers and transmit the same to the doctors present in the district hospitals of the state.
3. To connect Medical Colleges in the state through communication networks in order to provide a facility for

virtual classroom teaching.

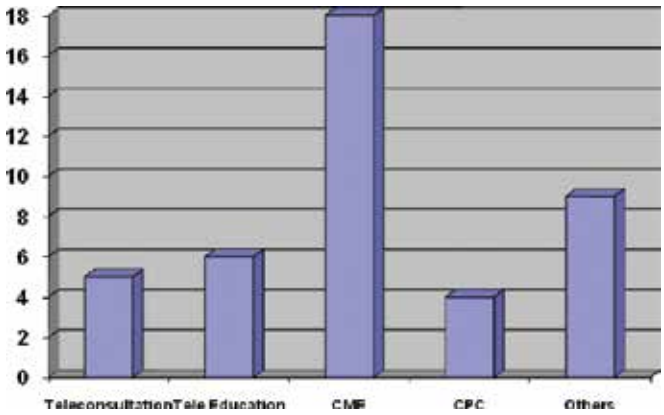
4. To provide a connecting link to the National Institutes and International Institutes for scientific interaction of doctors.

Tele-Consultation

1. To provide expert advice available in the Medical Colleges, SCTIMST and RCC to patients attending district hospitals through communication networks.

2 To provide a forum for scientific interaction between the doctors at District hospitals and the doctors of Medical Colleges, SCTIMST, RCC and other National and International Centres.

Usage Statistics



Programme	Centres connected	Department	Total No.	Mode of connectivity
Tele CME	AIIMS New Delhi, JIPMER Pondicherry, CIPS Hyderabad, ISRO Ahmedabad etc	Neurology, Cardiology, Microbiology, IS & IR	18	VSAT, NKN
Tele Consultation	GH Pathanamthitta,			
TH Koyilandy	Neurology, Cardiology,	5	KSWAN	
Tele Education	Research Institute Hyderabad, Germany,			
IIT Chennai, IIT Mumbai	Neurology, IS & IR, AMCHSS	6	NKN	
CPC	PGI Chandigarh	Cardiology, Neurology, IS & IR, Pathology	4	NKN
DC Meeting	IIT Chennai	Cardiology, Neurology, IS & IR	5	NKN
Tele Examination	IIT Chennai	Neurology, IS & IR, Microbiology, Neurosurgery	2	NKN
PhD discussion	IIT Hyderabad, IIT Chennai	IS & IR	2	NKN

National Knowledge Network

The Institute is connected to the National Knowledge Network and had participated in 18 CMEs, 6 Tele Education sessions, 4 CPCs, 5 DC Meetings, 2 Oral examinations and 2 PhD programme discussions, which were organized by AIIMS, New Delhi, PGI Chandigarh and JIPMER Pondicherry.

MEDICAL RECORDS DEPARTMENT

OVERVIEW

The Medical Records Department, which has existed from the inception of the Institute, continued to play a vital role in providing tertiary health care, assisting academic and research activities and sharing responsibility in the efficient management of hospital services.

Thampi .N.G, Senior Medical Records Officer, continued to serve as Assistant Public Information Officer (Patient Information) under the ambit of RTIA.

ROUTINE ACTIVITIES

- Documentation and updation of socio-economic and personal data of patients.
- Processing Registration and admission procedures.
- Maintenance of staggered appointment system.
- Analysis, deficiency check, ICD- Coding and indexing of diseases, procedures and preservation of records.
- Providing study material, health care statistics for academic and research activities.
- Generation and circulation of hospital statistics to administrators and clinical Heads periodically.
- Patient care-centered correspondence.
- Processing and issue of various certificates to patients for availing financial assistance and for personal/ official purpose.
- Online reporting of overseas patients to FRRO, Thiruvananthapuram.
- Death reporting to Corporation of Thiruvananthapuram.
- Supply of patient care-related forms for hospital usage.
- Conducting academic program in Medical Records Sciences.

STATISTICS

New patients registered	:	1745
Patients admitted	:	1096
Medical records supplied for review purpose	:	155079
Medical records supplied for study purpose	:	7440
Number of certificates issued	:	7475

NEW INITIATIVES

Establishment of Electronic Medical Records system in clinical departments.

Nursing Service Division

Overview

Nursing service division is committed to providing high quality patient care and ensuring patient safety. Its important mission is to bring innovation through evidence-based practice, to strive hard to display the art of caring with efficiency, devotion, compassion and empathy. Continuous updating of knowledge and skills of all nurses and ancillary staff is effectively carried out through a comprehensive staff development program. The division offers mentoring for 200 observers every year from nearly thirty institutions all over India.

Routine activities

Providing high standards of holistic care to patients to meet identified realistic goals and care needs.

Mentor and evaluate the performance of students and observers.

Carry out patient and family education for effective home care management.

Conduct structured short term training programmers for staff development

New initiatives

- Preparation of Standard Operating Protocols for cleaning, fumigation, waste disposal and patient care delivery.
- Re-editing & publishing of nursing manual.

Major Events: International Nurses Week celebrations: a series of academic programs were organized, including Academic quiz competitions, scientific paper presentations, theme-based symposium and panel discussion.

Awards: Dr Sudhmaniamma S, Nursing Officer, received National Florence Nightingale Award 2014 from the Honorable President of India, Sri Pranab Mukherjee

List of Supervisory Staff attached to MS Office

Department	Name	Designation	Qualification
Hospital Admn.	Dr. Sankarkumar. R (up to 31.12.2014)	Medical Superintendent	MBBS, MS, MCh(CVTS), FAMS, FIMSA
	Dr Sarada C (from 01.01.2015)		MBBS, MD, DM
	Dr. S.K. Jawahar	Deputy Medical Superintendent	MBBS, Dip NB, LLB, MHA
Nursing Services	Dr. Sudhamani Amma	Nursing Officer	MSc Nursing, PGDHRM, PhD
	Ms. Remadevi. S	Deputy Nursing Superintendent	BSc. Nursing and Nursing Admn.
	Ms. Valsala Kumari. C	Sr..Nursing Supervisor	BSc. Nursing and Nursing Admn.
	Ms Saraswathy Amma C	Sr..Nursing Supervisor	Post basic Bsc Nursing, Nursing Administration and MHRM
CSSD	Ms. Sujamani R Nair	Chief Ward Sister	Diploma in General Nursing, BSc. Nursing(IGNOU) Diploma Nursing Administration, PGDHM
Infection Control Unit & Bio medical Waste Mgt	Ms.Anasooya	Infection Control Nurse	MSc Nursing
Medical Record Department	N.G.Thampi	Senior Medical Record Officer	B.M.R.Sc,M.A,M.B.A
Construction Wing	Col. Vijayan Pillai	Construction Engineer	
	Mr. Gopinathakurup.G	Asst. Exec. Engineer	Diploma in Civil Engineering

Security & Safety	Mr Prasanna Kumar K	Security & Safety Officer-B	Diploma in Electrical Engineering, B.Com, B E (Electrical)
	Mr Hemanth Kumar R P	Asst. Security & Safety Officer-B	M Com, MBA
Dietary	Ms. Leena Thomas	Senior Dietician	BSc Nutrition, PG Diploma in Nutrition & dietetics
	Ms. Jyothi Lekshmy. S	Asst. Dietician	MSc. Nutrition
Laundry	Mr. Umesh Sankar. S	Laundry Supervisor	Diploma in Textile Technology and B.Com
MSW	Dr. Jayachandran. D	Scientific officer	MA Sociology, MA Psychology and PhD
	Ms. Rosamma Manuel	Junior Scientific Officer	MSW, LLB
Pharmacy	Ms. Rosily Joseph	Pharmacist (Gr.I)	BSC, D pharm
Transport	Mr. Saji. M.S	Transport I/C	S.S.L.C

DEPARTMENT OF ANESTHESIOLOGY

The Department of Anesthesia has two broad divisions- Neuroanesthesia and Cardiothoracic and Vascular Anesthesia that provide various services to the speciality needs.

Mission

1. To improve the health care of neurologically ill.
2. To improve the perioperative care of neurosurgical patients.
3. To contribute to growth of Neuroanesthesia by excellent teaching, training and research

The Division strove to fulfil the mission through an effort

1. To reduce costs in healthcare of neurologically ill by 2016, and
2. To achieve the highest standards in post-graduate education and training by 2016.

Division of Neuroanesthesia

Activities of the Division

Operation Theater:

The staff of the Neuroanesthesia division is primarily involved in the perioperative care of patients undergoing neurosurgical procedures. Complex intracranial aneurysms clipping, resections of AV malformations, removal of skull base tumors, extra-cranial to intracranial bypass procedures, pediatric patients with large tumors, complex spine instrumentation were managed efficiently with state- of-the-art anesthesia equipment and monitoring systems that aid in perioperative care of these patients. Two echo machines procured for the Neuroanesthesia division helped in detection of venous air embolism, hemodynamic instability, management of cardiac patients with neurosurgical patients and procedures in sitting posture. Transcranial Doppler was also routinely used in monitoring the cerebral blood flow and its pathologoical conditions Newer airway gadgets were procured for management of difficult airway.

Radiological Suite:

In addition to services in the operation theaters, anesthesia services were provided to patients in radiological suite for diagnosis and therapeutic procedures like stenting, coiling of aneurysms, AVM embolization, carotid cavernous fistula embolizations, and WADA test. Anesthesia services were provided for laser ablation of tumors in CT room, various diagnostic procedures in CT and MRI. In addition, the Division was actively involved in pulmonary function analysis of respiratory compromised patients presenting for neurosurgery as well as neurologically ill with respiratory disease.

Intensive care:

Neuroanesthesia division was actively involved in the post-operative and intensive care management of critically ill neurological patients. In the ICU, we were involved in ventilator care, performing invasive procedures like arterial lines, central venous catheterization, lumbar drainage, percutaneous tracheostomy. Transthoracic echo was done to monitor the hemodynamically unstable patients admitted in neurosurgical ICU. Transcranial Doppler, EEG monitoring, also formed an integral part of ICU management. Neuroanesthesia division provided respiratory, hemodynamic, fluid and electrolyte, arterial blood gas analysis, pain and sedation management and interdisciplinary consultations in the ICU.

Anesthetic and Intensive care of Stroke Patients

Neuroanaesthetists were part of the stroke team in the recently started acute stroke care unit. We were actively involved in the acute phase as well as sub-acute phase of stroke. We were involved during the initial assessment and stabilization in the intensive care unit, during MRI and intra-arterial thrombolysis, a specialized procedure done in radiological suite where we monitored and provided sedation and pain relief. We were also involved in ventilatory care, hemodynamic management and sedation of critically ill stroke patients. In addition, we provided anesthesia and perioperative management of patients taken for decompressive craniectomy. Our team was actively involved in neurovascular meetings on the management of patients with cerebrovascular disease.

Academic Activities

The department has well-structured academic programs with active participation of residents and faculty. Inter-departmental academic activities included faculty from other departments taking lectures and academic discussion with our residents. Our department faculties were also involved in teaching and training of other department residents, nursing staff, and technicians. Various hands on training was conducted to improve the clinical skills of residents.

Dr Vinoth and Dr Josemine Davis successfully completed the DM (Neuroanesthesiology) exams and Dr Amandeep Singh, Dr Surabhi, Dr Sourabh completed PDCC course in Neuroanesthesia in December 2014.

New initiatives during the year 2014-15

Difficult Intubation training

Neuroansthesia division acquired flexible fiberoptic laryngoscope, C-MAC video laryngoscope to facilitate endotracheal intubation in patients with anticipated and unanticipated difficult intubations. Training was given to residents in the use of these equipments in clinical practice and scientific research.

Intraoperative Evoked Potential Monitoring

Intraoperative Evoked potential monitoring is a highly specialized procedure, which helps in the monitoring functions of the brain intraoperatively. Its use brings improved care and shortens ICU and hospital stay. Very few centers in India only have facility for monitoring evoked potentials. Monitoring requires modification in the technique of anesthesia and the procedure is carried out without use of muscle relaxant. Patients who are at risk of neurological damage like aneurysms, CP angle tumors, posterior fossa tumors, spine surgeries are increasingly managed with evoked potential monitoring at our institute. Increasing number of patients undergo monitoring helping in improved neurological outcome and shortened hospital stay.

Day Care services for MRI Procedures

Many neurologically ill patients' especially children and elderly undergo Magnetic Resonant Imaging (MRI) of the brain and spinal cord to aid in diagnosis and management. They require anesthesia for maintaining immobility. Till recently patients requiring anesthesia were admitted to the hospital and the procedure was carried out on an inpatient basis. A new program of Day Care for MRI procedures was started an year ago. All the patients were assessed for fitness in the special MRI OPD clinic, conducted every day from 3-4 pm. These patients came to the MRI suite on the day of the procedure, underwent MRI under sedation and were discharged from recovery room. The statistics of day care MRI showed a steady increase in the number of patients undergoing MRI. 90% of patients in this group were administered day care anesthesia.

OPD Pre-anesthesia Checkup

Assessment of fitness of patients before surgery and optimizing the pre-operative conditions is a major challenge. The Division was actively involved in the OPD care of these patients and optimizing their medical illness before surgery.

Pain Services

The Division was actively involved in the management of acute pain services including postoperative pain. We have facility for patient-controlled analgesia. With the recognition of increasing incidence of chronic pain syndromes in the population, Pain Clinic, inaugurated to address the plight of these patients, is managed by a team of experts from Anesthesia, Neurology, Neurosurgery, Neuroradiology and Occupational Physiotherapist.

RESEARCH ACTIVITIES IN NEUROANESTHESIA DIVISION

1. Outcomes of tracheostomy in neuromedical intensive care unit
2. Risk factors and outcome of aspiration pneumonia in neuro icus
3. Peri operativecardiac outcomes in patients undergoing neurosurgery
4. Comparison of diastolic function between mannitol and hypertonic saline
5. Effect of levobupivacaine scalp block in patients undergoing neurosurgery
6. Effects of stroke volume variation on mannitol dose response
7. Effects of propofol in brain tumor patients
8. Effects of dexmedetomidine in brain av malformations
9. Comparison of dexmedetomidine vs propofol/fentanyl for awake fiberoptic intubations

Procedures done	TOTAL NUMBER
ANESTHESIA IN NEURO SURGERY	1371
ANESTHESIA FOR INTERVENTIONAL NEURORADILOGY	185
ANESTHESIA FOR MRI	242
ANESTHESIA OUTSIDE OT PROCEDURES	400
PERCUTANEOUS TRACHEOSTOMIES	40
NEUROSURGICAL ICU VENTILATORY CARE	260
STROKE ICU CARE	50
NEUROMEDICAL ICU VENTILATYORY CARE	126

CARDIAC ANESTHESIOLOGY

Area of focus Cardiovascular-Thoracic-Vascular Anesthesia and Intensive Care.

ROUTINE ACTIVITIES

Anesthesia and peri-procedural care were provided for the following:

1. Adult patients undergoing surgery in adult cardiac surgical operation theatre (open heart surgeries, closed heart & thoracic operations and vascular operations): 1276 cases
2. Pediatric patients undergoing surgery in pediatric cardiac surgical operation theatre (open heart cases and closed heart cases): 638 cases
3. Procedures in cardiac catheterization laboratory under general anesthesia: 475
4. Procedures in Electrophysiology laboratory under general anesthesia: 35
5. Cardiac Magnetic Resonance Imaging under general anesthesia: 38
6. Cardiac CT/Aortogram/pulmonary angiogram in CT suite under General anesthesia/sedation & monitored anesthesia: 56
7. Anesthesia in Digital Subtraction Angiography laboratory (Mostly for Endovascular stenting of aortic aneurysm aneurysm) : 14
8. Short procedures done under anesthesia in Cardiac Medical ICU, & Pediatric Surgical ICU: 67
9. Percutaneous tracheostomy: 10 numbers

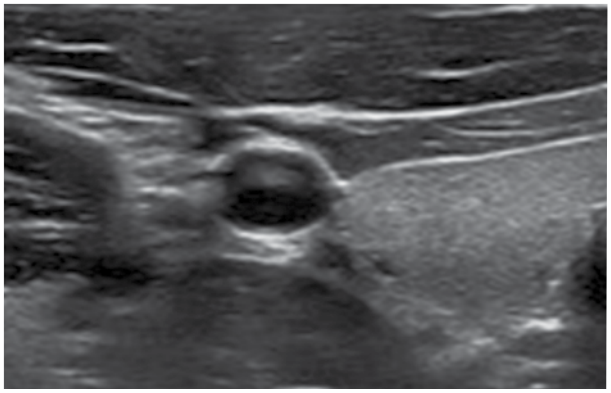
NEW INITIATIVES DURING THE YEAR

1) Weekly discussion in collaboration with Pediatric Cardiac Surgeons of all Pediatric Cardiac Surgical Cases done in the preceeding week.

2) Provision of Anaesthesiologist round the clock in adult and pediatric cardiac surgical intensive care units.

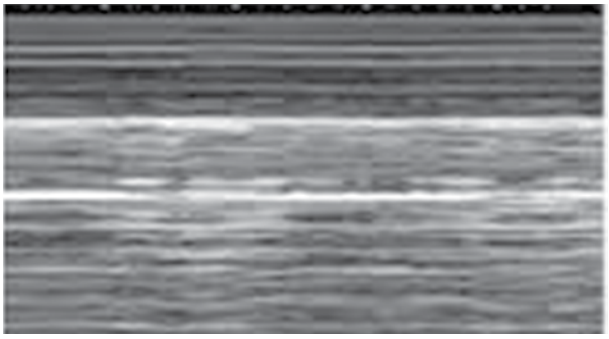
3) Neonatal and infant Transesophageal echocardiography during infant cardiac surgery became a reality after acquiring a neonatal transesophageal echocardiography probe.

4) Provision of ultrasound guided stellate ganglion block as a therapeutic modality for limb ischemia and for recurrent ventricular tachycardia following coronary artery bypass surgery.



Ultrasound image to guide performance of Stellate ganglion block

5) We started using lung ultrasound in the cardiac surgical intensive care unit to look for features of cardiac failure, pleural effusion, pneumothorax, and consolidation.



Ultrasound image of pneumothorax

TRAINEES

Students undergoing DM in Cardiac Anesthesia at Jayadeva Institute, Bangalore came for training for a period of one month.

ACADEMIC STAFF

Dr. R.C.Rathod, MD
Professor Senior Grade & Head of Department

Dr. (Mrs.) Rupa Shreedhar, MD, Dip.NB
Professor

Dr. Thomas Koshy, MD
Professor

Dr. Shrinivas V. Gadhinglajkar, MD
Professor

Dr. Prasant Kumar Dash, MD
Professor

Dr. S.Manikandan, MD
Additional Professor

Dr. P.R.Suneel, MD
Additional Professor

Dr. K.P.Unnikrishnan, MD
Additional Professor

Dr.Satyajeet Misra, M.D
Associate Professor

Dr. Smita P, MD, DM
Assistant professor

Dr.Subin Sukesan MD, DM
Assistant Professor

Dr.Arulvelan A, MD, DM
Ad hoc Assistant Professor

Mr. Binu Thomas
Scientific Assistant

Residents of DM course in Neuroanesthesia:

Dr. Madhusoodhanan Rao (3rd Year)

Dr. Ajay Prasad Hrishi (3rd Year)

Dr. Nilima Rachael Muthachen (2nd Year)

Dr.Soumya M (2nd Year)

Dr Bimal Kumar Sahoo (1st Year)

Dr Karen Ruby Lionel (1st year)

Dr Gautham NS (1st Year)

Post Doctoral Certificate Candidates (Neuroanesthesia)

2014 Batch

Dr Surabhi Chipde Sudhir

Dr Amandeep Singh

Dr Sourabh Bhangde

2015 Batch

Dr. Shyamala N

Residents of Post-doctoral Certificate Course (PDCC) in Cardiothoracic and Vascular Anesthesia

PDCC residents of 2014 batch

Dr. Lovhale Pravin Shriram

Dr. Rajesh M.G. (PDCC resident)

PDCC residents of 2015 batch:

Dr.T. Kappian

Dr. Indranil Biswas

Residents of DM course in Cardiothoracic and Vascular Anesthesia

Dr. Reshmi Liza Jose
(third year DM- completed on 31/12/2014)

Dr. Sujatha M (third year DM)

Dr. Roshith Chandran(third year DM)

Dr. Jagadeesh (third year DM)

Dr. Uvaraj.R(third year DM)

Dr. Suddhadeb Roy (third year DM)

Dr. Saravana Babu (third year DM)

Dr. Deepak Mathew Gregory (third year DM)

Dr. Keerthi Chigurupati (third year DM)

Dr. Neelam Aggarwal (third year DM)

Dr. Asha (First year DM)

Dr. Kirubanand (First year DM)

Dr. Manjusha Pillai (First year DM)

DEPARTMENT OF BIOCHEMISTRY

Overview

The Department of Biochemistry comprises research laboratories and the central clinical laboratory of the institute. The research wing pursued the molecular basis of disease processes affecting the vascular system, leading to neurological and cardiovascular disorders. Three main areas were under investigation:

a) identifying macromolecules involved in carbohydrate-dependent biological recognition events including immune complex formation and elucidating the basis of their vascular inflammatory potential , b) study of dysfunctional and structurally modified plasma lipoproteins and their contribution to atherosclerosis, c) the role of mitochondrial dysfunction in precipitating metabolic syndrome leading eventually to cardiovascular disorders.

The central clinical laboratory undertook the laboratory diagnostics of the institute in the areas of biochemistry, hematology and clinical pathology

Routine activities

A. clinical diagnostic service

Fully automated state-of-the-art equipments used in this service include Dade-Behring/ Siemens RXL, Olympus AU 400 Clinical Chemistry analyzers, Beckman 5 part and IRIS I-COUNT differential hematology analyzers, Roche U 411 urine analyzer and Amax (Germany) coagulation analyzer. The Central Clinical Laboratory performed a total of 8, 21,035 tests during the year, which was marginally higher (4.4%) than that of the previous year. Item wise break-up of the investigations follows:

Biochemistry	3, 39,826
Hematology	2, 20,278
Coagulation parameters	93,042
Blood gas and electrolytes	22,774
Miscellaneous:	1, 45,115
Total	8, 21,035

B. Ph.D program

Three research laboratories supervised by three faculty members together trained a total of 10 Ph.D students at various stages of their Ph.D program. The Ph.D course included, besides laboratory work and their publications, regular mandatory seminars, mid-course comprehensive examinations, Ph.D thesis preparation and public defence-cum-viva voce.

New initiatives during the year

Srinivas G collaborated with the Division of Endocrinology, Diabetes, Metabolism & Nutrition, Mayo Clinic, Rochester, MN, USA

Research programs and collaborative programs

1. S. mutans immune complexes are ligands for autologous tissue galectin -1 lectin.

S. mutans, the most common cause of periodontal infections, are also implicated in atherosclerosis since their antigens are detected in 69% of atheromatous plaques studied. We demonstrated that plasma antibodies involved in immune complex (IC) formation with S. mutans antigens are the α and α glucan-specific antibodies and that these ICs are efficient ligands for autologous tissue lectin galectin-1 indicating that IC uptake by cell surface galectin-1 may be a possible cause for S. mutans- mediated immune inflammatory pathology.

2. Human placental cell surface glycans are ligands for circulating anti-Gal antibody.

Anti-Gal is a human specific antibody that recognizes the clinically important Lp(a) alone out of all circulating lipoproteins. By ELISA, we found that human placental cell surface glycoproteins are also efficient ligands for the antibody and that LDL, which inhibits anti-Gal recognition of Lp(a), is , an inhibitor of the above recognition. The finding indicated a possible route for Lp(a) entry into extravascular space since anti-Gal -Lp(a) IC formed in circulation retains one binding site of the antibody that can enable its attachment to cells through surface glycoprotein receptors .

3. A simple method to measure antibody affinity and to detect antigens

Following antigen binding, the most consequential change in an antibody is conformational shift in its Fc region. The latter is now measured using sophisticated equipments. A simple and quantitative alternative method was developed

in our laboratory. Antibody was fluorescently labeled mainly at its Fc region while protecting the binding site and dialysed before treatment with candidate antigens. The protocol enabled identification of antigens for several circulating antibodies and comparison of their affinities. A prominent example was study of relative affinities of Lp(a) molecules of differing size synthesized by different individuals for circulating anti-Gal antibody leading to formation of immune complex.

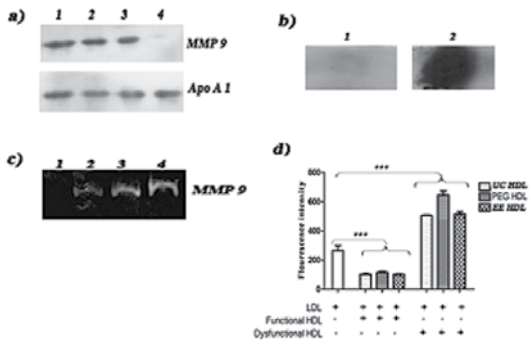
4. The two faces of high density lipoprotein: oxidized-HDL elicits pro-atherogenic response in human monocytes/ macrophages. [PhD thesis]

HDL, generally an antiatherogenic lipoprotein, may become pro-atherogenic mainly due to oxidative modification though the pathways remain poorly understood. Our study demonstrated that, following oxidative modification, HDL loses its atheroprotective functions and exerts proinflammatory response by releasing TNF-α and matrix metalloproteinases (MMP9 and MMP2), promoting oxidative stress and inducing cytotoxicity in human peripheral blood monocytes-macrophages. Unlike normal functional HDL, ox-HDL is able to induce NADPH oxidase/ ROS-mediated activation of MAPK signaling pathways that can be one mechanism for the enhanced formation of MMP9. MMP-9 over expression can destabilize extracellular matrix constituents and enhance plaque rupture.

5) Pro-atherogenic characteristics of dysfunctional HDL [INSPIRE fellow DST]

We demonstrated by in vitro assays that HDL molecules isolated from patients with established coronary artery disease are dysfunctional in terms of their antioxidant property of inhibiting LDL oxidation and are pro-inflammatory and pro-oxidant in monocytes/macrophages compared to HDL from healthy subjects. Further cellular studies demonstrated that dysfunctional HDL can induce intracellular lipid accumulation and formation of macrophage foam cells. Enhanced expression of macrophage scavenger receptor -CD36 associated with ERK ½ MAPK-dependent NFkB activation was found to be mainly involved in dysfunctional-HDL- induced foam cell formation. We also demonstrated, by gelatin zymography and by western blot of HDL probed with antibody specific to MMP-9, an exclusive association of matrixmetalloproteinase-9 with dysfunctional HDL and its pro-inflammatory property. This indicated a novel molecular connection that can enhance the risk of cardiovascular disease in subjects with dysfunctional HDL.

MMP 9 activity in HDL fractions isolated by three different methods and corresponding functionality of HDL. (a) Western blot of HDL fractions. Apo A1 was used as internal control. Lane 1, 2, 3 dysfunctional HDL fractions isolated by



UC(1), PEG(2) and EE(3)methods. Lane 4- functional HDL [UC]. (b) dot blot assay of EE HDL. Serum was subjected to PAGE in 3.75% gel. The band corresponding to HDL was excised, electroeluted and probed with MMP9 antibody. Lane 1&2- functional-and dysfunctional HDL respectively. (c) Gelatin zymogram of HDL isolated by different methods. Lane 1- functional HDL [UC], lane 2, 3, 4 dysfunctional HDL isolated by (2)UC, (3)PEG, (4)EE methods. (d) Antioxidant property of HDL. HDL isolated by three different methods. Values are the mean of 10 experiments ±SD, '***'$p < 0.0001$.

6. Thrombotic risk factors & platelet-P selectin expression in young CAD patients. [Collaborative research project with Dept. of Cardiology./CSIR fellow]

Since platelet activation plays a pivotal role in the process of thrombogenesis, the major objective of this case-control study was to assess the levels of platelet activation, atherogenic factors and thrombotic factors in~150 young patients (≤55 years) with angiographically proven CAD who were on treatment with statins and anti-platelet drugs and 100 asymptomatic controls. Platelet P-selectin expression measured using flow cytometry was significantly elevated in CAD patients along with conventional risk factors like diabetes mellitus, tobacco smoking, hypertension and low HDL-C compared to controls. Binary and multiple logistic regression analysis revealed that low anti-thrombin-III, high fibrinogen and high Lp(a) as important independent thrombotic risk factors in patients. Platelet P-selectin expression was higher in those who presented with acute coronary syndromes than those with effort angina, irrespective of the intake of anti-platelet drugs and statins. These findings suggest that these drugs might work with different mechanism in inhibiting platelet activation, independent of P-selectin expression.

7) Mitochondrial metabolism and function in type 2 diabetic heart

Increased risk of diabetics for developing heart failure

is attributed to dysregulated mitochondrial metabolism and increased mitochondrial free radical production due to pathologic accumulation of reactive oxygen species (ROS) and subsequent oxidative stress in heart tissue. Altered/low protein activity including those of enzymes involved in mitochondrial OXPHOS and metabolism may also contribute to cardiac dysfunction. An ongoing study focused on protein modifications induced by nitric oxide in myocardium, such as tyrosine nitration and cysteine S-nitrosylation and status of proteins like inducible nitric oxide synthase (iNOS) responsible for nitric oxide production. Formation of reactive nitrogen species, which are the main players in NO- mediated protein modifications, was found accelerated by the prevalent oxidative stress.

The above parameters were also analysed in type 2 diabetic human right atrial appendage tissue samples. Diabetic samples showed lower levels of DJ1 a cellular mediators of redox stress adaptation levels than non-diabetic samples. Low iNOS (inducible nitric oxide synthase) and high S-nitrosylation was also observed in diabetic cardiac tissues. The change in expression of OXPHOS complexes III, IV and V in diabetes gives a clue on the effect of diabetes in cardiac OXPHOS. Parallel studies on type 2 diabetes induced chemically in Swiss Albino mice has also begun.

8) Myocardial autophagic status in diabetic and non-diabetic conditions

Autophagy that involves protein degradation, organelle turnover and the breakdown of cytoplasmic components is important in heart for maintaining normal cellular function and the quality of proteins and organelles. Since little is known of pathophysiologic roles of autophagy in heart in diabetic conditions, the role of autophagy during different time points of diabetes was examined in a mouse model of diabetes on way to analyzing the status of autophagic process in human diabetic heart.

Levels of autophagic markers (LC3 II B, Bcl-2, LAMP-2) were studied in right atrial appendage tissue samples and blood collected from patients admitted in SCTIMST, undergoing coronary artery bypass graft surgery. A lower LC3 II/LC3 I ratio as well as lower levels of Bcl-2 than non-diabetic human samples indicated an altered autophagic course in diabetics .

Major equipment purchased during 2014-15 (above Rs 10.00 Lakhs)

Sl no.	Equipment	Approx. Cost
1	Automated amino acid analyser	Rs. 47 lakhs
2	Oroboros O2K Oxygraph (Order sent)	Rs. 18 lakhs

No. of faculty members with H index more than 10 = 3

Staff details with qualifications as on 31.03.2015

Sl no	Name	Designation
1	DR. APPUKUTTAN.P.S., Ph.D	PROFESSOR& HEAD
2	DR. JAYAKUMARI.N, Ph.D	PROFESSOR
3	DR. SRINIVAS.G, Ph.D	SCIENTIST E
4	THOMAS T.A, M.Sc. M.Phil.	SCIENTIFIC OFFICER (LAB)
5	JAYASREE K.K, M.Sc.	SCIENTIFIC OFFICER (LAB)
6	Dr. GEETHA.M, Ph.D	JR. SCIENTIFIC OFFICER (LAB)
7	RAJAMOHANAN.K	JR. TECHNICAL OFFICER (LAB)
8	SAJEEVAN SAGARAM	TECHNICAL ASST. (LAB)--A
9	VIJAYALEKSHMI.L	JR. TECHNICAL OFFICER (LAB)
10	RADHAKRISHNAN.B	JR. TECHNICAL OFFICER (LAB)
11	SREENIVAS.N.C., M.Sc.	JR.TECHNICAL OFFICER (LAB)
12	SUMITHA K.C, M.Sc.	TECHNICAL ASST. (LAB)--B
13	SANTHOSH KUMAR. R, M.Sc.	TECHNICAL ASST. (LAB)--A
14	SHEEJA. M, M.Sc.	TECHNICAL ASST. (LAB)--A
15	SREEDEVI .V.S	TECHNICAL ASST. (LAB)--A
16	DR. DEEPA. D, Ph.D	TECHNICAL ASST. (LAB)--A
17	SREEKALA BALAN. P	TECHNICAL ASST. (LAB)--A
18	MANJU G. NAIR	TECHNICAL ASST. (LAB)--A

2 temporary staff	

Ph D students
GENU GEORGE, M.Sc.
JESSY JOHN, M.Sc.
KARTHI S, M.Sc.
SINI S, M.Sc.
NANDINI RJ, M.Sc.
RAJI S.R, M.Sc.
ANAND C.R, M.Sc.
DHANYA KRISHNAN, M.Sc.PDF
DR.BINU.S,Ph.D

Open defence of the Ph.D thesis " Role of protein-carbohydrate recognition in formation of serum immune complexes: involvement of Lp(a) as glycoconjugate" of Ms. Geetha.M was conducted on 29th May.

Ms. Soumya Rani V.S, Ph.D student, had her public defence of Ph.D thesis entitled "The two faces of high density lipoprotein: oxidized HDL elicits proatherogenic response in human monocytes-macrophages" on 22nd January 2015.

Public defence and viva voce for the Ph.D thesis of Mr. P.S.Sabarinath , entitled, " Studies on antibodies that form immune complexes with lipoprotein(a) [Lp(a)] in plasma' was conducted on 22nd March, 2015.

DEPARTMENT OF CARDIOLOGY

During the year, the Department of Cardiology continued to provide state-of-the art patient care, along with research and academic programs. Apart from the ongoing training programs (6 DM trainees, 3 post-DM trainees and 3 cath lab technical trainees/year), the department conducted various workshops, initiated new research programs, and published in many international journals. In view of the enhanced opportunities for training of postgraduates, the number of DM trainees has been enhanced to 6 every year. There was an emphasis on training in and further advancement of the three sub-specialties within the department.

Division of Adult Cardiology and Intervention

The Division of Adult Cardiology and Intervention mainly dealt with coronary intervention and interventions for structural heart disease and valvular heart disease. The division performed about 700 coronary interventions yearly, thereby maintaining its position as a major interventional center. Coronary interventions were guided by state-of-the-art technologies like IVUS – Intravascular Ultrasound, OCT - Optical Coherence Tomography and FFR – fractional flow reserve estimations. Left main interventions and rotablations were routinely performed by the division.

The department acquired the state-of-the-art Optical Coherence Tomography (OCT) system, which improved the intra-coronary imaging capabilities and helped in guiding complex coronary interventions.

Structural heart disease interventions like device closure of paravalvular leaks and percutaneous closure of congenital and acquired defects like ruptured sinus of Valsalva (RSOV) were performed. We continued to be a large volume center for balloon mitral valvotomy, performing around 150 cases per year. These included high risk cases and pregnant patients.

Comprehensive Heart Failure Intervention Program is dedicated to the evaluation and management of heart failure patients and will give fillip to our plans to initiate a heart transplant program in the near future. The heart failure clinic has registered more than 450 patients with heart failure, and the registry information has already provided us with valuable information on how to optimally manage this chronic illness. In addition to providing quality care and dedicated follow up care for these patients, the heart failure intervention program is poised to make the institute a nodal center for advanced care for heart failure in this region.

Procedures	No
Coronary angioplasty	705
Coronary angiogram	1299
Cardiac Catheterization	312
PDA Device Closure (Adult)	5
RSOV Device closures	2
Balloon Mitral Valvotomy	102
Device closure of Valve leaks	2
Alcohol Septal Ablation	6
Pericardial aspiration	8

Division of Cardiac Electrophysiology

The cardiac electrophysiology division maintained its leadership position as one of the best Interventional electrophysiology centers in the country for management of cardiac arrhythmias and sudden cardiac death. The focus of the division continued to be on expanding the expertise in VT ablations. We performed nearly 400 ablations and electrophysiology procedures, one of the largest in the country. The number of device implantations was close to 280, including ICDs and cardiac resynchronization devices for heat failure. Our device clinic follows up nearly two thousand cases every year. The institute has been using the 3D electro anatomical mapping systems, CARTO 3 and Ensite Velocity to aid in complex ablation procedures. We upgraded the device follow up clinic to better cater to our patients and to maintain a database of our device cases. The electrophysiology division is also the most sought after training facility in the country for post-doctoral training in cardiac electrophysiology. The Asia Pacific Heart Rhythm Society (APHRS) requested for one International seat for Post-doctoral Fellowship in Electrophysiology. Cardiology residents and fellows from other institutions in the state also visited the department for observation and short duration in house training. The department has numerous ongoing projects to improve our knowledge base and innovate with newer treatment strategies.

The division is the national coordinating center for a nationwide Channelopathy registry, which will catalogue various causes of inherited abnormalities of cardiac ion channel functions that predispose to sudden cardiac death at a young age.

Procedures	No
3D electro anatomical mapping and ablation	85
Atrial tachycardia and flutter	37
Ventricular tachycardia – outflow tracts	18
Ventricular tachycardia – Fascicular VT	12
Ventricular tachycardia – Scar related	8
Ventricular tachycardia – Other	5
Atrial fibrillation	5
Conventional mapping and ablation	311
Ablation of SVT – AVNRT	143
Ablation of SVT – AVRT	80
Electrophysiological study	88
Device implantation procedures	280
Total Electrophysiological procedures	576

Electrophysiological Procedures in 2014

Division of Pediatric Cardiology

The pediatric cardiology unit of the department catered to the entire spectrum of congenital heart disease (CHD) patients from "fetus to adult". Advancement in imaging and intervention has occurred in recent years. The spectrum of device closure cases broadened from closure of simple defects like ASD and PDA to more complex procedures, including closure of VSD, coronary arterio-venous fistula (CAVF) and RSOV. In addition, interventions for post op complications improved the surgical outcomes. In association with congenital heart surgeons and anesthetists, the number of procedures (elective and emergency) for critically ill newborns with CHD increased. Diagnostic echocardiography and interventions were provided round the clock. The emergency neonatal procedures include balloon atrial septostomy, ductal stenting and balloon valvotomies. We are now focusing on developing a comprehensive infant neonate clinic. The division took special care in giving advanced training to residents and fellows in various diagnostic and treatment interventions. Weekly academic sessions were held for the faculty and residents.

Serial number	PROCEDURE	Number (n)
1	Device closure of Atrial septal defect (ASD DC)	189
2	Device closure of Ventricular septal defect (VSD DC)	10
3	Device closure of Patent ductus arteriosus (PDA DC)	111
4	Balloon pulmonary valvotomy (BPV)	30
5	Balloon aortic valvotomy (BAV)	9
6	Balloon atrial septostomy (BAS)	24
7	Balloon dilatation of coarctation of aorta (BCoA)	3
8	Patent ductus arteriosus stenting (PDA stenting)	12
9	Coarctation stenting	4
10	Coiling of aorto pulmonary collateral	3
11	Pulmonary venous baffle stenting	1
12	Cardiac catheterization	57

Pediatric cardiology procedures in 2014

Imaging

Complex interventions and surgical procedures benefited from a detailed understanding of cardiac structure and function through integration of information from cardiac imaging modalities. The department worked closely with the Cardio Radiology Division for Cardiac MRI and CT imaging. There were routine combined academic sessions with the radiologists and combined projects are in the anvil. Imaging modalities like IVUS and OCT, for interventional cardiology and 3D mapping systems for electrophysiology made performance of complex procedures more efficacious and safer. We will soon be upgrading to new 3D echocardiographic machines and catheterization lab with 3D image integration facilities for electrophysiology.

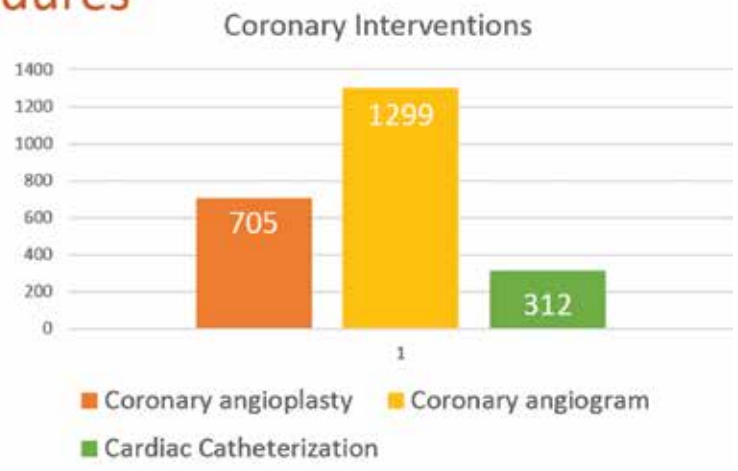
Appointed

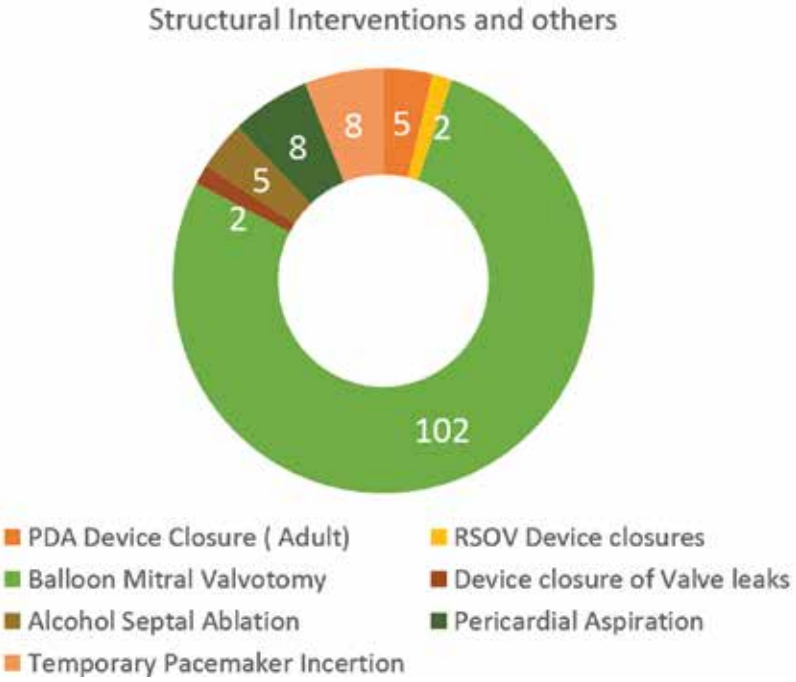
1. Research committee member of Asia Pacific Heart Rhythm Society: Dr. Ajit Kumar VK
2. Member, Devices Advisory Committee to Government of India: Dr. Ajit Kumar VK
3. Editor-in-Chief , Indian Pacing and Electrophysiology: Dr. Narayanan Namboodiri.

Adult Cardiac Interventions

2014

2448 Procedures

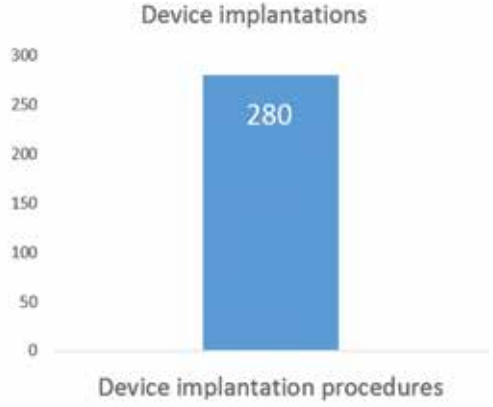


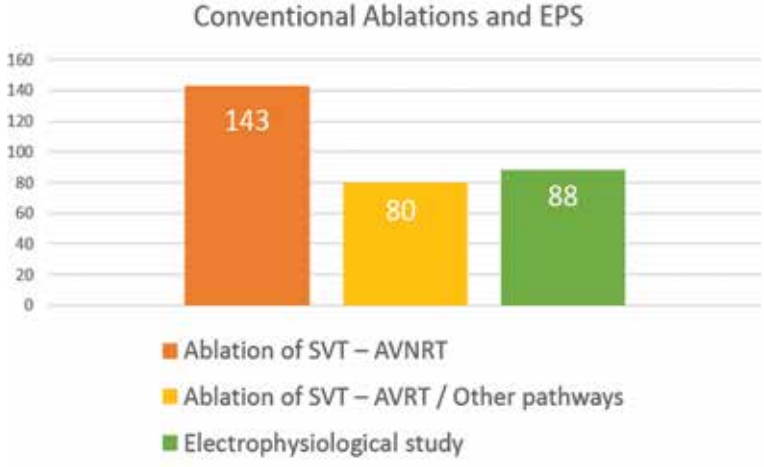


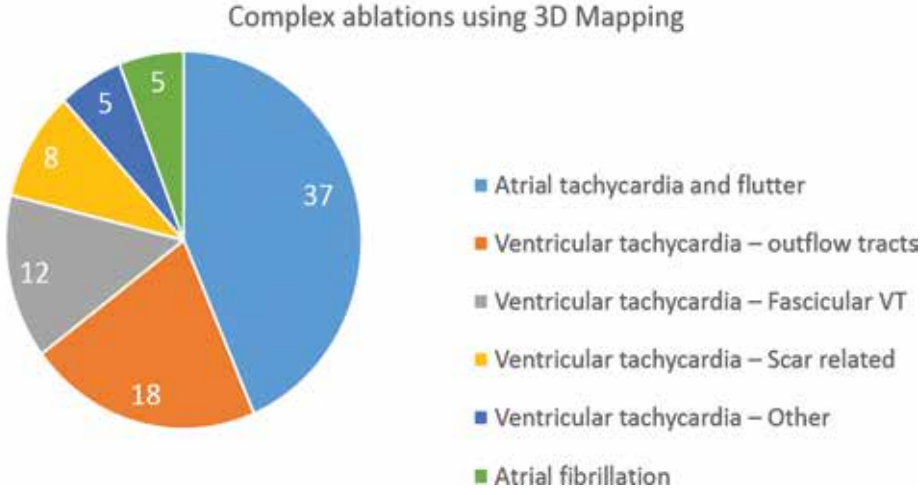
Cardiac Electrophysiology

2014

576 Procedures

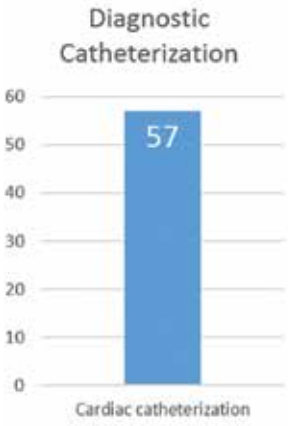


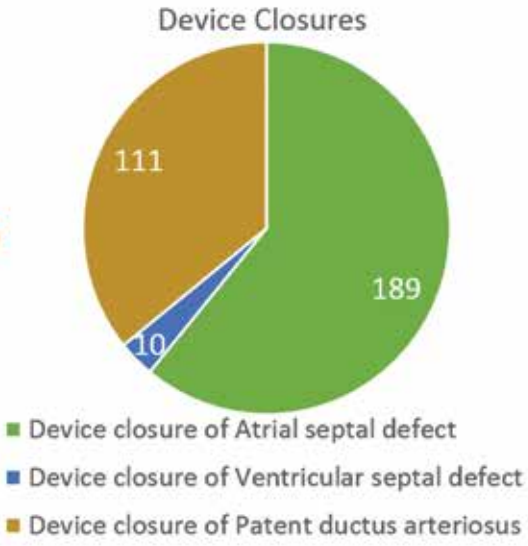


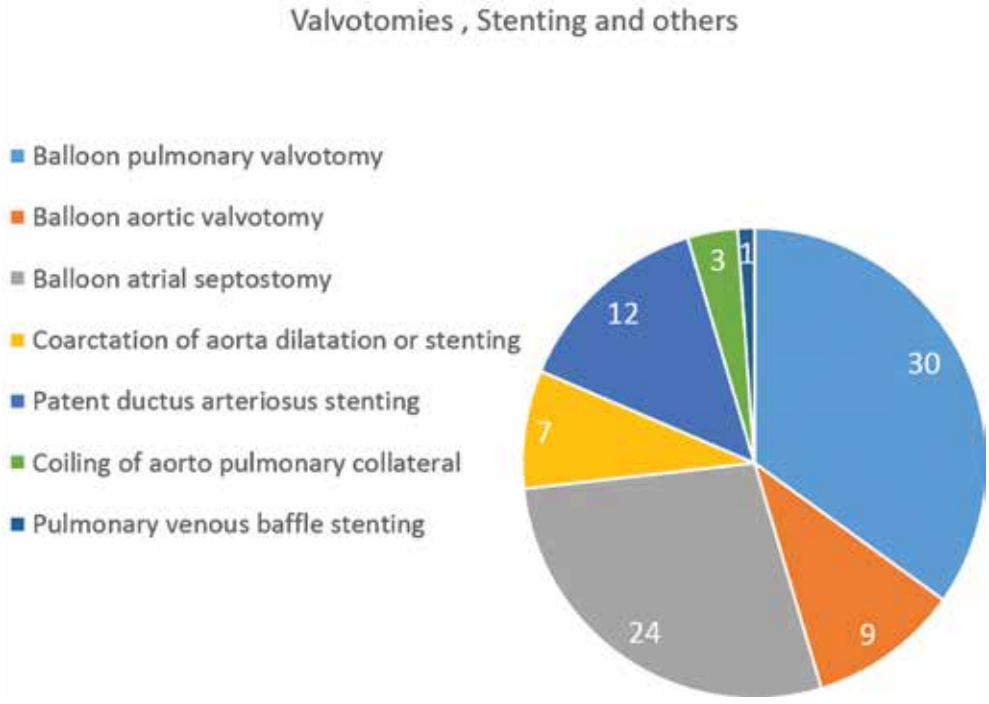


Pediatric Interventions 2014

453 Procedures







Staff Details

Thomas Titus
(Head of the Department)

Dr Ajit Kumar VK
Professor

Dr Sivasankaran S
Professor

Dr Krishna Moorthy KM
Additional Professor

Dr Harikrishnan S
Additional Professor

Dr Narayanan Namboodiri
Additional Professor

Dr Bijulal S
Associate Professor

Dr Anees T
Associate Professor

Dr Sanjay G
Assistant Professor

Dr Venkateswaran S
Assistant Professor

Dr Abhilash SP
Assistant Professor

Dr Krishna Kumar M
Assistant Professor

Paramedical/Technical Staff

Mr Suji K
Junior Scientific Officer

Mr Subrahmoniam HR
Junior Technical Officer

Ms Resmy PV
Technical Assistant - B

Ms Sheeja S
Technical Assistant - A

Ms Sethu Parvathy
Technical Assistant - A

Mr Midhun SV
Technical Assistant - A

Ms Rasmi Mohan
Technical Assistant - A

Ms Princy V
Technical Assistant

DEPARTMENT OF CARDIOVASCULAR & THORACIC SURGERY

The Department of Cardiovascular and Thoracic Surgery, comprising adult cardiac, pediatric cardiac and thoracic vascular divisions, is the largest unit in the state of Kerala and one of the biggest in India. With a total bed strength of 78, the department performs over 2000 surgeries an year, covering neonates to octogenerians. The department has been able to achieve and sustain world class surgical results in challenging operations like neonatal surgeries, valve repairs, aortic dissection repairs, redo opertions , thoaraco-abdominal aneurysm surgeries and endovascular repairs. Further, the department conducts research on clinical, biochemical, tissue engineering and biomedical device development besides running one of the best residency (M.Ch) programs in cardiac and vascular surgery in the country.

Academic Activites

The 2nd Annual Meeting of the Society for Heart Failure and Transplantation was conducted in October 2014 jontly by the Departments of Cardiology and Cardiovascular and Thoracic Surgery. With over 300 delegates from India and abroad, the meeting showcased conventional and cutting treatment startegies in the management of heart failure. Prof. Jayakumar was the Organising Chairman and Dr. Vivek V Pillai was the Treasurer of the meeting. As Senior Vice President of IACTS, Prof Jayakumar participated as faculty in the various CTCMEs held at Vellore and Jaipur. Prof. Unnikrishnan delivered an invited lecture at the Asian Society of Vascular Sugery 2014 in Hongkong.

The institute was well represented in the scientific sessions of IACTSCON2015 , PCSI 2014 and VSICON 2014,INDOVASC 2015 with numerous noteworthy papers by the faculty and residents. Dr.Sidharth Vishwanathan was awarded a registrarship at Doncaster Royal Infirmary, UK, by VSI. Dr.Thomas Mathew presented a poster at ISMICS, Boston.

Courses

M.Ch programs –

M.Ch CVTS – 4 candidates annually

M.Ch Vascular surgery – 1 candidate annually

Diploma in Clinical Perfusion – 2 candidates annually

Also the department participates actively in the training of cardiac nurses and M.Tech clinical engineering students.

Clnical Services

The department is divided into 3 divisions - Adult Cardiac, Pediatric cardiac and Thoracic-vascular divisions and has 6 operation theaters . Out patient clinic functions 6 days a week. Routine follow-up of the operated cases is done on a yearly basis.

In 2014-15, 2022 Cardio Vascular and Thoracic operations were performed, of which 1485 were open-heart procedures. The details are furnished below.

Adult Cardiac Operations

Open Heart : 1039 procedures

These include

1. Coronary artery bypass surgery
2. Valve replacement surgery
3. Valve Repairs
4. Surgeries for infective endocardits
5. Ascending aortic aneurysm repair
6. Aortic Dissection repairs
7. Adult congenital heart disease
8. Left Atrial Myxoma excision
9. Surgical Ventricular Restoration

Closed Heart - 537 procedures

These included:

1. Surgeries for complex aortic aneurysms and aortoiliac occlusive diseases
2. Advanced Endovascular Surgical Procedures
3. Carotid Endarterectomy
4. Lung surgery including VATS
5. Beating heart surgeries
6. Coarctation repair- adult and paediatric
7. PDA division- adult and paediatric
8. BT shunt operation

9. Thyroidectomy
10. Thymectomy
11. Thoracic tumour Excision
12. AV Fistula

Congenital Heart Surgeries.

Open Heart : 446 procedures

These included surgeries for

1. Septal defects – Atrial and Ventricular
2. Tetralogy of fallots
3. AV Canal defects
4. TAPVC corrections
5. TGA corrections
6. Hypoplastic left heart defect correction
7. Univentricular operation
8. Homograft PA conduits
9. Truncus Repairs

Academic Staff

1 Dr.K.Jayakumar M.S; M.Ch
Senior Professor and Head of Department

2. Dr. M. Unnikrishnan M.S; M.Ch
Senior Professor.
3. Dr. Baiju.S. Dharan M.S; M.Ch
Associate Professor
4. Dr. Vivek V Pillai M.S; M.Ch
Associate Professor
5. Dr. Varghese T Panicker M.S; M.Ch
Associate Professor
6. Dr. Thomas Mathew M S; M.Ch
Assistant Professor
7. Dr.Sabarinath Menon M.S,M.Ch
Assistant Professor
8. Dr.Bineesh KR M.S,M.Ch
Adhoc Assistant Professor
10. Dr.Sidharth Vishwanathan M.S,M.Ch
Adhoc Assistant Professor

Perfusion Division of CVTS

1. Ms.Beegum Thaslim
2. Mr.Monsy Sam
3. Ms.Maya.L
4. Mr. Sujith V.M
5. Mr. Don Sebastian
6. Mr. Shanu PS

DIVISION OF CLINICAL ENGINEERING

The responsibilities of the Division of Clinical Engineering included applying and implementing medical technology to optimise healthcare delivery by imparting training, supervising / inspecting / auditing and serving as technological consultants. Safe use and effective maintenance of the equipments in the institute are also vested in the hands of the Clinical Engineering Division.

The activities of DCE have been grouped under the following three major categories.

1. Patient care/Service/Management,
2. Academic/ Teaching/Training,
3. Research/Projects /technological consultation.

1.Patient care / Service / Management.

i) DCE carried out the routine activities and related responsibilities efficiently and effectively, ensuring patient safety.

ii) The equipment maintenance job was effectively monitored by the on-line job entry system.

iii) Data quality was ensured through proper computer entry of newly installed and maintained equipments.

iv) The newly introduced system of NEP, Item coding and RV entry format helped a lot in Equipment Control, Asset Management and Inventory management

v) With the help of the computer department, necessary correction and modification in the existing equipment maintenance programs were done for better management.

vi) The programs for equipment history, sparse list, and maintenance history and purchase order search were also developed, which is very useful for decision making.

vi). Data validation in the DCE maintenance program was checked and corrected at the time of issuing work permit to each job and ensure data assurance.

vii) Proper planning and auditing is going on to have a paperless office in future.

viii) All spares and accessories of all equipments are linked with the respective main equipment through proper Item coding and the computer program ensure accountability.

ix) Planned maintenance programs with proper auditing is being done on critical areas to ensure safety for equipments and operators

2. Academic/ Teaching/Training,

i) The Hospital Equipment Awareness Training Series ("HEATS"), which was started with the objective of giving training to the various equipment users like Doctors, Nurses, Technicians, Engineers and others, continued successfully. The result was overwhelming and there was heavy demand from outside institutions to extend training to them also. DCE hopes that HEATS program will continue its journey and will pave the way in molding the structure of maintenance process and ensure safety and quality.

The following is the list of HEATS conducted during this period.

HEATS-7	Hospital Equipment Maintenance Management program.	31st Aug 2014
HEATS-8	Mobile intervention C -Arm	15th & 16th Nov 2014
HEATS-9	MRI Hard ware	22th Dec 2014
HEATS-10	C T Instrumentation.	29st Dec 2014

ii) DCE continued giving training to MTech students as per the schedule.

iii) Training program of B Tech. Degree, Diploma & NCVT students continued under the apprentice training act.

iv) Mr. Koruthu P Varughese Engineer G attended the following programs.

a) Presented a paper at "The Rajiv Gandhi Centre for Biotechnology" (RGCB) on the National Technology Day celebration on the topic "Technology for better health" and also participated in the Panel discussion.

b) Served as the General Chair of "the South Asia Satellite conference of IEEE GHTC" 2015.

1. Presented a paper at the National Biomedical Conference NABICON-15 at TKM Institute of Technology Kollam on the topic "Biomedical sensors"

Research/Projects /Technological consultation

i). Ongoing Projects

a) Design, development and prototype making of an "External pneumatic Compression Equipment" for the treatment of DVT.

b) Developing program with the help of the Computer Division to link the DCE maintenance program with the Store & Purchase Division.

ii) Mr. Koruthu P Varughese was nominated to the following technological consultation.

a) Technical committee member of Electrometrical Equipment Section (MHD-15) of "Bureau of Indian Standards".

b) Technical Expert for Research and Manpower Development at "State Commissionerate for Persons with disabilities"

c) Expert committee member to "Kerala State Council for Science Technology and Environment" to start an Institute, dedicated for capacity building in Science and Technology based allied skills.

iii) Koruthu P Varughese continued as external guide for AMIE students and guided 4 students.

Staff Details

Mr. Koruthu P Varughese
BSc (Engg), PGDIISc, PGDCA, MBA,
Engineer G & Head of the Department (Acting)

Mr. G. Mohanlal
BSc (Engg), MBA,
Engineer G

Mr. B. Mdhusoodanan Pillai.
BSc (Engg), PGDCA, MBA,
Scientist Engineer F

Mr. G.S. Manoj. B.Tech, DOTT, MBA
Engineer B.

Mr. P. Ganesh
J.E (Electrical)

DIVISION OF CELLULAR AND MOLECULAR CARDIOLOGY

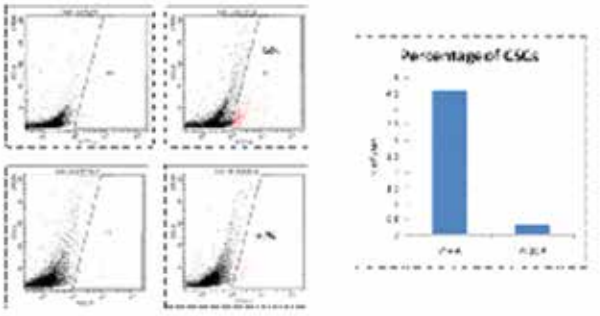
The Division aims at carrying out basic and applied research in Cardiology. Currently, the focus is on understanding molecular mechanisms in pathological cardiac remodeling and identifying strategies for prevention and repair. Studies are carried out using animal and cell culture models.

Routine activities & new initiatives during the year. Guiding students for the Ph.D. Programme is the major academic activity in the Division. One student was admitted to the program during the year and another was awarded Ph.D. Extramural grants from different funding agencies provided additional support for sustaining the research activities. Two new projects with support from DBT and BRNS were initiated during the year. Another project was approved for funding by ICMR.

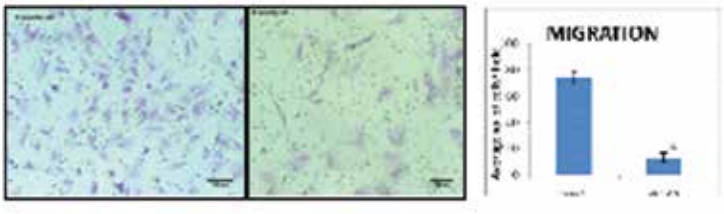
Research programs and collaborative programs -

Decrease in efficacy of resident cardiac stem cells mediate age-associated cardiac remodeling - Contrary to the belief that heart is a postmitotic organ composed of a predetermined number of myocytes, which is established at birth and is preserved throughout life, heart is a highly dynamic organ regulated by a pool of resident CSCs that modulate cardiac homeostasis and condition organ aging. The possibility that a certain degree of myocyte regeneration occurs in the human heart is currently accepted. Resident cardiac stem cells are the natural choice for the replacement of lost myocytes. Repeated cycling of stem cells can lead to decline in stem cell number and efficacy, thereby leading to cardiac failure - a leading cause of morbidity and mortality in the elderly. Assuming that "Age dependent deterioration in cardiac stem cell number and function can lead to adverse cardiac remodeling," the age-associated changes in stem cell characteristics were assessed in 6 month old and 18-month-old Wistar rat. Cardiac stem cells positive for c-kit antigen were separated by magnetic sorting, and used for assessment of the different variables.

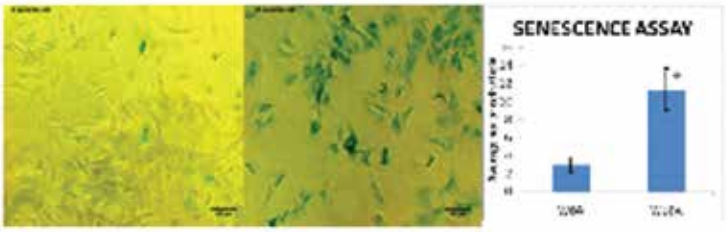
Ventricular tissue was digested and the proportion of Cardiac stem cells (CSCs) that stained positive for c-kit antigen, was determined by FACS analysis. The number of cardiac stem cells showed a significant decrease with age.



Cell migration assessed by trans-well migration assay 18hrs after seeding showed a significant decrease in migration of CSCs from older rat.

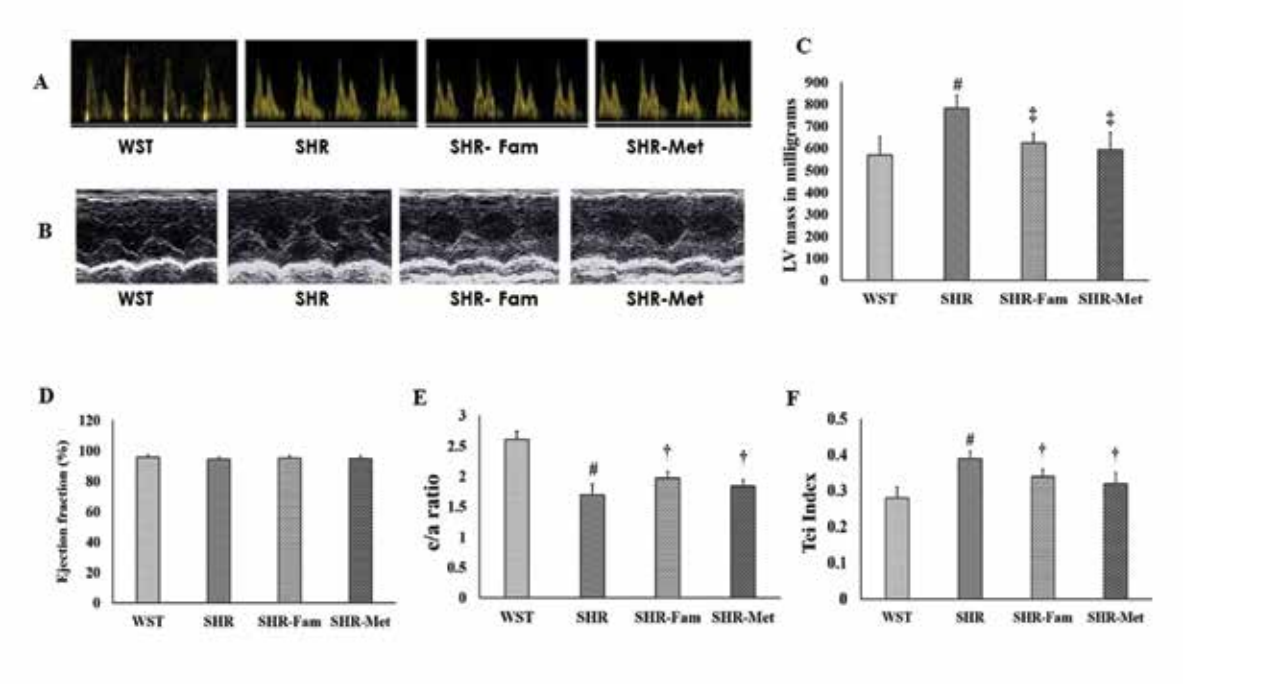


Proportion of senescent cells was determined by Senescence-associated beta-galactosidase (SA-α gal) staining. Positively stained cells were significantly more in older animals.

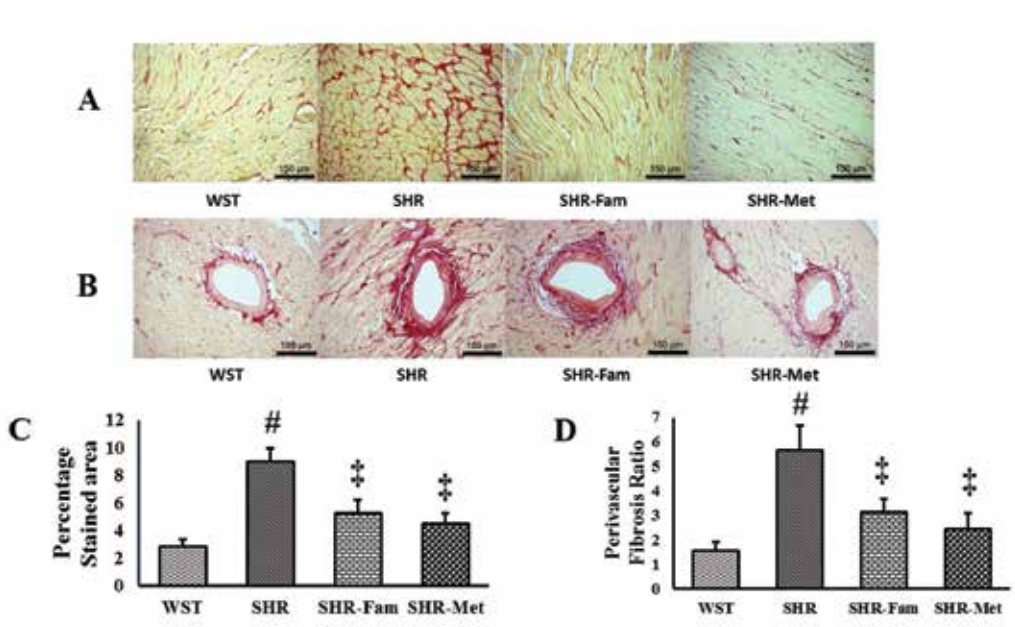


The analysis revealed a significant decline in stem cell number and function with age. Study is in progress to examine whether reduction of oxidative stress can prevent the age-associated changes of the stem cells.

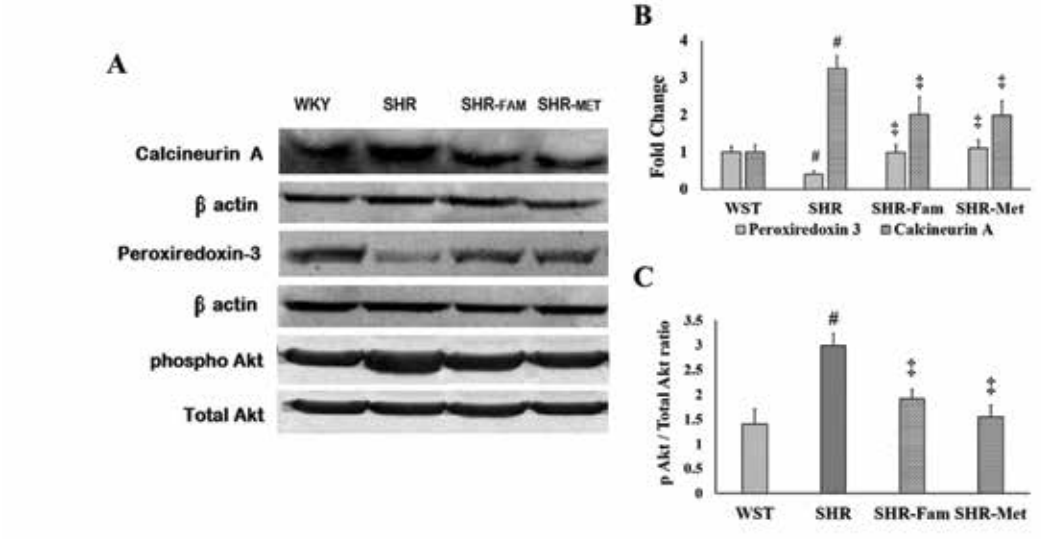
Targeting Histamine-2 receptor for prevention of cardiac remodelling in chronic pressure overload- Regression of hypertension-induced left ventricular hypertrophy (LVH) is known to reduce the risk of adverse cardiovascular events. Histamine is known to play a crucial role in cardiac remodelling. However, the role of histamine-2 receptor antagonism in prevention of LVH needs investigation. Hence, to examine the possible role of histamine-2 receptor antagonism in preventing the progression of LVH, Spontaneously Hypertensive Rats were treated with histamine-2 receptor blocker famotidine. Blood-pressure, as well as cardiac structure and function were evaluated. Tissue lipid peroxidation, histamine content, BNP expression, LDH activity, pro collagen type 1 and hydroxyproline content were measured. Expression of Calcineurin A, peroxiredoxin and Akt levels were assessed. Decrease of diastolic blood pressure was observed on treatment with famotidine. Decrease in cardiac hypertrophy, improvement in cardiac function and decrease in oxidative stress, to the same extent as metoprolol was observed. Reduction in calcineurin levels and Akt phosphorylation indicate their possible role in famotidine-mediated decrease in cardiac remodelling. The observation that famotidine can prevent adverse cardiac remodelling in chronic pressure overload along with reduction of blood pressure is an interesting observation and lends scope for further investigations on its possible use for prevention of cardiac remodelling, particularly in patients where beta-blocker is contraindicated.



Effect of famotidine treatment on cardiac performance as evaluated by 2D Echocardiography. Metaprolol treated group served as standard control. A- representative pictograph of pulsed wave Doppler assessment of mitral blood flow, B- m-mode evaluation of left ventricular morphology, C- graphical representation of effect of famotidine on LV mass represented in milligrams, D- effect of famotidine on ejection fraction E- effect of famotidine on e/a ratio F- effect of famotidine on Tei index. Data is represented as mean ± SD. Variance was analysed by one way ANOVA followed by bonferroni post hoc test and $p < 0.05$ is considered to be significant. Where # $p < 0.01$ Vs WST, † $p < 0.05$ Vs SHR and ‡ $p < 0.01$ Vs SHR



Effect of famotidine treatment on cardiac fibrosis as evaluated by picroscirius staining. A- Representative photomicrograph of interstitial fibrosis in different treatment and control groups, B- Perivascular fibrosis in different treatment and control groups, C- Graphical representation of effect of famotidine on interstitial fibrosis D- effect of famotidine on perivascular fibrosis. Metaprolol treated group served as standard control. Data is represented as mean ± SD. Variance was analysed by one way ANOVA followed by bonferroni post hoc test and $p < 0.05$ is considered to be significant. Where # $p < 0.01$ Vs WST and ‡ $p < 0.01$ Vs SHR.



Expression of mediators of hypertrophy in famotidine treated and control groups. A Representative pictograph of immunoblots of different mediators of cardiac hypertrophy B Graphical representation of densitometry analysis of calcineurin a and peroxiredoxin 3 levels C Graphical representation of densitometry analysis of Akt phosphorylation levels. Metaprolol treated group served as standard control. Data is represented as mean ± SD. Variance was analysed by one way ANOVA followed by bonferroni post hoc test and $p < 0.05$ is considered to be significant. Where # $p < 0.01$ Vs WST and ‡ $p < 0.01$ Vs SHR.

Molecular mechanisms in cardiac fibroblast growth

A major focus of the Division continued to be the mechanistic basis of cardiac fibroblast growth, which is an important determinant of the structural remodeling of the heart post injury. In this regard, investigations during the year revolved around the regulation of two key cell surface receptors, AT1 and DDR2, that impact the growth of these cells and, in turn, the cardiac stroma. The long-term goal is to gain insights into basic molecular processes that may have implications for the pathogenesis and treatment of heart disease.

Regulation of AT1 and DDR2 expression in cardiac fibroblasts

i. Investigations on the regulation of the Angiotensin II receptor, AT1, yielded useful insights into the mechanisms by which oxidative stress enhances AT1 gene expression in cardiac fibroblasts. Promoter binding and Chromatin immunoprecipitation assays confirmed the transcriptional up-regulation of AT1 by the redox-sensitive transcription factors, NF-kB and AP-1. The involvement of three MAP kinases, p44/42 MAPK, p38 MAPK and JNK, in the activation of these transcription factors was demonstrated through a combination of experimental approaches.

ii. DDR2 is a receptor tyrosine kinase that specifically binds to and is activated by collagen type 1. Given its manifold roles in diverse cellular processes such as cell proliferation and extracellular matrix protein turnover, it is surprising that the regulation of DDR2 expression per se and regulation of cardiac fibroblast activity by DDR2, particularly collagen synthesis, remain unexplored. Against this backdrop, experiments were carried out to examine the regulation of DDR2 expression in cardiac fibroblasts by Ang II and to uncover hitherto unknown regulatory links between Ang II, DDR2 and collagen that would regulate matrix production in the heart. The studies provided evidence, for the first time, of the sequential activation of the constituents of the G protein-coupled receptor (GPCR) pathway that culminates in p38 MAPK-mediated activation of NF-œB and its association with the DDR2 promoter to enhance DDR2 transcription in cardiac fibroblasts stimulated with Ang II. Importantly, using an siRNA-based gene silencing approach, the link between DDR2 and its ligand, type 1 collagen, which can profoundly impact tissue response to injury, was probed.

K. Shivakumar spent a month at the Laboratory of Cardiovascular Science, Biomedical Research Center, NIH, USA, to initiate studies on vascular adventitial fibroblasts.

K. Shivakumar continued to serve as member of the Project Review Committee of the Indian Council of Medical Research

K. Shivakumar served on the Editorial Board of Molecular Biology Reports.

10. Staff details with qualifications as on 31.03.2015

    Dr. R. Renuka Nair, Ph.D. FAMS, Scientist G (Senior Grade)

    Dr. K. Shivakumar, Ph.D - Scientist G

    Ms. Remani K. B.Sc., MLT- Jr. Technical Officer (Lab.)

    Ms. Susan Mani MSc. Technical Assistant (Lab) -A

    Dr. Sreeja Purushothaman Ph.D- Principal Investigator, Back to Lab programme, KSCSTE

11. List of students, including the number of PhD students enrolled during the year and awarded the degree.

Pramod S. M.Sc. M.Phil,
Research Scholar- Awarded Ph.D

Saifudeen Ismael M.Sc.
Research Scholar

Deepthy R.S. M.Sc.
Research Scholar

Anupama V. M.Sc.
Research Scholar

Ajay Godwin Potnuri M. Pharm.
Research Scholar

Sherin S. M.Sc.
Research Scholar

Mereena George U. M.Phil.
Research Scholar

Harikrishnan V. M.Sc.
Research Scholar

COMPUTER DIVISION

Routine activities

- Software development and updates
- Web Site development & updates
- Network management and new cabling work.
- Tender publishing, Online recruitment
- Training for staff and students
- OMR evaluation
- Hardware and software maintenance of servers, storage, PC's , routers, switches, scanners, printers etc. with a remarkable uptime of 99.98% (Total 1225 devices)

The major progress with the expansion of system environments was as follows:

New Initiatives

- Electronic Medical Records (EMR) for Review Patients in Cardiology OP
- Implemented fee collections through SBI e-collect
- Conversion of programs from Oracle 6i forms to Oracle 11g.
- Online investigation entry for ISIR requests from IP.
- Online Register for Cardiac Anesthesia cases.
- Software for uploading quotation for Pharmacy Tender participants
- Study completed for developing Project Portal, Transport Management Portal and Technical Advisory Committee portal.
- Software for patient's scanned chart view.
- Software for archiving documents of BMT Wing
- Backup solution implemented for network clients.
- Online entry of staff dependent details for medical reimbursement.
- Online entry of various schemes for Patient billing.

Major Activities

New Software Development and Hardware Implementations

- EMR, DCE, Accounts, Salary, Medical Records, IP Billing, Purchase, Drug Entry - Modifications in GUI based program was made for EMR, maintenance details, bill cancelling, to incorporate updates in tax calculation, pension calculation, hl7 messaging for PACS, RIS , SMS sending , drug entry etc.
- Implemeted new version of biometric verification software Biostar.
- Modifications of existing live softwares running in various departments as per user requirements.
- Fibre network cabling completed for new Canteen, new ISIR block and Ladies hostel.

New Purchases

Sl no.	Hardware and Software	Quantity	Approx. Cost
1	PC INTEL CORE I5-4690(3.5GHZ,6MB CACHE)	15	Rs 576750.00
2	SYMANTEC ENDPOINT PROTECTION	1	Rs213372.00
3	WINDOWS SERVER STANDARD 2012 R2 SNGL OLP	1	Rs210990.00
4	SYMANTEC NETBACKUP ENTERPRISE ACADEMIC	1	Rs662406.00
5	MDAEMON 14.X PRO, 1500 MAIL BOXES	1	Rs325305.00
6	THIN CLIENT LQ64-F9R7	15	Rs537973.00
7	HP SCANJET N9120(A3)		Rs173250.00

8	PRINTER LASER H-P P1606DN	5	Rs83500.00
9	SWITCH CISCO CATALYST 2960 48 PORT	3	Rs399946.00
10	SWITCH CISCO CATALYST 2960 24 PORT	5	Rs461281.00
11	SCANNER A4 SIZE, ADF TYPE	2	Rs55562.00
12	HP SCANJET N9120(A3)	1	Rs166500.00
13	SERVER IBM X 3650 M4(7915	2	Rs 1104654.00
	Total		Rs 3866835.00

Staff Details

Mrs.Geetha,
G. Scientist G, B. Tech (E&C), M. Tech (Computer Science), PhD (Bioinformatics)

Mr. Suresh Kumar B,
Engineer C, B. Tech (Computer Science), M. Tech (Computer Science)

Mr. Rejith L .R. MCA, MBA

Mr. Saji K. S.,
3 Year Diploma in Computer Engg ,B. Tech (Computer Science)

Mr. ManojM
3 Year Diploma in Computer Engg, BSc Maths

Mr. Anish R
3 Year Diploma in Computer Engg, BCA

Mr. Sakilnag P.S.
B.Tech(Computer Science)

Temporary Staff

VinithaKumari V.S., 3 Year Diploma in Computer Engg

Raji R., 3 Year Diploma in Computer Engg

Shahnas S, 3 Year Diploma in Computer Engg

Mohammed Shefeeq B., 3 Year Diploma in Computer Engg ,B.Tech(Computer Science)

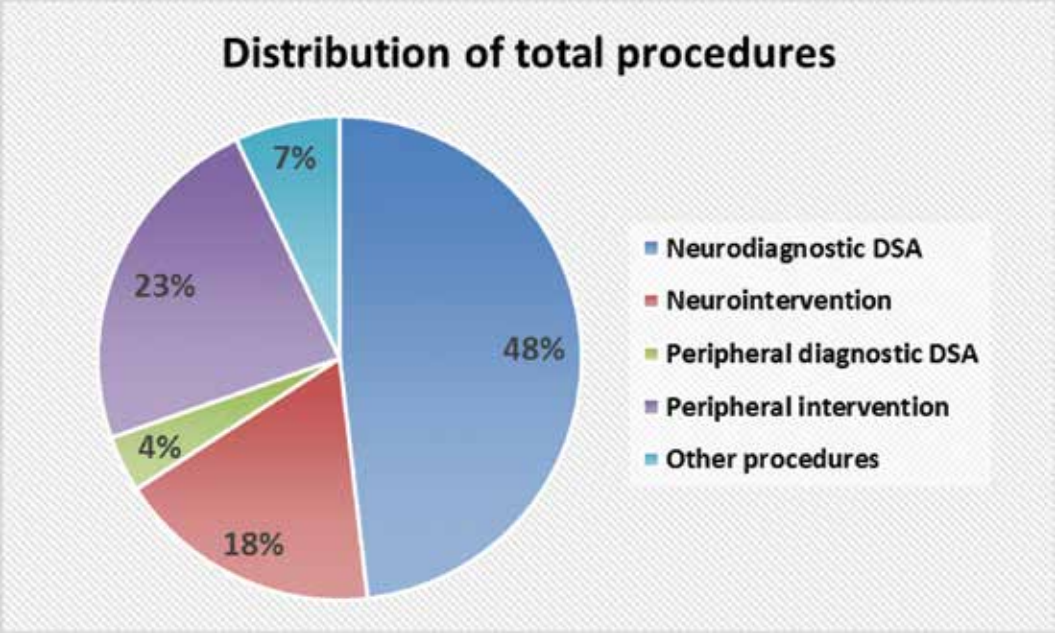
Aswin Kumar M.M., 3 Year Diploma in Computer Engg

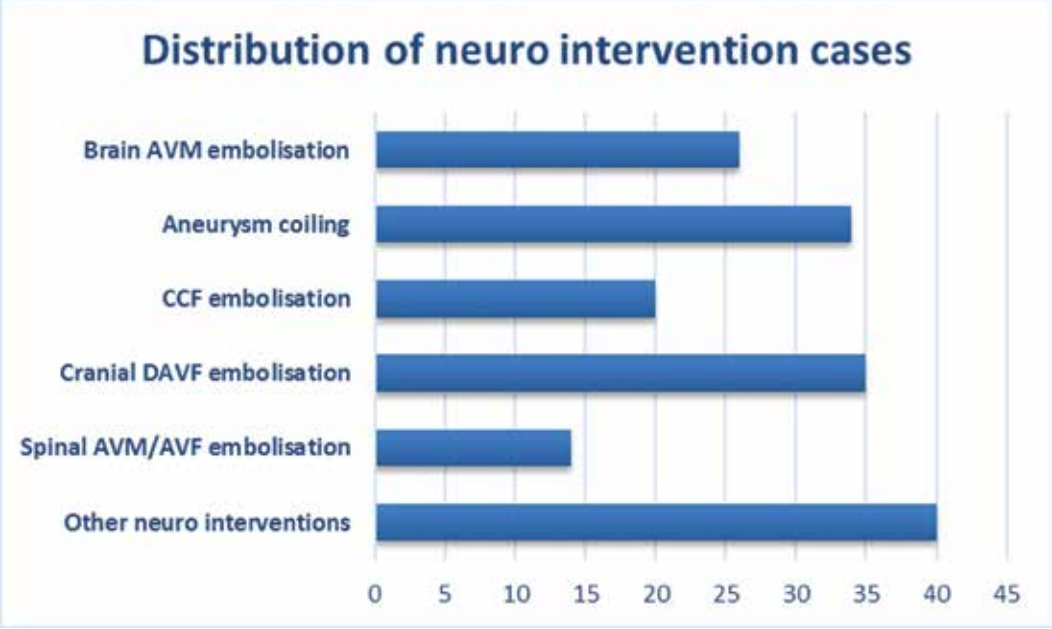
Apprentice

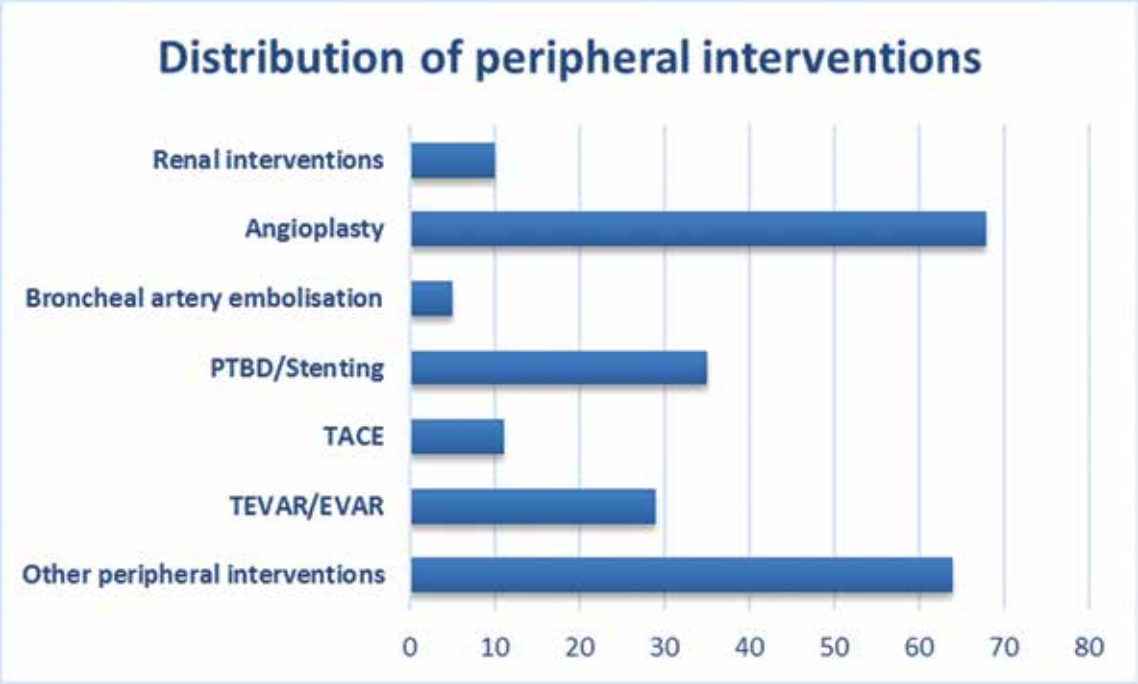
Anjana S.S., 3 Year Diploma in Computer Engg

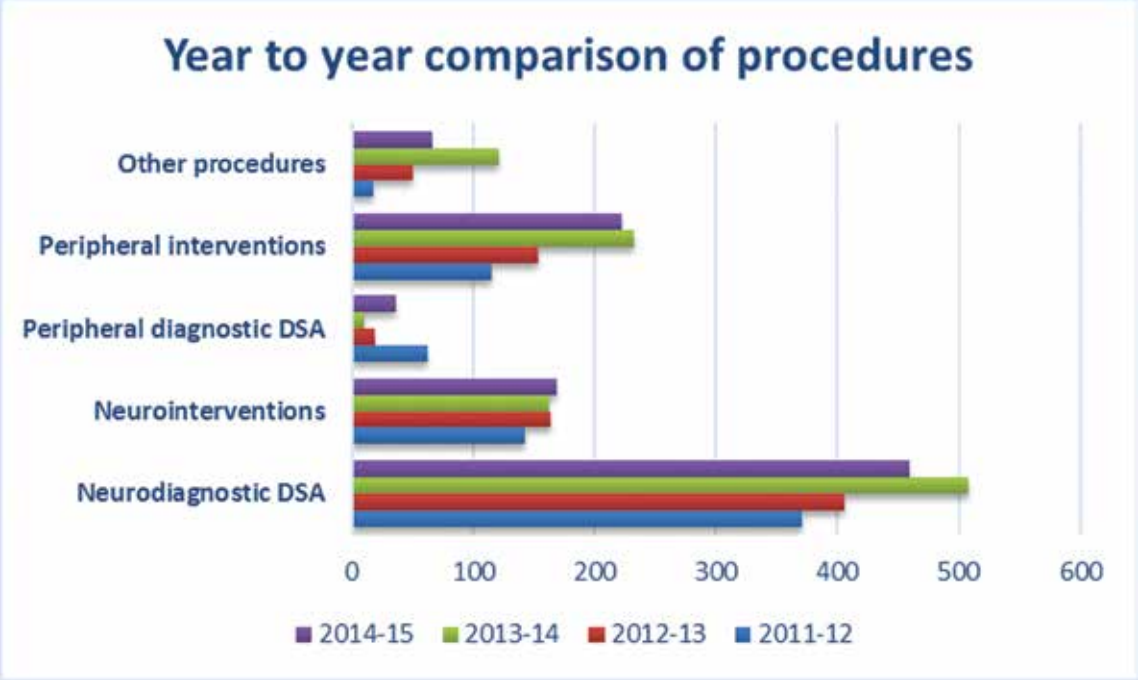
DEPARTMENT OF IMAGING SCIENCES & INTERVENTIONAL RADIOLOGY

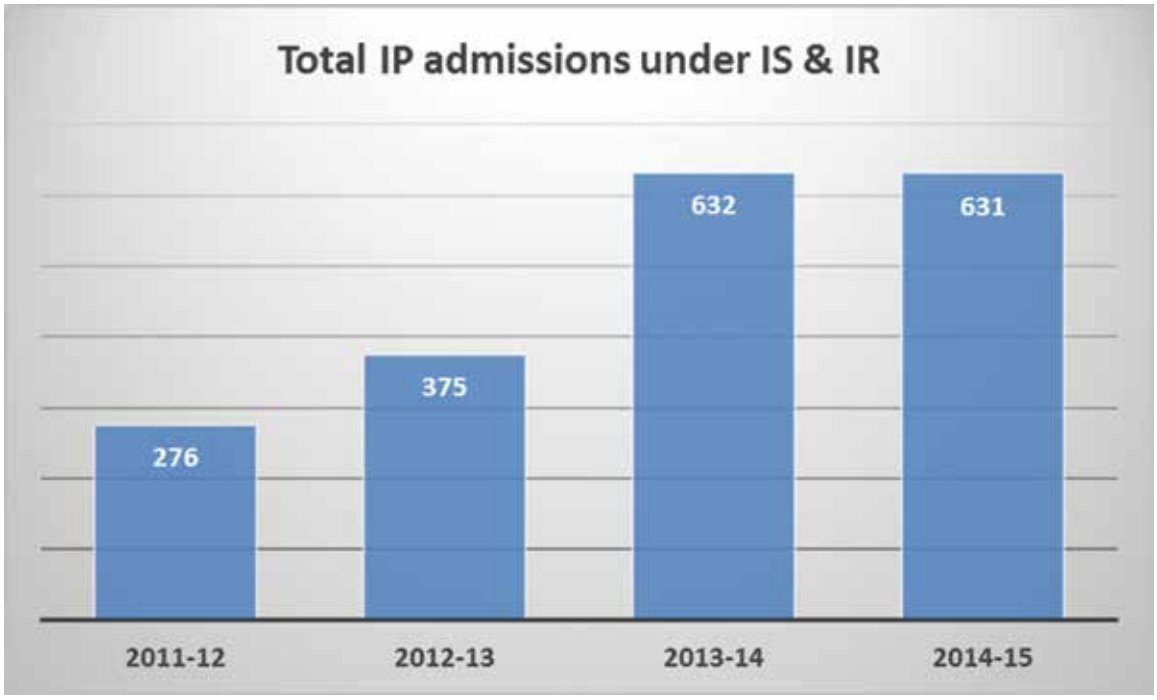
Neuro intervention center (NIC) is a tertiary care facility for the comprehensive management of patients suffering from various neuro-vascular disorders. After starting the neuro intervention center (NIC) in 2013, the number of neurointerventions and peripheral interventions have increased significantly. The quality management practices coupled with a strong multidisciplinary co-operative directions of NIC contributed significantly in achieving less than 1% morbidity and mortality in the past year with no procedure-related morbidity or mortality.

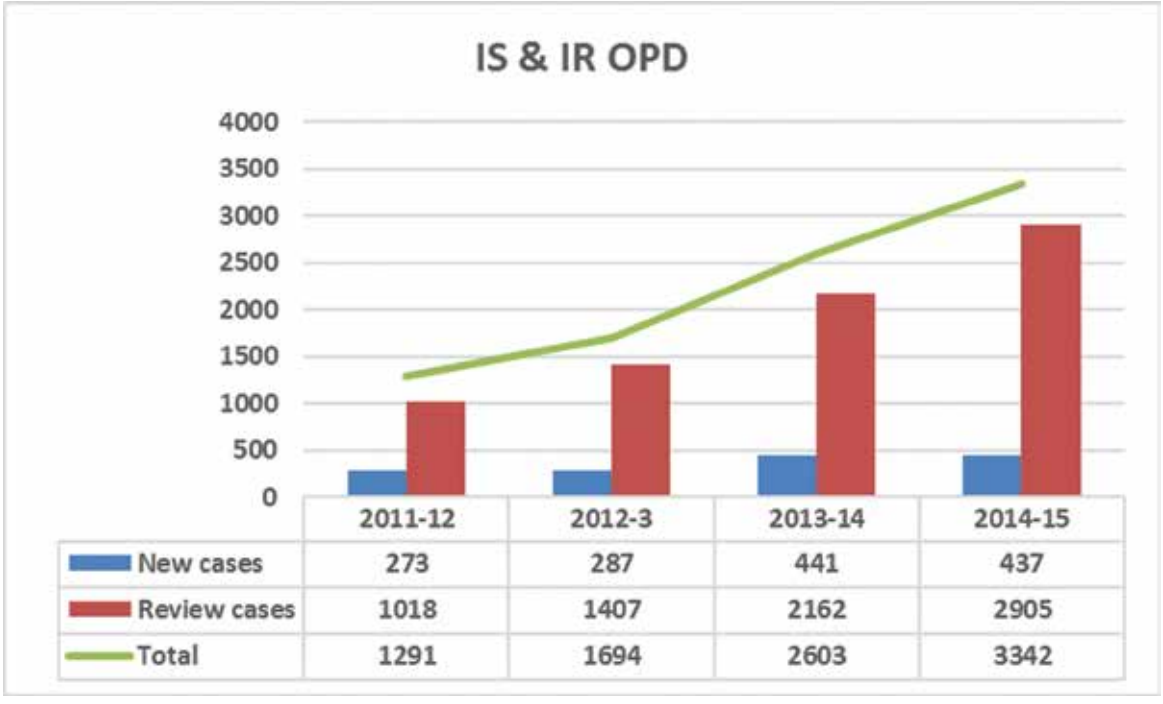





Distribution of peripheral interventions
Renal interventions
Angioplasty
Broncheal artery embolisation
PTBD/Stenting
TACE
TEVAR/EVAR
Other peripheral interventions
0
10
20
30
40
50
60
70
80


Year to year comparison of procedures
Other procedures
Peripheral interventions
Peripheral diagnostic DSA
Neurointerventions
Neurodiagnostic DSA
0
100
200
300
400
500
600
2014-15
2013-14
2012-13
2011-12





	2011-12	2012-3	2013-14	2014-15
New cases	273	287	441	437
Review cases	1018	1407	2162	2905
Total	1291	1694	2603	3342

IMAGING SCIENCES

STATISTICS

X-RAY	36483
Ultrasound & Doppler	3301
Computed Tomography Peripheral & Cardiac	1219

Neuro	5650
Magnetic Resonance Imaging Peripheral & Cardiac	360
Neuro	3392

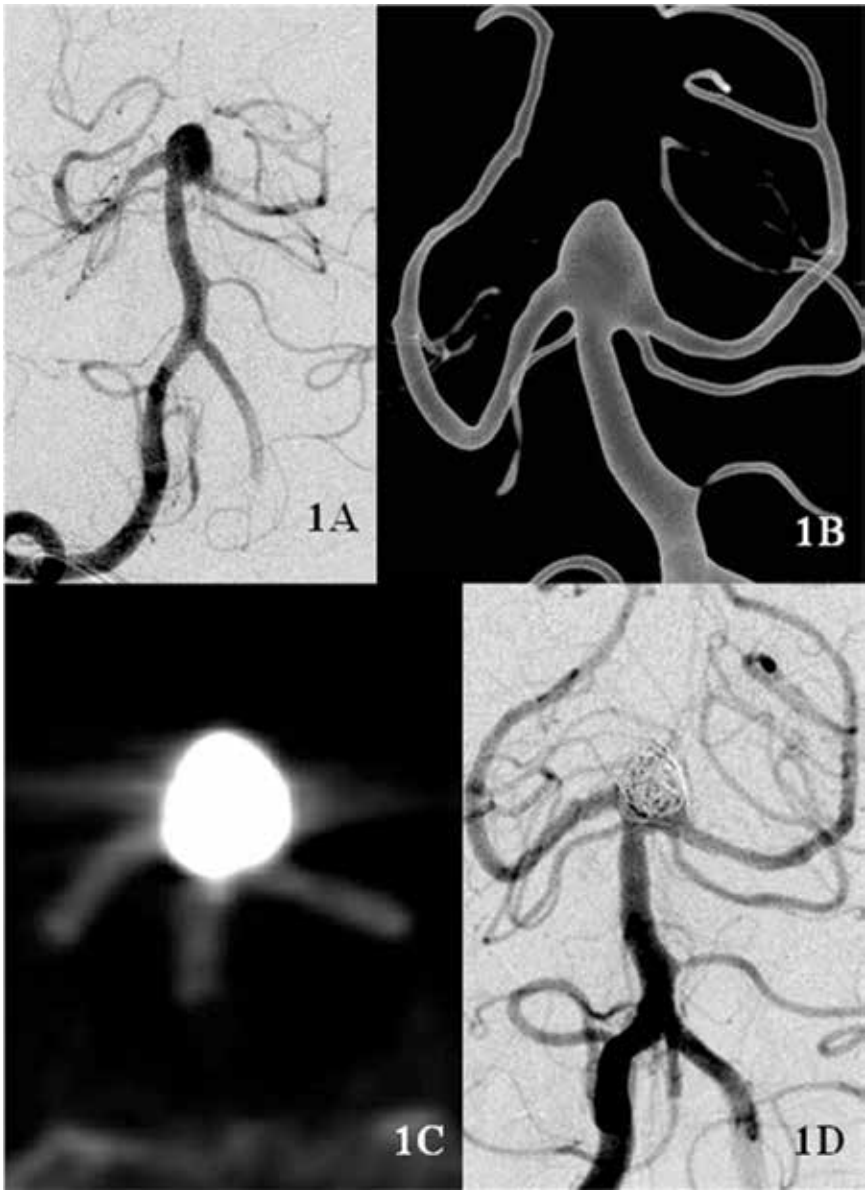


Figure 1A-D. Wide neck basilar top aneurysm treated with two stents ("Y")and detachable coils

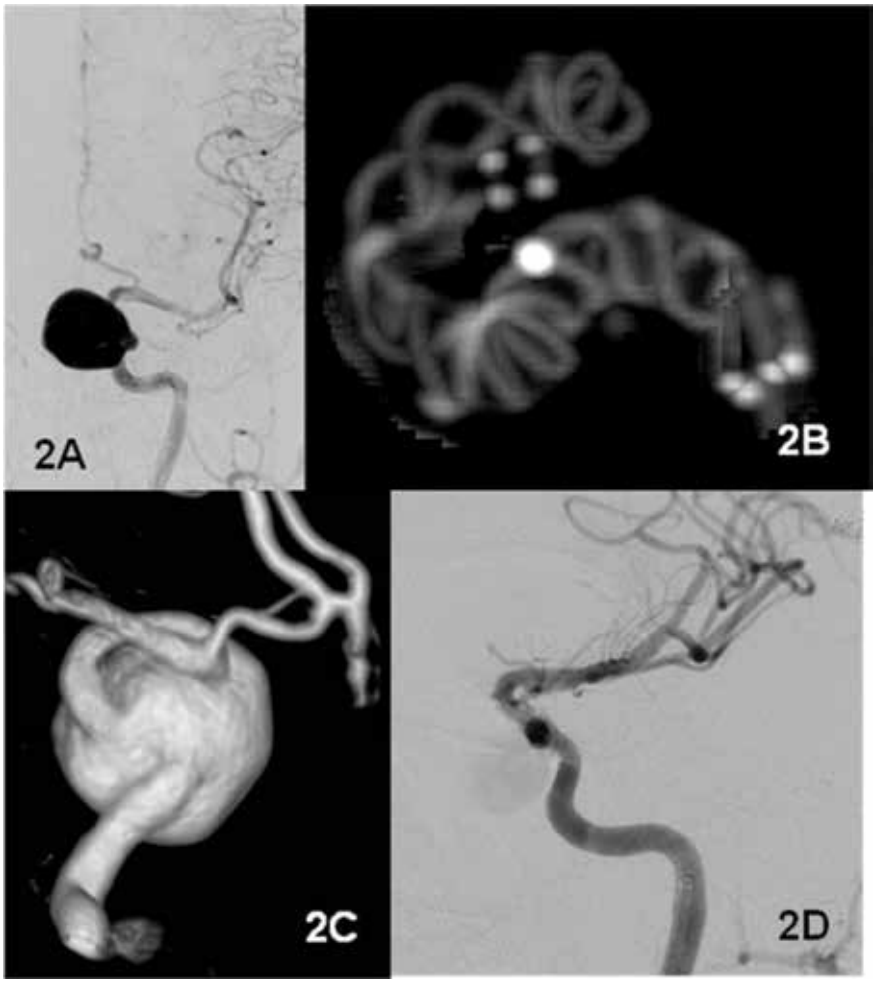


Figure 2A-D.Giant Cavernous ICA aneurysm treated with flow diverter(FRED) with good result

Faculty

Dr. T. R. Kapilamoorthy
Professor and Head

Dr. C. Kesavadas
Professor

Dr. Bejoy Thomas
Additional Professor

Dr. Jayadevan E. R.
Associate Professor

Dr. Santhosh Kumar K
Assistant Professor

Dr. Rasmiranjan Padhi
Consultant (Adhoc)

MICROBIOLOGY

Overview

The mission of the Department has been to

a) Provide accurate and quick reports on all specimens sent to the laboratory.

b) Give a consultant clinical microbiology service one component of which is antibiotic stewardship.

c) Develop molecular diagnostic services to include more infectious diseases

d) Maintain the viral culture facility

e) Train MD and MSc Microbiology students as observers and as Apprentice trainees, respectively, which may in the future be upgraded to a course.

f) Enhance research activities

Routine activities

1) Bacteriology –

a) Infective endocarditis – 30 cases were followed up till discharge and advice given for appropriate antibiotic therapy. There were 7 cases of αlytic Streptococci, 6 cases of Staphylococcus aureus (2 MRSA), 4 cases of Staphylococcus epidermidis , 3 cases of Enterococcus faecalis, two cases of Candida parapsilosis (byVitek) and one Aspergillus niger(from vegetation only). Unusual organisms were Pseudomonas mendocina and Kytococcus sedentarius. There were 10 prosthetic valve infections.

b) Hospital acquired infections – A new input facility was devised by the Computer Division for entry of device use in patients and has made calculation of device days easier. Rates of HAIs will be more accurate now. More such changes are needed to make diagnosis of HAI more objective. Link nurses met every month and present ed cases. Infection Control Team met twice.

c) Mycobacteriology – Two cases of Non-tuberculous mycobacteria (NTM) infection and one positive for Mycobacterium tuberculosis by growth on LJ medium. One NTM was identified by HPLC at District TB Centre.

2) Molecular diagnostics: TB PCR for tuberculous meningitis – 86 done with 4 positive.

RT-PCR equipment was installed. Dr.Molly Antony, Scientist G, and Ms Sujatha, Scientific Officer, went to the company laboratory and had a two-day training on use of the machine. Proposal for modification of serology lab to accommodate the new machine with all safety features was given to construction wing and got approval.

3) Other sections – Mycology – Yeasts: 52 non-Candida albicans and 17 Candida albicans identified both by Vitek and manual method. Mould fungi isolated included Acremonium, Aspergillus, Penicillium and Mucor.

4) Viral Serology – More of HBsAg positives (78) than HIV(6) or HCV(17)

a) ABBOTT ARCHITECT system for viral serology made it possible to do more tests in less time. Anti HbsAg titre check for staff can also be done with greater accuracy in this reagent rental machine.

b) All new students admitted in January were tested for viral markers and all vaccinated once for titre of anti-HBsAg. One student had low titre.

5. Serology – CRP and procalcitonin were done, especially by the Cardiology unit for Infective endocarditis. ASO tests came down in number

Homograft valve bank continued its successful program with 50 heart valves harvested and stored. 19 successful implants were performed by the Pediatric Cardiac Surgery Department in patients with congenital heart disease, ages ranging from 7 months to 28 years. Interaction with the relatives and counseling was done by the medical sociologist in Microbiology.

New initiatives during the year – An amniotic membrane storage facility was requested by the Regional Institute of Ophthalmology and steps were initiated to start it on the lines of the Homograft program. Two meetings were conducted with the Director of RIO.

Research programs and collaborative programs. Internal faculty project on drug resistance in nosocomial infections continued. Data collection was nearly completed.

Major equipment purchased during 2014-15 (above Rs 10.00 Lakhs)

Sl no.	Equipment	Approx. Cost
1	RT-PCR machine	Rs 15 Lakhs

13. Any other information:

1. Evaluation of a thesis on "Hospital based cohort study to estimate the proportion of maternal genitourinary and periodontal infections and associated risk for adverse pregnancy outcomes" by Ms Chaitanya TAK, KMC, Manipal University.- Dr.Kavita Raja
2. Appeals successfully answered as First Appellate Authority of RTI Cell – 29, by Dr.Kavita Raja, FAA, RTI Cell
3. Equipment register started to keep track of performance of all instruments-Ms Sojarani and Ms Sujatha

Staff details:

ACADEMIC

1. Dr.Kavita Raja, DCP, MD, MPhil(Clin.Epidem) – Professor and Head
2. Dr.Molly Antony, MSc, DMV, PhD – Scientist G
3. Dr.Muraleedhar Katti MSc,PhD, FISCD – Associate Professor

TECHNICAL

Smt. Sujatha – Scientific Assistant

Four Technical Assistants, four apprentice trainees with MSc Microbiology and two vocational higher secondary (VHS) trainees

DEPARTMENT OF NEUROLOGY

The Neurology department comprises different subspecialties that provide comprehensive care to patients suffering from various neurological diseases. 6101 new patients attended Neurology clinics and the Inpatient admissions were 2928. The average hospital stay was 6 days and mortality rate 1.47%. Total bed strength 60 beds.

IP bed turn over 2928/60 = 49

Bed occupancy rate 19672/60 =89.835

NEUROMUSCULAR DIVISION

This unit was responsible for the evaluation, investigation and management of patients with diseases of muscles, nerves, plexus and anterior- horn cells of the spinal cord. Besides work up of patients in the outpatient clinics and in-patients in the wards, the unit also conducted a specialty Clinic every Tuesdays to follow up their disease status and response to treatment.

Patient Management Conference

A Multi-disciplinary approach was adopted to manage complex and difficult- to-treat neuromuscular cases, with careful evaluation, discussion and formulation of strategy in the form of targeted modalities of treatment, regular follow up and active rehabilitation to enable the patient to make the best use of motor and physical ability and cope with residual deficits and disabilities. This session was conducted once a week by a team of 3 neurologists with focused interest, a Physiatrist, occupational and Speech therapist and a medico-social worker. In the current year, about 46 cases were discussed.

Group Sessions

Group therapy was conducted for 1 to 2 hours before each review clinic for patients with specific diseases like Myasthenia Gravis. Supervised by the neuromuscular consultant, neuro-nurse and senior medico social worker, patients were encouraged to discuss their problems, clear their doubts and also share their experience with other similar patients. This reinforced their confidence, helping to cope up with their illness, reducing their stress and frustration. During these sessions, they also received updated information on their illness.

Clinico-pathological discussions were conducted once in 2 weeks on muscle, nerve and skin biopsies of patients with neuromuscular diseases, confirming the diagnosis made on clinical and electrophysiological parameters.

ACTIVITIES

Neuro Muscular Review clinic attendance	1581
Large Volume Plasma Exchange	
Small Volume Plasma Exchange	165
High Dose IV Immunoglobulin	69
Thymectomy in Myasthenia Gravis	6
Lab Studies	
Electro Neurophysiology NCV	597
EMG	551
RNS	113
VEPs	280
BAER	110
SSEP	74
Genetic tests	15
Muscle and Nerve Biopsy	37

Plasma exchanges

29 patients underwent large volume PLEX

169 PLEX cycles were done

IV Immunoglobulin use

Indication	Number of patients	Dose (in grams)
Immune neuropathies	17	5035
Myasthenia gravis	5	580
NMO/ NMO spectrum disorders	4	240
Autoimmune encephalitis	11	1280
Epilepsy syndromes	10	1225
Total	47	8360

IV immunoglobulin for Neuromuscular disorders

Indication	Number of patients	Dose in grams
AIDP	9	1075
CIDP	4	2825
Myasthenia gravis	5	580
MMNCB	2	870
Sensory neuronopathy	1	140
Lumbosacral plexopathy	1	125
Total	22	5615

Research

A Long-term Clinical Outcome Study of patients with Myasthenia Gravis based on their immunological profile in Anti-Acetyl choline Receptor and Anti- Muscle specific Tyrosine Kinase antibodies was started.

The International, multi-center, double blind, randomized, parallel-group trial of Interferon 1a versus Daclizumab in Remitting Relapsing Multiple Sclerosis (RRMS)- Protocol 205MS 301 sponsored and funded by Biogen Idec, Basel, Switzerland.,was completed at site. A new study, EXTEND ,an open label study protocol 205 MS 303 of the Daclizumab,was initiated. Studies were intiated on slient period in Carpal tunnel Syndrome, Diabetes and syringomyelia and cognitive aspects in Multiple Sclerosis, the latter study done as part thesis was completed.

The other projects included : Standardisation of temperature measurements in the EMG laboratory, Standardisation of F wave parameters in nerve conduction studies, Family and genetic studies in Myotonic dystrophy patients,

Mortality studies in the neuro medical ICU, inching technique and 2nd Lumbrical/interossi latency difference in the diagnosis of Carpal tunnel syndrome.

Clinical studies in Prion Diseases.

Registry of follow -up patients attending the neuromuscular clinic for the utility of services and Computer database of the biopsy studies in pations with neuromuscular studies were prepared.

Completed projects included :

Clinical radiological correlative study in multiple sclerosis- and MUNE in Motor neurone Disease, Trigeminal Nerve RNS in diagnosis of Myasthenia gravis , clinico electrophysiological correlation in Diabetic Neuropathies and SSPE Natural History study.

Genetic studies in Duchenne Muscular Dystrophy especially on Single Nucleotide Polymorphism (SNP) to evaluate its association with severity and Steroid responsiveness, in collaboration with Rajiv Gandhi Center for Biotechnology, Trivandrum. This was done as part of post- graduate dissertation.

Acute Flaccid Paralysis program: under the National Polio Surveillance Project , Government of India, is a WHO initiative which has identified the neurology department of SCTIMST as a nodal center.In March 2014, India was declared free of Polio infection, this Project continues its surveillance for AFP in children.

Organisation of Conferences:

(i) Organised the First National Symposium on Endovascular Interventions in Acute Stroke & Workshop on Transcranial Doppler (TCD) and Carotid Duplex (Stroke Interventions Trivandrum 2015) from February 26 to 27, 2015 at Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST). This conference was held as a Pre-Congress event to the Annual Conference of the Neurological Scoiety of India (Kerala Chapter) . The Congress was endorsed by the World Stroke Organisation and was inaugurated by Shri. V.S.Sivakumar, Minister for Health, Family Welfare and Devaswom, Government of Kerala and, the Guest of Honor was Brig. Samir Salunke, Station Commander, Trivandrum. (Two pictures attached)

(ii) Organised the Annual Conference of the Neurological Society of India (Kerala Chapter) NSIKC Trivandrum 2015 at Mascot Hotel, Trivandrum from February 28 to March 1, 2015. Dr. Muralidharan Nair, Professor & Chairman of the Dept.of Neurology was the Organising Chairman and Dr. Abraham Kuruvilla, Professor of Neurology was the Organising Secretary. The Conference was inaugurated by Shri. Justice (Retd) P. Sathasivam, Hon'ble Governor of Kerala. (one picture attached)

R Madhavan Nayar Centre for Comprehensive Epilepsy Care, Department of Neurology.

Overview of the Division

R. Madhavan Nayar Center for Comprehensive Epilepsy Care (RMNC) provides comprehensive care for all types of adult and pediatric epilepsies to patients from all parts of

India and the neighboring countries. It is the main center for epilepsy surgery in India and South-east Asia and offers world-class yet affordable comprehensive epilepsy care, comparable to any other center in the world. The mission of the RMNC is as follows: (1) To provide comprehensive medical, surgical, psychosocial and occupational care for patients with epilepsy with a special emphasis on the surgical treatment of medically refractory epilepsies; (2) To undertake advanced clinical and basic science research in various areas of epilepsy; (3) To enhance epilepsy awareness among the primary care physicians and general public; (4) under the subsection of Kerala Registry for Epilepsy in Pregnancy (KREP) to address issues pertaining to women with epilepsy.

New initiatives during the year (including major capital equipment purchased and their end use)

RMNC had initiated regular workshops on EEG and video EEG on a biennial basis and the first workshop was carried out in December 2014. It was attended by around 70 delegates.

A pediatric epilepsy clinic is running all Wednesdays 10 AM to 1PM

A "first seizure clinic" is envisaged to take off in 2015

Programmes (Give the aims and a brief summary. 2-4 relevant photographs may also be appended)

Epilepsy Day awareness campaign held on 17/11/14 at AMC auditorium graced by the presence of noted cine actor-director Sri Balachandra Menon. The Program aimed to promote epilepsy awareness and patient rights and was attended by 120 participants

Special programmes

Rural remote clinic: 12 clinics were conducted at PHC Changaramkulam in collaboration with Alamcode Panchayat Committee.

Special clinic for women with epilepsy at Women and Children Hospital, Trivandrum, (every Tuesday, 10 am - 12 pm.

Epilepsy Camp for detection of epilepsy was organized at Mangam, Allepey in November 2014 attended by 30 patients.

Research programmes and collaborative programmes

A workshop on Metanalysis was organized by RMNC in collaboration with the South Asian Cochrane Centre at AMC auditorium, SCTIMST in January 2015 with Dr. R. Sridharan and Dr Prathap Tariyan from the cochrane centre as faculty.

Status of ongoing/routine activities

Video EEG monitoring- 1267

Intracranial monitoring- 08

Epilepsy Surgery-134

Intra-operative ECoG-115

WADA test-12

Cortical Stimulation & Mapping-03

Honors/awards to staff and students

Dr Pradeep Nair (PDF Epilepsy) won first prize for Best Paper in epilepsy at IANCON 2014, PGIMER, Chandigarh.

R Sruthi S Nair won the first prize for the Best paper award in epilepsy at ECON,Kolkatta, 2014

Comprehensive Care Center for Movement Disorders

Overview

The Comprehensive Care Center for Movement Disorders, the first of its kind in India, provides comprehensive medical and surgical treatment to patients with Parkinson's disease (PD) and various other movement disorders. The center also trains senior residents in Neurology in the diagnosis and treatment of movement disorders, offers post-doctoral fellowship course in Movement Disorders and PhD programs. The program conducts clinical, genetic and neurophysiological research including international collaborative research. A new international collaborative research project and 4 in house research projects were intiated and 4 scientific papers were published. The faculty presented scientific papers at international conferences and gave invited lectures at international scientific meetings.

Routine activities

1. Movement Disorder Clinic: The clinic provides comprehensive care to patients with movement disorders referred from all over India, including medical and surgical treatment, counseling, neuropsychological and psychiatric evaluation and advice on Physiotherapy and rehabilitation. It is conducted weekly by a team consisting of Movement Disorder Specialists, psychologist, social worker, movement

disorder nurse and physiotherapist. 2. Botulinum Toxin Clinic: This clinic is offers treatment to conditions like focal and segmental dystonia, hemi-facial spasm, post-stroke spasticity etc. Special equipments and techniques including Electromyography (EMG) are used to identify the muscles for Botulinum toxin injection. 3. Movement Disorder Surgical Program: The center pioneered Deep Brain Stimulation (DBS) surgery for Parkinson's disease in India. This multispecialty program is performed using state- of- the art techniques like Micro-Electrode Recording (MER) and image guidance (Surgical Planning System and Neuronavigation System). DBS treatment is also offered to patients with other movement disorders like intractable Tremor and Dystonia. The Centre also performs lesioning surgeries like MR-guided radiofrequency lesioning of 'Globus Pallidus' for Parkinson's disease, and Stereotactic Thalamotomy for Essential Tremor. 4.Non invasive brain stimulation and motor physiology lab: The Center is engaged in various internationally and nationally funded research projects using modern research tools like image-guided Transcranial Magnetic Stimulation (TMS). It also performs activities like tremor analysis and back averaging studies.

The following table shows the clinical activities of the Center during the year

Procedure	Number performed in 2014-2015
Movement Disorder Clinic Attendance	1800
Botulinum Toxin therapy	334
Deep Brain Stimulation and Neurostimulator Re-implantations	32
Deep Brain Stimulation programming sessions	60
Transcranial magnetic stimulation sessions	240

New and ongoing research activities

1. LRRK2 role in idiopathic Parkinson's disease
2. Encoding of interhemispheric interactions in mirror dystonia: a window to the physiology of dystonia.
3. Cerebellar modulation of the ventral premotor-motor cortex interaction in shaping the motor output.
4. Developing experimental therapeutics using Transcranial magnetic stimulation for Movement disorders
5. Validation of the Malayalam version of the Montreal Cognitive Assessment scale and a prospective evaluation of mild cognitive impairment in Parkinson's Disease using the Malayalam version (MoCA–M).
6. Association of dopamine receptor (DRD2, DRD3), glutamate receptor (GRIN2B) and serotonin transporter (5HTTLPR) gene polymorphisms in Parkinson's Disease patients with impulse control disorders while on dopamine agonist therapy
6. Elucidation of molecular interactions between autophagy and alpha-synuclein in a cell line with endogenous alpha-synuclein: relevance to Parkinson's disease
7. Study of factors that promote aggregation of alpha synuclein and their influence on the clearance mechanisms: relevance to sporadic Parkinson's disease.
8. Evaluation of the role of abnormal cerebellar processing function in early stages of Parkinson's disease.
10. Ten year-outcome of bilateral subthalamic nucleus Deep Brain Stimulation in PD.
11. Is hearing impairment a non-motor symptom in Parkinson disease? A prospective cross-sectional study

Major equipment purchased during 2014-15

Sl no.	Equipment	Approx. Cost
1	Micro-electrode recording system with electrical stimulator (For Deep Brain stimulation Surgery for Movement Disorders)	Rs. 40 lakhs.

Comprehensive Centre for Sleep Disorders (CCSD), Department of Neurology (project # 6065)

Overview:

The Comprehensive Center for Sleep Disorder (CCSD) of the department of Neurology was started at the Biomedical technology wing of Poojappura of SCTIMST in May 2009, with a mission of providing diagnostic support, patient care, research, training and education of the public about the sleep disorders. This is the first comprehensive care program of its' kind in the country catering to people of

all form of sleep disorders through a disciplined approach. It thereby maintains a cohesive interface with the various other subspecialties in Neurology as well as other disciplines in medicine.

Routine activities:

CCSD has three bedded sleep lab with facilities for polysomnography (PSG),continuous positive airway pressure(CPAP) titration, Multiple Sleep Latency Test(MSLT), maintenance of wakefulness test (MWT) and Suggested Immobilization Test (SIT).Patients are seen in sleep clinic every Thursday between 2-5 pm. These patients in addition to medical consultation undergo neuropsychological evaluation, counseling etc.All patients on CPAP are re-evaluated on Thursdays once every three months in CPAP review clinic. Group sessions moderated by social worker are conducted for patients for over thirty minutes prior to sleep clinic. Patients discuss their problems, experiences and get to know each other.

Designated Activities:

Total number of PSGs = 203

Total number of CPAP trials =71

Total number of MSLT= 13

Comprehensive Stroke Care Division

1. Overview

The comprehensive stroke care program was started in 2011 and we have a 11 bedded unit with 7 stroke ICU beds. The program is managed by a stroke team which involves neurologist, neurosurgeon, vascular surgeon, interventional radiologists and neuroanesthetist. A rehabilitation team with physiotherapist, occupational therapist, speech therapist and stroke nurse are involved in the comprehensive rehabilitation of our stroke patients. Currently we do intravenous thrombolysis for acute ischemic stroke patients , mechanical thrombectomy for acute patients with major vessel occlusion, decompressive hemicraniectomy for malignant strokes, haematoma evacuation in haemorrhagic strokes and carotid endarterectomy and stenting for stroke prevention. In the last four years the number of thrombolysis, mechanical thrombectomy and carotid endarterectomy have increased. Through the stroke unit we were able to improve the door to needle time and reduce the morbidity and mortality of the stroke patients. Our mission is care of stroke patients to improve their outcome and the quality of life. Considering the rising burden of stroke, we need a 20 bedded stroke unit with a separate rehabilitation unit for inpatient and outpatient rehabilitation.

2. Routine activities. (April 2014-March 2015)

Number of stroke patients seen in the clinic - 2555

Number of patients admitted in stroke ICU - 420

Number of carotid endarterectomies- 32

Number of thrombolysis and mechanical thrombectomy - 36

Number of haematoma evacuation - 7

Number of hemicraniectomy- 7

Number of moyamoya revascularization – 6

3. New initiatives during the year

4. Research Programs and Collaborative Programs

Currently we have four international funded projects ongoing and one national funded project. From these research projects we were able to present four abstracts for the International Stroke Conference 2014, three abstracts for the World Stroke Congress 2014, and one abstract for the National Conference of the Indian Academy of Neurology. Two neurology residents who presented abstracts for the World Stroke Congress 2014 received the Young Neurologist award.

Cognition & Behavioural Neurology Section, Department of Neurology

Overview of the Division

The section provides clinical services to patients with cognitive problems and dementia. It also provides advice & technical support to the Alzheimer's & Related Disorders Society of India (ARDSI), a voluntary organization that helps dementia patients and carers. The section also carries out clinical & basic science research in the field of Dementia, Cognition and Behaviour.

New initiatives during the year (including major capital equipment purchased and their end use)

Resting state fMRI in patients with MCI and healthy controls- development of new technology with grant from cognitive science initiative, DST

Designated Activities

1) Conducting a Memory & Neurobehavioural Clinic every week that caters to patients with MCI and dementias.

2) Comprehensive assessment of patients with cognitive problems admitted to the Institute.

3) Counselling of caregivers of patients with dementia along with psychosocial support.

4) Research activties on structural and functional neuroimaging in dementias as well as development and validation of neuropsychological batteries.

Research programmes and collaborative programmes

1) MCI- Sleep study

2) Validation of the Malayalam version of Montreal Cognitive Assessment Battery in a cohort of patients with Parkinson's Disease and cognitively normal healthy controls in collaboration with the Comprehensive Care Centre for Movement Disorders

3) Cognitive Assessment of patients with minor stroke and subtyping of cognitive impairment following stroke in collaboration with the Comprehensive Stroke Care Centre.

4) Control based validation of neuropsychological test batteries for material specific memory impairment in patients with medically refractory temporal lobe epilepsy due to hippocampal sclerosis.

5) " Validation of memory fMRI paradigms and its utility in pre-surgical evaluation of patients with Refractory Temporal Lobe Epilepsy-(TLE)"

6) " Development and validation of a comprehensive clinical and neuropsychological battery for use in the Indian context for patients with Vascular Cognitive Impairment"

7) Non-Linear Analysis of EEG Signals of Patients with Alzheimer's Disease

8)The human brain mapping project a resting state fMRI study of healthy controls and patients with mild cognitive impairment (MCI) & degenerative dementia of the Alzheimer's type (AD)

Status of ongoing/routine activities

Speech Evaluation –1299

Speech therapy – 166

Audio Evaluation – 307

Neuropsychological Testing –1337

IQ Assessments –77

Counseling Sessions –128

Memory & Neurobehavioral Clinic Attendance – 397

New Patients with Dementia –81

Awards for Neurology students/ faculty

- Dr Radhamani M, third year resident, won third prize in the IAN Quiz in Indian Academy of Neurology Conference, November 2014 at Chandigar.
- Dr Joseph Samuel, third year resident, won first prize in platform presentation in NSI- Kerala Chapter Annual Conference, Trivandrum, March 2015 for his paper on 'Resective surgeries in drug resistant tumoral epilepsies – seizure outcome and its predictors'.
- Dr Soumya Sundaram and Dr Sruthi S. Nair, Assistant Professor Ad Hoc, were selected for Young Neurologist Award for their posters in World Stroke Conference held at Istanbul, Turkey in October 2014.
- Dr Manna Jose, PhD, Project Staff, won second prize in platform presentation in NSI- Kerala Chapter Annual Conference, Trivandrum, March 2015 for paper titled "Pharmacogenetic evaluation of methylene tetrahydrofolate reductase polymorphisms in teratogenicity of anti-epileptic drugs in women with epilepsy.

Staff List

Prof. Muralidharan Nair
Head of the Department

Prof. C. Sarada
Professor and Medical Superintendent

Prof. Sanjeev V Thomas
Professor

Prof. Asha Kishore, MD, DM

Professor

Prof. Abraham Kuruvilla
Professor

Dr. P.N. Sylaja
Additional Professor

Dr. Ashalatha.Radhakrishnan, MD, DM
Additional Professor

Dr. Sajith. S
Associate Professor

Dr. Syam Krishnan, MD, DM
Associate Professor

Dr. Ramshekhar Menon, MD, DNB, DM, Post Doc. Fellowship in Epilepsy Assistant Professor

Dr. Sapna ES
Assistant Professor

Dr. Ajit Cherian
Assistant Professor

Staff of EEG Lab

Nandini. V.S

Preetha Govind G

Salini K.R

Shana N Nair, DNT (Senior PSG technician)

Pradeep MJ, DNT (Senior PSG technician)

Anees CA, DNT (Senior PSG technician)

PhD Students:

Swapna Nandakumar

Bejoy Vijayan

Sheela Kumari R, MSc, M. Phil- Physics

Post-Doctoral Fellows:

Dr Sunitha Raj (2014)

Dr Roopa Rajan (2015)

Research fellows

Densa Mary Shajan. B.Tech

Arun Mathew George. B.Tech

Uma K. BTech

Ashwin S (M.Tech)

Neuropsychologists-

Aley Alexander (MA Psychology)

Gangadhara Sarma S, MA

Sunitha Justus (MA Psychology)

Geetha.M. G (MA Psychology)

Occupational Therapist-

Lincy Phillip

Speech Therapists

Manju Mohan , MSc Speech Language Pathology

Manita Thomas , Masters in Audiology & Speech Language Pathology

Sociologist-

Lekha V S (MA Sociology)

Senior Research Fellow

Rajesh PG (Msc Computational Biology)

Mr. Unnikrishnan J. P , MA, MSW, PGDHM, M. Phil (Social Worker cum Programme co-ordinator)

Mrs. Asha GN (Staff Nurse)

Mrs. Suchitra N, DNT (PSG technician)

Mrs. Aswathy, DNT (PSG technician)

Mr. Praveen James, B.Tech (Engineer B,Adhoc)

DEPARTMENT OF NEUROSURGERY

Overview

The Department of Neurosurgery at SCTIMST caters to ailments in various subspecialties including skull base surgery, cerebrovascular disorders, neuro-oncology, epilepsy surgery, pediatric neurosurgery, surgery for movement disorders and spine surgery with extensive experience in surgical management of various disorders. The department aims at delivering quality health care using state of the art equipment, keeping in mind the socio-economic factors of the patient population and cost-effectiveness. It also strives to generate a new breed of young neurosurgery talents who will propagate this mission all over the country.

Routine activities: The last one year has witnessed the department surging forward with increased patient turnover and performance of more complex surgeries with quality results. This was reflected in the list of academic and research platforms where faculty members were integral contributors, including invited lectures at plenary sessions, moderators for complex issues in neurosurgery, guest lectures and live operative workshops including the 6th annual educational course of the Neurological Society of India conducted in Lucknow in August 2014. Prof.Nair was a visiting Professor to All India Institute of Medical Sciences, New Delhi, and gave guest lecture to the faculty and students in Feb 2015. The number of observers from various teaching hospitals in the country doubled. The residency program, which is one of the most structured one in the country, trained four residents per year aiming at development of specialists who will excel in neurosciences and possess all skills required to pursue an academic career or patient related social practice. Exposure to a wide range of disorders and bedside discussions on technical problem solving and decision making aspects of neurosurgery made them independent in clinical and operative decision-making. Regular teaching rounds and seminars promoted their involvement in discussion of current issues with emphasis on recent advances and management protocols. Journal discussions and neuro-radiology sessions also contributed to the evolution of better patient management strategies.

New initiatives during the year

With the arrival of the flat panel image intensifier, hybrid neurovascular procedures gained momentum in the department. Patients who required multi-modality treatment for complex vascular anomalies were the chief beneficiaries.

Research programs and collaborative programs.

The department was involved in the joint program for Biomedical engineering (M Tech and PhD) in collaboration with IIT Chennai and VIT, Tamil Nadu. The trainees were exposed to various avenues where technology shakes hands with clinical neurosciences.

Major equipment purchased during 2014-15 (above Rs 10.00 Lakhs)

Sl no.	Equipment	Approx. Cost
1	Image Intensifier (Zeihm Vision RFd)	Rs. 1.3 Cr

A summary of the operative procedures done during the year is as follows

Table : 1

Intracranial aneurysms	134
AVMs	20
Cavernoma	11
Vestibular schwannoma and other CP angle tumors	57
Pituitary tumors	41
Craniopharyngioma	28
Spinal tumors	38
Cervical degenerative disease	15
AAD	09
Chiari malformation	20
Glioma s	124
Meningiomas	102
Colloid cyst	17
Pediatric and adolescent posterior fossa	37
Epilepsy Surgery	134
Movement disorder: Deep Brain Stimulation and Neurostimulator re-implantations	32

Endoscope assisted procedures	70
Others	482
Total	1371

Staff details

- Suresh Nair MCh Professor & Head of the Department
- Girish Menon MCh, DNB Professor (resigned in Dec 2014)
- Mathew Abraham MS,FRCS, MCh, Associate Professor
- H V Easwer MCh (on leave), Additional Professor
- K. KrishnakumarMS,MCh, Associate Professor
- CV Gopalakrishnan MS, MCh, Associate Professor (resigned in July 2014)
- George VilanilamMS, MRCS, MCh, Assistant Professor
- Jayanand Sudhir B.MCh, Assistant Professor (adhoc)
- Prakash NairMS,MCh, Assistant Professor (adhoc)
- Vishwaraj P Ratha MS, MCh, Assistant Professor (adhoc)
- Tobin George MCh, Assistant Professor (adhoc)

Post doctoral Fellow

Deepak Kumar Parida MCh: Post doctoral Fellow in Neurovascular surgery

MCh Trainees (residents).

1	Dr. Adam K	MS
2	Dr. Chandrashekhar T S	MS
3	Dr. VarunAgarwal	MS
4	Dr. Vishal Dabare	MS
5	Dr. Sridutt BS	MS
6	Dr. RanjitR	MS
7	Dr. Vishal T	MS
8	Dr. Vihang S	MS
9	Dr. Gopikrishnan	MS
10	Dr. Pankaj S	MS
11	Dr Bimal K P	MS
12	Dr. Shashank A	MS

DEPARTMENT OF PATHOLOGY

Patient care services including Surgical Pathology, Cytopathology, Squash preparations for rapid per-operative diagnosis and immunological tests were offered for Cardiology, Neurology, Cardio-vascular and Thoracic, Neurosurgery and Imaging Sciences & Interventional Radiology Departments. Immunohistochemistry was employed wherever required for accurate and definitive histopathological diagnosis. Fine needle aspiration cytology (including CT- and MRI-guided FNAC), provided rapid preoperative diagnosis in many mediastinal and pulmonary tumours. Rapid and accurate per-operative diagnosis was given on squash preparations for neuro-surgical cases. ELISA-based Immunology tests helped in better patient management and treatment.

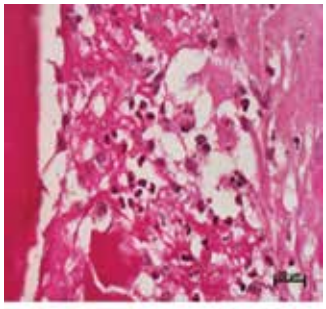
Interesting and unusual tumours and inflammatory lesions were discussed with and demonstrated to concerned clinicians and residents during weekly classes. These were also published as case reports. MD Pathology students from Pushpagiri Medical College and Regional Cancer Centre, Trivandrum, spent two weeks each in the Pathology Department as Observers.

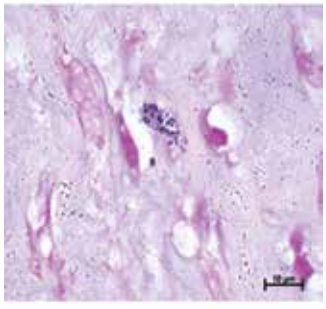
The Pathology Department initiated a new Academic Programme by conducting the first Grand Clinico-Pathological Conference (CPC), inviting Prof. Sudaya Kumar, retired Cardiologist, Kottayam, as the discussant. The management of the case was discussed in detail by Dr. Thomas Titus, Professor and Head, Cardiology Department, followed by discussion on possible diagnoses. This was a clinically challenging case of a young lady with a pseudo-aneurysm of unknown etiology, around the aortic root, affecting the conduction system of her heart.

Unexpectedly, the histopathological examination showed typical findings of acute rheumatic involvement of the aortic valve and causing a Takayasu's type of aortic wall inflammation also. The biopsies showed the presence of numerous Gram positive cocci in and around the Aschoff lesions, which were conclusively shown to be Group A Streptococci, using specific antibodies (Figure 1a, 1b). Also, Aschoff lesions were shown to contain mixtures of degraded connective tissue mucins (proteoglycans) and fibrin. The case provided concrete evidence for the first time that Group A Streptococci were directly responsible for causing both rheumatic valve disease and Takayasu's disease of the aorta. In addition, the biopsy from this CPC case showed formation of a biofilm over the surface of aortic valve and the presence of yeast organisms also.

The Grand CPC elicited a tremendous response from faculty and students of the Institute, from the Medical College and other institutions. Based on the histopathological findings and the discussions, the patient was treated with specific anti-rheumatic and anti-fungal therapy and she had a dramatic improvement. The Grand CPC case was an eye-opener and provided fresh insights into the etio-pathogenesis of rheumatic and Takayasu's diseases, which was eluding medical scientists for several decades. The presence of streptococci and abnormal proteoglycans in other rheumatic cases was confirmed by Dr. Deepa Surendran (PhD Scholar with Institute fellowship). The implications of these findings are that infective organisms lurking in rheumatic valve tissue can potentially flare-up and cause considerable morbidity and even mortality due to variations in the immune status of the patient, particularly in the post-operative period following valve replacement. Hence definitive anti-rheumatic therapy should be recommended for all such patients.

Dr. Santhosh Kumar, DST Fast Track Fellow, continued studies on characterization of lung and chest tumours based on auofluorescent biomarkers. He found important differences in the pattern of autofluorescence between the types of common tumours. He also developed a rapid and simple method of photo-bleaching to suppress interference by background autofluorescence of the glass microslide substratum and of the tissue sections. This resulted in clearer and sharp autofluorescence exhibited by the tumour cells. The technique has wide applications in immunofluorescence studies also.





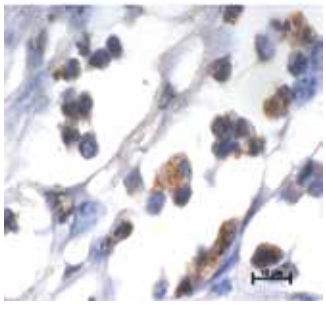


Table 1.

List of diagnostic investigations carried out in Pathology Department (2014-2015)

Histopathology (Neuro, Cardio-Vascular &Thoracic Biopsies)	1402
Rapid Cytology / Frozen Sections	396
Cytology	60
Immunology Tests	3355

Legends

Cover Page: The Aschoff body, typical of rheumatic disease, is a collection of macrophages and other inflammatory cells around degraded masses of mucin (proteoglycans) and fibrin.

Figure 1a. A cluster of Gram positive cocci is seen within a pocket of mucin in the section of heart valve.

Figure 1b. Immunohistochemistry with specific antibodies shows positively stained brown coloured Group A Streptococci engulfed by macrophages in a rheumatic valve lesion.

Additional Information:

- Dr. S. Sandhyamani was Member of Bio-Safety Committee, Central Tuber Crops Research Institute, Trivandrum.

Staff:

Dr. S. Sandhyamani, MD, FAMS, FICP
Professor & Head

Dr. Amita R., MD, DNB
Ad-Hoc Consultant

Ms. Sushama Kumari P., BSc, MLT
Junior Scientific Officer

Mr. James T., MSc, MLT
Junior Scientific Officer

Ms. Neena Issac, MSc, MLT
Technical Assistant A

Ms. Resmi S.R., BSc, MLT
Technical Assistant A

Mr. Omanakuttan,
Unit Helper

Dr. Deepa Surendran, MVSc
PhD Scholar (Institute Fellow)

Dr. Santhosh Kumar, PhD (Biophysics), MAMS
DST-SERB Fast Track Fellow

COMPREHENSIVE PAIN CLINIC

Comprehensive multidisciplinary pain clinic completed 3 years on 31st March 2015. We run OPD services on Friday 2 p.m. onwards. A multidisciplinary team was involved in patient care. Patient management decisions were taken based on broad consensus. We were involved with Interventional Pain Management in patients with chronic pain conditions.

Services offered and procedures performed:

1. Trigger point injections

1. Musculo-skeletal infiltrations

2. Nerve blocks

1. Transforaminal injections

1. Sacro-iliac joint interventions

1. Selective dorsal root ganglia radiofrequency ablation

1. Facet joint interventions

1. Epidural steroid injection

1. Radiofrequency ablation in Trigeminal neuralgia

1. Radiofrequency ablation of Stellate ganglion in CRPS

1. Ozone therapy

Figure: Pudendal nerve block using robotic arm- Precise Intelligent Guide Arm (PIGA)

Types of referrals to the clinic

Persons presenting with chronic non-cancer pain

a. Low back pain

a. Neck pain

a. Musculo-skeletal pain

a. Facial pain

a. Shoulder and arm pain

a. Painful digits

a. Complex regional pain syndrome

a. Post-Herpitic neuralgia

a. Patients with poor response and tolerance to medications

a. Patients with poor surgical fitness / surgical outcome / poor willingness for surgery

Although equipped to treat patients with intractable cancer pains (e.g. patients with pancreatic carcinoma, gastric carcinoma, head and neck cancer), the main focus was on chronic non-malignant pain.

How the patients were referred and registered:

- referred to the pain clinic by the primary physician in OPD
- Appointment to be taken for Pain clinic at SCTIMST on Fridays -2pm, from MRD

1. Some patients were referred directly by physicians from other government/private hospitals

2. All the patients were registered under pain clinic separately (PC 01/PC02 code) and a separate file for the individual patient was made and kept separately. However their primary registration remained with NM/NS/CM/CS/RD (even in the case of patients with direct referrals)

Treating Pain Physicians:

Multidisciplinary Pain Team comprising faculty members from:

- Physical Medicine and Rehabilitation
- Interventional Radiologist
- Anesthesiologist
- Neurologist
- Neurosurgeon
- Pain Nurse

Our clinical service in last 1 year (1st April 2014-31st March 2015)

- Total patients catered to by the clinic OPD & interventions: 658
- Major interventions performed - PC-07 (under fluoroscopy- trans foraminal, sacro-iliac joint injection, facet joint injection, stellate ganglion block/RF, gasserion ganglia RF ablation, intra-discal ozone injection): in 19 patients
- Minor interventions performed - PC-03, PC-04, PC-16 & PC-17: (nerve block, plexus block, musculo-skeletal injections/infiltrations, trigger pint injections): in 44 patients

Procedure	Name	A	B	B1	C	D	TOTAL
PC01	NEW REGISTRATION						54
PC02	REVIEW PATIENTS	43	79	107	21	291	541
PC03	INTERVENTIONS (MINOR 1)		1	2		3	6
PC04	INTERVENTIONS (MINOR 2)		2	3		8	13
PC07	INTERVENTIONS (MAJOR 2)	1	1	3	2	12	19
PC16	TRIGGER POINT INJECTIONS		4	1		4	9
PC17	MUSCULOSKELETAL INFILTERATIONS	1	2	1		12	16
		45	89	117	23	330	658

Nature of the procedure	Description of the procedure	Code of the procedure	Charges for the procedure
Interventions (Minor I)	Epidural steroid injections, nerve blocks, ozone therapy	PC 03	Rs. 1000/-
Interventions (Minor II)	Trans foraminal epidural steroid injections, CT guided injection procedures	PC 04	Rs. 2500/-
Interventions (Minor III)	Trans foraminal epidural steroid (multiple sites), facet joint diagnostic blocks, laser discectomy, CT guided Radiofrequency (RF) ablation procedures	PC 05	Rs. 3500/-
Interventions (Major I)	Dorsal root ganglion RF ablation, facet joint RF ablation of medial branch, sacro-iliac joint interventions, ozone discectomy	PC 06	Rs. 5000/-

Interventions (Major II)	RF ablation in trigeminal neuralgia, facet joint RF ablation of medial nerve (multiple sites), dorsal root ganglion RF ablation (multiple sites), RF/chemolysis of lumbar sympathetic ganglion, RF ablation of stellate ganglion	PC 07	Rs. 6000/-
Interventions (Major III)	Vertebroplasty, laser ablation of osteoma	PC 08	Rs. 6500/-
Interventions (Risk)	Any intervention with added risk, requiring sedation, additional monitoring, monitored anesthesia care or general anesthesia	PC 09	Rs 2500/- (in addition to standard procedure charges)
Physiotherapy	Pain exercises (single day)	PC 10	Rs. 100/-
Physiotherapy	Pain exercises (5 day package)	PC 11	Rs. 450/-
Physiotherapy	Pain exercises + TENS/IFT/UST/traction/ES (single day)	PC 12	Rs. 150/-
Physiotherapy	Pain exercises + TENS/IFT/UST/traction/ES (5 day package)	PC 13	Rs. 650/-
Physiotherapy	Pain exercises + any two of TENS/IFT/UST/traction/ES (single day)	PC 14	Rs. 170/-
Physiotherapy	Pain exercises + any two of TENS/IFT/UST/traction/ES (5 day package)	PC 15	Rs. 750/-
Rehabilitation	Trigger point injections	PC 16	Rs. 300/-
Rehabilitation	Musculoskeletal infiltrations (local anesthetic)	PC 17	Rs. 400/-
Rehabilitation	Musculoskeletal infiltrations (local anesthetic + steroid)	PC 18	Rs. 500/-
Rehabilitation	Joint aspiration/infiltration/tendon sheet infiltration	PC 19	Rs. 600/-
Consultation charge	Consultation with clinical psychologist	PC 20	Rs. 150/-
Pain Clinic new			
registration	Registration of a new patient in the clinic	PC 01	Rs. 200/-
Pain Clinic			
review	Review charges for a patient already registered in the Pain Clinic	PC 02	Rs. 100/-

Our intended future initiatives:

- Organizing awareness programs
- To reach more number of patients and to widen the scope of the clinic
- Interactions and exchange programs with similar governmental/NGO organisations
- To conduct scientific studies to assess the extent and impact of common pain conditions in the population
- Technology development

To initiate Spinal Cord Stimulator (SCS) implantation and Implantable Intra-thecal drug delivery systems (ITDDS)

DEPARTMENT OF TRANSFUSION MEDICINE

Overview

The Department stepped into its next phase of growth with the introduction of a PG program, MD Transfusion Medicine, from Jan 2015. This will open new avenues of teaching and research in the department. After complete evaluation of the infrastructure and facilities in the department, Department of AIDS control (DAC) selected the centre as a training centre for doctors, technicians and nurses from different parts of the State.

Routine activities: The Department continued to provide state of the art and high quality transfusion support to the patients round-the-clock. A total of 7482 units of blood were collected in the year 2014. Optimum use of blood collected was ensured by 100 percent component separation. We increased our voluntary donor collection to 68% with a target 100% voluntary collections, thus taking the responsibility of arranging blood donors off the shoulder of patients. We initiated steps to provide leuco-filtered blood to our patients to increase transfusion safety.

New initiatives during the year

a. The Department took the initiative to start Post-graduate program (MD) in Transfusion Medicine in the year 2014-15. The Institute Governing Body approved the program and an All India entrance examination was conducted to select candidates for the course. The course was started from 1st of January 2015 and one student got enrolled.

b. Thanking blood donors through messages and intimating them their blood groups and test results were initiated. This helped us to improve the regular donor base by reminding them by electronic message.

c. Upgraded Transfusion Transmissible infection screening methods from ELISA to Immunofluresent Technology.

Mrs .Sindhu M.S Technical Assistant received first prize for her presentation of the paper titled Acquired B in a patient with missing antibodies at the 23 rd ISBTI chapter meeting held at Thrissur in August 2014.

Staff Details

1.Dr. Jaisy Mathai MBBS, DCP HOD & Scientist G (Senior Grade)

2.Dr.P.V Sulochana MBBS Scientist G

3.Dr.Debasish Gupta MD Prof.,Transfusion Medicine

4.Dr.Sathyabhama.S MBBS Scientist G

5.Dr Usha Kandasamy MSW. Senior Scientific Officer

List of students

1. Dr.Revathy Nair MBBS MD Transfusion Medicine - Junior Resident

2. Ms Abhija DBBT student.

3. Ms Aswathy DBBT student.

PHYSICAL MEDICINE & REHABILITATION

The Department offered support services to the clinical specialties. It functioned under a Visiting Professor (Dr U Nandakumaran Nair) and five Physiotherapists.

1. During the year 2014 – 15, the patient care services were:

Sl No	Clinical specialty	No of sessions
1	Cardiac Surgery ICU	1800
2	Cardiac Surgery Ward	1157
3	Cardiology ICU	28
4	Cardiology Ward	10
5	Congenital Heart Surgery ICU	1180
6	Congenital Heart Surgery Ward	482
7	Epilepsy Ward	18
8	General Medical Ward	90
9	NIC	84
10	Neurology	09
11	Neurology ICU	569
12	Neurology Ward	450
13	Neurosurgery ICU	733
14	Neurosurgery Ward	392
15	PMR	9357
16	OPD Services	4328

2. The Physiotherapy section under PMR works from 8 am to 6 pm. The Rehabilitation Clinic functions from 8 am to 10 am on Tuesdays and Wednesdays. It receives patients with rehabilitation needs. Last year, about 300 patients had consultations in the Clinic.

3. The PMR is an active participant of the Pain Clinic. Various physiatric interventions are being done in the clinic. Patients who need physiotherapy are being seen in the PMR department.

4. New Equipment: The PMR has acquired new equipment like the Monarch Ergo cycle system, and Dynamic Posturography System. A new Treadmill has been purchased and is about to be installed.

5. Advanced Certificate Programme in Physiotherapy: Two new programmes in Physiotherapy in Cardiovascular Sciences and Neurological Sciences have been approved. These are 1-year programmes and are to start from the coming academic year.

6. Observership: The PMR now offers regular short-term Observer training to students in Physiotherapy.

7. Examinership: P V Vijesh, MPT PhD, officiated as external examiner for the BPT programme of M G University, Kottayam.

Staff Details

- Visiting Professor: Dr U Nandakumaran Nair
- Senior Physiotherapist: Ms G. Deepa
- Physiotherapists – A: Mr K Aji, Dr PV Vijesh, Mr S Rahool, Ms Jijimol George (Ms Jijimol is now on maternity leave)

BIOMEDICAL TECHNOLOGY WING

Our Mission

- To develop innovative healthcare technologies and translate them into patient care
- To undertake research in frontier areas of biomedical science & engineering
- To generate competent biomedical professionals through education & training
- To offer internationally accepted medical device testing & evaluation

Our Vision

- To become a global leader in developing and translating affordable healthcare technologies through innovative research, education & training by 2020

FROM THE HEAD OF BIOMEDICAL TECHNOLOGY WING

For the Biomedical Technology Wing, the year 2014-15 provided a unique opportunity to enhance its core activities. On the technology transfer front, Dental Caries Dissolver used to remove dental caries before restoration of teeth was transferred to Dr. Tom's Laboratory Pvt Ltd, Calicut. The clinical evaluation of the tissue engineered graft for large segmental bone defects at the Christian Medical College, Vellore progressed smoothly. The project for the development of fluoro-passivated and gel sealed vascular graft completed all preclinical studies and is ready for clinical evaluation. Projects for development of electromagnetic flow meter, ceramic-coated coronary stent and dural substitutes for cranioplasty made substantial progress. The tissue engineered corneal endothelial construct, cartilage, wound care construct and bio-artificial liver programs also show promising results.

The Institute Governing Body resolved to initiate the setting up of two centres for mission mode R&D in cardiovascular and neuroprosthetic devices. These centres will be entities to address cardiac and neurology related needs of the patients and clinicians and to find unique solutions which are appealing to the market. Major devices planned are deep brain stimulators (DBS), left ventricular assist devices (LVAD) and catheter based endovascular devices with their own spin off devices. Some of the related areas are the non-invasive monitoring devices and wireless power transfer systems. These centres will consist of scientists / engineers, clinicians and industrialists working together hands to hand with a shared vision.

A Technology Incubator for Medical Devices and Biomaterials (SCTIMST-TIMed) for fostering the growth of entrepreneurship culture in the medical device domain is being established at the BMT Wing. The TIMed is designed as a partnership entity among SCTIMST, Kerala State Industrial Development Corporation (KSIDC) and Department of Science & Technology, Govt. of India. TIMed will have all basic facilities for the development and pilot production of medical devices. The facility was launched by the Hon. Minister for Science Technology, Government of India in May 2015.

The BMT Wing, SCTIMST has been chosen as the National Collaborating Centre for the Matero-Vigilance program of India (MvPI). This is an initiative for safety data collection so as to enable regulatory decision and recommendations on safe use of medical devices and will be run in in collaboration with the Central Drug Standard Control Organisation (CDSCO).

During the year, BMT Wing continued to build productive partnerships with industry as well as academic institutions. The quality management system being practiced at the Biomedical Technology Wing went through the periodic auditing of the third party accreditation agencies. The surveillance audit in the area of biological evaluation of materials was successfully carried out by Le Comité Français d'Accréditation (COFRAC, France). The National Accreditation Board for Testing and Calibration (NABL, India) carried out its audit of the calibration facilities and extended the accreditation.

The academic activities, PhD programs, M Tech in Clinical Engineering and M Phil in Biomaterials Technology continued smoothly during the year. The BMT Wing provided training to many young technicians as part of its apprenticeship-training program.

Generation of intellectual property continued to be the focus of applied research at the BMT Wing. Applications for seventeen new Indian patents and one International patent were filed during the year. Over 80 research publications during the year with average impact factor of about 3.0 signifies the state of competitive research in the campus.

On the whole, in the year 2014-15, the Biomedical Technology Wing strove to excel in all its areas of activities like device development, biomaterials research, accredited testing services and academic programs. Many new programs were initiated to propel the BMT Wing to new heights in the years to come.

BIOMEDICAL TECHNOLOGY WING

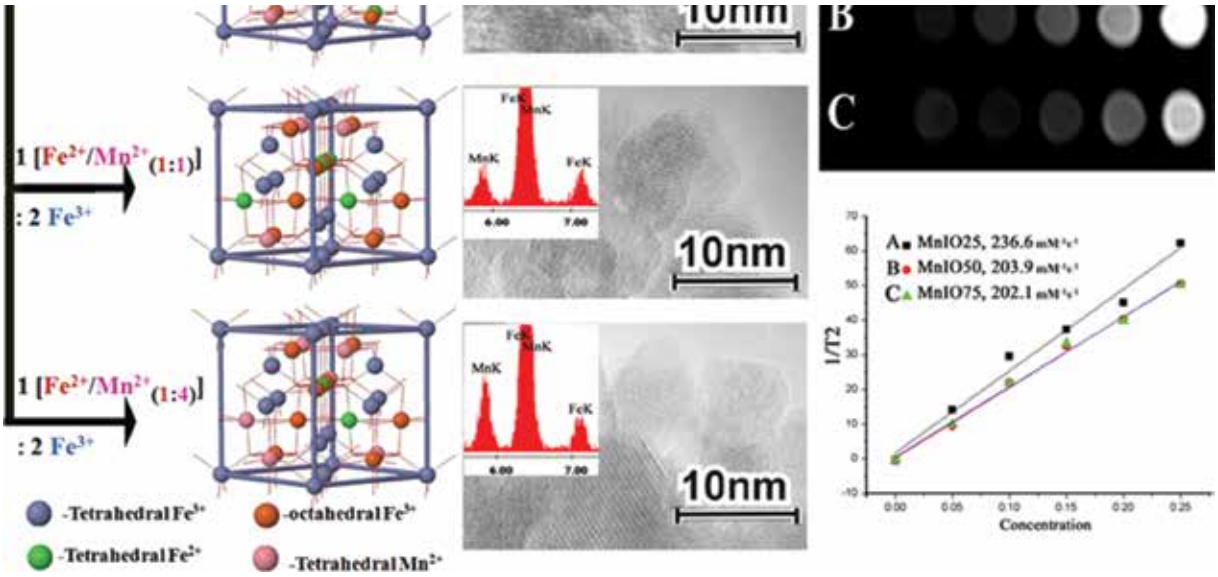
Biomaterials / Biological research and development activity

Bioceramics Laboratory

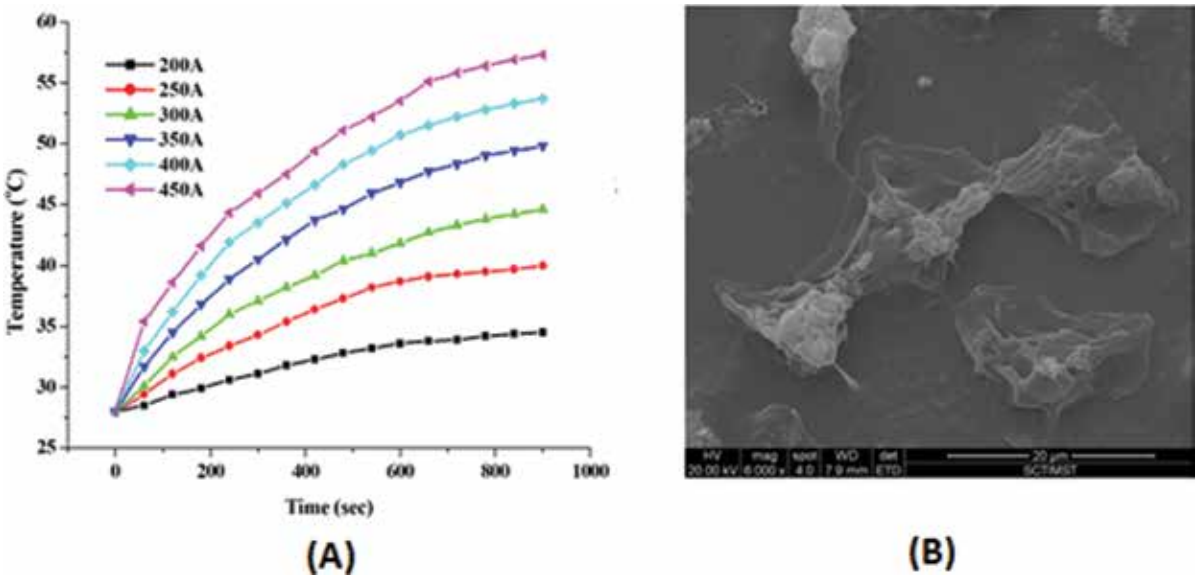
Magnetic nanoparticles for contrast enhancement in MR imaging and hyperthermia therapy

Magnetic nanoparticles have great attention in the last decades due to their outstanding magnetic features and biomedical application especially in the case of MR imaging contrast enhancement and hyperthermia therapeutic approach. Magnetic resonance imaging is one of the most efficient molecular level 3D imaging technique to visualize biological process within the living system. In order to improve the visualization or make good contrast effect in images, various inorganic nanoparticles has been used. Similarly, these magnetic nanoparticles are used for non invasive hyperthermia since the magnetic nanoparticles can generate controlled hyperthermia temperature under alternating magnetic field. This is useful for cancer therapy because the cancer cells are more sensitive to elevated temperature than normal tissue cells.

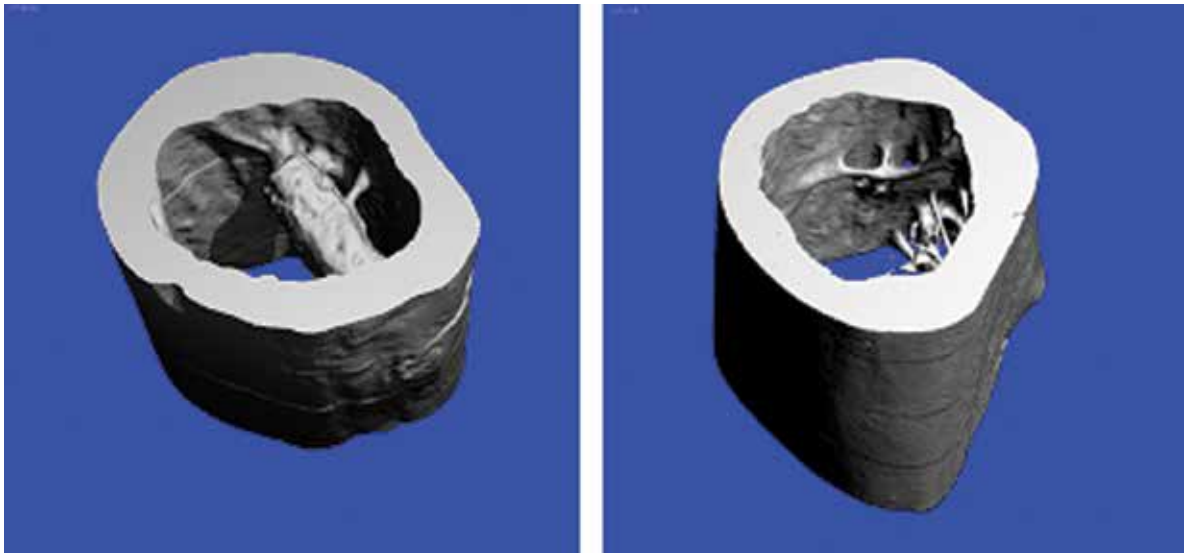
Among the various nanoparticles, the superparamagnetic iron oxide particles [SPIONs] are getting importance as better contrast agent in MRI against conventional heavy element based ones. Further to improve the contrast efficacy, magnetic properties and hyperthermia efficiency, various structural modifications are carried out in the spinel form of SPION. In our study, we have developed an easily aqueous dispersible manganese substituted iron oxide nanoparticles [MnIO] containing approximately four times higher contrast efficiency than bare iron oxide particles. The same particle's temperature generation with respect time under alternating magnetic field has been evaluated. The therapeutic potential of MnIO evaluated under in vitro condition and confirmed via advanced techniques. Also these particles revealed excellent blood compatibility characteristics, cytocompatibility and cellular internalization properties. Taken together, MnIO prove to be highly useful in the design of nanoparticles for biomedical theranostic application.



Schematic representation of manganese substituted iron oxide development and its corresponding nanoparticles contrast enhancement evaluation in aqueous solution.



(A) Time-Temperature graph of MnIO particles under alternating magnetic field (B) Magnetic nanoparticles hyperthermia induced In vitro cell destruction abilities evaluated by ESEM microscopic technique.



Micro CT analysis - 26 weeks after implantation of hydroxyapatite ceramics (control, left picture) and new cement (test material, right picture)

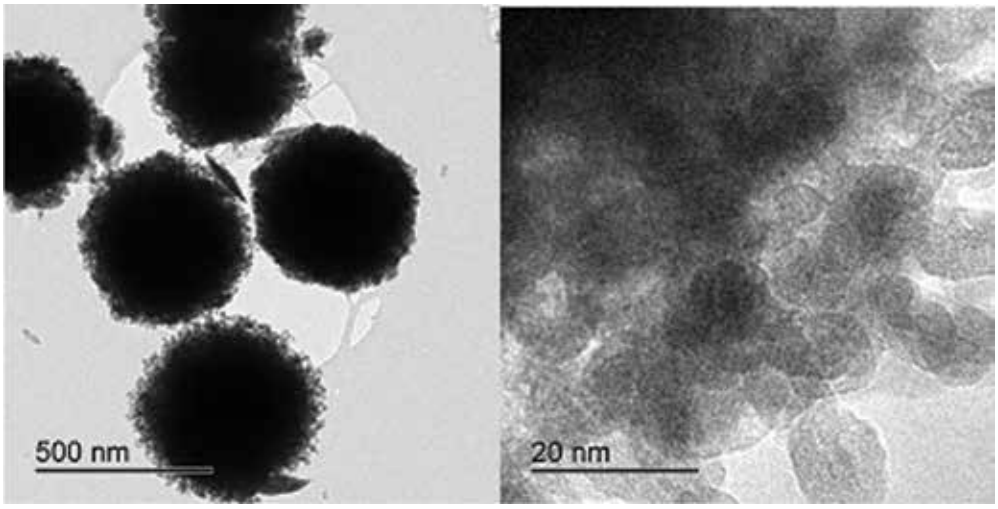
Injectable calcium sulphate bone cement

Toxicological evaluation has been conducted on the newly developed calcium sulfate - phosphate injectable cement formulation to study the safety. Various essential tests as per ISO 10993 Standard (Biological evaluation of medical devices - evaluation and testing within a risk management process). The product qualified all the essential tests prescribed for a bone graft substitute. Thereafter, long term implantation test for different time period was carried out to assess the efficacy of the product. The cement has been implanted in critical sized bone defect in rabbit femur with porous hydroxyapatite as control. The Micro-Computed Tomographic images of the implanted sites after 26 weeks are shown below. Only slight resorption of the HA with partial degeneration of the bone was observed in the control site.

The new cement was found to undergo almost complete resorption with regeneration of the host tissue. Histological analyses are ongoing to reconfirm the analysis.

Rare Earth Based Fluorescent Upconversion Nanomaterials for Biosensor Applications

An important feature of rare earth (lanthanide) doped phosphors in addition to their high photochemical stability and long fluorescent life time is their ability to emit photons in the visible range after being excited with infrared light, in a process known as upconversion. Hence lanthanide phosphors are supposed to have many applications in biomedical field, especially in the area of biosensors. Different NaYF4-rare earth based upconversion nano systems (NaYF4 doped with Yb/Er, Yb/Tm, Yb/Ho, Yb/Ce/Ho) have been synthesised. The change in upconversion fluorescence with the addition of new born calf serum (NCS) and myoglobin (Mb) in selected systems has been observed, as a part of detection trials. But to increase the specificity, the antibody of the biomarker is attached to the nanoparticles, via surface functionalization and crosslinking. The attachment is confirmed by dot blot. Antibodies of different biomarkers including myoglobin and cardiac troponin have been tried. Different concentrations of biomarkers are added and the fluorescence is measured to see the limit of detection. In order to reduce the detection limit in the ng/ml regime, trials are going on with different rare earth systems. A fluorescence resonance energy transfer (FRET) based detection scheme has been elucidated in order to reduce the detection limit. Rare earth doped silica substrates (La, Ce and Pr doped crack-free silica substrates) have been prepared adopting a sol-gel method, in order to study the basic upconversion properties of rare earth systems.



A part of this work, Padmaja Parameswaran Nampi, Harikrishna Varma, Biju P. R., Tarun Kakkar, Sikha Saha, Paul Millner, Gin Jose, Sodium yttrium fluoride based upconversion nanophosphors for biosensing has been presented at Sixth International Conference on Optical, Optoelectronic and Photonic Materials and Applications (ICOOPMA-2014), July 27-Aug 1, Leeds, UK.

Biophotonics and Imaging laboratory

Main activities comprises development of biosensors, in vitro diagnostics (based on various imaging techniques), nanocarriers for brain diseases, liver diseases and cancer. Most of these works are based on nanomaterials synthesized and tuned to have required properties to suit the applications.

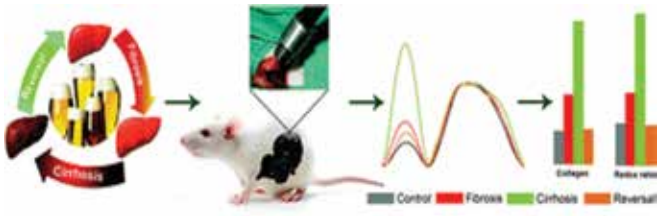
In brief, in the laboratory, Superparamagnetic Ironoxide nanoparticles (SPIONs) based multimodal nanoprobes are being synthesized and modified for the use as MR and Optical imaging based contrast agents. Many of the probes were tested in vivo on liver fibrosis induced Wistar rat models using MRI and optical imaging techniques.

Also, Hybrid nano materials are one of the most promising candidates in various fields because of the various properties of the parental nano materials. We have developed a hybrid system based on Carbon nanotube (CNT) and qantum dot (Qd) and it is modified for tumor targeting. Targeted Photothermal therapy has been demonstrated

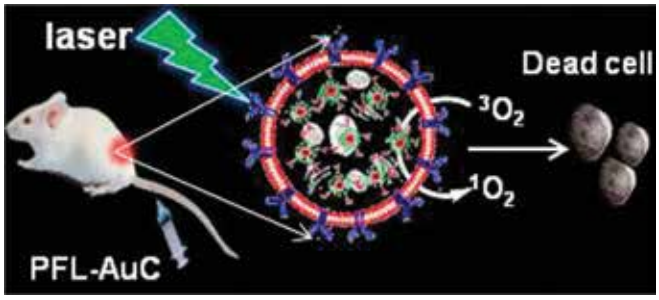
at the cellular level. In vivo tumour imaging and therapy with this system has been completed. The work has been appeared as the cover page of the International Journal "Small" in its 14th issue of 2014.

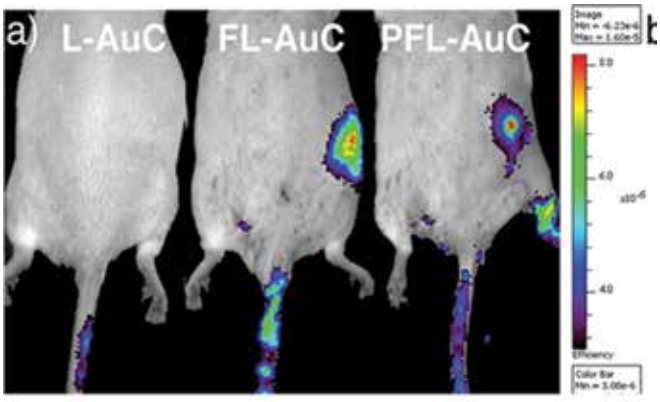
Gold quantum clusters, which are a new group of materials are being tested for its efficacy in sensing, imaging and therapy and has been found to be a highly potential material with apparently no side effects.

Our lab also reports the Optical pathology for the diagnosis of liver diseases. This has been done through minimally invasive procedure using autofluorescence spectroscopy on intoxicant, carbon tetrachloride induced liver damage in a rodent model. Different stages of liver damage, including the reversed stage, on stoppage of the intoxicant were examined. Emission from prominent fluorophores, such as collagen, nicotinamide adenine dinucleotide (NADH), and flavin adenine dinucleotide (FAD), and variations in redox ratio have been used for the diagnosis. A direct correlation between the severity of the disease and the levels of collagen and redox ratio was established. On withdrawal of the intoxicant, a gradual reversal of the disease to normal conditions was observed as indicated by the decrease in collagen levels and redox ratio.



In another work, we have synthesized a near-infrared-emitting gold quantum cluster capped with lipoic acid based nanoplatform with excellent tumor reduction property by incorporating a tumor-targeting agent (folic acid) and a photosensitizer (protoporphyrin IX), for selective Photodynamic therapy. Effective destruction of tumor cells was evident from the histopathology and fluorescence imaging, which confirm the in vivo PDT efficacy of PFL-AuC. This work has been published in the Journal ACS Nano.





In vivo targeted tumor imaging

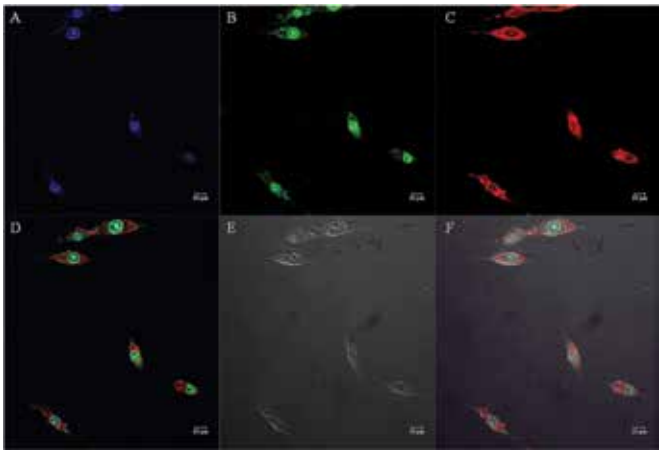
Other works in progress in the lab include 1. Vanadia nanoparticle based system has been developed and its anti diabetic 2. Detection of Zinc in epileptic condition using ratiometric fluorescent molecular probes is in progress 3. Gold Nanorods for Targeted Phodynamic Therapy and Fluorescence Imaging 4. Multisensor based systems for sensing different analytes with a single sensor

Biosurface Technology

Nucleic acid therapeutics delivery for anticancer therapy

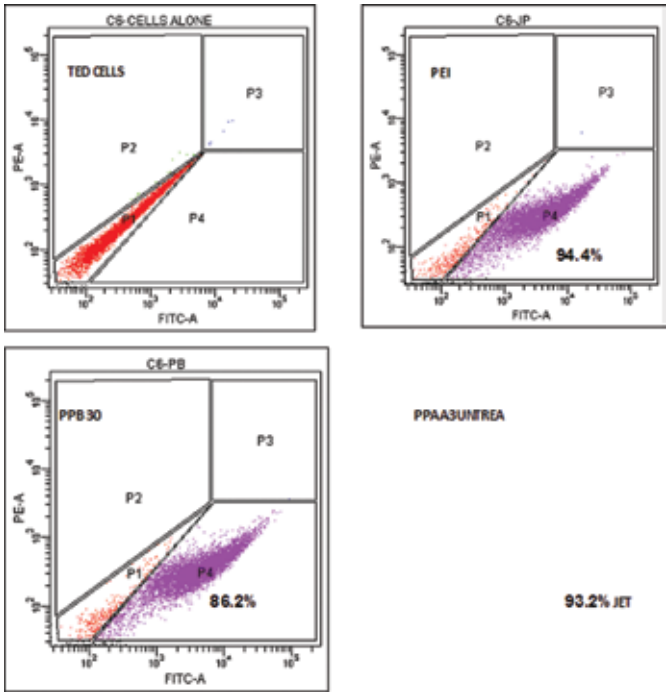
Cancer is a major health problem caused by genetic instability and uncontrolled growth of cells. Of late, nucleic acid based therapeutics is gaining importance in cancer therapy with haemocompatible no-viral polymeric vectors.

We are trying to develop non-viral vectors with low toxicity and good hemocompatibility for which pullulan based cationic polymers were synthesized. The hemocompatibility, cell viability and improved transfection efficiency of cationized pullulan (pullulan-PEI) is a proven factor. To enhance the efficacy of cationized pullulan two different molecules were conjugated to it at different ratios; ascorbic acid and betaine. Betaine has intrinsic property to act as anti – fouling agent while ascorbic acid may impart an anti-metastatic role to the system. The conjugation was established by various techniques such as FTIR, NMR and chemical analysis. The polymers also exhibited good buffering capacity which is an important parameter in determining the transfection efficiency. The nanoplexes formed with these polymers and DNA was evaluated for its particle size, zeta potential and DNA binding stability. The stability of these nanoplexes was evaluated in presence of plasma also. Plasma contains negatively charged proteins which may displace the DNA from the nanoplex, it was found that most of the polymers shielded the DNA and was stable. The polymers were found to be able to protect the DNA from enzymatic degradation also. The hemocompatibility of these polymers were evaluated by carrying out the haemolysis assay, RBC, WBC and platelet aggregation. Polymers with optimum composition demonstrating good hemocompatibility and no cytotoxicity were chosen for further studies. The optimum ratios suitable for transfection were determined in each case and were evaluation for its cellular uptake and transfection efficiency. The uptake was good with the optimized ratios and was visualized by fluorescence microscopy, confocal microscopy and quantified by flow cytometry analysis. The gene of interest was p53 and the polymers demonstrated good transfection efficiency as shown by microscopic and flow cytometry analysis. The cell viability and transfection efficiency of the system has proved that both PPB and PPAA may be considered as an effective carrier of nucleic acid. Internalization of nanoplexes is imparted by appropriate size and charge of the nanoplexes. The enhanced buffering capacity ensured that the nanoplexes evaded the lysosomal degradation. The possibility of anti –metastatic property by induction of collagen production and inhibition of collagen degradation by the polymeric conjugates provides an additional relevance to cationized pullulan – ascorbic acid polymer. The anti fouling property of PPBs and stability of PPAA stable in the presence of serum make the polymers efficient for in vivo applications. So it may be concluded that both systems can act as efficient gene transfection agent. But for cancer gene therapy PPAA may be considered as better choice because of the anti- metastatic property of PPAA.



Confocal image representing uptake of PPB30: (A) Hoescht stained nucleus (B) YOYO tagged DNA (C) TRITC labelled polymer (D) overlay of all three channels. (E) DIC image and (F) Overlay of DIC and all other channels.

Transfection efficiency of the polymers was evaluated using reporter gene pGL3 and the therapeutic gene p53. The efficacy of p53 expression was evaluated using live/dead assay and Annexin V assay was carried out to assess whether the cell death is occurring due to apoptosis itself. It was found that PPAA expressed the highest transfection efficiency among the polymers developed and was comparable to the efficacy of the commercial transfecting agent JetPEI.



Annexin V-FITC assay was done to check whether the cell takes apoptosis pathway. P4 quadrant was the annexin positive, P2 is PI positive and P3 is annexin and PI positive. From the data it was shown that majority of cells were in early apoptosis stage.

The p53 expression in C6 cells were examined by immunocytochemistry also.

JetPEI	PPB	PPAA
93.8 %	85.5%	95.3%

p53 immunostaining was done on transfected C6 cells along with untreated cells and quantification of expression was carried out with FACS

Dental Products Laboratory

Research activities continued in the areas of wound dressing materials, smart dental composites and tissue engineering.

Development of Wound dressing materials

Terpolymers of polylactide-glycolide-caprolactone were synthesized in the lab. Solutions of the same were electrospun into fibrous mats which were subsequently biologically modified. All physicochemical evaluations, cytotoxicity studies were completed and preclinical evaluation is in progress.

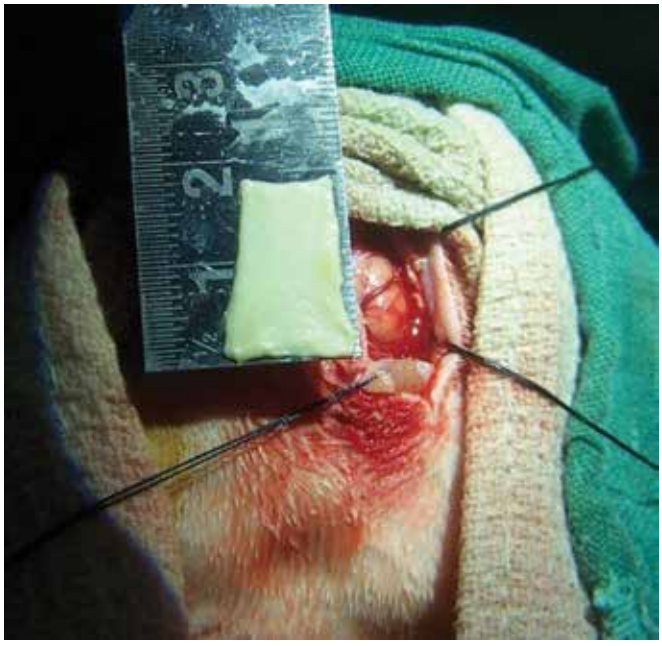
Collaborative work in the same area has been also initiated with clinicians of Burn Centre, Jubilee Mission Hospital, Trichur who provided amniotic membranes which were subsequently modified in our lab for potential wound dressing materials. Another alternate approach has been to prepare hydrogels by light curing method and modify them biologically. This work is also under progress as part of a PhD work.

Development of smart dental composites for barodontalgia

A project proposal was submitted to DRDO for initiating joint collaborative programme for development of smart dental composites for barodontalgia. After a series of meetings between SCTIMST and DRDO during the year, the project proposal has been approved for funding and the work will be initiated in June 2015.

Division of In Vivo Models & Testing

Proof of concept study to evaluate tissue response and calcification potential in rat subcutaneous implantation model of a non-calcifying glutaraldehyde cross-linked bovine pericardium was completed during this period. This material is being evaluated for its application as dura substitute and as valved conduit in rabbit and sheep models respectively.



Non-calcifying glutaraldehyde cross-linked bovine pericardium just before implantation into rabbit dura

Division for Tissue Engineering and Regeneration Technologies

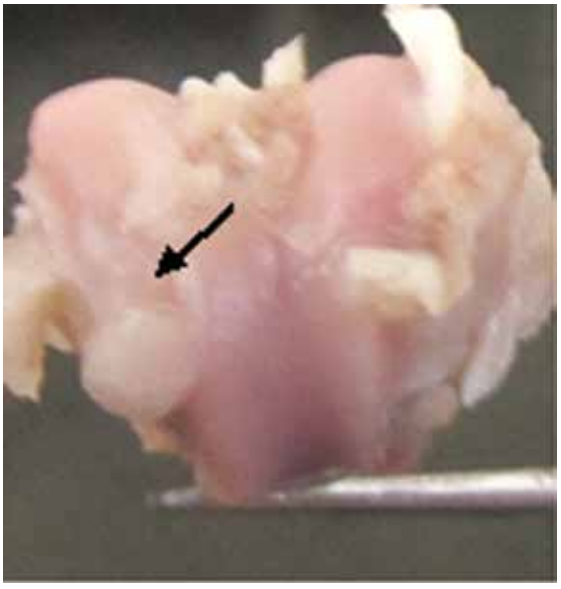
During the year, we have continued our work and made considerable progress in the different programs related to tissue engineering in the areas of pancreas and blood vessel and cartilage as follows

Indo-Danish program on musculoskeletal stem cells in tissue regeneration led to new biodegradable polymers for tissue engineering application are being synthesised.

In the area of cartilage, a successful large animal preclinical study for physeal defects using our injectable hydrogel and chondrocytes was carried out at CMC Vellore in goats in the previous year. Preparations are on for a pilot human study.

As part of gathering the data for obtaining regulatory approval for the human study, several toxicological analyses of the material are ongoing. An in vivo study was also carried out to evaluate the efficacy of a chitosan-hyaluronic

acid hydrogel for articular cartilage regeneration in rabbits. Critical size defects were created in rabbit knee joints and the hydrogel and hydrogel-chondrocyte combinations were implanted in the defect and the regeneration was evaluated after 3 months. The gross morphological analysis showed the formation of a smooth, white glistening tissue at the repair site and integrated with the surrounding tissue. The histological analysis is ongoing.



New materials generated (2014-2015)

- A biodegradable polyurethane with potential applications as matrix for tissue engineering.

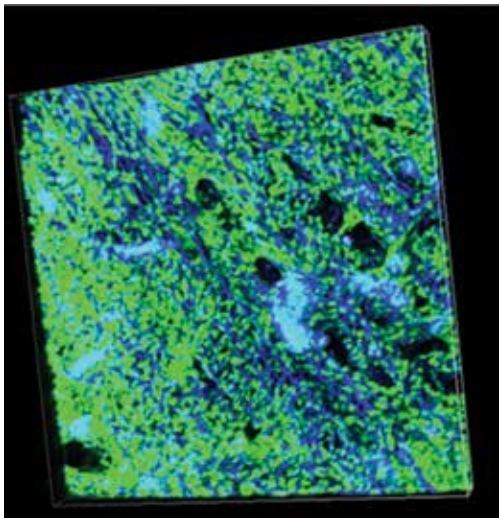
A noncytotoxic biodegradable and viscoelastic polyurethane material was developed which can perform as a good platform for growing mesenchymal stem cells and can find potential applications as scaffold for efficient tissue engineering applications.

- Novel Polysaccharide cryogel scaffold for cartilage tissue repair

The material show higher biocompatibility with excellent chondrocyte interaction and evidenced very good cell infiltration through the scaffold after 21 days culture.

- Polymer-Inorganic Hybrid Scaffoldswith Cell Adherent Surfaces and Enhanced Mechanical Properties for Osteochondral Tissue Engineering

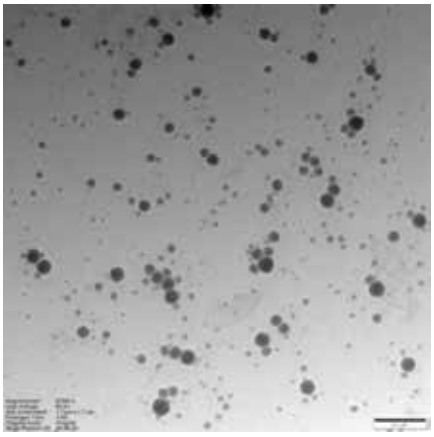
A layered mineral-osteogenic drug complex and its composite scaffold for bone tissue engineering applications have been developed. Physicochemical characteristics of the scaffold have been evaluated and the preliminary in vitro evaluation has been conducted using human osteosarcoma cells. The studies have proven that the scaffold may have potential for bone tissue engineering applications. Further, studies with the scaffold and MSC in vivo are ongoing at partner lab in Denmark.



Living cells on hybrid scaffold

- Cationic polymer modified silica nanoparticle system for siRNA delivery

Nanometer sized silica nanoparticles were synthesised and modified with cationic polymer for its use for the delivery of siRNA. Physical, chemical characterization and cell compatibility of the nanoparticles were investigated. Uptake study shows promising result for its use as siRNA delivery vector and was confirmed by cy3 labelled siRNA using flow cytometry.



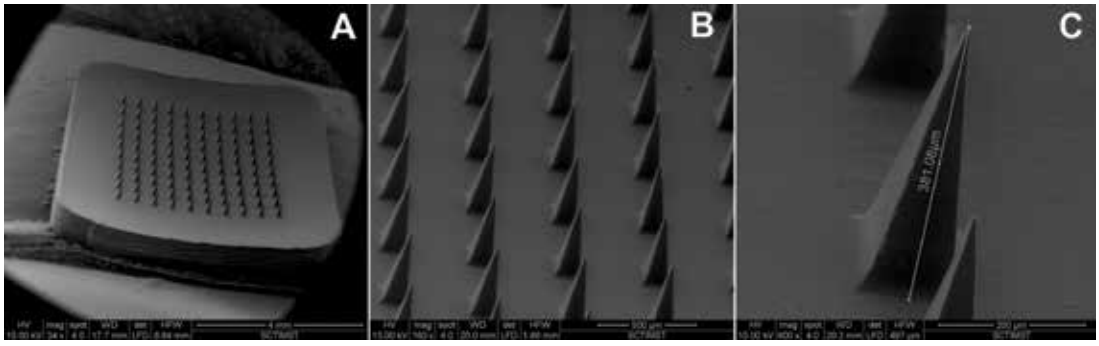
TEM image of nanoparticle

- PLGA based porous scaffold for tissue engineering

A three-dimensional (3D) poly(lactide-co-glycolide (PLGA, lactide:glycolide 75:25, Mol wt 66000 - 107000) scaffold with high porosity was fabricated by freeze drying technique for bone tissue engineering application. The morphological structure and pore size of the scaffold w ere analyzed by scanning electron microscopy (SEM).The pore size of the scaffold was 60-70 αm. Live-dead assay conducted on the porous PLGA scaffold by using L929 fibroblast cells confirmed that the material is not cytotoxic. Further, studies with the scaffold and MSC in vivo are ongoing at partner lab in Denmark.

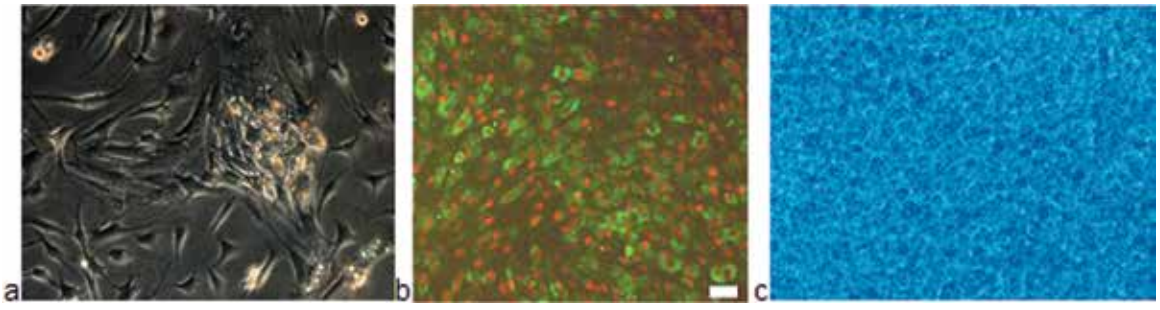
New program on Controlled delivery of biological molecules using biodegradable microneedles

Non-invasive delivery of protein and peptide therapeutics has been a long-standing objective in pharmaceutical development. Micro-needle (MN) arrays are minimally invasive devices that can be used to by-pass the stratum corneum barrier and thus achieve enhanced Transdermal Drug Delivery. This project attempts at developing a simple and versatile technique that would produce solid, completely degradable MN based drug delivery system with the capability of achieving sustained delivery of drugs/ biomolecules. We have explored the possibility of forming MN devices with a blend of water soluble polymers. The polymer solution is poured on a silicone template which is then subjected to centrifugal casting and freeze thaw cycles to form tough gels which are dried to form MN. The MN produced remains to be characterized. We successfully fabricated insulin loaded MN and the in vitro release of insulin from these MN was monitored over a period of 24 h. A sustained release of insulin was observed over this period.



Basic studies on In vitro osteoarthritic model

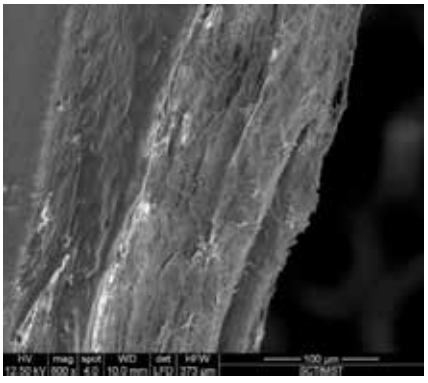
The study on in vitro osteoarthritic model was focused on developing a 3D platform to evaluate the success of tissue engineered and MSCs for therapy or regeneration in osteoarthritis. The microenvironment of osteoarthritis is unique from the normal healthy tissue by the presence of synoviocytes and pro-inflammatory cytokines. The regeneration of cartilage or bone needs to be evaluated in a microenvironment to mimic osteoarthritis. A 3D micromass co-culture of synovial fibroblasts and synovial stem cells was established. The synovial fibroblasts were characterized by the presence of lipid bodies containing lubricin at early passages. The cells were also characterized by prominent expression of VCAM and surface marker CD44. High density micromass of synovial stem cells and synoviocytes shows formation chondrogenic nodules and stain positive for Alcian blue.



a) Synoviocytes characterized by presence of lipid bodies and b) shows prominent expression of VCAM c) Micromass culture of synoviocytes and synovial stem cells show positive for chondrogenesis

Basic studies of An in vitro skin tissue engineering approach for evaluating the potential of hair follicle derived stem cells - Implication to wound healing

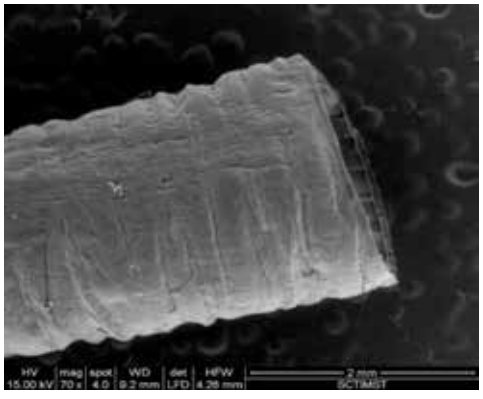
Collagen structure of epidermis and dermis showed a gradation in fiber dimension. To mimic this structural architecture of skin, it was decided to develop a sandwich model with three different polymer membranes with varying pore size and fiber diameter.Hair follicle bulge stem cells and fibroblasts were successfully grown in the sandwich model of the skin.



SEM image of trilayered construct.

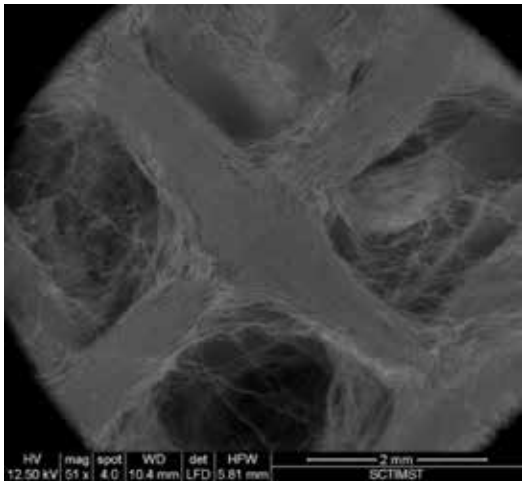
Tissue engineered small diameter small vascular graft

Tissue engineering approach towards the development of small diameter vascular graft (<6mm) has been a major challenge to be addressed. A blend of natural –synthetic biodegradable polymer scaffold were electrospun on a tubular mandrel with 2mm internal diameter. The physicochemical characterization of blend scaffold provided optimal results. Further scaffold showed appreciable cytocompatibility and hemocompatibility. Scaffold also supported the differentiation of rabbit adipose derived mesenchymal stem cells to smooth muscle cell lineage under the effect of differentiation cues.



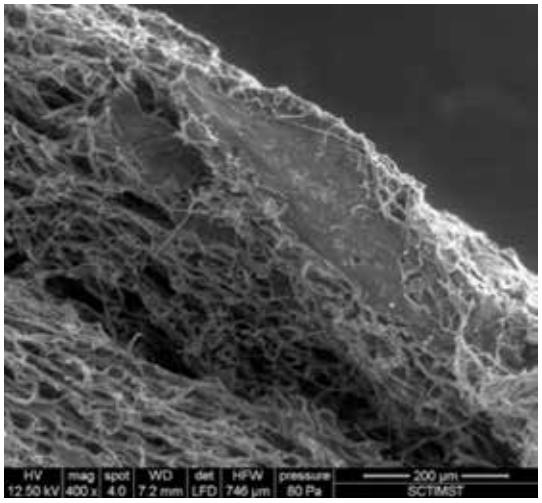
Highly Porous 3D Electrospun scaffold for islet tissue engineering.

Since the conventional electrospinning on steel mandrel formed a sheet with inadequate porosity for islets with size ranging from 50-250um, the spinning technique was modified by using designed patterned collectors with different patterned mesh sizes. A hydrophilic and biodegradable polymer which was earlier found to be suitable for growing islets and mesenchymal stem cells was electrospun on the patterned substrates. The resulting electrospun sheet had the morphology of the collectorand had adequate pores to hold mature rat islets.



Tissue engineering of a trachea

Bio-engineering of a tracheal construct – identification of appropriate biomaterial scaffolds and conditions study ongoing. An innovative material is identified for the purpose



Experimental Pathology

The Division developed an innovative no-detergent/ enzymatic method for preparing biomaterial grade scaffolds from porcine cholecyst (gall bladder), small intestine and urinary bladder method. It involves ex situ treatment of the donor organ in a preservative that facilitated controlled cross-linking biomolecules without compromising the preservation of major biomolecules. The scaffolds were used for developing Porcine cholecyst-derived scaffold was found useful as skin graft-substitute and wound healing matrix

Histopathology Laboratory

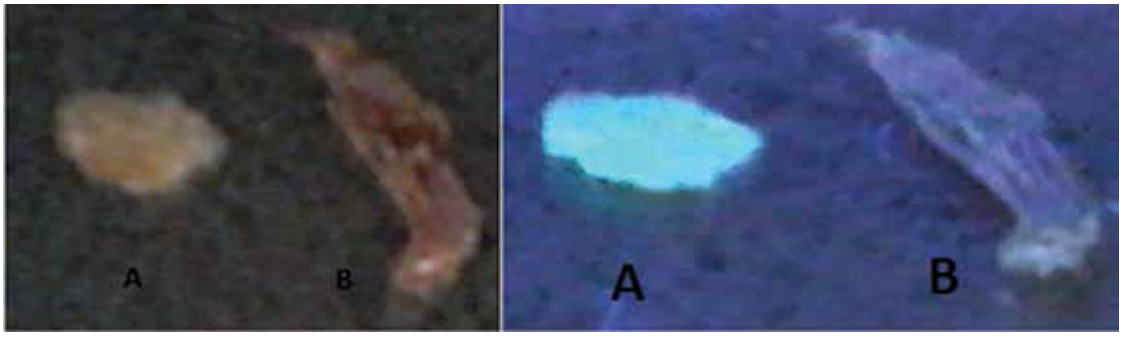
Biphasic hydroxyapatite based Keratoprosthesis evaluation in a rabbit model. A TDF project was initiated. Keratoprosthesis was designed and manufactured at in house facility (Bioceramics laboratory). The animal model was created and the implantation of the prosthesis is being carried out.

BRNS funded project titled "Biological evaluation of laser rapid manufactured Ti-porous structures" was initiated. Major objective of the project is creation titanium porous structures simulating the natural bone using Laser rapid manufacturing (LRM) technique. Preliminary cytocompatibility and haemocompatibility evaluation of specimens manufactured using LRM technique showed features of cytocompatibility and haemocompatibility.

Lab for Polymer Analysis

The laboratory's major research efforts were largely focused on the synthesis and evaluation of new materials particularly nano scale materials for drug delivery and sensing applications. The high light of the major findings during the last one year are outlined below.

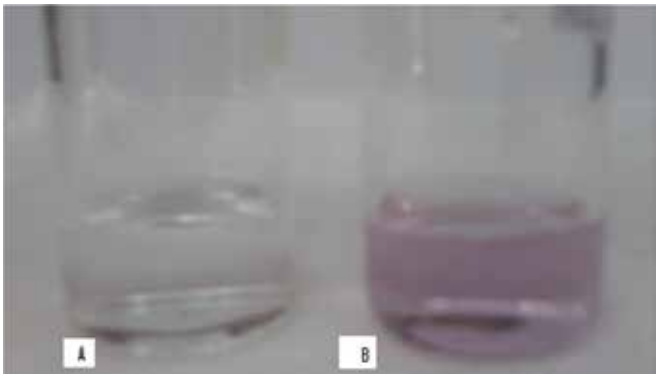
Recently emerged carbon based materials, dubbed as carbon dots (CDs) was found to be highly fluorescent and coined as a futuristic material for bio imaging and related applications. The notable attraction of these materials are their water solubility, chemical inertness, easiness in functionalization, high fluorescence along with the most required non toxicity and biocompatibility. We recently turned our attention on these materials and a variety of fluorescent probes capable of locking onto cracks on bones; fatty deposits in tissues etc have been synthesized. The potential of these probes to visualize cracked bones and fatty plaques on tissues have been demonstrated.



(A) Fat deposited tissue (B) Muscle tissue incubated with multifunctionalized carbon dots when viewed in day light (left) and under 365 nm light source (right). The strong fluorescence emanating from the fatty deposit apparently suggests the ability of the probes to dock onto the fatty plaques.

We recently designed a signal amplification process which enables the visualization of color change and there by the detection of extremely small quantity of molecules of clinical interest. Using existing techniques presence of a low quantity of analytes cannot be seen. The technique could be used in analyzing fluids which are difficult to get in more quantity. Our studies indicated that these types of methods can open up new avenues in clinical diagnosis.

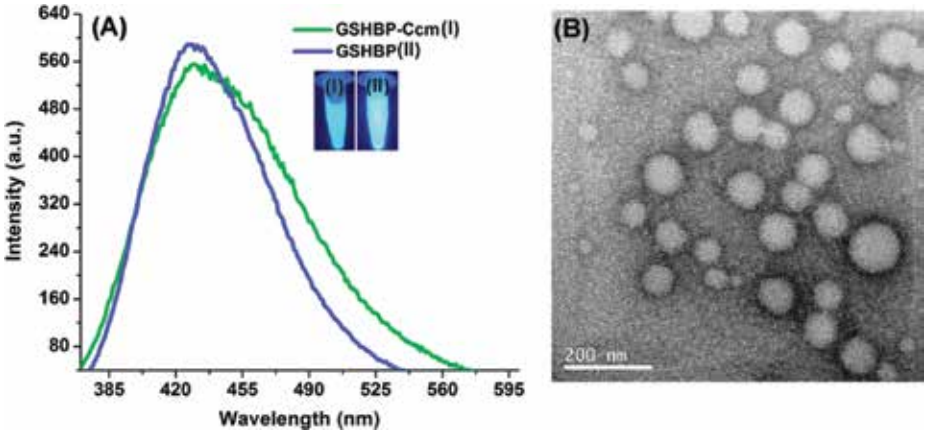
Solution (A) did'nt show the presence of a specific analyte since the concentration is very low. The same solution (B) shows a red color after amplification through further recation.



It is evident from the figure that there is no visibly observable color in the presence of low quantity of glucose (Fig A) while in the amplication stage, observable color can be seen. This is an interesting approach to view analyte like glucose in fluid such as tear which is difficult to collect. A very low volume is sufficient to detect glucose. Another notable observation was the strong influence of the concentration of glucose on the color of the solution.

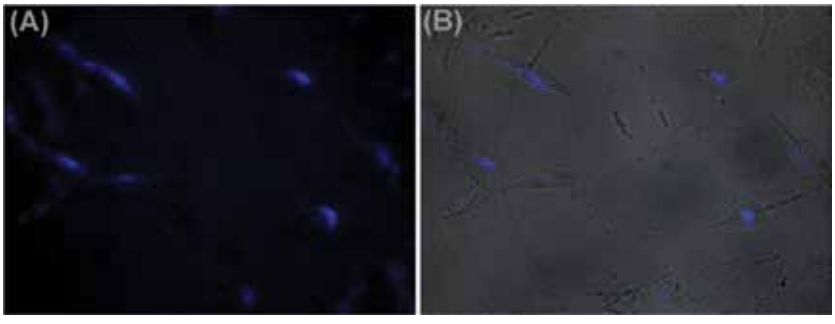
We further expended our efforts to develop nano probes to monitor our environment. We developed gold cluster based approach to detect hypochlorite in water samples. We also generated graphene oxide sensing platform for the detection of antibiotic residues in environmental water samples.

We also generated and evaluated biodegradable, photoluminescent polymers for drug delivery application with a view to address many of the drawbacks of organic fluorescent polymers and quantum dots. This kind of polymers possesses better biodegradability, cytocompatibility, clearance from the body and controllability over photoluminescence. A series of polymers were synthesized and characterized. These polymers were further conjugated with drugs having anticancer potential.



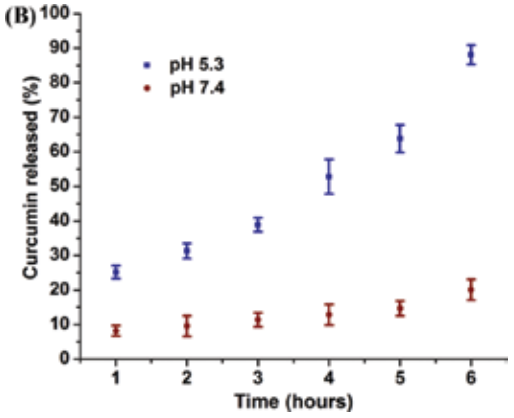
(A) Fluorescence emission of glutathione based polymer and its drug conjugate (inset: fluorescent images of the same under UV lamp) and (B) cryo-TEM image of conjugate micelles in aqueous dispersion.

Here we reasoned that the fluorescent polymer -drug conjugate can be useful not only for safer drug delivery, but also for label-free cellular imaging. The fluorescence of the polymer in the drug conjugate was exploited for label-free cellular imaging too. The self-fluorescence (blue) arising from the polymer as shown in Fig. A and B (shown below) affirms that the biocompatible fluorescent polymer can be utilized for label-free cellular imaging. The facile internalization of nano-sized conjugate micelles was confirmed by the cellular imaging of C6 cells utilizing the inherent blue fluorescence of the conjugate micelles. Thus, as indicated by the results, the fluorescent polymer possesses the potential of a theranostic agent.

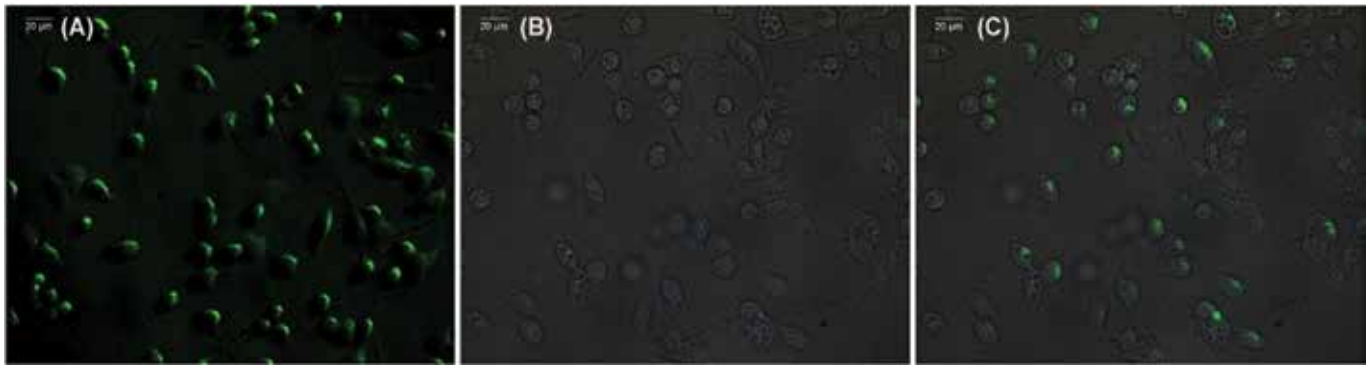


Cellular imaging using fluorescent polymer micelle

Another interesting finding was the generation of pH responsive gold nanoparticles (AuNPs) using drug conjugates. AuNPs have been extensively used as the vector for various types of drug molecules including anticancer therapeutics. AuNPs have emerged as the potential drug delivery vehicle because of its striking features like low cytotoxicity, non-immunogenicity, excellent stability in the nanoscale, easy synthesis and functionalization along with tunable surface properties. We recently reported the development of a delivery vehicle for curcumin based on water soluble polymer stabilized AuNPs for the enhancement of aqueous solubility and bioavailability of the hydrophobic drug. To fabricate the nano carrier, AuNPs were first stabilized with a water soluble, low molecular weight polymer which was subsequently modified via succinylation producing polymer-AuNPs with succinate linker. Finally curcumin conjugated AuNPs were developed by conjugation of curcumin to the succinate linker through esterification reaction. The physicochemical properties of the nano carriers were characterized and in vitro cytotoxicity assessment was carried out against Glial cells from rat glioma (C6 Glioma) to prove the retention of intrinsic antiproliferative activity of curcumin after covalent conjugation onto the surface of polymer functionalized AuNPs. Cellular uptake of FITC tagged drug carriers was visualized by fluorescence microscope. The succinate linker due to its susceptibility to acidic pH enabled rapid drug release inside cancer cells where pH is lower than physiological pH.

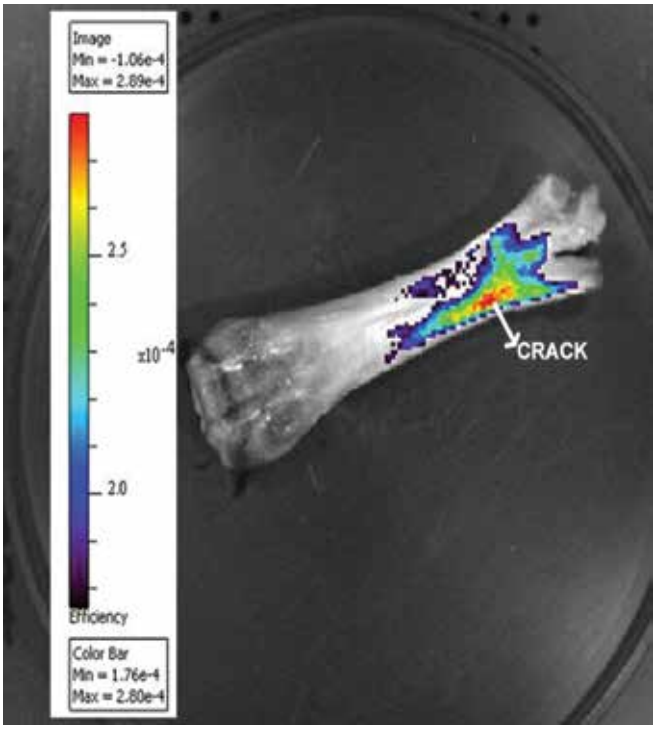


Curcumin release profile from Ccm-SA-P1-AuNPs in buffer solution of different pHs.



Fluorescence microscopic images of C6 glioma cells after 3h incubation with FITC tagged AuNPsbased nano carriers: green fluorescence from FITC (A) fluorescence image (B) bright field image and (C) merged image of green fluorescence in bright field.

Stemming from our success in using functionalized carbon dots in detecting bone crack, we further explored their potential as probes for the simultaneous imaging and drug delivery application. We synthesized carbon dots decorated with targeting moieties and drug. We demonstrated their impending ability as theranostic agents.



Bone crack detection (marked) by modified carbon dots imaged with IVIS system. Since the probe is amended with a drug/growth factor, the same is also delivered to the site.

In a nutshell, during the last one year a variety of nanomaterials based on polymers and carbon dots have emerged from the laboratory as potential theranostic agents. Our results indicate that these materials may catalyze further developments in the imperative domains of imaging and drug delivery.

Microbial Technology

Department of Microbial Technology focuses on research on In vitro mimics to cell- cell material and microbial interactions, Bacterial biofilms and immuno-modulations and development of diagnostic and therapeutic modalities. Towards this end various programmes were initiated and work continued in the ongoing programmes.

Establishing In-vitro mimics for testing of medical devices, pharmaceuticals and toxins: three dimensional test models:

The pulmonary epithelium is uniquely situated so that it has a large surface area exposed to air facilitating efficient diffusion directly from air to blood. This site hence provides immense possibilities for understanding molecular pathology of alveolar diseases, development of novel treatment methodologies and as testing system for medical devices, pharmaceuticals and pollutants. A system, which can faithfully reproduce the complex alveolar epithelial structure and inter-cellular interactions in vitro, will prove an invaluable tool. The challenges faced in development of functional three dimensional pulmonary tissue-like structures are due to the complexity of the lung, the number of different cell types in the lung, and the inability to maintain surfactant synthesis invitro. For this a careful selection of scaffold, cell types, cell source, and culture conditions are essential. In our work, we have used alveolar pneumocytes and fibroblasts which are the major lung cell types. The tissue engineered hybrid artificial lung construct developed maintain tissue architectural and organizational features, particularly the integration of multiple cell types preserving distinct integrated phenotypes and is functional with regards to surfactant expression.

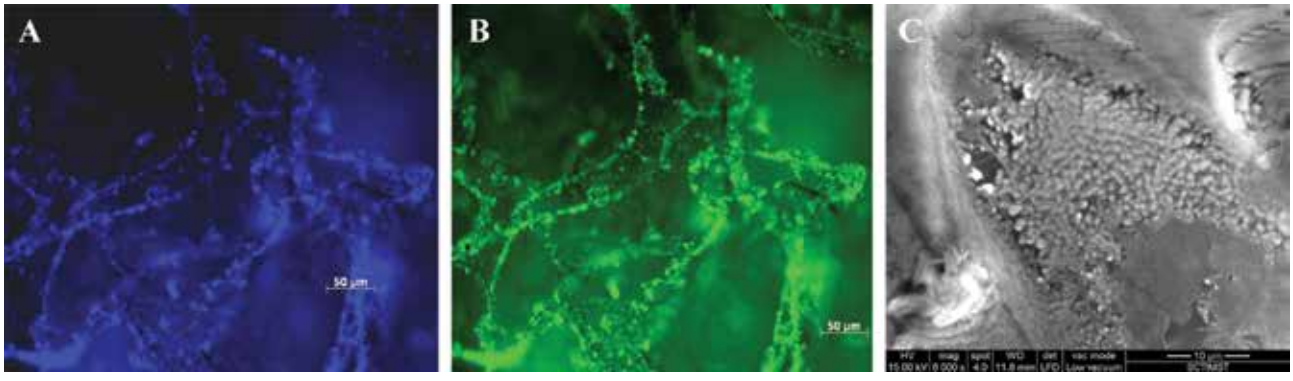


Figure 1 Surfactant protein C expression evaluation in the 3D construct on GeVAc scaffolds of A 549–MRC-5 combination by fluorescent microscopy. (A) Construct stained with Hoechst 33342 showing cell distribution in the construct. (B) SPC staining showing cells expressing surfactant protein C. (C) ESEM micrograph showing surfactant globule secretion in the construct under dynamic co-culture of A549–MRC-5.

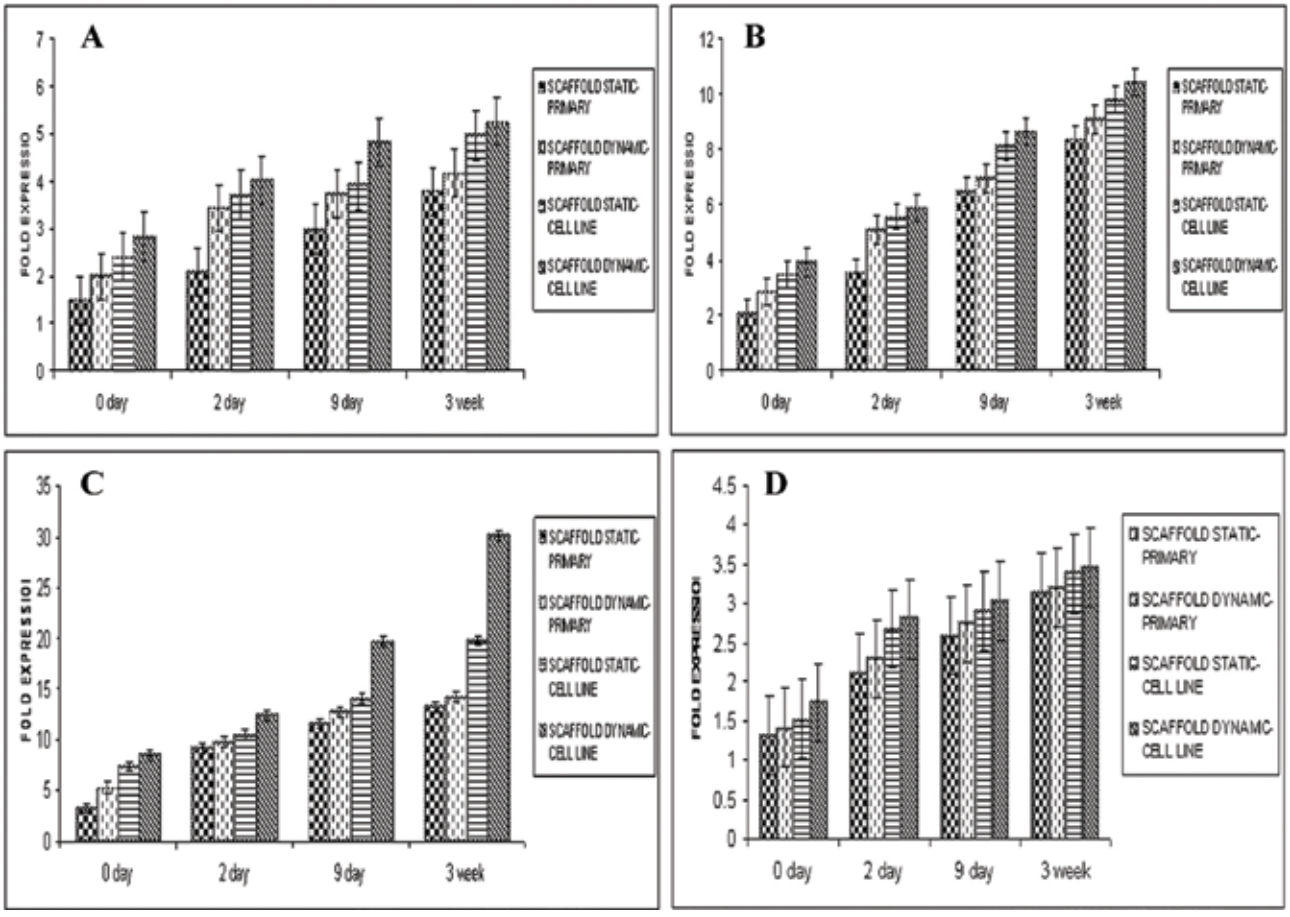


Figure 2 Real time qRT-PCR analysis of the four different surfactant mRNAs in the different types of 3D constructs both under dynamic and static conditions uisng primary alveolar cells and cell lines. (A) SP-A, (B) SP-B, (C) SP-C, (D) SP-D.

Work is ongoing in characterizing the systems response to various stimuli like pathogens, Nanoparticles and toxins.

Bacterial biofilms and Immunomodulations:

Biofilms are a complex aggregate of bacteria surrounded by a self-produced extracellular shell containing polysaccharide, protein and DNA (Hoiby et al 2010). Statistics suggest that 65% of the hospital acquired infections are due to biofilms (Smith and Hunter 2008). Biofilm formation has been implicated in various infections like urinary tract infections, dental plaques, endocarditis and infections of indwelling medical devices.

Some of the key features of biofilms which makes it important in the clinical scenario are their increased ability to resist antimicrobials and modulate the host immune response facilitating their survival and persistence in the host giving rise to chronic infections recalcitratnt ot antibiotic therapy.

Immunomodulations by Pseudomonas biofilm infection on airway epithelial cells.

Bronchiectasis is one disease affecting a wide spectrum of age with prevalence from congenital to old age. This disease state defined by localized, irreversible dilation of part of the bronchial tree is caused by destruction of the muscle and elastic tissue. In all these majority of patients have chronic untreatable Pseudomonas aeruginosa infection. These isolates were noticed to be extremely slow growing and sensitive to wide spectrum of antibiotics. But they were not amenable to antibiotic therapy (Our own unpublished observations). Different strains of P. aeruginosa

have been characterized as having either an invasive or a cytotoxicity phenotype. Cytotoxic strains cause necrosis of epithelial cells in vitro and in vivo. The ability to induce acute cytotoxicity is associated with the expression of ExoU, a type III secretary cytotoxin regulated by the transcriptional activator ExsA. Cell density-dependent virulence regulatory systems also appear to be involved in the pathogenesis of bacterial dissemination and in causing the mortality associated with P. aeruginosa. This motivated us to study in detail the genetic modulations as Ps. aeruginosa infections which results in increased severity of disease, greater airflow obstruction and poorer quality of life. Understanding the molecular mechanisms leading to the development of airway inflammation and bacterial persistence in the bronchiectasis airway are central to finding new treatments for this disease.

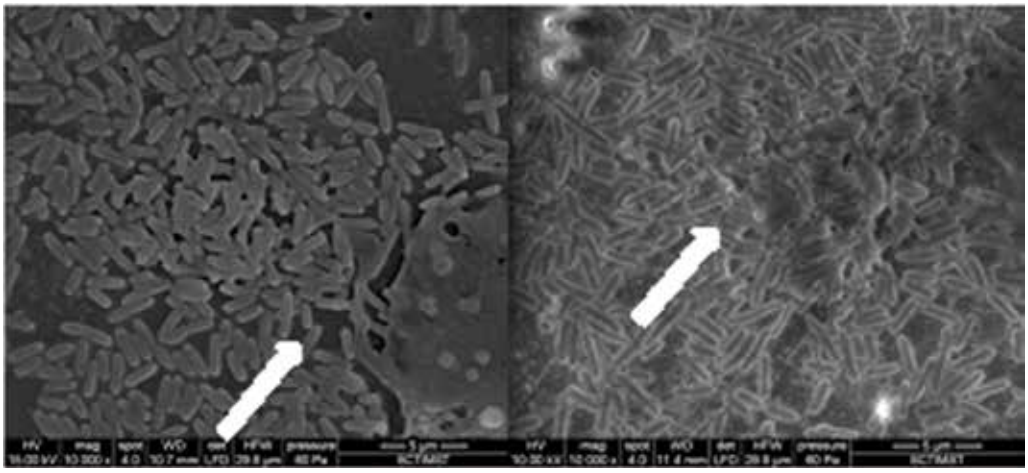


Figure: Pseudomonas biofilms on A549 cells 6hr PI. Pseudomonas aggregates forming micro-colonies (as indicated by the arrow head) was observed from the SEM images.

Collaborative research for development of antimicrobial materials:

Microbial biofilm infections: Both tissue- based and associated with the use of medical devices and Microbial disease diagnostics

Titanium because of its low corrosivity and biocompatibility and mechanical properties is biomaterial of choice for mechanical heart valves and hip and knee implants. Hip and joint infections and Valvular endocarditis are biofilm based disease with severe consequences. Although bacterial adhesion on titanium is less when compared to other materials Staphylococcus epidermidis is known to adhere to it and this would lead to development of biofilms and valvular endocarditis and joint infections. The molecular dynamics of Staphylococcus epiderrmidis in biofilm

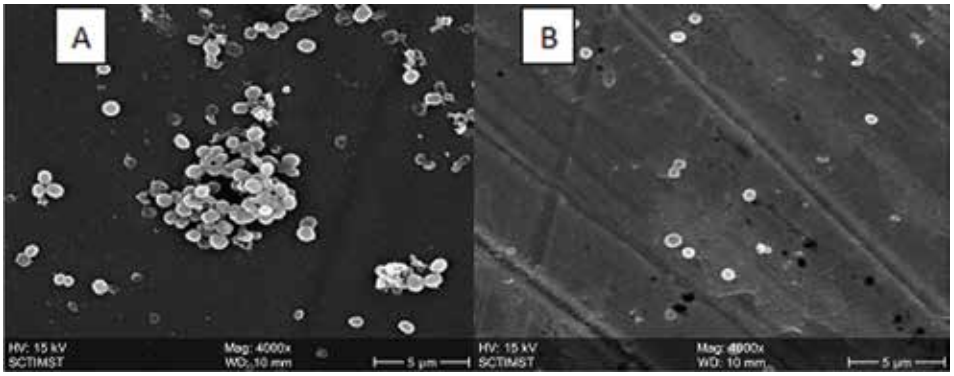


Figure: A: S. epidermidis ATCC 35984(RP62A) adhere to titanium disc and forming colonies which develop into biofilms. B: DLC coated titanium disc prevent adhesion of S. epidermidis ATCC 35984(RP62A), there by preventing biofilm formation

formation on Titatnium discs are being analysed. Diamond like carbon coating on titanium discs is being studied for antimicrobial properties and ability to prevent bacterial adhesion and biofilm formation as a means of preventing medical device related infections. Modulations in ica gene cassette responsible for biofilm formation in S.epidermidis is being analysed.

Study the modulations in molecular mechanisms of Klebsiella pneumonia infection using three dimensional hybrid artificial lung model

Acute respiratory infections result in 1.9 million childhood deaths per year in developing countries, 20 % of these deaths are from India. Among this, pneumonia is the leading cause of death in young children and burden of disease is disproportionately high in South-East Asia Region of WHO. In India, mortality due to pneumonia accounts for approximately one-fourth of the total deaths in under-five children. K. pneumoniae has emerged as an important cause of hospital acquired infections, especially among patients in the neonatal intensive-care unit and mortality rates can be as high as 70%. Over the last two decades, the incidence of infections caused by multidrug-resistant Klebsiella strains has increased.

Studying the changes in molecular mechanism of both pathogen and lung cells could augment the development of novel treatment strategies. As the lung tissue is composed of different cell types, its co-ordinated activity results in smooth function. So for understanding the interactions and modulations in molecular mechanism there should be a construct with different lung cell types. A three dimensional lung model with different cell types to study the co-ordinated cellular interactions would help in comprehensively understanding the problem of Klebsiella infection in vitro. With this background the current study deals with the investigation on modulation of molecular mechanism during Klebsiella infection using hybrid artificial lung model developed.

Pulmonary fibrosis and mesenchymal- epithelial transition- role of biomaterials:

Fibrosis is a common pathophysiological response of many tissues to chronic injury. On the one hand, wound healing, tissue remodeling and repair are protective mechanisms activated in response to stress and injury in order to maintain functional integrity of organs and systems and on the other hand, deregulation of normal healing and continued exposure to chronic injury results in tissue fibrosis, massive deposition of extracellular matrix, scar formation, and organ failure. Pulmonary fibrosis is a chronic lung disease characterized pathologically by excessive accumulation of extracellular matrix (ECM) and remodeling of the lung architecture, Although there are various initiating causes and factors, the terminal stages are characterised by proliferation and progressive accumulation of connective tissue replacing normal functional parenchyma. Pulmonary fibrosis (PF) is the final stage of various pulmonary diseases including Idiopathic pulmonary fibrosis (IPF), asbestosis, Hypersensitivity pneumonitis etc. Currently available therapeutic approaches have little impact on pulmonary fibrotic processes. Today PF is viewed to be the result of an abnormal wound healing process and aberrant cross-talk between fibroblast and epithelial cells promote chronic fibroproliferation. Pulmonary fibrosis other than being a chronic inflammatory disorder could also result from multiple cycles of epithelial injury. So it is imperative that the mechanisms that drive epithelial mesenchymal transitions be understood and those that promote mesenchymal to epithelial transition be explored. This would help in developing treatment strategies for repair and functional regeneration of the lung. Using the three dimensional hybrid lung cell system developed in the department the molecular cues responsible for fibro- proliferation are being analyzed.

Molecular Medicine

Understanding the molecular pathways involved in neuronal pathfinding, during development as well as in damage, is critical in developing therapeutic strategies for various neurological diseases. One of the powerful tool to study this is using the nematode Caenorhabditis elegans. Its nervous system consists of only 302 neurons and each neuron is tracable. The nematode exhibits an array of highly predictable behaviours. One can train the worm to learn to associate odors with foods.

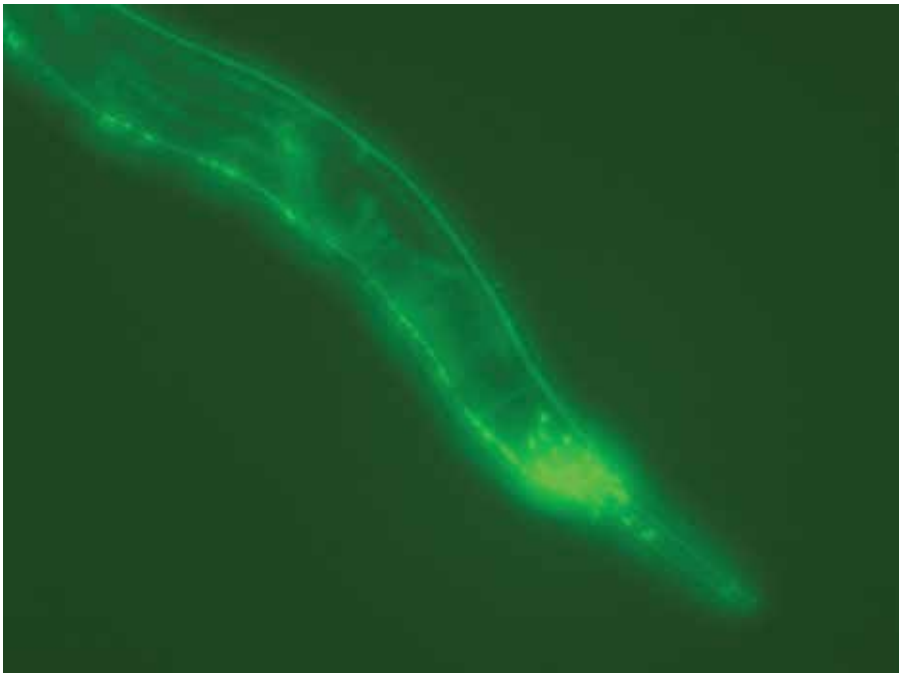
The entire connectome of the C. elegans has been mapped. Hence it makes an excellent model to study how the connectome was initiated during development as well as if any damage in one or a group of neurons in the network, how the system responds to it.

We are focusing on how the connectome (especially the synapse) gets modified during initiation of long term learning. The simple circuit of a sensory neuron and two interneruons in the head region has been studied for its synaptic plasticity.

Since C.elegans maintain a constant number of cells in its adult life, the cell death can occur only through necrosis. Neuronal cells, being postmitotic undergoes only necrotic cell death. We are studying how the necrosis pathway gets initiated in C. elegans. We have identified a fast cycle of

neuclear disapperance on onset of necrosis in the model.

As neuronal damage model, we have induced partial damage to the dopaminergic neurons to study the pathways involved in dopamine and its downstream molecules in accelerating neuropathy.



C.elegans (LX928) showing labelled cholinergic neurons

Polymer Lab

Under the programme 'Studies on novel biodegradable polymeric materials and tissue engineering as cardiac implants', the studies on hydrogels based on poly (propylene fumarate- co- ethylene glycol)/PEGDA was continued. The injectable hydrogel material formulated with pegylated-carboxy terminated poly (propylene fumarate) (93.5%) and PEGDA. (6.5%) has matrix and bulk characteristics of equilibrium water content (EWC) 84.45±0.80%, freezable water content 67.93%, Young modulus 212.2±0.02 kPa and pore diameter 88.64±18.96 μm. This hydrogel with higher free water content, favourable pore dimensions and mechanical strength was used to encapsulate cardiomyoblast. The encapsulated cardiomyoblast were showing increasing viability from 3-30 days with viable green fluorescence. The matrix and bulk characteristics of hydrogel are favourable and elicited uniform green fluorescing live cardiomyoblasts (H9c2) inside with 150% cell viability (MTT assay) and uniform ECM protein distribution after 30 days. The slow in vitro degradation of hydrogel in physiological-like conditions is favourable for delivery and retention of the encapsulated cells at the injection site.

Under the programme 'Studies on polymer nanogels for theranostic applications, multi-modal biodegradable photoluminescent comacromer [poly(propylene fumarate)-PEG-glycine] (PLM) and nanogel having visible and near infra-red (NIR) emitting capabilities were prepared and studied for biomedical applications. The comacromer exhibits photoluminescent properties viz multiple emissions, higher photo stability and higher fluorescence lifetime. Investigation on the self fluorescence characteristics of PLM analogues of PEG based on glycine, maleic acid and poly(propylene fumarate), reveals excitation dependent fluorescence characteristics which is attributed to the presence of multiple number of carbonyl groups present in PEG units which may initiate numerous electronic transitions (n-ϖ*) inside the molecule. The nanogel prepared by crosslinking comacromer with acrylic acid, has smooth spherical morphology with a particle size of 100 nm. In vitro cytotoxic and hemolytic studies reveal biocompatibility. The cellular imaging of the nanogel with L929 fibroblast and Hela reveals bright green and red emissions from the cell line and confirms the visible and near IR emission characteristics. The drug loading and release profiles of the synthesized nanogel, was studied using doxorubicin as

a model drug. Drug release profile at different pH values was evaluated. The self fluorescence in the present PEG based polyesters have great scope for the construction of new biocompatible fluorescent systems for biomedical applications.

Under CHVF programme, a stand-alone bone substitute materials for hard tissue engineering coupled with drug delivery applications was prepared. Citric acid (CA) resin with hydroxyapatite (HA) incorporated in situ employing EDC chemistry was initially synthesized to achieve a homogenous mixture. The biodegradable copolymer nanocomposites poly (propylene fumarate-co-citrate-co-PEG) was subsequently synthesized by a one-pot polycondensation reaction. The compressive properties of the nanocomposites evaluated (218.7±15.69-423.96±51.4) were within the range of values reported for human trabecular bone. The blood compatibility, hemolytic potential, cytocompatibility, cell proliferation and protein adsorption of the nanocomposites were also evaluated. In vitro release profile with gentamycin as a model drug suggests that the nanocomposites depict a gradual and sustained release pattern due to the presence of nano HA.

The studies on engineering of cucurbitural/hydroxyapatite nanoparticles and Cyclodextrin/hydroxyapatite complexes based theranostic systems for simultaneous targeted drug delivery and fluorescence imaging guidance was also carried out. The Cucurbitural/Hydroxyapatite particles with varying size, surface charge and tunable degradation profiles manifested advantages of cucurbitural presence with respect to drug loading, encapsulation efficacy and release kinetics. In vitro release profiles with two model drugs, Doxorubicin hydrochloride and Nile Red dye were evaluated. The nanoparticles reveal reveal excellent blood compatibility and cellular internalization properties as visualized by fluorescence microscopy. Particles excited at 300 nm revealed Dox emission in green channel (470 nm) as well as Sm3+ emission in the red channel (590 nm) respectively. Similarly the luminescent, multifunctional, needle-like hydroxyapatite (HA) nanoparticle complexes containing cyclodextrin were prepared by a co precipitation technique The in vitro loading and release studies using doxorubicin hydrochloride demonstrate that the nanoparticle complexes show high drug adsorption capacity and sustained drug release profiles. The nanocomplexes further reveal excellent blood compatibility, inappreciable toxicity and cellular internalization properties. Upon excitation at 420 nm, these complexes exhibit strong near-infrared emission at 680 nm.

Under INSPIRE programme studies on poly(xylitol-co-maleate-co-PEG) (pXMP) macromers and as injectable cell carriers for tissue engineering applications was carried out. The designed pXMP elastomers were non-toxic and water-soluble with viscosity values permissible for subcutaneous injectable systems. pXMP-based hydrogels prepared via free radical polymerization with acrylic acid as crosslinker possessed high crosslink density and exhibited a broad range of compressive moduli that could match the natural mechanical environment of various native tissues. The hydrogels displayed controlled degradability and exhibited gradual increase in matrix porosity upon degradation. The hydrophobic hydrogel surfaces preferentially adsorbed albumin and promoted cell adhesion and growth in vitro. Actin staining on cells cultured on thin hydrogel films revealed subconfluent cell monolayers composed of strong, adherent cells. Furthermore, fabricated 3D pXMP cell–hydrogel constructs promoted cell survival and proliferation in vitro. Cumulatively, our results demonstrate that injectable xylitol–PEG-based hydrogels possess excellent physical characteristics and exhibit exceptional cytocompatibility in vitro. We are also actively engaged in developing novel stimuli-responsive systems for drug delivery applications. We are designing polyethylene glycol-polypropylene fumarate-drug (PEG-PPF-drug) conjugates for pH-responsive micellar drug delivery. PEG-PPF-drug conjugates have been synthesized using standard protocols and have been characterized by FT-IR, NMR, and GPC. Ibuprofen is been used as a model drug and ongoing work focuses on optimizing drug release from the synthesized pH-responsive micelles.

Under the industry sponsored project, development of polyurethane adhesive and potting compound for the fabrication of extracorporeal medical devices has been initiated with the preparation of two component potting compound with shorter pot life, biocompatibility and dispensability.

Polymer Processing Laboratory

Sericin based hydrogel for biomedical applications

A new research work was initiated to develop hydrogels from naturally occurring materials that undergo biodegradation within a short period of time. Sericin is a naturally occurring glycoprotein obtained from silk cocoon. It contains 18 amino acids and out of that some are essential amino acids. Work has initiated to develop biodegradable hydrogels from sericin. Preliminary investigations showed that hydrogels obtained from sericin are biodegradable and absorbs about 150% water. The new hydrogel materials developed has the potential to be used as tissue engineering scaffolds and as wound dressing material.

Improving the hemocompatibility of electrospun poly(ethylene-co-vinyl alcohol) fibroporous mats

2-Hydroxyethyl acrylate (HEA) was photografted onto porous poly(ethylene-co-vinyl alcohol) (EVAL) electrospun mat. Degree of grafting, bonding between fibers as well as fiber diameter increased as a function of UV exposure time whereas mechanical properties showed a decreasing trend. The modified membranes showed improved wetting characteristics. In vitro hemocompatibility tests revealed that the grafted EVAL surface exhibited significantly lower hemolytic activity, protein adsorption and platelet adhesion than neat EVAL. Photografting led to significant reduction in the adhesion of RBCs whereas WBC consumption remained above 90%. The results implied that photografting of HEA substantially improves hemocompatibility of electrospun EVAL.

Development and characterization of aligned fibro porous polycarbonate urethane/graphene oxide nanocomposite membrane

Aligned graphene oxide (GO) nanoplatelets incorporated polycarbonate urethane (PCU) electrospun fibrous mats were prepared. The mechanical properties of PCU fibroporous electrospun membranes were improved through fiber alignment and GO incorporation. Membranes with 1, 1.5, and 3% loadings of GO were evaluated for their morphology, mechanical properties, crystallinity, biocompatibility, and hemocompatibility. The mechanical properties were assessed under both static and dynamic conditions to explore the tensile characteristics and viscoelastic properties. The results show that GO presented a good dispersion and exfoliation in the PCU matrix, contributing to an increase in the mechanical performance. In vitro cytotoxicity tests with L-929 fibroblast cells and percentage hemolysis tests with fresh venous blood displayed the membranes to be cytocompatible with acceptable levels of hemolytic characteristics. These results highlight the potential of this mechanically improved composite membrane's application in the biomedical field.

Development of electrospun composite scaffolds as bone substitute

Anti-resorptive drug pamidronate disodium pentahydrate (PDS) with different loadings (1, 3, 5 and 10 wt%), has been incorporated into polycaprolactone (PCL), blend of PCL with synthesized triblock copolymer polycaprolactone/ polycaprolactone - polyethyleneglycol - polycaprolactone / polycaprolactone (PCL/CEC) and their nanohydroxyapatite (nHA) filled composites (PCL/CEC/nHAP). Since PDS has a strong affinity for nHA, HA-PDS particles were also prepared and have been incorporated in PCL/CEC blend. All the systems were evaluated for their morphology, fiber diameter, surface wettability, static and dynamic mechanical properties. In vitro release studies of PDS from microspheres at 37°C were carried out using ninhydrin analysis and by cerium ammonium nitrate. In vitro degradation studies in PBS at 37°C were also carried out to investigate the change in morphology and mechanical properties. In vitro cell culture studies indicated the cytocompatibile nature of the scaffolds. Further in vivo studies are in progress.

Sleep Disorders Research Lab

Sleep Research lab investigates the unresolved questions related to sleep and its functions. This facility aims to explore the neural mechanisms involved in sleep regulation and to conduct translational research in emerging aspects of sleep medicine for improving human health. This laboratory is equipped with the latest instruments and technology to conduct sleep research. The lab is carrying out studies on neural dynamics after sleep deprivation using animal models using 16 channel Brain Electro Scan System. Studies are also carried out to identify the role of sleep in modulating cognitive behavior in offspring. The sleep during pregnancy is telemetrically monitored using stereotaxically implanted EEG and EMG electrodes. Active principles of the medicinal plants are tested for regulation of sleep as part of translational research. Non-pharmacological interventions for treatment of primary insomnia are explored through evaluation of ambient temperature manipulation in human subjects. The lab is also aiming at finding out inflammatory markers after acute and chronic sleep deprivation.

The Sleep Disorders Research Lab received 3rd year grant (2014-15) from CSIR and DST (in the Cognitive Science Research Initiative (CSRI) program) and the in-house grant from BMT wing, SCTIMST. Research training in Neurophysiology of Sleep was given to all the PhD students and project staffs in the laboratory.

Many of research findings from lab are published in International Journals and acclaimed awards (best poster) in several International meetings and find place in News Daily reports. Dr Kamalesh K Gulia successfully organized International Conference of the Asian Sleep Research Society in Kovalam which was attended by International Sleep experts from more than 15 countries (www.asrs2014.org).

Thrombosis Research Unit

For wound healing biodegradable scaffold derived from poly lactide-glyolide-caprolactone (PLGC) terpolymer incorporated with silver nano particles has been standardized for in vivo burn wound healing studies in rabbits as part of an internal technology development funded (TDF) project. Using an in-house engineered template, patches of electrospun scaffold sized 3cm diameter was hybridized with fibrin for treating burn wound. This is continuation of a previous study in diabetic model and with completion of the current study the scaffold is expected to be qualified for initiating human trials for wound healing. With completion of the animal experiment it will be ready for translation of the technology in limited clinical study. Previously standardized method for differentiation of peripheral blood-derived multi potent adult progenitor cells into keratinocytes has been modified. Briefly, fetal calf serum was replaced with human serum to make the protocol suitable for clinical use.

Human adipose tissue derived mesenchymal stem cells (ADMSC) are being isolated from patients for differentiating into cadiomyocytes for development of regenerative therapy to repair ischemic myocardial tissue. Induction of ADMSC into cardiogenic lineage resulted in the development of cardiac progenitor cells (CPC) which express myosin light chain, myosin heavy chain, Troponin and Connexin 43 as evidenced by reverse transcriptase polymerase chain reaction (RT-PCR) and immunocytochemistry. Expression of TroponinI and Connexin43 in ADMSC derived CPC has been confirmed by immunocytochemistry (Fig 2 A & B). Differentiation of ADMSC into endothelial cells and smooth muscle cells are carried out for tissue engineering of small diameter blood vessel. To promote angiogenesis of regenerating tissues at different ischemic sites such as myocardium and skin, we attempted transfection of ADMSC with vascular endothelial growth factor (VEGF). Upon culture, the transfected cells over expressed VEGF and released the growth factor (GF) into medium. Upon supplementing the endothelial cell culture medium with the GF enriched medium, proliferation of human umbilical vein endothelial cells was significantly enhanced.

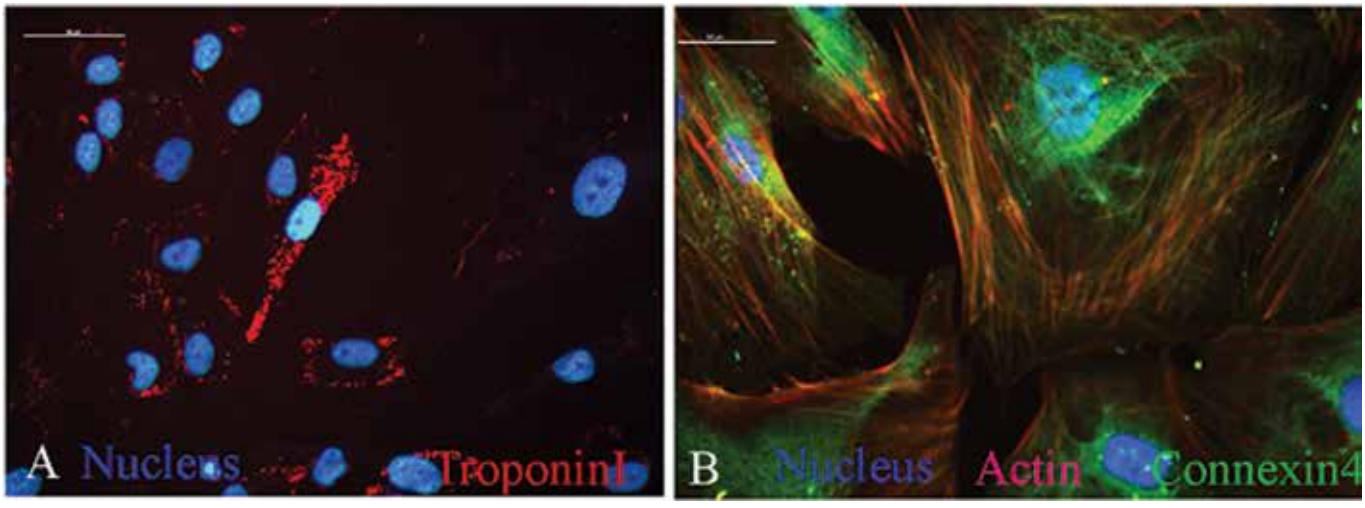


Fig 2A: ADMSC –derived cardiomyocyte progenitor cell (CPC) stained for nucleus (blue) and troponinI (red); B, CPC staine for nucleus (blue) actin (orange) and connexion 43 (green)

The feasibility of using fibrin as the cell carrier for efficient retention of transplanted autologous neural progenitor cells (NPC) at spinal cord injury (SCI) was evaluated in rat model. The transplanted cells were tracked by labelling of neural progenitors in culture with PKH26 prior to transplantation. The analysis of SCI site after 7 days of transplantation indicated significantly more cell retention when fibrin was used as cell delivery vehicle (Fig 3A & 4B). Immunostaining of tissue sections revealed co-expression of neural markers and PKH26 of transplanted cells. The results confirmed that survival of transplanted autologous neural progenitors at SCI site could be improved by using fibrin as cell delivery matrix.

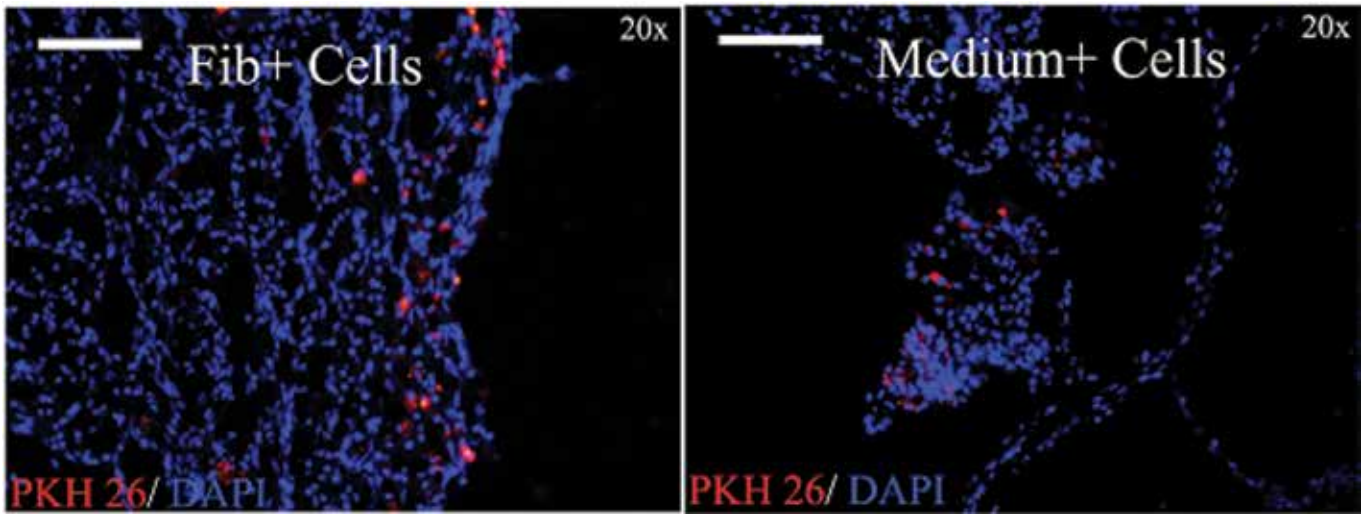


Fig3.A. Explanted tissue section after 7 days of transplantation of neural progenitor cells (NPC) injected with fibrin- blue nucleus, pink-tracker dye; B, NPC injected with culture medium blue nucleus, pink-tracker dye. More fluorescence corresponding to transplanted labelled cells is seen when fibrin is used as cell carrier

For proteome profiling of platelet protein from diabetic patients (test) and healthy subjects (control) were analyzed by 2 dimensional electrophoresis and mass spectrometry. Significant changes between the proteome of two groups were observed (Fig 4A&B). Western blot analysis confirmed presence of inflammatory proteins in the platelets of tests which was undetectable in control. The result of the study indicates risk for inflammatory cardiovascular diseases in diabetic subjects.

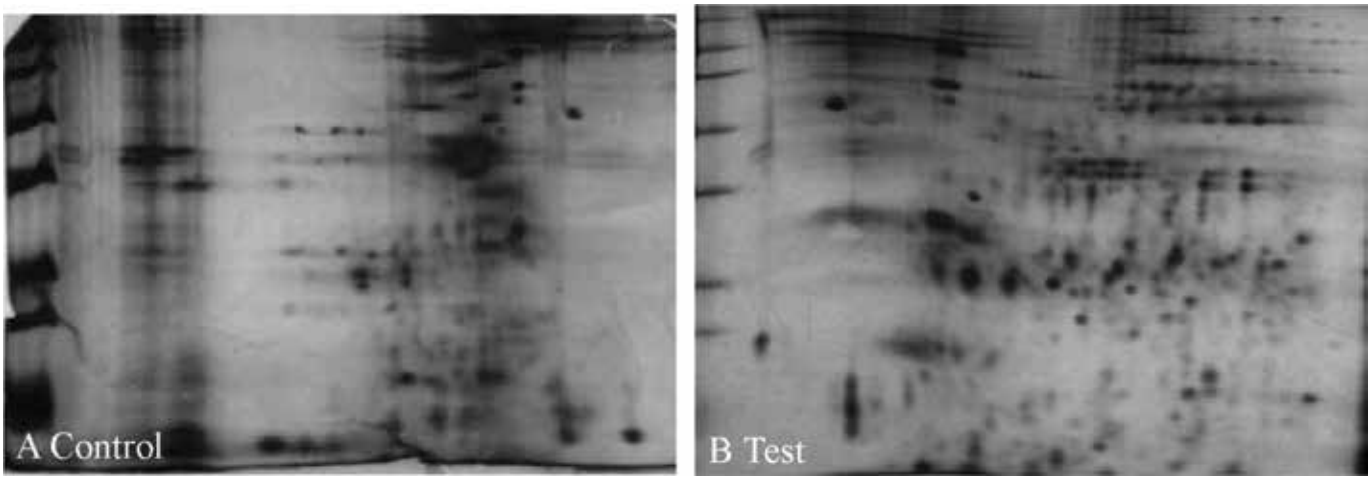


Fig4 2D- PAGE pattern showing profile of platelet proteome: A, sample from control; B, sample from test (diabetic subject). Each spot correspond to a protein. Many additional spots seen in the test indicate many new proteins/peptides are present in the platelets of diabetic subjects which include inflammatory proteins

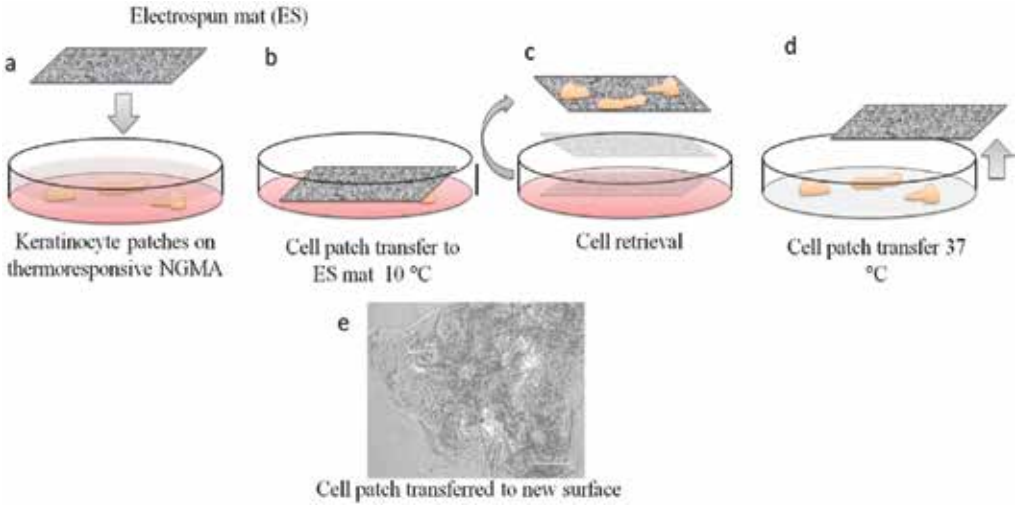
Tissue Culture Lab

Cell sheet engineering with cardiomyocytes

Cells from Wharton's jelly, the gelatinous connective tissue from umbilical cord, is known to differentiate into many lineages including cardiomyocyte. Commercially available Wharton's Jelly Mesenchymal Stem Cells originally isolated from human umbilical cords collected post-partum was procured and used for the study. Cells were cultured in DMEM + 10% FBS and the cytidine analogue 5-azacytidine for 24 h to induce myocardial differentiation. The culture was maintained for 21 days to differentiate to cardiac lineage. The differentiation was monitored by change in morphology and alignment. The differentiation was confirmed by analyzing the cardiac marker alpha sarcomeric actinin which progressively increased over 7, 14 and 21 days. The cells were also characterized by the expression of cardiomyocyte genes like Connexin 43, GATA4, Nkx2.5, Beta myosin heavy chain and Cardiac troponin T.

Cell sheet engineering on electrospun scaffolds for skin tissue engineering

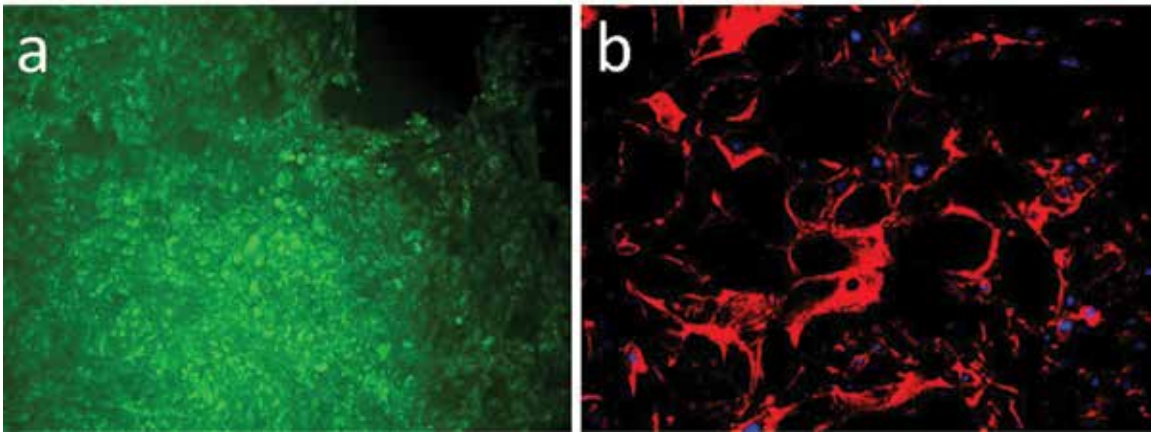
Cell sheet engineering is an alternate technology to overcome the disadvantages of conventional cell culture method of using cell destructive enzymatic procedure to retrieve cells. For efficient cell supply in large area tissue defects a carrier tool is essential for transfer of cell sheet. An electrospun carrier matrix was developed from Chitosan and Poly(Caprolactone) (CS-PCL) to transfer cultured keratinocytes from in house developed thermoresponsive culture surface. Primary keratinocyte culture established on in house developed thermoresponsive NGMA polymer coated dishes was transferred to fresh culture dish with the help of electrospun CS-PCL mats and temperature variation.



(a to d) Illustration of the various steps involved in transfer of cell patches from thermoresponsive surface using electrospun mat. (c) Phase contrast image of transferred cell patch is also shown.

Thermoresponsive Substrate functionalized with Stromal Extra Cellular Matrix Proteins for Corneal Tissue Engineering

Thermoresponsive culture surface allows retrieval of intact monolayer or multilayer without disrupting the extracellular matrix. In-house developed N-Isopropylacrilamide-Co-Glycidylmethacrylate (NGMA) has been proved to be a very good thermoresponsive culture substrate for cell sheet engineering. Modification by functionalizing with biomolecules will allow to create customized substrates for different cell types. Biofunctionalization of NGMA was done by conjugating proteins derived from goat corneal stroma in order to support the growth of isolated corneal epithelial cells. The results confirmed that corneal epithelial cells adhere on modified surface and retained thermoreponsive property for cell sheet retrieval.



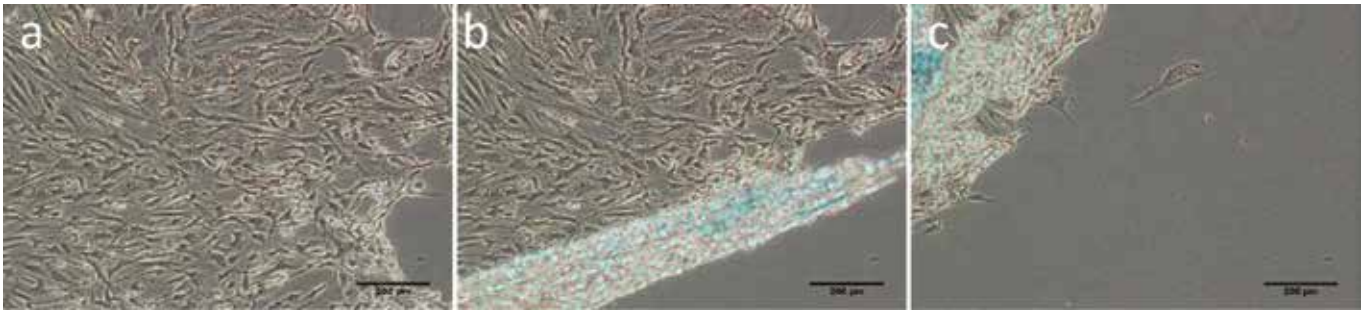
(a) Live (green) - dead (red) staining of goat corneal epithelial cells sheet retrieved from biofunctionalized thermoresponsive surface using FDA/PI. (b) cell sheet stained with rhodamine-phalloidin (red) for cell morphology. Cell nucleus was counter stained with Hoechst (blue).

Tissue engineering of a carrier free corneal endothelial construct towards transplantation for endothelial –Keratoplasty

Corneal endothelial dystrophies are cured by Endothelial keratoplasty, where the non-functional endothelium is surgically replaced. This demands lot of donor endothelium obtained through donated corneas. The limitation of donor tissue shortage can be overcome by using tissue engineered endothelial constructs. Tissue constructs with intact extracellular matrix are generated using stimuli responsive polymers. Different culture methods were tried to optimize the endothelial cell isolation procedure. The feasibility of using the thermoresponsive NGMA surface for generating and harvest viable corneal endothelial cell sheets was then studied. The retrieved cell sheet showed intact architecture, cobble stone morphology, and cell-to cell contact with strong extracellular matrix. The cells also expressed endothelial markers such as aquaporin 1, collagen IV, Na+-K+ATPase, and FLK-1.

Developing Mesenchymal Stem Cell (MSCs) sheets using thermo responsive polymer

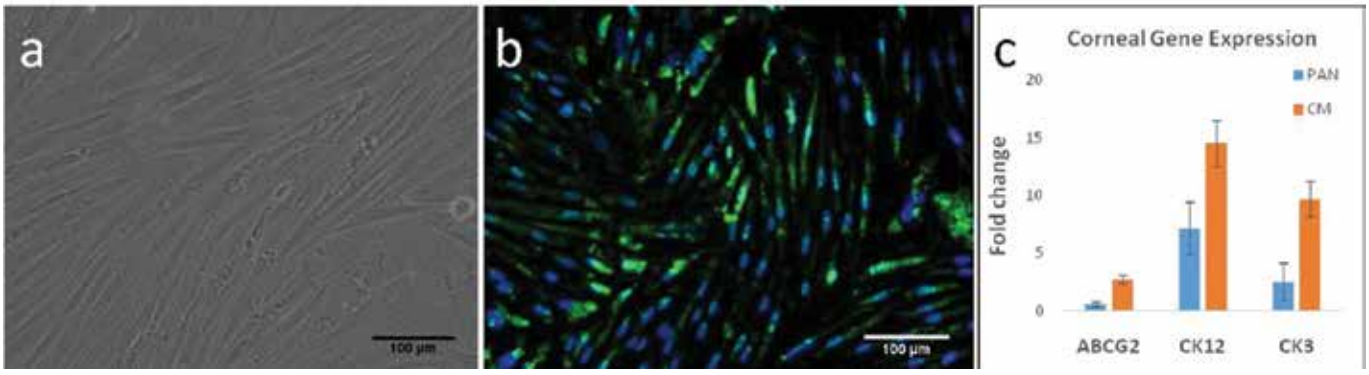
Role of stem cells in tissue engineering is getting more important especially those application involving adult stem cells. The use of MSCs as autologous cell source in clinical application has been demonstrated based on its characteristics such as multi lineage differentiation, trans-differentiation potential, immune modulatory properties and paracrine signalling ability. Using the in-house developed thermo responsive culture substrate rabbit bone marrow MSC sheets were successfully developed in the context of better cell supply in transplantation compared to cells in suspension.



(a) MSC monolayer on thermoresponsive surface. (b and c) Retrieval of MSC cell sheet by mere temperature variation.

Alternate stem cell source for ocular surface regeneration

Cornea is the transparent outermost protective layer of the eye which is prone to damages from accidents, burns and trauma. Insults to limbal stem cells in cornea results in limbal stem cell deficiency (LSCD) that can lead to corneal blindness. In bilateral LSCD, limbal microenvironment in both the eyes will be hampered without leaving any chances for autologous limbal source. Hence an alternate cell source other than limbal stem cells is necessary for ocular surface reconstruction. Being adult stem cells, Bone marrow derived MSCs and Adipose derived MSCs (ADMSCs) could be considered as alternate cell source for corneal surface therapies. With this intention, trans differentiation of MSCs was attempted by culturing mesenchymal stem cells with limbal stem cell conditioned medium. Studies are in progress to screen the potential stem cells for ocular surface regeneration.



Differentiated MSC monolayer (a) expressing corneal marker CK3/12 (b). Corneal specific gene expression (ABCG2, CK3, CK12) by MSC derived cells.

Dental pulp regeneration in the presence of bioceramics

Teeth possess multiple functions and longevity of teeth is essential to maintain the quality of life. Diseases affecting pulp may lead to irreversible pulpitis which is treated with removal of entire pulp followed by filling the root canal space with artificial materials. Complicated cases due to incomplete disinfection and coronal leakage may end up in periapical disease and reduce the endodontic success considerably. Hence it is necessary to find a replacement for natural pulp and dentin. Regenerating pulp tissue is one of the approaches in order to restore functional tooth. In vitro cell culture studies have been initiated to understand the possibilities of regenerating pulp tissue in the presence of bioactive bioceramic materials.

Toxicology

'Molecular and immunotoxicological effects of Dextran coated Ferrite and Hydroxylapitite nanomaterials', Nanomission, DST, New Delhi.

The work includes the cytotoxicity, acute oral toxicity, sub-chronic toxicity, combined chronic toxicity and carcinogenicity, dermal toxicity, immuno-toxicity studies (B and T lymphocytes proliferation and inflammatory cytokines), DNA damaging effect, lipid peroxidation and antioxidant enzymes (Glutathione, glutathione reductase and glutathione peroxidase).

'In Vitro alternative test system development for Ocular Irritation' ICMR, New Delhi

The objective of the present project is, to develop an in vitro test system for acute and sub acute ocular irritation and will be suitable for evaluating the biomaterials, medical devices, pharmaceuticals and chemicals

Transmission Electron Microscopy

Tissue engineering activities under the ambit of the TEM lab focuses on material evaluation with final application (ceramics, hydrogels, decellularized tissue) for repair, reconstruction or replacement of skeletal and allied tissues under normal or pathological conditions. The lab is also investigating the process of cell cytoskeleton organization. Current projects as highlighted below; focuses on cell source evaluation, developing suitable scaffolds and preparing pathological models of analysis.

Evaluation of tissue engineered Strontium incorporated hydroxyaapatite (SrHA) for the healing of Osteoporotic

bone defect in sheep model.

Tissue Engineering Strategies focused on developing repair solutions for fracture fixation under osteoporotic conditions are being evaluated. In the proposed project Strontium incorporated Hydroxyapatite (SrHA) has been developed into a bifunctional unit with MSCs (cSrHA). This is in view of the fact that the cellular part would facilitate osteogenesis and osteointegration. Strontium (Sr^{2+}) ions would simultaneously attribute to its dual role to favor osteogenesis and inhibit resorption.To evaluate strategies in development for use in such scenarios an Osteoporotic Model was developed in sheep via Ovariectomy & a calcium deficient diet.

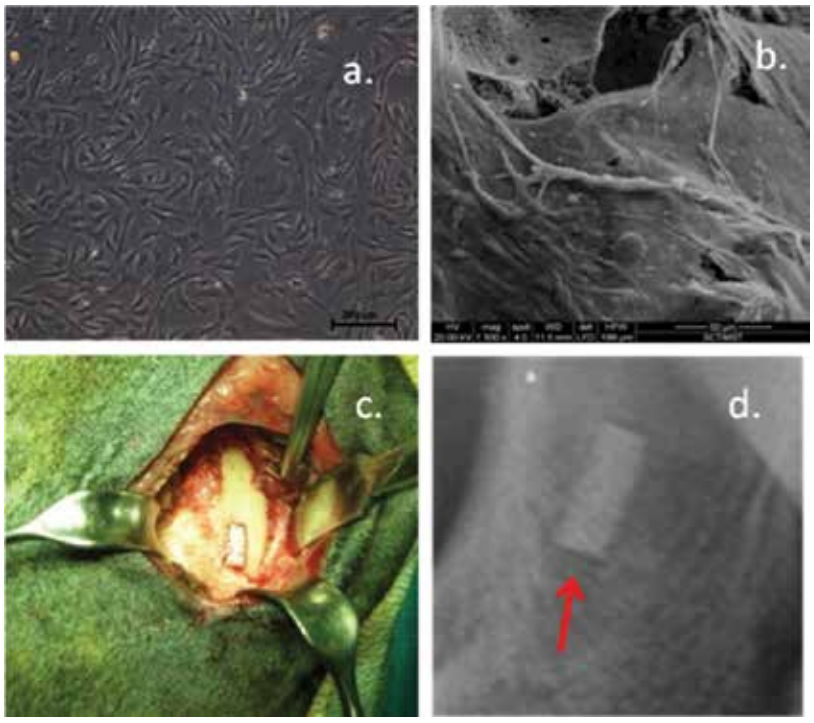


Fig. 2 (A) Phase contrast image of sheep ADMSC, (B)Scanning electron micrograph of cell seeded SrHA (C) Press fit method adopted for implantation in sheep osteoporotic model, (D) Radiograph depicting the improved osteointegrative ability of cSrHA implants in osteoporotic condition.

Regeneration of Intervertebral discs – A tissue engineering approach.

Alginate, a natural polymer has been selected as a good candidate scaffold for the regeneration of the Nucleosus Pulposus (NP) of the IVD. Combination of alginate with Strontium chloride provides a porous radiopaque hydrogel which can accommodate cells. This hydrogel showed 74.28% porosity which mimics extra cellular matrix of NP which is ideal as a substitute for IVD repair.

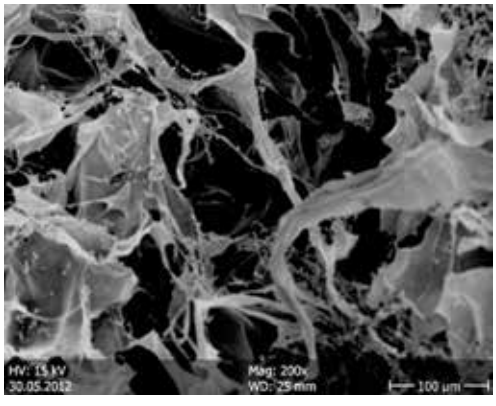


Fig 3. Scanning Electron Micrograph of porous Alginate - Strontium gel

Meniscal Tissue Engineering:

Meniscal injury is one among the major injuries in knee joint. Current therapies are invasive and non – reparative in nature with long term deterioration. This study aims in the development of an alginate dialdehyde gelatin scaffold which in combination with fibrochondrocytes will help in the healing of meniscal injury.

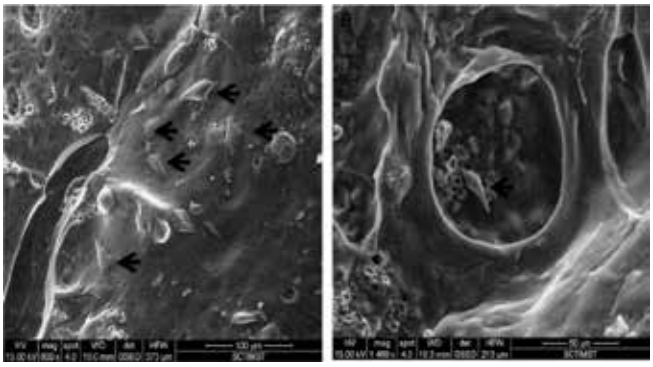
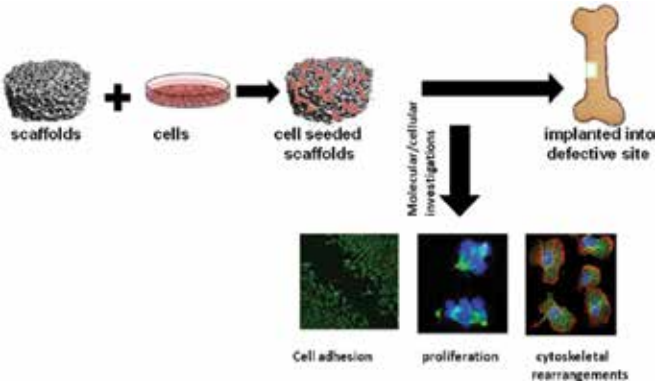


Fig 4: SEM images of Fibrochondrocyte adhesion on hydrogel

Role of Microtubule Associated Proteins in Cytoskeletal Interactions

The project aims to understand the molecular and cellular mechanisms involved in cell migration and adhesion on scaffolds, which might help to develop better scaffolds as orthopaedic implants. It focuses on the mechanisms of cytoskelatal cross linking which is important for different processes such as regeneration of fractured bone, wound repair and cancer metastases. Cytoskeleton associated proteins, specifically the proteins that regulate microtubule dynamics can influence cell migration and therefore might play a role in the aggressive and metastatic spread of many cancers to bones.



Product Development and Technology Transfer activity

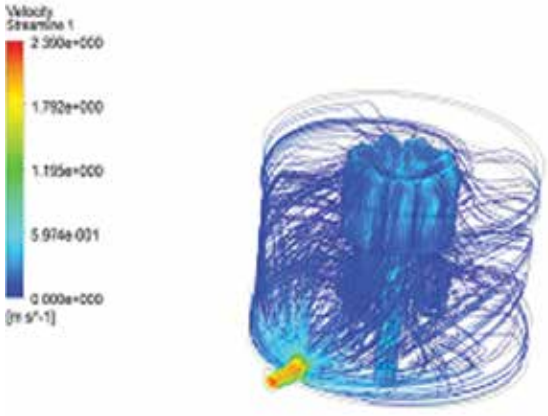
Artificial Organs

Modelling & Prototyping Lab

Development of cardiopulmonary devices

The project aimed at development of Membrane Oxygenator and arterial filter for paediatric and neonatal applications; membrane Oxygenator in itself has two components called the Heat Exchanger and Gas Exchanger.

- Computational fluid dynamics (CFD) analysis of different design of gas exchanger designs were conducted to estimate the gas transfer and pressure drop in the designs and prototypes were fabricated based on these.



Velocity profiles observed in CFD analysis

Experiment for estimation of Gas transfer rate

- Evaluations on the device prototypes were conducted to estimate the gas transfer and pressure drop with simulated fluid.

- Three design iterations were done and the final design has shown acceptable gas transfer performance and multiple prototypes are being fabricated based on this design for further evaluation.

- A technique for cutting and end sealing of fiber mat for Oxygenator was standardized and is used for development of prototype gas exchangers.

Process of cutting Oxygenator fiber mat to the required size.

- Based on a series of evaluations for heat exchanger performance factor with different heat exchanger designs, a suitable heat exchanger design was finalized which has sufficient performance factor. Different combination of heat exchanger tube outer profiles and insert designs were evaluated to arrive at the optimum design.

Electromagnetic Blood Flow Meter

In this project for development of an Electromagnetic blood flow measurement system, three types of devices are being developed, one is a benchtop unit, second one is a portable hand held unit and the third one is intended to be used in intra operative flow measurement.

- Fabricated prototypes of bench top and hand held type devices were subjected to different types of evaluations during this period to assess the performance of the system with reference to Fluid temperature, ambient temperature, day to day environmental variation etc and also the effect of Warm-up time, effect of electromagnetic interference on the system and also a response time analysis.

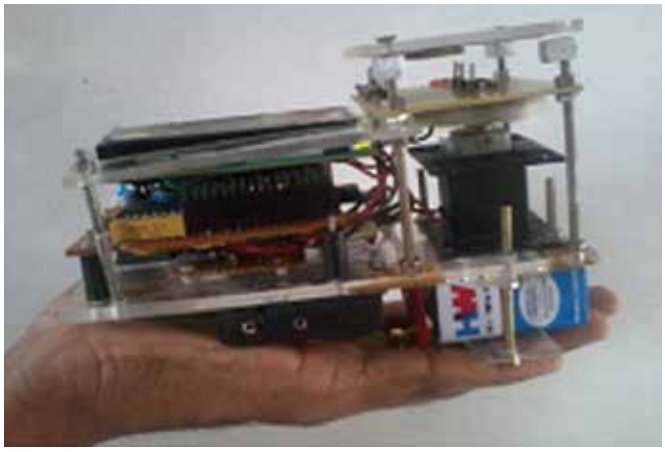
- The portable flow meter electronic circuits were modified to incorporate latest components like microprocessors, amplifiers and brushless DC motors to arrive at a state of the art product.

- In the Intra Operative Flow Measurement device, Proof of concept studies started for measurement of intra operative blood flow measurement. A novel magnetic excitation scheme was introduced for small probe design suitable for vascular connections.

Blood warmer

Prototype Blood warmer based on Infra red heating for blood transfusion is in progress and the power electronic control boards and other electronic circuitries were fabricated. Two types of warmers developed; one is for warming blood or blood components in blood bag and a second warmer system for warming fluid passing through the IV line.

Blood warmer prototype



Prototype of Portable Electromagnetic bloodflow meter

Biomaterial and Biological Products

Bioceramics Laboratory

The product 'BioGraft HABG Active' for orthopedic application, manufactured by IFGL bioceramics based on technology transferred by the Institute has been under consideration for manufacturing license approval by the Drug Controller General of India (DCGI). The company received DCGI clearance for the multi centre trails for their product Biograft HABG.

As a part of the "Festival of Innovation" organised by National Innovation Foundation during 7-13 March 2015, Indian Council for Medical Research (ICMR) organised a "Medical Science and Bio-Technology Innovations Exhibition" at Rashtrapati Bhavan, New Delhi. The Bioceramic products were displayed in this exhibition.

Industry has shown interest in the possibility of developing various tissue engineered scaffolds used for bony injuries and a non-disclosure agreement for collaborative work has been signed to facilitate exchange of information.

Dental Products Laboratory

a) Intrauterine system EMILY

Nearly 15000 units have already been sold as per data provided by industry. Modifications were done on the design of the T-stem by industry by making it anchor shaped. Current production rate is about 100-150 units per day. Emily was also showcased at the "Festival of Innovation" organised by National Innovation Foundation during 7-13 March 2015 during which Indian Council for Medical Research (ICMR) organised a "Medical Science and Bio-Technology Innovations Exhibition" at Rashtrapati Bhavan, New Delhi.

b) Caries Removal Agent

A new caries dissolving agent developed by the lab and whose technology was transferred to industry was marketed during the year under the brand name `Dsolv'. The product is being sold at 1/3rd the price of the imported product. Production and marketing started from 1st January 2015.

c) Dental composites

Meetings were held with three industries who showed interest in absorbing the dental composite technology during the year. Technology is likely to be relicensed during May 2015.

Division of In Vivo models & Testing

The division has developed process for decellularised and non-calcifying glutaraldehyde treated bovine pericardium for cardiovascular applications. An Indian company has shown interest for technology transfer. Negotiations are ongoing for technology transfer.

The division is also involved in development of Bi-leaflet valved conduit made from processed bovine pericardium meant for RVOT reconstruction surgery. Sheep implantations are ongoing for evaluation of this device.

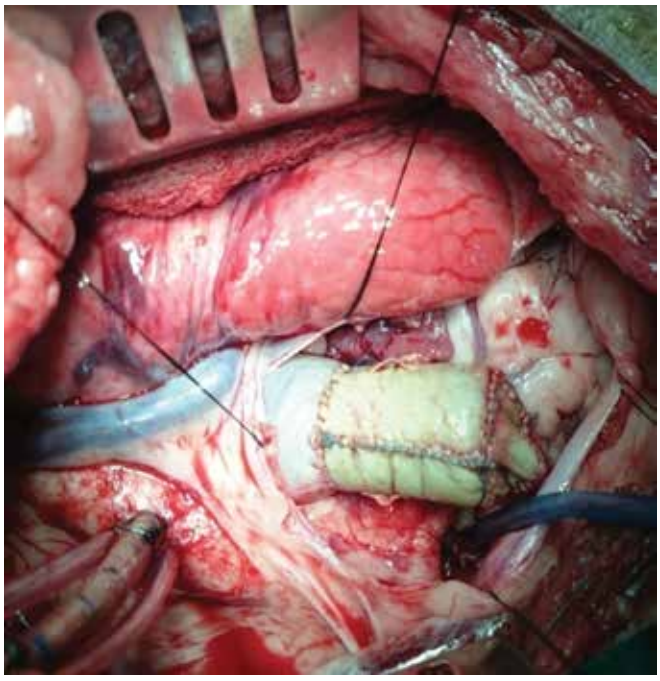


Figure showing implanted graft in sheep pulmonary position

Division for Tissue Engineering and Regeneration Technologies

Development of novel scaffold materials for tissue engineering of different tissue types, development of different fabrication methods for scaffolding technologies like gels, freeze drying, gas foaming, electrospinning etc. is ongoing. Materials we develop are also shared with other labs within campus and collaborating labs elsewhere in the country. Industry has envinced interest in our scaffolds for cartilage tissue regeneration application. NDA has been signed with an industry for this purpose.

Experimental Pathology

Porcine cholecyst-derived scaffold was found useful as skin graft-substitute and wound healing matrix in animal models. The data are now published in indexed journals. Efforts are being made to identify a suitable industry partner to commercialize the product.

Polymer lab

The bone cement development has been undertaken under the DST sponsored project 'Dispensable and biodegradable polymeric bone cement for minimally invasive treatment of bone diseases'. For the clinical trial, necessary steps have been taken up with Mahatma Gandhi post graduate institute of Dental Sciences, Puduchery for the treatment of bone cavities in dental endodontic periapical surgeries.

ii.Under the programme 'Biodegradable polymeric composite materials for orthopedic fixation devices', the development of mechanically favorable and degradable nanocomposites consisting in situ polymerized biodegradable copolyester and hydroxyapatite (HA) was continued. We have also functionalized nano hydroxy apatite (HA) with citric acid and subsequently crosslinked with poly(propylene fumarate), PEG and N-vinyl pyrrolidone to give a composite with better interfacial bonding properties. Uniform homogenous distribution of HA was identified through Raman spectral imaging in both the composite matrices. The compressive moduli of the biomimetic composites after 4-week immersion in PBS ranged between 100 - 300 MPa which falls well within the accepted values reported for human trabecular bone. Moreover, biodegradation studies revealed only an average weight loss of 10 - 17% during the 7-week time period. Furthermore, apatite mineralization was evaluated using SEM and EDAX analysis. The contact angle measurements revealed hydrophobic surfaces with preferential adsorption to albumin. More importantly, blood compatibility studies demonstrated no significant heamolysis and no visible RBC aggregation while cytotoxicity evaluation via direct contact, MTT and live/dead assays on HOS osteoblast cell line exhibited good biocompatibility with negligible cytotoxicity. In addition, in vitro drug release studies with gentamycin loaded composites demonstrated a controlled and sustained release profile with about 35% of drug released over a period of 2 weeks. These findings show that these composites could be developed into stand-alone bone substitutes for bone tissue engineering coupled with drug delivery applications.

Polymer Processing

The technology development, performance evaluation and pre-clinical studies of the implant device, 'fluoropassivated and hydrogel sealed large diameter vascular graft' are completed and the technology is being transferred to M/s. TTK Healthcare Ltd.

Thrombosis Research Unit

Scale up of Fibrin Sealant production activity has been initiated. The Class100 GMP facility has become functional. Facility is being evaluated by the drug controller office for small scale production of fibrin sealant. The outcome of preliminary inspection was satisfactory; the minor modification suggested is being addressed. Scale up procedure has been standardized using the equipments installed in the facility and ~100 vials of fibrinogen concentrate is the yield from a pool of 40 fresh frozen plasma units. The sealant produced meets specifications listed in European Pharmacopoeia. A team of four personnel are being trained to work in the GMP facility.

The delivery systems developed in the lab for curcumin has been evaluated by patent examiner and is now ready for second stage filing for patent protection by PCT law. The patent (PCT) processing is supported by Indian Council of Medical Research, Govt. of India. In vivo evaluation of curcumin delivery systems have been found effective in reducing tumour in mice cancer model. Both safety and efficacy have been proven. No mortality was observed upon intra-peritoneal administration of high concentration of clear curcumin solution of albumin conjugate. Sub chronic dose of conjugate for 14 days was non-toxic at cellular and biochemical level. Administration of the conjugate is immuno-modulatory in animal models as demonstrated by normal bone marrow function after continuous drug administration. Safe and efficient use of curcumin solution at high concentrations in animals suggests potential for its clinical translation.

Diagnostics and Instrumentation

Instrumentation lab

External Pneumatic Compression Pump for Deep Vein Thrombosis Prophylaxis

This device has an array of bladders which is placed inside a cuff. The bladders are provided with closed loop monitoring of pressure levels in each bladder and are controlled by employing pneumatic valves which is driven by a microcontroller. The device is equipped with a more efficient air pump. This model ensures an increased life span of the air pump by controlling the timing chains of bladder inflation and deflation by PWM switching from the microcontroller. A power supply back up is also included in the device to serve in case of power failure for longer runs.

The device primarily intended to be used as a prophylaxis measure for preventing Deep Vein Thrombosis thereby preventing the more dangerous pulmonary embolism to occur will enhance the blood flow velocity to a desired level by aiding the musculoskeletal pump which works as the peripheral heart for the human body.

Ambulatory Vital Signs Monitor for Screening of Sleep Disorders

Develop a home based vital signs monitor for screening of sleep disorders incorporating three channel electrocardiogram (ECG), two channel impedance pneumography and single channel oxygen saturation (SPO2). This device will serve as a prescreen device before going to an actual PSG-Polysomnography test for a patient suspecting sleep disorders like Apnea, OSA-Obstructive sleep apnea etc. This system consists of a harness to capture the biosignals and sophisticated software built on android platform to display the parameters

Microbial Technology

DST sponsored project is ongoing for manufacture of 1000 plus UTI rapid diagnostic kit. Such kits will be tested at different centers for multicentric evaluation.

Toxicology

The development of an In vitro pyrogen test kit for the evaluation of pyrogenicity using human whole blood is completed. This is an ELISA method for pyrogenicity assessment and will be suitable for evaluating wide spectrum of applications to measure the undetected non endotoxin pyrogens, such as pyrogens of any chemical or biological nature. Under validation process, different parameters expected to affect the process were evaluated. The validation process under different environmental conditions is yet to study.

Technology Transfer & Project Coordination

Technology Business Division

The main focus of Technology Business Division was on setting up of the Technology Business Incubator (TBI) for Medical Devices and Biomaterials. A project proposal for funding was submitted to Department of Science & Technology and Kerala State Industrial Development Corporation and in principle approval has been received. A not-for-profit society by name SCTIMST-TIMed was registered for this purpose. Preliminary steps to make the TBI operational made good progress.

The other activities of the division included

- coordinating institute industry interactions related to technology transfer and research project collaborations.
- coordinating testing services and specific protocol based study requests from the industry and academia for medical devices and biomaterials.
- coordinating the internal research project funding of the Institute comprising of the Technology Development Fund Scheme and the Overhead Fund Scheme
- preparing various reports for submission to external agencies such as DST, DSIR, ICMR etc. on the activities of Institute

The division also coordinated the signing of an MOU between Institute and National Health Systems Resource Centre (NHSRC), New Delhi for cooperation and collaboration in areas of mutual interest in healthcare technology on 27th Oct 2014.

The division coordinated the participation of the Institute and showcasing its two commercialized technologies namely Bioceramics and Hormone releasing IUD at the Innovations in Healthcare exhibition organized by ICMR at Rashtrapati Bhavan on 11th March 2015.

The division coordinated interactions with various industry representatives for the technology transfer of different technical leads under development such as decellularised bovine pericardium, Hydroxyapatite and Beta tricalcium

phosphate, valve durability testing equipment, relicensing of dental composites etc.

Project Co-ordination

The Technology Development Fund (TDF) scheme which is used for funding internal research projects was revamped and implemented with better systems and processes for peer review of proposals and aligning it to the objectives. The Overhead Fund Scheme was also implemented. Periodic review of the ongoing projects was also done in the Overhead Fund Scheme.

Intellectual Property Rights Cell (IPC)

a. Patent granted during this financial year: Nil

Patents(India) Under Processing						
Sl. No	REF NO	APPLICATION No	DATE OF FILING	TITLE OF INVENTION	INVENTORS	REMARKS
	IPDPL052. Y14	2398/ CHE/2014	14/05/2014	Development of a biodegradable and bio mimetic hybrid scaffold using synthetic plgc terpolymer and biopolymer for tissue engineering	Kalliyanakrishnan Venkateswaran Lissy Kalliyana krishnan	Stage-III Provisional Specification filed on 14/05/2014 Complete specification to be filed before 13/05/2015
	IPHOW053. Y14	2863/ CHE/2014	12/06/2014	An improved adjustable lift system for minimal incision surgeries	Thomas Mathew Jayakumar Karunakaran	Stage-IV Complete specification filed on 26/08/2014 Publication due on 11/12/2015
	IPMPL054. Y14	3482/ CHE/2014	15/07/2014	A portable device and a method for non-contact warming of blood and intravenous fluids with infrared heating from refrigerator condition to physiological condition	sarath sasidharan Nair Nagesh Divakara Panickar Sulochana	Stage-IV Complete specification filed on 15/07/2014 Publication due on 14/01/2016
	IPBCL055. Y14	3799/ CHE/2014	04/08/2014	Ceramic moiety modified magnetic nano particle-biomedical applications in cell separationand hyperthermia therapy.	ansar Ereath Beeran Sekharapillai Vijayan, Parimanathu Kovilakom Rama Varma Hari Krishna Varma	Stage-III Provisional Specification filed on 04/08/2014 Complete specification to be filed before 03/08/2015

	IPDPL056.Y14	4027/CHE/2014	18/08/2014	A process for the synthesis of inorganic-organic hybrid resins comprising of alkoxides or mixtures of alkoxides of calcium, magnesium, zinc, strontium, barium and manganese	Iizymol Philipose Pampadykandathil Vibha Chandrababu	Stage-III Provisional Specification filed on 18/08/2014 Complete specification to be filed before 17/08/2015

Application dispatched to attorney & provisional specification to be filed

b. The patent applications received by IP Cell is 14 ,including four joint applications and its status is as follows:

4. Total no of patents filed during the financial year :12

5. Foreign patents Granted during the financial Year:2 (Both the applications filed through CSIR)

Patents (International)							
PATENT NO	APPL NO	Date of filing	TITLE OF INVENTION	INVENTORS	APPLICANT	COUNTRY	Date of Grant
EP1924248	05856290.1	30/12/2005	pH SENSITIVE NANO PARTICLE FORMULATION FOR ORAL DELIVERY OF PROTEIN/ PEPTIDES	Chandra Prakash Sharma, Mannemcherril Ramesan Rekha	CSIR	EP*	Date of grant 22/10/2014 bullettin 2014/43
CA2621641	CA 2621641	30/12/2005	pH SENSITIVE NANO PARTICLE FORMULATION FOR ORAL DELIVERY OF PROTEIN/ PEPTIDES	Chandra Prakash Sharma, Mannemcherril Ramesan Rekha	CSIR	CA*	Granted on 21/10/2014

*EP:European Union, CA:Canada

6. Total No of foreign patents filed: 2 (Both the patents are filed through ICMR and the details are as follows.)

PCT Applications						
	REF NO	APPLICATION No	DATE OF FILING	TITLE OF INVENTION	INVENTORS	REMARKS
1	IPTRU031. Y13	1516/CHE/2013 PCT/IN2014/000300 Dtd.05/05/2014.	03.04.2013 03.05.2013	FIBRIN WAFER/DISC AS A BIOLOGICAL CARRIER FOR SUSTAINED DELIVERY OF CURCUMIN JOINT APPLICATION WITH ICMR & NO PAYMENT REQUIRED.	Lissy Kalliyana krishnan Lakshmi Sreedharan Pillai	Stage-VI Request for Examination filed Awaiting outcome.
2	IPTRU032. Y13	2200/CHE/2013 (PCT/IN2014/000338) Dated 20/05/2014	20/05/2013	DEVELOPMENT OF SOLUBLE ALBUMINATED CURCUMIN FOR APPLICATION IN CANCER THERAPY JOINT APPLICATION WITH ICMR & NO PAYMENT REQUIRED.	Lissy Kalliyana krishnan Christina Thomas	Stage-VI Request for Examination filed Awaiting outcome

Testing, Quality system and Technical services related activity

Calibration

Calibrations (internal): 335

Calibrations (external): 40

New work procedure: Procedure for measurement of specific gravity

Quality Cell

Activities of Quality Cell include the implementation, maintenance and improvement of management systems to assure that the facilities, equipment, personnel, methods, practices, records and its control are in conformance to the requirements of the standards.

Following were the major activities of the quality cell during the period from April 2014 to March 2015

a. COFRAC surveillance assessment was conducted on 17-18 June 2014. There were no nonconformities reported. All the NC's from last assessment were closed.

   Extended scope received from COFRAC. The new scope is effective from 15th September 2014 (Annexure-1, List of Accredited Tests).

b. NABL Assessment

   Site verification of calibration cell (owing to shifting) was carried out by NABL assessor on 6th September 2014.

   Desktop Surveillance successfully completed at Calibration Cell.

c. Training: ISO 9000 awareness training was organized on 16th January 2015. Twenty three personnel attended the training programme.

d. Management review

   - A Management Review Committee meeting was held on 15th May 2014.
   - Two Technical Management Committee meetings were held on 10th June 2014 & 9th December 2014.

e. Internal Audits carried out:

   - 19th – 28th May 2014. Total of 25 Non-conformities reported and subsequent corrective actions taken.

- 17th – 26th November 2014. Total of 27 Non-conformities reported and subsequent corrective actions taken.

LIST OF ACCREDITED TESTS - 2014

No	Name of Test	Reference
1	Medical-surgical material. Medical devices and materials biocompatibility. Extraction methods	ISO 10993-12
2	Standardised method for extraction of medical plastics	ASTM F 619-03
3	Animal skin irritation test	ISO 10993-10: 6.3
4	Intracutaneous reactivity test	ISO 10993-10 B-2/ USP 28(88)
5	Penile irritation test	ISO 10993-10 B-5
6	Acute systemic toxicity: acute intravenous application	ISO 10993-11: 6.5.4/ USP 28(88)
7	Acute systemic toxicity: acute intraperitoneal application	ISO 10993-11: 6.5.5/ USP 28(88)
8	Partial thromboplastin time (PTT)	ISO 10993-4 B 3.1
9	Fibrinogen Assay	ISO 10993-4 B 3.5
10	Prothrombin Time (PT)	ISO 10993-4 B 3.2
11	Quantification of platelet aggregates	ISO 10993-4 B 2.7
12	Complement Activation test	ISO 10993-4 B.6
13	Haematology- Leucocyte Count & Haemoglobin	ISO 10993-4 C.6.1.2.1
14	Leucocyte adhesion on materials- Light microscopy	ISO 10993-4 B 2.7
15	Standard practice for assessment of haemolytic properties of material	ISO 10993-4 / ASTM 756
16	Maximisation test for delayed hypersensitivity	ISO 10993-10: 7.4
17	Closed patch test for delayed hypersensitivity	ISO 10993-10: 7.5

18	Vaginal irritation test	ISO 10993-10: B-7
19	Systematic toxicity – Selection of test for Pyrogenicity-testing for pyrogenic substances of either endotoxin or non-endotoxin origin(pyrogen test)	ISO 10993-11: 7.1 / USP 28(88)
20	Test for local effects after implantation: -implantation in subcutaneous tissue -implantation in muscles and in bone(s)	ISO 10993-6: 4, 5, 6
21	Invitro test for genotoxicity- carcinogenicity and reproductive toxicity	ISO 10993-3: 4.4 / OECD no 471
22	Invivo test for genotoxicity-- Micronuclei test	ISO 10993-3: 4.4.2/ OECD no 474
23	Invivo test for genotoxicity -Metaphase analysis in rodent bone marrow	ISO 10993-3: 4.4.2/ OECD no 475
24	Tests for in vitro cytotoxicity	ISO 10993-5
25	Sterility test to check particularly the date of "end of use" of the product - Medical device	USP 28(71)
26	Estimation of ATP in Red Cell & Platelets	ISO 10993-4 C.6.2
27	Estimation of Plasma Glucose	ISO 10993-4 C.6.2
28	Estimation of Plasma Lactate	ISO 10993-4 C.6.2
29	Estimation of Plasma Potassium	ISO 10993-4 C.6.2
30	Estimation of Plasma Sodium	ISO 10993-4 C.6.2
31	Estimation of 2,3 DPG in Red cell concentrate	ISO 10993-4 C.6.2
32	Bioburden Analysis	ISO 11737-1

Scope available at www.sctimst.ac.in/ www.cofrac.fr

Bioceramics Laboratory

Various tests are offered by the Lab for the internal and external customers –

1. X-Ray Powder Diffraction
2. Scanning Electron Microscopy, Environmental Scanning electron Microscopy and EDS analysis.
3. Atomic Emission Spectroscopy with Inductively Coupled Plasma (AES ICP) for elemental analysis.

Dental products Laboratory

Testing facilities were extended to internal and external customers as usual. An amount of Rs. 193779/- excluding taxes was generated by the lab through testing this year. Micro CT was re-commissioned again after changing X-ray tube.

Division of In Vivo Models & Testing

The division has completed and submitted report for the study titled "28 days dose ranging study on Everolimus eluting coronary stent in porcine coronary artery high injury model" to Industry M/s Sahajanand Medical technologies Pvt. Ltd, Surat, during this period.

Another study 'Evaluation of bioresorbable polymeric stent system' was initiated during this period. Animal implantations in pig coronary artery model was completed for this study during this period.

Division of Laboratory Animal House

DLAS is registered under the CPCSEA guidelines supplies quality laboratory animals that are cared and managed in the Laboratory on the platform of ISO 17025 to aid Testing & Research activities. Periodic quality assurance and compliance to ISO 10993 Part II guidelines is assured for the year at this facility.

1. Breeding, welfare, care and management of rats, mice, rabbits and guinea pigs remains the prime area of concern.
2. Health monitoring of small laboratory rodents and rabbits was carried out by the introduction of a sentinel animal plan with a four tier health monitoring system.
3. An occupational health and safety plan was established to specially suit the personnel working with small laboratory animals in line with internationally accepted guidelines in the field.

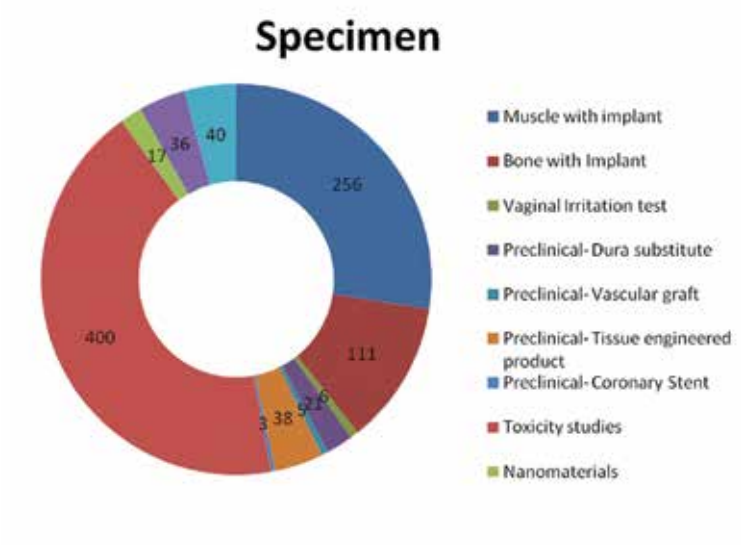
Animals Bred and Supplied for testing and research during 2014-15 from DLAS	Rabbits (NZW:Sctb)	Rats
Wi:Sctb/SD:Sctb/SHR	Mice	
BALB/c / SA:Sctb	Guinea Pigs (HA:Sctb)	

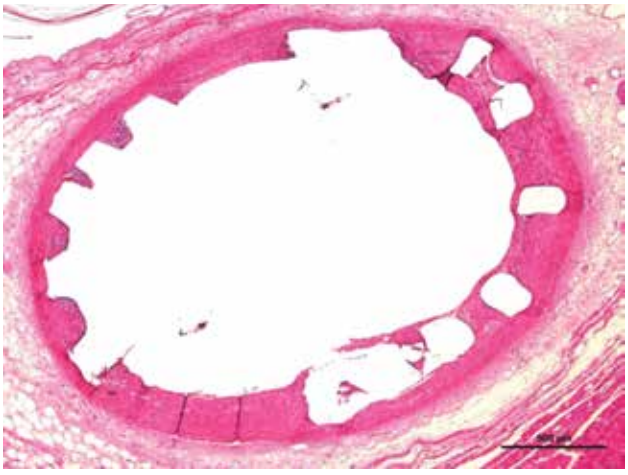
Experimental Pathology Lab

The Division received and completed 26 work orders (total 130 samples) from external and internal customers for histopathology evaluation

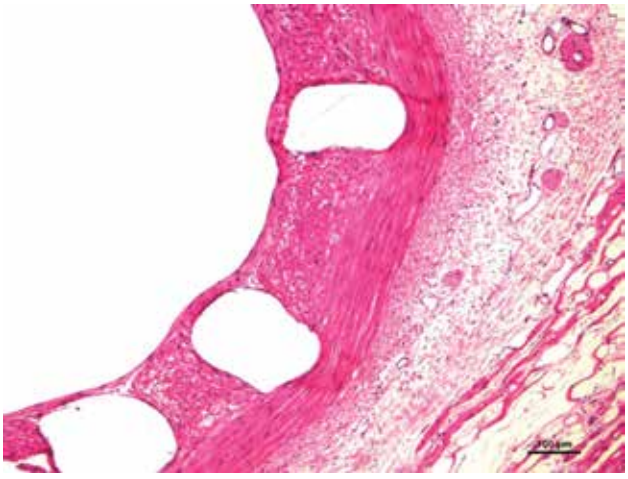
Histopathology Lab

The laboratory is unique in the country as a histopathology laboratory having facilities to undertake routine as well as a wide range of specialized techniques for evaluation of biocompatibility of various materials as per International standards and pre-clinical evaluation of medical devices as per approved protocols. The laboratory is well equipped for evaluation in soft and hard undecalcified tissues, with and without materials.



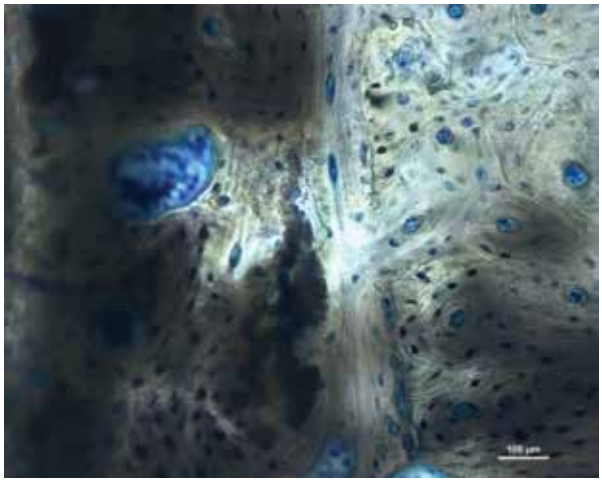


A. Coronary blood vessel with degradable polymer stent



B. Stent strut and neointima

C. Rabbit femoral condyle with dental implant



D. New bone formation and interface in Hydroxyapatite implant

Lab for Polymer Analysis

The laboratory extended its analytical services to analyze thousands of materials submitted by external and internal customers. The analytical equipments include of FTIR, HPLC, GPC, TGA, DTA, DSC, LC/MS/MS, GC and UV-Vis spectrophotometer. Laboratory's analytical services are under the quality platform of the Institute. The laboratory generated a reasonable amount as revenue through technical services.

Microbial Technology

The Department functions on the quality platform and offers accredited test, tests in support of accredited facilities and non-accredited tests. This year saw an increase in request form industries for sterility testing, Growth Promotion Study in Media Validation based on USP <71>, ISO/7218:2007(E), Anti- microbial activity testing- Agar Diffusion method and Antimicrobial activity testing- Dynamic contact method- ASTM E 2149.

In support of testing and developmental activities of the Institute, Microbiological monitoring of air in controlled facilities, Microbiological monitoring of water and sentinel screening for pathogens in small experimental animals was done. Several materials developed by faculty of the Institute were tested for antimicrobial properties. The list of tests

List of tests performed in 2014 – 15.

Sl No	NAME OF TEST	Number of requests [number of samples]
	Accredited test s	
1	Sterility Test	20(32)
2	Bioburden Assay as per ISO 11737-1	1(1)
3	Invitro genotoxicity assay- the bacterial reverse mutation (AMES) Assay	2(2)
	Tests in support of accredited facilities	
4	Microbiological monitoring of air based on USP <1116>	33(84)
5	Water Analysis based on APHA/ AWWA	18(55)
6	Sentinel screening for pathogens in small experimental animals.	34(34)
	Non - accredited tests	
7	Spore Viability Test USP 28 NF 23<55>	2(2)
8	Anti- microbial activity testing- Agar Diffusion method	12(38)
9	Bacterial Adhesion studies	4(12)
10	Antimicrobial activity testing- parallel streak method as per AATCC 147	3(11)
11	Antimicrobial activity testing- Dynamic contact method- ASTM E 2149	7(18)
12	Culture/ Staining	2(2)
13	Growth Promotion Study in Media Validation based on USP <71>, ISO/ 7218:2007(E)	8(21)

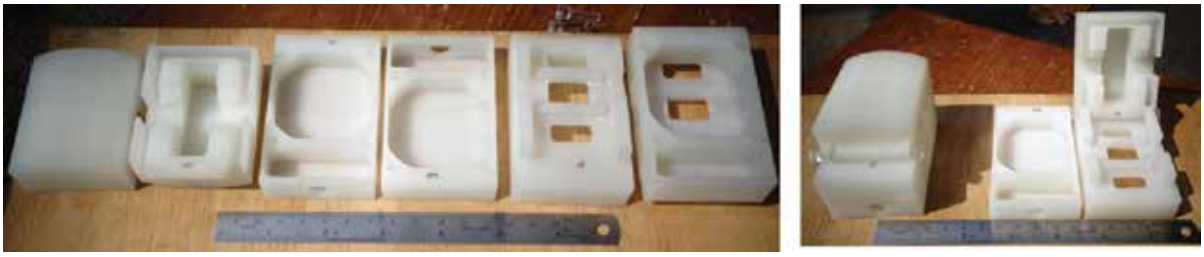
Precision Fabrication Facility

This division provided the service support to other scientific/ technical labs in fabricating moulds, dies, Jigs, fixtures and machining of prototype components related to various projects using CNC machines and conventional machines to deliver high precision fabrication and mould making work for the research programs of the Institute.

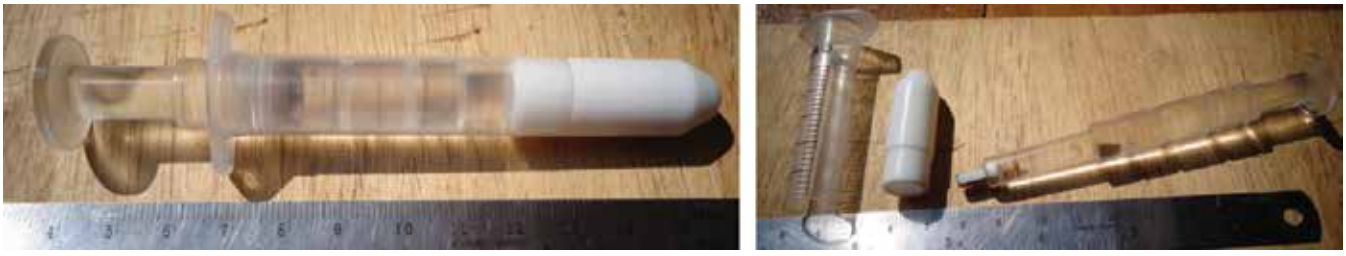
From Precision Fabrication Facility, nearly 58 work orders were executed during the year 2014-15 related to fabrication, machining of test setups and prototypes for the various projects and for other department al R&D activities.

Some of important technical service activities carried out are:-

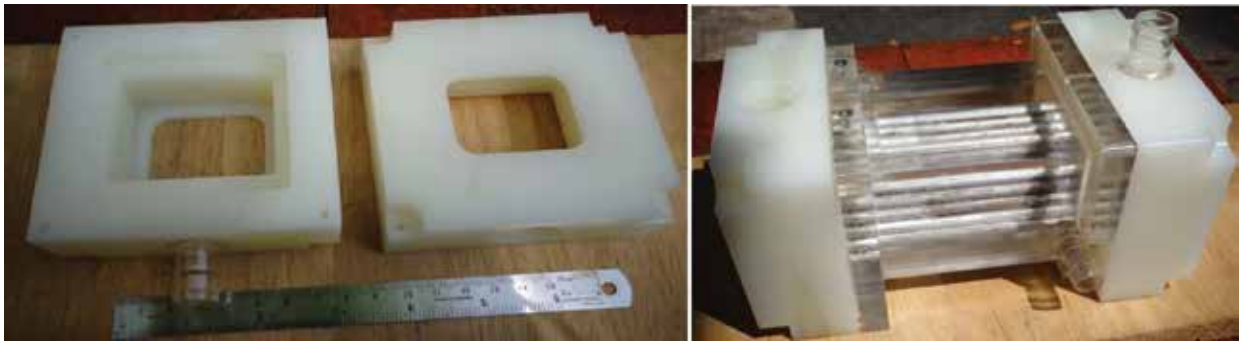
1. Designed and completed the machining of Spinner flask scaffold fixture to TEM lab.



2. Completed the machining of two sets of Electromagnetic Flow Meter Probe casing unit MPL lab.



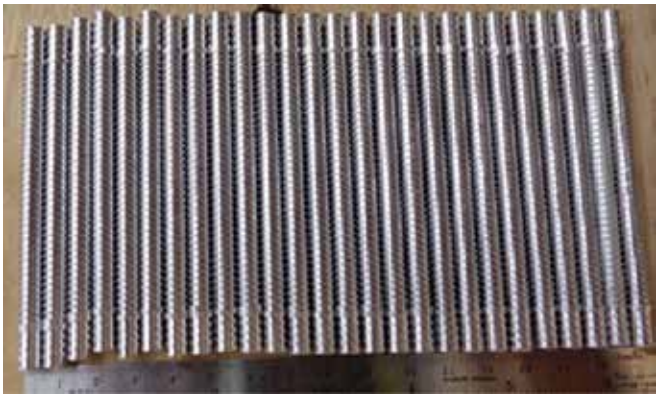
3. Designed and completed the machining of Magnetic Separator Syringe fixture work to Bio ceramic lab.



4. Executed the machining of Polypropylene Caps for the heat exchanger shell of oxygenator project to MPL.

5. *Executed the brass top and bottom mould cavity cam portion machining work to the Mandibular advancement Device project.*

6. *Designed and fabricated the 2mm channel S.S. mould to Dental Products lab.*



7. *Completed the thread profile machining on the supplied Aluminium tube to MPL.*

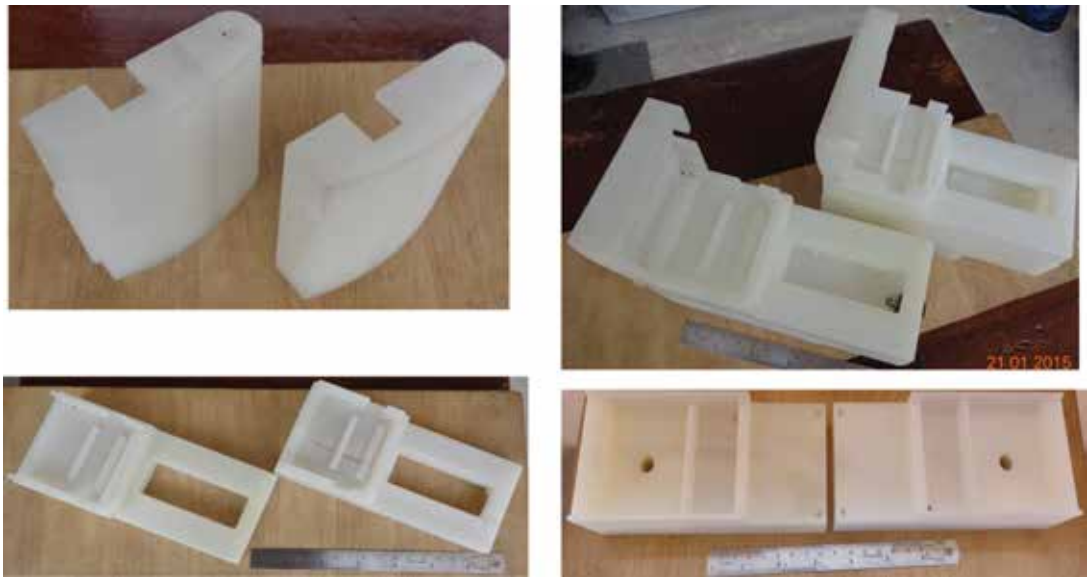
8. *Designed and completed the machining of Conical Valve sizer to Hospital wing.*

9. *Completed the machining of Acrylic Shell for heat exchanger of Oxygenator project to MPL.*

10. Designed and completed the machining of suture testing fixture to POP lab .

11.Executed the machining of outer shell, inner shell, potting cap, inner tube, cone and inner bottom part components for the Gas exchanger unit of Paediatric oxygenator Project of MPL.

12. Designed and completed the machining of S.S. mould for moulding a multi cavity specimen holder to POP lab.



13. Completed the machining of 2 sets of Revolving Magnetic Blood flow meter components to MPL.

14. Designed and completed 3 sets of Rat Restrainer to Sleep Disorder Research Lab.

Polymer Processing Laboratory

About 54 work orders and 270 samples were received from external customers for mechanical and dynamic mechanical testing. Mechanical testing was conducted for 254 samples and 16 samples were tested for dynamic mechanical properties. All samples were tested within the stipulated time and test reports were issued. Apart from these all the test requests from internal customers were also entertained.

Thrombosis Research Unit

Various biomaterials and devices intended for blood contacting applications were evaluated and more test reports than the previous year were issued during the period. More than 1000 samples were analyzed for an international customer to validate leuko-depletion filters using sophisticated technology. Stringent measures were taken to ensure quality of test reports which included Inter-laboratory comparison with a NABL accredited local lab for biochemical tests, and external quality assurance program organized by Royal College of Pathologists of Australia for haematology parameters. Surveillance Audit by COFRAC team was carried out smoothly during the past year. The Institutional Ethics Committee evaluated the need for use of human blood for checking compatibility of devices and approved voluntary blood collection for the cause. Overall, the blood compatibility testing facility is being extensively utilized by researchers, in addition to both domestic and international device manufactures. Representatives of international customers visited at different occasions to see the facility and expressed their appreciation for the services received from our laboratory (Fig 1).

Fig1.Industrial customer getting ready for first hand observe data related to his leukofiltration device performance

Tissue Culture Lab

Tissue Culture Laboratory continued maintenance of Quality system based on ISO17025 and COFRAC approved continuation of accreditation status for In vitro cytotoxicity tests. Different cytotoxicity tests and other cell culture studies were imparted to internal as well as external customers based on requests. Testing facility was extended on study mode to satisfy customized requirements.

Transmission electron Microscopy

The Laboratory has Transmission Electron Microscopy facility (Hitachi H-7650) for analysis of samples varying from animal or plant tissues, cells & also nanoparticles (morphology, size and distribution). The facility is available to researchers (Internal and External) on a charge basis.

1. *Biological Samples – Preparation of samples such as cells, tissues, bacteria etc. (fixation, embedding, ultra thin sectioning (50-70nm), heavy metal staining and evaluation with image capture via Transmission Electron Microscope (TEM).*

2. *Inorganic samples – Drop casting of particulate inorganic or organic samples (ceramic powders, lipid droplets, nanoparticles) etc. for analysis under TEM.*

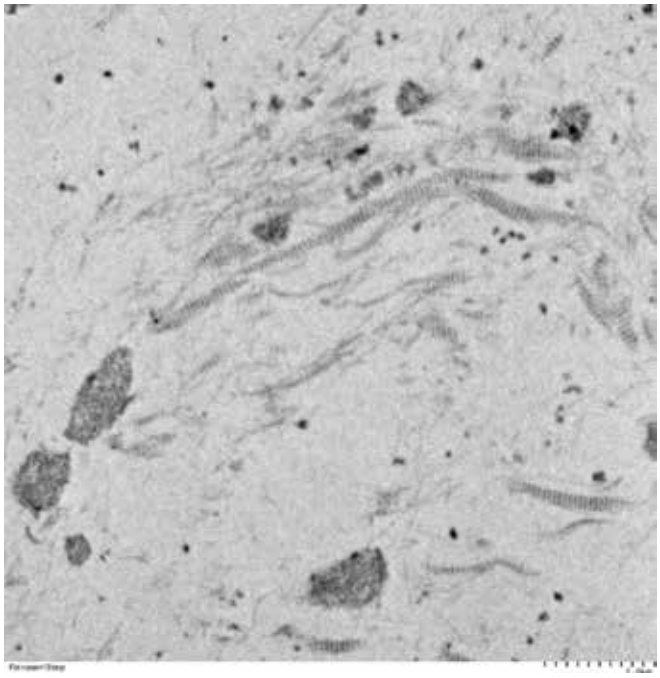


Fig 1. Classic banding pattern of collagen fibers at 1500X captured at 80kV on H-7650.

Toxicology

Following are the summary of routine toxicity/biocompatibility testing of materials done during last one year (2014).

Toxicity testing

No	Name of test	No of samples
	Accredited tests	
1	Closed patch test for delayed hypersensitivity	3
2	Maximization test for delayed hypersensitivity	13
3	Intracutaneous Test	19
4	Acute systemic toxicity test	28
5	Test for local effects after Implantation in muscle	3
6	Pyrogen Test	7
7	Vaginal irritation Test	0
8	Penile irritation	0
9	In vivo Mammalian chromosomal Aberration test	1
10	In vivo Mammalian erythrocyte micronucleus test	1
12	Test for local effects after implantation in subcutaneous tissue	0
13	Bone Implantation	1
14	Animal skin irritation Test	2
15	Haemolysis	2
16	Sub chronic toxicity	1
17	Acute oral toxicity	0

Completed GLP Studies		
No	Title	Sponsor
1	90 day sub-chronic toxicity by intraperitoneal implantation of Copper T material in wistar rats	M/s HLL Life Care Trivandrum Completed

No	COLLABORATIVE WORK	
1	Carcinogenicity combined with chronic toxicity of Dextran Coated Ferrite nanomaterials (DST, New Delhi)	140 rats (completed)
2	Carcinogenicity combined with chronic toxicity of hydroxyapatite nanomaterials (DST, New Delhi)	140 rats (completed)
3	Knee joint Implantation studies in rabbits (Dr. Prabha D Nair, DTRT)	8 rabbits
	WATER ANALYSIS	
1	Physico Chemical Analysis of Potable Water for various Divisions	25 Samples.

Honors, Awards and Recognitions

- *Dr H.K.Varma was elected as the President of Society for Biomaterials and Artificial Organs, India, SBAOI for the period 2014-2017*
- *Dr.Jayasree R.S was elected as the Secretary of MRSI, Trivandrum chapter.*
- *Dr.V .S. Harikrishnan completed the masters degree in Laboratory Animal Science which is a FELASA-D accredited course recommended as higher education by ISO 10993 guidelines.*
- *Dr V.S Harikrishnan received scholarship and grant from Lundbeck and Novo Nordisk, Denmark for the completing master's project at Department of Veterinary Disease Biology, University of Copenhagen, Denmark. He also received grant to Co-Chair a Scientific session "Distress Evaluation in Rodents" from the organizers of WC9 Alternatives World Congress held at Prague Czech Republic during August 2014*
- *Dr.V .S. Harikrishnan received travel grant to present a paper at the ESLAV-ECLAM joint meeting entitled as "Laboratory Animal Science and medicine in Translational Research" at Athens Greece from 22nd and 23rd September 2014*
- *Dr. V. Kalliyana Krishnan received the national innovation award of the Ministry of Chemicals and Fertilizers at a function held at Bangalore in March 2015 jointly with HLL Lifecare for successful development of EMILY, hormone releasing IUD.*
- *Dr V. Kalliyanakrishnan, Dr Manoj Komath and Shri S. Balram participated in the Festival of Innovations on 11th March 2015 at Rashtrapati Bhavan, New Delhi to showcase the EMILY and BIOCERAMIC innovations from the Institute.*
- *Dr. P.P. Lizymol won the S.Vasudev Award for the best project report submitted during 2014 among projects funded by KSCSTE for the year 2014 (Project title: Development of smart dental composites consists of calcium containing resin and fillers). Cash Prize of Rs. 50000/- and a certificate were awarded to her in Kerala Science congress held at Alleppey in January 2015.*
- *Dr Prabha D. Nair was conferred Fellowship of the Society of Biomaterials and Artificial Internal Organs, India (FBAOI)*
- *Dr. TV Anilkumar was conferred Fellowship of the International Academy of Toxicologic Pathology*
- *Dr. TV Anilkumar was declared as President-Elect (2016-2017) by the Asian Society of Veterinary Pathology*
- *Dr Anoopkumar T was nominated as Member, Institutional Review Board, Government of Kerala*
- *Dr. Roy Joseph and Mr. C.V. Muraleedharan received the 4th National Award for Technology Innovation in Petrochemical & Downstream Plastics Processing Industry under the category of 'Polymers in Public Healthcare' (Individual/Team) for developing "Fluoropolymer Coated and Hydrogel Sealed Vascular Graft Implant." The Award was conferred by the Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Government of India. They received the award from Shri Ananth Kumar, Union Minister for Chemicals & Fertilizers, Govt. of India at a function organized in New Delhi on July 17, 2014*
- *Dr Kamalesh K Gulia received the Best poster Award*

(2nd) for the work 'Pre-clinical evaluation of ' -asarone', an active principle of Acorus calamus for management of insomnia and anxiety' authored by Kamalesh K Gulia, Arathi Radhakrishnan, Velayudhan Mohan Kumar (2015) at the International Training Workshop on 'Herbal Medicine: Drug Discovery from Herbs - Approaches, Innovations and Applications', Mysore (Karnataka) & Ooty (Tamil Nadu), India, 30th March- 3rd April 2015.

- *Dr Kamalesh K Gulia was International Research Supervisor to provide training under the Research Training Fellow-for Developing Country Scientists (RTF-DCS) scheme by Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre).*
- *Dr Kamalesh K Gulia organized the International conference as Organizing Secretary of the ASRS2014.*
- *Dr. Anil Kumar PR was awarded with the* Medi Biotech Award – 2014 during the International Conference on Biosciences: State- of- the- Art Advancements, organized by the Society for Educational and Scientific Research at Kumarakom, Kottayam, Kerala, 11-12 September, 2014,
- *Ms R. Resmi won the best paper award in the Health Sciences Stream for the paper titled `GELATIN-HYDROXYPROPYL METHACRYLATE COPOLYMERS FOR POTENTIAL ANTIMICROBIAL WOUND DRESSING APPLICATIONS' (Resmi R and Kalliyana Krishnan.V) in Kerala Science Congress (January 27-29) held at Alappuzha, Kerala. The award consists of Rs. 10000/- cash prize, a certificate and Rs. 1 lakh contingency.*
- *Ms. Sunitha Chandran won the BEST PAPER AWARD for the paper titled `Bioactive Strontium Hydroxyapatite– Reinforcing Osteoporotic Bones In Women And Beyond' in the INDO-AUSTRALIAN CONFERENCE ON BIOMATERIALS, TISSUE ENGINEERING, DRUG DELVERY SYSTEM & REGENERATIVE MEDICINE (Bi-TERM 2015) held at Chennai, India from 5th to 7th February,2015.*
- *Thomas Edison Award-2014: Reshma SC, Syama S, Leji B, Anju M, Sreekanth PJ, Varma HK, Mohanan PV. In Free Radicals and Antioxidants, for excellent research on 'Determination of antioxidant defense mechanism after acute oral administration ofhydroxyapatite nanoparticles in rats'.*
- *Ms. Syama S, PhD Scholar, won the prestigious Raman-Charpak Fellowship 2014, by the Indo-French Centre for the Promotion of Advanced Research (Centre Franco-Indien pour la Promotion de la Recherche Avancée), New Delhi.*
- *Ms. Subha S. won second prize in basic science stream during Science Fete presentations conducted during the Institute Day celebrations in Mar 2015, for the paper entitled "Derivation of cardiomyocyte progenitor cells from adipose derived mesenchymal stem cells (ADMSC) in vitro using fibrin-based niche"*
- *Resmi.V.Nair , won the Best Poster Award' for her poster entitled `Gold nanorod based Multifunctional system for in vivo cancer therapy at the BiTERM conference at Anna University Chennai.*
- *Lakshmi.V.Nair was awarded the Best Presentation Award during the MRSI Annual Technical Meet held at SCTIMST for the presentation entitled "Multifunctional Gold nanocluster: An insight into cancer diagnosis and treatment"*
- *Shaiju.S.Nazeer was selected for the Dr. D.S.Kothari post doctoral fellowship by UGC*
- *Ms.Resmi (Project Fellow) won the best paper award in the Health Sciences Stream for oral presentation in the Kerala Science Congress held at Alleppey in January 2015. Cash prize of Rs. 10000/-, a certificate and a contingency of Rs. 1 lakh were awarded to her during the function. (Paper : Silver nanoparticle incorporated gelatin-hydroxypropyl methacrylate hydrogels for potential antimicrobial wound dressing applications Authors: Resmi R and Kalliyana Krishnan.V)*
- *Arathi Radhakrishnan received the Best Poster Award in the ASRS-2014 International conference for her paper presentation "Effect of alpha-asarone on sleep, brain and body temperature during acute total sleep deprivation" co-authored by Lakshmy R, Jayakumari N, Velayudhan Mohan Kumar, Kamalesh K Gulia.*

BIOMEDICAL TECHNOLOGY WING 2014-15
(As on 31st March 2015)

Mr OS Neelakantan Nair
Acting Head, BMT Wing

Mr. C.V. Muraleedharan, M.Tech
Associate Head, BMT Wing

ARTIFICIAL ORGANIS

(i) Devices Testing Lab

Mr. C.V. Muraleedharan, M.Tech.
Engineer G & Scientist In Charge, Device Testing lab

Mr. Sujesh Sreedharan, ME
Engineer D

Mr. G. Ranjith, B.Tech.

Engineer C

Mr A Rajeev, M.Tech
Scientific Assistant- (Instruments)

(ii) Modelling & Prototyping lab

Mr. D. S. Nagesh, M.Tech.
Engineer G & Scientist In Charge,

Mr. V. Vinod Kumar, M.Tech.
Engineer E

Ms Sreedevi V, B.Tech.
Technical Assistant-A (Instruments)

(iii) Instrumentation Laboratory

Mr. C.V. Muraleedharan, M.Tech.
Engineer G & Scientist In Charge

Mr. Biju B. Diploma in Electronics
Technical Assistant (Instruments)

Bioceramics and SEM Laboratory

Dr. P. R. Harikrishna Varma, PhD
Scientist F & Scientist In Charge

Dr. Manoj Komath, PhD
Scientist F

Mr. S. Vijayan, B.Sc
Scientific Officer

Dr. S. Suresh Babu, M.Sc.,Ph.D.
Jr. Scientific Officer (Instruments)

Mr K.V. Nishad, M.Sc
Technical Assistant (Instruments)-A

Biophotonics and Imaging Laboratory

Dr R.S. Jayasree, PhD
Scientist D & Scientist In Charge

Biosurface Technology Division

Dr. M. R. Rekha, PhD
Scientist D & Scientist In Charge

Mr. Willi Paul, MSc
Scientific Officer (Instruments)

Ms. Jasmin Joseph, MSc
Technical Assistant (Instruments)-A

Calibration Cell

Mrs. Leena Joseph, B.Tech
Engineer E & Scientist In Charge

Mr Armugham V, Dip. Elec. Engg, DCA
Scientific Assistant (Instruments)

Mr Rajesh R.P, B.Tech, MBA
Scientific Assistant (Instruments)

Ceramic Coating Facility

Dr. Manoj Komath, PhD
Scientist F & Scientist In Charge

Mr. Sujesh Sreedharan, ME
Engineer D

Mr. Sajin Raj R.G. Diploma in Mechanical Engineering
Technical Assistant (Instruments)

Dental Products Laboratory

Dr. V. Kalliyana Krishnan, PhD
Senior Scientist G & Scientist In Charge

Dr. P. P. Lizymol, PhD
Scientist D

Division of In-vivo Models and Testing

Dr. P. R. Umashankar, MVSc, PhD
Scientist F & Scientist In Charge

Dr. Sachin J. Shenoy, MVSc
Scientist D

Ms. P.Smitha, Dip(Elect Eng), Dip (OTT)
Technical Assistant (Anesthesia)-A

Mr. Prem Mohan M, B.Sc MLT,
Master of Health Science (Clinical Child Devpt.)

Technical Assistant (Lab)-A
Division of Laboratory Animal Science

Dr. Annie John, PhD
Scientist F & Scientist In Charge

Dr. Harikrishnan V. S, BVSc & AH, MLAS (FELASA-D)
Scientist C

Ms. Sreeja.K.R, MSc MLT
Technical Assistant –A

Mr. Sarath kumar R.S, BSc MLT
Technical Assistant –A

Engineering Services

Mr. O. S. Neelakantan Nair, BSc (Engg.)
Sr. Engineer G & Scientist In Charge

Mr. D. Ranjit, BE
Engineer- F & Scientist In Charge, Electrical Maintenance Division

Mr. K. Venugopalan Nair, Dip. Elec. Engg.
Assistant Engineer (Electrical Maintenance Division)

Mr. K Rajan, Dip. Elect. Engg.
Jr. Engineer(Instrumentation)-B

Mr. K. R. Asokakumar, Dip. Civil Engg.
Jr. Engineer (Water & Sewerage)-A

Mr. Binu.C.P, Dip.Mech. Engg.
Jr. Engineer (Incinerator & AC)

Experimental Pathology

Dr. T. V. Anil Kumar, MVSc, MSc, PhD

Scientist F & Scientist in charge

Ms. Geetha. C. S, MSc, M.Phil
Jr. Scientific Officer

Histopathology

Dr. A. Sabareeswaran, MVSc
Scientist D & Scientist In Charge

Mrs. Sulaikhababy, BSc MLT
Scientific Officer (Lab)

Mr Thulaseedharan N.K BSc MLT
Jr. Technical Officer

Mr. Joseph Sebastian, BSc MLT
Technical Assistant – A

Intellectual Property Rights Cell

Mr. D. S. Nagesh, M.Tech
Engineer G & Scientist In Charge

Mr. Rajkrishna Rajan, B.E MBA
Engineer D

Dept. of Microbiological Technology

Dr. A. Maya Nandkumar, PhD
Scientist F & Scientist In Charge

Mr. Pradeep Kumar SS, BSc, BSc MLT
Sr. Scientific Assistant (Lab)

Molecular Medicine Laboratory

Dr. Anoopkumar Thekkuveettil, PhD
Scientist F & Scientist In Charge

Mr. Jose Jacob, BSc
Jr. Technical Officer (Instruments)

Networking Services Cell

Mr. V. Arun Anirudhan, M.Tech.
Engineer D

Mr. M. K. Sajithlal, M.S. B.Tech.
Engineer C
Polymer Analysis Lab

Dr. K. Sreenivasan, PhD
Scientist G & Scientist In Charge

Mr. P. R. Hari, BSc, AIE
Scientific Officer (Lab)

Dr. C. Radhakumari, PhD
Jr. Scientific Officer (Instruments)

Polymer Division

Dr. M. Jayabalan, PhD, D.Sc
Scientist G & Scientist In Charge

Polymer Processing Laboratory

Dr. Roy Joseph, M.Tech., Ph.D.
Scientist F & joint in-charge

Dr. P. Ramesh, M.Tech., Ph.D.
Scientist F & joint in-charge

Dr. M. C. Sunny, PhD
Jr. Scientific Officer

Precision Fabrication Facility

Mr. V. Ramesh Babu, M.Tech
Engineer F & Scientist In Charge

Mr. S.Rajalingam, Dip. Mech.Engg
Jr. Technical Officer-A

Quality Cell

Dr. P. Ramesh, PhD
Scientist F, Quality Manager

Mrs. Leena Joseph, B.Tech
Engineer E & Dy.Quality Manager

Dr. Anugya Bhatt, MSc, PhD
Scientist D & Dy.Quality Manager (GLP Studies)

Mr S L Sreekanth, B.Tech,MBA
Scientific Assistant

Sleep Disorders Research Lab

Dr. Kamalesh K Gulia, PhD
Scientist D & Scientist In Charge

Technology Business Division

Mr. S. Balram, M.Tech
Scientist F & Scientist In Charge

Ms. Sandhya.C.G, B.Tech,MBA
Engineer D

Ms. Asha Rani V, MSc
Technical Assistant (Instruments)-A

Technology Proving Facility

Mr. D. S. Nagesh, M. Tec
Engineer G

Tissue Culture

Dr. T. V. Kumary, PhD
Scientist G & Scientist In Charge

Dr. P. R. Anil Kumar, PhD
Scientist D

Mrs. Usha Vasudev, BSc, MLT
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Mr. Vinod D, B.Sc MLT
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Dr. Prabha D. Nair, PhD
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Ms. Nimi.N, MSc
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Thrombosis Research Unit

Dr. Lissy K. Krishnan, MSc, PhD
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Dr. Anugya Bhatt, MSc, PhD
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Mr. Ranjith S, M.Sc. MLT
Technical Assistant A

Toxicology

Dr. P. V. Mohanan, MSc, PhD
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Dr. Remya. NS, MSc MLT, PhD
Technical Assistant A

Transmission Electron Microscopy

Dr. Annie John, PhD
Scientist F & Scientist In Charge

Ms. Susan Mani M.Sc.
Technical Assistant (Lab)-A

ACHUTHA MENON CENTRE FOR HEALTH SCIENCE STUDIES

FROM THE HEAD OF AMCHSS

In addition to the usual MPH, DPH and PhD programs, the Achutha Menon Centre for Health Science Studies (AMCHSS) started a part-time PhD program to build public health teaching and research capacity in the country. Several new public health schools and national and state health systems are likely to benefit from this new initiative. We continued our training programs through our affiliated Institutes such as the National Institute of Epidemiology, Chennai and the Christian Medical College, Vellore.

The AMCHSS continued research activities in collaboration with several international universities such as the University of Arizona in the US, Melbourne and Monash Universities in Australia, the University of Edinburgh, UK and the University of Heidelberg, Germany.

One of the new initiatives was the International Development Research Centre (IDRC) funded project "Closing the gaps: Health Equity Research Initiative in India". The following activities were undertaken in this project during the current year. A detailed mapping of health equity research in India has been completed and final report is available. A protocol for priority setting areas for health equity research in India is under preparation. A Steering Group for the project has been constituted consisting of eminent experts.

One of the major research projects completed this year was on building capacity for tobacco cessation in India and Indonesia supported by the Fogarty International Centre of the US National Institutes of Health. The teaching materials developed and implemented in the five Indian medical colleges are available in the quit tobacco website (www.quittobaccoiternational.org), which can be used anywhere in the world. As a follow up of this project, the Kerala University of Health Sciences has initiated implementation of tobacco cessation education in all the medical colleges under them and the Rajiv Gandhi University of Health Sciences will be approached for similar implementation in the medical colleges under that university. The Medical Council of India will be approached for a formal integration of tobacco cessation education in all the medical colleges in India.

Twenty six research papers were published in the year with a cumulative impact factor of 28.961. Faculty members of AMCHSS continued to serve on the editorial boards of journals and contributed to the academic activities of several Indian public health institutions in various capacities.

K.R. Thankappan

ACHUTHA MENON CENTRE FOR HEALTH SCIENCE STUDIES

Overview

The Achutha Menon Centre for Health Science Studies continued its activities on training and research in the area of public health. Eighteen MPH students successfully completed their program in the reporting year, 15 students continued in their second year and the year 2015. In addition to the regular PhD program, we started the part time PhD program this year, which attracted several good applicants for the program. Research activities in collaboration with major universities such as the University of Arizona in the United States, Melbourne and Monash Universities of Australia, University of Edinburgh in the UK and University of Heidelberg, Germany were able to produce excellent results.

Routine Activities

In addition to the MPH training program of the Centre, the MPH program offered through the National institute of Epidemiology, Chennai, and the Christian Medical College, Vellore, continued training the MPH students. Ten PhD students continued their training program in the reporting year.

We continued research activities in collaboration with several international universities such as the University of Arizona in the US, Melbourne and Monash Universities in Australia and the University of Edinburgh, UK. A new research project was initiated during this year on health equity research initiatives in India.

Five PhD students continued their program in the current year and one new PhD students joined in January 2015. Two part-time PhD students joined in January 2015. Eighteen MPH students and four DPH students completed their respective programs from our institute. From two of our affiliated Institutes (NIE Chennai and CMC Vellore), 11 and 15 MPH students respectively completed their programs. Nineteen students joined the NIE MPH program and six students joined the CMC Vellore MPH program in 2014. Eighteen students were given certificates for participating in the workshop on 'Analysing Health and Medical Data using 'R'. Five external students along with 15 MPH students completed the short course on Ethics in Health Research.

New Initiatives during the year

One of the new initiatives during the year was the starting of the part time PhD program in Public Health. Five were selected for the part time PhD program.

Another new initiative in the reporting year was the IDRC-funded project "Closing the gaps: Health Equity Research Initiative in India". The following activities were undertaken in this project during the current year. A detailed mapping of health equity research in India was completed and final report was made available. From the mapping exercise, five consultants were identified to carry out a synthesis of research evidence. A detailed protocol for the synthesis exercise was prepared. A protocol for priority-setting areas for health equity research in India was initiated. Steps were taken to have a web-portal for the project to be used as a means of networking and establishing an e-network of health equity researchers in India. All preliminary tasks of preparing a TOR and identifying a suitable consultant was completed. A Steering Group for the project was constituted (as part of the project requirements) consisting of eminent experts: The first meeting of the group was held in December 2014.

Research Programs and collaborative programs

One of the major research projects was on building capacity for tobacco cessation in India and Indonesia supported by the Fogarty International Centre of the US National Institutes of Health. The major objective of this project was to develop and implement tobacco cessation modules for undergraduate medical education in India. We developed and implemented 15 modules on tobacco cessation related to different departments of five medical colleges in south India. We also produced 14 clinical videos to support the teaching of tobacco cessation to the medical students. These videos were professionally made and uploaded along with the teaching modules in our quit tobacco website (www.quittobaccoiternational.org). About 25 research articles were published from this project.

Another important project was the community interventions for health project supported by the Oxford Health Alliance UK. This was a pilot project implemented in three countries:

China, India and Mexico. In all these sites the major objectives of the project were to reduce three risk factors of non-communicable diseases such as tobacco use, unhealthy diet and physical inactivity through community-based interventions. The interventions were implemented in schools, worksites, health centers and the neighborhood groups. The first publication using data from all the three sites came out this year. Now the individual sites can publish their own findings. Over all the interventions were moderately effective in reducing the risk factors in these three communities.

The Kerala diabetes prevention program was another project supported by the National Health and Medical Research Council of Australia through the Melbourne University. The objective of this project is to reduce the incidence of diabetes through life style modification focusing on improving healthy diet and physical activity. This is a cluster randomized controlled trial and we completed baseline and 13 months data collection. The 24 month data collection was started, with a plan to expand it to other parts of Kerala and, if possible, to the rest of India.

Controlling hypertension in rural India is another project supported by the global alliance for chronic diseases and the National Health and Medical Research Council of Australia. This project was implemented in three sites in India: Kerala, East Godavari in Andhra Pradesh and Rishy Valley in Andhra Pradesh. These three sites represent three levels of epidemiological and demographic transition and are looking at the prevalence of hypertension in these three areas and the barriers of hypertension control there. The baseline data collection was over in two sites.

The project titled "Research Initiative on factors influencing women's reproductive choices" is supported by the Ford Foundation. The project consists of three inter-related activities:

Activity 1: A multi-centred prospective research study on factors influencing postpartum reproductive choices in Jharkhand and Kerala. Two-rounds of data collection covering 500 women in each of the two sites have been completed in Activity 1, for which data entry is complete and preliminary analysis begun. The third round of data-collection is in its final stages.

Activity 2: A smaller-scale study on sexual and reproductive rights and reproductive choices among married and unmarried young women in Kerala. Data collection and entry are complete and preliminary analysis has started.

Activity 3: Mapping and critical review of research on sexual and reproductive health and rights in India during 2000-2013. Five annotated bibliographies have been prepared. These are now being edited and reorganized into three volumes for e-publication.

A consultation on conceptual and methodological challenges in studying the intersections of gender with other social inequalities: implications for health equity research was organized by the "Gender "sub-theme group of "AROGYAM" project on 11-12 September 2014 in Trivandrum. A report of the consultation was prepared and circulated to all the participants.

A brain storming meeting on Public Health Challenges in India was organized during 14 October-16 October forenoon. Senior faculty members from All India Institute of Medical Sciences New Delhi, Indian Institute of Public Health New Delhi, Centre for Social Medicine Jawaharlal Nehru University new Delhi, Post Graduate Institute Medical Education and Research Chandigarh, Tata Institute of Social Sciences Mumbai, National Institute of Mental Health and Neurosciences Bangalore, National Institute of Epidemiology Chennai and Christian medical College Vellore participated in the meeting. Dr K R Thankappan, Dr. V Raman Kutty, Dr. TK Sundari Ravindran, Dr Mala Ramanathan, Dr K Srinivasan, and Dr Biju Soman participated from AMCHSS.

Staff details with qualifications

Sl No	Name and degree	Title
1	Dr K R Thankappan MD, MPH	Professor and Head
2	Dr V Raman Kutty MD, MPH	Professor
3	Dr T K Sundari Ravindran, PhD	Professor
4	Dr P Sankara Sarma PhD	Professor
5	Dr Mala Ramanathan PhD, MA	Professor
6	Dr Biju Soman MD, DPH	Additional Professor
7	Dr K Srinivasan PhD	Additional Professor
8	Dr Ravi Prasad Varma MD	Assistant Professor
9	Dr Manju R Nair MBBS, MPH	Scientist C
10	Mrs. VT Jissa MSc	Scientist B
11	Ms Jayasree Neelakantan	Upper Division Clerk

PhD Students who joined in the previous years and continued in the year 2014-15

Rekha M Ravindran (Guide Dr V Raman Kutty)

Elezebeth Mathews (Guide Dr K R Thankappan)

Uma V Sankar (Guide Dr V Raman Kutty)

Tulsi Ram Bhandari (Guide Dr V Raman Kutty)

Thankachi Yamini Ramachandran (Guide Dr T K Sundari Ravindran)

Neena Elezebeth Philip (Guide Dr T K Sundari Ravindran)

PhD students who joined in the year 2014-15

Sreejini J (Guide Dr T K Sundari Ravindran)

Malu Mohan (Guide Dr T K Sundari Ravindran)

Part- time PhD students who joined in the year 2014-15

Neethu Suresh (Guide Dr K R Thankappan)

Reethu. S (Guide Dr V Raman Kutty)

MPH Students who successfully completed their MPH program in December 2014	
Sl No	Name
1	Joanna Sara Valson
2	Anna Ninan
3	Jayalakshmi Rajeev
4	Shammy Rajan
5	Anna Pius
6	Veena Saroji H
7	Anand T N
8	Priyanka.S
9	Jasmine Jomichen
10	Shilpa Nair S
11	Aravind L R
12	Kirti Sundar Sahu
13	Dona Boban
14	Kadam Sanjay Ramrao
15	Sunu .C. Thomas
16	Almas Shamim
17	Rohan Thakur
18	Parvathy Mini Pradeep

MPH students who joined in January 2014 and in their second year program	
Sl No	Name
1	Bandagar Sanjay Babasaheb
2	Bevin Vinay Kumar V N
3	Prittty Titus
4	Aakshi Kalra
5	Minu Abraham
6	Souvik Pyne
7	Shreeporna Bhattacharya
8	Nayana E P
9	Peeyush
10	Tijo George
11	Aayam Gupta
12	Athulya Thomas
13	Shabna D S
14	Sambit Kumar Behera
15	Vishnu Nataraj

MPH students who joined in January 2015	
Sl. No	Name
1	Suseendar.K.K
2	Ariba Peerzada
3	Lalchhanhima Ralte
4	Neethu T
5	Asmita Behera
6	Revathi V
7	Sreeja M
8	Donald M. Paul
9	Sarath. S. M
10	Lijimol A.S
11	Sahane Vikram Kundlik
12	Sakeena .K
13	Liss Maria Scaria

14	Sumitha T S
15	Anjalikrishnan. R

List of DPH students

List of DPH students who completed the program in December 2014

Sl No	Name	
1	Sunil Ankushrao Nakhate(Dr.)	
2	Kakade Vinod Abasaheb(Dr.)	
3	Avinash Pandharinath Patil(Dr.)	
4	Gavhane Sanjeevani Chitambar (Dr.)	
DPH students who joined in January 2015		
Sl. No	Name	
1	Ebrahim Belutheth Bidumkat	

MPH students from the National Institute of Epidemiology, Chennai

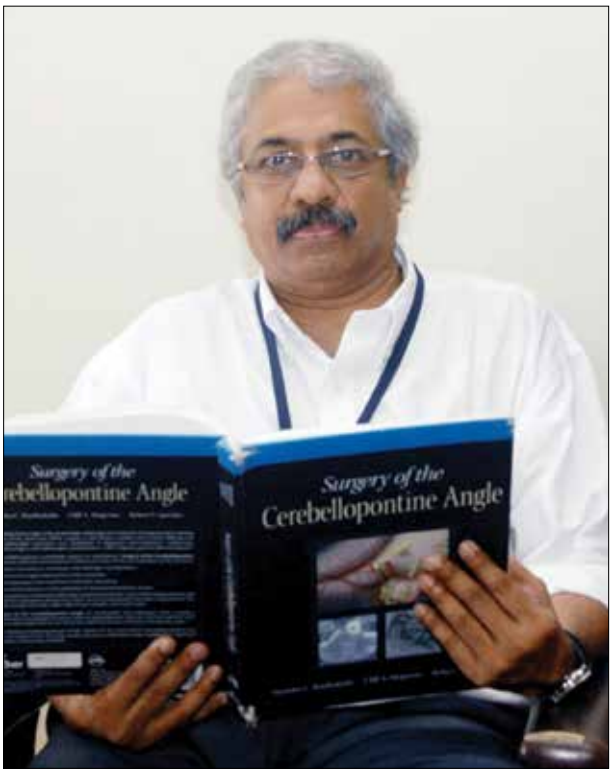
Batch of 2013 (July) -2015 (June)

Reg. No.	Name of the Scholar	Gender
030601	Dr. AonungdokTushiAo	M
030602	Dr. VikasUttamraoAthawale	M
030603	Dr. Shashidhar Somashekharappa Otageri	M
030604	Dr. Ashutosh Das	M
030605	Dr. SatishBapuraoShinde	M
030606	Dr. PradeepAravindanMenon	M
030607	Dr. Kiran S K Keshavamurthy S P	M
030608	Dr. M Geetha Rani	F
030609	Dr. DhandeSachinMurlidhar	M
030610	Dr. Zorinsangi	F
030611	Dr. Ganesh S R	M

Batch of 2014 (July)- 2016 (June)

Reg. No.	Name of the Scholar	Gender
030701	Dr. BanuRekha VV	F
030704	Dr. Saroja M	F
030707	Dr. NilanjanMondal	M
030709	Dr. Ansari MdRafiquddin Md Kabeeruddin	M
030716	Dr. Prakash V	M
030719	Dr. Boopesh N	M
030702	Dr. Baranidharan B	M
030703	Dr. FalguniDebnath	F
030708	Dr. Velmurugan Ganesh G	M
030711	Dr. MrigankamouliKar	M
030715	Dr. Vidhya V	F
030718	Dr. Asha Frederick	F
030710	Dr. ViduthalaiVirumbi B	M
030705	Dr. Bhavani P K	F
030706	Dr. Yogananth N	M
030712	Dr. Vijayalakshmi V	F
030713	Dr. BiswajitDey	M
030714	Dr. Vinay Kumar K	M
030717	Dr. Balasubramaniyan N	M

ACADEMIC AFFAIRS



FROM THE DEAN'S DESK

"Those who know how to think need no teachers"

....M.K Gandhi

A momentous and memorable academic year has just gone by. We, in the academic section, look back with immense pride at the innumerable achievements of our students. We strongly believe that our students know how to "think, chart new paths and set worthier goals." Hence, as faculty, we just need to mentor them, help them concretize these thoughts and give shape to their ideas.

In our multi-faceted institution, with clinicians, basic scientists and public health experts as faculty, the term "student" encompasses senior resident doctors, post-doctoral fellows, doctoral scholars, public health scientists and nursing post graduates. The term "student" may seem amateurish, under training, less professional and well short of being an expert. Today's student may be tomorrow's nobel laureate. We are all, in fact, "students", as learning is an ongoing, enjoyable, lifelong process.

I am honored to note the achievements of our students. They are truly the "upper crust" of the academic elite, having been chosen through a very competitive selection procedure. In addition to the DM,/ MCh superspeciality courses, PDF programmes, PhD, MPH & MPhil courses, we also have the MTech in Clinical Engineering in collaboration with IIT Chennai and CMC Vellore. We have started the MD Transfusion Medicine course from this academic year, a new feather in our cap. Our annual convocation on 16 May, 2015 was graced by the presence of Dr. Harsh Vardhan, Honorable Union Minister for Science and Technology, Prof. Ashutosh Sharma, Secretary, DST, and our Institute President, Shri K M Chandrasekhar.

We put in endless effort to reinvent our courses of study, their syllabi and offer not just knowledge and degrees, but worldly wisdom and education in their deepest sense. We sincerely hope our efforts would make a significant difference to humankind. We are excited about the future where we look forward to many more academic courses and a larger, vibrant student and faculty force. My humble advice to all the students is to imbibe the quality of listening to their guides and getting the best out of them by focusing on their strengths. Patience, trust, honesty and, most importantly, following an ethical code of conduct are the qualities that should keep the students going. Every resident should have a strong "determination" and I believe that determination is a necessary trait for success in any sphere, professional or personal.

I gratefully acknowledge our Director, Associate Deans, the Registrar, Deputy Registrar and all my colleagues in the Academic Division for their contribution to making the process of teaching and learning a memorable experience for all our students. I take this opportunity to recognize and appreciate the painstaking efforts of our faculty and their zeal excellence, which have taken this institute to greater heights

Prof Suresh Nair
DEAN

DIVISION OF ACADEMIC AFFAIRS

The Division of Academic Affairs is headed by Dean, Academic Affairs. Admission of students and evaluation of students registered for various programmes are the primary responsibilities of the Division. The Division co-ordinates the work of standing Academic Committee of the Institute which has been constituted to make recommendations to the Governing body on general supervision over the academic policies of the Institute and method of instruction, teaching, training, evaluation of research and improvement in academic standards. The Division of Academic Affairs strives to create a positive environment suitable for the holistic growth and development of students with the support of five Associate Deans.

The Division of Academic Affairs has been co-ordinating with the students group for students representing in the various committees.

PROGRAMMES OFFERED- 2015:

<table>
<tr><th>Post-doctoral courses</th><th>Ph.D./Master's</th><th>Other Programmes</th></tr>
<tr><td>1.DM Cardiology</td><td>16.MD in Transfusion Medicine</td><td rowspan="10">Joint Programmes:
(1) M Tech. (Clinical Engineering) Ph.D. (Biomedical Devices and Technology)
Affiliated Programmes with other Centres: A. National Institute of Epidemiology, Chennai:
(1) Master of Public Health Epidemiology and Health Systems)
B. Christian Medical College, Vellore.
(1) Master of Science Bioengineering
(2) Ph.D.in Bioengineering
(3) Master of Public Health (MPH) C. IIITMK, Trivandrum
(1) Ph.D (For Engineering Graduates)</td></tr>
<tr><td>2. DM Neurology</td><td>17. Master of Public Health (MPH)</td></tr>
<tr><td>3.DM Neuroimaging and Interventional Neuroradiology</td><td>M Phil (Biomedical Technology)</td></tr>
<tr><td>4. DM Cardiothoracic & Vascular Anesthesia</td><td>Ph.D (Full Time) & (Part Time)</td></tr>
<tr><td>5. DM Neuroanesthesia</td><td>Diplomas</td></tr>
<tr><td>6.MCh Cardiovascular & Thoracic Surgery</td><td rowspan="3">Diploma in Public Health
Diploma in Cardiovascular & Thoracic Nursing
Diploma in Neuro-Nursing
Diploma in Operation Theatre Technology
Diploma in Advanced Medical Imaging Technology</td></tr>
<tr><td>7. MCh Vascular Surgery</td></tr>
<tr><td>8.MCh Neurosurgery (after M.S)</td></tr>
<tr><td>9. MCh Neurosurgery—5-year course (after MBBS and 1 year Senior housesurgency / Residency in General Surgery)</td><td>PG Diplomas</td><td></td></tr>
<tr><td>10. Post-doctoral certificate course in Cardiothoracic and Vascular Anesthesia</td><td rowspan="2">Cardiac Laboratory Technology
Neuro-Technology
Medical Records Science
Clinical Perfusion
Blood Banking Technology</td><td rowspan="2"></td></tr>
<tr><td>11. Post-doctoral certificate course in Neuroanesthesia</td></tr>
</table>

12. Post-doctoral certificate course in Cardiovascular Imaging and Vascular Interventional Radiology	Advanced Certificate	
13. Post-doctoral certificate course in Diagnostic Neuroradiology	Advanced Certificate Programmes in Physiotherapy	
14. Post-doctoral certificate course in Vascular Surgery	Advanced Certificate Programme in Physiotherapy in eurological Sciences	
15. Post-doctoral Fellowship (Post DM/ MCh./DNB)	Advanced Certificate Programme in Physiotherapy in Cardiovascular Sciences	

CONVOCATION: The Annual Convocation of the 30th batch of graduates was held on 23rd May, 2014. The convocation address was delivered by Smt. Sheila Dikshit, Her Excellency, The Governor of Kerala. 115 graduants received degrees.

Sl. No.	Name of Programme	Total Numbers	Remarks
1	DM	12	
2	MCh	9	
3	MPhil	10	
4	MPH	11	
5	PhD	9	
6	PDF	12	
7	PDCC	6	
8	DPH	1	
9	MPH	17	NIE Chennai
10	MPH	5	CMC Vellore
11	PhD	3	CMC Vellore
12	Diploma in Neuro Nursing	3	
13	Diploma in Cardiac vacular & Thoracic Nursing	5	
14	Diploma in Operation Theature Technology	1	
15	Diploma in Cardiac Laboratory Technology	2	
16	Diploma in Neuro Technology	2	
17	Diploma in Clinical Perfusion	2	
18	Diploma in Blood Banking Technology	2	
19	Diploma in Advanced Medical Imaging Technology	3	

NUMBER OF STUDENTS ENROLLED FROM 01-04-2014 TO 31-03-2015:

1	DM	24	
2	MCh	9	
3	MPhil	6	
4	MPH	15	
5	MD	1	
6	PhD (Full time & Part Time)	17	
7	PDF	7	

8	PDCC	8	
9	DPH	1	
10	Diploma in Neuro Nursing	10	
11	Diploma in Cardiac vacular & Thoracic Nursing	10	
12	PG Diploma in Cardiac Laboratory Technology	3	
13	PG Diploma in Neuro Technology	4	
14	PG Diploma in Clinical Perfusion	2	
15	PG Diploma in Blood Banking Technology	2	
16	PG Diploma in Medical Records Science	1	
17	Diploma in Advanced Medical Imaging Technology	3	

SHORT –TERM TRAINING/OBSERVERSHIP:

Candidates sponsored by Government/Autonomus Institutions/Health Sector Organizations/Approved medical/dental/nursing/engineering colleges, Paramedical Institutions were provided short-term training. The training/ observership was arranged in consultation with the respective department/discipline and the time and duration of the training were decided. Observers from various institutions all over the country spend varying period from one week to 3 months in different department of the Institute.

NATIONAL SCIENCE DAY 2015 CELEBRATIONS:

National Science Day 2015 was celebrated on 25th February, 2015 in the Institute. Several science-related events were organized on the occasion of the National Science Day in the Institute premises. A large number of students participated in the competitions, including posters and essays and the theme was 'SCIENCE FOR NATION BUILDING'.

PROGRESSIVE USE OF HINDI:

The Institute complied with the provisions relating to the Official Language Act, Rules and Instructions and Directives of the Government of India.

During the year, various competitions were held for the employees in Hindi. Hindi Fortnight/Hindi Day was observed. Hindi workshops were conducted for the benefit of staff members to increase the knowledge of functional Hindi. Letters received in Hindi were also reported in Hindi.

The Institute participated in the Town Official Language Implementation Committee meetings.

Staff Details

Dr. Suresh Nair
(DEAN)

Dr K Shivakumar
(ASSOCIATE DEAN, Research & Publications)

Dr Thomas Koshy
(ASSOCIATE DEAN)

(ASSOCIATE DEAN)

Dr .A.V. George
MA,B.Ed, M.Phil, PhD (REGISTRAR)

Dr. Sundar Jayasingh MA,MBA,DLL,PhD
(Dy. REGISTRAR)

Mr. Shiju.V.S
MA, MBA, MHRM, LL.B, PGDC&J,PGDMM ,DCA,DIH,SET
(Asst. Administrative Officer [Academic]-A)

Mrs. Jeeva K.H, BSc, DMRSc, PGDPM&IR, HINDI (BHOOSHAN)
(Executive Asst-A)

Mrs. Remya.A, MCom ,MPhil, NET
(UDC-A)

Library, Hospital Wing

The Hospital Wing library has a collection of 15182 books and 15696 back volumes of journals. During the current year, 208 books and 28 back volumes were added and 112 journals were subscribed to. Electronic access to the journals we subscribe to was activated and made available in both the campuses.

Being part of National Knowledge Resource Consortium, the library continued to get access to full text of selected journals from Elsevier, Wiley, Springer, Oxford University Press, American Chemical Society, Nature Publishing Group, Taylor & Francis, etc.

The information management system and library automation are built on Microsoft SQL Server 2005. The complete information about the library is available on the Internet.

An account was set up with iThenticate for checking plagiarism in manuscripts.

Staff details with qualifications as on 31.03.2015

S.Jayachandradas, MA, MLIS - Librarian-cum-Information Officer – I

Sudha T, MA, MLIS - Librarian-cum Documentation Officer – B

N.Suresh, B.Com, MLIS - Senior Librarian-cum-Documentation Assistant

Joy Vithayathil, MA, MLIS - Senior Librarian-cum-Documentation Assistant

Dimple Gopi, MA, MLIS, PGDITLAN - Librarian-cum-Documentation Assistant – A

Seema S, M.Sc, MLIS - Librarian-cum-Documentation Assistant – A

PUBLICATIONS

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- Sriganesh K, Manikandan S. Anesthetic Management of a Child with Severe Dystonia and G6PD Deficiency for Deep Brain Stimulation.J Neurosurg Anesthesiol. 2014 Nov 11.
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- Kalaivani.V and Appukuttan.P.S Plasma Lipoprotein(a) Size Polymorphism and Function: Apo(a) Subunit Size Determines Galectin-1 Recognition and ApoB Subunit Epitope Masking.; Open J. Biochemistry 2015, Vol. 2, No. 1 . DOI: 10.15764/BIOC.2015.01003
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EXTERNALLY- AND INTERNALLY-FUNDED RESEARCH PROJECTS

HOSPITAL WING

Externally funded research project

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration & Status
Tele Health & Medical Education	Dr. S.K. Jawahar	Planning Board, Govt. of Kerala	3 lakhs	1 yr

Internally funded Research Projects:

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration & Status
Clinical Application of Cryopreserved Homograft Valves in Cardiovascular Surgery	Dr. K. Jayakumar Ms. Molly Antony, Dr.S.K. Jawahar	Technology Development Fund, SCTIMST	8.96 lakhs	1 yr Ongoing

ANESTHESIOLOGY

Externally/internally funded research projects

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration & Status
the effect of Dexmedetomidine on cerebral blood flow and SjVO2 in patients with brain arteriovenous malformations	Dr Josemine Davis, Dr S MANIKANDAN		500000	
'Comparison of propofol and servo fluorine induced burst suppression on cerebral blood flow and oxygenation	Dr Smita Vimala		45000	ongoing study

CARDIAC ANESTHESIOLOGY

RESEARCH PROGRAMS

a) Collaborative research & development programs with biomedical technology wing & other research institutions

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration & Status
Development of Video Laryngoscope for Tracheal Intubation	Dr Shrinivas Gadhinglajkar (Professor of Anesthesia), R. Ravindrakumar (The Director, CDAC), Dr Rupa Sreedhar (Professor of Anesthesia, SCTIMST), Biju C. Oommen (Additional Director, CDAC).	Funding has been sanctioned by the Department of Information Technology for this externally funded project with Centre for Development of Advanced Computing (CDAC),Vellayambalam, Trivandrum.		
Technology development of ventilation circuit holder and Technology development of fibreoptic endoscope holder	Dr Shrinivas Gadhinglajkar (Professor of Anesthesia), Dr Rupa Sreedhar (Professor of Anesthesia, SCTIMST), Dr Niranjan Khambete (Ex- Scientist/ Engineer F, SCTIMST).			Nearing completion

Projects in Progress

b) Clinical Research Programs Completed during this period

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration & Status
Comparison of Sevoflurane versus Sevoflurane-Propofol combination on renal function in patients undergoing valvular heart surgery A prospective randomized study'.	Dr. Reshmi Liza Jose, Dr. Unnikrishnan K.P., Dr. Suneel P.R.			
Estimation of right ventricle to pulmonary artery pressure gradient in patients subjected to intra-cardiac repair for Tetralogy of Fallot- Comparison of echocardiographic methods to direct measurement'.	Dr. Sujata M, Dr. Suneel P.R., Dr. Unnikrishnan K.P., Dr. Thomas Mathew, Dr. Venkateshwaran S.			

Ongoing Research Programs during this period

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration & Status
Comparison of three different methods of radial arterial cannulation: A prospective randomized study	Dr. Suddhadev Roy, Dr. Prashanta Kumar Dash, Dr. Rupa Sreedhar			
Effect of left stellate ganglion block on left internal mammary artery blood flow and post bypass radio-femoral pressure difference in patients undergoing CABG	Dr. Roshith Chandran, Dr. Rupa Sreedhar, Dr. Shrinivas Gadhinglajkar, Dr. K Jayakumar, Dr. Praveen K Varma			
Evaluation of transient and persistent regional wall motion abnormality using live 3D parametric imaging in patients undergoing elective myocardial revascularization surgery – A prospective observational study.	Dr. Neelam Aggarwal, Dr Unnikrishnan KP, Dr. Suneel PR, Dr K Jayakumar.			
Effectiveness of Ventilation of Non-dependent Lung in Improving Arterial Oxygenation During One Lung Ventilation	Dr.Keerthi Chigurupathi, Dr.Suneel PR, Dr.Unnikrishanan KP, and Dr. M.Unnikrishnan			
Comparision of Left Ventricular Outflow diameter measured from 2D and 3D Transesophageal Echocardiography	Dr.Uvaraj.R, Dr.Thomas Koshy and Dr.Suneel PR			
Ease of insertion of Double Lumen Endotracheal Tube. Comparative study using Macintosh Laryngoscope and C-MAC Video Laryngoscope	Dr.Uvaraj.R, Dr.Thomas Koshy and Dr.Suneel PR			
Intraoperative hemodynamic performance and echocardiographic characteristics evaluation of Chitra heart valve prosthesis in the mitral position using transesophageal echocardiography	Dr. Jagadeesh, Dr. Shrinivas Gadhinglajkar, Dr. Rupa Sreedhar, Dr. Jayakumar K.			
Intraoperative hemodynamic performance and echocardiographic characteristics evaluation of Chitra heart valve prosthesis in the aortic position using transesophageal echocardiography.	Dr. Saravana Babu, Dr. Shrinivas Gadhinglajkar, Dr. Dr. Rupa Sreedhar, Dr. Jayakumar K.			

Biochemistry

Externally- and internally-funded Research Projects:

a. Newly Initiated Projects 2014-15

Title	Principal Investigator	Funding Agency	Amount	Duration
Mitochondrial metabolism and Function in Diabetic Heart		SERB	Rs. 50,77,000/-	2014-2017
In vitro beta amyloid uptake by peripheral blood macrophages: predictor for progression of mild cognitive impairment (MCI) to Alzheimer's disease (AD)?	Srinivas G Srinivas G	ICMR	Rs. 42,00,000/-	2015-2018

b. Ongoing Projects 2014-15[collaborative project]

Title	Principal Investigator	Funding Agency	Amount	Duration
"Effects of short and long term administration of alpha-asarone on oxidative stress and anxiety alleviation in insomnia model in rats"	PI: Kamalesh K Gulia Comprehensive Centre for Sleep Disorders, BMT Co-I: N.Jayakumari	CSIR	13.74 lakh	3 years
2. LDL receptor on macrophages as a ligand for Lp(a):anti-Gal antibody immune complex from plasma : a possible route for Lp(a) incorporation in atherosclerotic plaques	P.S.Appukuttan	Kerala state council for Science, Technology and Enviromnment.	7,60,000	2 years
Comprehensive Centre for Sleep Disorders, BMT Co-I: N.Jayakumari				

c. Completed Projects 2014-15

Title	Principal Investigator	Funding Agency	Amount	Duration
Coronary Artery Disease in the Young	Dr.Harikrishnan.S Dept.of cardiology Co-investigators: 1, Dr.J.M.Tharakan, Dept.of Cardiology; 2, Dr.N.jayakumari, Dept. of Biochemistry; 3. Dr. Anugya Bhatt, Dept. of Thrombosis Research unit, BMT Wing	KSCSTE, Govt.of Kerala	–	~3.5years

CARDIOLOGY

Title	Principal Investigator	Funding Agency	Amount	Duration
PILOT STUDY FOR ESTABLISHING NATIONWIDE NETWORK OF REGISTRIES ON MANAGEMENT OF ACUTE CORONARY EVENT (MACE REGISTRY):	Dr.Harikrishnan.S (PI) Dr.Bijulal. S Dr.Sanjay G:	ICMR		
CORONARY ARTERY DISEASE IN THE YOUNG:	Dr.Harikrishnan.S (PI) Dr.JaganmohanTharakan, Dr Jayakumari.N, Dr. Anugya Bhatt:	Kerala State Council for Science, Technology and Environment		
DOES NON-REGRESSION OF PULMONARY HYPERTENSION FOLLOWING BALLOON MITRAL VALVOTOMY CORRELATE WITH BMPR2 MUTATIONS?	Dr.Harikrishnan.S (PI), Dr.Renuka Nair, Dr.Mukund A Prabhu	PVRI – Pulmonary vascular research Institute, Canterbury ,UK.		
COMPREHENSIVE HEART FAILURE INTERVENTION PROGRAM	Dr.Ajit Kumar V.K, DR.Harikrishnan S (PI), Dr.Sanjay G, And Dr.Bijulal S	NHLBI		
MicroRNAs in Essential Hypertension: Understanding the role of SNPs in miRNA binding sites in 3 UTRs of target candidate genes influencing blood pressure:	DR. Harikrishnan S (PI), Dr.Ramankutty, Ms.Jissa V.T, and Ms.Linda Koshy Vaidyan.			
ISCHEMIA: International Study of Comparative Health Effectiveness With Medical and Invasive Approaches:	Dr JA Tharakan (PI),Dr K Jayakumar, Dr Harikrishnan S, Dr Sanjay G, Dr Bijulal S, Dr Kapilamoorthy:	NIH USA.		
Community Interventions for Health	Dr K R Thankappan (PI), Dr Sivasankaran, Dr Revi Prasad varma, Rekha M Ravindran			
Kerala Diabetes Prevention Program: National Medical And Health Research Council Australia:	Dr KR Thankappan (PI), Dr S Sivasankaran, T Sathish, NeenaPhiliph, Anoop Velayudhan:	National Medical And Health Research Council Australia		
Intermediate and short terms outcomes of cribriform device closure:	DrVenkiteswaran (PI), DrKrishnamoorthy, DrSivasankaran			
Evaluation of protocol for suspected Channelopathy and Channelopathy registry:	Dr. Anees Thajudeen (PI), Dr. Narayanan Namboothiri, Dr. Jagan Mohan Tharakan			

CVTS

Research Activities

Title	Principal Investigator	Funding Agency	Amount	Duration
Homograft Valve Bank project				
Comprehensive Heart Failure Program				
Mitochondrial metabolism in diabetic hearts				
Autophagy and its markers in human diabetic hearts				
Autocrine and paracrine mechanisms in cardiac stem cell signalling following hypoxic injury				
Tissue-engineered small diameter vascular graft (3mm)				
Indigenous pericardial valve conduit for RVOT reconstruction				

DCMC

a. Ongoing Projects 2014-15

Title	Principal Investigator	Funding Agency	Amount	Duration
Oxidative stress mediated stem cell modification promotes cardiac failure in hypertrophic Remodeling	R. Renuka Nair	Board for Research in Nuclear Sciences	Rs. 19,99,852/-	3 yrs
Molecular mechanisms in wound healing in the heart: Regulation of the cardiac fibroblast AT1 receptor"	K Shivakumar	DBT, New Delhi	Rs. 45,000,00/-	3 years
Regulation of the cardiac fibroblast cell cycle by p44/42 MAPK" - 3 year research grant from the Indian Council of Medical Research	K Shivakumar	ICMR	Rs. 19,000,00/-	3 years

b. Completed Projects 2014-15

Title	Principal Investigator	Funding Agency	Amount	Duration
Autocrine and paracrine mechanisms in human resident cardiac stem cell signaling following hypoxic injury	R.Renuka Nair	KSCSTE	Rs. 16,000,00/-	3 years

Molecular basis of cardiac fibroblast resistance to oxidative stress	K Shivakumar	DBT, New Delhi	Rs. 45,000,00/-	3 years
Regulation of the cardiac fibroblast cell cycle by p44/42 MAPK" - 3 year research grant from the Indian Council of Medical Research	K Shivakumar	ICMR	Rs. 19,000,00/-	3 years

RADIOLOGY

Projects:

Title	Principal Investigator	Funding Agency	Amount	Duration
Development of a prototype (proof of concept) flow diversion intracranial stent for the treatment of complex intracranial aneurysms	Santhosh Kannath Co PI: Sujesh S,Jayadevan ER,Ranjith G,Jayanand S.	Technology development fund, SCTIMST		
OPTOSIS: Development of Portable Optical Brain-Computer-Interface and Orthosis for Movement Restoration after Stroke under the New INDIGO Partnership Programme on Biotechnology applied to Human Health : A New INDIGO Initiative for the Development and Integration of Indian and European research centres	Kesavadas C Co PI: Ranganatha Sitaram, Sujesh S,Arun KM	Department of Biotechnology, Govt. Of India		
A resting state fMRI and task based fMRI study: Optimization, language lateralization, memory lateralization and connectivity in normal subjects versus patients with epilepsy" in the year July 2014-May 2015.	Smitha KA Co PI:Kesavadas C			

MICROBIOLOGY

Research Projects:

Title	Principal Investigator	Funding Agency	Amount	Duration
Nosocomial infection : Phenotypic characterization of Resistant Gram negative bacilli and risk factors for resistance in a Tertiary Health care centre	Dr.Kavita Raja			Ongoing

NEUROLOGY

New Initiatives in Neuromuscular Division

Title	Principal Investigator	Funding Agency	Amount	Duration
Project title	Investigators			
Surface stimulation single fibre EMG in myasthenia gravis	Dr Sruthi S Nair Dr MD Nair Dr Abraham Kuruvilla			
Clinical profile and prognosis of acquired central nervous system demyelinating disorders with special reference to clinically isolated syndromes	Dr Sruthi S Nair Dr MD Nair			
Vitamin D levels in multiple sclerosis	Dr Aniket Pande Dr Abraham Kuruvilla			
Cutaneous silent period in carpal tunnel syndrome	Dr SaiSateesh Dr MD Nair			
Myasthenia gravis post thymectomy – correlation of thymic histology with serological status	Dr Shreedhara AS Dr Sarada C			
Utility of nerve biopsy in a tertiary care centre	Dr Jithesh Goel Dr MD Nair			
Association of HLA DRB1 1501 tagging rs 3135388 with multiple sclerosis susceptibility	Dr Arun K Dr Sarada C			

R Madhavan Nayar Centre for Comprehensive Epilepsy Care, Department of Neurology.

Title	Principal Investigator	Funding Agency	Amount	Duration
Improving localization in lesion negative focal epilepsy: Can EEG-FMRI predict the epileptogenic zone and the likelihood of post-operative seizure freedom?		KSCSTE funded	Rs. 14,85,000/-	3 years, ongoing
EEG-f MRI as tool in pre surgical evaluation of medically refractory epilepsy, DBT funded, 3 years			Rs. 9,00,000/-	ongoing
Can EEG-fMRI predict the epileptogenic zone and the likelihood of post-operative seizure freedom? DST funded			Rs. 21,25,200/-	3 years ongoing
EEG-fMRI to analyse the circuitry in drug-resistant IGE		DST	25 lacs	approved in May 2015
Memory fMRI in refractory TLE		DST	INR 15,00,000(first year grant of INR 5,00,00 obtained)	

Movement Disorders

New initiatives, and externally and internally funded research and collaborative projects

Title	Principal Investigator	Funding Agency	Amount	Duration & Status
LRRK2 role in idiopathic Parkinson's disease (Indo-German project)	Dr. Asha Kishore and Dr.Manu Sharma (University of Tubingen).	Michael J. Fox foundation for Parkinson's disease research.	Total cost $250,000	ongoing
Encoding of interhemispheric interactions in mirror dystonia: a window to the physiology of dystonia	Dr Asha Kishore.	Dystonia Medical Research Foundation, USA	Rs. 40 Lakhs	3 years Ongoing.
Cerebellar modulation of the ventral premotor-motor cortex interaction in shaping the motor output	Dr. Asha Kishore	Center for Neurological Research of the Sal Petriere, Paris	Rs. 4 Lakhs	2 years Ongoing
Developing experimental therapeutics using Transcranial magnetic stimulation for Movement disorders" - Indo-French collaborative project	Dr. Asha Kishore	Center for Neurological Research of the Sal Peteriere, Paris;	Rs 5 Lakhs	2 years ongoing.
Validation of the Malayalam version of the Montreal Cognitive Assessment scale and a prospective evaluation of mild cognitive impairment in Parkinson's Disease using the Malayalam version (MoCA–M)"	Dr Syam K	Pre-proposal accepted by ICMR for funding; funding expected to be released by August 2015.	Rs. 9.5 Lakhs	4 years ongoing..
Association of dopamine receptor (DRD2, DRD3), glutamate receptor (GRIN2B) and serotonin transporter (5HTTLPR) gene polymorphisms in Parkinson's Disease patients with impulse control disorders while on dopamine agonist therapy	Dr Asha Kishore	In-house project 5040	Rs. 5 Lakhs	2 years Completed.
Elucidation of molecular interactions between autophagy and alpha-synuclein in a cell line with endogenous alpha-synuclein: relevance to Parkinson's disease"	Dr. Asha Kishore	Funding project 5170	Rs 3 Lakhs	4 years; Ongoing.
Study of factors that promote aggregation of alpha synuclein and their influence on the clearance mechanisms: relevance to sporadic Parkinson's disease	Dr. Asha Kishore	Funding project 5170	Rs. 5 Lakhs	4 years Ongoing.
Evaluation of the role of abnormal cerebellar processing function in early stages of Parkinson's disease.	Dr Asha Kishore	In house Project 5135		1.5 years Ongoing.

Ten year -outcome of bilateral subthalamic nucleus Deep Brain Stimulation in PD.	Dr Asha Kishore	Funding Project: 5040		Ongoing.
Is hearing impairment a non-motor symptom in Parkinson disease? A prospective cross-sectional study	Dr Syam Krishnan	In-house project	Rs. 2 Lakhs	2 years Ongoing

Sleep Disorders

Title	Principal Investigator	Funding Agency	Amount	Duration & Status
Cognitive Behavioral Neurology Section (CBNS) project "Influence of Sleep Architecture on patients with MCI "				
Prevalence of Sleep disorders and OSA in Kerala, a population based study				
Prevalence of Sleep apnea in school going children with ADHD.				
Formulation of new sleep apnea clinical score and its correlation with OSA severity				
Neuropsychological and psychiatric manifestations of patients with OSA and its improvement after CPAP treatment.				
Contribution of sleep apnea in the progression of CHF, systemic hypertension, isolated pulmonary hypertension, COPD and Type 2 DM- a prospective trial.				
Prevalence of SDB in patients with drug resistant epilepsy and seizure control after CPAP treatment.				
Comparison of the Sleep Disorders in Familial Vs Sporadic Parkinson's Disease – a Prospective Study		Institute funded	Rs. 1,00,000/-	completed.
Study of the prevalence and severity of obstructive sleep apnea in acute ischemic stroke and its impact on recovery from stroke			Rs. 1,00,000/-	completed.
Genome-Wide Association and Blood Marker Study in Narcolepsy and Hypersomnia		International collaborative trial with Standford University, NIH		since 2012

Comprehensive Stroke Care

a) ATTEND Trial- A Family Led Rehabilitation for Indian Stroke Patients	Dr P N Sylaja	National Health and Medical Research Council of Australia	Rs 14,000,00/-	February 2014-October 2016
b) Indo-US Collaborative Stroke Registry and Infrastructure Development	Dr P N Sylaja	NIH and DBT	Rs 23,000,00/-	March 2012-July 2015
c) Efficacy of computer based language therapy (Malayalam Version) for stroke patients with aphasia	Dr P N Sylaja	Centre for disability studies	Rs 4,000,00/-	September 2013-September 2015
d) Biorepository of DNA of stroke in South Asians	Dr P N Sylaja	Imperial College, London	Rs 2,000,00/-	June 2014-December 2015
e) International Stroke Perfusion Imaging Registry	Dr P N Sylaja	University of Newcastle	Rs 50,000/-	June 2012-December 2016

Cognition & Behavioural Neurology

Title	Principal Investigator	Funding Agency	Amount	Duration & Status
The Influence of Sleep Architecture on the Severity of Memory Disruption in Amnestic Mild Cognitive Impairment		Kerala State Council for Science, Technology and Environment	Rs 8.5 Lakhs	
Validation of memory fMRI paradigms and its utility in pre-surgical evaluation of patients with Refractory Temporal Lobe Epilepsy-(TLE)		Science and Engineering Research Board		
Development and validation of a comprehensive clinical and neuropsychological battery for use in the Indian context for patients with Vascular Cognitive Impairment		Indian Council Of Medical Research		
The human brain mapping project a resting state fMRI study of healthy controls and patients with mild cognitive impairment (MCI) & degenerative dementia of the Alzheimer's type (AD)"		Cognitive Science Research		

Neurosurgery

Title	Principal Investigator	Funding Agency	Amount	Duration
Audit of Neurosurgical outcome	Dr George Vilanilam	Royal College of Surgeons, Edinburgh	Under processing	
Non- contiguous level cervical disc degeneration: clinical –radiological correlation and outcome	Dr Krishnakumar K	None		
Temporal lobe morphometry and venous anatomy-Intra operative analysis	Dr George Vilanilam	None		
Learning Curve in Neurosurgery-A Structured analysis	Dr George Vilanilam	None		

Ongoing Projects

Title	Principal Investigator	Funding Agency	Amount	Duration
Preclinical animal studies on decellularised bovine pericardium as dural substitute	Dr Suresh Nair	TDF, SCTIMST	Rs 1 lakh	Three years
Developing an E Log for neurosurgical procedures	Dr Suresh Nair	Internal Faculty funding, SCTIMST	Rs 1.5 Lakhs	Three years

Completed Projects

ongoing study

Pathology

Title	Principal Investigator	Funding Agency	Amount	Duration & Status
Fluorescence Optical biopsy: A novel diagnostic tool for rapid characterization of cancer biomarkers	Dr. Santhosh Kumar B. – Fast Track Fellow with Dr. S. Sandhyamani (Mentor) and Dr. R.S. Jayasree (Co-Investigator).	DST-SERB Fast Track Scheme for Young Scientists	Rs. 25,00,000/-	3 years Ongoing

TRANSFUSION MEDICINE

Ongoing Projects

Title	Principal Investigator	Funding gency	Duration
A comparative study of platelets prepared from blood units collected in house and units collected in mobile camps. 1. Study on TTI status of Vol. Blood donors and in house and in mobile camps was compared	Ms Vineetha Alexander Ms. Safeena	Student project Student project	2 years 2 years.

Newly Initiated Projects

Title	Principal Investigator	Funding Agency	Amount	Duration
Efficacy of Therapeutic Plasma exchange on patients with GBS	Dr.Revathy Nair	MD Thesis		3 years

BMT WING

Externally- funded Research Projects

a. Newly Initiated Projects

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Bioresorbable nano porous Bioceramic matrices for drug delivery in osteoporosis management	Dr. HK Varma	DST	30 Lakhs	3 years
A new drug delivery method by ceramic modified superparamgnetic nanoparticles incorporated polymeric microspheres	Dr. HK Varma and Prof.Y.Yokogawa	DST-JSPS, Indo Japan collaborative programme between SCTIMST and Osaka City University, Japan	5.86 Lakhs	2 years
Preparation of hydrogel formulations from cholecystic extracellular matrix for biomedical applications	Dr. Akhila Rajan	SERB (DST)	24 lakhs	3 years
Biological evaluation of laser rapid manufactured Ti-porous structures.	Dr. A Sabareeswaran	BRNS-Dept of Atomic Energy	18.77 Lakhs	3 years
DBT-IYBA Award-Project on Multifunctional HAP lanthanides core shell nanocomposites for NIR theranostic imaging	Dr. Sunita Prem Victor	DBT	45 Lakhs	3 Years
Action of Guibourtia tessmannii (Caesalpiniaceae) extracts on sleep and reproductive system in obese male rats	Research Training Fellowship to Deeh Defo Patrick Brice Dr. Kamalesh K Gulia (Supervisor)	NAM S&T Centre	2.7 Lakhs	6 months
Role of Microtubule Associated Proteins in Cytoskeletal Interactions	Dr. Renu Mohan	DBT BioCare Programme	50 Lakhs	3 years
An innovative tissue-engineered corneal regenerative therapy derived from a thermoresponsive bio-functionalized polymer and multipotent corneal stromal stem cells	Dr. TV Kumary	UKIERI-DST	16.56 Lakhs	2 years

b. Ongoing Projects 2014-15

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Detection of Zinc in epileptic condition using ratiometric fluorescent molecular probes	Dr. RS Jayasree	DBT	85.02 Lakhs	3 years
Gold Nanorods for Targeted Phodynamic Therapy and Fluorescence Imaging	Dr. R S Jayasree	ICMR	41 Lakhs	3years
Development of Zerovalent Iron Nanoparticles as Positive Contrast Agent for Molecular Imaging/Angiography	Dr. RS Jayasree	Institute	2.5 Lakhs	2 years
Synthesis of oxide based magnetic nanoparticles for biocompatibility studies, magnetic hyperthermia and mri applications	Dr. HK Varma	DST	16.40 Lakhs	3 years
Nonviral gene delivery vectors for therapeutic gene and siRNA delivery for glioma targeting: In vitro evaluation of cationized pullulan based materials	Dr. Rekha MR	DBT under Bio-CARe	36.11 lakhs	3 years and 6 months
Musculoskeletal Stem cells in tissue regeneration	Project Coordinator and Principal PI : Dr. Prabha D Nair	DBT India and Danish Ministry of Science & Technology	637.89 Lakhs	4 years
Exploring the potential of Islet like cell aggregates generated from mesenchymal stem cells of human placenta for treating type I Diabetes in NOD mice by immunoisolation approach	Co PI Dr. Prbha D Nair	DBT	80.81 Lakhs	3 years
In vitro osteoarthritic model to evaluate the regenerative capability of implants or engineered constructs"	Dr. Neethu Mohan – PI and Mentor : Prabha D Nair	Fast Track : DST	18 Lakhs	3 years
An in vitro skin tissue engineering approach for evaluating the potential of hair follicle derived stem cells- implication to wound healing	Dr. Babitha S	Fast Track : DST	25 Lakhs	3 years
Polymer Inorganic Hybrid Scaffolds with Cell Adherent Surfaces and Enhanced Mechanical Properties for Osteochondral Tissue Engineering	Dr. Bindu P Nair - DST INSPIRE Faculty	DST	83 Lakhs	5 years
Controlled delivery of biological molecules using biodegradable microneedles	Dr. Shiny Velayudhan Prabha D. Nair Co PI	DBT-Biocare project	43.8 Lakhs	3 years

Non-enzymatic Blood glucose measurement system	Dr. K Sreenivasan	ICMR	46.34 Lakhs	3 years
Visible light induced insitu gelling Multifunctional Hydrogels as Potential Wound Dressings	Dr. C Radhakumary	DST	39.80 Lakhs	3 years
HAP-Polymer supramolecular structures for potential bioimaging and drug delivery applications	Dr..Sunita Prem Victor	DST	25 Lakh	3 years
The effects of maternal sleep deprivation on cognition in the offspring in an animal model	Dr. Kamalesh K Gulia	DST	42.47 Lakhs	3 years
To investigate the effects of short and long term administration of alpha-asarone on oxidative stress and anxiety alleviation in insomnia model in rats	Dr .Kamalesh K Gulia	CSIR	26.8 Lakhs	3 years
Treatment of Large Segmental Bone Defects with Custom Made Triphasic Hydroxyapatite Scaffolds loaded with Autologous MSCs in children - Clinical Trial at CMC Vellore.	Dr. Annie John (Co- PI)	DBT	80 Lakhs	3 years
	Dr. K Sreenivasan	ICMR	46.34 Lakhs	3 years
Visible light induced insitu gelling Multifunctional Hydrogels as Potential Wound Dressings	Dr. C Radhakumary	DBT	39.80 Lakhs	3 years
HAP-Polymer supramolecular structures for potential bioimaging and drug delivery applications	Dr..Sunita Prem Victor	DST	25 Lakh	3 years
Regeneration of Intervertebral discs – A tissue engineering approach	Dr. Annie John	KSCSTE	15.99 lakhs	3 years
Do platelets in patients with type II diabetes release proteins which can activate aortic endothelial cells?"	Dr. Anugya Bhatt	KSCSTE	23 Lakhs	3 years
Adult Stem Cells As Alternate Cell Sources For Ocular Surface Regeneration	Dr. TV. Kumary	DST	47.21 Lakhs	3 years
Rapid UTI diagnostic kit with antibiotic sensitivity	Dr Maya Nandkumar	DST	27 Lakhs	2years
Role of Transforming growth factor - alpha in neuronal growth and regeneration.	Dr Anoopkumar Thekkuveettil	KSCSTE	16 Lakhs	3 years (extended for one more year)

c. Completed Projects 2014-15 :

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Development of smart dental composite consists of calcium containing resin and fillers	Dr. Lizymol PP	KSCSTE	14.65 Lakh	3 years
Development of Bio artificial skin grafts from mammalian derived scaffolds	Dr. TV Anilkumar	DBT	45.00 Lakh	3 years
Molecular and immuno - toxicological effects of Dextran coated Ferrite and Hydroxylapitite nanomaterials	Dr. PV Mohanan	DST, Nanomission	49.40 Lakh	3 years
In Vitro alternative test system development for Ocular Irritation	Dr. PV Mohanan	ICMR	40.11 Lakh	3 years
Bioengineered hybrid skin substitute for burn wounds	Dr. Lissy Krishnan	KSCSTE, Kerala Government & HLL Lifecare, Trivandrum	27.50 Lakh	3 years
Assessment of Ceramic Constructs & Human Adipose Derived Stem Cells	Dr. Francis Boniface Fernandez	KSCSTE	1.00 Lakh	1 year
Cell sheet engineering on electrospun scaffolds for efficient cell supply in skin tissue engineering	Dr. Anil Kumar PR	DST	19.44 Lakh	3 years

Institute Technology Development (TDF) /Overhead Fund (OHF)/ SCTIMST Internal Projects

a. Newly Initiated Projects 2014-15 :

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Development of a bioactive radiopaque inorganic organic hybrid rein for dental and orthopaedic applications	Dr. Lizymol PP	TDF	8.032 Lakhs	2 years
Graphene based nanoprobes as optical sensors to aid in rapid clinical diagnosis	Dr. CL Gopu	OHF	2 Lakhs	2 years
To investigate the effects of REM sleep restriction on the blood-brain barrier (BBB) functions on the basis of gold nanoconstructs and the circulatory inflammatory markers in an animal model	Dr Kamalesh K Gulia	OHF	2.5 Lakhs	2 years
Polymeric platform for developing 3D organotypic culture for in vitro toxicity evaluation – [SCTIMST]	Dr. Anil Kumar PR	TDF	1.98 Lakhs	1.5 years

Ongoing Projects

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Feasibility of using Glutaraldehyde processed bovine pericardium as dural substitute in rabbit model	Dr. Girish Menon	TDF	1.03 Lakhs	6 months
Application of decellularised bovine pericardium for fabrication of a novel valved conduit for RVOT reconstruction in sheep model	Dr. Baiju S Dharan	TDF	9.91Lakhs	3 years
Characterization and documentation of baseline reference data of Inhouse bred Ankamali Swine for application in biomedical research".	Dr Sachin J Shenoy	OHF	2.50 Lakhs	2 years
'Development of a non invasive stress assessment technique in New Zealand white rabbits (sctb : NZW) using enzyme immuno assay	Dr.V.S. Harikrishnan	Internal	1.5 Lakhs	3 years
Preclinical evaluation of tissue engineered skin patches for diabetic wound healing	Dr.V. Kalliyana Krishnan	TDF	4.02 lakhs	1 year
Intellectual Property Information Management System	Mr. Rajkrishna Rajan	TDF	2.33 Lakhs	One year
Biphasic Hydroxyapatite based keratoprosthesis evaluation in a rabbit model	Dr. A Sabareeswaran	TDF	1.95 Lakhs	2 years
Evaluation of tissue engineered Strontium incorporated hydroxyaapatite (SrHA) for the healing of Osteoporotic bone defect in sheep model.	Dr. Annie John	OHF	2.50 Lakhs	3 years
Meniscal Tissue Engineering	Dr. Annie John	Internal	1.50 Lakhs	3 years
Role of platelet protein on endothelial cell and smooth muscle proliferation	Dr. Anugya Bhatt	Internal	1.50 Lakhs	3 years
In vitro differentiation of adipose derived mesenchymal stem cells for myocardial regeneration	Dr. Lissy Krishnan	Internal	1.5 Lakhs	3 years

Completed Projects

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
External Pneumatic Compression Pump for Deep Vein Thrombosis Prophylaxis.	Mr. Koruthu P Varughese Mr. Jithin Krishnan	SCTIMST	1.63 Lakh	1 year

Industry –Sponsored R&D Projects 2014-15

Newly Initiated Projects

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Development of polyurethane adhesive and potting compound for the fabrication of extracorporeal medical devices	Dr.M.Jayabalan	Manali Petrochemicals and SIDD Lifesciences, Chennai	24 Lakhs	2 years

Ongoing Projects

Title of the project	Principal investigator	Funding agency	Cost (Rs)	Duration
Development of Cardiopulmonary devices	Mr. DS Nagesh	M/s SIDD Lifesciences Pvt. Ltd, Chennai	18 Lakhs	2 years
Pre-clinical evaluation of fluoropassivated and hydrogel sealed vascular graft	Dr. Roy Joseph	M/s TTK Healthcare Ltd,Trivandrum	42.91 Lakhs	6 years

AMC

Externally and internally funded projects
Newly Initiated Projects 2014-15

Sl. No	Project Title	Principal Investigator	Funded Agency	Amount	Duration
1	Closing the gaps: Health Equity Research Initiative in India	Prof. TK Sundari Ravindran	IDRC	Rs. 2.95 Crores	4 years

Ongoing Projects

Sl. No	Project Title	Principal Investigator	Funded Agency	Amount	Duration
1	Community Interventions for Health	Prof KR Thankappan	Oxford Health Alliance	US $ 690,000	Six Years Up to 31 March 2016
2	Kerala Diabetes Prevention Program	Prof K R. Thankappan	National Health and Medical Research Council, Australia	AUD 1.03 Million	Five years up to June 30, 2016
3	Improving the Control of Hypertension In Rural India (CHIRI): Overcoming barriers to diagnosis and effective treatment.	Prof K R. Thankappan	GACD & the National Health and Medical Research Council Australia	200,000 AUD	Three years up to June 30, 2017
4	Advances in Research on Globally Accessible Medicine (AROGYAM)	Prof K R. Thankappan	ICSSR	21.6 lakhs	Three years up to June 2016
5.	Building Capacity for Tobacco Cessation in India and Indonesia	Prof K R. Thankappan	Fogarty International Centre of the National Institutes of Health	472,500 USD	Eight years up to June 2016
6	Impact of type 2 Diabetes on women's lives and wellbeing.	Dr.V Raman Kutty	Women Component plan of DST	19.85 lakhs	Five years until June 31, 2016
7	Research Initiative on factors influencing women's reproductive choices.	Dr.TK Sundari Ravindran	The Ford Foundation, India	US$ 75,000	30 months starting October 2013
8.	Ethical analysis of maternal health and reproductive health outcomes using secondary data	Dr.Mala Ramanathan	NIH, USA	Rs.1,50,909	11 months until Jan 31, 2016

a. Completed projects

Sl. No	Project Title	Principal Investigator	Funded Agency	Amount	Duration
1	Asian Collaboration for Excellence in Non-Communicable Diseases (ASCEND)	Prof K R. Thankappan	Fogarty International Centre of the National Institutes of Health, USA	US $ 1.0343 Million for all the countries	Five years up to March 31, 2015

Institute Body

Shri. K M Chandrasekhar
Former Central Cabinet Secretary & Vice Chairman
Kerala State Planning Board
Pattom, Thiruvananthapuram-695004

Shri. Joy Abraham
Hon'ble Member of Parliament (Rajya Sabha)
Mazhuvannoor House
Melampara PO, Bharananganam
Kottayam-686 578

Two Hon'ble Members of Lok Sabha

Secretary to Govt. of India
Dept. of Science and Technology
Technology Bhavan, New Mehrauli Road
New Delhi- 110 016

Joint Secretary and Financial Advisor
Department of Science & Technology
Technology Bhavan, New Mehrauli Road
New Delhi - 110 016.

Director General of Health Services (DGHS)
Directorate General of Health Services (DGHS)
Ministry of Health & Family Welfare
Nirman Bhavan, Maulana Azad Road
New Delhi – 110011.

Joint Secretary
Ministry of Health & Family Welfare
Room No-149-"A"Wing
Govt. of India
Nirman Bhavan, Maulana Azad Road
New Delhi -110 011

Dr. Suresh Das
Executive Vice President
KSCSTE
Kerala State Council for Science, Technology and Environment
Sasthra Bhavan, Pattom, Thiruvananthapuram 695004

Dr. K Ellangovan
The Secretary to Govt. of Kerala
Department of Health & Social Welfare
Secretariat
Thiruvananthapuram-695 001

Prof. P K Radhakrishnan
Vice Chancellor
University of Kerala
Palayam, Thiruvananthapura

Dr. G K Singh
Director
AIIMS, Patna
Phulwari Sharif
Bihar 801 505

Prof. Sneh Anand
Professor
Dept. of Biochemical Engineering
Indian Institute of Technology Delhi
Hauz Khas, New Delhi-110 016

Dr. Suranjan Bhattacharji
Christian Hospital
Bissamcuttack, Rayagada Dist
Odisha 765 019

Prof. Kamala Krithivasan
(Professor (Retd) Dept.of Computer Science & EngineeringIIT-Madras)
87 (Old No:44), SriPadmanabha Nagar
5th Street,Adayar , Chennai 600 020

Prof. K George Thomas
Ag. Director
Dean (Academic & Faculty Affairs)
Indian Institute of Science Education & Research (IISER)
Computer Science Building, College of Engineering
Trivandrum Campus, Trivandrum 695 016

Dr. Shyam Sundar
Prof. of Medicine
Institute of Medical Sciences
Banaras Hindu University
Varanasi-221 005

Prof. Balram Bhargava
Prof.of Cardiology, Cardiothoracic Science Centre,
Executive Director, Stanford India Biodesign Centre,
AIIMS, New Delhi -110 029

Prof. V Ramgopal Rao
Institute Chair Professor
Dept. of Electrical Engineering
IIT-Bombay
Powai, Mumbai-400 076

Prof. M V Padma Srivastva
Professor, Dept. of Neurology,
Room No 708, 7th Floor, Dept. of Neurology
Neurosciences Centre, AIIMS
New Delhi -110 029

Dr. Jaganmohan A Tharakan
Director (In-Charge)
Sree Chitra Tirunal Institute for Medical Science & Technology
Thiruvananthapuram-11

Shri. O S Neelakantan Nair
Ag Head, Biomedical Technology Wing
Sree Chitra Tirunal Institute for Medical Science & Technology
Thiruvananthapuram-12

Governing Body

Shri. K M Chandrasekhar
Former Central Cabinet Secretary & Vice Chairman
Kerala State Planning Board
Pattom, Thiruvananthapuram-695004

Secretary to Govt. of India
Dept. Of Science and Technology
Technology Bhavan, New Mehrauli Road
New Delhi- 110 016

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Directorate General of Health Services (DGHS)
Ministry of Health & Family Welfare
Nirman Bhavan, Maulana Azad Road
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KSCSTE
Kerala State Council for Science, Technology and Environment
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Sree Chitra Tirunal Institute for Medical Science &
Technology, Thiruvananthapuram-11

Shri. O S Neelakantan Nair
Ag Head
Biomedical Technology Wing
Sree Chitra Tirunal Institute for Medical Science & Technology
Thiruvananthapuram-12

Dr. Unnikrishnan
Professor (Sr. Grade)
Sree Chitra Tirunal Institute for Medical Science & Technology
Thiruvananthapuram-11

Finance Committee SCTIMST

Dr. Jaganmohan A Tharakan
(Chairman)
Director (in- Charge)
SCTIMST, Thiruvananthapuram-11

Secretary to the Govt. of India
Ministry of Science & Technology
Technology Bhavan, New Mehrauli Road
New Delhi- 110 016

Ms. Anuradha Mitra, IDAS
Joint Secretary and Financial Advisor to Govt. of India
Department of Science & Technology
Technology Bhavan, New Mehrauli Road
New Delhi- 110 016

Shri. O S Neelakantan Nair
Ag. Head
BMT Wing, SCTIMST
Thiruvananthapuram-11

Ms. Shiny George Ambat
Financial Advisor (Ex-officio Convener)
SCTIMST
Thiruvananthapuram-11

ACADEMIC COMMITTEE MEMBERS:

(1)	Prof. Jaganmohan A Tharakan, Prof. (Senior Grade), Dept. of Cardiology & Director	-	Chairman
(2)	Prof. Suresh Nair, Prof. (Senior Grade) & Head, Dept. of Neurosurgery- Dean, Academic Affairs	-	Member Secretary
(3)	Mr. O.S.Neelakantan Nair, Head ,BMT Wing	-	Member
(4)	Dr. P.K.Radhakrishnan, Vice-Chancellor, University of Kerala	-	Member
(5)	Prof. V. Ramakrishnan, Dirctor, IISER, Thiruvananthapuram	-	Member
(6)	Prof. K.P.Aravindan, Prof. & Head, Dept. of Pathology, Govt. Medical College, Calicut	-	Member
(7)	Prof. Sunil Chandy, Director, CMC, Vellore	-	Member
(8)	Prof. Mukesh Dhoble, Dept. of Biotechnology, IIT, Madra	-	Member
(9)	Dr. Kalliyana Krishnan, Scientist 'G' (Senior Grade),BMT Wing	-	Member
(10)	Dr. Renuka Nair, Scientist 'G' (Senior Grade)	-	Member
(11)	Prof. K . Jayakumar, Prof. (Senior Grade) & Head, Dept. of CVTS	-	Member
(12)	Prof. V. Ramankutty, Prof. of Health Science Studies, AMCHSS	-	Member
(13)	Prof. Muralidharan Nair, Prof. & Head , Dept. of Neurology	-	Member
(14)	Mr. Muraleedharan.C.V, Scientist 'G', BMT Wing	-	Member

Technology Development Committee

Dr. Jaganmohan A Tharakan
(Chairman)
Director (in- Charge)
SCTIMST
Thiruvananthapuram-11

Dr. Baldev Raj
Former Director
IGCAR , Kalpakkam

Dr. K Balasubramanian
Director
NFTDC, Hyderabad

Dr. R Krishna Kumar
Professor
IIT Madras, Chennai

Dr. S. Radhakrishnan
Formerly Scientist-G
NCL, Pune

Dr. M. Radhakrishnan Pillai
Director
RGCB, Thiruvananthapuram

Dr. K G Rajendran
Formely Vice President
USV Ltd, Mumbai

Dr. K Jayakumar
HOD and Sr Prof CVTS
SCTIMST

Dr. Sanjeev Thomas
Prof. of Neurology, SCTIMST

Dr. Kalliyana Krishnan V
Scientist 'G', BMT Wing
SCTIMST

Convenor
Head
BMT Wing

Building Committee SCTIMST

Dr. Jaganmohan A Tharakan
(Chairman)
Director (in-charge)
SCTIMST
Thiruvananthapuram-11

Secretary to the Govt. of Kerala
Department of Health & Social Welfare
Secretariat
Thiruvananthapuram-695 001

Shri. K.N.S Nair
Head, Engineering Maintenance Division
VSSC (Retd.)
"Deepthi", Kazhakuttam
Thiruvananthapuram

Shri. O S Neelakantan Nair
Ag. Head (upto 01.03.2014)
BMT Wing, SCTIMST
Thiruvananthapuram

Mr. K.M Nair
Former Head CMD (Retd.)
VSSC/ISRO
(A member co-opted by the Director as and when necessary)

Ms. Shiny George Ambat
Financial Advisor (Ex-officio Convener)
SCTIMST
Thiruvananthapuram-11

Institutional Ethics Committee

Chairman-

Shri. Justice P. S. Gopinathan
Former Judge, High Court of Kerala
Pullukatte House, 67/1723, SRM Road
Eranakulam-682018.

Members

Dr. Meenu Hariharan
Director, Indian Institute of Diabetes, Trivandrum
Abha, 20/1677,No.8,Sasthri Nagar, Karamana,
Thiruvananthapuram-695002

Dr. Rema M. N.
(Former DME and Professor and Head of the Dept. of Pharmacology)
"Manjush", Puthupally Lane
Thiruvananthapuram-695011

Dr. M. D. Gupte
(Former Director (National Institute of Epidemiology(ICMR), Chennai)
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Poojapura Trivandrum -12

Smt. Sathi Nair
Retd. Chief Secretary,
'Samtripthi' Devapalan Nagar
Peroorkada, Thiruvananthapuram.

Dr. K. R. S. Krishnan
Director, Technical & Operation
HLL Life Care Limited, Poojappura
Thiruvananthapuram - 12.

Dr. Kala Kesavan P.
Prof.of pharmacology
Medical College
Thiruvananthapuram

Director
SCTIMST
Thiruvananthapuram

Head- BMT Wing
SCTIMST
Thiruvananthapuram

Internal Member

Dr. K. Jayakumar
Prof.& Head

Dept.of Cardiovascular and Thoracic Surgery
SCTIMST,Thiruvananthapuram

Member Secretary

Dr. Mala Ramanathan
Additional Professor, AMCHSS
SCTIMST,Thiruvananthapuram

Ethics Committee Co-ordinator

Ms. Sreepriya C. S.
Executive Secretary to the Director cum Ethics Committee Co-ordinator, SCTIMST, Thiruvananthapuram

Institutional Committee For Stem Cell Research (ICSR)

Shri. Justice M R Hariharan Nair
(Chairman)
LIVRA-57, Link Valley
Kakkanad, Kochi- 682 030

Director
SCTIMST
Thiruvananthapuram

Head
Biomedical Technology Wing
Thiruvananthapuram

Dr. R V G Menon
H No: 22, Haritha
Kesavadev Road, Poojappura
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Vellore 632 004

Dr. Jackson James
Scientist-E,Neurobiology Division
Rajiv Gandhi Centre for Biotechnology
Thiruvananthapuram-14

Dr. K Jayakrishnan
KJK Hospital, Thiruvananthapuram

Dr. Renuka Nair
Scientist 'G'(Sr.Grade) C M Cardiology
SCTIMST, Thiruvananthapuram

Dr. Prabha D Nair
(Member Secretary)
Scientist G, Division of Tissue Engineering & Regeneration Tech
BMT Wing, SCTIMST, Thiruvananthapuram

Dr.Lissy K Krishnan
Scientist G, Thrombosis Research Unit, BMT Wing,
SCTIMST, Thiruvananthapuram

Dr.Anoop T
Scientist F, Molecular Medicine, BMT Wing, SCTIMST
Thiruvananthapuram

Ms. Sreepriya C S
(Co-ordinator)
Executive Secretary to Director.Cum.Ethics Committee Co-ordinator
SCTIMST, Thiruvananthapuram

Institutional Animal Ethics Committee

Shri. O.S. Neelakantan Nair
Chairman

Dr. Kavita Raja
Biological Scientist

Dr. Lissy Krishnan
Scientist from Biological Discipline

Dr. P.R. Umashankar
Veterinarian

Dr. Annie John
Scientist in Charge AHF

CPCSEA Members

Dr. J.C. Stephenson
Main Nominee

Dr. Arun George
Link Nominee

Mr. A.G. Babu
Non Scientific DSocially aware member

Dr. Robin D. Culas
Scientist from outside the institute

Senior Staff Selection Committee

Dr. Jaganmohan A Tharakan
(Chairman)
Director (in- Charge)
SCTIMST, Thiruvananthapuram-11

Head
BMT Wing, SCTIMST
Poojappura, Thiruvananthapuram

Prof. Jayaprakash Muliyil
Professor & Head of Community Medicine
Christian Medical College, Vellore

Nominee of the Secretary
Dept. of Science & Technology
Govt. of India, New Delhi-110 016

A Senior Professor of SCTIMST

An External Expert nominated by the
President of the Institute

Junior Staff Selection Committee

Medical Superintendent
SCTIMST
Thiruvananthapuram

Head
BMT Wing, SCTIMST
Poojappura
Thiruvananthapuram

Nursing Superintendent
SCTIMST
Thiruvananthapuram

Dr. Kalliyana Krishnan V
Scientist 'G', BMT Wing

Representative of Academic Wing of the
Institute nominated by the Director of the Institute

OTHER INTERNAL WORKING COMMITTEES

Biosafety Committee
Hospital Management Committee
Hospital Infection Control Committee
Hospital Transfusion Committee
Institutional Animal Ethics Committee (IAEC)
Library Committee
Official Language Implementation Committee
Research & Publication Cell
Technical Management Committee
Technical Advisory Committee (TAC)
Technical Advisory Committee for Studies on Medical Devices
Technical Advisory Committee for Clinical Studies (not including medical devices)
Technical Advisory Committee for Studies on Public Health
Complaints Committee for Redressal of Complaints on Sexual Harassment of Working Women

Right to Information :
Vigilance Officer
Dr. K R Thankappan

The Internal Complaints Committee for Prevention of Sexual Harassment of Women at Workplace functioned effectively.

The Annual Report of the Internal Complaints Committee, SCTIMST fulfils the requirements as specified vide section 14 of the Sexual Harassment of Women at Workplace(Prevention, Prohibition and Redressal) Rules, 2013 notified on December 9, 2013.

a. The number of complaints of sexual harassment received in the year- 5

b. Number of complaints disposed off during the year-5

c. Number of cases pending for more than 90 days- Nil

d. Number of workshops or awareness programmes against sexual harassment carried out-2

e. Nature of action taken by the employer – Minor penalties were levied based on the report of the ICC, including one of false complaint.

Additionally, when a group of women expressed their concern regarding a possible threat to their safety, the ICC held discussions. Based on the recommendations; redressal measures were taken by the Employer.

STATEMENT OF ACCOUNTS

187

BALANCE SHEET AS AT 31st MARCH 2015

		2014-15	2013-14
CORPUS/CAPITAL FUND AND LIABILITIES	Schedules	[Rs.]	[Rs.]
CAPITAL FUND	1	2376196137	2541256081
RESERVES & SURPLUS	2	567019319	559945101
EARMARKED ENDOWMENT FUNDS	3	211742527	226864981
SECURED LOANS & BORROWINGS	4	0	0
CURRENT LIABILITIES & PROVISIONS	7	177767447	116638013
TOTAL		3332725430	3444704177
ASSETS			
FIXED ASSETS	8	1540131215	1500549362
INVESTMENTS FROM EARMARKED ENDOWMENT FUNDS	9	690602518	659715439
CURRENT ASSETS , LOANS, ADVANCES ETC	11	1101991697	1284439375
MISCELLANEOUS EXPENDITURE (TO THE EXTENT NOT WRITTEN OFF)		0	0
TOTAL		3332725430	3444704177
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 2015

INCOME	Schedules	2014-15	2013-14
		[Rs.]	[Rs.]
Income from Sales / Services	12	817631349	793644742
Grants Received from Govt of India(Salary,General,Non Plan)	13	840588000	814805000
Fees/Subscription	14	6101380	6308905
Income from Investments	15	12029861	43495498
(Income on Investment from earmarked/endow.Funds transferred to Funds)			
Income from Royalty, Publication etc	16	586646	184392
Interest Earned	17	89168342	134094394
Other Income	18	9246047	25715672
Total		1775351625	1818248603
EXPENDITURE			
Establishment Expenses	20	1023042825	948316422
Other Administrative Expenses	21	797725390	783569405
Bank Charges	23	247154	174730
Depreciation (Net Total at the year-end-corresponding to Schedule 8)		143476883	146995944
Total		1964492252	1879056501
Balance being Excess Expenditure over Income		189140627	60807899
Add: Transfer to Special Reserve Account		26889638	62908664
BALANCE BEING DEFICIT CARRIED TO CAPITAL FUND		216030265	123716563
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

SCHEDULES

		2014-15	2013-14
	PARTICULARS	[Rs.]	[Rs.]
	SCHEDULE 1 - CORPUS/CAPITAL FUND		
1000	Balance as at the beginning of the year	4148187087	4044379953
	Less Depreciation up to the end of the previous year	1606931005	1459935061
	Net balance at the beginning of the year	2541256080	2584444892
1005	Add: Plan Grants received from Government of India	66250000	95893000
	Add: Grants received from Others for Capital Assets(WCP)	0	0
	Less:Contribution towards Corpus/Capital Fund	0	0
	Deduct: Balance of net expenditure transferred from the Income and Expenditure Account	216030265	123716563
3730	Less:Value of Assets Written off during the year	15279678	15365248
2746/1201	DeductTransfer to BMT/Add Transfer from CHO	0	0
2395/2395			
	BALANCE AS AT THE YEAR-END	2376196137	2541256081
	SCHEDULE 2-RESERVES AND SURPLUS:		
	1. Capital Reserve:		
	As per last Account	--	--
	Addition during the year	--	--
	Less:Deduction during the year	--	--
	3. Special Reserves:		
1302/2620/2621	As per last Account	559945101	460849639
2620/1302	wAddition during the year (Current year transfer- Increase in provision)	7074218	99095462
3231	Less: Deductions during the year		

	4. General Reserve:		
	As per last Account	--	--
	Addition during the year	--	--
	Less: Deductions during the year	--	--
	TOTAL	567019319	559945101
	SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS		
	a) Opening balance of the funds		
	b) Additions to the funds:		
	i. Donations/grants		
	ii. Income from Investments made on account of funds		
	iii. Other additions (Specify nature)		
	TOTAL (a+b)		
	c) Utilisation / Expenditure towards objective of funds		
	i. Capital Expenditure		
	- Fixed Assets		
	- Others		
	Total (Detailed Schedule Attached)		
	ii. Revenue Expenditure		
	- Salaries, Wages and allowances etc.	211742527	226864981
	- Rent		
	- Other Administrative expenses		
	Total	211742527	226864981
	TOTAL (c)		
	NET BALANCE AS AT THE YEAR-END (a+b+c)	211742527	226864981

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS - AS ON 31.03.2015 (Amount Rs)

PROJ #	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	FUND-WISE BREAK UP			TOTAL		
		OPENING BALANCE	ADDITIONS TO FUND				
			GRANTS	OTHER RECEIPTS		FIXED ASSETS	
5000	PROJ-MISCELLANEOUS	1154399.00	6314630.00	0.00	7469029.00	0.00	
5008	GENERAL CONFERENCE, WORKSHOP	10916.00	0.00	0.00	10916.00	0.00	
5033	MPH PROGRAMME	1480.00	0.00	0.00	1480.00	0.00	
5040	DEVELOPING EXPERIMENTAL THERAUPEUTICALS	994215.70	0.00	0.00	994215.70	0.00	
5055	ROCKFELLER FOUNDATION,USA	686120.00	0.00	0.00	686120.00	0.00	
5078	PROJECT GRANT/DR MALA RAMANATHAN	5810.00	0.00	0.00	5810.00	0.00	
5082	HEALTHAWARENESS PROGRAM	127537.00	0.00	0.00	127537.00	0.00	
5091	EURO REG. OF EPILEPSY & PREGNANCY	71796.00	0.00	0.00	71796.00	0.00	
5094	KERALA STATE AIDS CONTROL SOCIETY	90470.00	179946.00	0.00	270416.00	0.00	
5100	AMC/MAC ARTHUR FOUNDATION/02-70546	46315.05	0.00	0.00	46315.05	0.00	
5108	EVAL.SUB-TYPES DEMENTIA/DR.MATHURA	15800.50	0.00	0.00	15800.50	0.00	
5110	TOBACCO CESSATION & RESEARCH / DR.THANKAP	3364429.94	0.00	0.00	3364429.94	0.00	
5119	STAKE HOLDER-PERCEPT/INST.REV BO	118211.73	0.00	0.00	118211.73	0.00	
5128	INDENT. OF MACOBACTERIAL/DST/V.V.RADHAKRISHN	136107.00	0.00	0.00	136107.00	0.00	
5130	TELE-HEALTH & MEDICAL EDUCATION/JAWAHAR	580947.00	0.00	0.00	580947.00	0.00	
5133	WHO FELLOWSHIP TRAINING CBICD	215059.00	0.00	0.00	215059.00	0.00	
5135	A 16-WEEK,DOUBLE BLIND/ASHA KISHORE	1398536.00	0.00	0.00	1398536.00	0.00	
5137	MECHANISM OF ANTICANCER/DAE, BRS	2761.00	0.00	0.00	2761.00	0.00	
5139	A 24 WEEK, MULTICENTER/DR. MATHURANATH	2602046.78	0.00	0.00	2602046.78	0.00	
5140	HARVARD SCHOOL OF PUBLIC HEALTH	91794.32	0.00	0.00	91794.32	0.00	
5142	BANKING FOR BETTER HEALTH-MEDISAVE	153911.36	0.00	0.00	153911.36	0.00	
5146	DEVELOPMENT OF SPECTROSCOPIC PROTOCOL	11026.00	0.00	0.00	11026.00	0.00	
5147	FATHERHOOD INITIATIVES	39137.00	0.00	0.00	39137.00	0.00	
5150	PROTOCOL 6002-INT 001	290546.60	0.00	0.00	290546.60	0.00	
5153	DEV REF. MANUAL FOR PRIMARY	155802.00	0.00	0.00	155802.00	0.00	
5155	COMM BASED DETECTION	209315.00	0.00	0.00	209315.00	0.00	
5156	TSUNAMI PROJECT	237766.50	0.00	0.50	237767.00	0.00	
5159	NCD RISK FACTOR SURVEILLANCE	71123.00	0.00	0.00	71123.00	0.00	
5161	DOSE RANGING STUDY:CGHR	1409354.00	0.00	0.00	1409354.00	0.00	
5168	PROJ/VERMEER STUDY	1378590.00	0.00	0.00	1378590.00	0.00	
5170	SAFETY OF E 2007 IN LEVODOPA	1622261.00	0.00	0.00	1622261.00	0.00	
5174	CHANGES IN SLEEP WAKEFULNESS-Dr.Mohanku.	49317.00	0.00	0.00	49317.00	0.00	
5175	SURGICAL TRAIL IN LOBAR INTRACEREBRAL	39125.27	0.00	0.00	39125.27	0.00	

UTILISATION						TOTAL EXPENDITURE	NET BALANCE
CAPITAL EXPENDITURE		REVENUE EXPENDITURE					
OTHERS	TOTAL	SALARIES/WAGES	RENT/CONSUMABLES	OTHER ADMN EXP	TOTAL		
0.00	0.00	3423214.40	859403.60	353959.50	4636577.50	4636577.50	2832451.50
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10916.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1480.00
0.00	0.00	124466.00	0.00	0.00	124466.00	124466.00	869749.70
0.00	0.00	0.00	0.00	0.00	0.00	0.00	686120.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5810.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	127537.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	71796.00
0.00	0.00	0.00	0.00	15427.00	15427.00	15427.00	254989.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	46315.05
0.00	0.00	0.00	0.00	0.00	0.00	0.00	15800.50
0.00	0.00	169083.00	0.00	1233711.00	1402794.00	1402794.00	1961635.94
0.00	0.00	0.00	0.00	13719.00	13719.00	13719.00	104492.73
0.00	0.00	0.00	0.00	0.00	0.00	0.00	136107.00
0.00	0.00	180000.00	0.00	79318.00	259318.00	259318.00	321629.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	215059.00
0.00	0.00	0.00	0.00	16291.00	16291.00	16291.00	1382245.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2761.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2602046.78
0.00	0.00	0.00	0.00	0.00	0.00	0.00	91794.32
0.00	0.00	0.00	0.00	0.00	0.00	0.00	153911.36
0.00	0.00	0.00	0.00	0.00	0.00	0.00	11026.00
0.00	0.00	0.00	0.00	39137.00	39137.00	39137.00	0.00
0.00	0.00	45000.00	0.00	9660.00	54660.00	54660.00	235886.60
0.00	0.00	0.00	0.00	0.00	0.00	0.00	155802.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	209315.00
0.00	0.00	0.00	0.00	237767.00	237767.00	237767.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	71123.00
0.00	0.00	0.00	0.00	43056.00	43056.00	43056.00	1366298.00
0.00	0.00	0.00	0.00	17290.00	17290.00	17290.00	1361300.00
0.00	0.00	180000.00	0.00	0.00	180000.00	180000.00	1442261.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	49317.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	39125.27

5176	WOMEN COMPONENT PLAN	59065.25	0.00	0.00	59065.25	0.00	
5180	COMMUNITY BASED INTRVEN-CV DIS	18308.00	0.00	0.00	18308.00	0.00	
5181	PARKINSONS DISEASE NEUROIMAGING	-14350.00	0.00	0.00	-14350.00	0.00	
5182	KERALA REGISTRY FOR EPILEPSY AND PREGNANCY	671828.00	0.00	0.00	671828.00	0.00	
5183	OXFORD HEALTH SCHEME,LONDON	2185198.92	0.00	0.00	2185198.92	0.00	
5184	COMP HEALTH CARE PROJECT ST	1186321.00	500000.00	0.00	1686321.00	0.00	
5187	ROLANDIC EPILEPSY INTERNATIONAL	175445.00	0.00	0.00	175445.00	0.00	
5189	IMPACT CVDISEASE ON HOUSEHOLD	1012.00	0.00	0.00	1012.00	0.00	
5190	PREVALENCE OF TYPE II DIABATES IN RURAL	42210.00	0.00	0.00	42210.00	0.00	
5191	GENITICS OF PARKINSONS DISEASE	129793.50	0.00	0.00	129793.50	0.00	
5192	TO PROVIDE INFRASTRUCTURE TO AMCHSS	256737.50	0.00	0.00	256737.50	0.00	
5193	SAFE MOTHERHOOD PROGRAMME	71796.00	0.00	0.00	71796.00	0.00	
5198	MODULATION OF ENERGY METABOLISM	6142.00	0.00	0.00	6142.00	0.00	
5199	CLINICAL APPLICATION CRYOPRESE	1243768.00	0.00	0.00	1243768.00	0.00	
5201	OPEN LEBEL TRIAL IN PARKINSON	3629311.50	0.00	0.00	3629311.50	0.00	
5203	STUDY IN MRI - ISIR	45243.00	0.00	0.00	45243.00	0.00	
5205	EFFICACY AND SAFETY OF AP-1200	213090.00	0.00	0.00	213090.00	0.00	
5207	BRAIN MRI STUDIES	6692.00	0.00	0.00	6692.00	0.00	
5209	MANAGEMENT - CORONARY EVENT	13040.00	412996.00	0.00	426036.00	0.00	
5210	EMPOWERMENT OF WOMEN	993896.00	0.00	0.00	993896.00	0.00	
5212	YOUNG CORONARY ARTERY DISEASE	48674.00	0.00	0.00	48674.00	0.00	
5213	CREATION OF AMC FUND	0.00	6192368.00	0.00	6192368.00	0.00	
5214	CREATING A STIMULATOR	0.00	20323.00	0.00	20323.00	0.00	
5216	PROTOCOL SP921 A MULTICENTRE	1053692.10	0.00	0.00	1053692.10	0.00	
5217	STUDY ON WORKLOAD ON NURSES	954577.50	0.00	0.00	954577.50	0.00	
5219	HEALTH IMPACT OF TECHNOLOGY	1049164.00	0.00	0.00	1049164.00	0.00	
5220	CAPACITY BUILDING WOMEN HEALTH	650123.00	0.00	0.00	650123.00	0.00	
5221	RESEARCH PROJECT EQUITY ISSUES	420132.00	0.00	0.00	420132.00	0.00	
5224	IMPROV- EPILEPSY LOCALISATION	145218.00	0.00	17961.00	163179.00	0.00	
5226	ISOLATION, CHARACTERIZATION OF GLIOMAS	357092.00	0.00	0.00	357092.00	0.00	
5227	MONOTHERAPY/ ACTIVE CONTROL	621664.00	635823.00	0.00	1257487.00	0.00	
5229	REAL TIME FMRI IN STROKE	60780.00	0.00	0.00	60780.00	0.00	
5232	CEREBELLUM AND CORTICAL	243876.00	0.00	0.00	243876.00	0.00	
5233	DEVELOPING AN INDO-CANADIAN COLLABORATION	91.00	0.00	0.00	91.00	0.00	
5234	IMPROVING LOCALIZATION IN LESION NEGATIVE	234922.00	0.00	12500.00	247422.00	0.00	
5235	REGULATION OF THE CARDIAC FIBROBLAST C..	401976.00	0.00	0.00	401976.00	0.00	
5237	KERALA DIABETES PREVENTION PROGRAM(K-DPP	3725958.91	5123395.59	0.00	8849354.50	0.00	
5238	IMPROVING LOCALIZATION IN LESION NEGA...	29973.00	0.00	0.00	29973.00	0.00	
5240	AUTOCRINE AND PARACRINE MECHANISMS IN ..	65933.00	0.00	0.00	65933.00	0.00	
5243	STEROIDS IN CARDIAC SURGERY	150929.00	122612.00	0.00	273541.00	0.00	

0.00	0.00	0.00	0.00	0.00	0.00	0.00	59065.25
0.00	0.00	0.00	0.00	0.00	0.00	0.00	18308.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-14350.00
0.00	0.00	271700.00	0.00	143296.00	414996.00	414996.00	256832.00
0.00	0.00	169038.00	0.00	868403.00	1037441.00	1037441.00	1147757.92
0.00	0.00	0.00	0.00	891005.00	891005.00	891005.00	795316.00
0.00	0.00	0.00	0.00	175445.00	175445.00	175445.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1012.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	42210.00
0.00	0.00	0.00	61591.00	123.00	61714.00	61714.00	68079.50
0.00	0.00	0.00	0.00	332.00	332.00	332.00	256405.50
0.00	0.00	0.00	0.00	0.00	0.00	0.00	71796.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	6142.00
0.00	0.00	447149.00	199740.00	49262.00	696151.00	696151.00	547617.00
0.00	0.00	0.00	0.00	192259.00	192259.00	192259.00	3437052.50
0.00	0.00	0.00	0.00	0.00	0.00	0.00	45243.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	213090.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	6692.00
0.00	0.00	4878.00	0.00	0.00	4878.00	4878.00	421158.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	993896.00
0.00	0.00	0.00	0.00	32801.00	32801.00	32801.00	15873.00
0.00	0.00	0.00	0.00	5526672.00	5526672.00	5526672.00	665696.00
0.00	0.00	0.00	0.00	20323.00	20323.00	20323.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1053692.10
0.00	0.00	0.00	0.00	0.00	0.00	0.00	954577.50
0.00	0.00	0.00	0.00	3676.00	3676.00	3676.00	1045488.00
0.00	0.00	0.00	0.00	22.00	22.00	22.00	650101.00
0.00	0.00	0.00	0.00	1071.00	1071.00	1071.00	419061.00
0.00	0.00	0.00	0.00	163179.00	163179.00	163179.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	357092.00
0.00	0.00	262426.00	0.00	75563.00	337989.00	337989.00	919498.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	60780.00
0.00	0.00	0.00	0.00	17400.00	17400.00	17400.00	226476.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.00
0.00	0.00	119332.00	0.00	35824.00	155156.00	155156.00	92266.00
0.00	0.00	0.00	313716.00	80259.00	393975.00	393975.00	8001.00
0.00	0.00	1660121.00	0.00	2910391.00	4570512.00	4570512.00	4278842.50
0.00	0.00	0.00	0.00	25089.00	25089.00	25089.00	4884.00
0.00	0.00	15658.00	15158.00	35117.00	65933.00	65933.00	0.00
0.00	0.00	0.00	0.00	388.00	388.00	388.00	273153.00

5244	MOLECULAR BASIS OF CARDIAC FIBROBLAST ..	282091.00	728000.00	0.00	1010091.00	0.00	
5245	IMPROVING LOCALIZATION IN LESION N..	521921.00	0.00	0.00	521921.00	0.00	
5246	COMPREHENSIVE HEART FAILURE	3891204.00	0.00	3309.00	3894513.00	0.00	
5247	A PHASE 3, 12-WEEK, DOUBLE BLIND, PLA...	2617149.10	0.00	0.00	2617149.10	0.00	
5248	A PHASE 3, DOUBLE BLIND, PLACEBO AND A..	2039634.50	2158.20	0.00	2041792.70	0.00	
5249	CNRS-INDO-FRENCH PROJECT	594651.00	0.00	0.00	594651.00	0.00	
5250	DIABETES, PREDIABETES AND INSU	1734.00	0.00	0.00	1734.00	0.00	
5251	NEUROBIOLOGICAL MARKER OF POPULATION D..	22916.00	0.00	0.00	22916.00	0.00	
5252	INDO-US COLLABERATIVE STROKE	5364.00	1149401.00	13736.00	1168501.00	0.00	
5255	PRIVATIZATION OF HEALTHCARE	327241.50	0.00	0.00	327241.50	0.00	
5256	HEALTHY LIFE STYLE	4618209.00	614979.00	0.00	5233188.00	0.00	
5257	PULMONARY HYPERTENSION,BMPRII	134404.00	0.00	0.00	134404.00	0.00	
5259	EFFICACY OF THE THETA BURST	87392.00	0.00	0.00	87392.00	0.00	
5260	INFLUENCE OF SLEEP ARCHITECTUR	289620.00	200000.00	0.00	489620.00	0.00	
5261	IMAGE PROCESSING FOR IMPROVING	135185.00	0.00	0.00	135185.00	0.00	
5262	HAEMODYNAMIC IMAGING	20810.00	0.00	0.00	20810.00	0.00	
5263	MITOCHONDRIA SPECIFIC ANTI-OXI	415816.00	38226.00	0.00	454042.00	10490.00	
5264	FLUORESCENCE OPTICAL BIOPSY	618012.00	600000.00	0.00	1218012.00	0.00	
5265	DEVELOPING PHYSCIAN EDUCATION	463685.00	0.00	0.00	463685.00	63100.00	
5266	RAPID ASSESSMENT OF THE SCHEME	3910.00	0.00	0.00	3910.00	0.00	
5267	EVALUATION STUDY OF THE ASHA	346247.00	0.00	0.00	346247.00	0.00	
5269	SURVEILLANCE OF JAUNDICE	299700.00	0.00	0.00	299700.00	0.00	
5270	ESTIMATION OF AUTOANTIBODIES -	96950.00	0.00	0.00	96950.00	0.00	
5271	DEVELOPMENT OF A COMPUTER BASED LANGUAGE -	118541.00	227000.00	0.00	345541.00	0.00	
5272	PORTABLE OPTICAL BRAIN-COMP	2623610.00	844000.00	0.00	3467610.00	0.00	
5273	INTERNATIONAL STROKE	0.00	134376.00	0.00	134376.00	0.00	
5274	IMPROVING THE CONTROL OF HYPERTENSION .	3837527.82	2295371.00	41935.00	6174833.82	0.00	
5275	ENCODING OF INTERHEMISPHERIC -	1818633.00	2188657.00	0.00	4007290.00	0.00	
5276	VALIDATION OF FMRI	434391.00	0.00	0.00	434391.00	0.00	
5277	VASCULAR CONGNITIVE IMPAIRMENT	258142.00	601672.00	0.00	859814.00	52227.00	
5278	INDO-GERMAN SYMPOSIUM -	74000.00	0.00	0.00	74000.00	0.00	
5279	FAMILY LED REHABILITATION AFTER STROKE..	77701.00	659430.00	0.00	737131.00	39568.00	
5280	DEVELOPMENT OF A TECHNICAL GUIDE: INTE.. -	1502475.00	0.00	0.00	1502475.00	0.00	
5281	LDL RECEPTOR ON MACROPHAGES -	232526.00	398700.00	0.00	631226.00	0.00	
5282	INDIAN –EUROPEAN RESEARCH	933836.00	0.00	0.00	933836.00	0.00	
5283	RESEARCH INITIATIVE ON FACTORS	2582244.00	0.00	0.00	2582244.00	0.00	
5284	INTERNATIONAL STUDY FOR COMPARATIVE	0.00	260507.00	0.00	260507.00	0.00	
5285	INTERNATIONAL RANDOMIZED	0.00	36000.00	0.00	36000.00	0.00	
5286	INDIAN HEART RHYTHM SOCIETY	0.00	75000.00	0.00	75000.00	0.00	
5287	STUDY OF CARBAMAZEPINE ...	0.00	770000.00	0.00	770000.00	0.00	

0.00	0.00	25300.00	765577.00	203214.00	994091.00	994091.00	16000.00
0.00	0.00	62100.00	0.00	7366.00	69466.00	69466.00	452455.00
0.00	0.00	1480991.00	0.00	19282.00	1500273.00	1500273.00	2394240.00
0.00	0.00	135268.00	0.00	77475.00	212743.00	212743.00	2404406.10
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2041792.70
0.00	0.00	0.00	0.00	0.00	0.00	0.00	594651.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1734.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	22916.00
0.00	0.00	508129.00	0.00	16310.00	524439.00	524439.00	644062.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	327241.50
0.00	0.00	0.00	0.00	692.00	692.00	692.00	5232496.00
0.00	0.00	0.00	80858.00	22.00	80880.00	80880.00	53524.00
0.00	0.00	0.00	0.00	23824.00	23824.00	23824.00	63568.00
0.00	0.00	20570.00	0.00	115281.00	135851.00	135851.00	353769.00
0.00	0.00	59151.00	0.00	73559.00	132710.00	132710.00	2475.00
0.00	0.00	0.00	4400.00	16410.00	20810.00	20810.00	0.00
0.00	10490.00	99500.00	18940.00	175357.00	293797.00	304287.00	149755.00
0.00	0.00	418871.00	61261.00	695525.00	1175657.00	1175657.00	42355.00
0.00	63100.00	150403.00	0.00	60532.00	210935.00	274035.00	189650.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	3910.00
0.00	0.00	185708.00	0.00	29090.00	214798.00	214798.00	131449.00
0.00	0.00	0.00	0.00	299700.00	299700.00	299700.00	0.00
0.00	0.00	0.00	0.00	96950.00	96950.00	96950.00	0.00
0.00	0.00	74200.00	0.00	21746.00	95946.00	95946.00	249595.00
0.00	0.00	194615.00	0.00	84355.00	278970.00	278970.00	3188640.00
0.00	0.00	0.00	0.00	2159.00	2159.00	2159.00	132217.00
0.00	0.00	2446630.00	0.00	1015897.00	3462527.00	3462527.00	2712306.82
0.00	0.00	430968.00	0.00	166770.00	597738.00	597738.00	3409552.00
0.00	0.00	190942.00	0.00	120682.00	311624.00	311624.00	122767.00
0.00	52227.00	429943.00	0.00	80935.00	510878.00	563105.00	296709.00
0.00	0.00	0.00	0.00	5840.00	5840.00	5840.00	68160.00
0.00	39568.00	432000.00	14885.00	54874.00	501759.00	541327.00	195804.00
0.00	0.00	0.00	0.00	14448.00	14448.00	14448.00	1488027.00
0.00	0.00	352455.00	24143.00	0.00	376598.00	376598.00	254628.00
0.00	0.00	0.00	0.00	389285.00	389285.00	389285.00	544551.00
0.00	0.00	474974.00	0.00	1299547.00	1774521.00	1774521.00	807723.00
0.00	0.00	0.00	0.00	23543.00	23543.00	23543.00	236964.00
0.00	0.00	0.00	0.00	7107.00	7107.00	7107.00	28893.00
0.00	0.00	0.00	0.00	75000.00	75000.00	75000.00	0.00
0.00	0.00	345333.00	7579.00	17138.00	370050.00	370050.00	399950.00

5288	BIO-REPOSITORY OF DNA -STROKE	0.00	119622.47	0.00	119622.47	0.00	
5289	MITOCHONDRIAL METABOLISM...	0.00	2800000.00	0.00	2800000.00	42950.00	
5290	CLOSING THE GAP; HEALTH EQUITY	0.00	4472484.04	0.00	4472484.04	39030.00	
5291	OXIDATIVE STEM MEDIATED STEM..	0.00	756000.00	0.00	756000.00	0.00	
5292	A RESTING STATE FMRI & TASK ..	0.00	309200.00	0.00	309200.00	0.00	
5293	DECIPHERING LRRK2 GENE	0.00	664706.00	0.00	664706.00	0.00	
5294	MTP/EC SERVICES OF WOMEN	0.00	772380.00	0.00	772380.00	0.00	
5296	ELECTROENCE PHALOGRAPHY WORKSHOP	0.00	834000.00	0.00	834000.00	0.00	
5297	THE HUMAN BRAIN MAPPING PROJ..	0.00	939200.00	0.00	939200.00	0.00	
5298	MOLECULAR MECHANISMS	0.00	1776400.00	0.00	1776400.00	0.00	
5299	BIOMEDIAL SIGNAL ANALYSER	0.00	462000.00	0.00	462000.00	0.00	
5300	ANALYSING FUNCTIONAL NETWORKS	0.00	500000.00	0.00	500000.00	0.00	
5302	/DISABILITY STUDIES IN EPILEPSY	0.00	372900.00		372900.00	0.00	
6054	PROJ/DR RADHAKRISHNAN NEUROLOGY	0.54	200.00	0.00	200.54	0.00	
6055	MOVEMENT DISORDER SURGERY	-3406201.00	0.00	0.00	-3406201.00	0.00	
6058	ATHIYANOOR SCT ACTION/DR.K.R.T	21006.00	0.00	0.00	21006.00	0.00	
6064	SPEECH THERAPY	-883914.00	0.00	0.00	-883914.00	0.00	
6065	COMPREHENSIVE CENTRE FOR SLEEP DIS ORD.	-4281777.00	0.00	238000.00	-4043777.00	0.00	
6072	COMPREHENSIVE STROKE CARE	-13733137.00	0.00	10505.00	-13722632.00	0.00	
6075	CORRELATION FETAL ECHOCARDIO	109885.00	0.00	0.00	109885.00	0.00	
6077	TECHNICAL ADVISORY COMMITTEE	-390355.00	0.00	0.00	-390355.00	0.00	
6080	COMPREHENSIVE PAIN CLINIC	448000.00	0.00	0.00	448000.00	0.00	
6081	VALIDATION OF A CLINICAL PROTO	143490.00	0.00	0.00	143490.00	0.00	
6082	NOSOCOMIAL INFECTION	116962.00	0.00	0.00	116962.00	0.00	
6084	NEURO INTERVENTION CENTRE(NIC)	-5977447.00	0.00	0.00	-5977447.00	0.00	
6085	PREVALENCE- METABOLIC SYNDROM	18580.00	0.00	0.00	18580.00	0.00	
6087	AUTONOMIC DYSFUNCTION	116310.00	0.00	0.00	116310.00	0.00	
6089	THE EFFECTS OF PROPOFOL	36880.00	0.00	0.00	36880.00	0.00	
6090	STUDY ON THE EFFECT OF DEXMEDE	45000.00	0.00	0.00	45000.00	0.00	
6091	PUBLIC HEALTH DOCUMENTATION -	746792.00	0.00	0.00	746792.00	0.00	
6092	COMPARISON OF SEVOFLURANE -	20.00	0.00	0.00	20.00	0.00	
6093	EVALUATION OF VASCULAR GRAFT	149000.00	0.00	0.00	149000.00	0.00	
6094	EPCE FOR DVT TREATMENT -	83683.00	0.00	0.00	83683.00	0.00	
6096	MOLECULAR BIOLOGY OF PEDIATRIC	0.00	50000.00	0.00	50000.00	0.00	
6097	DEVELOPMENT OF E LOG BOOK	0.00	110000.00	1500.00	111500.00	0.00	
6098	RESEARCH ON MEDICAL TOURISM	0.00	70000.00	0.00	70000.00	0.00	
6099	CLINICO PATHOLOGICAL CORR...	0.00	130000.00	0.00	130000.00	0.00	
6100	CLINICO PATHOLOGICAL CORRELATION	0.00	50000.00	0.00	50000.00	0.00	
6101	EXECUTIVE FUNCTION IN PERSONS	0.00	50000.00	0.00	50000.00	0.00	

0.00	0.00	0.00	0.00	20446.00	20446.00	20446.00	99176.47
0.00	42950.00	60480.00	302368.00	24886.00	387734.00	430684.00	2369316.00
0.00	39030.00	293226.00	0.00	426271.00	719497.00	758527.00	3713957.04
0.00	0.00	72890.00	526959.00	22852.00	622701.00	622701.00	133299.00
0.00	0.00	193703.00	0.00	0.00	193703.00	193703.00	115497.00
0.00	0.00	47845.00	50889.00	118857.00	217591.00	217591.00	447115.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	772380.00
0.00	0.00	0.00	0.00	653082.00	653082.00	653082.00	180918.00
0.00	0.00	0.00	0.00	5742.00	5742.00	5742.00	933458.00
0.00	0.00	28387.00	132292.00	21073.00	181752.00	181752.00	1594648.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	462000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	500000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	372900.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	200.54
0.00	0.00	20720.00	0.00	0.00	20720.00	20720.00	-3426921.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	21006.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-883914.00
0.00	0.00	162000.00	0.00	45560.00	207560.00	207560.00	-4251337.00
0.00	0.00	3634910.00	0.00	988521.00	4623431.00	4623431.00	-18346063.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	109885.00
0.00	0.00	144000.00	0.00	0.00	144000.00	144000.00	-534355.00
0.00	0.00	39000.00	0.00	0.00	39000.00	39000.00	409000.00
0.00	0.00	0.00	0.00	780.00	780.00	780.00	142710.00
0.00	0.00	0.00	46619.00	22.00	46641.00	46641.00	70321.00
0.00	0.00	2852770.00	7140.00	1090797.00	3950707.00	3950707.00	-9928154.00
0.00	0.00	0.00	0.00	18580.00	18580.00	18580.00	0.00
0.00	0.00	0.00	0.00	5830.00	5830.00	5830.00	110480.00
0.00	0.00	0.00	0.00	4230.00	4230.00	4230.00	32650.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	45000.00
0.00	0.00	172800.00	0.00	45221.00	218021.00	218021.00	528771.00
0.00	0.00	0.00	0.00	20.00	20.00	20.00	0.00
0.00	0.00	0.00	0.00	12640.00	12640.00	12640.00	136360.00
0.00	0.00	0.00	0.00	83683.00	83683.00	83683.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	50000.00
0.00	0.00	51500.00	0.00	79.00	51579.00	51579.00	59921.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	70000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	130000.00
0.00	0.00	0.00	0.00	6800.00	6800.00	6800.00	43200.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	50000.00

7101	ADVANCE TO P I	-4140.00	0.00	3221971.00	3217831.00	0.00	
7102	AMOUNT PAYABLE TO PROJECT STAFF	2153.00	0.00	0.00	2153.00	0.00	
		44219613.39	46564663.30	3561417.50	94345694.19	247365.00	
	OTHER PROJECTS						
1014	NEW PENSION SCHEME	7686826.05	0.00	70613358.00	78300184.05	0.00	
1301	EMPLOYEES PENSION FUND	120347675.65	0.00	197652981.00	318000656.65	0.00	
1075	PATIENT WELFARE FUND	3823016.35	0.00	495021.00	4318037.35	0.00	
1077	INSTITUTIONAL ETHICS COMMITTEE FUND	0.00	0.00	0.00	0.00	0.00	
1078	DR. RICHARD A CASH & DR K MOHANDS AWARD	56060.00	0.00	79431.00	135491.00	0.00	
1080	STAFF BENEVOLENT FUND	2468348.25	0.00	2995755.00	5464103.25	0.00	
1079	VICE CHANCELLORS CONFERENCE FUND - Hospital	0.00	0.00	0.00	0.00	0.00	
1081	CONTINUUM - SPECIAL CME PUBLICATION FUND - Hospital	51707.00	0.00	0.00	51707.00	0.00	
5000	PROJECT SUSPENSE	900494.00	1687944.00	0.00	2588438.00	0.00	
5057	DYNAMIC ORTHOPAEDIC PVT LTD, HYDROXY	6787.55	0.00	0.00	6787.55	0.00	
5089	DETEC & TREAT OF CANCER BY LASER	3959.00	0.00	0.00	3959.00	0.00	
7000	MISCELLENEOUS PROJECT	30944.09	0.00	0.00	30944.09	0.00	
7001	PRO;SAHAJANAND VASCU;DR.AURTHUR	558785.75	0.00	0.00	558785.75	75026.00	
7002	Dr.TOMS LABORATORY, Dr. K.KRISHNAN	13876.00	0.00	0.00	13876.00	0.00	
7003	PROJ:D.S.T. DR.P.V. MOHANAN	2537.40	0.00	0.00	2537.40	0.00	
7004	PROJ: ATMRF:DR LISSY KRISHNAN	551.25	0.00	0.00	551.25	0.00	
7005	PROJECT:DYNAMIC ORTHOPAEDICS	13656.00	0.00	0.00	13656.00	0.00	
7006	PROJ: D.S.T. D.S.NAGESH	181074.00	0.00	0.00	181074.00	0.00	
7008	NMITLI, PROJECT C.S.I.R	0.90	0.00	0.00	0.90	0.00	
7009	CHITOSAN BASED WAINED DRESSING	4761.75	0.00	0.00	4761.75	0.00	
7011	DST-FAB: CLINICALLY/SIG:SHAPE OF HEVA	213826.00	0.00	0.00	213826.00	0.00	
7014	AUROLAB,ARAVIND EYE HOSPITAL	13674.00	0.00	0.00	13674.00	0.00	
7015	TTK.HEALTHCARE.DEVELOPMENT OF VALV	39424.00	0.00	0.00	39424.00	0.00	
7016	INDO-GERMAN COMMITTEE MEETING-DST	5407.00	0.00	0.00	5407.00	0.00	
7017	HINDUSTAN LATEX.EVALU:BLOOD BAG	698318.50	413919.00	0.00	1112237.50	0.00	
7018	ALL INDIA COUNCIL FOR TECHNI:EDU:SH	339919.00	0.00	0.00	339919.00	0.00	
7019	DST.NIRANJAN	69847.00	0.00	0.00	69847.00	0.00	
7020	IFCPAR-DR.JAYAKRISHNAN	188.00	0.00	0.00	188.00	0.00	
7022	DST-LBFDPSBC-DR.SHARMA	79385.00	0.00	0.00	79385.00	0.00	
7023	DEV: HYDRO-CEPHALUS-HINDUSTAN LATEX	45510.00	0.00	0.00	45510.00	0.00	
7026	DEV.HEART VALVE-DST.MURALEE	2522.00	0.00	0.00	2522.00	0.00	
7027	STED-DR T V KUMARY-INVITRO	5089.00	0.00	0.00	5089.00	0.00	
7029	DONERG/LIFE SCIENCE BOARD	6876.00	0.00	0.00	6876.00	0.00	

0.00	0.00	0.00	0.00	3219813.00	3219813.00	3219813.00	-1982.00
0.00	0.00	0.00	0.00	2153.00	2153.00	2153.00	0.00
0.00	247365.00	23364347.40	3493518.60	25415088.50	52272954.50	52520319.50	41825374.69
0.00	0.00	0.00	0.00	67589409.00	0.00	67589409.00	10710775.05
0.00	0.00	0.00	0.00	216910954.00	0.00	216910954.00	101089702.65
0.00	0.00	0.00	0.00	192560.00	0.00	192560.00	4125477.35
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	15000.00	0.00	15000.00	120491.00
0.00	0.00	0.00	0.00	2114986.00	0.00	2114986.00	3349117.25
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	51707.00
							119447270.30
0.00	0.00	0.00	0.00	0.00	2039463.00	2039463.00	548975.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	6787.55
0.00	0.00	0.00	0.00	0.00	0.00	0.00	3959.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	30944.09
0.00	75026.00	0.00	399000.00	0.00	399000.00	474026.00	84759.75
0.00	0.00	0.00	0.00	0.00	0.00	0.00	13876.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2537.40
0.00	0.00	0.00	0.00	0.00	0.00	0.00	551.25
0.00	0.00	0.00	0.00	0.00	0.00	0.00	13656.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	181074.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90
0.00	0.00	0.00	0.00	0.00	0.00	0.00	4761.75
0.00	0.00	0.00	0.00	0.00	0.00	0.00	213826.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	13674.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	39424.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5407.00
0.00	0.00	25500.00	373182.00	41105.00	439787.00	439787.00	672450.50
0.00	0.00	0.00	0.00	0.00	0.00	0.00	339919.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	69847.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	188.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	79385.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	45510.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2522.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5089.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	6876.00

7031	DBT/DR P V MOHAN/DEV INVITROPYRO	79064.00	0.00	0.00	79064.00	0.00	
7032	DST. DR. ANNINE/BONE REGENERATION	29166.00	0.00	0.00	29166.00	0.00	
7033	BIOFUNCTIONAL EVALUATION DR. UMASANKER	72581.00	0.00	0.00	72581.00	0.00	
7034	DST. DR. NIRMALA RACHEL	14664.00	0.00	0.00	14664.00	0.00	
7035	DST-H.K.VARMA	95433.00	0.00	0.00	95433.00	0.00	
7036	INVITRO HEMO CAMPABILITY/ DR. LISSY	-16905.00	0.00	16905.00	0.00	0.00	
7037	INVIVO EVALUATION/ STED/DR. LISSY	6205.00	0.00	0.00	6205.00	0.00	
7039	JNC/ASR/DR. MOHANAN/STUDY OF ACCUTE…..	44684.00	0.00	0.00	44684.00	0.00	
7040	BIOMED/ C.V. MURALEEDHARAN	44000.00	0.00	0.00	44000.00	0.00	
7041	CSIR-GRANT-ASHA S MATHEW,PHD STUDENT	55973.00	0.00	0.00	55973.00	0.00	
7042	CSIR-GRANT-BERNADETTE K. MADATHIL,PHD	25870.00	0.00	0.00	25870.00	0.00	
7043	CSIR-GRANT-SAILAJA.G.S.SRF	9067.00	0.00	0.00	9067.00	0.00	
7044	LISI NO TRIAL TRIAL MERIND	21672.65	0.00	0.00	21672.65	0.00	
7045	NIRMALA RACHEL, CSIR	14063.00	0.00	0.00	14063.00	0.00	
7047	U.G.C. GRANT- RESEARCH FELLOW	300935.00	0.00	0.00	300935.00	0.00	
7048	CSIR GRANT- JOSENA JOSEPH	47473.00	0.00	0.00	47473.00	0.00	
7049	CSIR GRANT - MARY VARGHESE	35837.00	0.00	0.00	35837.00	0.00	
7050	INTEREST-PROJECT ACCOUNT	0.00	0.00	1980993.00	1980993.00	0.00	
7051	CSIR GRANT - MANITHA B NAIR	12062.00	0.00	0.00	12062.00	0.00	
7052	DBT/DR.PRABHA/DEV. OF TEMP - RES - CO-OPLY	-229010.25	0.00	0.00	-229010.25	0.00	
7053	DR.SREENIVASAN/DEVEL.OF TEMP.RES.CO-OPLY	22619.00	0.00	0.00	22619.00	0.00	
7054	DST-DR.ANOOP-DIFF:EXPR:RAT BRAIN……	44434.00	0.00	0.00	44434.00	0.00	
7055	CSIR-NMITLI SCHEME-C.V.MURALEEDHARAN	756552.00	0.00	0.00	756552.00	0.00	
7056	D.S.T.ROYJOSEPH, BONE GRAFT SUB:SPINAL	110047.00	0.00	0.00	110047.00	0.00	
7057	DST - PROJECT.DR.JAYABALAN	14471.00	0.00	0.00	14471.00	0.00	
7059	DBT-DR. PRABHA D NAIR, ISLET IMMUN…..	67574.00	0.00	0.00	67574.00	0.00	
7060	ICMR PROJECT/ SUDHAKAR MUTHALEE	124392.00	0.00	0.00	124392.00	0.00	
7061	DR. UMASANKAR/PRELIMI:EVALU: BIODEGRADABLE	241.00	0.00	0.00	241.00	0.00	
7062	DR. LIZY-SAHAJA:EVA "STENT"INVITRO…..	102361.00	0.00	0.00	102361.00	0.00	
7063	DR.P.V.MOHAN, SHAJANAD	-10824.00	0.00	10824.00	0.00	0.00	
7065	DR.T.V.KUMARI, DBT.BIOGENE	38659.00	0.00	0.00	38659.00	0.00	
7067	DBT.DR. JAYABALAN,DEV:& STUDIES…..	-27459.00	0.00	0.00	-27459.00	0.00	
7069	VSSC - PROJECT. D.S. NAGESH	153475.00	0.00	0.00	153475.00	0.00	
7070	CHO PROJECT - 5146 JAYASREE	-872.00	0.00	0.00	-872.00	0.00	
7071	STEC-PROJECT: DR.MAYA NANDKUMAR	-2164.00	0.00	4631.00	2467.00	0.00	
7072	SAHAJANAND MED.TECH. C.V.MURALIDHARAN	76292.00	0.00	0.00	76292.00	0.00	
7073	STUDY PROJECT:DR.P.V.MOHANAN	-95386.00	0.00	0.00	-95386.00	0.00	
7074	STUDY PROJECT: CLRI- DR.MOHAN	289303.00	0.00	0.00	289303.00	0.00	
7075	STUDY PROJECT - BIOSYNC SCI	11935.00	0.00	0.00	11935.00	0.00	
7076	ARROW INTERNATIONAL : DR.UMASHANKAR	399773.00	0.00	0.00	399773.00	0.00	

0.00	0.00	0.00	0.00	0.00	0.00	0.00	79064.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	29166.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	72581.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	14664.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	95433.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	6205.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	44684.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	44000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	55973.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	25870.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	9067.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	21672.65
0.00	0.00	0.00	0.00	0.00	0.00	0.00	14063.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	300935.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	47473.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	35837.00
0.00	0.00	0.00	0.00	1980993.00	1980993.00	1980993.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	12062.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-229010.25
0.00	0.00	0.00	0.00	0.00	0.00	0.00	22619.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	44434.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	756552.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	110047.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	14471.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	67574.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	124392.00
0.00	0.00	0.00	0.00	241.00	241.00	241.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	102361.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	38659.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-27459.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	153475.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-872.00
0.00	0.00	0.00	0.00	2092.00	2092.00	2092.00	375.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	76292.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-95386.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	289303.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	11935.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	399773.00

7077	UMHOU SENEMBYU:DR.UMASHANKAR	603714.00	0.00	0.00	603714.00	0.00	
7079	D.B.T.DR.SREENIVASAN, DESIGNNING.... - BMT Project	-186.00	0.00	186.00	0.00	0.00	
7080	DBT-DR.MAYA- TISSUE ENGINEERING HYBRID	-391887.00	461651.00	0.00	69764.00	0.00	
7081	USV LTD. MUMBAI - DR.MOHAN	88349.00	0.00	0.00	88349.00	0.00	
7082	INDO-US JOINT PROJECT	878.00	0.00	0.00	878.00	0.00	
7083	ARROW HAEMO DIALYSIS	30882.00	0.00	0.00	30882.00	0.00	
7085	DR.R.V.THAMPAN - CSIR	26381.00	0.00	0.00	26381.00	0.00	
7086	HORMONE RELEASING INTRA DEVICES	-86027.00	0.00	0.00	-86027.00	0.00	
7087	CSIR - KALADHAR - BST	39103.00	0.00	0.00	39103.00	0.00	
7090	PROJ/7090/TISSUE ENGINEERS VASCULAR	130504.00	0.00	0.00	130504.00	0.00	
7092	PROJ/7092/SEA FOOD	1993.00	0.00	0.00	1993.00	0.00	
7093	PROJ/7093/CSIR GRANT-LPA	73396.00	0.00	0.00	73396.00	0.00	
7095	PROJ/7095/CSIR GRANT-VIOLA.B.MORRIS	22072.00	0.00	0.00	22072.00	0.00	
7097	PROJ/7097/ACCELERATED AGEING	1752081.00	585528.00	372720.00	2710329.00	354575.00	
7098	PROJ/7098/EVALN OF NTU DRUG	451985.00	0.00	0.00	451985.00	0.00	
7099	PROJ/7099/BCL	7011.00	0.00	0.00	7011.00	0.00	
7100	PROJ/7100/ITR PROGRAMME	4079.00	0.00	0.00	4079.00	0.00	
7101	PROJ/7101/CSIR/SONIA.T.A	2650.00	0.00	0.00	2650.00	0.00	
7103	PROJ/7103/CSIR/VIDYARAJ	5682.00	0.00	0.00	5682.00	0.00	
7104	Renjith P Nair PhD Shol	0.00	68800.00	0.00	68800.00	0.00	
7105	PROJ/7105/CSIR/ARJUN NAMBOODIRI	26821.00	0.00	0.00	26821.00	0.00	
7107	PROJ/7107/CSIR/NEENA & 2 FELLOWS	44686.00	279200.00	0.00	323886.00	0.00	
7108	PROJ/7108/CSIR/FRANCIS.B.FERNANDEZ	16994.00	216000.00	0.00	232994.00	0.00	
7109	PROJ/7109/CSIR/TARA.S	4011.00	65922.00	0.00	69933.00	0.00	
7110	PROJ/7110/CSIR/DEEPA.R	48467.00	364078.00	0.00	412545.00	0.00	
7111	PROJ/7111/CSIR/SHEEJA LIZA EASO	5806.00	279200.00	0.00	285006.00	0.00	
7112	PROJ/7112/ICMR/JASEER MOHAMMED	26108.00	137632.00	0.00	163740.00	0.00	
7113	PROJ/7113/KSCSTE/RATHIKALA	257612.00	0.00	396.00	258008.00	0.00	
7200	JOINT PROGRAME/M.TECH	600996.00	0.00	0.00	600996.00	0.00	
7210	PROJ/7210/CSIR/SOMA DEY	79794.00	553400.00	0.00	633194.00	0.00	
7220	COST OF ANIMAL FEED	1478916.00	0.00	2640816.00	4119732.00	90300.00	
7230	PROJ/7230/CSIR/MANJU.S	12421.00	0.00	0.00	12421.00	0.00	
7240	PROJ/7240/CSIR/SUNITHA CHANDRAN	4662.00	279200.00	0.00	283862.00	0.00	
7250	PROJ/7250/CSIR/KIRAN.S.NAIR	8615.00	93066.00	0.00	101681.00	0.00	
7260	PROJ/7260/ST0X083Y09/ DR.P.V. MOHANAN	149985.00	0.00	0.00	149985.00	0.00	
7280	PROJ/7280/CSIR/SUSAN.M.ALEX	39518.00	0.00	0.00	39518.00	0.00	
7290	PROJ/7290/CSIR/RAKHI.A	12603.00	743730.00	0.00	756333.00	0.00	
7300	PROJ/7300/CSIR/ARIYA SARASWATHY	6104.00	395533.00	0.00	401637.00	0.00	
7310	PHARMACOKINETIC EVALUATION OF MIV-DR.UMA	448400.00	0.00	0.00	448400.00	0.00	
7320	90 DAY SUB-CHRONIC TOXICITY -DR.P.V.MOHA	258674.00	0.00	0.00	258674.00	0.00	

0.00	0.00	0.00	0.00	603714.00	603714.00	603714.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	54615.00	4631.00	59246.00	59246.00	10518.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	88349.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	878.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	30882.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	26381.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-86027.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	39103.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	130504.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1993.00
0.00	0.00	0.00	0.00	22834.00	22834.00	22834.00	50562.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	22072.00
0.00	354575.00	130685.00	178926.00	21460.00	331071.00	685646.00	2024683.00
0.00	0.00	0.00	0.00	451985.00	451985.00	451985.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	7011.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	4079.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2650.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5682.00
0.00	0.00	64800.00	0.00	4000.00	68800.00	68800.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	26821.00
0.00	0.00	259200.00	0.00	14714.00	273914.00	273914.00	49972.00
0.00	0.00	216000.00	0.00	14840.00	230840.00	230840.00	2154.00
0.00	0.00	61200.00	0.00	0.00	61200.00	61200.00	8733.00
0.00	0.00	349083.00	0.00	46372.00	395455.00	395455.00	17090.00
0.00	0.00	259200.00	0.00	0.00	259200.00	259200.00	25806.00
0.00	0.00	160748.00	0.00	2992.00	163740.00	163740.00	0.00
0.00	0.00	237600.00	7769.00	9120.00	254489.00	254489.00	3519.00
0.00	0.00	0.00	0.00	19000.00	19000.00	19000.00	581996.00
0.00	0.00	518400.00	0.00	32841.00	551241.00	551241.00	81953.00
0.00	90300.00	0.00	367969.00	52944.00	420913.00	511213.00	3608519.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	12421.00
0.00	0.00	259200.00	0.00	21350.00	280550.00	280550.00	3312.00
0.00	0.00	86400.00	0.00	0.00	86400.00	86400.00	15281.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	149985.00
0.00	0.00	0.00	0.00	39518.00	39518.00	39518.00	0.00
0.00	0.00	592000.00	86400.00	53899.00	732299.00	732299.00	24034.00
0.00	0.00	367200.00	0.00	17001.00	384201.00	384201.00	17436.00
0.00	0.00	0.00	0.00	448400.00	448400.00	448400.00	0.00
0.00	0.00	92000.00	0.00	0.00	92000.00	92000.00	166674.00

7330	Y.M.THASNEEM - UGC GRANT	47065.00	0.00	0.00	47065.00	0.00	
7350	UGC GRANT - LAXMI.R.NAIR - BMT Project	41215.00	0.00	0.00	41215.00	0.00	
7360	MAMMALIAN BONE CHROMOSOME-DR.P.V.MOHANA	266292.00	0.00	0.00	266292.00	0.00	
7370	VALIDATION OF ETO STERILSATION SYSTEM-	177908.00	0.00	4650.00	182558.00	0.00	
7375	ICMR PROJECT- Ms. Renu Ramesh	10000.00	0.00	0.00	10000.00	0.00	
7385	CSIR GRANT - CAROLINE DIANA SHERLY	11891.00	500800.00	0.00	512691.00	0.00	
7390	TOXICITY STUDY OF MATIRIALS Dr. P V Mohanan	277031.00	0.00	0.00	277031.00	0.00	
7395	RAISNG ANTIBODIES IN RABITS - DR V S HARIKRISH	50706.00	10119.00	0.00	60825.00	0.00	
7400	CSIR GRANT :SHAIJU S NAZEER	18333.00	325733.00	0.00	344066.00	0.00	
7401	CSIR GRANT - MR RAJESH	54442.00	0.00	0.00	54442.00	0.00	
7402	PROOF OF CONCEPT STUDY - DR UMA SHANKAR	100747.00	0.00	0.00	100747.00	0.00	
7403	ICMR GRANT - PARVATHY R S	29533.00	250400.00	0.00	279933.00	0.00	
7404	BIOFUNCTIONAL AND HISTILO - DR UMA SHANKAR	579407.00	181962.00	0.00	761369.00	0.00	
7405	IN VITRO EVALUATION OF CELL- DR T V KUMAR	59827.00	188752.00	0.00	248579.00	0.00	
7406	CSIR GRANT - R ARATHI	353344.00	247066.00	0.00	600410.00	0.00	
7407	TRSF MESENCHYMAL STEM CELL	0.00	100000.00	0.00	100000.00	0.00	
7408	DURGADAS - PHd STUDENT - CSIR	0.00	301750.00	0.00	301750.00	0.00	
7409	SRUTHI PHD STUDENT UGC	0.00	245400.00	0.00	245400.00	0.00	
7411	DEV POLY ADHESIVE & POTT	0.00	537120.00	0.00	537120.00	0.00	
7412	REMYA K CSIR FELLOW	0.00	312326.00	0.00	312326.00	0.00	
8001	PROJ/8001/PROGRAM SUPPORT &TISSUE	120000.00	0.00	0.00	120000.00	0.00	
8002	PROJ/8002/PROGRAM SUPPORT & TISSUE	114254.00	0.00	0.00	114254.00	0.00	
8003	PROJ/8003/PROGRAM SUPPORT & TISSUE	262577.00	0.00	0.00	262577.00	0.00	
8004	PROJ/8004/PROGRAM SUPPORT & TISSUE	-278345.00	0.00	0.00	-278345.00	0.00	
8005	PROJ/8005/PROGRAM SUPPORT & TISSUE	-83778.00	0.00	0.00	-83778.00	0.00	
8006	PROJ/8006/BIOCONJUGATION NANO MAT.	-226843.00	365862.00	0.00	139019.00	0.00	
8008	PROJ/8008/CSIR GRANT-PADMAJA.P.NAMBI	12990.00	0.00	0.00	12990.00	0.00	
8009	PROJ/8009/DBT/DR.T.V.ANILKUMAR/DE...TISSUE	-719313.00	0.00	0.00	-719313.00	0.00	
8010	PROJ/8010/DBT/DR.NIRANJAN/IMPLATED....CONTROL	221565.00	0.00	0.00	221565.00	0.00	
8011	PROJ/8011/NANOFRONT/DR.NIRANJAN/INTRAMAS	139900.00	0.00	0.00	139900.00	0.00	
8012	PROJ/8012/VSSC/DR.NIRANJAN/DESIGN STUDIES	2148623.00	0.00	0.00	2148623.00	0.00	
8014	PROJ/8014/DBT/DR.ROY JOSEPH/DEV....V.GRAFT	-17063.00	0.00	0.00	-17063.00	0.00	
8015	PROJ/8015/DR.ANOOPKUMAR/PROGRAMME...	4566.00	0.00	0.00	4566.00	0.00	
8016	PROJ/8016/DBT/DR.UMASHANKAR/DEVE....APPLN.	-49189.00	0.00	49189.00	0.00	0.00	
8017	PROJ/8017/AYUTECH/DR.UMASANKAR	647130.00	0.00	0.00	647130.00	0.00	
8018	PROJ/8018/ICMR/DR.P.V.MOHANAN	-55191.00	0.00	0.00	-55191.00	0.00	
8019	PROJ/8019/STEC/DR.P.RAMESH	82284.00	0.00	0.00	82284.00	0.00	
8020	PROJ/8020/CSIR/DR.LISSY KRISHNAN	-20725.00	645192.00	0.00	624467.00	0.00	
8021	PROJ/8021/ANGIOGENESIS EXP/DR.UMASHANKAR	79036.00	0.00	0.00	79036.00	0.00	
8022	PROJ/8022/AIR POLLUTION/SUJESH SREEDHAR	-306.00	0.00	0.00	-306.00	0.00	

0.00	0.00	0.00	0.00	0.00	32270.00	32270.00	14795.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	41215.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	266292.00
0.00	0.00	0.00	0.00	10944.00	10944.00	10944.00	171614.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10000.00
0.00	0.00	441600.00	7000.00	0.00	448600.00	448600.00	64091.00
0.00	0.00	66503.00	0.00	0.00	66503.00	66503.00	210528.00
0.00	0.00	8100.00	13760.00	0.00	21860.00	21860.00	38965.00
0.00	0.00	302400.00	0.00	38333.00	340733.00	340733.00	3333.00
0.00	0.00	0.00	0.00	54442.00	54442.00	54442.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	100747.00
0.00	0.00	204800.00	0.00	34016.00	238816.00	238816.00	41117.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	761369.00
0.00	0.00	0.00	212743.00	0.00	212743.00	212743.00	35836.00
0.00	0.00	488319.00	99560.00	0.00	587879.00	587879.00	12531.00
0.00	0.00	0.00	87556.00	0.00	87556.00	87556.00	12444.00
0.00	0.00	280080.00	16833.00	0.00	296913.00	296913.00	4837.00
0.00	0.00	230400.00	0.00	0.00	230400.00	230400.00	15000.00
0.00	0.00	38392.00	0.00	0.00	38392.00	38392.00	498728.00
0.00	0.00	268180.00	0.00	0.00	268180.00	268180.00	44146.00
0.00	0.00	0.00	0.00	120000.00	120000.00	120000.00	0.00
0.00	0.00	0.00	0.00	114254.00	114254.00	114254.00	0.00
0.00	0.00	0.00	0.00	262577.00	262577.00	262577.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-278345.00
0.00	0.00	0.00	14944.00	0.00	14944.00	14944.00	-98722.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	139019.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	12990.00
0.00	0.00	0.00	0.00	479.00	479.00	479.00	-719792.00
0.00	0.00	0.00	0.00	200000.00	200000.00	200000.00	21565.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	139900.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2148623.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-17063.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	4566.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	8362.00	0.00	638768.00	647130.00	647130.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-55191.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	82284.00
0.00	0.00	0.00	18000.00	247790.00	265790.00	265790.00	358677.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	79036.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-306.00

8023	PROJ/8023/KSCSTE/DR.H.K.VARMA	10945.00	0.00	65600.00	76545.00	0.00	
8024	PROJ/8024/IIT/DR.P.R.ANILKUMAR	2935.00	0.00	0.00	2935.00	0.00	
8025	PROJ/8025/	409011.00	0.00	0.00	409011.00	0.00	
8026	PROJ/8026/	3339.00	0.00	0.00	3339.00	0.00	
8027	PROJ/8027/DR.P.V.MOHANAN	79732.00	0.00	0.00	79732.00	0.00	
8028	PROJ/8028/DR.DIKSHA PAINULY	22332.00	0.00	0.00	22332.00	0.00	
8030	PROJ/STUDY/DR.UMASHANKAR	373234.00	0.00	0.00	373234.00	0.00	
8031	PROJ/8031	-292359.00	0.00	0.00	-292359.00	0.00	
8032	PROJ/8032/O.S.N.NAIR	128471.00	0.00	0.00	128471.00	0.00	
8033	PROJ/8033/DEV. OF IRON OXIDE-DR.R.S.JAYASREE	381517.00	0.00	156031.00	537548.00	179481.00	
8034	PROJ/8034/FLURO PASSI...DR.ROY JOSEPH	696929.00	0.00	0.00	696929.00	0.00	
8035	PROJ/EVALN OF SEWING RING-DR.UMASHANKAR	22201.00	0.00	0.00	22201.00	0.00	
8038	PROJ/DEV OF MISSION PROGRAM - DR.GSB	1182638.00	0.00	0.00	1182638.00	0.00	
8039	PROJ/DISPENSABLE & BIODEGR- DR.JAYABALAN	-429843.00	0.00	0.00	-429843.00	0.00	
8040	PROJ/SYNTHESIS OF OXIDE-DR.H.K.VARMA	-30337.00	0.00	0.00	-30337.00	0.00	
8041	PROJ/DEV OF NANO DEVICES DNA-DR.C.P.SHARMA	0.00	0.00	0.00	0.00	0.00	
8042	PROJ/BIOENGINEERED HYBRID -DR.LISSY KRISH	299931.00	0.00	45955.00	345886.00	0.00	
8043	PROJ/MOLECULAR IMMUNOTOX-DR.P.V.MOHANAN	366477.00	0.00	203968.00	570445.00	0.00	
8044	PROJ/TISSUE ENGINEERING-BERNADETTE	263764.00	0.00	4700.00	268464.00	36698.00	
8045	PROJ/COLOUR ATLAS OF TISSUE-DR.MIRA	-1405.00	0.00	1405.00	0.00	0.00	
8046	PROJ/DIFF. OF ADULT PRO - DR.ASHA.S.MATHEW	739755.00	0.00	0.00	739755.00	0.00	
8047	PROJ/INVIVO GENOTOXICITY-DR.P.V.MOHANAN	467651.00	0.00	0.00	467651.00	0.00	
8048	PROJ/STUDIES DR.KAMALESH GULIA	774.00	0.00	0.00	774.00	0.00	
8049	PROJ/NEW VISION BIOMAT-DR.C.P.SHARMA	-44861.00	0.00	0.00	-44861.00	0.00	
8050	PROJ/GENOTOXICITY STUDY-DR.P.V.MOHANAN	130338.00	0.00	0.00	130338.00	0.00	
8051	PROJ/INVITRO ALTE.TEST-DR.P.V.MOHANAN	594189.00	0.00	0.00	594189.00	0.00	
8052	PROJ/ROLL OF TRANFORMN GROWTH-DR.ANOOP	113091.00	488194.00	0.00	601285.00	0.00	
8053	PROJ/DEVELOPMENT OF SMART../DR.LIZYMOL.PP	557512.00	0.00	0.00	557512.00	0.00	
8054	PROJ/MUSCULASKELETAL STEM CELL/DR.PDNAIR	2169553.00	5030684.00	2262.00	7202499.00	0.00	
8055	PROJ/MUSCULASKELETAL STEM /DR.H.K.VARMA	-100971.00	375359	0.00	274388.00	0.00	
8057	PROJ/INVITRO PRECLINICAL / DR.LISSY	228339.00	0.00	83833.00	312172.00	0.00	
8058	PROJ/AORC FELLOWSHIP/MAYURI.P.V.	4725.00	279200.00	0.00	283925.00	0.00	
8059	PROJ/CELL SHEET ENGG-DR.P.R.ANILKUMAR	-252322.00	650000.00	0.00	397678.00	0.00	
8060	PROJ/DEVELOPMENT OF SKIN GRAFT	-225560.00	814000.00	51873.00	640313.00	0.00	
8061	PROJ/VISIBLE LIGHT INDUCED../DR.RADHAKUMARI	676796.00	0.00	0.00	676796.00	0.00	
8062	PROJ/ACCELERATED AREING../MR.C.V.MURALI	213728.00	0.00	0.00	213728.00	0.00	
8063	PROJ/EFFECTS OF MATERIAL SLEEP/DR.K.GULIA	323029.00	500000.00	0.00	823029.00	0.00	
8064	NONVIRAL GENE DELIVERY VECTORS- DR.REKHA	1498463.00	235.00	0.00	1498698.00	191724.00	
8065	PROJ/8065/RATE EARTH BASED MATERIALS	-178895.00	0.00	0.00	-178895.00	44932.00	
8066	TO INVESTIGATE THE EFFECTS OF/ DR.GULIA	217207.00	468338.00	0.00	685545.00	32327.00	

0.00	0.00	0.00	0.00	0.00	0.00	0.00	76545.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2935.00
0.00	0.00	0.00	367512.00	0.00	367512.00	367512.00	41499.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	3339.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	79732.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	22332.00
0.00	0.00	0.00	8026.00	365208.00	373234.00	373234.00	0.00
0.00	0.00	0.00	12803.00	0.00	12803.00	12803.00	-305162.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	128471.00
0.00	179481.00	65600.00	185829.00	113784.00	365213.00	544694.00	-7146.00
0.00	0.00	0.00	160975.00	0.00	160975.00	160975.00	535954.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	22201.00
0.00	0.00	0.00	0.00	415.00	415.00	415.00	1182223.00
0.00	0.00	0.00	0.00	1259.00	1259.00	1259.00	-431102.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-30337.00
0.00	0.00	0.00	0.00	6255.00	6255.00	6255.00	-6255.00
0.00	0.00	0.00	56173.00	289713.00	345886.00	345886.00	0.00
0.00	0.00	45832.00	345008.00	179605.00	570445.00	570445.00	0.00
0.00	36698.00	0.00	81131.00	150635.00	231766.00	268464.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	739755.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	467651.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	774.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	-44861.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	130338.00
0.00	0.00	27174.00	387516.00	159355.00	574045.00	574045.00	20144.00
0.00	0.00	21035.00	58741.00	34933.00	114709.00	114709.00	486576.00
0.00	0.00	36300.00	50660.00	470552.00	557512.00	557512.00	0.00
0.00	0.00	481387.00	3281715.00	743079.00	4506181.00	4506181.00	2696318.00
0.00	0.00	248400.00	659.00	155130.00	404189.00	404189.00	-129801.00
0.00	0.00	0.00	312172.00	0.00	312172.00	312172.00	0.00
0.00	0.00	259200.00	21240.00	0.00	280440.00	280440.00	3485.00
0.00	0.00	71582.00	230082.00	108000.00	409664.00	409664.00	-11986.00
0.00	0.00	219716.00	189479.00	194608.00	603803.00	603803.00	36510.00
0.00	0.00	304181.00	249755.00	197318.00	751254.00	751254.00	-74458.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	213728.00
0.00	0.00	329918.00	4611.00	278131.00	612660.00	612660.00	210369.00
0.00	191724.00	249900.00	1417556.00	130585.00	1798041.00	1989765.00	-491067.00
0.00	44932.00	0.00	0.00	0.00	0.00	44932.00	-223827.00
0.00	32327.00	271664.00	120476.00	183593.00	575733.00	608060.00	77485.00

8067	QUANTUM DOT CONJUGATED -DR.R.S.JAYASREE	6740.00	0.00	0.00	6740.00	0.00	
8068	INSPIRE RESEARCH PROJECT -DR.BINDU.P.NAI R	1157561.00	1695288	13781	2866630.00	128125.00	
8069	PROJ/8069/STUDIES BIODEGRADABLE	1425.00	0.00	0.00	1425.00	0.00	
8070	PROJ/8070/PINSPIRE FACULTY AWARD-DR.SHIV	331803.00	3416084.00	0.00	3747887.00	0.00	
8071	PROJ/8071/REGEN .OF INTERVERTEBRAL DISC	491884.00	0.00	0.00	491884.00	0.00	
8072	PROJ/8072/NANO CALCIUM PHOSPHATE	-111716.00	450000.00	0.00	338284.00	0.00	
8073	PROJ/8073/DEVELOP.OF CARDIOPULMONARY	430323.00	500000.00	0.00	930323.00	0.00	
8074	PRODUCTION OF NOVEL NANO INDO-UK DR.CP.S	275909.00	562876.00	0.00	838785.00	0.00	
8075	DST INSPIRE FELLOWSHIP - ASWATHY B S	3315.00	242085.00	0.00	245400.00	0.00	
8076	ICMR - DR K SREENIVASAN	663228.00	0.00	1399.00	664627.00	0.00	
8077	HOME BASED VITAL SIGNS - DR.NIRANJAN.D.	1350014.00	0.00	0.00	1350014.00	0.00	
8078	PROJ/8078/AN INVITROSKIN TISSUE ENG	273902.00	600000.00	0.00	873902.00	0.00	
8079	DOSE RANGING STUDY FOR DES / DR.SABAREES	986273.00	180190.00	0.00	1166463.00	0.00	
8080	PROJ/8080/DETECTION OF ZINC IN EPILEPTIC	5332462.00	0.00	6140.00	5338602.00	156031.00	
8081	EXPLORING THE POTENTIALOF ISLET-DR.PRABH	195423.00	486400.00	18927.00	700750.00	0.00	
8082	ASSESSMENT OF CERAMICCONSTRUCTS - FRANC	16373.00	50000.00	0.00	66373.00	0.00	
8083	IN VITRO OSTEOARTHRICITIC-DR.NEETHUMOHAN	573767.00	450000.00	0.00	1023767.00	0.00	
8084	ROLE OF NMDA- DR.PRADEEP PUNNAKKAL- RAM	1460940.00	1910333.00	0.00	3371273.00	0.00	
8085	PROJ/8085/ELECTROCHEMICALLY ASSISTED	863750.00	0.00	0.00	863750.00	0.00	
8086	PROJ/8086/GOLD NANORODS FOR THERAPY	2430619.00	514726.00	0.00	2945345.00	0.00	
8087	PROJ/8087/CONTROLLED DELIVERY	1537143.00	0.00	0.00	1537143.00	0.00	
8088	CANCER TISSUE ENGINEERING A 3D - ARAVIN	284500.00	0.00	0.00	284500.00	0.00	
8089	DO PLATELETS IN PATIENTS -DR.ANUGYABHATT	750200.00	0.00	0.00	750200.00	0.00	
8090	INSPIRE FELLOW PHD KEERTHI S JRF	0.00	250400.00	0.00	250400.00	0.00	
8091	BIORESORBABALE NANO- DR H K VARMA	0.00	2061440.00	0.00	2061440.00	0.00	
8092	BIOLOGICALSTRUCTURES	0.00	495900.00	0.00	495900.00	0.00	
8093	A NEW DRUG-CERAMIC MOD SUPER-DR. H K VARMA	0.00	270000.00	0.00	270000.00	0.00	
8094	ALTERNATE	0.00	1800000.00	0.00	1800000.00	0.00	
8095	DEV RAPID UTI DR. MAYA-DST	0.00	2216950.00	0.00	2216950.00	0.00	
8096	PREP OF HYDROGEL -DR AKHILA RAJAN	0.00	700000.00	0.00	700000.00	0.00	
8097	MULTIFUNCN - DBT SUNITHA PREM	0.00	1980000.00	0.00	1980000.00	0.00	
8098	HOW ACTIN FILAMENT STRUCTUDR RENU MOHAN	0.00	100000.00	0.00	100000.00	0.00	
8099	INSPIRE FELLOW RESHMA S	0.00	250400.00	0.00	250400.00	0.00	
8100	DETAILED . . .CONDITIONS- ARUN ANIRUDHAN	0.00	632200.00	0.00	632200.00	0.00	
		46657327.59	41258567.00	5737184.00	93653078.59	1289219.00	
	INTERNAL PROJECTS						
6044	DEVELOP. OF MANDIBULAR ADVANCEMENT DIV	0.00	22713.00	0.00	22713.00	0.00	
6045	ROLE OF PLATELET PROTEINS ON THE ENDOTHE	-113539.00	113539.00	0.00	0.00	0.00	
6047	DEVELOPMENT OF TITANIUM NITRIDE - Dr SUJE	0.00	65745.00	0.00	65745.00	0.00	

0.00	0.00	0.00	10900.00	0.00	10900.00	10900.00	-4160.00
0.00	128125.00	1064208.00	425366.00	105753.00	1595327.00	1723452.00	1143178.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1425.00
0.00	0.00	960000.00	560604.00	38260.00	1558864.00	1558864.00	2189023.00
0.00	0.00	144600.00	427229.00	0.00	571829.00	571829.00	-79945.00
0.00	0.00	0.00	48450.00	0.00	48450.00	48450.00	289834.00
0.00	0.00	504368.00	232131.00	0.00	736499.00	736499.00	193824.00
0.00	0.00	0.00	87722.00	283270.00	370992.00	370992.00	467793.00
0.00	0.00	230400.00	0.00	9360.00	239760.00	239760.00	5640.00
0.00	0.00	176844.00	359588.00	35052.00	571484.00	571484.00	93143.00
0.00	0.00	314710.00	559137.00	0.00	873847.00	873847.00	476167.00
0.00	0.00	385000.00	145933.00	93333.00	624266.00	624266.00	249636.00
0.00	0.00	96823.00	307915.00	0.00	404738.00	404738.00	761725.00
0.00	156031.00	213525.00	247830.00	141368.00	602723.00	758754.00	4579848.00
0.00	0.00	230400.00	177229.00	15000.00	422629.00	422629.00	278121.00
0.00	0.00	0.00	22896.00	0.00	22896.00	22896.00	43477.00
0.00	0.00	0.00	518746.00	129368.00	648114.00	648114.00	375653.00
0.00	0.00	1183567.00	283976.00	228777.00	1696320.00	1696320.00	1674953.00
0.00	0.00	420000.00	222853.00	122803.00	765656.00	765656.00	98094.00
0.00	0.00	218700.00	98423.00	40475.00	357598.00	357598.00	2587747.00
0.00	0.00	480000.00	403374.00	38173.00	921547.00	921547.00	615596.00
0.00	0.00	220000.00	61420.00	16500.00	297920.00	297920.00	-13420.00
0.00	0.00	130261.00	217215.00	89746.00	437222.00	437222.00	312978.00
0.00	0.00	230400.00		3840.00	234240.00	234240.00	16160.00
0.00	0.00	73063.00	57465.00	5847.00	136375.00	136375.00	1925065.00
0.00	0.00	16000.00	176229.00	0.00	192229.00	192229.00	303671.00
0.00	0.00	0.00	36958.00	136500.00	173458.00	173458.00	96542.00
0.00	0.00	17571.00	70088.00	0.00	87659.00	87659.00	1712341.00
0.00	0.00	22193.00	3048.00	0.00	25241.00	25241.00	2191709.00
0.00	0.00	127581.00	54825.00	0.00	182406.00	182406.00	517594.00
0.00	0.00	100000.00	0.00	0.00	100000.00	100000.00	1880000.00
0.00	0.00	97097.00	0.00	0.00	97097.00	97097.00	2903.00
0.00	0.00	96000.00	0.00	0.00	96000.00	96000.00	154400.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	632200.00
0.00	1289219.00	16401552.00	15297926.00	10923232.00	44694443.00	45983662.00	47669416.59
0.00	0.00	14791.00	0.00	7922.00	22713.00	22713.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	45585.00	20160.00	0.00	65745.00	65745.00	0.00

6200	SCALE UP AND SMALL SCALE PRODUC-Dr Lissy	0.00	107325.00	0.00	107325.00	0.00	
6203	PRIECLINICAL EVALUATION OF TISSUE	0.00	270040.00	0.00	270040.00	0.00	
6204	INTELLECTUAL PROPERTY	0.00	194317.00	0.00	194317.00	0.00	
6205	BIPHASIC HYDRO OXYAPATITE	0.00	34658.00	0.00	34658.00	0.00	
6206	DEV NON INVASIVE STRESS - DR V S HARIKRISHNAN	0.00	150000.00	0.00	150000.00	0.00	
6207	POLYC PLTERM DEV 3D	0.00	111372.00	0.00	111372.00	0.00	
6208	IN VITRO DIFFERENTIATION	0.00	150000.00	0.00	150000.00	0.00	
6209	MENISCAL DR ANNIE	0.00	150000.00	0.00	150000.00	0.00	
6500	OHF PROJECT DR. ANNIE JOHN	20550.00	0.00	0.00	20550.00	0.00	
6501	OHF PROJECT DR KALADHAR	160000.00	0.00	0.00	160000.00	0.00	
6502	OHF PROJECT DR SATHIN J SHENOY	180000.00	0.00	0.00	180000.00	0.00	
6503	CONSTRUCTION OF TEBV	250000.00	0.00	0.00	250000.00	0.00	
6504	DEVELOPMENT OF IRON NANO PRACTICLE	0.00	250000.00	0.00	250000.00	0.00	
6505	REM SLEEP RESTRICTION	0.00	250000.00	0.00	250000.00	0.00	
7380	NETWORKING SERVICES -NTC BLDING-ARUN ANI	-86400.00	86400.00	0.00	0.00	0.00	
7410	APPLICATION OF DECELLULARISED - DR. BIJU	-76973.00	692085.00	0.00	615112.00	0.00	
7420	FEASIBILITY OF USING GLUTARA-DR.GIRISH M - BMT	0.00	0.00	0.00	0.00	0.00	
2622	OHF- FOR INNOVATIVE PROJECTS	960000.00	0.00	1000000.00	1960000.00	0.00	
2621	IIPC FUND(INDUSTRY INSTITUTE PARTNERSHIP - BMT	260769.00	0.00	0.00	260769.00	0.00	
		1554407.00	2648194.00	1000000.00	5202601.00	0.00	
		48211734.59	43906761.00	6737184.00	98855679.59	1289219.00	
	GRAND TOTAL	226864981.28	90471424.30	282135147.50	599471553.08	1536584.00	

0.00	0.00	87310.00	17015.00	3000.00	107325.00	107325.00	0.00
0.00	0.00	208800.00	61240.00	0.00	270040.00	270040.00	0.00
0.00	0.00	191197.00	3120.00	0.00	194317.00	194317.00	0.00
0.00	0.00	0.00	34658.00	0.00	34658.00	34658.00	0.00
0.00	0.00	0.00	50400.00	10807.00	61207.00	61207.00	88793.00
0.00	0.00	111372.00	0.00	0.00	111372.00	111372.00	0.00
0.00	0.00	0.00	63958.00	0.00	63958.00	63958.00	86042.00
0.00	0.00	0.00	64743.00	0.00	64743.00	64743.00	85257.00
0.00	0.00	0.00	17500.00	0.00	17500.00	17500.00	3050.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	160000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	180000.00
0.00	0.00	0.00	232480.00	0.00	232480.00	232480.00	17520.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	250000.00
0.00	0.00	0.00	10366.00	0.00	10366.00	10366.00	239634.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	215036.00	400076.00	0.00	615112.00	615112.00	0.00
0.00	0.00	0.00	0.00	30600.00	30600.00	30600.00	-30600.00
0.00	0.00	0.00	0.00	500000.00	500000.00	500000.00	1460000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	260769.00
0.00	0.00	874091.00	975716.00	552329.00	2402136.00	2402136.00	2800465.00
0.00	1289219.00	17275643.00	16273642.00	11475561.00	47096579.00	48385798.00	50469881.59
0.00	1536584.00	40639990.40	19767160.60	323713558.50	99369533.50	387729026.50	211742526.58

SCHEDULE 4-SECURED LOANS AND BORROWINGS:			
	1. Central Government	--	--
	2. State Government (Specify)	--	--
	3. Financial Institutions	--	--
	a) Term Loans	--	--
	b) Interest accured and due	--	--
	4. Banks:	--	--
	a) Term Loans-Interest accured and due	--	--
	b) Other Loans(specify)- Interest accured and due-Over draft	--	--
	5. Other Institutions and Agencies	--	--
	6. Debentures and Bonds	--	--
	7. Others(Specify)	--	--
	Against OD facility- cheques issued	--	--
	TOTAL		
SCHEDULE 5-UNSECURED LOANS AND BORROWINGS			
	1. Central Government	--	--
	2. State Government (Specify)	--	--
	3. Financial Institutions	--	--
	4. Banks:	--	--
	a) Term Loans	--	--
	b)Other Loans(specify)	--	--
	5. Other Institutions and Agencies	--	--
	6. Debentures and Bonds	--	--
	7. Fixed Deposits	--	--
	8. Others(Specify)	--	--
	TOTAL		
SCHEDULE 6-DEFERRED CREDIT LIABILITIES:			
	a) Acceptances secured by hypothecation of capital equipment and other assets	--	--
	b) Others		
	TOTAL	--	--
SCHEDULE 7-CURRENT LIABILITIES AND PROVISIONS			
	A. CURRENT LIABILITIES		
	1. Acceptances		
	2. Sundry Creditors:		
	a) For Goods	55276315	18168574
	b) Others	3759099	2185662
	3. Advances Received	59179090	70892535
	4. Interest accured but not due on:	0	0
	a) Secured Loans / borrowings	0	0
	b) Unsecured Loans / borrowings	0	0

	5. Statutory Liabilities:	0	0
	a) Overdue	10155896	1003264
	b) Others	48675051	24387978
	6. Other current Liabilities	0	0
	TOTAL (A)	177045451	116638013
	B.PROVISIONS		
	1. For Taxation	0	0
	2. Gratuity	0	0
	3. Accumulated Leave Encashment	0	0
	4. Trade Warranties/Claims	0	0
	5. Others(Specify) Audit fee	135350	0
	Sinking fund contribution O. BAL	0	0
	Additional contribution Rs.	586646	0
	TOTAL (B)	721996	0
	TOTAL(A+B)	177767447	116638013
	SCHEDULE 9 - INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS		
	1. In Government Securities	56010278	56010278
	2. Other approved Securities	5685391	5685391
	3. Shares	0	0
	4. Debentures and Bonds	0	0
	5. Subsidiaries and Joint Ventures	0	0
2388	6. Others (to be specified) Sinking Fund Investments	500000000	480771226
	Technology Fund	67019319	59945101
	Pension & staff funds	61887530	57303443
	TOTAL	690602518	659715439
	SCHEDULE 10-INVESTMENTS-OTHERS		
	1. In Government Securities	--	--
	2. Other approved Securities	--	--
	3. Shares	--	--
	4. Debentures and Bonds	--	--
	5. Subsidiaries and Joint Ventures	--	--
	6. Others (to be specified)	--	--
	TOTAL	--	--
	SCHEDULE 11-CURRENT ASSETS,LOANS,ADVANCES ETC		
	A. CURRENT ASSETS		
	1. Inventories:		
	a) Stores and Spares	313119289	276754822
	b) Loose Tools	9605588	9600957
	c) Stock-in trade	0	0
	Finished Goods	0	0
	Work-in-progress	0	0
	Medicine	11809064	10886176

	2. Sundry Debtors:	0	0
	a) Debts Outstanding for a period exceeding six months	44679523	43512301
	b) Others	94190929	47017491
	3. Cash balances in hand(including cheques/drafts and imprest)	1441133	1260191
	4. Bank Balances:	0	0
	a) With Scheduled Banks:	0	0
	-On Current Account	1	1
	-On Deposit Accounts(L.C. margin & Commitment deposit)	181972785	465798461
	-On Savings Accounts	130699396	143279527
	b) With non-Scheduled Banks:		
	-On Current Account	0	0
	-On Deposit Accounts	0	0
	-On Savings Accounts	0	0
	5. Post-Office-Savings Accounts	0	0
	TOTAL(A)	787517709	998109927
	B.LOANS, ADVANCES AND OTHER ASSETS		
	1. Loans:		
	a) Staff	11982491	11665605
	b) Other Entities engaged in activities/objectives similar to that of the Entity	0	0
	c) Other(specify)	0	0
	2. Advances and other amounts recoverable in cash or in kind or for value to be received:	0	0
	a) On Capital Account	217231086	187130920
	b) Prepayments	41204489	26243882
	c) Others	0	0
	3. Income Accured:	0	0
	a) On Investments from Earmarked/endowment Funds	44055923	61289041
	b) On Investments-Others	0	0
	c) On Loans and Advances	0	0
	d) Others	0	0
	(includes income due unrealised Rs)	0	0
	4. Claims Receivable	0	0
	From Govt of India on Plan Funds	0	0
	TOTAL(B)	314473989	286329448
	TOTAL(A+B)	1101991697	1284439375
	Savings bank account includes Rs.15/- (GL code No.2410-Synd Bank vikas certificate)		

SCHEDULE 12- INCOME FROM SALES/SERVICES

	1. Income from Sales		
	a) Sale of Finished Goods	0	0
	b) Sale of Raw Material	0	0
	c) Sale of Scraps	0	0
	2. Income from Services		
	a) Labour and processing charges	0	0
	b) Professional/Consultancy Services	0	0
	c) Agency Commission and Brokerage	0	0
	d) Maintenance Services	0	0
	e) Others (Specify)	0	0
	From Hospital Services-Gross Income	810189582	789117754
		0	0
	From Projects	2835965	60583
	Testing & Facility charges received	4605802	4466405
	TOTAL	**817631349**	**793644742**
	SCHEDULE 13- GRANTS/SUBSIDIES		
	(Irrevocable Grants & Subsidies Received)		
	1. Central Government	840588000	814805000
	2. State Government(s)	0	0
	3. Government Agencies	0	0
	4. Institution/Welfare Bodies	0	0
	5. International Organisations	0	0
	6. Others(Specify)	0	0
	TOTAL	**840588000**	**814805000**
	SCHEDULE 14-FEES/SUBSCRIPTIONS		
	1. Entrance Fees	1398700	1244450
	2. Annual Fees/ Subscriptions	3842380	3882605
	3. Seminar/Program Fees	0	0
	4. Consultancy Fees	0	0
	5. Examination Fees and others	860300	1181850
	TOTAL	**6101380**	**6308905**
	SCHEDULE 15- INCOME FROM INVESTMENTS		
	(Income on Invest.from Earmarked/Endowment Funds transferred to Funds)		
	1) Interest		
	a) On Govt. Securities	0	0
	b) Other Bonds/Debentures	0	0
	2) Dividends:		
	a) On Shares	0	0
	b) On Mutual Fund Securities	0	0
	3) Rents	0	0
	4) Others(Specify) On Sinking Fund	4955643	42172843

	On Technology Fund	7074218	1322655
	TOTAL	12029861	43495498
	TRANSFERRED TO EARMARKED/ENDOWMENT FUNDS		
	SCHEDULE 16- INCOME FROM ROYALITY,PUBLICATION ETC		
	1) Income from Royalty	586646	184392
	2) Income from Publications	0	0
	3)Others(Specify)	0	0
	TOTAL	586646	184392
	SCHEDULE 17- INTEREST EARNED		
	1) On Term Deposit		
	a) With Scheduled Banks	43203988	64828659
	b) With non-scheduled banks	0	0
	c) With Institutions	0	0
	d) Others	0	0
	2) On Savings Account	0	0
	a) With Scheduled Banks	8627289	7280679
	b) With non-scheduled banks	0	0
	c) Post Office Savings Account	0	0
	d) Others(accrued)	36396155	61289041
	3) On Loans	0	0
	a) Employees/Staff	940910	696015
	b) Others	0	0
	4) Interest on Debtors and other Receivables		
	TOTAL	89168342	134094394
	SCHEDULE 18- OTHER INCOME		
	1. Profit on Sale/disposal of Assets:		
	a) Owned assets	0	0
	b) Assets acquired out of grants, or received free of cost	0	0
	c) WIP written back from Repairs and Maintanance	0	0
	2. Rent	2293671	1985379
	3. Fees for Miscellaneous Services	0	0
	4. Miscellaneous Income (income from Projects)	97600	35700
	Other Income	6854776	16215525
	Prior period income	0	7479068
	TOTAL	9246047	25715672
	SCHEDULE 20-ESTABLISHMENT EXPENSES		
	a) Salaries and Wages	751111663	683397691
	b) Allowances and Bonus	7296428	7131266
	c) Contribution to Provident Fund	0	0
	d) Contribution to other fund(specify)	0	0
	e) Staff Welfare Expenses	19036141	16757699

	f) Expenses on Employee's Retirement and Terminal Benefits	125114063	131762746
	g) Others(Specify) PG Training & Accademic payments	120484530	109267020
	TOTAL	1023042825	948316422
	SCHEDULES 21- ADMINISTRATIVE EXPENSES		
	a) Purchases	516982013	496076072
	b) Concession to Poor patients/Labour and processing expenses	132714270	161868756
	c) Cartage and Carriage Inwards	147859	417255
	d) Electricity and power	45904579	43011039
	e) Water charges	4622676	2762159
	f) Insurance	244056	397130
	g) Repairs and maintenance	50304198	35878809
	h) Excise duty	0	0
	i) Rent,Rates and Taxes	227070	523314
	j) Vehicles Running and Maintenance	722746	772203
	k) Postage,Telephone and Communication Charges	2346782	2511238
	l) Printing and Stationary	2015369	2002472
	m) Travelling and Conveyence Expenses	2624265	2294461
	n) Expenses on Seminar/Workshop	1618415	892533
	o) Subscription Expenses	131175	51312
	p) Expenses on Fees	0	0
	q) Auditors Renumeration	841566	31460
	r) Hospitality Expenses	0	0
	s) Professional Charges	0	0
	t) Provision for Bad and Doubtful Debts/Advances	0	0
	u) Irrecoverable Balances Written-off	0	0
	v) Packing Charges	0	0
	w) Freight and Forwarding Expenses	0	0
	x) Distribution Expenses	0	0
	y) Advertisement and Publicity	6851780	6015783
	z) Others(specify)	29426571	28063409
	TOTAL	797725390	783569405
	SCHEDULE 23-INTEREST		
	a) On Fixed Loans		
	b) Bank Charges)	247154	174730
	c) Others(specify)	0	0
	TOTAL	247154	174730

SCHEDULE 8- FIXED ASSETS

	GROSS BLOCK				
PARTICULARS	Cost/valuation as at the beginning of the year (01.04.2014)	Additions during the year 2014-15	Deductions during the year 2014-15	Cost/valuation at the year end (31.03.2015)	
A. FIXED ASSETS:					
1. LAND:					
a) Freehold	16894606	0	0	16894606	
b) Leasehold	0	0	0	0	
2.BUILDINGS:					
a) On Freehold Land *	47037608	0	0	47037608	
b) On Leasehold Land	0	0	0	0	
c) Ownership Flats/Premises	0	0	0	0	
d) Superstructures on Land not belonging to the entity	124407120	31567540	0	155974660	
3. PLANT MACHINERY & EQUIPMENT	1930280785	120250541	13482986	2037048340	
4. VEHICLES	7474234	0	0.00	7474234	
5. FURNITURE,FIXTURES	48223855	2866636	628244	50462247	
6. OFFICE EQUIPMENT	1236622	0	0	1236622	
7. COMPUTER/PERIPHERALS	4852352	742605	577402	5017555	
8. ELECTRIC INSTALLATIONS	47267093	7345591	0	54612684	
9. LIBRARY BOOKS	158140190	15509761	0	173649951	
10. TUBEWELLS & W.SUPPLY	282915	19050	0	301965	
11. OTHER FIXED ASSETS	0	0	0	0	
a)OXYGEN CYLINDERS	234319	0	0	234319	
b)AIR CONDITIONERS	46572274	346674	36000	46882948	
c)TELEPHONE INSTALLATIONS	2151442	0	0	2151442	
d) COLD ROOM INSTALLATION	341700	0	0	341700	
e) WATER COOLERS	62867	0	0	62867	
f) LIFT INSTALLATION	11250942	0	0	11250942	
g) KITCHEN EQUIPMENTS	1405978	0	0	1405978	
h)CANTEEN EQUIPMENTS	358160	0	0	358160	
I) PAINTINGS	450216	0	0	450216	
k) LIVESTOCK	0	0	0	0	
l) GAS PLANT INSTALLATIONS	1171261	0	0	1171261	
m) SURGICAL EQUIPMENTS	7759021	0	555046	7203975	
Total for the year (Total -A)	2457855558	178648398	15279678	2621224278	
Total for the previous year	2309157646	179594006	28455038	2460296615	
Captial Work in Progress (B)	649624809	19690017	0	669314826	
Total for the year (A+B)	3107480367	198338415	15279678	3290539104	

* Depreciation for item2(a) has been provided along with depreciation on 2(d)

DEPRECIATION				NET BLOCK	
Depreciation as at the beginning of the year (01.04.2014)	Depr on items written off	During the year 2014-15	Total up to the year end (31.03.2015)	As at the end of current year end (31.03.2015)	As at the previous year end (31.03.2014)
0	0	0	0	16894606	16894606
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
109685527	0	9332674	119018201	83994066	61759200
1236807256	11412987	110335124	1347142379	689905961	693473530
5768707	0	255829	6024536	1449697	1705526
33053118	499395	1291457	34344575	16117672	15170737
945273	0	29135	974408	262214	291349
4686564	438352	23254	4709818	307737	165788
26989302	0	2762338	29751640	24861044	20277791
146088116	0	16537101	162625217	11024734	12052074
174943	0	12702	187645	114320	107972
0	0	0	0	0	0
232370	0	1170	233540	780	1949
23402795	32268	2318974	25721769	21161179	23169479
1977651	0	17379	1995030	156412	173791
340119	0	158	340277	1423	1581
62719	0	15	62734	133	148
7841783	0	340916	8182699	3068243	3409159
1025968	0	38001	1063969	342009	380010
170984	0	18718	189702	168458	187176
378441	0	7177	385619	64597	71775
0	0	0	0	0	0
1095301	0.00	45576	1140877	30384	75960
6204067	484629	109186	6313253	890722	1554954
1606931005	12867631	143476883	1750407888	870816389	850924553
1316527893	0.00	143407167	1459935061	1000361554	1476923022
0	0	0	0	669314826	649624809
1606931005	12867631	143476883	1750407888	1540131215	1500549362

RECEIPTS & PAYMENTS ACCOUNTS FOR THE PERIOD FROM 01-04-2014 TO 31-03-2015

	RECEIPTS	2014-15	2013-14		Payments	2014-15	2013-14
		Rs.	Rs.			Rs.	Rs.
I	Opening Balances			I	Expenses		
a)	Cash In Hand	1260190.55	1516100.38				
b)	Bank Balances				a) Establishment expenses	771067498.10	735973226.53
	I) In Current Account	1.15	1.15		b) Administrative Expenses		
	ii)In deposit Account				For Purchases	330888154.00	361920372.00
	iii)Savings Account *	146827995.91	203534784.89		Other expenses	66029193.00	60321668.00
				II	Payments made against funds for various		
II	Grant Received				Projects		
	From Government of India				As Per schedule	89233083.00	87473605.00
	Under Plan - Capital scheme	66250000.00	95893000.00				
	Under Plan Salary/ General scheme	814465000.00	785780000.00	III	Investments & Deposits made		
	Unde Plan scheme -NCMMR/Nurses Training	1614248.00	2081086.00				
	Non-Plan scheme	26123000.00	29025000.00		a) Out of Earmarked funds	92927595.00	69108383.00
					b) Out of own funds		
III	Receipts against Earmarked Funds						
				IV	Expenditure on Fixed Assets & Capital work		
	a) Earmarked funds	5554266.00	8658772.00		-in- progress		
	b)Own funds						
					a) Purchase of Fixed Assets	203551298.00	217386218.00
IV	Interest Received				b)Capital work-in-progress		

	a) On Bank deposits	33269314.49	77219302.18	V	Refund of Loans		
	b) Loans Advances etc	180584.00	7067.00				
V	Receipts from services						
				VI	Finance Charges(Bank charges)	59501.00	66431.00
	Receipts from Patient services	623823664.04	644511931.67				
	Other receipts including Royalty	20478375.00	15669651.42	VII	Other Payments		
					To Funds/ Deposit- refunds	694195703.00	545879357.00
VI	Other receipts			VIII	Closing Balance		
	Grant received for Projects	108695810.30	92398427.05		a) Cash in hand	1441133.06	1260190.55
	Refund of Deposits(LC Margin)				b) Bank Balances		
	Other receipts	535289443.30	269922324.40		I) In current Account	1.15	1.15
					ii) In Deposit Account		
					iii) Savings Account *	134438733.43	146827995.91
	Total	2383831892.74	2226217448.14		Total	2383831892.74	2226217448.14
	*Closing balance of Bank include grant amount received from DST for setting up of NCMMR, Thiruvananthapuram						
		0.00	0.00				

FINANCIAL ADVISOR

DIRECTOR

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY, THIRUVANANTHAPURAM NATIONAL CENTRE FOR MOLECULAR MATERIALS RESEARCH - Receipts & Payments Account for the period 01.04.2014 -31.03.2015			
Receipts	Rs.	Payments	Rs.
Opening Balance - Bank	3548469	Advertisement charges	703655
Grant in aid	750000	Bank Charges	56
Interest earned	144579	Closing Balance - Bank	3739337
	4443048		4443048

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY, THIRUVANANTHAPURAM NATIONAL CENTRE FOR MOLECULAR MATERIALS RESEARCH - Income & Expenditure Account for the period 01.04.2014 -31.03.2015			
Expenses	Rs.	Income	Rs.
Advertisement charges	703655	Interest	144579
Bank Charges	56		
		Excess of Expenditure	559132
		over income	
	703711		703711

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY, THIRUVANANTHAPURAM NATIONAL CENTRE FOR MOLECULAR MATERIALS RESEARCH - BALANCE SHEET AS ON 31-03-2015			
Particulars		2013-14	2012-13
		[Rupees]	[Rupees]
LIABILITIES			
CAPITAL FUND			
Opening Balance		3548469	2576767
Add: Grant received		750000	2250000
Less: Excess of Expendiure over income		559132	1278298
TOTAL		**3739337**	**3548469**
ASSETS			
BANK BALANCE (Union Bank of India Account No.541502010002675)		3739337	3548469
TOTAL		**3739337**	**3548469**

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY, THIRUVANANTHAPURAM PROVIDENT FUND ACCOUNT FOR THE YEAR ENDED 31-03-2015		
Particulars	2014-15	2013-14
	[Rupees]	[Rupees]
LIABILITIES		
MEMBERS BALANCE	251599543	250305574
MEMBERS CREDITS [for march]	3941042	0
BALANCE DUE TO MEMBERS NOT IN SERVICE		
Under EPF scheme	7696523	7696523
,, GPF ,,	532055	532055
PENSION FUND DUES	51168169	51168169
RESERVES&SURPLUS-INTEREST	82854794	158755931
TOTAL	397792126	468458252
ASSETS		
INVESTMENT AT COST	343058764	337051449
DUES TO PF ACCOUNT		
FROM INSTITUTE	3941042	0
FROM PF COMMISSIONER	8403467	8403467
INTEREST ACCRUED NOT DUE	22598675	110826497
BALANCE WITH BANKS		
SBT -GPF A/C	19790178	12176839
TOTAL	397792126	468458252

FINANCIAL ADVISOR

DIRECTOR

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY, THIRUVANANTHAPURAM

SCHEDULES FORMING PART OF ACCOUNTS AS AT 31-03-2015

SCHEDULE 24- SIGNIFICANT ACCOUNTING POLICIES

1. ACCOUNTING CONVENTION

Financial Statements are prepared on the basis of historical cost convention and on accrual method of accounting except in the accounts not directly connected with the functioning of the Institute including Staff Benevolent Fund, Pension,etc.

2. INVENTORY VALUATION

Stores and spares including machinery spares are valued at cost

3. INVESTMENTS

Investments including long term investments are carried at cost.

4. FIXED ASSETS

Fixed assets are stated at cost of acquisition inclusive of inward freight, duties and taxes incidental and direct expenses related to acquisition.

5. DEPRECIATION

Depreciation is provided on reducing balance method at the rates specified by the Income Tax Act 1961. In respect of additions to fixed assets during the year depreciation is provided for full year. In case of condemnation of an asset, depreciation for the current year has not been provided and the accumulated depreciation for the previous years has been duly adjusted from the depreciation of the current year.

6. GOVERNMENT GRANTS/SUBSIDIES

Government Grant from Plan fund-Capital is treated as additions to Capital fund of Institute. Grants in respect of specific fixed assets acquired are shown as deduction from the cost of the related asset. Government Grants/subsidies are accounted on Grant release order basis.

7. FOREIGN CURRENCY TRANSACTIONS

Transactions denominated in foreign currency are accounted at exchange rate prevailing at the date of transactions.

8. RETIREMENT BENEFITS

Gratuity: From the year 2006, (with the implementation 6th Pay Commission report), the gratuity payments are treated as Institute expenses and accounted on actual payment basis.

Leave Salary: Leave encashment eligible at the time of retirement/reliving is treated as Institute expenses and accounted on actual payment basis.

Pension: From the year 2006, (with the implementation 6th Pay Commission report) 12% of the salary is transferred to the Pension Fund.

New Pension Scheme: In the case of employees who joined on or after 01.01.2004, 10% of the salary is deducted as employees subscription and equal contribution is being made by the Institute. The funds are remitted to NPS Trust Account maintained by GOI and subscription details forwarded to NSDL/ CRA every month.

9. PROVIDENT FUND

Assets and Liabilities of General Provident Fund accwount were separated from Balance sheet of Institute and shown as separate statement. Interest is provided on the accumulations as per the rates prescribed by Central Government from time to time.

10. EMERGENCY RESERVE FUND

An amount equal to 7.50 percent of receipts from patient is to be transferred to a Fund for meeting unexpected requirements for Fixed assets subject to a maximum of Rs. 50 Crores.

11. TECHNOLOGY DEVELOPMENT FUND

Receipts against technology developed by the Institute are transferred to the above fund and interest earned is utilized for meeting additional expenses on Improvement of technologies already developed.

12. OVER HEAD SCHEME

Overhead Funds scheme for Innovative Projects has been introduced from the year 2012-13. An amount of upto Rs.10 lakhs can be transferred to this account every year and utilised for innovative projects.

S/d S/d

Financial Advisor Director

SCHEDULE 25-CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS

1. CONTINGENT LIABILITIES	Rs. In lakhs	
	2014-15	2013-14
Claims against the Institute not acknowledged as debts	6.00	1.11
Bank Guarantee given by Institute	35.53	35.53
Letters of credit opened on behalf of Institute	466.37	18.89
Disputed demands on Service tax etc	4.81	NIL
In respect of claims from parties for non- execution of orders	NIL	NIL
2. UNEXPIRED CAPITAL COMMITMENTS	Rs. In lakhs	
	2014-15	2013-14
Estimated value of orders remaining to be executed on Capital Account	1256.09	486.00
Lease obligation for rentals for Plant & Machinery	NIL	NIL

3. CURRENT ASSETS, LOANS & ADVANCES

The aggregate amount shown in the Balance sheet for the Current assets, Loans and Advances, have the value, which is realisable in the ordinary course of business.

4. PROVISIONS

Provision for Income tax not made since there is no taxable income for Institute under Income tax Act 1961, during the year.

5. FOREIGN CURRENCY TRANSACTIONS:

	Rs. In lakhs	
	2014-15	2013-14
5.1 Value of Imports		
Capital Goods	469.66	551.49
Stores Spare &		
Consumables	152.75	118.73
5.2 Expenditure in		
foreign currency		
Travel Expenses	NIL	NIL
5.3 Earnings: Value of Exports	NIL	NIL

6 Current year Income, net of expenditure, under Institute Ethics Committee has been treated as income of the Institute amounting to Rs.15.13 lakhs (previous year Rs.37.31 lakhs).

7. Claim for Audit fees by C&AG amounting to Rs.12.51 lakhs has been paid during the year and included under prior-period expenditure. Provision for Audit fees has been made for current year amounting to Rs.1.35 lakhs.

8. Grants received for Salary and General Expenses has been treated as Non-Plan grants as suggested by C&AG Auditors and approved by Competent Authority of the Institute.

9. Accrued Interest on Investment amounting Rs.363.96 lakhs (previous year Rs. 612.89 lakhs) has been provided in the current year accounts.

10. In order to release the pension dues as per the CCS pension rules, an additional amount of Rs.481.64 lakhs has been expended over and above the sanctioned 12% Institute contribution (amounting to Rs.505.69 lacs) to the Pension Fund.

11. Emergency Reserve Fund & Technology Development Fund

During the year, an an amount of Rs.NIL (previous year Rs.192.28 lacs) and Rs.70.74 lakhs (previous year Rs.14.76 lakhs) has been transferred to Emergency Reserve Fund & Technology Development Fund respectively. During the year Rs.16.04 lakhs has been spent from Technology Development Fund.

12. Overhead Fund Scheme

During the year an amount of Rs.10 lakhs (previous year Rs. 8 Lakhs) has been transferred to the Fund from the Overhead Charges collected from External Projects.

13. National Centre for Molecular Materials Research, Thiruvananthapuram

Receipts and Payments Account, Income and Expenditure Account and Balance Sheet in respect of NCMMR has been prepared separately and annexed to the accounts.

14. Corresponding figures for previous years have been regrouped, wherever necessary.

Schedules 1 to 25 annexed, form an integral part of the Balance Sheet as at 31-03-2015, and Income & Expenditure Account for the year ended on that date.

S/d S/d

Financial Advisor Director

Separate Audit Report of the Comptroller & Auditor General Of India on the Accounts of the Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Thiruvananthapuram for the year ended 31 March 2015

1. We have audited the attached Balance Sheet of Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Thiruvananthapuram as at 31 March 2015, the Income & Expenditure Account and the Receipts & Payment Account for the year ended on that date under Section 19(2) of the Comptroller & Auditor General's (Duties, Powers & Conditions of Service) Act, 1971 read with section 18(2) of the SCTIMST Act, 1980. These financial statements include the accounts of Bio-Medical Technology (BMT) wing of the SCTIMST. These financial statements are the responsibility of the SCTIMST's management. Our responsibility is to express an opinion on these financial statements based on our audit.

2. This Separate Audit Report contains the comments of the Comptroller & Auditor General of India (CAG) on the accounting treatment only with regard to classification, conformity with the best accounting practices, accounting standards and disclosure norms, etc. Audit observations on financial transactions with regard to compliance with the Law, Rules & Regulations (Propriety and Regularity) and efficiency-cum-performance aspects etc., if any, are reported through Inspection Reports/ CAG's Audit Reports separately.

3. We have conducted our audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements. An audit includes examining, on a test basis, evidences supporting the amounts and disclosure in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of financial statements. We believe that our audit provides a reasonable basis for our opinion.

4. Based on our audit, we report that:

i We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit;

ii The Balance Sheet, Income & Expenditure Account and Receipt & Payment Account dealt with by this report have been drawn up in the format approved by the Government of India, Ministry of Finance.

iii In our opinion, proper books of accounts and other relevant records have been maintained by the SCTIMST as required under Section 18 (1) of SCTIMST Act, 1980 in so far as it appears from our examination of such books subject to observations made hereunder.

iv Based on our audit, we further report that:

(A) Balance Sheet

A.1 Investment from Earmarked Endowment Funds Rs.69.06 crore.

Technology Development Investment register depicts a balance of Rs.6,68,31,142 under Technology Development Fund as of 31 March 2015 whereas the same was depicted as Rs.6,70,19,319 in Schedule 9 – Investment from Earmarked Endowment Funds. The difference needs to be reconciled.

A.2 Earmarked Endowment Funds Rs.21.17 crore

The above included closing balance of (-) Rs.3.68 crore in respect of five projects viz. Stroke care, sleep disorder, Neuro Intervention Centre, Movement disorder and speech therapy among other project/schemes/programmes.

Though these projects/programmes are regular institute programmes, the expenditure incurred on these institute programmes were not shown under the expenditure side of the Income and Expenditure Account and debited to Earmarked Endowment funds. Consequently, Earmarked Endowment Fund and Deficit of SCTIMST was understated by Rs.3.68 crore.

(B) General

B.1 Revenue recognition

According to common format of accounts prescribed by Ministry of Finance for Autonomous bodies, Annual Accounts were to be prepared on the basis of accrual basis. Also as per the significant policies (Schedule 24) of SCTIMST, Financial statements are prepared on the accrual method of accounting except in the accounts not directly connected with the functioning of the Institute including staff benevolent fund, pension etc., However, it was observed that the Institute recognize its income such as income from testing charges facility utilization charges fees, subscriptions and Royalty on cash basis. The income receivable was not shown under Current Assets, Loans and Advances (Schedule 11).

B.2 Retirement Benefit

According to Notes and Instructions for compilation of financial statements framed by Ministry of Finance for the Central Autonomous Bodies liability payable towards Gratuity, Super Annuation and Accumulated Leave Encashment needs to be accounted on accrual basis and provided up to the yearend under Schedule -7 Current Liabilities and Provisions.

As per para 8 of Schedule 24- significant Accounting Policies, retirement benefits are being accounted for on cash basis. As per the actuarial valuation of pension and gratuity got done by the Institute in 2011, it has a liability of Rs.127.34 crore which has not been provided for in accounts.

Thus the SCTIMST is accounting for post retirement benefits on cash basis which is in contravention of Accounting Standard 15, Accounting for retirement benefits in financial statements of Employers'.

B.3 Disclosure of details of assets acquired out of sponsored projects

In terms of Rule 215(3) of GFR, 2005, while projects are ongoing, the recipient should not treat such assets as their own assets in their Books of Acounts but should disclosure

their holding in the Notes to Accounts, specifically, SCTIMST however did not disclose holding of assets acquired out of sponsored projects in the Notes to Accounts as required in GFR.

Further , on completion of such projects, if the assets are allowed to be retained by the Institute/organization, the implementing agency should include the assets at book value in their own accounts.

According to Schedule 3-Earmarked funds, about 50 projects had been completed as of 31 March 2015. However, audit could not ascertain from Schedule 8-Fixed assets, the status of retention of assets procured for such projects.

B.4 Investment from special Reserve Fund disclosed, wrongly under investment from Earmarked Fund

The accumulate fund under Reserve and Surplus amount of Rs.56.70 crore was disclosed as Sinking fund Investment and Technology fund Investment under Schedule 9. Investment from Earmarked/Endowment funds instead of under schedule 10. Investment others income of Rs.1.20 crore from that investment was shown under income from Investment from Earmarked/Endowment funds in Schedule 15 instead of income of Special Reserve Funds.

(C) Grand in aid

Grant of Rs.90.84 crore (Rs.6.62 crore Plan Salary/General Scheme, Rs.2.61 crore Non Plan Scheme and Rs.16 lakh for NCMMR/Nurses Training) was received and utilized during the current year viz.2014-15

(D) Management letter

Deficiencies which have not been included in the Separate Audit Report have been brought to the notice of Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram through a Management letter issued separately for remedial/corrective action.

v. Subject to our observations in teh preceding paragraphs, we report that the Balance Sheet, Income & Expenditure Account and Receipts & Payment Account dealt with by this report are in agreement with the books of accounts.

vi. In our opinion and to the best of our information and according to the explanations given to us, the said financial statements read together with the Accounting Policies and Notes on Accounts, subject to the significant matters state above and other matters mentioned in annexure to this Audit Report give a true and fair view in conformity with accounting principles generally accepted in India.

In so far as it relates to the Balance Sheet of the state of affairs of the Sree Chitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapuram as at 31st March 2015 and

in so far as it relates to Income and Expenditure Account of the deficit for the year ended on that date.

For and on behalf of the C &AG of India

Sd/-

Place : NEW DELHI
Date : 03.12.2015

Principal Director of Audit
Scientific Departments

Annexure to Separate Audit Report

1. Adequacy of Internal Audit

The internal audit wing of the Department of Science and Technology is conducting the internal audit of SCTIMST. Internal audit of SCTIMST has been conducted up to the period ending March 2014 and 11 paragraphs are outstanding. Therefore, Internal Audit in SCTIMST is inadequate.

2. Adequacy of internal control.

Internal control is inadequate to the extent that internal audit is inadequate, physical verification of assets not carried out and non completion of fixed assets registers etc.

3. System of physical verification of assets.

Annual Physical Stock Verification of assets items for the year 2014-15 is yet to be completed. Due to non-availability of the verification report Audit could not verify the physical status of the items shown in Schedule-8(Fixed Assets).

3.1 Asset Register

As per Schedule – 8 of the Annual Accounts of SCTIMST for the year 2014-15, the Institute is in possession of Fixed Assets worth Rs.262.12 crores which was not completely reflected in the Asset register.

4. System of physical verification of inventories.

Annual physical verification of inventories, as envisaged in the General Financial Rules, for the entire items held by store, was not carried out for the year 2014-15.

Records made available to Audit revealed that physical verification of inventories has been carried out by the stores divisions frequently on a random basis (about once in two to three months).

5. Regularity of payment of statutory dues.

No irregularity was observed pertaining to payment of statutory dues in SCTIMST

Sd/-

Deputy Director (Insp.)

Sree Chitra Thirunal Institute for Medical Science & Technology, Trivandrum

Reply To Separate Audit Report on the accounts for the year 2014-15

Sl. No	Audit Comments	Reply
(A)	Balance Sheet A.1 investment from Earmarked Endowment Funds Rs.69.06 crore. Technology Development Investment register depicts a balance of Rs.6,68,31,142 under Technology Development Fund as of 31 March 2015 whereas the same was depicted as Rs.67019319 under Schedule 9 – investment from Earmarked Endowment Funds. The difference meets to be reconciled.	Technology Development Investment register has been added with FD of Rs.1,88,177, and as on date (2015-16) Investment Register is tallied with Technology development fund account.
	A.2 Earmarked Endowment Funds Rs.21.17 crore The above included closing balance of (-) Rs.3.68 crore in respect of five projects viz. Stroke care, sleep disorder, Neuro Intervention Centre, Movement disorder and speech therapy among other project/schemes/programmes. Though these projects/programmes are regular institute programmes, the expenditure incurred on these institute programmes were not shown under the expenditure side of the Income and Expenditure Account and debited to Earmarked Endowment funds. Consequently, Earmarked Endowment Fund and Deficit of SCTIMST was understated by Rs.3.68 crore.	Necessary accounting entries will be made in the accounts.
(B)	General B.1 Revenue recognition According to common format of accounts prescribed by Ministry of Finance for Autonomous bodies, Annual Accounts were to be prepared on the basis of accrual basis. Also as per the significant policies (Schedule 24) of SCTIMST, Financial statements are prepared on the accrual method of accounting except in the accounts not directly connected with the functioning of the Institute including staff benevolent fund, pension etc., However, it was observed that the Institute recognize its income such as income from testing charges facility utilization charges fees, subscriptions and Royalty on cash basis. The income receivable was not shown under Current Assets, Loans and Advances (Schedule 11).	Institute has adopted accrual system of accounting for miscellaneous income/interest income, testing and facility utilization charges, fees etc., to the extent possible. Estimating Royalty income after ascertaining the quantum of income earned by companies to which technology transfer has been done (within the date of finalization of accounts of this Institute) is not within the powers of the Institute.
	B.2 Retirement Benefit According to Notes and Instructions for compilation of financial statements framed by Ministry of Finance for the Central Autonomous Bodies liability payable towards Gratuity, Superannuation and Accumulated Leave Encashment needs to be accounted on accrual basis and provided up to the year end under Schedule -7 Current Liabilities and Provisions. As per para 8 of Schedule 24- significant Accounting Policies, retirement benefits are being accounted for on cash basis. As per the actuarial valuation of pension and gratuity got done by the Institute in 2011, it has a liability of Rs.127.34 crores which has not been provided for in accounts. Thus the SCTIMST is accounting for post retirement benefits on cash basis which is in contravention of Accounting Standard 15, Accounting for retirement benefits in financial statements of Employers'.	Actuarial valuation will be done and provision for retirement benefit will be provided in the accounts from the year 2015-16.

	B.3 Disclosure of details of assets acquired out of sponsored projects In terms of Rule 215(3) of GFR, 2005, while projects are ongoing, the recipient should not treat such assets as their own assets in their Books of Accounts but should disclosure their holding in the Notes to Accounts, specifically, SCTIMST however did not disclose holding of assets acquired out of sponsored projects in the Notes to Accounts as required in GFR. According to Schedule 3-Earmarked funds, about 50 projects had been completed as of 31 March 2015. However, audit could not ascertain from Schedule 8-Fixed assets, the status of retention of assets procured for such projects.	From the current financial year onwards Institute will disclose the value of assets acquired out of sponsored projects in the Note to Accounts.
	B.4 Investment from special Reserve Fund disclosed, wrongly under investment from Earmarked Fund The accumulate fund under Reserve and Surplus amount of Rs.56.70 crore was disclosed as Sinking fund Investment and Technology fund Investment under Schedule 9. Investment from Earmarked/Endowment funds instead of under schedule 10. Investment others income of Rs.1.20 crore from that investment was shown under income from Investment from Earmarked/Endowment funds in Schedule 15 instead of income of Special Reserve Funds.	Necessary disclosure will be made from the year 2015-16 on wards.
(C)	Grand in aid Grant of Rs.90.84 crore (Rs.6.62 crore Plan Salary/General Scheme, Rs.2.61 crore Non Plan Scheme and Rs.16 lakh for NCMMR/Nurses Training) was received and utilized during the current year viz.2014-15	Noted.