

Annual Report 2011-12



High Quality Patient Care - Medical Devices Development - Health Science Studies

Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum
Thiruvananthapuram, Kerala, India - 695 011

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY
THIRUVANANTHAPURAM – 695011, KERALA



Annual Report

2011-2012

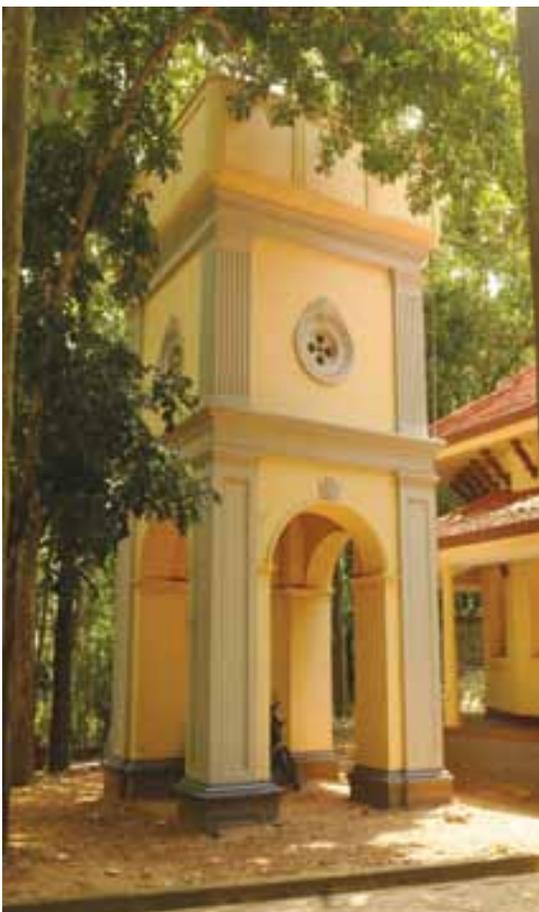
Annual Report
2011-2012

Sree Chitra Tirunal Institute for
Medical Sciences and Technology
Trivandrum - 695011

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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 underway. The Biomedical Technology Wing followed soon at the Satelmond Palace, Poojapura, again a gift by 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 as 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 named it as Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum.

Dr. Manmohan Singh, the then Honorable Finance Minister of Government of India, laid the foundation stone of the third dimension of the Institute, 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.



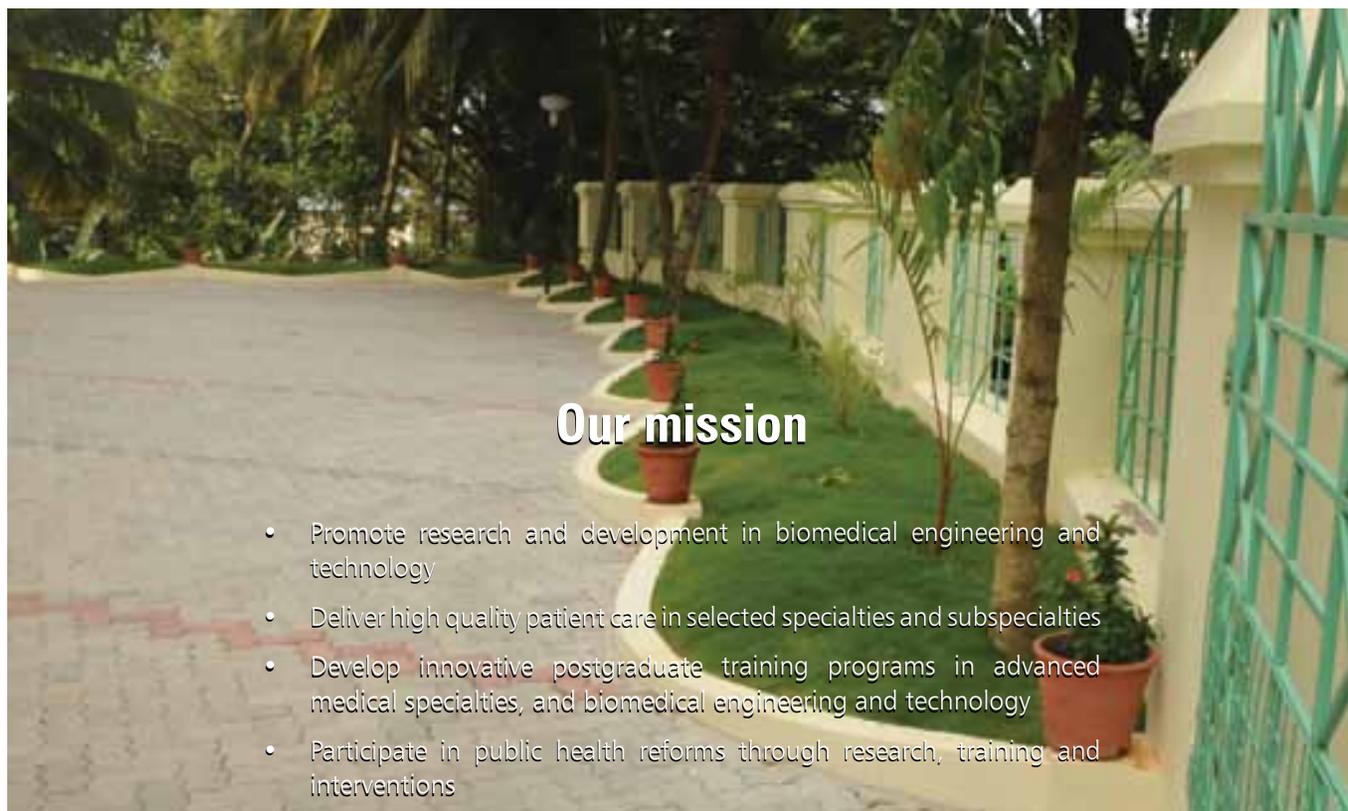
Hospital Wing



BMT Wing



Public Health Wing
(AMCHSS)



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 sciences studies by 2020



डॉ. आर. चिदम्बरम्

भारत सरकार के प्रमुख वैज्ञानिक सलाहकार
एवम्
डी.ए.इ. - होमी भाभा प्रोफेसर

Dr. R. Chidambaram

Principal Scientific Adviser to the Govt. of India
&
DAE - Homi Bhabha Professor



सत्यमेव जयते

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MESSAGE

As the President of the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum, I have great pleasure in penning this message. The institute in its journey of over 36 years has scaled many heights and is now considered as one of the finest institutions in the country in the area of health care. The institute has always had the strong support of the Department of Science and Technology, in its efforts to develop itself into a premier medical institution of the country. The strength of the institute lies in its inter-disciplinary approach, combining uniquely patient care, academics, research and development with a very strong thrust on biomedical technology. Such an approach has led to unique contributions to the health care system in Kerala, with many patients also coming from other parts of the country. Recognising its' significant contributions, the Government of India has declared it through an Act of Parliament as an 'Institution of National Importance' with the status of a University.

The patient care activities include several subspecialty areas in the field of surgery for highly complex congenital cardiac anomalies, stroke and acute coronary problems, neuro-endoscopic surgery, movement disorders, epilepsy, sleep disorders and interventional radiology. The patient care wing of the institute has successfully conducted for the first time homograft valve transplant implantation in the State of Kerala and is the second public sector institute in the country to achieve this. The Neuroanesthesia Division has also initiated intraoperative evoked potential monitoring system. I am confident that this procedure will be beneficial to the patients who look up to this public institute for advanced and affordable health care.

The establishment of an information kiosk will improve the patient services in the outpatient departments and help patients. The launching of the health insurance scheme "Chis Plus Scheme" with M/s CHIAK is another milestone in the annals of the institute. The MoU signed with NIC for the implementation of National Knowledge Network (NKN) will further help the institute to network with the leading institutes in the country and also in dissemination of knowledge among doctors and researchers; it will also speed up the tele education and tele consultation.

The pioneering efforts of the Biomedical Technology Wing in the indigenous development of medical devices and implants have facilitated active collaboration and interaction between the institute and the medical device industry. This facility also provides the industry to address the problems of scale-up, production, market seeding of the product, as well as manpower training for setting up and running the commercial plant. The technology transfer to M/s. IFGL Refractories Ltd., Kolkata for injectable calcium phosphate cement for dental applications and bioactive composite ceramics for orthopaedic applications and hormone releasing intrauterine device to M/s. HLL Lifecare Ltd., Trivandrum are some of the notable achievements during this year. I am sure that the MoUs signed with various other institutes and companies will be mutually beneficial.

The Institute offers regular postdoctoral, doctoral and postgraduate courses in medical specialities, public health, nursing, basic sciences and health care technology. Apart from these, the institute also offers off-campus programmes such as Master in Epidemiology (MAE). The joint initiatives with IIT Madras and CMC, Vellore, offering M. Phil in Biomedical Technology, M. Tech programme in Clinical Engineering and Ph. D in Biomedical Devices are unique examples of inter-disciplinary initiatives.

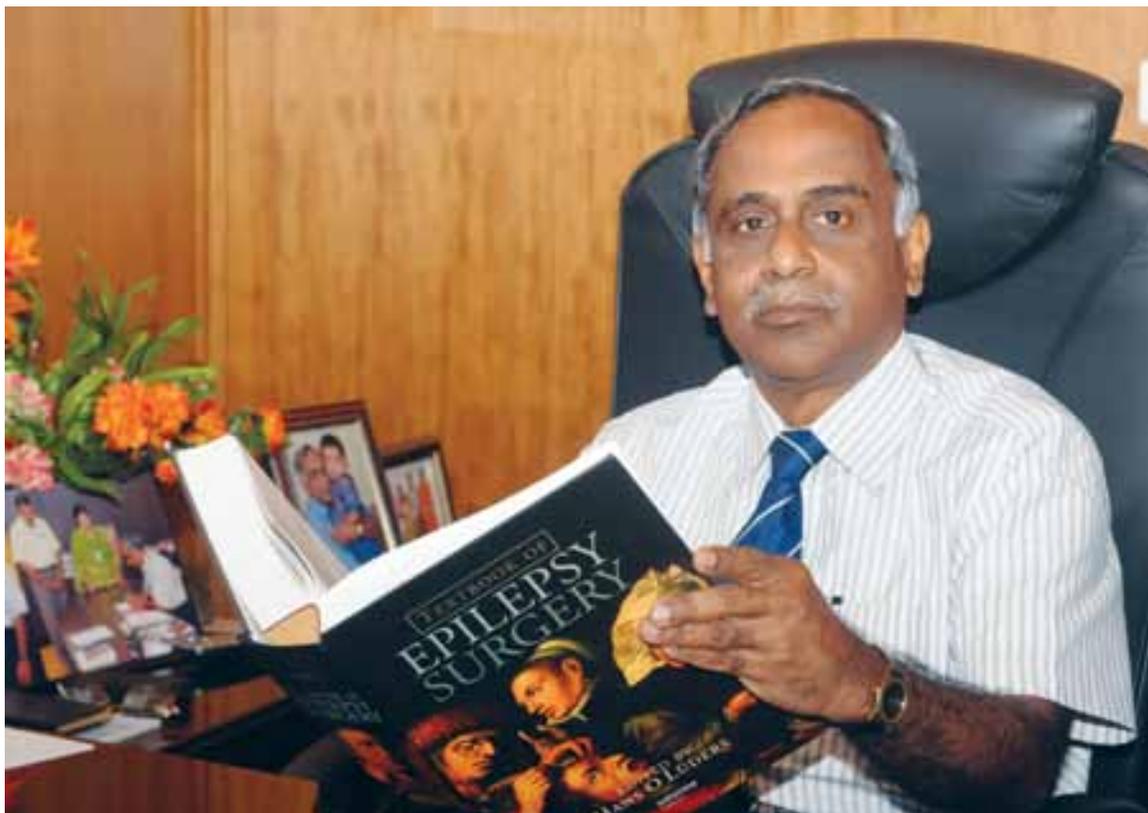
The country's first Master's programme in Public Health (MPH) was started in 1997 by the School of Public Health, Achutha Menon Centre for Health Science Studies (AMCHSS) with the mission to train highly competent and socially committed health professionals, to advocate policies that promote equity in health, to undertake quality research on priority health issues and to offer consultancy services. The Centre conducts several diploma courses, short courses in subjects such as ethics in health research, biostatistics for Biomedical technology, Cardiac and Neuro Nursing, gender sensitization, maternal and child health etc. The Centre also runs the Asian Collaboration for Excellence in Non-Communicable Diseases (ASCEND), Kerala Diabetes Prevention Programs etc.

I am very happy to note that the mandate assigned to the institute by the Parliament is being successfully fulfilled by the hard work of doctors, scientists, engineers, nurses, paramedical staff, administrative staff and the students of the institute. I am sure that in the coming years the institute will scale greater heights and benchmark itself with the best in the world.

I convey my best wishes.



R. Chidambaram



From Director's Desk

It is with immense sense of satisfaction that I am writing this message during the second year since I assumed the charge of the Director of the Institute. We are surging ahead fulfilling our mandate, namely biomedical research and development, high quality patient care and human resource development. The individual departments and divisions have narrated their achievements during 2011-12. I wish to highlight three of them:

First, after dedicated and untiring efforts, at last, we acquired 83 cents of land from the Medical College, Thiruvananthapuram. Let me place on record the services rendered by Dr. Douglas Lindsby, Officer on Special Duty, and Mr. Gopinathan, Estate Officer, who spent several days to overcome obstacles after obstacles in getting this area of land vacated and legally transferred to the Institute. A 750-bedded hospital facility in two blocks, a medical and surgical, will rise up here within an year or two. This will increase the bed strength in the Hospital Wing to nearly 1000 predicting a quantum jump in the area of advanced care of patients with cardiological and neurological diseases.

Second, the Board of Studies, through a series of deliberations, have come up with recommendation for the revisions of course curriculum, postgraduate teaching methods and evaluations. This is a major undertaking in line with the changes that are happening in postgraduate education all over the world. I thankfully acknowledge the untiring efforts of Dr. Asha Kishore, the Associate Dean of Curriculum and Examinations, in achieving this objective. In the coming years, with these innovations, there will be a sea of changes in the academic activities of the Institute.

Third, with the formation of the Division of Research and Publication under the leadership of an Associate Dean, the research and publications have been given the emphasis required in an academic institution of national and international standing. The quality of research and publications is expected to surge ahead because these are the attributes based on which faculty selection and promotion are decided.

Dear colleagues, let me thank each and every one of you from the bottom of my heart for your support and cooperation in advancing the Institute in its international standing.

Sincerely,



K. Radhakrishnan

HIGHLIGHTS OF THE YEAR



Smt. P. K. Sreemathi Teacher, Honourable Minister of Health & Family Welfare ,Government of Kerala is handing over the patta of the land transfer to Dr. K. Radhakrishnan, Director, SCTIMST on May 4, 2011



Dr. K. Radhakrishnan, Director,SCTIMST is discussing about the hospital facilities that are going to be established in the land transferred with Sri. Oommen Chandi, Honourable Chief Minister of Kerala.



A plan of the Medical Block that is going to be built in the acquired area. This eight storied building will have the most modern advanced care facilities in Cardiology, Genetics and Immunology, Imaging Sciences, Neurology and Physical Medicine and Rehabilitation. Nearly 500 beds, in both general and private wards, will be available.



Dr. K.N. Sharma, Emirates Professor of National Academy of Medical Sciences delivering the Golden Jubilee Lecture on May 7, 2011.



Dr. K. Shivakumar, Scientist G, Division of Cellular and Molecular Cardiology, receiving the ICMR Amrut Mody Unichem Prize from the Honourable Union Health Minister Shri. Gulam Nabi Azad on November 8, 2011.



Ms. Simi, the first recipient of the Homograft Valve along with the Homograft Valve Bank Team on December 20, 2011.



Dr. K. Radhakrishnan, Director, SCTIMST inaugurating the new Institute website on January 2, 2012.



Dr. K. Radhakrishnan, Director, SCTIMST inaugurating the Indo-Swiss Symposium on Cohorts and Biobanks with special reference to Chronic Non- Communicable Diseases on January 27-28, 2012.



Dr. K. Radhakrishnan, Director, SCTIMST inaugurating the Sree Chithra Children's Park on February 16, 2012.



Exchanging of MOU signed between SCTIMST and SIDD Life Sciences for establishing a Hub for Cardiopulmonary Devices on March 6, 2012.



Signing of Technology Transfer Agreement on Hormone Relasing IUD between SCTIMST and HLL Life Care Ltd. on March 30, 2012.



Dr. K. Radhakrishnan receiving the Outstanding Achievement Epilepsy Award at the Asian Oceanian Epilepsy Congress, Manila, Philippines on March 22, 2012.



In the Asian Oceanian Epilepsy Congress, Manila, Philippines, Mrs. Yasoda Wakankar was honoured as the Outstanding Person with Epilepsy. Mrs Yasoda underwent epilepsy surgery at SCTIMST in July 2003. After becoming seizure-free, she dedicated her services to women with epilepsy at Pune, Maharashtra. The Institute wish to congratulate Mrs. Yasoda on her outstanding achievement and thank her giving an opportunity to make a difference in her life.



HOSPITAL WING

Mission

- Improve patient health outcomes
- Increase patient satisfaction
- Decrease medical errors, costs and waste
- Serve the underserved

Vision

- Be a global leader in high quality patient care and in postgraduate training programs in cardiovascular, thoracic and neurological diseases by 2020.







From the Desk of Medical Superintendent

The past year saw more of consolidation than of physical progress in hospital services. Our governmental austerity measures due to the difficult economic situation cast their shadow on us too. But, we could still march ahead though at a slower pace. Our staff rose to the occasion as one to embrace the slew of our Institute's efforts to contain expenditure and maximize utilization of men and material.

The newly introduced modified working hours in January, 2012 has been welcomed by all, without affecting our services. A few hitches noticed would be reviewed at year-end and addressed appropriately.

Our computerization efforts started bearing fruits in the fields of patient services - reducing the load on human resources, faster delivery of patient-care and support services, including laboratory reports and in-patient billing. Digitization of the medical records has reached half-way mark and hopefully would be completed by March 2013, paving the way for the digital case records by late 2013.

There has been a 23% increase in the outpatient attendance over the last five years, but till now we managed without spending more on infrastructure. To address this ever-increasing outpatient attendance, we would soon be launching modernization efforts to optimize out-patient facilities, which could not be significantly augmented over three decades. The newly acquired land will help in the addition of much-needed expansion and new facilities for our patients.

There has been a 13% increase in the number of Interventional procedures, with the optimal utilization of existing surgical and cath lab facilities. This has helped to reduce the wait-list of patients, but we still have "miles to go...."

As ever, we could get the whole-hearted support of all our dedicated and selfless staff, which is our best asset in the Institute's path to excellence.

R. Sankarkumar

Department of Hospital Administration



New Initiatives

- The Institute succeeded in acquiring 83 cents of land from Government of Kerala for building a modern hospital. Various other activities to improve infrastructure were initiated which included construction of a Neuro Interventional Center and Hospital Canteen Block. Proposals are already finalized for modification of out patient department and construction of a block for the Department of Hospital Administration, classrooms and faculty rooms.
- The Institute successfully conducted the first homograft valve transplant implantation in the State of Kerala. This is the second time in the country in public sector to undertake homograft valve surgery.
- A Memorandum of Understanding was signed with National Informatics Centre (NIC) for the implementation of National Knowledge Network (NKN) at SCTIMST on 12th September, 2011. NKN has been designed to ensure the highest level of availability, quality of service and robust and reliable connectivity for extending network-based services. Accordingly Network based connectivity has been successfully implemented at SCTIMST.
- The Division of Physiotherapy was renamed as Department of Physical Medicine and Rehabilitation with effect from 15th October 2011 with visiting professor of Physical Medicine as a faculty in order to augment the physiotherapy services.
- State level inauguration for the extension of benefits of Chis Plus Scheme was held on 12th November 2011. A memorandum of understanding (MoU) was also entered with M/s CHIAK for the implementation of Chis Plus Scheme at SCTIMST. The scheme shall provide coverage for meeting the expenses of hospitalization for medical and/or surgical procedures to the enrolled BPL families to a maximum limit up to Rs. 70,000/- (Rupees Seventy Thousand only) per family per year, in any of the network providers for the treatment of heart diseases and disease of nervous system. The benefit to the family will be on f oater basis, i.e., the total reimbursement of Rs. 70,000/- can be availed of individually or collectively by members of the family per year.
- A Patient safety programme was initiated. As an initial phase, study was conducted to evaluate the awareness of patient safety programmes and results were presented to the faculty and nursing staff of the Institute on December 26, 2011.
- A programme on hospital ergonomics was initiated for addressing the issue of work related musculoskeletal disorders among the staff. Accordingly, a one-day workshop was organized for doctors, nurses and supervisors. Experts in the field handled various sessions.
- In order to improve the patient services in the out

patient department an Information Kiosk was installed for the patients. This facility is utilized for providing information to patients about hospital services and for retrieval of investigation reports by patients.

- The hospital has taken initiatives to computerize the hospital records. The digitization of existing medical records was started and is progressing well. Steps are also taken to fully computerize the billing of hospital services and speed up patient discharges and account closure.

Clinical services

During the year 2011-12, for various services in Cardiology, Neurology, Cardiac Surgery, Neurosurgery and Imaging Sciences & Interventional Radiology 16,806 new patients were registered. A total of 10,487 patients were admitted for treatment including surgical and interventional procedures (Fig. 1).

Out-patient Department services attracted 1,24,559 patients for review in various Departments, including specialty clinics (Fig. 2).

About 10% of the patients were provided free treatment and 57% patients were offered subsidized treatment based on their socio-economic background (Fig.3). The facilities available were optimally utilized for the patient care services which is evident from the data related to bed turn over i.e., 43 (slight increase over the previous year) (Fig. 4). The average length of stay remained the same as that of last year ie, 7 days. The bed occupancy rate

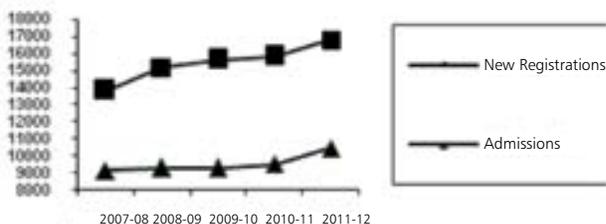


Fig. 1. New Registrations and Admissions

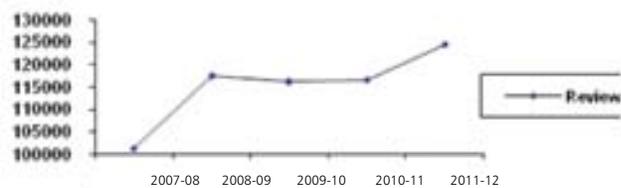


Fig. 2. Follow Up

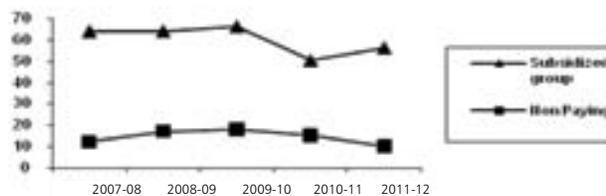


Fig. 3. Free & Subsidized Treatment (%)

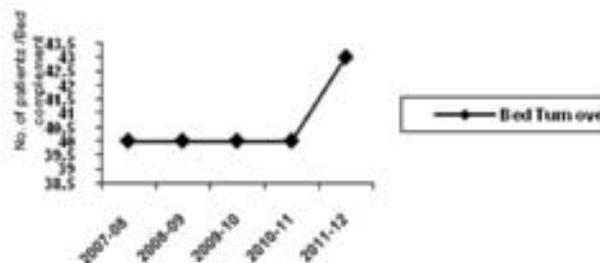


Fig. 4. Bed Turn Over

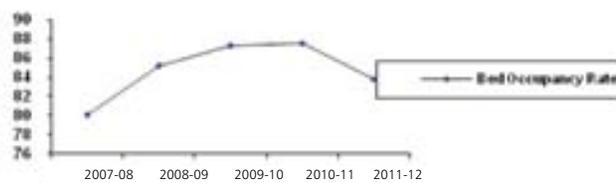


Fig. 5. Bed Occupancy Rate (%)

Tele-Consultation

- To provide expert advice available in the Medical Colleges, SCTIMST and Regional Cancer Centre (RCC) to the patients attending District Hospitals through communication networks.
- 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.
- Connectivity to Village Resource Centres.
- The State Planning Board has proposed to include SCTIMST in the Village Resource programme of Wayanad. As per the request, six Tele Talk sessions of health related issues would be handled by the experts of the Institute

International Tele Connectivity

International Tele Project discussions for the following projects were handled with dedicated Internet Connectivity.

- o Tobacco –Quit Tobacco India
- o Community Intervention for Health (Oxford Health Scheme, London)



National Workshop on implementation of NABH standards in hospitals was held on April 9, 2011, The programme was inaugurated by Dr. Balraman Nair, Former Director of Medical Education, Government of Kerala



Hand Hygiene Day was observed on May 5, 2011. Dr. R.Sankarkumar, Medical Superintendent, SCTIMST inaugurated the programme



Dr. R. Sankarkumar, Medical Supdt. of SCTIMST is inaugurating International Nurses Day on May 12, 2011



Dr. K. Radhakrishnan, Director, SCTIMST inaugurated Patient information Kiosk on August 9, 2011



Dr. K. Radhakrishnan, Director, SCTIMST inaugurated Medical Records scanning facility on September 7, 2011



Dr. K. Radhakrishnan, Director, SCTIMST inaugurated online recruitment facility on October 21, 2011



Sri. Shibu Baby John, inaugurated Chiss plus Scheme on November 12, 2011



Workshop on making workplace safe-role of ergonomics was inaugurated by Dr. K. Radhakrishnan, Director, SCTIMST on February 4, 2012



After the inauguration of inpatient service automation system on December 5, 2011, Dr K. Radhakrishnan, Director, SCTIMST watching the same

Nursing Education



The speciality nursing programmes continue to attract registered nurses as evidenced by the increase in the number of applicants for the two programmes – Diploma in Cardiovascular and Thoracic Nursing, and Diploma in Neuro nursing. 180 cardiac nurses and 127 neuro nurses trained in SCTIMST are presently working in many parts of the world, thereby promoting the reputation of the Institute.

Currently thirty-four students, Cardiovascular and Thoracic Nursing (19) and Neuro nursing (15) are enrolled for the 2-year Diploma programme in Speciality Nursing.

In addition, clinical rotation facility was offered for MSc. Nursing students from various other institutions (97 students from 20 Institutions).



Department of Anaesthesia

Division Of Cardiothoracic and Vascular Anaesthesia



The Division of Cardiothoracic and Vascular Anaesthesia provides peri-operative care during all the cardiothoracic and vascular surgeries as well as intensive care to all the patients in the cardiac intensive care units. The main mission of the division is to pioneer the development of new techniques for improving the perioperative and intensive care for all cardiac and vascular surgery patients and provide advanced training in this field.

New initiatives

- Pain Clinic: A multidisciplinary 'Pain Team' was formed to run a Pain Clinic on every Friday, where a comprehensive evaluation of the patient will be done clinically with appropriate investigations/imaging, and management will be based on broad consensus and standard protocols.
- 'Guidelines for Care of patients receiving ventilator therapy' was formulated to ensure that evidence based guidelines are followed while providing care for ventilated patients in the intensive care units (ICU) of our Institute.



Inauguration of Pain clinic on March 30, 2012

Division of Neuroanaesthesia



New initiatives

- Intraoperative Evoked potential monitoring is a highly specialized procedure which helps in monitoring the functions of the brain intraoperatively. Its use brings improved care, shortens ICU and hospital stay. Few centers in India only have facility for monitoring evoked potentials. We have started using intraoperative evoked potential monitoring recently. Patients who are at risk of neurological damage like aneurysms, CP angle tumors, posterior fossa tumors, and spine surgeries are increasingly managed with evoked potential monitoring at our institute.
- A new program of Day care for MRI procedures has been started since 6 months. All the patients are assessed for fitness in the special clinic as outpatients every day from 3-4 pm. These patients come to the MRI suite on the day of procedure, undergo MRI under sedation and are discharged home after recovery.
- The division is actively involved in the management of patients in stroke unit during the initial assessment and stabilization in the intensive care unit, while undergoing MRI and during intra-arterial thrombolysis. The division is also involved in the ventilatory care, hemodynamic management, and sedation of critically ill stroke patients.
- With the recognition of increasing incidence of chronic pain syndromes in the population, pain clinic has been inaugurated recently to address the plight of these patients. Pain clinic is managed by a team of experts from Neuroanesthesia, Neurology, Neurosurgery, Neuroradiology and physiotherapist.

Department of Biochemistry



Patient services

The central clinical laboratory (CCL) of this department is engaged in round the clock clinical diagnostic services employing sixteen technical assistants and two scientific officers. Three main sections of the CCL are: biochemistry, hematology and clinical pathology. Fully automated state-of-the-art equipments serving CCL include Dade-Behring RXL, OLYMPUS AU 400 Clinical Chemistry analyzers, Radiometer, GEM Premier 3000, NOVA blood gas analyzers, Beckman 5 part differential hematology analyzers, Roche U 411 urine analyzer and Amax (Germany) coagulation analyzer.

The Central Clinical Laboratory performed a total of 6, 91, 500 tests during this year in Biochemistry, Hematology and Clinical Pathology as detailed below

| | |
|----------------------------|-----------|
| Biochemistry | 2, 92,505 |
| Hematology | 1, 81,588 |
| Coagulation parameters | 44,948 |
| Blood gas and electrolytes | 31,809 |
| Miscellaneous | 1, 40,650 |

New Initiatives

- Studies on metabolic and biochemical changes occurring in cardiac tissues of type 2 diabetic patients have been started in collaboration with the CVTS department. Identification of monocyte/macrophage subtypes in subjects with atherosclerosis and metabolic syndrome was also started.

Department of Cardiology



The Department of Cardiology is striving to be the leading center in the country for cardiac rhythm management especially, tachy arrhythmia management. The department has also initiated steps to start a Heart Failure Program and Registry with cardiac transplantation as the goal.

Patient care

7869 new patients attended the cardiology outpatient services and 47,400 patients attended the review outpatient services. 4065 patients were treated as inpatients during the year with an average bed occupancy rate of 83% and mortality rate of 1.5%.

The non invasive labs performed 27500 ECGs, 2500 Treadmill exercise tests, 1500 Holter tests and more than 950 special Echo Doppler investigations including trasesophageal echo studies.

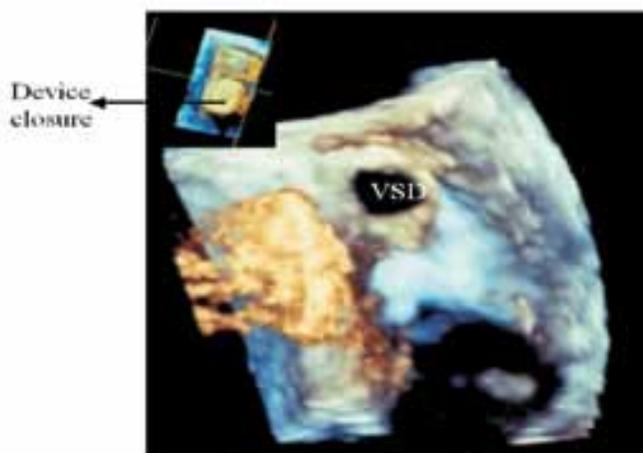
The department performed 3657 invasive procedures including 670 coronary angioplasties, 300 electrophysiology (EP) procedures (including 225 radiofrequency ablations for tachyarrhythmias) and 200 permanent pacemaker implantations. More than 50 cases of complex cardiac arrhythmias were mapped and ablated with the assistance of EnSite, and Carto, the 3-D electroanatomical mapping systems.

Our institute continues to be the only centre in government sector in South India having this advanced technological tool in the electrophysiology lab.

The department continues to do maximum pediatric

interventions in India for the last two years with 209 ASD and 79 PDA percutaneous device closures.

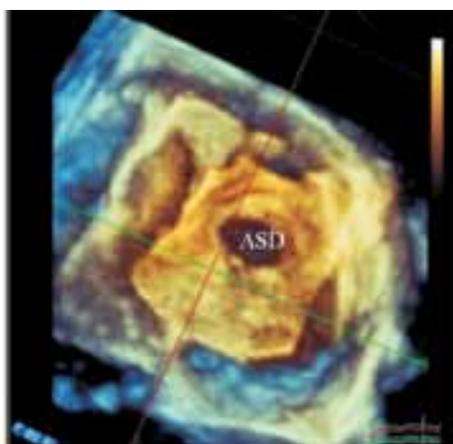
The Department continued to perform state-of-the art coronary interventions aided by IVUS (Intra-vascular ultrasound) and also FFR fractional flow reserve assessment of the intermediate coronary lesions.



Heart defect well seen in real-time helps precise closure with devices

Invasive and Interventional Procedures

| Diagnostic Studies | Number |
|---|-------------|
| Coronary Angiography | 1682 |
| Cardiac Catheterization | 208 |
| EPS | 70 |
| Total | 1960 |
| Non-coronary Interventions | |
| ASD device closure | 209 |
| VSD device closure | 6 |
| PDA device closure | 79 |
| Balloon mitral valvotomy | 183 |
| Balloon pulmonary valvotomy | 20 |
| PDA coil closure | 27 |
| Balloon Atrial Septostomy | 20 |
| MAPCA coiling, PDA stenting, Coronary AV fistulae closure | 20 |
| <u>Coronary intervention</u> | |
| PTCA | 674 |
| Electrophysiological procedures | |
| Electrophysiological study and RF ablation | 225 |
| Permanent pacemaker implantation | 202 |
| ICD | 18 |
| CRT | 9 |
| Total | 434 |
| TOTAL PROCEDURES IN 2011-12 | 3657 |



3D reconstruction of Atrial septal defect



CT Angiogram showing 3D reconstructed image of crisscross origin of the right and left pulmonary arteries

Academic activities

- Organized a Live Transmission workshop on Pediatric Cardiac Interventions at SCTIMST, Trivandrum, during the Annual Pediatric Cardiac Society of India Annual Conference in October 2011.
- Organized South-East Asia region meeting of the PVRI on October 1st and 2nd, 2011.
- Organized the Coronary Intervention Update and Rotablator workshop in January 2012 and performed 2 rotablation cases and 3 complex coronary angioplasties.
- “Simulator based coronary intervention training program for Fellows” was organized at the Institute on December 18&19, 2011.
- Organized the Coronary Intervention Update and Rotablator workshop in January 2012 and performed 2 rotablation aided coronary interventions and 3 complex coronary angioplasties.
- As part of the ICMR Heart Failure study, the heart failure clinic was started in the surgical block from 1st January 2012.
- With commissioning of the new electro anatomic mapping system, the department undertook several complex atrial and ventricular arrhythmias for radio frequency ablation with success.

Department of Cardiovascular and Thoracic Surgery



The highlight of the year is the Homograft valve Bank project. In a landmark achievement, the first homograft implant was done successfully in a girl with Tetralogy of Fallots with anomalous coronary crossing RVOT. The cryopreserved graft was used as an RV-PA conduit. This was the first surgery of its kind in the state. The program is running in a full swing. The harvesting, processing and storage procedures have been standardised and the implants are being used regularly.

Patient care: In the area of patient care, affordable, uniform, evidence based, high quality cardiac surgical care is given to the citizens of the country by well trained staff who are committed, knowledgeable and focused. The department is the biggest cardiac surgical service provider in the state and undertake all routine cardiac surgical cases like coronary bypass operation both on pump and off pump coronary artery bypass (OPCAB), valve replacement and repair, redo operations, aortic surgeries, pericardectomies and repair of congenital heart defects with excellent results. Specialized areas of focus are minimally invasive cardiac surgery, arrhythmia surgeries, heart failure operations and neonatal surgeries like Arterial Switch operation, BT Shunts, TAPVC corrections, neonatal ICRs. Vascular and Thoracic surgeries include thoracoabdominal aneurysm repairs, endovascular aneurysm repairs, carotid endarterectomies, carotid body tumors excisions, lobectomies and video thoracoscopic procedures.

In the year 2011-2012, 2065 Cardio Vascular and Thoracic operations were performed; of this 1523 were open-heart procedures. Of the surgeries on congenital heart defects 126 neonates weighed less than 5kg. The Division of Vascular and Thoracic Surgery performed 332 operations.

Two typical surgical procedures

Prosthetic graft Ascending Aorta to Bilateral Carotid arteries with an extension to left Subclavian artery followed by Thoracic Endovascular Aneurysm Repair (TEVAR) i.e., HYBRID REPAIR in a case of distal aortic arch aneurysm (Right)



Ulcerated Carotid plaque



Carotid Endarterectomy

| Procedures | No. |
|--|-------------|
| Adult Cardiac Operations | 1311 |
| Coronary artery bypass surgery | 480 |
| Valve replacement and valve repair surgery | 369 |
| Ascending aortic aneurysm repair and Bentall operation | 23 |
| Adult congenital heart disease, etc., Closed Heart | 88 |
| Surgeries for complex aortic aneurysms and aortoiliac occlusive diseases | 71 |
| Lung surgery including open and VATS – Lobectomy, Pneumonectomy, LN Biopsy | 43 |
| Beating heart surgeries OPCAB | 58 |
| Coarctation repair- adult and paediatric | 25 |
| AV Fistula Creation | 25 |
| Carotid Endarterectomies | 102 |
| Thymectomies | 16 |
| Pericardectomy | 8 |
| BT shunt operation | 1 |
| | 2 |
| Congenital Heart Surgeries | 489 |
| ASD Closure | 112 |
| VSD Closure | 91 |
| AV Canal defect Correction | 12 |
| TAPVC Repair | 29 |
| PDA and Coarctation Repair | 19 |
| Arterial Switch Operation | 28 |
| Tetralogy Of Fallot – Repair | 144 |
| BD Glenn and Fontan Operations | 44 |

The Department Organised the following meetings and Workshops :

- Annual Meeting of Pediatric Cardiac Society of India was conducted at the Institute in September 2011 jointly by the Departments of Cardiology, CVTS and Anaesthesia.

Eminent cardiac surgeons and cardiologists from India and abroad participated. Workshop on pediatric valve repair was conducted by Dr. Pedro del Nido of Brigham and Women's hospital, Boston.

- The Department conducted a Mitral Valve Repair workshop by Dr. Carlo De Vincentis and Dr. Priyanka Sinha on repair of Rheumatic and non-Rheumatic valvular heart disease. Surgeons from all over the country attended the workshop.
- The Department conducted a workshop on Minimally Invasive Aortic Valve replacement and Mitral Valve Repair in March 2012 by Dr. Prem Sekher of Brigham and Women's – Harvard Medical school. A CME of Heart Failure was also conducted along with the workshop.
- "Vascular Day" was conducted in August 2011. A public awareness program was conducted in the forenoon followed by quiz program in Vascular Surgery for postgraduates from Medical college, Trivandrum. A CME program on Abdominal Aortic aneurysm, Endovascular procedures and Carotid revascularizations was conducted in the evening for medical professionals.



Inauguration of Workshop on Minimally Invasive Aortic Valve replacement and mitral, valve repair and CME on Heart Failure Surgery, March 2012

Division of Cellular and Molecular Cardiology



The aim of the Division is to carry out basic research in cardiology directed at understanding the molecular mechanisms involved in adverse cardiac remodeling. Experimental studies in animals and cell culture models focus on mechanisms in reverse remodeling. Convergence of basic research with clinical application and human resource development by training science graduates for a career in cardiovascular research are major objectives of the Division.

Research on cardiac responses to injurious and protective agents remain the focus of the Division. The major areas of research are cellular responses to hypoxia and hypertrophy-stimulating factors, modulation of energy metabolism for prevention of adverse cardiac remodeling, and stem cell response to hypoxia. The studies are supported by externally-funded research projects. Productive collaboration with the NIH, USA, was sustained during the year and the highlight of the year was a fresh collaborative project with the University of Connecticut Health Center, USA.



Computer Division



New Initiatives

The Division focused on expansion of system environments that included:

- Online application and processing for the recruitment of junior staff and senior staff for Personnel & Administration Division. This required new software development and implementation right from application registration to uploading of rank lists.
- Internet website renovation and its implementation.
- Integration of lab information system with lab equipments-software development and implementation to retract biochemistry test results of patients from Biochemistry Lab Equipments and display of results in Wards, ICUs and OTs
- Installation of Kiosks for hospital information and lab report printing.
- Medical record scanning & secured software for viewing in patient areas.
- Online leave application implementation in BMT Wing
- Integrated Nation Knowledge Network, Internet connectivity with BSNL, Internet connectivity with load sharing

New Software Developments and Hardware Implementations:

- Salary, Pension, NPS, Arrears –6th pay implementation in continuation-modifications in GUI based program was made for revised pay fixation calculation of temporary and permanent staff
- Item code revision to 10 digits from 7 digits and updating of all programs related to that in Purchase, Stores, DCE and Accounts.
- Developed software for Doctors Order Form entries, patient billing entries for automatic inpatient billing and for inpatient service automation.
- Modifications of existing live softwares running in various departments as per user requirements.
- Installed two numbers of 40TB storage system.
- Installed robotic arm supported tape backup system.
- Network cabling for new units
- Integration of OMR Evaluation Software with Recruitment Software

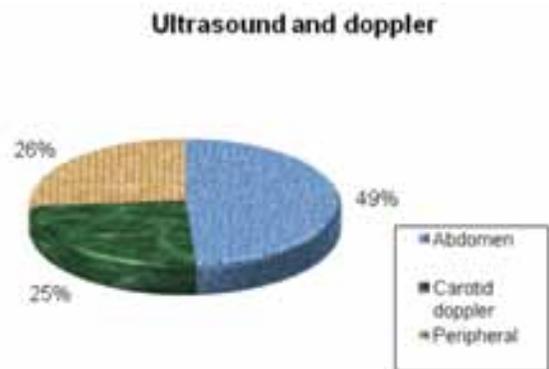
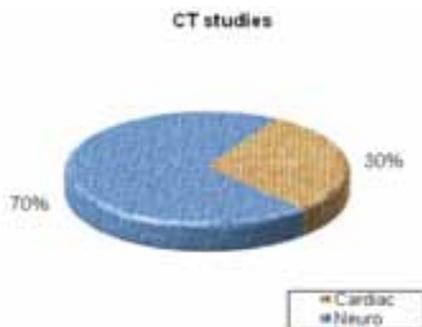
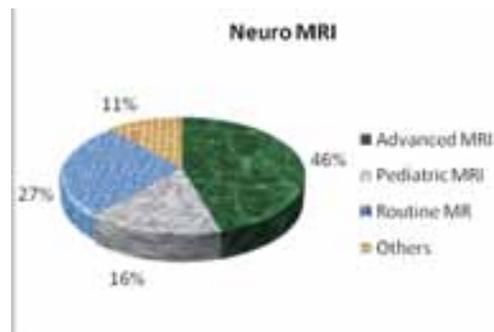
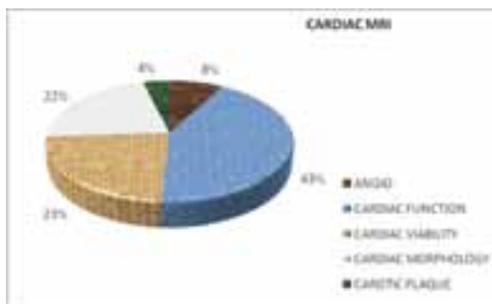
Department of Imaging Sciences and Interventional Radiology



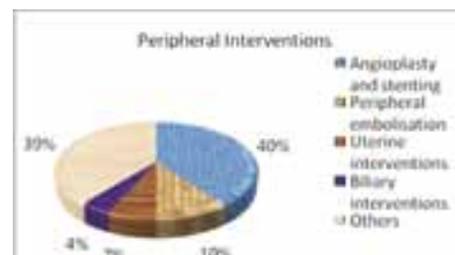
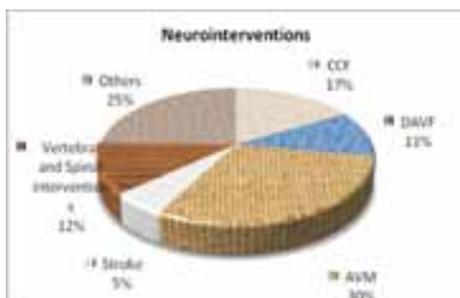
The department is providing Diagnostic Imaging and Interventional Radiology services in neurological and cardiovascular diseases.

Summary of Investigations done during the year

Diagnostic Procedures



Interventional Radiology Procedures



Interventional Radiology Clinical Services:

| | |
|--|------|
| Patients attending Radiology OPD | 1678 |
| In patient admissions | 279 |
| Interventional Radiology Procedures in DSA lab (Both out patients and in patients) | 714 |

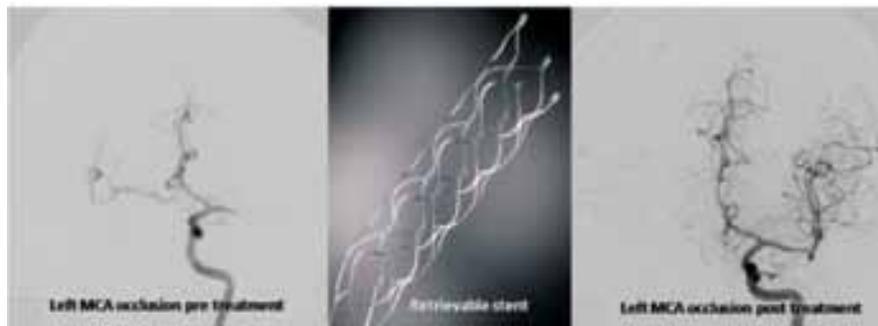
New initiatives

- MoU signed between our Institute and the Indian Institute of Information Technology & Management, Kerala (an autonomous institute under the Govt. of Kerala) to collaborate in the field of medical imaging informatics.
- New procedures being done in CT :
Perfusion CT with optimised stroke protocol and Coronary CT were initiated

- New Procedures performed in Intervention
 1. Detachable tip microcatheter for AVM embolisation
 2. Detachable intracranial stent for aneurysm and stroke treatment



VRT reconstruction of post CABG coronary CT angiogram obtained from 256-slice CT scanner for stroke treatment



Patient presenting with acute left MCA occlusion within 6 hours successfully revascularised by mechanical clot removal using detachable completely retrievable Solitaire intracranial stent



Signing of MoU between the Indian Institute of Information Technology & Management, Kerala and SCTIMST



14th Annual Conference of Indian Society of Vascular and Interventional Radiology, October 13-16, 2011



Dr.C.Kesavadas receiving the Dr.M.L Aggarwal Memorial Oration Award at The Annual scientific meeting of Indian Radiological & Imaging Association at Hyderabad on January 29, 2012.

Department of Microbiology



The mission of the Department

- Provide accurate and quick reports on all specimens sent to the Laboratory.
- Give a consultant clinical microbiology service, one component of which is antibiotic stewardship.
- Develop molecular diagnostic services to include more infectious diseases.
- Maintain the viral culture facility.
- Train MD and MSc Microbiology students as observers and as Apprentice trainees respectively, which may in the future be upgraded to a course.
- Enhance research activities.

New initiatives

- Homograft valve bank was inspected by external experts and the license was extended for an additional period of 5 years. First Homograft valve was implanted successfully. This was followed by two more successful transplants.
- Patient safety initiative: A study on patient safety practices including Infection control measures was completed.

Department of Neurology



Department of Neurology continues to be a center of excellence in providing comprehensive patient care for all types of neurological disorders and in conducting basic and clinical research in neuroscience. The main focus of the department is to develop different neurological subspecialties and thus provide advanced patient care and conduct focused high quality research.

Clinical Services

Department of Neurology conducts five general neurology outpatient clinics every week and five different subspecialty clinics. Patients with all types of complex neurological disorders, who are referred from all over the country, are evaluated and expertly managed during these clinics. A total of 5529 new patients attended the Neurology clinics which represents an increase of 4.6% as compared to previous year.

Department has a total of 60 inpatient beds including Neurology and Stroke ICU beds. The number of admissions also increased from 2366 in the previous year to 2752 this year. The bed occupancy rate was 82% with an average hospital stay of 6 days and mortality of 1.44%

Research

Apart from the research being conducted in individual subspecialties, Department of Neurology is involved in international trials on multiple sclerosis and demyelinating diseases. The department is also conducting new clinical studies in Prion Diseases and subacute sclerosing panencephalitis.



The R. Madhavan Nayar Center for Comprehensive Epilepsy Care (RMNC) is the first center in India and South Asia catering to the diagnosis, treatment, awareness and overall welfare of people with epilepsy. Since its inception in 1998, headed by the current Director of the institute and Senior Professor in Neurology Kurupath Radhakrishnan, the center aims at facilitating and augmenting epilepsy care through a comprehensive care approach backed by sound academic and technological foundations. Presently it provides comprehensive evaluation and treatment for all kinds of adult and pediatric epilepsies with a special emphasis on surgical management of medically refractory epilepsy. It receives patients from all corners of the India as well as from neighboring countries and offers world-class yet affordable comprehensive epilepsy care, comparable to any other center in the world. The mission of the division is to provide:

- Medical, surgical, psychosocial and occupational management of individual patients with epilepsy.

- Educate the primary and secondary care physicians about the current trends in the management of epilepsy, and enhance the public awareness about epilepsy in order to dispel the prevailing misconceptions.
- Undertake clinical, applied and basic science research and evolve cost-effective investigative and treatment strategies.

RMNC Team: Comprehensive epilepsy care team at RMNC consists of four epileptologists, two epilepsy neurosurgeons, two neuroradiologists, three post-doctoral fellows in epilepsy, one neuropsychologist, one speech therapist, one occupational therapist, seven EEG technologists, three medical-social workers and six epilepsy nurses.

Clinical service

Patient care at tertiary level: RMNC conducts two epilepsy clinics every week where epileptologists evaluate patients with complex epilepsies, provide appropriate medical advice and treatment along with neuropsychological

and occupational counseling. This year, an average of 492 patients/month were evaluated at these epilepsy clinics. The psychosocial issues related to epilepsy are dealt with by expert psychologist/medical social workers and occupational therapist. This year, neuropsychology evaluation for pre-surgical evaluation, development assessment and counseling were conducted in 1,112 patients. The Occupational Therapist evaluated and counseled 1,118 patients which included 238 post-operative cases to aid their emotional and social wellbeing.

Patients with drug resistant and difficult to diagnose epilepsies are admitted for Video-EEG monitoring. Epilepsy monitoring unit at RMNC has six VEEG units, largest in the country. This year, a total of 1096 video EEGs were conducted. Ninety-nine patients underwent surgery during this year which included four patients who underwent long-term video EEG monitoring following intracranial electrode placement.

A subsection of the comprehensive epilepsy care center, Kerala Registry of Epilepsy and Pregnancy (KREP) deals with epilepsy care for women in the reproductive age group. Appropriate epilepsy management and counseling related to issues like marriage, fertility and pregnancy for women with epilepsy is separately provided through KREP.

Patient care at community level: RMNS conducts

two outreach community-based epilepsy clinics per month in a rural set-up in central-north Kerala at PHC Changaramkulam and Ansar Hospital, Perimpilavu. On an average 75-80 patients were seen in both clinics. In addition to basic care, patients who require advanced care were referred to RMNC. Through these community-based epilepsy care programs, we also educate the public about epilepsy.

The section has established and supports a very active Epilepsy self-help group. It publishes a quarterly news letter, Pratheeksha, for the lay public. It provides counseling, financial assistance in procuring antiepileptic drugs and assistance in job placement for patients whose epilepsy is cured or controlled.

Academic activity and human resource development: Four post-doctoral fellows (PDF) and four technology students were recruited this year to undergo training in clinical, electrophysiological and technological aspects of epilepsy management in this academic year which commenced on January 1st 2012.

The fellows who have undergone training through RMNC have established epilepsy care programs in different regions, in India, and in SAARC countries like Sri Lanka and Bangladesh.



National Epilepsy Day on November 17, 2011

Comprehensive Movement Disorder Care Center



The Center provides high quality and comprehensive medical and surgical treatment to patients with Parkinson's disease (PD) and various other movement disorders. The centre conducts clinical, genetic, neurophysiological, neuropharmacological and basic science research and provides training to post-graduate trainees in Neurology, post-doctoral fellows in Movement Disorders and PhD scholars, with a vision to become a leading referral, training and research center for Movement Disorders in India.

Clinical service

1. **Movement Disorder Clinic:** Movement disorder specialists conduct a weekly clinic dedicated to the treatment of all cases of Movement Disorders referred to this Institute and provides counseling, education and neuropsychological and psychiatric evaluation. A physiotherapist attached to the clinic provides guidance on exercise regimens, avoidance of falls, improvement of mobility, walking aids etc. Annually, approximately 1200 to 1500 patients attend the clinic.
2. **Botulinum Toxin Clinic:** This clinic is devoted to the treatment of focal and segmental dystonia, hemifacial spasm, post-stroke spasticity etc. The faculty has vast experience with conducting more than 1,000 treatment sessions so far (1996-2012) and has an annual attendance of 150 patient visits a year.
3. **Movement Disorder Surgical Program:** The Center is the pioneer of Deep Brain Stimulation (DBS) surgery for Parkinson's disease (Figure 1) in India, with the first procedure of Globus Pallidus deep brain stimulation performed in India in August 1998 and one of the leading centers in this field in the country. The surgical procedures are done 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 intractable tremor and dystonia. The Centre is also well experienced in lesioning surgeries like MR-guided radiofrequency lesioning of 'Globus Pallidus' for Parkinson's disease, and Stereotactic Thalamotomy for Essential Tremor. The Centre has performed around 270 functional neurosurgical procedures for medically refractory Movement Disorders and the faculty have presented the results at several international meetings and published their experience in reputed international journals.
4. **Motor Physiology Lab:** The motor physiology lab run by the Center is engaged in various research and treatment related projects using modern research tools like image guided Transcranial Magnetic Stimulation (TMS) (Figure 2). Findings from three of the completed research projects have been published in high impact journals in Neurology and Neurophysiology. The center

also performs activities like tremor analysis and back averaging studies for differentiating between different types of 'myoclonus'



Figure 1- A patient with advanced Parkinson's disease undergoing Deep Brain stimulation (DBS) surgery



Figure 2. A subject undergoing image-guided Transcranial Magnetic Stimulation (TMS) in the motor physiology lab

New initiatives during the year: The Neuronavigation system for image-guided TMS was acquired and TMS based research and therapeutic studies are now conducted with image guidance. This improves the accuracy and reliability of the results. The centre is represented by Dr. Asha Kishore as a member of the international consortium on Genetic Epidemiology of Parkinsons disease (GEOPD)

Summary of activities during the year:

| | |
|-------------------------------------|------|
| Deep Brain Stimulation Surgery | 12 |
| DBS Neurostimulator replacement | 11 |
| Botulinum Toxin Injection | 148 |
| Movement disorder clinic attendance | 1380 |
| Post operative programming | 52 |
| Transcranial Magnetic Stimulation | 458 |
| Training to Post Doctoral Fellow | 1 |

Important visitors/ trainees during the year

1. Prof. Mark Hallet, Chief of the Human Motor Control Section at the National Institute of Neurological

Disorders and Stroke (NINDS), National Institute of Health, USA visited the Comprehensive Care Center for Movement Disorders on 26th and 27th of September, 2011. He delivered a lecture on 'Myoclonus' on September 27th, 2011 (Figure 3).

2. Dr. Sabine Meunier, Professor of Neurology and Movement Disorders, Hospital Sal Petriere, Paris worked as Visiting Professor in Comprehensive Care Center for Movement Disorders from 08/07/2011 to 07/10/2011. She visited the Center again from 20/11/2011 to 04/12/ 2011, as part of the Indo-French collaborative project "Cerebellum and Cortical Plasticity – The Case of Dystonia". She also gave a lecture on the topic "Intracortical Inhibition" on 4th October 2011 at SCTIMST (Figure 4).
3. Dr.Traian Popa, Neurophysiologist and the French collaborator of the ongoing TMS projects visited the TMS lab in August 2011 and again in December 2011.



Figure 3- Prof. Mark Hallet, delivering his lecture on Myoclonus, during his visit to SCTIMST, September 27, 2011



Fig.4- Dr. Sabine Meunier, Visting Professor, Comprehensive Care Center for Movement Disorders

Comprehensive Stroke Care Center



The Comprehensive Stroke Care Center carries out evaluation and management of acute and subacute strokes and transient ischemic attacks (TIA). The center is equipped with a seven bed ICU and four ward beds with all facilities for giving acute care, including thrombolytic therapy. The center provides advanced and comprehensive stroke care including intravenous and intra-arterial thrombolysis, mechanical revascularization in hyperacute strokes, carotid revascularization, decompressive craniectomy for malignant middle cerebral artery strokes and surgical evacuation in intracerebral hematomas. The center has

crossed the milestone of 100 carotid endarterectomies this year. The mission of the stroke center is to become leading center for hyperacute stroke care in the country, develop a state-of-the-art comprehensive stroke rehabilitation program, to help increasing stroke awareness in the society and carry out advanced research in stroke.

Clinical service

The team at the comprehensive stroke care center includes stroke neurologists, interventional radiologists, neuroanaesthesiologists, neurosurgeons, cardiologists

and vascular surgeon. In addition, stroke unit has a rehabilitation team comprising of a physiotherapist, occupational therapist, speech therapist, nutritionist and medical social worker who are actively involved in long-term care and rehabilitation of stroke patients. There is a 24-hour stroke helpline for receiving calls from other hospitals so that timely referral and early acute stroke care is possible. The centre conducts a weekly stroke clinic for follow-up and evaluation of stroke patients which caters to around 50 patients per week.

A summary of the clinical activities during the year

| | |
|-------------------------------|------|
| Stroke clinic attendance | 2336 |
| Stroke ICU admissions | 393 |
| Thrombolysis | 17 |
| Decompressive Hemicraniectomy | 6 |
| Hematoma evacuation | 5 |
| Carotid endarterectomy | 17 |
| Moya moya revascularization | 5 |
| Patent foramen ovale closure | 1 |

New initiatives

- A 10-minute short documentary on acute stroke and emergency treatment was made for patient awareness in April 2011. It was displayed in patient waiting areas and was telecast in the local TV channels for creating

awareness among the public regarding the urgency of acute stroke treatment.

- A collaboration with 108 emergency ambulance services was started to train the emergency medical personnel on identification of acute stroke and myocardial infarction and rapid transfer of patients to the Institute. This was done from May 2011 to October 2011 during which eight classes were conducted by the Cardiologists, Stroke Neurologists and Neuroanesthesiologists.
- An academic program was started for the nurses in the stroke ICU from April 2011, which consist of one class in a week. The classes are taken by Neurologists, Anaesthesiologists, nurses, physiotherapists, occupational therapists and speech therapists.

Important visitors/trainees

Dr Kasia Lipska, Endocrinologist from Yale University, US is currently conducting a research project "Diabetes, prediabetes and insulin resistance in patients with recent transient ischemic attack and ischemic stroke" in collaboration with Stroke Program from September 2011-May 2012.



Sri. Jagathy Sreekumar, Film Celebrity is inaugurating World stroke day 2011 on October 29, 2011

Cognition & Behavioural Neurology Center

The section provides clinical services to patients with cognitive problems and dementia. It also provides advice and technical support to the Alzheimer's & Related Disorders Society of India (ARDSI), a voluntary organization that helps dementia patients and care givers. The section carries out clinical and basic science research in the field of Dementia, Cognition and Behaviour. The staff members at the section include two Neurologist, Speech therapist, Neuropsychologist, Sociologist and Data manager.

Clinical service

The section conducts a weekly Cognitive Disorders Clinic where patients with complex cognitive problems are evaluated and counseled.

New initiatives

In addition to the ongoing research programs, a new

A summary of the clinical activities during the year

| | |
|--|------|
| Speech evaluation | 851 |
| Speech therapy | 361 |
| Audio evaluation | 274 |
| Neuropsychological testing | 1014 |
| IQ assessments | 103 |
| Counseling sessions | 177 |
| Memory & Neurobehavioral clinic attendance | 355 |
| New patients with dementia | 101 |

National Institute of Health (NIH) USA, funded multi-centric Indo-US collaborative project, the Kerala-Einstein study, commenced from June 2011. This new project looks into assessment of life-time diet on the development of cognitive problems and dementia in old age.

Comprehensive Care Center for Neuro-muscular Disorders

This subspecialty focuses on the management issues of patients with disorders of muscles, nerves, plexus and anterior horn cells of the spinal cord. Besides coordinating the investigations and treatment protocols of these patients, this subsection runs a specialty review clinic aimed at follow-up of their response to treatment.

Clinical activities

Neuromuscular Review Clinic: This clinic is conducted every Tuesday for four hours. Each clinic is conducted by one Neuromuscular Consultant, two Residents, one neuro nurse, one senior medical social worker, one occupational therapist and one physiotherapist to advice regarding further exercises and activities to promote functional recovery. Any additional monitoring, investigations and consultations from other specialties are advised from this clinic. The patients, depending on the disease status are reviewed at 3 months, 6 months or 1 yearly interval. This year, 1239 patients attended the clinic.

Group Sessions: Group therapy is conducted over one hour prior to each review clinic for patients with specific diseases like Myasthenia gravis. This is moderated by the Neuromuscular consultant along with a neuro nurse and a senior medical social worker during which patients discuss their disease states, clear their doubts, share their experience with other patients and get to know each other thus helping them to cope up better with their disease.

Electromyography (EMG) and Nerve conduction laboratory: The section also runs an EMG laboratory for the evaluation and diagnosis of neuromuscular diseases. This is conducted on all week days and approximately 5-6 patients are evaluated every day.

A summary of the clinical activities during the year

| | |
|---|------|
| Nerve conduction studies (NCS) | 1142 |
| Needle Electromyography (EMG) | 441 |
| Repetitive Nerve Stimulation test (RNS) | 110 |
| Visual Evoked Potentials (VEP) | 119 |
| Brainstem Auditory Evoked Response (BAER) | 46 |
| Somatosensory Evoked Potentials (SSEP) | 38 |
| Muscle Biopsy | 51 |
| Nerve Biopsy | 19 |
| Specific immunologic tests | 48 |
| Genetic Tests | 15 |
| Large volume Plasma Exchange | 14 |
| Small volume Plasma Exchange | 1 |
| High dose Intravenous Immunoglobulins | 8 |
| Thymectomy for Myasthenia gravis | 14 |
| Mechanical ventilation (Neuromedical ICU) | 61 |

Comprehensive Center for Sleep Disorders



Comprehensive Center for Sleep Disorders (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 with all forms 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.

The Division aims to become India's premier center of sleep medicine and research. The division is committed towards providing comprehensive clinical care for sleep disorders and to conduct research on various aspects of sleep disorders.

Clinical service

CCSD has a 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 and 5 pm. These patients in addition to medical consultation undergo neuropsychological evaluation, psychiatric counseling and dental sleep evaluation. 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 and experiences and get to know each other.

Academic activities

Apart from the clinical research, CCSD is actively involved in the basic science research pertaining to sleep disorders. Sleep Research Laboratory is an integral component of the CCSD and is aimed to explore the basic mechanisms and to conduct translational research in emerging aspects of sleep regulation for improving human health. The unique feature of this laboratory is that the knowledge gained from animal experiments would be applied to cure various sleep disorders in humans. The research laboratory works in close collaboration with the Sleep Clinic in identifying the unresolved puzzles of sleep disorders and seeks to find a solution to those human maladies. This most modern research laboratory is equipped with the latest instruments and technology to conduct basic sleep research in animal models and human subjects. A PhD program in Neuroscience is initiated to look into the various aspects of sleep loss on cognition (anxiety, learning & memory), developmental plasticity in neural networks, interrelationship of sleep and thermoregulation, and inflammatory markers.

A summary of the clinical activities during the year

| | |
|-----------------------------|-----|
| Total number of PSGs | 308 |
| Total number of CPAP trials | 138 |
| Total number of MSLT | 23 |
| Total OPD attendance | 665 |

New initiatives

- Initiative to design portable sleep detection devise based on EEG sensors with alarm system (in collaboration with instrumentation lab), DBT funding applied.
- Initiative to devise an apnea detection device for home-PSG in collaboration with CDAC.
- Initiative to design newer ambulatory polysomnography machines with EEG sensors (in collaboration with instrumentation lab).



The Honourable Speaker of the Kerala Legislative Assembly Shri. G. Karthikeyan inaugurating the National Sleep Day, 2011



Continuous Positive Airway Pressure machine in the sleep lab

Department of Neurosurgery



The Department of Neurosurgery continued to maintain high standards in patient care and academic pursuits as in previous years. The mission of the Department is to develop and pioneer new techniques in various neurosurgical subspecialties and provide excellent training to future neurosurgeons.

Clinical service

Routine clinical activities of the Department include outpatient clinics and the operation theatre, functioning five days a week. All the complex neurosurgical cases referred from within Kerala and from neighboring states, are evaluated and operated throughout the year. Major focus of the Department is subspecialty oriented development and the major areas of operative focus are micro vascular surgery, surgery of the skull base, endoscopic surgery, epilepsy surgery, movement disorder surgery, spinal instrumentation and minimally invasive procedures with the aid of neuronavigation equipment. This year, a total of 1431 cases were operated with an overall mortality of 1.2%. These results are comparable with the best centers of the world.

Academic activities

Regular academic activities are conducted on weekends wherein regular Neuroradiology meetings are held followed by grand rounds and case discussion or seminars. The faculty and the students maintained high standards in academic and research areas. The Institute was well represented at all major national and international conferences, symposia and seminars. Four candidates successfully completed their MCh training and four new residents joined the department.

A summary of the operative procedures during the year

| | |
|-------------------------------|-------------|
| Vascular: 203 | |
| Intracranial aneurysms | 178 |
| AVMs | 12 |
| Cavernomas | 07 |
| Moya Moya | 06 |
| Skull base: 141 | |
| Vestibular schwannomas | 61 |
| Skull base meningiomas | 63 |
| Others | 17 |
| Sellar suprasellar: 95 | |
| Pituitary tumors | 61 |
| Craniopharyngiomas | 26 |
| Others | 8 |
| Spinal surgeries: 146 | |
| Spinal tumours | 66 |
| Cervical degenerative disease | 48 |
| Lumbar degenerative disease | 32 |
| CV junction anomalies: 54 | |
| AAD | 09 |
| Chiari | 43 |
| Others | 02 |
| Neuro-oncology: 327 | |
| Meningiomas | 77 |
| Gliomas | 182 |
| Pediatric posterior fossa | 23 |
| Colloid cyst | 23 |
| Others | 22 |
| Endoscopy: 65 | |
| Epilepsy surgery: 101 | |
| ATL-AH | 59 |
| Hemispherectomy | 3 |
| Callosotomy | 3 |
| Lesionectomy | 15 |
| VNS | 1 |
| Intracranial Grid placement | 19 |
| Movement disorder 20 | |
| Others | 396 |
| Total | 1483 |

Department of Pathology



The focus of the Department is on the development of newer diagnostic parameters for neuromuscular and muscle diseases using nerve biopsies. The Department has developed an image analysis system for the neuronal cell counts in the surgical specimens from temporal lobe, amygdala and hippocampus of patients with temporal lobe epilepsy. The department has also developed simple immunodiagnostic system for tuberculosis.

Patient services

The Department performed histopathological analysis of 1900 surgical specimens in patients undergoing surgical treatment for neurological and cardiac diseases. Intra-operative tissue diagnosis (frozen section) was

performed in 640 patients. Enzyme histochemical and immunohistochemical studies were performed in 65 muscle biopsies. Immunopathological investigations were performed in 3500 cases.

Academic activities

Apart from the service oriented diagnostic work, the Department also conducted weekly teaching programmes (case demonstration, CPC and seminars) for the postgraduate students in Neurology, Neuro-surgery and Neuroradiology. Specialised training was also extended to postgraduate students in Pathology from Medical Colleges of Trivandrum and Kottayam, Amritha Institute of Medical Sciences, Kochi and Madras Medical College, Chennai.



Department of Physical Medicine & Rehabilitation



The Division of Physiotherapy metamorphosed into the Department of Physical Medicine & Rehabilitation (PMR) with effect from 15 Oct 2011. Dr. U. Nandakumaran Nair joined the Department as Visiting Professor from 24 April 2011. The department currently offers services in these areas:

- Physiotherapy services for inpatients and outpatients.
- Rehabilitation consultations to patients in wards, outpatient departments and their follow-up

The department hopes to establish itself as an advanced centre for neuro & cardiac rehabilitation.

Rehabilitation services will focus on assessment of disability, improvement of QOL and opportunity for self-actualization in persons with neurologic and cardiac impairment.

Dr Pesi H. Khatrak, Senior Consultant in Rehabilitation, Dept of Rehabilitation Medicine, Prince of Wales Hospital, University of NSW, Australia visited the Department on 23/1/2012

Patient service

| Name of service/ department | No: of sessions |
|-----------------------------|-----------------|
| Neurosurgery | 2843 |
| Neuromedicine | 3887 |
| Cardiac Surgery | 7437 |
| Paediatric Cardiology | 4644 |
| Out-patient Department | 3483 |
| Neuro-muscular Clinic | 123 |
| Total | 22417 |

Department of Transfusion Medicine



The mission of the Department is to save human lives by carrying out medical services, imparting training and conducting scientific research that improves the safety and efficacy of blood transfusions. The Department aims to retain the leading position in the State, simultaneously striving to become a national leader in research, education and services in transfusion related healthcare.

A new initiative during the year, based on the decision of Hospital Transfusion Committee is the use of bigger size eye-catching labels on RBC packs as part of error prevention strategy.

Patient services

The blood requirements are met through regular, voluntary repeat donations. All efforts are made to maintain 100% voluntary blood donations through mobile camps and in house blood collections. Focus is on increasing the number of repeat voluntary blood donors to enhance blood safety. Blood component support is provided to other hospitals as well. Three levels of blood safety checks before donations ensures safe transfusions. Appropriate tests at each level of Blood Banking have made it possible to provide quality products with clinical efficacy. Improvement in quality is achieved with the introduction of Levy Jennings chart in Transfusion transmissible infections and Statistical process control charts for blood components. Blood support is provided round the clock for the patients. Blood component support is provided for other hospitals also.

Academic activity

Training is provided to doctors and observers on Modern Blood Banking Technology. The programme is sponsored

by Kerala State AIDS Control society. World Health Day was celebrated with mega community based blood donation camp. Hospital Transfusion Committee meets regularly and discusses relevant matters and takes policy decisions.

Regular classes, practicals and seminars are held for students of Diploma in Blood Bank Technology along with short projects.

Community service in the form of awareness programme is provided to donors on health related issues and emphasis is laid on the need for voluntary donations.

Technical support and subject expertise is provided to Kerala State Aids Control Society as and when required.

Consultancy services for referred cases, resolving serological discrepancies, serological investigations for autoimmune hemolytic anemias and transfusion support for Thalassemia and Congenital dyserythropoiesis patients are extended for other hospitals.



On October 1, 2011, National Blood Donors' Day was inaugurated by Dr. R. Sankarkumar, Medical Superintendent

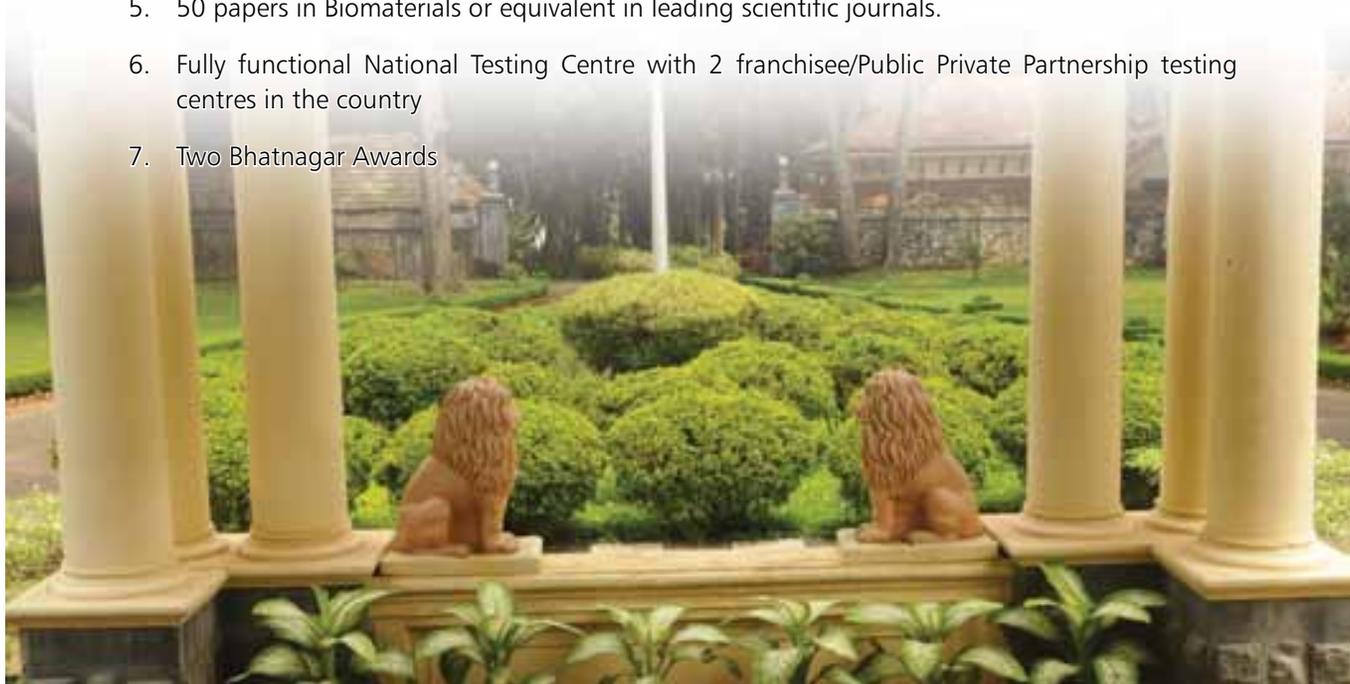
BIOMEDICAL TECHNOLOGY WING

Mission

To deliver high quality healthcare technology through innovation in science and education.

Vision 2020

1. 50% self sufficiency
 - a) 20% self sufficiency through externally funded R&D
 - b) 20% self sufficiency through testing services
 - c) 10% self sufficiency through technology transfer
2. 30 new technologies including 5 tissue engineered products
3. Two technology transfer to Multi National Companies
4. Fully functional incubator and 2 industry sponsored R&D Centres.
5. 50 papers in Biomaterials or equivalent in leading scientific journals.
6. Fully functional National Testing Centre with 2 franchisee/Public Private Partnership testing centres in the country
7. Two Bhatnagar Awards







From the Desk of the Head of Biomedical Technology Wing

The year 2011-12 was another year of effective technology transfers, project collaborations, testing activities and academic programmes. The emphasis for technology transfer and industry linkages resulted in holding hands with industry through technology transfer of three products viz, Injectable Calcium Phosphate Cement for dental applications, Bioactive ceramic composites for orthopedic applications to M/s IFGL Refractories Ltd, Kolkota and Intrauterine Device to M/s HLL Lifecare Ltd, Trivandrum. An MoU was signed with M/S SIDD Life Sciences, Chennai to explore a hub for developing cardiopulmonary devices so that medical device development would cater to the market pull. Many other MoUs and non-disclosure agreements were signed with both industry and academic institutions for collaborative research of which those with M/s Lifecare Innovations Pvt Ltd, Indian Institute for Information Technology and Management-Kerala, Trivandrum (IIITM-K), Agharkar Research Institute, Pune etc are notable.

Testing services were offered to medical device industry on the evaluation of biomaterials and medical devices. The overwhelming increase in demand during the year, for these testing services clearly shows that the Institute has to continue to play a major role in this area for supporting the growth of the medical devices industry in the country. On the academic front, the second batch of M.Tech in Clinical Engineering and MPhil in Biomedical Technology students successfully passed out.

The various product development projects are steadily moving through the different stages of development. The research projects made excellent progress resulting in an increased number of publications in journals with good impact factor, while a record number of 19 patent applications were filed on new innovative developments.

Overall, it is clear that BMT Wing continues to grow from strength to strength in the development of biomedical technology and training of human resources for the advancement of the country, while maintaining strong industrial links through testing services and technology transfer.

G.S. Bhuvaneshwar

BIOMEDICAL TECHNOLOGY DEVELOPMENT

The period 2011-12 was yet another year of strengthened relationships with existing industrial partners. New collaborations with industries through support in technology transfer activities, testing services and joint product development were explored. The different projects made good progress towards the set objectives.

HIGHLIGHTS

Technology transfers: The year saw the technology transfer of three products to industry. The Injectable Calcium Phosphate Cement for dental applications and Bioactive ceramic composites for orthopedic applications were transferred to IFGL Refractories Ltd, Kolkata. The hormone releasing Intrauterine device, which was developed in collaboration with HLL Lifecare Ltd, Trivandrum was formally licensed to the company. Discussions are ongoing with prospective industrial partners for commercialisation of other products that are at various stages of development.

Collaborations: An MoU with SIDD Life Sciences, Chennai was signed for establishing a hub for developing cardiopulmonary devices with a view to accelerate targeted development of devices based on market pull. The existing MoU with Agharkar Research Institute, Pune was extended and new MoU was signed with Lifecare Innovations Pvt Ltd, Gurgaon for technology partnerships. Nondisclosure agreements and material transfer agreements were signed with International Stem Cell Services Ltd, Bangalore and Vins Bioproducts Ltd, Hyderabad for exploring technology partnership for different products.

Quality: The quality management system continued to improve with the COFRAC Surveillance audit taking place during January 27th & 28th 2012 and the NABL audit held during 17th & 18th January, 2012.

Research & Development: The large number of research projects made good progress. While the product development projects moved towards clinical evaluation stage or towards technology transfer phase, the research projects contributed substantially to produce better outputs through patents and publications.

Patents

| Year | Patents granted | New patents filed |
|---------|-----------------|-------------------|
| 2009-10 | 4 | 8 |
| 2010-11 | NIL | 15 |
| 2011-12 | NIL | 19 |

Patents held (sealed) = 85 Nos.

Patents filed and pending = 67 Nos.

Designs held (sealed) = 13 Nos.

Publications – 74 publications in indexed journals were contributed during the year from BMT Wing with a impressive impact factor of 3. The table below shows a healthy growth during the last 3 years.

| Year | Publications in indexed journals | Average Impact Factor |
|---------|----------------------------------|-----------------------|
| 2009-10 | 55 | 3.01 |
| 2010-11 | 72 | 2.99 |
| 2011-12 | 74 | 3.00 |

Product Development, Technology Transfer & Industrial Linkages

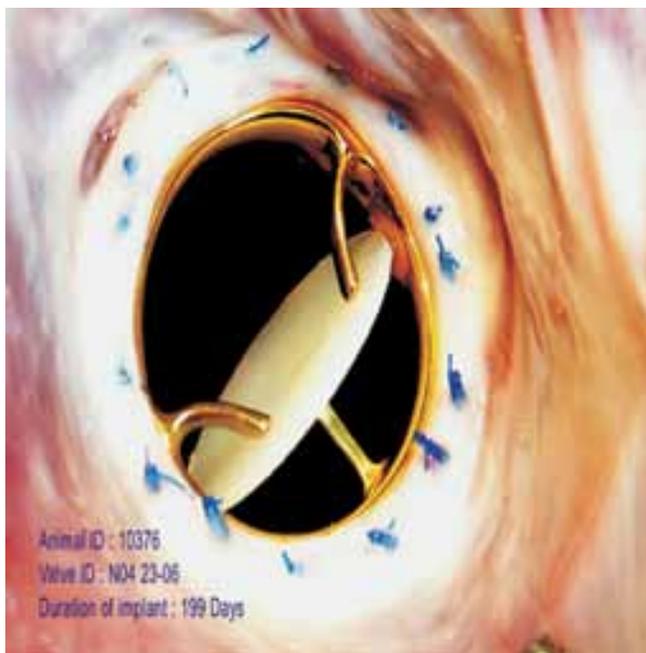
Artificial Organs

(a) Device Testing Lab



Development of improved tilting disc heart valve

The project involves the development of an improved tilting disc heart valve with objectives of reducing thrombotic potential, enhancing MRI compatibility and improving hydrodynamic performance. The improved model incorporates an MRI compatible titanium alloy cage coated with titanium nitride ceramic coating to improve tissue and blood compatibility and reduce metal ion release while implanted.



Improved tilting disc heart valve prosthesis:
Healing response of the improved valve model six months after implantation in the animal experiments

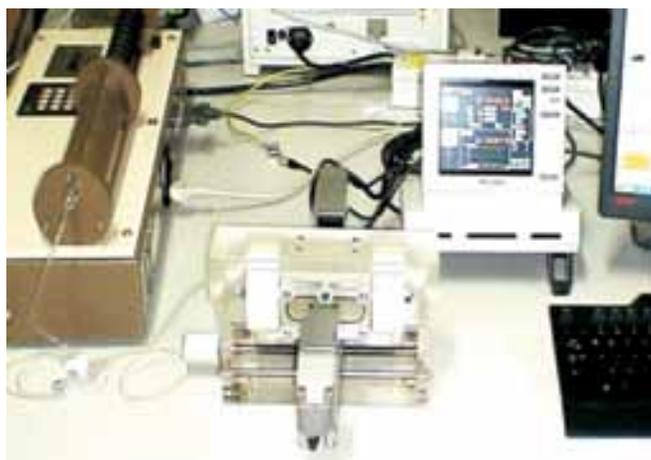
The improved design has gone through all preclinical testing requirements as per the International standard ISO 5840 and is found to excel in terms of hydrodynamic performance. The accelerated durability studies showed no structural dysfunction during the evaluation of more than twenty five valves for a duration of 400 million cycles each. Preclinical animal evaluation showed excellent healing response, reduced tissue overgrowth and incorporation of the sewing ring.

A titanium nitride coating facility was set up to coat the valves for clinical trials. The Industrial partner is organizing a pilot production for conducting clinical trials of the device.

Development of Coronary Stent System

The project aims at the development of a coronary stent system for coronary artery stenting. The stent design with minimal gouging during deployment was achieved and validated through structural analysis studies. The metallic stent is coated with a non-porous ceramic coating (titanium nitride) in order to minimize the elution of metallic ions into the surrounding tissue.

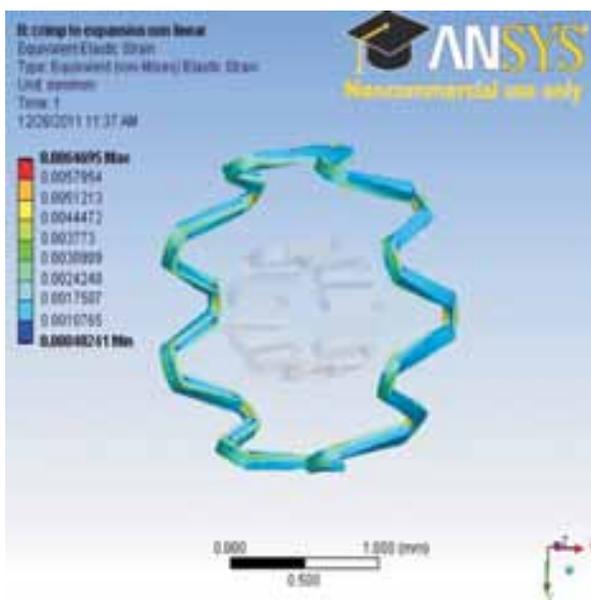
Various test systems for qualifying the stent for safety and performance has been developed and validated. These include the ones for stent expansion characterization, fatigue life estimation, surface characterization etc. Most of the preclinical laboratory evaluations have been completed. Pilot production for carrying out the preclinical animal evaluation is in progress.



Finite element structural analysis showing that the lateral strain which produces gouging of the endo luminal surface during the deployment of the stent is brought down to less than 10 micron by optimization in the design

Development of PVDF coated and gel sealed vascular graft

The industry sponsored project (M/s TTK Healthcare Ltd) (executed in collaboration with Division of Polymer Processing) aims at imparting a thrombo-resistant fluoropolymer (PVDF) coating on the fabric along with closure of the graft pores using hydrogel. After the standardisation of the processes, a set of forty grafts was produced for conducting the preclinical animal trials. Animal trials have just begun in March 2012.



Finite element structural analysis showing that the lateral strain which produces gouging of the endo luminal surface during the deployment of the stent is brought down to less than 10 micron by optimization in the design

(b) Modelling & Prototyping Lab**Commercialisation of Centrifugal blood pump**

Objective of the project is commercialisation of Centrifugal Blood pump for extra-corporeal cardiopulmonary bypass. In the completed project, the pump prototypes were fabricated in limited numbers for evaluation and in the current project, the aim was to develop a mould for mass production of pumps for pre-clinical and clinical evaluation and subsequently commercial production.

Process of finalisation of the mould is ongoing and a number of changes were made on the mould design to meet the requirements, with the help of in-vitro tests.

Activities during the year

- Additional process for improvement of surface finish was implemented during the year, which includes vapour polishing and annealing. The process of annealing and vapour polishing were standardised and validated.
- Number of prototypes were assembled for evaluations. In-vitro evaluations of few pump components were conducted for comparing the blood damage levels of the pumps.
- A new design with improved outlet geometry and better washout holes is prepared based on CFD analysis and the fabrication of prototype is ongoing.
- Completed Ex-vivo evaluation of 5 LVADs in porcine model for a duration up to 6 hours.



Ex-Vivo evaluation of SCTIMST-VSSC Left Ventricular Assist Device (LVAD)

Development of Left Ventricular Assist Device

This is a collaborative project with VSSC, Trivandrum and the responsibility the lab is to evaluate the LVAD device in-vitro for hemolysis index, coordinate and conduct ex-vivo evaluation to assess the performance of the device on live animal models. Ex-vivo evaluation of the 5th device in the series was conducted during the year and the device performed successfully for the duration of evaluation. A report of evaluations were prepared and submitted to the sponsor. Waiting for further devices from VSSC (the sponsor) for the next phase of evaluation.

Biomaterial and Biological Products

Bioceramics lab



The following technologies developed in the lab were transferred to IFGL Refractories Ltd, Kolkata for the commercial production: (i) Injectable Calcium Phosphate Cement for dental applications (ii) Bioactive composite ceramics for orthopaedic applications. The agreement was signed on 10th May 2011

Production scale-up of Calcium phosphate cement (Chitra-CPC)

The project is aimed at the scaled-up production of the calcium phosphate cement developed in the Bioceramics Lab, named as "Chitra-CPC". This is an injectable bone substitute with cohesive consistency, and hence it is ideal for wide range of applications in orthopedics and dentistry. Pre-clinical studies were done as standard Endodontic Usage Test (ISO 7405), in a pig model. Two human clinical trials have been done in dental applications, with encouraging outcomes.

Dental products



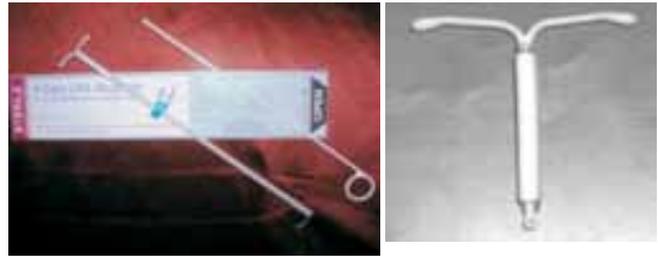
Development of a drug releasing intrauterine device for contraceptive applications (Collaborative programme between SCTIMST and HLL Lifecare Ltd): The developmental part was completed during the year and the technology

transfer documents were prepared and handed over to HLL Lifecare (industry partner). HLL has already set up a limited production facility at their factory in Aakkulam. They have also identified a CRO for carrying out the clinical trials for

proving the safety and efficacy of the product. Approval from Drug controller has already been obtained for test manufacturing and marketing the product. The industry hopes to put the product into market at the earliest.



Signing of the TT agreement and handing over of TT documents to HLL Lifecare



H-Care IUD developed jointly by SCTIMST and HLL lifecare Ltd

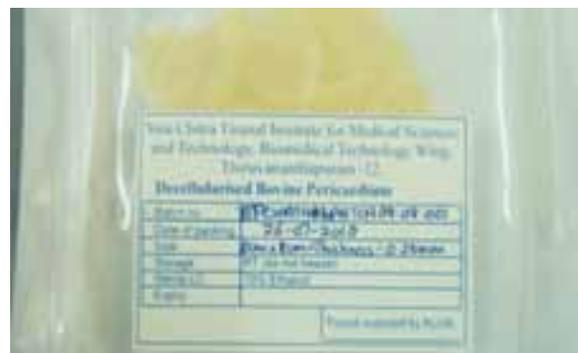
In vivo Models & Testing



Development of decellularised animal tissue for cardiovascular application

Through this project, a source of quality bovine tissue, which is safe for biomedical use, has been set up at Kerala Livestock Development Board unit, Kulathupuzha. A decellularised bovine pericardium safe for human implantation was developed in this project.

'Expression of interest' from the industry for this technology was invited through our website and discussions were initiated with the companies which showed interest for technology transfer.



Decellularised bovine pericardium developed in this project.

Laboratory Animal Sciences

Development of a paper pulp product was completed with the co-operation of an industrial partner MASPAK, Alleppey. Discussions are underway to launch the product.

Thrombosis Research Unit

Discussions were held with a biological products manufacturer who showed interest in commercialising the know-how of anti-snake venom raised in chicken and purified from egg yolk by a process developed at the Institute.

Diagnostics and Instrumentation



Instrumentation lab

The laboratory has been involved in development of indigenous technology for Disposable ECG Electrodes. The preclinical evaluation of raw materials and prototype electrodes has been completed. This technology is ready for clinical evaluation and transfer of technology to an industry.

The laboratory, in collaboration with Centre for Development of Advanced Computing (CDAC), Trivandrum, have completed indigenous technology development for Portable Medical Electrical Safety Analyser. The prototypes have been evaluated and this technology is expected to be transferred soon.

Laboratory for Polymer Analysis



Non-enzymatic Blood glucose measurement system

The goal of the programme, currently undertaken in collaboration with Vinvish Technologies, Trivandrum is to design simple, 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. The immediate objective is the demonstration of glucose measurement in fluids like blood using non-enzymatic method based on molecularly imprinted fluorescent polymeric hydrogel and functionalized gold nanoparticles. One of the chemical approaches depending upon the suitability for the application will be integrated with appropriate optics and electronic components to generate a prototype non-enzymatic glucose-measuring device.

Microbiology

RAPID Antibiotic sensitivity kit for urinary tract infection (UTI)

At present by classical clinical microbiology methods it takes 48 to 75 hours for UTI identification and antibiogram

which requires a microbiologist and an established microbiology laboratory.

The objective of the project is to develop a rapid diagnostic kit for UTI with antibiogram where the results will be available by 6 hours without sophisticated equipments and expert manpower. The kit is to be cheap and without the need for infrastructure and technical skills demanded of classical microbiological diagnosis for UTI. A prototype of the kit for rapid diagnosis for UTI has already been developed and 20 kits have been tested at Department of Microbiology, Hospital wing, SCTIMST.

Toxicology

In vitro pyrogen test kit for the evaluation of pyrogenicity using human whole blood assay is developed. This new development will be an ELISA method for pyrogen test 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. Validation part has been initiated.

Technology Transfer & Project Coordination

Technology Business Division



Technology Business Division facilitates active collaboration and interaction between the Institute and medical device industry in research, technology development and transfer. The division fosters the industry and intra-institutional linkages by facilitating instruments such as research agreements, non-disclosure and confidentiality agreements, material transfer agreements, MoU, technology transfer license agreements etc. The customer service cell coordinates all external and internal testing requirements for the accredited testing services offered by the BMT wing of the Institute.

Technology transfer agreements

The division co-ordinated the following technology transfers during the year:

1. Technology Transfer agreement was executed on 10th May 2011 with M/s IFGL Refractories Ltd, Kolkata for
 - a. Injectable calcium phosphate cement for dental applications
 - b. Bioactive composite ceramics for orthopedic applications
2. Technology transfer agreement was signed on 30th March 2012 with M/s HLL Lifecare Ltd, Trivandrum for hormone releasing intrauterine device. The technology transfer documents were also handed over to M/s HLL Lifecare Ltd.

Memorandum of Understanding (MoU)

During the year, the following Memorandum of Understanding (MOU) were signed:

1. MOU with M/s Lifecare Innovations Pvt Ltd on 11th Nov 2011 for collaboration in oral heparin.
2. MOU with Indian Institute for Information Technology and Management, Kerala, Trivandrum (IIITM-K) on 12th Dec 2011 for cooperation in the area of medical informatics.
3. Extension of MOU was signed in January 2012 with Agharkar Research Institute, Pune for evaluation of Actinokinase molecule.
4. MOU with M/s SIDD Life Sciences Pvt Ltd, Chennai on 6th March 2012 to set up a hub for development of cardiopulmonary devices.

Non disclosure / Confidentiality agreements / Material Transfer Agreements

Different instruments such as NDAs, MTAs etc were entered into with the following organizations for various projects:

- NTU, Singapore
- International Stem Cell Services Ltd, Bangalore
- Vins Bioproducts Ltd, Hyderabad

Industry interactions

Several industrial interactions for different projects at different levels were coordinated by the division, some of which includes interactions with the following industries:

- Reliance Lifesciences, Mumbai
- Kerala Livestock Development Board (KLDB), Trivandrum
- ISCSL, Bangalore
- Trivitron, Chennai
- CDAC, Trivandrum
- Vins Biotech, Hyderabad
- Manali Petrochemical Ltd, Chennai

Project co-ordination

As part of the monitoring of technology development and technology transfer activities, the following statutory committee meetings were convened and conducted during the year:

- The technology development committee (TDC) meeting was held on 6th and 7th April 2011.
- The Standing Internal Technology Transfer Committee met on 15th July 2011.

The 12th Internal Research Conclave, RESCON was conducted during 12th, 14th and 16th March 2012 to review all the research activities and projects by faculty of BMT wing.

The system for internal funding from the Technology Development Fund was coordinated with new projects being sanctioned during the year and 2 projects given extension.

The division co-ordinated the preparation of statutory reports to DST and other reports to DSIR etc.

Training programmes

A customised training program on medical devices was conducted for the Engineers from L&T IES Ltd, Mysore from 2nd May to 4th May 2011, which included a hospital wing orientation, as part of the Industry Institute Partnership Cell.

Personnel targets & self assessment system

The division was involved in evolving and developing a system for personnel targets and self-assessment for the academic staff of BMT Wing using a wiki based Conference software.

Meeting of the Minds-Brainstorming meetings with Industry Captains and Academia

As part of a DST sponsored project to develop recommendations for setting up a mission mode programme for medical instrumentation and devices development through Science and Technology, the Institute organised three brainstorming meetings with captains of medical device industry in India at Chennai, New Delhi and Mumbai during Aug to Sept 2011. A fourth meeting with innovators from industry and experts from academia and clinicians was held at Thiruvananthapuram on 29th Oct 2011 under the chairmanship of Dr M. S. Valiathan. A report titled "From Neglect to Nurturing" was submitted to the Department of Science and Technology.

Biomaterials and Biological Research & Development

Bioceramics Laboratory Pulsed laser coating of bioactive ceramic composite on Titanium bone implants

The present project aims at the development of state-of-the-art bioactive composite (calcium phosphosilicate) material coatings on titanium/Ti-alloy bone implants. The work plan includes the development of the coating through Pulsed Laser Deposition (PLD), optimization and characterization of the coatings and their functionality testing (biological as well as mechanical) in animals.

Synthesis of oxide based magnetic nanoparticles for biocompatibility studies, magnetic hyperthermia and MRI applications

In this project, the focus is on the synthesis of oxide based magnetic nanoparticles for biocompatibility studies, magnetic hyperthermia and MRI applications. In our study, size controlled formation of iron oxide (Fe_3O_4) has been synthesized by chemical methods. The stable iron oxide formation and appropriate temperature required for coating of this iron oxide with hydroxyapatite have been optimized. Also a new series of iron oxide embedded hydroxyapatite particles by an in-situ precipitation method was developed. Superparamagnetic hydroxyapatite composites with varying concentrations of iron oxide formation has been studied for biomedical application. The various percentage of iron oxide did not cause any phase changes in the formation of iron oxide embedded hydroxyapatite composite; hence it is an advantage for biomedical applications.

Biophotonics and Imaging Laboratory

Development of iron oxide nanoparticle probes for organ specific molecular MR imaging, under Dr.Jayasree R. S., has



been funded by Board of Research in Nuclear Sciences, DAE, Govt. of India.

Biosurface Technology

Metallic bhasma preparations are highly efficient in Ayurvedic treatments. Uptake of these particles can occur not only



via micro-fold (M)-cells, the highly specialized epithelial cells in the Peyer's patches and isolated follicles of the gut associated lymphoid tissue (GALT), but also across the

apical membrane of enterocytes. Therefore, compatibility of these preparations with blood is an extremely important factor when these particles are absorbed into the blood

stream. The in vitro biological evaluation of bhasma preparations are needed along with their physicochemical characterization and clinical evaluation to meet the criteria that supports their use worldwide. Therefore, attempt has been made to standardize the methods of physicochemical characterizations and blood compatibility/biological evaluation of bhasma preparations. Two batches each of gold, zinc and mercury bhasma preparations namely Swarna bhasma, Naga parpam and Rasa chenduram were studied.

Bovine serum albumin capped fluorescent gold clusters were demonstrated as nanosensors for Cu²⁺ ions. Results on the quenching of the fluorescence by addition of Cu²⁺ ions and recovering the fluorescence by addition of glycine were reported. The fluorescent probe was found to be useful to sense the free copper ions in live cells up to a concentration of 50 μ M. The fluorescent probe can be used for cancer cell imaging and targeted drug delivery applications.

A nanoceramic matrix from a combination of calcium phosphate, zinc phosphate and magnesium phosphate was developed. The matrix was prepared along with chitin nanofibres which help in the nucleation of the mineral phase. The matrix developed was having pores in the range of 100 to 200 microns. Cell proliferation studies (osteoblast like cells, MG63 and HepG2 cells) were studied along with growth factor loaded matrix. An increased collagen production as well as alkaline phosphatase activity was demonstrated with the growth factor (BMP 2) loaded nanomatrix. Compressive strength was also similar for all matrices, which were comparable to various ones reported in literature for bone tissue engineering. SEM micrograph has shown irregular pores in the range of 100 to 200 microns. 1:1:1 matrix and the physiological ratio of 1:0.1:0.5 matrix exhibited elevated alkaline phosphatase activity, which is a strong indication of mineralization. 1:1:1 matrix showed good MG63 cell proliferation. Studies on the degradation of the matrices and pore volume Vs cell proliferation are progressing.

Development of nanodevices for DNA delivery and cell transfection using Elastin Like Polymers coupled to cell interaction motifs

The objective of this programme is to synthesize appropriate elastin like polymers for gene delivery applications by means of genetic engineering using bacteria. Elastin like polymers thus synthesized will be developed as nanodevices for DNA delivery and cell transfection using cell interaction

motifs. Four ELP polymers synthesized by Spanish group were received and its hemocompatibility and efficacy of these recombinant polymers for intracellular gene delivery were studied in various cell lines using reporter genes. Though the polymers exhibited good hemocompatibility and DNA complexation, the transfection efficiency was not high enough. On discussion between the two groups new ELP's are designed and the development of new ELP is progressing.

Facility for nano/microparticles for Advanced Drug Delivery systems

The fundamental requirement in in vitro- in vivo correlation of drug delivery systems is the understanding of gastrointestinal permeability of the drug. The correlation of insulin permeability and its efficacy on diabetic rats were established. Similarly, heparin nanoparticles have been developed and standardized for its oral delivery. PLGA nanoparticles based growth factor (VEGF) delivery system at the site of rabbit ear demonstrated qualitative changes in angiogenesis compared to the controls. The significant effect of bFGF on cell proliferation and collagen synthesis was demonstrated on chitosan sponges in vitro. On rabbit experiments the extent of re epithelialisation was similar for chitosan sponge with cells and without cells. Although the epithelialisation was similar, studies related to cell cultured chitosan sponge are relevant since the final application is for burn cases. Keratinocyte cell culturing has been shown to reduce collagen production. Therefore an attempt has been made for co culture of keratinocyte cells with fibroblast cells.

Dental Products lab

Toxicological evaluation of a new dental restorative composite containing `Diphenyl [2,4,6-trimethyl benzoyl] phosphine oxide [TPO] as photoinitiator

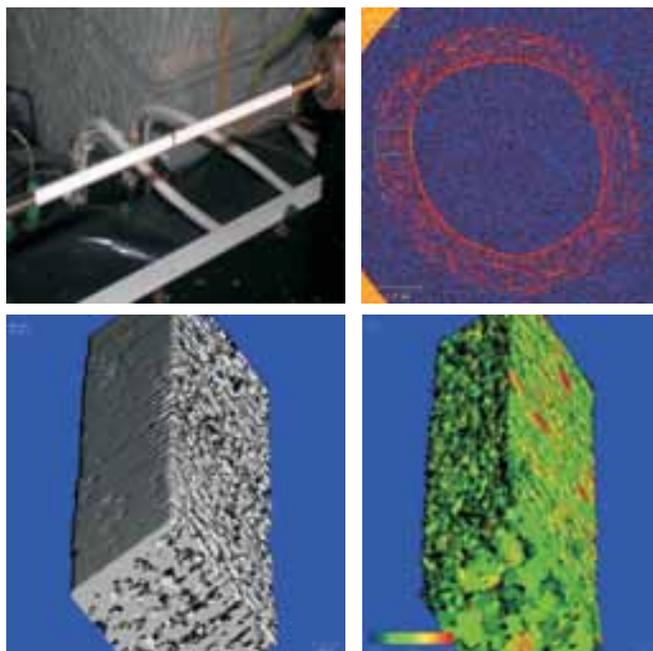
TPO is preferred over camphorquinone (CQ) as photoinitiator in dental composite curing due to its colourless nature, lower cost and good efficiency; only drawback being that it needs a light source between 390-410 nm to generate free radicals. We had already completed the evaluation of physicochemical properties and cytotoxicity studies of the TPO based dental composites last year. This year the toxicological evaluation was taken up in a TDF project. Samples for acute systemic toxicity test, intracutaneous irritation test, subcutaneous implantation test and sensitization test were prepared as per ISO 10993 standards and toxicological studies are in progress. The composite has already cleared the intracutaneous irritation test. The pulp and dentine test

has been planned to be carried out during the next 6 months in large animals.

Development of smart dental composites consisting of calcium containing resins and fillers

Our objective is to develop visible light cure smart restorative composites based on calcium containing inorganic-organic hybrid resins with high refractive index and fillers like, calcium hydroxide, zirconium oxide, calcium carbonate, tricalcium silicate/calcium chloride, hydroxyapatite and/or silica along with conventional fillers such as silanated quartz/ radiopaque glass which can enhance dental remineralization by releasing calcium and phosphate ions depending on the pH of the surroundings which controls dental decay.

Tissue engineered small diameter vascular graft (TEVG) fabrication & evaluation



Electrospinning of double layered small diameter vascular graft and micro CT pictures of the same showing different porous nature of the layers

97 polymer scaffolds (21 electrospun, 33 solvent cast and 43 double layered) were fabricated and supplied to TRU for biological modification during the last year.

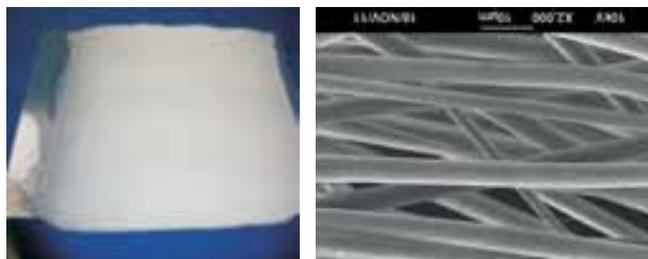
In vivo studies are in progress with novel double layered biologically modified scaffold material. Already 10 animals have been implanted during 2011-12 with the graft. More studies are in progress.

Development of bioactive bone cements based on organically modified ceramic resin

Objective is to develop potentially bioactive cement capable of strengthening the mechanical retention of the implant by allowing direct bone apposition. Novel calcium, barium and zirconium containing inorganic-organic resins were synthesised which were used as precursors for bone cement. Various parameters were optimised. Synthesis conditions for copolymers of poly methyl methacrylate (PMMA-co-PS) and hydroxyl apatite (HAP) were standardised.

Development of hemostatic scaffold using biodegradable polymer and biomimetic extracellular matrix components for healing of chronic dermal wounds

Synthesis and characterization of 6 batches of PLGC (polylactide-co-glycolide-co-caprolactone) terpolymer was completed. Formulation is undergoing optimization, while fabrication conditions of scaffold using Electrospinning were optimized. Evaluation of electrospun scaffold and in-vitro hydrolytic degradation studies are ongoing. Cytotoxicity evaluation was completed and found non-cytotoxic. Cytocompatibility study using fibroblast cells for 7 & 30 days was completed.



Electrospun sheet of PLGC terpolymer and its SEM image showing the fibres

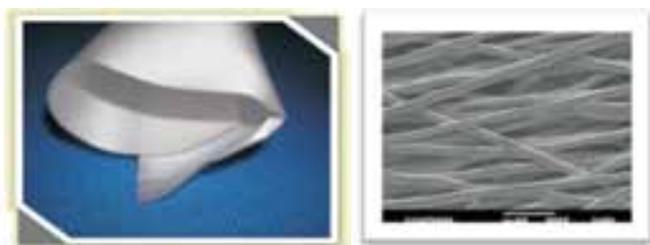
Quantum dots for cardio-vascular applications

CdSe/ZnS core/shell synthesis and their physicochemical characterization- at different concentrations- optical, structural, chemical and surface characterization (TEM, XRD, UV, PL, IR, Raman, EDAX, DLS) were carried out during the year. Effect of purification (dialysis), surface modification (biological) and aging on the properties of the core/shell- Luminescence and DLS technique were studied. Cytotoxicity Evaluation using different cell lines (L-929 and HUVEC) – MTT assay, both morphological and Flow Cytometry studies showed that the Core shell had better cytocompatible compared to bare quantum dots. Drug (Urokinase) binding to core/shell using a cross-linker was carried out. Drug/core-shell characterization using absorption and luminescence were performed and drug estimation was done using Lowry's method and UV spectrometry.

Bioengineered hybrid skin substitutes for burn wounds

Synthesized five batches of poly(l-lactide-co-glycolide-co-caprolactone)-PLGC Physico-analytical characterization of PLGC so synthesized were carried out using spectroscopic and thermogravimetric methods. NMR data provided information about the monomer ratios present in the polymer. Electrospinning of the polymer so obtained provided very fine sheets which are being subjected to biological modifications. Degradation study of electrospun scaffold was conducted for the periods 7, 21 and 45 days. Studied on morphological and mechanical characterization of scaffold before and after degradation.

Discussions were held with the experts from Burns Unit in Jubilee Mission hospital in Trichur and Amrita Institute, Kochi.



Electrospun terpolymer sheets for hybrid skin substitutes prepared at DPL

Development of organically modified ceramic based dental composites

Pulp and Dentine test was carried out on 3 dog models. 8 indigenously developed composite samples (test) samples and 4 negative control (glass ionomer cement) samples were used to restore teeth on each dog. The restorations will be subjected to histopathological studies after 7 days, 28 days and 70 days.



Hydrogel scaffold developed at DPL



Small diameter vascular graft with optimum porosity developed in DPL

Studies on polyurethane based dental composites

Novel urethane dimethacrylate based dental composites were prepared in the lab and properties evaluated. Characterization of UDMA using FTIR, FT Raman and UV Spectrophotometer was carried out. Determination of mechanical properties like depth of cure, diametral tensile strength, compressive strength and flexural strength of the prepared dental composite completed after varying diluent concentration from 20 parts to 60 parts; optimum concentration finalized. Studies on the effect of varying concentrations of combination of resin matrices Bis-GMA and UDMA in dental composites was also carried out.

Histopathology Laboratory



Medical device retrieval programme

The objective of the study is to examine failed medical devices, which are removed from the patient at revision surgery. The examination will include investigations of the surface and bulk physical properties of the retrieved components of the device with advanced techniques and carry out detailed study of the adjoining tissue using microscopy, immuno histochemistry and techniques in molecular biology. Cells, cytokines, signaling molecules and modulatory niche involved in determining the end fate of the implant within the host will be studied. The data obtained will help in creating a source of information, both biological and material, on behaviour of materials in the physiological environment of the human body and how tissues respond over a period of time. This information will help the industry in the development and manufacture of improved medical devices and will help clinicians to devise strategies to prevent adverse tissue responses leading to clinical failure.

Colour atlas of tissue response to biomaterials

Biomaterials for medical devices are evaluated by structured programmes following International standards. Material scientists and medical device companies get their materials evaluated by agencies specific for the purpose. The field of biomaterial science being interdisciplinary, young researchers, entering this field need to know

the response of tissue to materials placed in vivo. The histological evaluation of cells and tissue around implanted biomaterials is important. Researchers and students need help in identifying the various changes occurring in the tissues. A self-help atlas of photomicrographs with detailed explanations would be very useful and provide important information. The Histopathology laboratory in Sree Chitra Tirunal Institute of Medical Sciences and Technology is dedicated to the study of tissue response to materials for purpose of evaluation of biocompatibility and pre-clinical evaluation of medical devices. The laboratory has valuable material for the preparation of an Atlas, the first of its kind in the world.

Transmission Electron Microscopy laboratory

Bioconjugation of nanomaterials and their applications in cancer therapy

Major challenge in cancer diagnosis is to determine the cancer biomarkers to detect tumour at an early stage without affecting the normal surrounding cells. Metal particles like gold nanoparticles for skin cancers & photo thermal therapy; gold nanorods for deep-seated cancers, semiconductor nanomaterials (Quantum dots) conjugated with specific antibodies for the early detection of cancer and imaging are few such applications addressed in the project.

The principal aim of the study was to develop

nanobioconjugates for cancer cell diagnosis and therapeutics using in vitro and in vivo models.

Salient features

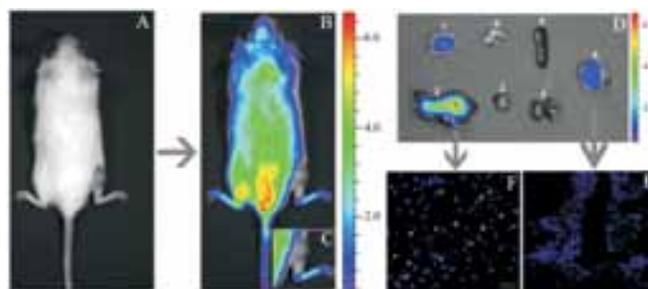
- Efficient for cellular imaging applications
- Internalization efficiency of CdSe-Silica 640 QDs are very high
- In vivo cancer targeted imaging results showed the tumor targeting efficiency of CdSe-Silica 640 QD probes in solid tumor developed mice
- In vivo early cancer diagnosis results showed the high targeting efficiency CdSe-Silica 640 QD probes in skin cancer developed initial stage mice.

Tissue Culture

Development and feasibility study of polymeric scaffolds for tissue culture under microgravity

Microgravity or weightlessness is a state attained when the acceleration due to gravity has negligible effect. This issue can be studied with the concept of tissue culture under microgravity as an in vitro model using bioreactors capable of simulating microgravity. This project aims at

developing a suitable hydrogel scaffold, which can be used in tissue culture under normal conditions as well as under microgravity.



Photograph of A-solid tumor bearing mice, B-whole body imaging of mice after 4 h of injection, C-inset showing tumor area, D-Ex vivo imaging of mice organs: 1) Liver, 2) Heart, 3) Kidney, 4) Solid tumor, 5) Spleen, 6) Lungs and 7) Brain, CLSM micrograph of the cryosection of (E) the solid tumor site and (F) the liver.

The weak fluorescence signal from the liver (marked with white arrows) is due to the distribution of QDs, whereas no evidence for the localization of QDs in tumor site. Nuclei were counterstained (blue fluorescence) with DAPI.

Polymer Division



Dispensable and biodegradable polymeric bone cement for minimally invasive treatment of bone diseases – product validation

In the present project, the newly developed candidate bone

cement will be evaluated and validated as per standard protocols for safety and efficacy for the treatment of spinal lesions, vertebral haemangioma and spinal compression fractures. The biomechanical stability and biomechanically

induced degradation will be evaluated to assess the efficacy and functional performance of the bone cement-loaded vertebral disc. Safety tests will be carried out with the newly developed candidate bone cement. The blood

compatibility will be evaluated. The most promising bone cement formulation will be identified for clinical trials and limited clinical trials will be carried out. The technology package will be developed for technology transfer.

Polymer Processing



Development of a Dura Substitute by Electrospinning of ϵ -Caprolactone-Co- Lactide

The main objective is to develop innovative porous polymer scaffold materials with tailored properties and to explore the interaction mechanisms at nanoscale between the cells and porous membranes/scaffolds. It is also envisaged to design nano-fibrous structures that could slowly degrade over a period of time. Thus the current project could lead to the development of an ideal dural substitute for neurosurgery applications. The major works carried out in the project during the current year are:

- The electrospun mats of polycaprolactone blended with caprolactone-co-lactide polymers were prepared and evaluated for the various mechanical properties.
- Cytotoxicity evaluation of the fibrous mats was carried out and found that they were non-cytotoxic.

Pre-clinical evaluation of fluoropassivated and hydrogel sealed vascular graft

The objective of the project is to evaluate a fluoropolymer coated hydrogel sealed vascular graft by analytical,

mechanical and biological techniques so that its suitability can be assessed for clinical applications. Polyvinylidene fluoride was deposited onto the polyester vascular graft by dip coating. A hydrogel forming material, prepared from alginate dialdehyde and gelatin, was spray coated onto the external surface of the graft. SEM image of the coated graft is shown below. Coated grafts were subjected to various performance tests as per the international standard, ISO 7198. Performance tests such as water permeability, burst strength, longitudinal tensile strength, circumferential tensile strength, etc. were conducted for grafts of different sizes. Water permeability of the coated graft was optimized to a level $\leq 5\text{ml/min/cm}^2$. Various mandatory in vitro and in vivo biological tests were completed successfully and the graft is made ready for preclinical evaluation in pigs.

Development of Mandibular Advancement Device for the Treatment of Obstructive Sleep Apnea

This project is aimed to design, fabricate and evaluate prototype models of oral mandibular advancement device for the treatment of obstructive sleep apnea. A detailed

literature survey of various national and international patents on sleep apnea devices was carried out. A procedure to construct a 3D model of a real time object was developed. It is planned to develop devices with silicone rubber as this material is expected to provide better patient comfort than devices made of other plastic materials. So a number of silicone rubber formulations were developed and tested to get appropriate hardness levels for the device.

Toxicology



Molecular and immunotoxicological effects of Dextran coated Ferrite and Hydroxylapitite nanomaterials

The objective of this project is to evaluate the molecular and immuno-toxicological effects of Dextran coated Ferrite and Hydroxyapatite nanomaterials. This will lead to the development of safe nanomaterials which can be used in targeted drug delivery for minimizing adverse reactions; e.g., the use of hyperthermia of cancer cells and magnetic properties of ferrite for targeted delivery of drugs in cancer therapy. The following activities were completed during the year.

In Vitro studies (two materials)

- In vitro cell culture cytotoxicity test
- DNA Analysis (Genomic and mtDNA)
- Analysis of 8OHdG
- Lipid peroxidation
- Estimation of antioxidant enzymes

Laboratory for Polymer Analysis

Visible light induced insitu gelling multifunctional hydrogels as potential wound dressings

The aim of the project is to develop new wound dressing formulations having multiple abilities like fluid absorption, antibacterial effect, biocompatibility are easily removable from the wound site without causing any trauma to the patients.

In vivo studies

- 28 days repeated dose dermal toxicity (1 material)
- Delayed hypersensitivity by guinea pig maximization test

In Vitro alternative test system development for Ocular Irritation (ICMR)

The objective of this project is, to develop an in vitro test system for acute and sub-acute ocular irritation, which will be suitable for evaluating biomaterials, medical devices, pharmaceuticals, cosmetics and chemicals. The outcome of the proposal will be a more comprehensive assay for acute and sub acute ocular irritation tests, which will be cost effective and readily available to the various segments of health care industry and a total replacement of animal experimentation. The following activities were completed during the year:-

- Development of organo typic culture
- Standardization of corneal cell culture for in vitro test

Development of National GLP Guidelines & Identification and selection of National Regulatory Guidelines for Testing and Evaluation of Medical Devices (National GLP Compliance Monitoring Authority, Dept. of Science and Technology, New Delhi)

The objective of the project proposal is to develop an appropriate National Guideline for GLP compliance and regulatory guidelines for testing and evaluation of medical devices in India, which conform to current global practices. The following activities were completed during the year.

- 12 documents prepared and is in final draft stage.
- One vertical and 1 horizontal standards prepared
- First National Steering Committee held at SCTIMST and evaluated the draft documents on 2nd March, 2012.

Evaluation of Interleukin 1 β levels from human lymphocytes in response to pyrogens (MPhil research work)

The objective of the present study is to detect the Interleukin-1 β levels from single and pooled human lymphocytes in response to gram negative and gram positive pyrogens. The study was carried out to evaluate the role of pyrogens in inducing inflammatory response, from human lymphocytes (O Positive, A Positive, B Positive and AB Positive donors). Lymphocytes isolated from blood of healthy individuals were challenged with 5EU of gram negative (LPS) and 1 μ g /ml of gram positive pyrogens (LTA) in vitro and the inflammatory cytokine, Interleukin 1 β (IL-1 β) release was measured by Sandwich ELISA method. The results suggests that the IL-1 β release is concentration dependent; i.e., when the cell numbers are greater, there is more release of Interleukin 1 β . Furthermore, the release of IL-1 β increases immediately after the initiation of incubation and reaches a maximum at 4 to 6th hour and then stabilizes for both the pyrogens. Based on the results obtained, it can be concluded that the isolated lymphocyte system can be used as an alternative test system to the in vivo rabbit pyrogen assay.

Evaluation of molecular toxicity of newly developed materials intended for biomedical applications'. Indian Council of Medical Research (ICMR), New Delhi

The objective of the project is to evaluate the molecular level toxicity of the six newly developed materials and their chemical leachants on mtDNA, antioxidant enzymes, lipid peroxidation and cytogenetic effects. The results of the study shows, that the physical presence of the material or chemical leachants of the material did not induce any toxic effects at the molecular level and established that all the

material used were safe. Hence it can be concluded that the evaluation of toxicity at the molecular level is a cardinal change in approach to biocompatibility evaluations leading to a paradigm shift in bringing in newer regulations for development of safer medical devices, implants and tissue engineered organs for life time application.

Thrombosis Lab

In vitro and preclinical evaluation of curcumin released from biodegradable drug carriers

Objective: Develop proteinous carrier for curcumin for cancer therapy

Progress during last year: Loading of curcumin with fibrin was standardized. Loading efficiency of curcumin with fibrin was determined and release profile from fibrin sheet was evaluated. Curcumin-loaded fibrin sheet induced significant death of cells; A549 lung carcinoma cell lines within 24h of contact which is equivalent to \sim 10 μ M curcumin in the medium.

To study the role of platelet proteins on the endothelial cells and smooth muscle cells proliferation

Objective: To identify the differently expressed platelet protein in diabetic/hypertensive (high risk) groups and to study effect of few of these proteins on EC and SMC proliferation.

Results of this study have shown remarkable difference between the protein profile of high risk group when compared to control. Protein profile of these two groups (diabetes and hypertensive) also showed difference in the expression. Cell culture studies are initiated to identify if these differently expressed proteins influence cell proliferation.

Quantum Dots (QDs) as Drug Carriers for Cardiovascular Disease

Objective: To test the cytocompatibility of quantum dots (QDs) and their efficacy in clot lysis after conjugation with a fibrinolytic drug.

Different batches of QDs were tested for cyto-compatibility on ECs; based on the results the synthesis parameters were optimized to obtain non cytotoxic QDs. It was found that PEG coated QDs are best for the cells and were used for further studies. The best cytocompatible one is chosen for conjugating urokinase for the clot-lyse assay. Preliminary data suggested that the urokinase conjugated to QD induced clot lysis.

Coronary artery diseases in the young

Objective: To estimate the non-conventional risk factors – thrombotic risk factors, and activated platelets in young CAD patients

Platelet activation and clottable fibrinogen was studied

in 30 test and 10 control subjects in TRU. Very high level of fibrinogen was observed in the patients when compared to control. Percentage of activated platelets was also very high in CAD patients as compared to healthy subjects. Study is ongoing to estimate the level of other prothrombotic factors.

Tissue Engineering & Biological Research

Device Testing Lab

Bioreactor Development

Three programs for development of suitable bioreactors (in collaboration with the divisions of Thrombosis Research, Tissue culture and Tissue Engineering & Regenerative Technologies) for cartilage tissue, liver cells and vascular tissue engineering applications have been taken up. The systems have been developed and the validation studies on these bioreactors have been completed.

Microbiology

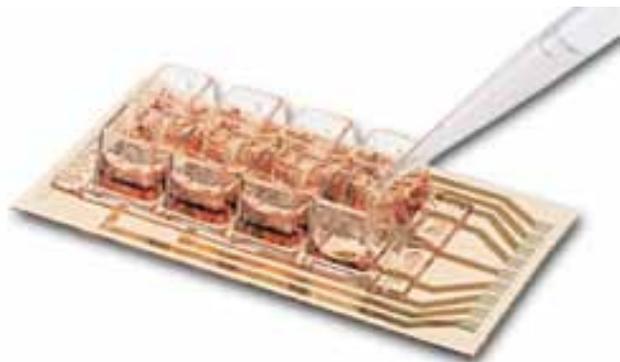


Epithelial-mesenchymal interactions in tissue engineered hybrid artificial lung: role of angiogenic factors

Current limitations of monolayer cell-culture hinder progress in understanding the features and dynamics of heterotypic cell communication pathways critical for the development of more sophisticated or efficient tissue engineered devices. This is important as cell-cell communication and biochemical cross-talk have been shown to be essential for the maintenance of differentiated cell functions in tissues and organs, and in FP this cross talk has turned aberrant promoting chronic fibrosis.

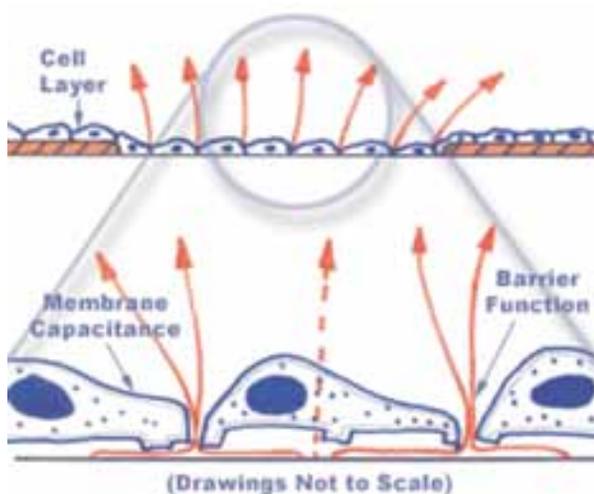
Alveolar epithelium is composed of two specialized cells – the Type I pneumocyte, which is squamous epithelial cell and the Type II pneumocyte, which are the surfactant producing cuboidal cells and also progenitor cells for Type I. But Type II cells lose their specific properties by 5 -10 days of culture. So to have a functional in vitro system, this tendency should be controlled and a system, which will maintain specific characters for prolonged periods of culture. For this, porous Gelatin-vinyl-acetate (GeVac scaffold) was chosen and interactions of alveolar Type II cells and fibroblast are being studied with their influence on surfactant synthesis. At the same time, Bleomycin, a

known agent causing lung fibrosis in vivo is being used to study its effect using the electrical cell impedance ECIS system. A clear understanding of the epithelial/mesenchymal interactions will help in understanding alveolar fibrosis and IPF and help in devising better treatment modalities so that such patients have a better chance of survival.



ECIS multi-well for seeding cells and culture to study effect of drugs etc using the ECIS system

The ECIS system was used to study the effect of Bleomycin on co-culture of alveolar epithelial and fibroblast cells



With cells attached and spread upon this region, the current must now flow in the spaces under and between the cells, as cell membranes are essentially insulators

Molecular medicine



Role of Transformation growth factor-alpha in neuronal growth and regeneration

Regenerating damaged neurons is a challenging area mainly because of the post mitotic nature of the cell as well as the complex signaling pathways required for

developing functional connection between neurons. Various approaches have been tried like growth factors and scaffolds as guiding molecules for the damaged neurons to recover. However, the success of these approaches has been limited. We have developed a recombinant transformation growth factor (TGF) alpha protein, which

was found to induce cellular growth, including neurons. There are recent reports that TGF-alpha induces growth of inhibitory neurons, especially the dopaminergic neurons. However it is not clear whether the neurons, which are growing under these stimulatory conditions, have the same cellular architecture for growth cone formation and axonal growth as in normal cells. This study will be analysing the actively growing neurons on transport of synaptic vesicles to the axonal terminal and the microtubule dynamics: phosphorylation dephosphorylation cycles of actin and tubulin. It is essential to understand the variations in cellular architecture to predict the success of functionally active neuroregeneration. This study aims to answer these fundamental questions.

Tissue Culture Laboratory



Differentiation of foetal progenitor cells and fabrication of a prototype of bioreactor for bioartificial liver

Liver disease is a serious health problem affecting millions of patients all over the world. Due to the shortage of donor organs for liver transplantation, alternate methods using stem cells are looked into. The project intends to fabricate and evaluate the indigenously developed prototype bioreactor for bioartificial liver (BAL). Primary hepatocytes are the best cell source identified for cell based therapy in liver regeneration. Mature hepatocytes have the limitation of low proliferation and reduced differentiated function in vitro. Hence alternate primary stem cell sources (both embryonic and adult) were considered to overcome these challenges. The initial

Evaluation of functional efficacy of recombinant TGF alpha and VEGF proteins

Objectives:

- MALDI-TOFF for sequence confirmation of TGF alpha and VEGF.
- Assay the efficacy of recombinant TGF alpha and VEGF with that of commercially available ones.
- Measure the activity units of the enzymes for functional comparison.
- Develop HUVAC cell culture assay for VEGF.

screening of fiber assembly components for BAL were evaluated for cytotoxicity and cell adhesion. Cell lines were used to evaluate the efficacy of the prototype. Many batches of prototypes were fabricated and evaluated for the performance by in vitro culture methods. Both cell lines and primary isolated hepatocytes were considered for the evaluation. Primary cells were cultured to verify the performance of the bioreactor. It was observed that the bioreactor inoculated with hepatocytes effectively maintains liver specific functions such as protein synthesis, detoxification etc. Since the ethical clearance for collecting discarded nonviable human fetus liver is ongoing, alternate stem cell source were also identified and studied. Rat bone marrow mesenchymal stem cells were selected as progenitor source. The procedure for standardization

of differentiation conditions of MSC to hepatocytes is ongoing. More stem cell sources are being screened for the present study.

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

The common mode of treatment of corneal endothelial failure has been via corneal transplantation wherein the whole donor cornea is used to replace the damaged corneal endothelial layer. A new paradigm shift in the field is the evolvement of the technique of endothelial keratoplasty, which involves the surgical replacement of only the diseased endothelial corneal layer. However both modes of treatment require a donor cornea. To make up for the inadequate supply of donor corneas, the use of in vitro cultured corneal endothelial cells, as an alternate therapeutic option is being studied. The use of amniotic membrane, collagen and gelatin membranes as carriers for transplantation pose the risk of contamination and affecting corneal transparency, hence the present project proposes to generate carrier free corneal endothelial cell sheets via the use of an in-house developed thermo-responsive polymer. The project has been initiated using animal corneal endothelial cells. To this end, initial standardization of cell isolation techniques, in vitro culture conditions and characterization of cells is being conducted. Culture and retrieval of the corneal endothelial cells is being standardized.

Cell Sheet Engineering on Electrospun Scaffolds for Efficient Cell Supply in Skin Tissue Engineering

Skin tissue engineering represents one of the most successful clinical applications of regenerative medicine. Certain technical and functional restrictions like fragility, contraction, handling and in vitro manipulation time still remain as limitations to this approach. Efficient cell supply to a three-dimensional matrix known as scaffold and from scaffold to host tissue after implantation are critical parameters. The proposed project aims to develop a biosynthetic product using polymeric matrix and skin cells. Skin cells cultured on thermoresponsive surface enable harvest as monolayer and transfer to polymer scaffold is expected in improved cell supply.

Transmission Electron Microscopy

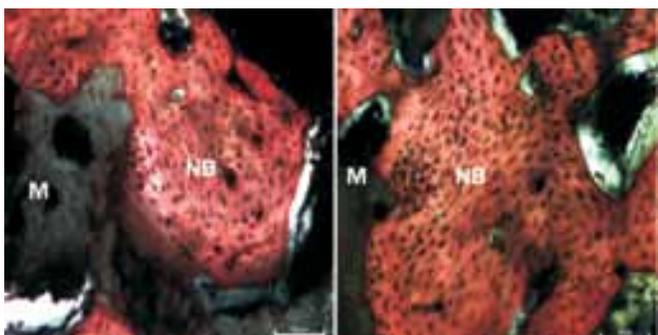
Bone tissue engineering using adipose stromal cells on 3D porous bioactive ceramic scaffolds

Repair of critical sized segmental bone defects caused by severe trauma; resection of tumours, and congenital

deformity remains a big challenge to orthopaedic surgeons. Autologous bone grafts are usually limited by considerable donor site morbidity and less availability. Strontium calcium phosphate (SrCaPO₄) is applicable in cases of trauma & tumours in Orthopaedic Surgery because of its relevance in radio-opacity in view of easy clinical and radiographical evaluation. Besides, strontium has also been reported to play a special role in bone remodelling and formation of de novo bone. Again, using differentiated adipose derived stem cells (AdMSCs) in conjunction with SrCaPO₄ takes a step forward in the bone healing process.



1, 3 & 6 months post-implanted samples depicted new bone formation in par with material degradation. Immature woven bone and slow degradation of material was found in one month post implantation studies. Mature lamellar bone establishing osteointegration was observed in 3 months post implantation studies. Six months post-implanted samples depicted mature mineralized lamellar bone establishing osteointegration and ensuring stability of the implant.



Cell based tissue engineered fabrication of osteochondral constructs

Articular cartilage may be damaged by trauma or disease processes. For both full-thickness and partial-thickness defects, repair tissue fails to recreate a fully functional articular surface. The avascular and low cellularity of articular cartilage may stand in the way of effective repair. In particular, cells with chondrogenic potential may fail to be recruited to the site of injury in sufficient numbers. For these reasons, there is considerable interest in developing cell therapies to treat damaged cartilage.

Thrombosis Research Unit



Tissue Engineered Small Diameter Vascular Graft (TEVG): Fabrication & Evaluation

Objective: Standardization of Vascular Tissue Engineering Technology

Silver nanoparticles (SNP) were found to inhibit platelet activation, secretion, aggregation and adhesion. SNP-incorporated polycaprolactone (PCL) scaffold was demonstrated to be nonthrombogenic. Platelet adhesion to virgin PCL and SNP-PCL are demonstrated by scanning electron microscopy of both after exposure to platelet rich plasma (PRP) (Fig.23 A &B).

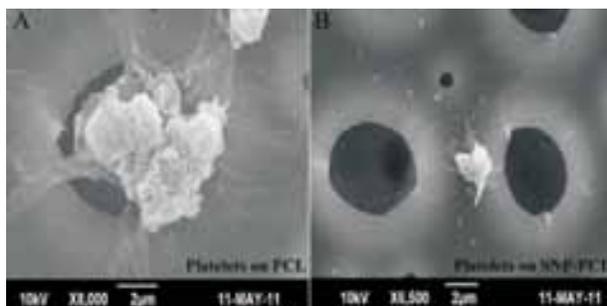


Fig.23. Micrographs demonstrating reduced platelet adhesion to SNP-PCL scaffold from PRP; A, platelets on virgin PCL; B, platelets on SNP PCL.

The in vitro construction of TEVG with endothelial cells (EC) and smooth muscle cells (SMC) on 4 mm diameter PCL conduit was standardized. Objective was to seed the EC in the lumen and SMC in the albumen of the conduit and to culture cells under dynamic medium flow using a bioreactor, to produce a functional vessel with stabilized cell. Between 4 to 7 days of culture was found to be sufficient to align the EC towards the direction of medium flow (Fig 24A) and the SMC (Fig 24B) across the direction of flow; which indicates generation of contractile phenotype of the SMC after dynamic culture.

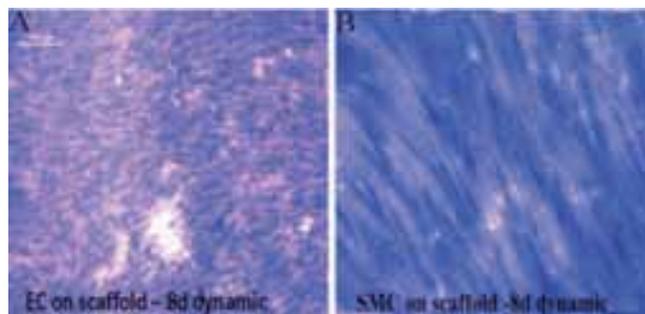


Fig 24 Micrographs showing alignment of cells in TEVG due to shear stress; A, EC in the lumen aligned to the direction of flow; B, SMC aligned perpendicular to the direction of flow.

The EC released NO into the medium indicate non thrombogenic phenotype of EC. Communication from EC to SMC was confirmed by the generation of NO-induced cGMP during dynamic in vitro culture of the construct. Thus functional tissue engineered vascular graft (TEVG) construction is standardized using EC and SMC obtained by differentiating circulating adult progenitor cells.

Development of hemostatic scaffold using biodegradable polymer and bio mimetic extra cellular matrix for healing of chronic dermal wounds

Objective: Skin tissue engineering for diabetic wounds.

Progress during last year: The biodegradable electrospun scaffold, developed by Co-PI at DPL was modified by hybridizing with fibrin. The hybrid scaffold was seeded with dermal fibroblast and showed that the cells proliferate and connect electrospun fibers of scaffold (Fig 25 A&B).

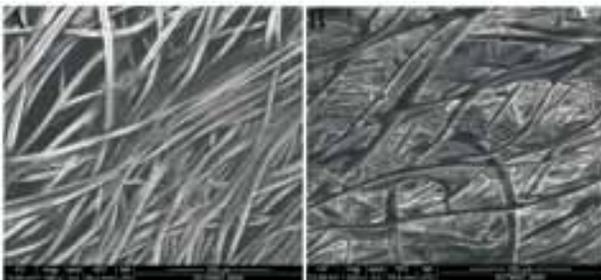


Fig. 25. Micrographs showing cell sheet formation on hybrid scaffold seeded with fibroblasts; A, Cell-grown bare PGLC electrospun scaffold; B, Cell-grown PGLC-fibrin hybrid scaffold. Fibroblasts grown on hybrid scaffold deposited both collagen (Fig 26 A&B) and elastin indicating the skin tissue generation on the modified scaffold. Engineered tissue constructs are ready for testing in diabetic rabbit models.

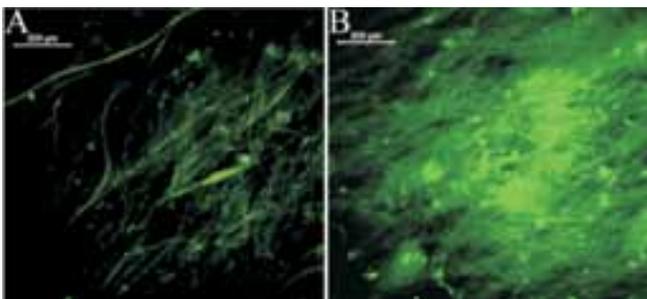


Fig. 26. Immunofluorescent micrographs showing collagen deposition on cell grown & decellularized scaffolds; A, bare PLGC scaffold; B, decellularized PLGC-fibrin scaffold

Bioengineered hybrid skin substitute for burn wounds
Objective: Skin tissue engineering for burn wounds using biodegradable scaffold and ADMSC.

Progress during the last year: With the development of a biodegradable scaffold, we attempted to differentiate adipose derived mesenchymal stem cells (ADMSC) into dermal fibroblast using biomimetic matrix directed strategy using cells grown on tissue culture polystyrene as control. The differentiation of ADMSC into fibroblast is proven by the expression studies using RT-PCR for differentiation markers; fibrillin (Fig27A) fibroblast specific protein (FSP) (Fig 27B) and qPCR for collagen and elastin expression in the differentiated fibroblasts (Fig. 27C).

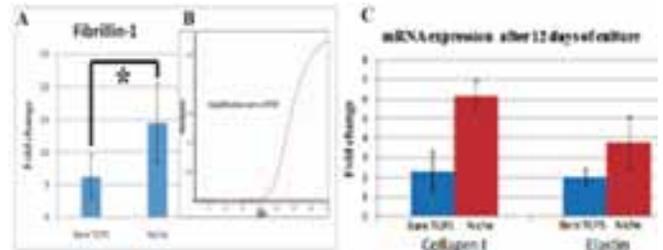


Fig. 27. Data showing expression of fibroblast marker; a difference in fibrillin expression between control and test; B, amplification curve of FSP; C, difference in expression of collagen between control and test.

Deposition of collagen (fig 28A) and elastin (fig 28B) by fibroblasts differentiated from human ADMSC was demonstrated by immunochemical staining of the decellularized culture surface. Use of biomimetic matrix as in vitro niche is found to be a good strategy for generating dermal tissue using adult autologous ADMSC.

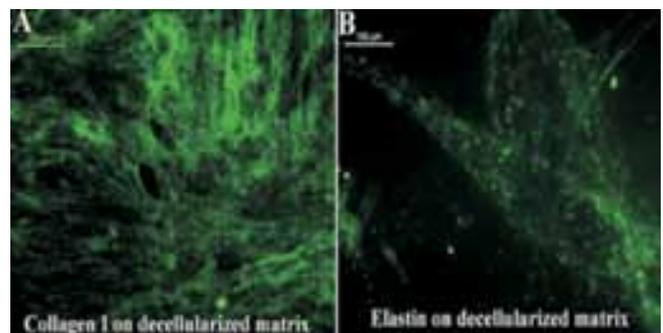


Fig. 28 Immunofluorescent micrographs showing deposition of collagen and elastin after ADMSC culture on biomimetic niche. A, collagen; B, elastin.

Development of neurons from adult stem cells for the application of regenerative medicine

Objective: Differentiation of circulating neural progenitor cells (NPC) to neuron for regenerative application

Progress made during last year: For differentiation of circulating NPC to neurons and for their long term survival, specific niche with different compositions were experimented. Presence of various important growth factors such as fibroblast growth factor-2 (FGF-2), brain-derived neural factor (BDNF) and vascular endothelial growth factor (VEGF) were verified using Western blot analysis of bovine hypothalamus extract (HE) and human platelet releasate (PR) which are used as components of biomimetic matrix. Dose response of BHE and PR on NPC was tested and identified optimum concentration of both

for getting differentiated neurons that expressed specific differentiation markers. It was found that the designed niche directed NPC differentiation to neuron-like cells (Fig 29A); but when all-trans retinoic acid (RA) was also added to the medium, glial cells were seen more frequently (Fig 29B).

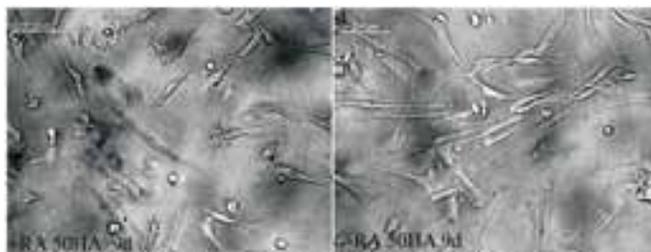


Fig. 29. Neurons derived from NPC by culture of peripheral blood mononuclear cell on a specifically designed biomimetic niche; A, cells on matrix+RA; B, cells on matrix without RA.

Tissue Engineering & Regeneration Technologies



Program support for a Lead program on Centre of excellence in Tissue engineering (COE) program of the Department of Biotechnology (DBT), Govt of India

This program apart from the Lead program initially comprised the support to 4 projects for the initial 3 year period. Project completion report for first phase (3 years) of DBT COE program support for Tissue Engineering was defended at TAC meeting of DBT at New Delhi and extension of sanction for 2 more years for 3 of the 4 projects was obtained.

Approved programs are as follows:

1. Tissue engineering of cartilage using biomimetic scaffolds under dynamic conditions – Dr. Prabha D Nair (PI)

2. Differentiation of foetal progenitor cells and fabrication of a prototype of bioartificial liver – Dr. T. V. Kumari (PI)

3. Cell-based tissue-engineered fabrication of Osteochondral Constructs - (Dr. Annie John – PI)-

Under the activities of the core program,

*Bioreactors for TE of liver and cartilage tissue engineering are developed and validation studies are underway.

*An electrospinning facility is set up for the fabrication of polymer nano fibres and other morphologies for various TE applications.

*Atomic force microscope and isothermal titration

calorimeter have been installed and studies are in progress.

*New biomaterials-various polymers, honeycomb structured polymer membranes, bioceramics and composites have been prepared

*Animal models for disease and standard implantation methods are being developed as part of core activity and in individual projects.

* 8 PhD students are being trained in specific parts of the program.

Tissue engineering of cartilage using biomimetic scaffolds under dynamic conditions

Significant research contributions are towards development of biomimetic and mechanically strong novel scaffolds for larger cartilage defects whilst maintaining their chondrogenic phenotype. Other novel fast gelling and injectable gels and electrospun membranes have been developed for cartilage cell encapsulation and delivery in smaller defects.

Other contributions are towards delineating the biochemical and biomechanical stimuli that can dictate adult and fetal stem cell differentiation toward a chondrogenic lineage in tissue engineered constructs. The program is currently engaged in carrying out the preclinical trials in animal models and limited clinical trials with the help of CMC Vellore.

Chondrocytes were isolated from goat articular cartilage and their chondrogenesis on 3D- PVA-PCL scaffold were evaluated for their ability to maintain their phenotype and induce ECM deposition. The in vitro chondrogenic induction was studied by culturing rabbit adipose MSCs, human umbilical cord MSC and goat MSC on the PVA-PCL scaffold. The chondrogenesis was evaluated by biochemical analysis of aggrecan, GAGS, DNA and protein content, and gene expression studies by real time PCR (Biorad, India) as well as histology of tissue-engineered constructs.

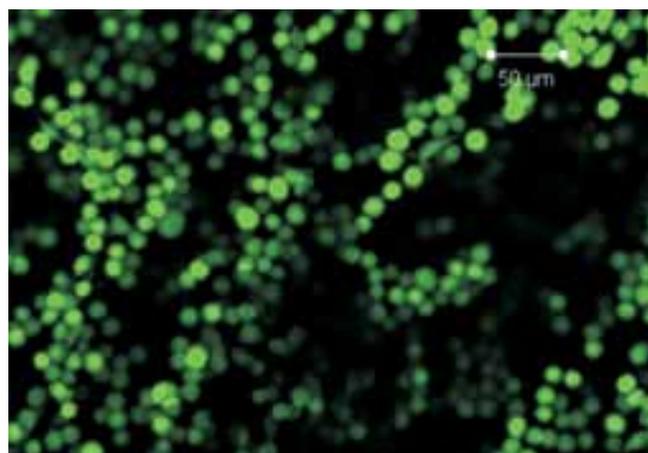
Effect of compressive forces (cyclic unconfined compression) on chondrogenesis of goat chondrocyte seeded scaffolds were studied in Cartigen bioreactor from Tissue Growth Technologies (Minnetonka, MN) and compared with mechanical stimulation through compression, hydrostatic pressurization and shear stress on goat chondrocyte on scaffolds in an in-house built bioreactor.

Dynamic stimulation of the goat chondrocyte seeded

scaffolds on compression alone had resulted in higher deposition of GAG. The GAG accumulation was found to be higher in the constructs cultured under mechanical stimulation with perfusion. Chondrogenesis was also confirmed by the expression of Col2a and aggrecan gene expression. With the combination of perfusion and compression, the relative expression of Col 2 and aggrecan were higher than the results with compression alone



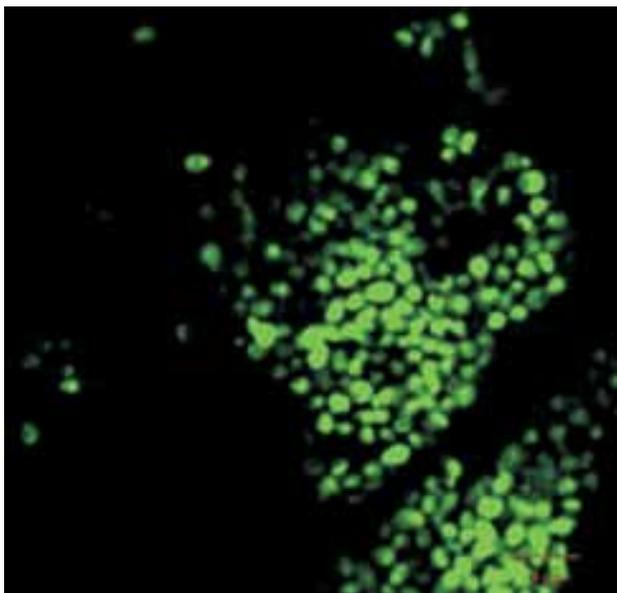
PVA-PCL electrospun membranes



Viable chondrocytes on the PVA-PCL electrospun membrane



CHHA gel



Chondrocyte viability within CHHDA gel

Quality Management Systems, Testing & Technical Services

Quality Management System

Calibration Cell (CAC)

During 2011-12 period, CAC carried out 396 calibrations/validations, of which 78 were for external customers, which predominantly were healthcare industries and clinical laboratories. The external calibration activities showed a marked increase from 29 operations during the previous year to 78 operations during the current year.

Two batches of in house reference materials (for hemolysis and implantation studies) to meet the requirements of testing services were prepared. Three inter laboratory comparisons (ILC) with reference laboratories were conducted as part of routine quality assurance programs in calibration.

Quality Cell

Following were the major activities of the quality cell during the period from April 2011 to March 2012

- a. COFRAC surveillance assessment was carried out on January 27th & 28th 2012. There were no non-conformances reported.
- b. NABL Assessment was conducted on 17th & 18th January, 2012 at Calibration Cell. Relative Humidity and mass calibration was included in the scope. NABL renewed the accreditation for another two years up to 13-01-2014.

- c. Training: Seven internal training programmes viz. "Introductory training for newcomers" were organised.
- d. Management review
 - A Management Review Committee meeting was held on 06th July 2011.
 - Two Technical Management Committee meetings were held on 31st May 2011 and 15th December 2011.
- e. Internal Audits
 - 09th -19th May 2011. Total of 30 Non-conformities reported.
 - 14th-22nd November 2011. Total of 31 Non-conformities reported.
- f. Document initiated/revise

System Procedures: SPBMT306 was revised during the period. Also a new guideline GLBMT007 was also introduced to the system.

The following were revised / issued during the period

- (i) 12 system procedures of various laboratories.
 - (ii) Work Procedures: 202 Nos
 - (iii) Lab notebooks – 94 Nos
 - (iv) Registers & Logbooks – 107 Nos
 - (v) Quality related forms: 4 Nos of forms were revised
 - (vi) Corrective/ preventive actions/ Accident reports.
- A total of 31 CAR's were generated in this period by different laboratories
 - Two preventive actions were raised this year.
 - Three accidents were reported during the period. Necessary corrective actions are in progress in two of them and one has been closed.

LIST OF COFRAC ACCREDITED TESTS - 2012

| No | Name of Test | Reference |
|----|---|---------------------------------|
| 1 | Animal skin irritation test | ISO 10993-10: 6.3 |
| 2 | Intracutaneous reactivity test | ISO 10993-10 B-2/ USP 28(88) |
| 3 | Test for local effects after implantation: -implantation in subcutaneous tissue -implantation in muscles and in bone(s) | ISO 10993-6: 4, 5, 6 |
| 4 | Acute systemic toxicity: acute intravenous application | ISO 10993-11: 6.5.4/ USP 28(88) |
| 5 | Acute systemic toxicity: acute intraperitoneal application | ISO 10993-11: 6.5.5/ USP 28(88) |
| 6 | Standard practice for assessment of haemolytic properties of material | ISO 10993-4 / ASTM 756 |
| 7 | Maximisation test for delayed hypersensitivity | ISO 10993-10: 7.4 |
| 8 | Closed patch test for delayed hypersensitivity | ISO 10993-10: 7.5 |
| 9 | Penile irritation test | ISO 10993-10 B-5 |
| 10 | Vaginal irritation test | ISO 10993-10: B-7 |
| 11 | 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) |
| 12 | Medical-surgical material. Medical devices and materials biocompatibility. Extraction methods | ISO 10993-12 |
| 13 | Standardised method for extraction of medical plastics | ASTM F 619-03 |
| 14 | Invivo test for genotoxicity-- Micronuclei test | ISO 10993-3: 4.4.2/ OECD n° 474 |
| 15 | Invivo test for genotoxicity -Metaphase analysis in rodent bone marrow | ISO 10993-3: 4.4.2/ OECD n° 475 |
| 16 | Invitro test for genotoxicity- carcinogenicity and reproductive toxicity | ISO 10993-3: 4.4 / OECD n° 471 |
| 17 | Sterility test to check particularly the date of "end of use" of the product - Medical device | USP 28(71) |
| 18 | Partial thromboplastin time (PTT) | ISO 10993-4 B 3.1 |
| 19 | Fibrinogen Assay | ISO 10993-4 B 3.5 |
| 20 | Prothrombin Time (PT) | ISO 10993-4 B 3.2 |
| 21 | Quantification of platelet aggregates | ISO 10993-4 B 2.7 |
| 22 | Complement Activation test | ISO 10993-4 B.6 |
| 23 | Haematology- Leucocyte Count & Haemoglobin | ISO 10993-4 C.6.1.2.1 |
| 24 | Leucocyte adhesion on materials- Light microscopy | ISO 10993-4 B 2.7 |
| 25 | Tests for in vitro cytotoxicity | ISO 10993-5 |
| 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 |

Customer Service Cell: Testing & Evaluation Activity

The Customer Service Cell coordinates the testing requests from both external and internal clients for testing requirements. The external customers mainly

consist of medical device industry, research institutions and academia. The scope of testing services includes accredited tests under ISO 10993 standard for the biological evaluation of medical devices as well as physico-chemical characterisation of materials.

The summary of the testing services is as follows:

| Description | External | | | Internal | | |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 2009-10 | 2010-11 | 2011-12 | 2009-10 | 2010-11 | 2011-12 |
| Work orders | 512 | 718 | 672 | 413 | 304 | 335 |
| No. of test materials handled | 2060 | 3278 | 2097 | 1523 | 1144 | 997 |
| Income (Rs) | 32,95,378 | 44,32,572 | 34,40,861 | 19,96,495 | 21,36,875 | 22,80,480 |

The biofunctional evaluation of drug eluting stents for M/s Sun Pharma, carried out as a study project was completed during the year and report submitted to the sponsor. New study requests from various sponsors are being reviewed and planned for this year.

SUMMARY OF TESTING SERVICES OFFERED BY VARIOUS LABORATORIES

Microbiology Lab

| SI No | NAME OF TEST | Number of requests [number of samples] |
|-------|---|--|
| 1 | Sterility test | 67 |
| 2 | Air monitoring | 98 |
| 3 | Water analysis | 63 |
| 4 | Spore viability test | 10 |
| 5 | Anti microbial activity testing | 11 |
| 6 | Culture/ staining | 22 |
| 7 | Ames test | 1 |
| 8 | Growth promotion study in media validation | 8 |
| 9 | Screening for pathogens in small experimental animals | |

Toxicology

Toxicity tests done during 1st April 2011 to 31st March 2012

| Accredited Tests | | No. of Tests |
|------------------|-------------------------------------|--------------|
| 1 | Closed patch test (sensitization) | 7 |
| 2 | Maximization test (sensitization) | 10 |
| 3 | Intracutaneous test | 13 |
| 4 | Acute systemic toxicity test | 39 |
| 5 | Implantation in muscle | 24 |
| 6 | Implantation in subcutaneous tissue | 6 |
| 7 | Pyrogen test | 1 |
| 8 | Haemolysis test | 2 |
| 9 | Animal skin irritation test | 2 |

| | | |
|----|------------------------------|----|
| 10 | Vaginal irritation test | 1 |
| 11 | Penile irritation test | 1 |
| 12 | Chromosomal aberration study | 9 |
| 13 | Micronuclei study | 9 |
| 14 | Bone implantation | 28 |

Non accredited Test

| | | |
|----|-----------------|----|
| 15 | Water analysis | 36 |
| 16 | Dermal toxicity | 1 |

GLP Studies

| No | Title | Sponsor |
|----|--|---|
| 1 | 90 day sub-chronic toxicity by intraperitoneal implantation of degradable Polycaprolactone (PCL) based scaffold in wistar rats. | Dr. V. Kalliyana Krishnan, DPL, BMT Wing, SCTIMST Completed |
| 2 | Evaluation of long term biocompatibility of degradable Polycaprolactone (PCL) based scaffold in albino rabbits (ongoing) | |
| 3 | Evaluation of Chronic toxicity (12 months) by intraperitoneal implantation of degradable Polycaprolactone (PCL) based scaffold in wistar rats. | Dr. V. Kalliyana Krishnan, DPL, BMT Wing, SCTIMST Ongoing |
| 4 | Chromosomal aberration study of P.Saline extract of ECSIL | Aortech Biomaterials Pty Ltd, Australia completed |
| 5 | Chromosomal aberration study of ethanol-saline extract of ECSIL | |
| 6 | Micronucleus study of P.Saline extract of ECSIL | |
| 7 | Micronucleus study of P.Saline extract of ECSIL | Dr. Vinay Agarwal, Gujarat Ongoing |
| 8 | Mammalian erythrocyte micronucleus test of UHMWPE | |
| 9 | Mammalian bone marrow chromosome aberration UHMWPE | |

COLLABORATIVE WORK

| | |
|------------------------------------|-----------|
| Wound healing (BST) | 9 rabbits |
| LAL test (DIMT) | 1 LAL |
| Brain Implantation (ICMR 8018) | 13 rats |
| Dermal Toxicity (DST 8043) | 50 rats |
| Genotoxicity (ICMR 8018, DST 8043) | 176 mice |

Laboratory Animal Science

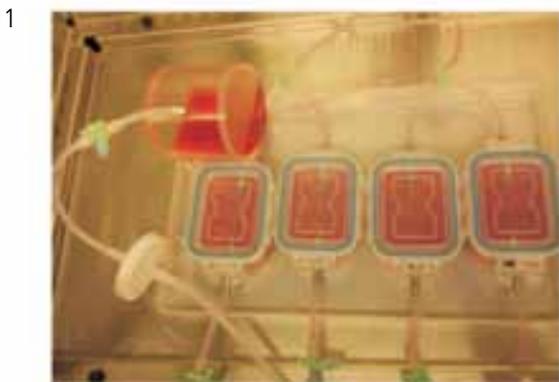


The Division facilitates research and testing using small laboratory animals by imparting care, welfare and management of small laboratory rodents and rabbits. The animal care and welfare is as per ISO 10993 Part-II for testing facility of which the quality system is based on ISO/IEC 17025; 2005, under the surveillance of COFRAC. The primary mandate of DLAS is to breed, stock and supply good quality small laboratory animals for testing and research. The Division is CPCSEA registered and has to its credit many work procedures maintained as per International guidelines applicable to the field. DLAS has set up a state-of-the-art experimental animal facility with Individually Ventilated Cages (IVC) System and changing stations. The HVAC system was also revamped for maintaining the macro environment for the experimental animals. The Division also has to its credit several animal models which are used for biomedical research by various investigators. Apart from these objectives, the division also carries out a bi-annual training session for budding researchers in ethics and technicalities of small laboratory animal handling and this course is attended by MSc and PhD scholars from all over the country.



Newly added IVC facility with Environmentally Controlled Rooms for small Laboratory Animals (mice, rats and guinea pigs).

Precision Fabrication facility



Completed the machining of Dampan er system for Bioreactor project of DTERT lab



Completed the machining of Bioreactor components and connectors to Tissue culture lab



Completed the designing and machining of ceramic slurry extruder setup for Bioceramic Lab



Completed the machining of blood pump pivots, bottom bearing and top bearing for the Blood pump project to MPL

5



Completed the machining of compression test fixture to device testing lab

6. Completed the designing and fabrication of intramedullary rod mould to Polymer Division.
7. Completed the designing and machining of various types of Teflon moulds to Dental Products Lab.
8. Completed the machining of intra cranial pressure sensor mould to DTL.
9. Completed the machining of potting fixture, vascular graft sample holding fixture, compression mould for bio reactor component, compaction dye for hemolysis test & muscular implantation test sample preparation to DTL.
10. Completed the designing and machining of 3 sets of Titanium prototype dental implants.
11. Completed the designing and machining of sample holder fixture to ceramic coating facility lab.
12. Completed the machining of for tensile testing of the graft in Instron.
13. Completed the machining of 6 sets of flow chamber to test the sample 1cm x 1cm to TRU.
14. Completed the machining of 100 nos. of Titanium coins and 30 nos. of Haynes alloy coins in wire cut machine to ceramic coating facility.
15. Provided support in machining the required fixtures for the Bio reactor project.
16. Completed the designing and machining of 3 nos. of conical valve sizer to Homograft valve project to hospital wing.
17. Completed the machining of multi start threaded Bioreactor cartigen chamber to DTL.
18. Completed the machining of digital flow control apparatus to Modeling and prototype lab.
19. Designed and fabricated 10 nos. of canister for LN2 flask for Cryopreservation purpose to Tissue culture lab.

LIST OF NEW PATENT APPLICATIONS (2011-12)

Details of the design registration filed during this year is as follows

| Serial No | Application No | Date of Filing | Title | Inventors |
|-----------|-----------------------------|----------------|--|---|
| 1 | 2675/CHE/2011 | 04/08/2011 | "A PROCESS FOR THE PRODUCTION OF BIOACTIVE CHITOSAN WOUND DRESSING SPONGES FOR BURN WOUNDS". | Willi Paul, Chandraprakash Sharma |
| 2 | 71/CHE/2012 | 06/01/2012 | NOVEL PROTEIN MIMETIC POLYMER NANAOPARTICLE BASED THERMO-RESPONSIVE COATING FOR TISSUE ENGINEERING | Kaladhar Kamalasanan Chandraprakash Sharma |
| 3 | Awaiting application Number | | A METHOD FOR EVALUATING PYROGENICITY BY IN VITRO USING HUMAN WHOLE BLOOD | P.V.Mohanan Siddarth Banerjee Muraleedharan Chirathody Vayalappil Lissy Kalliyana Krishnan Gobichettipalayam Subbratnam Bhuvaneshwar |
| 4 | Awaiting application Number | | A SIMPLIFIED PROCEDURE FOR ISOLATION OF TISSUE ENGINEERING- SCAFFOLDS FROM CHOLECYST | Thapasimuthu Vijayamma Anilkumar |
| 5 | Awaiting application Number | | A SIMPLIFIED PROCEDURE FOR ISOLATING TISSUE ENGINEERING SCAFFOLDS FROM SMALL INTESTINAL SUBMUCOSA OF WARM BLOODED ANIMALS | Thapasimuthu Vijayamma Anilkumar |
| 6 | Awaiting application Number | | A SIMPLIFIED PROCEDURE INVOLVING PRE-ISOLATION IN SITU CROSS LINKING OF BIOMOLECULES FOR ISOLATING TISSUE ENGINEERING SCAFFOLDS FROM URINARY BLADDER OF WARM BLOODED ANIMALS | Thapasimuthu Vijayamma Anilkumar |
| 7 | Awaiting application Number | | METALIC STENT FOR USE AS SUPPORT IN BLOOD VESSEL | Sujesh Sreedharan Muraleedharan Chirathody Vayalappil |
| 8 | 114/CHE/2012 | 11.1.2012. | AN IMPROVED SYSTEM FOR VAPOUR POLISHING OF PLASTIC COMPONENTS IN A METALLIC VESSEL | Nagesh Divakara Panickar Sulochana Vinod Kumar Viswanathan Pillai |
| 9 | 4470/CHE/2011 | 20/12/2011 | POLY URETHINE ELASTOMER WITH ADAPTABLE SURFACE PROPERTIES | Muthu Jayabalan, S.Dawlee |
| 10 | 149/CHE/2012 | 13/01/2012 | INHERENTLY RADIOPAQUE AND NON-TOXIC POLYURETHANE COMPOSITION | Roy Joseph, Kiran Sukumaran |
| 11 | 115/CHE/2012 | 11/01/2012 | RAPID ANTIBIOTIC SENSITIVITY TEST KIT FOR URINARY TRACT INFECTION(UTI) | Mayanandkumar Pradeepkumar Soman Pillai Sarojini Amma |
| 12 | 80/CHE/2012 | 09/01/2012 | PREPARATION OF IRON OXIDE NANOPARTICLES WITH HIGH TRANSVERSE RELAXIVITY AND SATURATION MAGNETIZATION FOR IMAGING APPLICATIONS | Jayasree Ramapurath Sarojini Amma Harikrishna Varma Parimanathu Kovilakom Rama Varma, |
| 13 | Awaiting application Number | | RESERVOIR FOR IN-VITRO EVALUATION OF CARDIOPULMONARY DEVICES | Nagesh Divakara Panickar Sulochana Vinod Kumar Viswanathan Pillai Arun Babu |
| 14 | Awaiting application Number | | NON TOXIC POLYURETHANE COMPOSITIONS WITH INHERENT RADIATION SHIELDING CAPABILITY AND OPTICAL TRANSPARENCY | Roy Joseph, Kiran Sukumaran |
| 15 | Awaiting application Number | | STRONTIUM CONTAINING CALCIUM SULPHATE BONE FILLER CEMENT | Manoj Komath P arimanathu Kovilakom Rama Varma Hari Krishna Varma, |
| 16 | Awaiting application Number | | AN IMPROVED BLOOD PUMP FOR CARDIOPULMONARY BYPASS | Nagesh Divakara Panickar Sulochana Vinod Kumar Viswanathan Pillai |

| Serial No | Application No | Date of Filing | Title | Inventors |
|-----------|-----------------------------|----------------|--|---|
| 17 | Awaiting application Number | | WATER ACTIVATABLE POLYURETHANE SYSTEM CONTAINING MICRO-ENCAPSULATED CATALYST FOR ORTHOPEDIC CASTING TAPE | Muthu Jayabalan |
| 18 | Awaiting application Number | | VASCULAR GRAFT SEALED WITH BIODEGRADABLE HYDROGEL | Roy Joseph, Chirathodi Vylappil Muraleedharan, Adathala Rajeev. |
| 19 | Awaiting application Number | | VASCULAR GRAFT SEALED WITH BIODEGRADABLE HYDROGEL AND PASSIVATED BY FLUROPOLYMER COATING | Roy Joseph, Chirathodi Vylappil Muraleedharan |

| Serial No | Reference No | Design No | Date Of Filing | Title | Inventors |
|-----------|--------------|-----------|----------------|----------------------------------|---|
| 1 | IPDTL010.Y12 | 241378 | 09/12/2011 | A STENT FOR USE IN BLOOD VESSELS | Sujesh Sreedharan, Chirathodil Vylappil Muraleedharan |

ACHUTHA MENON CENTRE FOR HEALTH SCIENCE STUDIES

Mission

- To train highly competent and socially committed public health professionals.
- To advocate for policies that promote equity in health
- To undertake quality research on priority health issues of the country
- To offer consultancy services to national and international agencies

Vision

- Be a Global Leader in Health Sciences Studies by 2020







From the Head of AMCHSS

As a part of faculty development in Achutha Menon Centre for Health Sciences Studies (AMCHSS), two of our junior faculty members, Dr. Biju Soman and Dr Manju R Nair completed their advanced training at the London school of Hygiene and Tropical Medicine, under the European Commission project on "Partnership for better health" and rejoined on September 22, 2011. This one year Masters' training in infectious diseases and environmental health will strengthen these core areas of public health.

Two major research projects were started in this year. The first one was the Asian Collaboration for Excellence in Non-Communicable Diseases (ASCEND). The project supported by a grant from the NIH, US through the Monash University Australia aims to build sustainable research capabilities in relation to the prevention of chronic non-communicable diseases for a network of research trainees and research institutions in three middle income countries in Asia: India, Malaysia, and Sri Lanka. The second one is a grant from the Australian Health and Medical Research Council for the Kerala Diabetes Prevention Program (K-DPP), a cluster randomized controlled trial that aims to find out the effectiveness of a culturally tailored and group-based lifestyle intervention program on the incidence of type -2 diabetes mellitus.

Dr. A.S. Pradeepkumar who was awarded the PhD degree in chronic disease epidemiology is currently working as the Additional Director of Public Health in the Government of Kerala and is in charge of the national program for the prevention and control of non-communicable diseases (NCD) along with other public health activities of the State. The State is likely to benefit immensely from his PhD training particularly in the area of NCDs.

Under our collaboration program with the Bielefeld University, Germany, three MPH Students from our Institute completed their two months mandatory field placement in that University during November-December 2011 fully supported by the German University.

The 10 core faculty members of AMCHSS published 21 peer reviewed indexed journal articles with an average of 2.1 articles per faculty with a mean impact factor of 2.25. In addition, two papers were published by the MPH students and one by a project staff. The faculty also published one chapter of a book and a report for the WHO.

Dr. Josephine Kershaw, Director of Health Care Management in the College of Business in the University of Findley in Findley Ohio, USA joined as a Full Bright lecturer at AMCHSS on 2nd January 2012 for a period of six months. She along with a few other Full Bright fellows from Kerala offered an AMC seminar on the various aspects of the Full bright fellowship.

An important activity this year was the formation of the Public Health Students Forum in September 2011. The Forum organized two major events between October 2011 and March 2012. The first one was a seven day program from 1-7 October 2011 around the World Elder's day and the second one was a workshop on water, food security and public health.



K.R. Thankappan

Achutha Menon Centre for Health Science Studies



Academic Activities

One PhD student was awarded the degree in chronic disease Epidemiology, one submitted her dissertation and another one was awarded the ASCEND (Asian Collaboration for Excellence in Non-Communicable Diseases) fellowship. One PhD student of the National Institute of Epidemiology (NIE), Chennai, affiliated to SCTIMST, defended his thesis.

Fourteen MPH students successfully completed their program. Fourteen MPH students graduated from the NIE Chennai and five from Christian Medical College (CMC) Vellore. From the NIE 15 Master of Applied Epidemiology students also completed their course. As part of our collaboration with Bielefeld University, Germany, three MPH Students completed their two months internship and two of them participated the summer school program in Germany.

Ten Diploma in Public Health (DPH) students completed their course and four joined in 2012. Short courses on Biostatistics, Research Methodology and Ethics in Health Research were conducted.

Major research projects of the centre are tobacco cessation, community interventions for health addressing three risk factors of non communicable diseases (tobacco, unhealthy diet and physical activity), diabetes prevention programs, workload of public health workers, capacity building for safe motherhood program and mental and social health outcomes of Tsunami affected people.

New Initiatives During The Year

Two of our faculty members, Dr. Biju Soman and Dr Manju R. Nair completed their advanced training in infectious diseases and environment health at the London school of Hygiene and Tropical Medicine, UK under the European Commission project on "Partnership for better health".

Asian Collaboration for Excellence in Non-Communicable Diseases (ASCEND)

The project aims to build sustainable research capabilities in relation to the prevention of chronic non-communicable diseases for a network of research trainees and research institutions in three middle income countries in Asia: India, Malaysia, and Sri Lanka. In view of current trends observed in each of these countries, the long-term objective of the project is to curb and ultimately prevent

the growing epidemic of chronic non-communicable diseases. At least ten mid-career professionals, policy makers and/or researchers will be recruited from each of the three countries annually over four years and each individual will participate in a 12 month training program. The program will consist of a mentored research project in participants' home countries, international mentorship, and participation in a three week short course in Malaysia/Sri Lanka/India focused on non-communicable chronic disease prevention. The first cohort of trainees was selected and they were given the initial three weeks training at Monash University, Malaysia.

Kerala Diabetes Prevention Program

The Kerala Diabetes Prevention Program (K-DPP) is a cluster randomized controlled trial of a culturally tailored and group-based lifestyle intervention program. The K-DPP targets individuals at high risk of developing type 2 diabetes mellitus (T2DM) in 60 neighborhoods from a rural area of Thiruvananthapuram district in Kerala State. The aims of the study are to implement and evaluate the K-DPP and its impact on T2DM incidence at 36 months compared with a standard care control group. (ii) To identify individual-, household-, and neighborhood-level factors likely to affect the wider system-wide uptake of K-DPP in India and other developing countries in the future. (iii) To estimate the population health impact and cost-effectiveness of screening and intervention in reducing the incidence of T2DM in a developing country with a very high prevalence of T2DM.

Training on Health Informatics

A joint proposal to conduct a week long training on Health informatics was submitted to the Indian Council of Medial Research by Dr. C. Kesavadas, Dr. Biju Soman, Dr. S.K. Jawahar and Dr. K. Srinivasan

The Public Health Students Forum

Students of the MPH program of the Centre formed the Public Health Students Forum in September 2011. The Forum organized two major events between October 2011 and March 2012.

A seven day program to mark the World Elders Day was organized from 1-7 October 2011 in collaboration with the Kerala Social Security Mission (KSSM). The program included medical camps, seminars and inter-generational sports events. The highlight was a one day conference organized in collaboration with KSSM and National Rural Health Mission (NRHM) on the theme "Ageing Kerala – A

challenge", at the auditorium of Achutha Menon Centre for Health Science Studies. More than 250 delegates attended this Conference.

A workshop on Water, Food Security and Public Health was organized in association with the Communication and Capacity Development Unit (CCDU), Department of Water Resources, Government of Kerala, on 22 March 2012. The workshop was co-sponsored by Kerala State Pollution Control Board and co-ordinated by the Food and Agricultural Organization of the United Nations. More than 80 participants attended the workshop including students and faculty from five engineering colleges and faculty and students of AMCHSS. An exhibition with more than 50 posters and working models of rain water harvesting, Terafil filter etc. accompanied the workshop.

Research

Completed Projects

Capacity Building for Safe Motherhood Program

This was a collaborative initiative between Society for Education, Welfare and Action – Rural (SEWA Rural), Jhagadia; Centre for Study of Ethics and Rights, Mumbai (CSER, Mumbai) and Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum (AMCHSS, SCTIMST; Trivandrum)' The study is completed and the following papers are in various stages of communication:

Impact of the 2004 Indian Ocean Tsunami on People in affected Regions of India and Sri Lanka: A Longitudinal Study of Mental and Social Health Outcomes and Recovery of Individuals, Families, and Communities

This parent project has been completed in 2009. A no-cost extension of the project, using savings from budget allocation, was taken up to study the major concern of the womenfolk in the community, alcoholism. Alcohol usage pattern in the community was studied in 750 randomly selected households (using GIS sampling techniques) in the Panchayat. Data collection was done by 15 trained women volunteers from the community and the male members were interviewed with the support of their female spouses.

Study on workload of public health nurses and other women health workers

The study on workload of "Public Health Nurses and other women health workers" completed in the year 2011-12. The study gathered information on work load among

women public health workers and factors associated with this in Thiruvananthapuram, Alappuzha, Ernakulam, Malappuram and Wayanad districts of Kerala. An increasing number of nurses were reported to have workload and suffering from related problems. Primary data collection was done from 1238 respondents that included, Junior Public Health Nurses, Junior Health Inspector, Staff nurses, Lady Health Inspectors and Lady Health Supervisors. In addition, time and work study in selected work places and Qualitative enquiries also been done. The prevalence of three components of workload namely role overload, role stagnation and self role distance were documented. The findings suggest workload higher among women. The study has given an insight in to the problem and given an opportunity to understand the nuances of workload among the public health nurses.

Ongoing Projects

Athiyannur Sree Chitra Action (ASA)

This is the ongoing initiative of SCTIMST in collaboration with the Athiyannur Block Panchayat. The two action research projects are being carried out in the area under the Women Component Plan. Recently Public Health Foundation of India has identified ASA as one among the 17 field based interventions that would be documented in detail under their India Research Site Landscape Analysis Initiative. ASA specialty clinics are being offered as a service to the community. The specialty clinics are being conducted on every alternate second Saturdays (Neurology) and all fourth Saturdays (Cardiology) since 2010 November. Now it has been changed to alternate first Saturdays (Neurology), and all third Saturdays (Cardiology) from 2011 February onwards. The functioning of clinic is going smoothly. Last year 27 referred patients were treated in the Neurology Clinic and 151 patients in the Cardiology clinic. Four patients from Neurology clinic and 16 patients from Cardiology clinic were referred to SCTIMST for further expert evaluation.

Building Capacity for Tobacco Cessation in India and Indonesia

This is a collaborative project between Achutha Menon Center for Health Science Studies of SCTIMST, Gadjah Mada University of Indonesia, and the University of Arizona USA. The overall objective of this project is to strengthen capacity for tobacco cessation training and research in India and Indonesia. The specific objectives of the project are to incorporate tobacco education into undergraduate medical education in selected medical

colleges in Kerala and Karnataka. Memorandum of understanding was signed between the SCTIMST and the above five medical colleges. Twelve modules were finalized after pilot testing and are being implemented in the five partner medical colleges. A randomized control trial of tobacco intervention among diabetes patients has been progressing in two specialty hospitals, Indian Institute of Diabetes (IID), Trivandrum and Medical Trust Hospital, Pandalam. Three oral presentations and eight poster presentations were made in the recent 15th World Conference on Tobacco or Health in Singapore during March 20-24th 2012. A community was also selected by each of the above medical colleges for tobacco control activities. Tobacco smoke free household initiative is one of the activities under the community project.

Community Interventions for Health

This pilot project was awarded by the Oxford Health Alliance, UK initially for four sites in the world. Three other sites that got this award are Mexico, China, and the United Kingdom. The objective of the project is to find out the feasibility of community based intervention to reduce the three major risk factors of chronic non-communicable diseases namely tobacco use, unhealthy diet and physical inactivity. Two community development blocks are selected, in Trivandrum district: one block is the intervention site and the other control site. A delayed intervention will be provided in the control community in the fourth year of the project. School, work site, hospital and community are the four settings where tailor made interventions will be provided. Interventions to reduce all the above risk factors were implemented in all the settings. A repeat survey was completed in both the intervention and the control sites.

Capacity building of women health workers

This project aims at capacity building of Junior Public Health Nurses in the study area in the monitoring of cardiovascular diseases with optimal adaptation of public health technologies. Baseline data collection has started in the selected wards using cluster spatial sampling method using GIS software. Algorithm for decision support system of the software is being developed in consultation with cardiologists, general physicians and grass root level workers.

Impact of type 2 Diabetes on women's lives and wellbeing

Objectives: The study proposed to describe the burden of diabetes on men and women's lives and the consequences of this condition on the life style of other members of the patient's family. **Methodology and outcomes:** Phase 1.a: This phase is an exploration of available secondary data to examine the associations between diabetes household level factors and also gender mediated factors. The 60th round of the National Sample Survey Organization's health survey was analyzed and a paper on 'The prevalence of diabetes mellitus and its correlates among the elderly in India: an exploration of the NSSO 60th round' is being drafted. A second paper Gender differentials is envisaged.

Phase 1.b: A set of 10 men and 10 women identified as diabetic patients for more than five years were interviewed for the development of case studies. The data collection for this phase has been completed and the materials transcribed. Report writing is in process.

Phase 2: This phase consists of a survey to examine the gender mediated factors determining the burden of households with diabetes and the patients' ability to manage diabetes. Patients coming to the Medical Trust Hospital for treatment will be prospectively recruited for the study, 150 men and 150 women. The inclusion criteria is diagnosis of diabetes for at least 5 years and not experiencing any acute ailments. The ethics clearance for this phase is being awaited.

Public health impact of use of technology by women

This project aims to create a set of user manuals for rural women on optimal and healthy use of household technologies through participatory action research. Preliminary trainings for the selected women volunteers are completed. Baseline data on use and pattern of household technologies from the selected 380 households in the area has been completed. Volunteers have been providing education sessions for womenfolk in the selected households through neighborhood meetings in the study area (Athiyannur and Chirayinkeezhu).

Partnership for better health

The objective of this project is to strengthen public health capacity of two Asian public health institutions namely the Achutha Menon Centre for Health Science Studies

(AMCHSS) of SCTIMST in India and the Bangladesh Rural Advancement Committee (BRAC) School of public Health in Bangladesh. Three institutions in Europe are partnering with this initiative: the London School of Hygiene and Tropical Medicine (LSHTM) UK, The Karolinska Institute of Sweden and the University of Amsterdam, The Netherlands. Two faculty members from the BRAC School of public health were sent for PhD training and two faculty members from AMCHSS were sent of Masters training at the London School of Hygiene and Tropical Medicine, The MPH student manual was updated and distributed to the MPH students under this project.

Prevalence of Type II diabetes in a rural community in Central Travancore: identification of the contributing economic and socio-cultural factors

Objectives: The study objectives were to examine the economic and socio-cultural determinants of life style modifications in a selected rural community in central Travancore.

Methodology and Outcomes: The study will be a qualitative study to facilitate the identification of the community perceptions of life style changes that have happened over the last 15 years. It consisted of 32 in-depth interviews among adults living in Ward A and B of Venmony Panchayat, including migrant and local households and persons of different socio-economic and diabetic status. In addition 8 focus group discussions were conducted among this community to identify the community perceptions of diabetes mellitus.

Workshops, Training Programs Organized

Short Courses

Basic Biostatistics Course

Instructors - Dr. V. Raman Kutty and P. Sankara Sarma

This course was designed for senior residents of SCTIMST and were mandatory for residents from the departments of Anesthesiology, Cardiology, Cardiovascular and Thoracic surgery, Neurosurgery, Neurology, IS & IR. All doctors doing PDCC and PDF programs were encouraged to attend this course but not mandatory. Interested faculty members could also attend this course.

The objective of this course was to familiarize common statistical terminologies and design issues in biomedical and clinical research.

The course was scheduled as eight lectures of two-hour duration each, adding to a total of 16 hours.

During the year 2011-12, this course was conducted twice; one during June 2011 where about 20 residents were deputed and another during October where about 30 were deputed.

Biostatistics classes in the Research Methodology course for MPhil (Biomedical Technology)

Instructor - P. Sankara Sarma

This course was designed for the MPhil program in Biomedical Technology that is conducted at BMT wing. In addition to the MPhil students, this course was attended by the PhD Scholars from the BMT wing and Hospital also.

Outline of the course: An introduction to the principles of statistics as it applies to the understanding and interpretation of the biomedical literature. The emphasis of this course is on the application of statistical tests commonly employed in biomedical research and the interpretation of their results. Topics which will be covered include: probability, principles of inference, hypothesis testing, parametric and non-parametric tests, principles of epidemiology, statistical vs. clinical significance, and quasi-statistical methods (e.g., meta-analysis, decision analysis).

There were eight lectures of two-hour duration each adding to a total of 16 hours and a written in-class exam (two credits for the program).

For the biostatistics classes that were taken during September, 2011, there were 23 participants.

Ethics in Health Research

A short course on Ethics in Health Research was organized by the AMCHSS and the IEC-SCTIMST from August 9-13, 2011 and was co-ordinated by Dr. Mala Ramanathan, Additional Professor, AMCHSS. The module aimed at enabling the participants to recognise and apply ethical analysis for decision making in research ethics. In all, 10 participants including AMCHSS research staff, researchers from BMT and faculty from SCTIMST completed the course. Dr. Rama Menon, Member, IEC-SCTIMST was an observer. Faculty for this course were drawn from the AMCHSS, Hospital wing and BMT wing. Certificates of participation were given to all those who completed the course.

Basic Statistics for Diploma in CVT/ Neuro Nursing program

It was a one-week course (12th Dec to 17th Dec 2011)

including five lectures (10 hrs) and an exam. The topics covered were organization and presentation of data, measures of central tendency and dispersion, correlation and regression, fundamentals of hypotheses testing and interpretation of statistical tests, critical evaluation of research studies /articles, statistical reporting and general rules for designing tables and graphs. Fifteen students attended the course. All passed in the examination.

Workshops/Conferences

An Indo-Swiss symposium on "Cohorts and Biobanks" was organized at the AMC auditorium January 27-28, 2012. There were 15 participants from Switzerland including the Swiss ambassador at Swiss Embassy at New Delhi and his wife, and a member of the Swiss parliament. Overall, there were around 100 participants from various institutions in India. Participants of the symposium were given five continuing medical education credits by the Travancore Medical Council, Trivandrum.

An international seminar on the role of tobacco control in the prevention and control of NCDs was inaugurated by the Honourable Minister for Health and Family Welfare, Government of Kerala, Sri Adoor Prakash on May 31, 2011. A tobacco information Kit was released on the occasion which was received by the Health Secretary Government of Kerala. More than 250 delegates from all the Medical Colleges in Kerala and selected Medical Colleges in Karnataka participated in the seminar. Twelve tobacco education modules implemented in the five partner Medical Colleges were presented by the faculty members from the partner Medical Colleges.

The Government of Gujarat organized a one day seminar on health systems development in Gujarat and all the MPH and DPH graduates along with two senior faculty members from AMCHSS were invited for the seminar. The former director of NIE Prof. MD Gupte also participated in this seminar.

A one day research methodology workshop was conducted for the cardiologists of Kerala which was organized by the Cardiology Society of India, Kerala Chapter in Trivandrum on June 12, 2011.

Collaboration with the Centre for Studies in Ethics and Rights, Mumbai and the University of Washington, Seattle (Drs. Neha Madhiwala and Beth E Rivin) to submit a proposal to the Wellcome Trust, UK on 'Fairness in drug trials, perspectives of medical professionals in two states of India' was established.

The second board of studies meeting of the Health Science Studies was held on July 28, 2011 at AMCHSS.

Dr. K. R. Thankappan, Professor and Head and Dr. P. S. Sarma, Professor offered expert consultation in Epidemiology and Statistics for investigators of the Cardiology Society of Kerala for their ongoing study on the prevalence and risk factors of CAD in three districts of Kerala on August 20, 2011 at AMC

A special session of the "Quit Tobacco India project" was held at the Indian Public Health Association Annual Conference at Kochi during February 10-12, 2012. Professor Mark Nichter, Mimi Nichter, Prof KR Thankappan, Dr Yamini Thankachi, Dr GK Mini and Ms Sreedevi Padmajam participated in this session and presented papers.

AMC public health students' forum conducted World Elderly Day on October 1, 2011. The function was inaugurated by Sri.K.Muraleedharan, MLA.

AMC Public Health student's forum conducted World Water Day on March 22, 2012

AMC Seminar Series

The following seminars were conducted during the past year:

"The Ethical Challenges relating to the Global Reproductive Tourism Industry" by Dr. Raywat Deonandan, Assistant Professor in the Faculty of Health Sciences, University of Ottawa, Canada 2nd June 2011.

"Identifying potential high risk behavior for post partum morbidity and neonatal mortality among women in Jhagadia- a Pilot research" by Dr Mala Ramanathan, Additional Professor-(AMCHSS) 4th July, 2011

"Through the Historical Looking Glass: The Medicalization of Childbirth in Travancore, 1880-1950". by Dr. Aparna Nair, Associate Professor, Centre for Development Studies on 25th November 2011.

"Shifting the locus of NCD Prevention: Insights from a qualitative study of adult onset diabetes in Kerala, South India." by Dr. Caroline Wilson, MRC-ESRC Post-Doctoral Fellow, School of Social and Community Medicine, University of Bristol, 4th February 2012.

Important Visitors /Trainees

Dr. Josephine Kershaw, Full Bright Fellow from the United States joined as a Full Bright lecturer at AMCHSS on 2nd January, 2012. She is the Director of Health Care Management in the College of Business in the University of Findley in Findley Ohio, USA.

As part of the student exchange programme between Bielefeld University Germany and AMCHSS of SCTIMST,

six students (Anna Hansen, Elzbieta Krupa, Josephine Goldner, Myriam Tobollik, Heiko Zimmermann, Lena Werdecker) from the Bielefeld University visited AMCHSS and participated in the academic programmes.

A planning meeting of the Kerala Diabetes Prevention program (K-DPP) was organized in AMCHSS during May 27-30, 2011. Four people from Monash University Australia including Prof Brian Oldenburg and Prof Pilvikki Asbetz from Finland participated.

Professor Mitchell Weiss, the Swiss coordinator for the Indo-Swiss symposium on Cohorts and bio-banks for chronic diseases visited our Institute and held discussions with the Director, SCTIMST and Director, NIE Chennai from during June 13-14, 2011 to plan for the above symposium scheduled for January 2012.

Dr Aparna Nair, Assistant Professor from Centre for Development Studies, Thiruvananthapuram spoke on "Through the Historical Looking Glass: The Medicalization of Childbirth in Travancore, 1880-1950 on 25th November at AMC Seminar Hall. Kerala's current high rates of institutionalized childbirths were analyzed from a historical and sociological perspective in this paper; which employed both archival research and oral history.

Prof. Sara Varghese, who is heading the State Prevention of Epidemics and Infectious Diseases (PEID) Cell took class for MPH students as part of the Infectious Disease Epidemiology module on 17th Apr 2011.

One video conferencing session was conducted at the telemedicine room for MPH students on 19th April 2012 with experts from New Delhi (Dr John Lewis, HISP India) as part of their Public Health Technologies module.

Prof. Sandeep Sahay and Dr John Braa, faculty members from Department of Informatics, University of Oslo, Norway took classes on Public Health Informatics for MPH students as part of their Public Health Technologies module on 19th and 20th of April 2012.

Prof. Jacob John, former Emeritus Professor of Virology, Christian Medical College, Vellore took classes for MPH students as part of their Infectious Disease Epidemiology module from 21st to 27th of April 2012.

The 10 core faculty members of AMCHSS published 21 peer reviewed indexed journal articles with an average of 2.1 articles per faculty with a mean impact factor of 2.25. In addition, two papers were published by the MPH students and one by a project staff. The faculty also published one chapter of a book and a report for the WHO.



Sri Adoor Prakash, Hon. Minister for Health and Family Welfare, Government of Kerala is inaugurating World No Tobacco day on May 31, 2011



World Elders Day 2011 inaugurated by Sri. K. Muraleedharan, MLA on December 1, 2011



Dissemination Workshop on Clinical Trials Registry on August 28, 2011



Biostatistics for Neurology Workshop, September 2-3, 2011



Participants of the Indo-Swiss workshop January 27-28 2012



Quit Tobacco International team members presented three oral and eight poster presentations at the World Conference on Tobacco or Health in Singapore 20-24th March 2012





Academic Division







From the Dean's Desk

The Annual Report of the Institute for the Year 2011-2012 documents the Institute's activities in keeping with the mandate conferred on it by the Indian Parliament and thereby the people of India and hence it reflects the continuing relevance of the institute to the national health priorities. It showcases the Institute's achievements during the past year in the three important fields of clinical medicine, public health and biomedical technology.

The Academic Division of the Institute has taken several steps to fine tune the academic curriculum and evaluation process of the various Post Doctoral programs leading to award of DM and MCh degrees in cardiac sciences, neurosciences, anesthesiology and radiology. This process is expected to make these programs at par with similar programs all over the world. The Academic Division is in the process of upgrading the curriculum and continuous evaluation process for all the diploma programs related to various clinical fields and this will be completed within a year. The Institute takes care to evaluate various academic programs conducted by other premier institutes and affiliated to our institute for quality and relevance to national needs and its health priorities. The Institute is contemplating entering into memorandum of understanding with International Institute for Biotechnology and Toxicology (IIBAT), Chennai and the Indian Institute for Information Technology and Management-Kerala (IIITM-K) to explore areas for academic collaboration which can be mutually beneficial.

Research and Publication Cell was established in the Academic Division in August 2011. One of the objectives of the cell is to facilitate the smooth functioning of extramural and

Institute funded research projects. The other objective is to establish norms and standards for publication of scientific and popular articles, annual reports, bulletins, and facilitate research initiatives by the academic community. As a first step, "Guidelines for writing research papers" was posted on the Institute's website.

The Annual Convocation for the 27th batch of graduates was held on the 7th of May 2011. Dr. R. Chidambaram, Principal Scientific Advisor to Government. of India and President of the Institute presided over the solemn function and Dr. K. Kasturirangan, Honorable Member, Planning Commission, Government of India was the Chief Guest and delivered the convocation address. Dr. K.N.Sharma, Emeritus Professor, National Academy of Medical Sciences, the Guest of Honor, addressed the graduates. The faculty and students wholeheartedly participated in the program and now the Annual Convocation takes a prominent place in the Institute's academic calendar.

The demand of the student community for various academic programs of the Institute continues to be encouraging, going by the large number of applicants nationally and the Institute is striving hard to elevate these programs to high standards to attract talented students from all over the country.

The Annual Report will remain as important reference document with which one can measure the institute's performance in the years to come.



Jagan Mohan Tharakan

Division of Academic Affairs

The Institute currently offers 25 academic (diploma, postgraduate, doctoral and post doctoral) courses in medical sciences, biomedical engineering and technology, basic sciences and public health. All academic programmes continue to attract students in significant numbers from all over India and for the MPH course, from other countries.

Admission of students and evaluation of students registered for various programmes are the primary responsibilities entrusted to 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.

Programmes offered in 2011-12

Post-doctoral

- DM Cardiology
- DM Neurology
- DM Neuroimaging and Interventional Neuroradiology
- DM Cardio Thoracic & Vascular Anaesthesia
- DM NeuroAnaesthesia
- MCh Cardiovascular & Thoracic Surgery
- MCh Vascular surgery
- MCh Neuro Surgery (after M.S)
- MCh Neuro Surgery (after MBBS and 1 year Residency in General Surgery)
- Certificate course in Cardiovascular & Neuro Surgical Anaesthesia
- Certificate course in Cardiovascular & Neuro Radiology
- Certificate course in Vascular Surgery
- Post DM/MCh Fellowship

Doctoral and Master's

- PhD
- Master of Public Health(MPH)
- M.Phil
- MTech Clinical Engineering

Diploma

- Cardio Vascular & Thoracic Nursing
- Neuro Nursing
- Blood Banking Technology
- Cardiac Laboratory Technology

- Neuro Technology
- Operation Theatre Technology
- Advanced Medical Imaging Technology
- Clinical Perfusion
- Medical Records Science

Sponsored Courses

- Diploma in Public Health(DPH)

Students Enrolment

The student strength for DM/MCh degree, Post-doctoral certificate courses and Post DM/ MCh Fellowships during the year was 87. The Master of Public Health degree programme has 24 scholars. The Institute has, as of now, 82 students for the PhD programme, 66 scholars for the various Nursing and Technology related Diploma Programmes. The affiliated programmes of SCTIMST at the National Institute of Epidemiology have an enrolment of 39 students for the Master of Applied Epidemiology programme and 32 students for the Master of Public Health.

Joint programmes with other Institutions

Two affiliated programmes of two-year duration are offered at the National Institute of Applied Epidemiology, Chennai (NIE) an institution under the Indian Council of Medical Research (ICMR)

1. Master of Applied Epidemiology
2. Master of Public Health (Health Services, Development and Research)

Joint Programme by IIT Madras / CMC Vellore / SCTIMST - Trivandrum

The three institutions – IIT Madras, CMC Vellore and SCTIMST Trivandrum, each having a set of unique strengths and facilities, have joined together in starting two Programmes – 'M.Tech in Clinical Engineering' and 'Ph.D in bio-medical devices and technology' to address the issue of capacity building for reducing India's dependence on imports of medical devices. A unique feature of these courses is the clinical attachment with a maximum exposure to the clinical environment. This ensures that, at the end of the course the students will be able to interact effectively with the clinicians and other medical and paramedical staff in the hospital resulting in the identification of unmet 'clinical needs'. This is also expected to trigger further research leading to development of innovative indigenous healthcare technology.

MS / Ph.D Bio-engineering courses at CMC Vellore

This affiliated campus programme of the Institute, post-graduate Bioengineering programme, emphasizes the R&D needs of health care in India to be developed. There are two students admitted for the programme.

Short-term training/observership upto period of three months

Candidates sponsored by the Government /Autonomous institutions/ Health sector organizations, approved Medical/Dental/Nursing colleges, paramedical Institutions and Government / Defence services are provided short term training.

This training / observership is arranged in consultation with the respective department / discipline and the time and period of training is decided by the Academic Division in consultation with the Head of the Department/Division.

Around 215 observers from 60 institutions all over the country spent varying periods from two weeks to three months in different department of the Institute.

Programmes Organised by the Division

National Science Day

In connection with the National Science Day, various activities were organized for the Higher Secondary School / College Students. About 150 students visited the Institute on 24th February 2012. The Institute held an open day in all three wings in the Hospital Complex, Achutha Menon Centre and in the Biomedical Technology wing for the visitors. The exposure to the service and research programmes and facilities of the Institute was greatly appreciated by the young visitors and the faculty.

Progressive use of Hindi

The Institute complied with the provisions relating to the Official Languages Act, Rules and instructions and Directives of 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 various Town Official Language Implementation committee meetings.

Library

The Hospital Wing library has a collection of 14538 books and 14651 back volumes of journals. During the current year, 333 books and 22 back volumes were added and 103 journals were subscribed. Electronic access to most of the journals has been activated and is available throughout both the campuses.

Being part of National Knowledge Resource Consortium, our library has access to full text of journals in addition to those we subscribe. The consortium resources includes journals of major publishers like Elsevier, Springer, Wiley, ACS, Sage, OUP, IEEE, ASME, Taylor & Francis, Nature, Science etc., and databases of ASTM Standards, ISI Web of Knowledge, and Derwent Patents Index.

The information management system and library automation are based on Microsoft SQL Server 2005. The library information is available to both the wings through intranet.

Medical Illustration

The Medical Illustration Division offers support to the Academic activities of the Institute by assisting the faculty and students in the preparation of slides and movies, photography and digital imaging graphic arts for national and international conferences.

The photographs seen in this Annual Report are contributed by the Division.



The Annual Convocation of the 27th batch of graduates was held on May 7, 2011. Dr. R. Chidambaram, President of SCTIMST presided, Dr Kasturirangan was the Chief Guest of the function and Dr. K.N. Sarma was the Guest of Honour



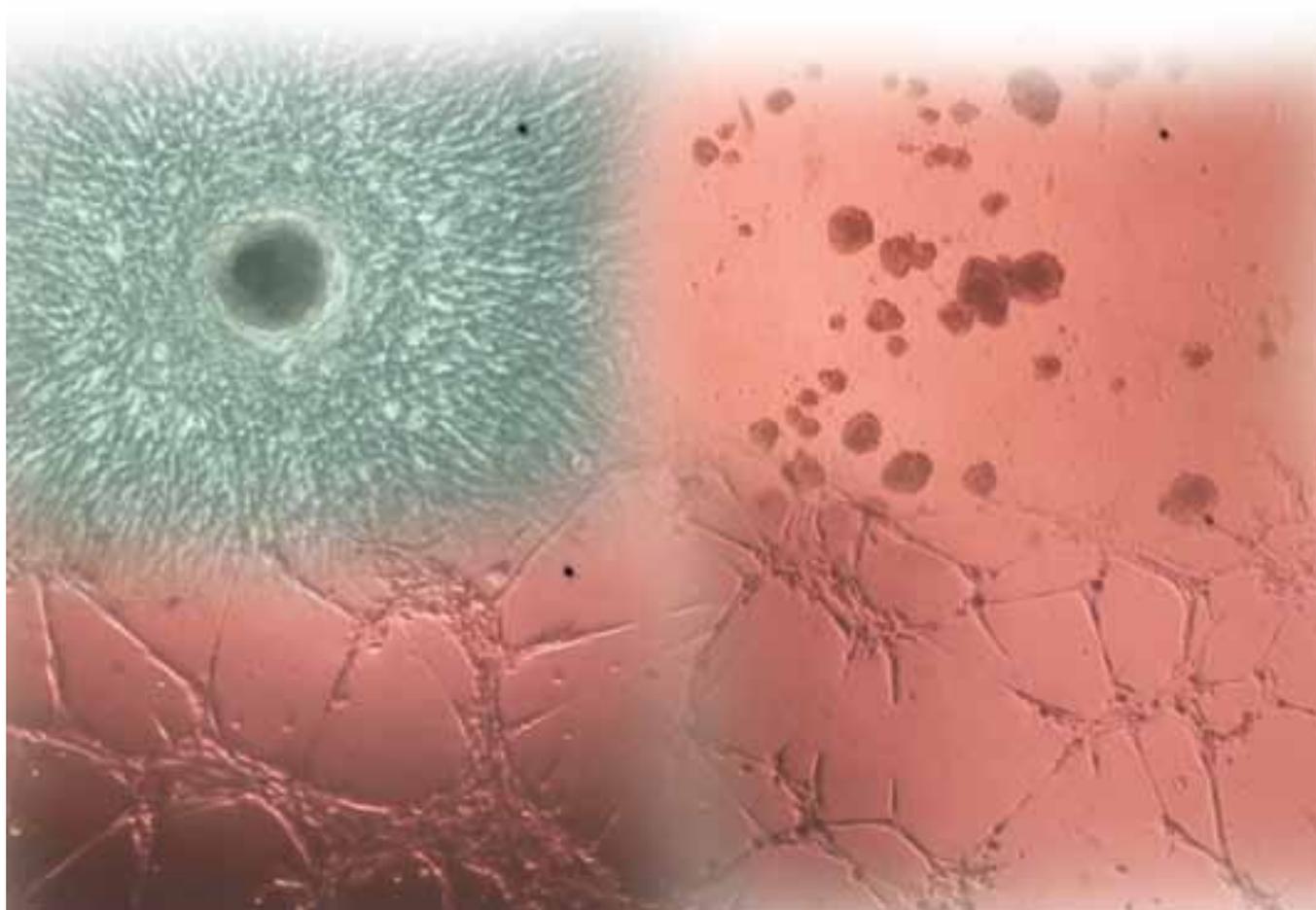
Dr. K.M. Chandrasekhar, Vice Chairman, Kerala State Planning Board presiding the valedictory function of Joint Hindi Fortnight of TOLIC held at SCTIMST on January 24, 2012



Dr. V.C.Joy, Principal Secretary, Finance, Government of Kerala inaugurating National Science Day, February 24, 2012



Research Activities



Clinical Research

Hospital Administration

An internally funded Research Project titled, "Clinical Application of Cryopreserved Homograft Valves in Cardiovascular Surgery" with Dr. K. Jayakumar as Principal Investigator and Ms. Molly Antony, Dr.S.K. Jawahar as co-investigators is under progress.

The primary objective of the project is to establish a homograft programme, by harvesting 120 homograft valves, processing, sterilizing and cryo-preserving them followed by clinical implantation and follow-up to ensure feasibility of the programme and safety and efficacy of the homografts.

The project is supported by Technology Development Fund of the Institute for a period of 2 years at a cost of Rs 5 lakhs

Biochemistry

Lactose-binding serum immunoglobulin (Llg) binds to Lp(a): Lactose-binding IgG from normal serum, prepared using lactose-Sepharose recognizes Lp(a) in its desialylated form, while LDL is inert. This may be a major source of Lp(a)-IC, especially in diabetes and infections that cause a surge in desialylation.

Desialylated Lp(a)-serum antibody immune complexes (IC) retain antibody binding sites that enable their binding to cell surfaces: De novo IC formed between Lp(a) and normal serum antibodies are found to consist of lactose binding immunoglobulin (Llg) and anti-T antibodies. Moreover, they retain part of the antibody binding sites, enabling the IC to anchor to other desialylated host cells. This may represent a major route for Lp(a) uptake by macrophages or smooth muscle cells.

Anti- α -galactoside antibody (anti-Gal) of normal serum binds Lp(a): All samples of anti-Gal antibodies prepared by affinity chromatography contained Lp(a) as co-purified molecule. Reconstitution experiments confirmed that anti-Gal, but not any other serum antibody complexes with Lp(a). Serine- and threonine-rich peptide sequences in Lp(a), akin to that in MUC-1 type peptides, may account for anti-Gal binding to it since Lp(a), but not LDL inhibited another α -galactoside and MUC-1 peptide-specific plant lectin, GS14. Notably, anti-Gal and Lp(a) arose contemporarily in mammalian evolution.

Adduct with Lp(a) may help tissue uptake of LDL: Using purified Lp(a) and LDL de novo adduct formation between the two was demonstrated. LDL from pre-existing adducts and free LDL were equally efficient in adduct formation. Further, Lp(a)-LDL adduct, but not free LDL could bind to immobilized human galectin-1, suggesting that adduct may be a vehicle for LDL transport across cell membranes.

Functional characterization of high-density lipoprotein [HDL]: This study is focused on the prevalence of dysfunctional HDL if any, in subjects and its compositional and functional characterization. HDL from majority of healthy subjects [\sim 30] showed remarkable antioxidant property. However, HDL from a very few healthy subjects and all subjects with inflammatory disease [coronary heart disease] were found to lack antioxidant capacity and were thus considered dysfunctional. Further, dysfunctionality in HDL does not show any association with HDL-cholesterol concentration. Functional assay of HDL offers the potential for early identification subjects at risk of developing chronic inflammatory diseases since dysfunctional HDL is a significant risk factor.

Oxidised high-density lipoprotein [HDL] and atherogenesis: Oxidized-HDL was found to enhance the production of reactive oxygen species, pro-inflammatory cytokine-TNF, Matrix metalloproteinases in monocytes/macrophages by the activation of NADH-NADPH oxidase pathway and induce lipid accumulation mediated by expression of CD36- scavenger receptor for oxidized lipids, while native HDL and mildly oxidized HDL had no such effects. These findings demonstrate that HDL can lose its cardioprotective function depending on the extent of oxidative modification and mediates deleterious effects such as enhanced oxidative stress and pro-inflammatory response in monocytes/macrophages. The generation of oxidized HDL in vivo might therefore augment atherogenesis.

Coronary artery disease in the young [collaborative research with the Dept. of Cardiology]: This study is aimed at developing a database: starting from anthropometric to angiography of young CAD patients in Kerala to evaluate the prevalence of both the conventional and non-conventional risk factors and for developing appropriate preventive strategies for our population. As part of the study, lipid profile, several thrombotic factors such as fibrinogen, homocysteine and lipoprotein (a), platelet activation and small dense LDL were quantitated

in ~30 young CAD patients [<55 years] and age and sex-matched healthy controls. Preliminary findings of this ongoing study indicate that the prevalence of these non-conventional risk factors is much higher in CAD patients.

Gliomasphere forming ability of cells isolated from human glioma tissue: The size and number of gliomaspheres developed from the cells isolated from different grades of human glioma tissues were found to have a positive correlation with the grade of tumor. Gliomaspheres were further characterized and their stemness was confirmed by analyzing the expression of stem cell marker protein nestin. Some cells within gliomaspheres also expressed glial and neural lineage markers such as GFAP and β -III tubulin respectively.

Phenethyl caffeate benzo[kl]xanthene lignan (PCBL) with DNA intercalating properties induces DNA damage and apoptosis in colon cancer cells: We have found that PCBL, a synthetic lignan with DNA intercalating properties was inducing autophagy along with apoptosis in colon cancer cells from results of comet analysis and the phosphorylation status of various DNA damage response proteins such as H2AX, ATR, Chk1 and BRCA1. Effector molecules of apoptosis such as caspase 3, 7 and 9 were activated along with the PARP cleavage in PCBL treated cells suggesting that apoptosis was the main mode of cell death induced by PCBL.

Molecular evidence for anticancer activity of aloe emodin in colon cancer cells: Aloe emodin (AE), a natural anthraquinone, inhibited cell proliferation by arresting cell cycle at G2/M phase and inhibition of cyclin

B1. AE appreciably induced cell death through induction of apoptosis, activating caspases 9 and 6. Relatively non-toxic concentration of AE suppressed the phorbol-12-myristyl-13-acetate (PMA) induced migration and invasion of tumor cells. Further investigations revealed that AE downregulated expression of MMP-2/9, and RhoB. It was also a strong inhibitor of Vascular Endothelial Growth Factor (VEGF) expression, promoter activity and endothelial cell migration/invasion and in vitro angiogenesis. AE suppressed the nuclear translocation and DNA binding of NF- κ B.

Insidious role of nitric oxide in migration/invasion of colon cancer cells by upregulating MMP-2/9 via activation of cGMP-PKG-ERK signaling pathways: Nitric oxide (NO), an uncharged free radical increases the proliferation of cancer cells and simultaneously prevents apoptosis. Expression of MMP-2/9, RhoB and Rac-1 was enhanced by NO in a time-dependent manner. Further, NO increased phosphorylation of ERK1/2 and induced nuclear translocation of Fra-1 and Fra-2. Electrophoretic mobility shift analysis and use of deletion mutant promoter constructs for the proteins MMP-2/9, iNOS, MMP-2/9, Fra-1 and Fra-2 in normal and colon adenocarcinoma tissues revealed increased expression of these proteins in cancer when compared to normal providing support to our in vitro findings. Normal epithelium showed mild staining for iNOS, MMP-2 and MMP-9. Cells in the inflammatory region showed moderate staining for iNOS, MMP-2 and MMP-9. Almost all cells in the tumor region showed intense and moderate staining for iNOS, MMP-2 and MMP-9. Metastatic lymphnode showed moderate staining for iNOS, MMP-2 and MMP-9. The study showed that the NO-cGMP-PKG promotes MMP-2/9 expression by activating ERK-1/2 and AP-1.

Cardiology

Faculty members are working on validation of a clinical protocol creation of a hospital registry for cardiac ion channelopathy.

Correlation between fetal echocardiographic findings and neonatal trans thoracic echocardiographic findings at segmental level is carried out as a Faculty Project by Dr. Bijul S and Dr. Sivasankaran.

D-Dimer as a tool to diagnose left atrial thrombus in rheumatic mitral stenosis is a student project supported by SCTIMST.

Other projects carried out with extra mural support are:

Atrial Fibrillation Registry

Coronary artery disease and its risk factors prevalence

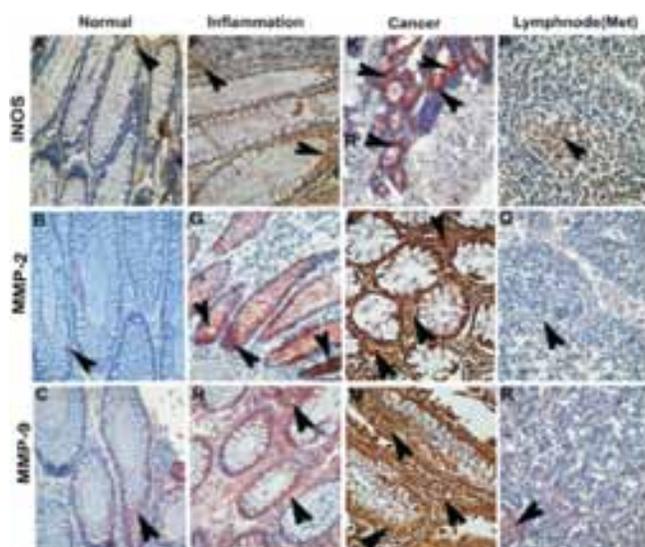


Figure showing staining in normal tissues and different grades of tumor

Feasibility study for establishing nationwide network of registries on Management of Acute Coronary Event (MACE REGISTRY)

Use of a Multidrug Pill in Reducing cardiovascular Events(UMPIRE)

Coronary artery disease in the young

Does non-regression of Pulmonary Hypertension following balloon mitral valvotomy correlate with Bmpr2 Mutations?

Comprehensive Heart Failure Intervention Program

Cardiovascular and Thoracic surgery

The Department has taken up a study on “Steroids in Cardiac Surgery” as part of international trial with Mc Master University, Canada. The study entails ascertaining the efficacy of low dose steroids in perioperative period in high risk patients undergoing cardiac surgery. Dr.Jayakumar is the Principal Investigator and the study co-ordinator is Dr.Vivek V. Pillai.

A number of animal trials were carried out in collaboration with the BMT Wing. This includes the LVAD program.. Dr.M.Unnikrishnan commenced animal experiments on tissue engineered small diameter graft and hydrogel coated large diameter grafts. Animal trails on decellularised bovine pericardium is in progress.The treated bovine epicardial tissue was implanted as an atrial defect closure patch in sheep and autopsy was done after 6 months to study the nature of the implanted patch invivo conditions. The experiments were conducted by Dr.Jayakumar and Dr.Umashanker.

Comprehensive Heart Failure Program in collaboration with the Dept of Cardiology aims at identifying and treating patients with heart failure and efforts are underway to start the heart transplantation program.

Mitochondrial metabolism in Type 2 Diabetic Heart- The metabolic effects of Diabetes Mellitus on the human heart is studied from cells obtained from the right atrial appendage and tissues from the papillary muscles. The study is conducted along with the Department of Biochemistry by Dr.Jayakumar, Dr.Vivek Pillai and Dr.Srinivas.G.



Cryopreserved Homograft prior to implantation

Cellular and Molecular Cardiology

Cardiac fibroblasts in myocardial remodeling: molecular mechanisms

The Division continued to focus on mechanisms in heart failure. Cardiac fibroblasts, the most abundant cell type in the heart, play a critical role in myocardial remodeling following injury. Replicative capacity, retained throughout adult life, and relative resistance to apoptosis are two major attributes of these cells that are central to their role in wound healing and myocardial remodeling post injury. Understanding the mechanisms regulating the cardiac fibroblast cell cycle and relative resistance to apoptosis could potentially lead to therapeutic strategies to regulate these processes and is therefore a clinically desirable goal.

Mechanisms regulating G1-S transition in cardiac fibroblasts

Investigations over the past year showed that p44/42 MAPK is a positive regulator of the cardiac fibroblast cell cycle. Mitogenic stimulation of cardiac fibroblasts leads to activation of p44/42 MAPK. In mitogenically-stimulated MAPK-inhibited cells, accumulation of cells

in the G0/G1 phase with a corresponding reduction in the number of cells in the S phase indicated that p44/42 MAPK is required for G1-S transition in cardiac fibroblasts. (Fig. 1) A significant reduction in cyclin D1 and cyclin A levels and hypophosphorylation of Rb were observed in serum-stimulated, p44/42 MAPK-inhibited cells. MAPK-inhibited cells, consistent with impaired G1-S progression. Induction of p21 and p27, observed upon p44/42 MAPK inhibition, could explain the G1-S block in these cells.

The expression of Skp2, an F-box protein involved in the post-transcriptional regulation of p21 and p27, was markedly reduced upon MAPK inhibition, which suggests a post-translational mechanism of regulation of p21 and p27 by Skp2.

Mechanisms underlying apoptosis resistance in cardiac fibroblasts

Since cardiac myocytes are susceptible to oxidative injury and cardiac fibroblasts are not, and oxidative stress is known to be a major component of much cardiac pathology, this laboratory examined the apoptosis-resistance mechanisms recruited in cardiac fibroblasts exposed to oxidative stress. Oxidative stress was found to enhance the mRNA and protein expression of cIAP-2, an important anti-apoptotic protein. siRNA-mediated silencing of cIAP2 rendered the cells susceptible to oxidative injury, confirming its protective role. Further, cIAP2 was found to be regulated by NF- κ B whose inhibition reduced cIAP-2 expression and promoted cell death under conditions of oxidative stress. Electrophoretic Mobility Shift Assay showed that oxidative stress activates NF- κ B in cardiac fibroblasts.

Modulation of energy metabolism in the prevention of cardiac remodeling

Cardiac hypertrophy in chronic pressure overload is a risk factor for cardiac failure and sudden death. Cardiac hypertrophy is associated with a shift in energy metabolism from predominantly fatty acid to glucose, leading to energy depletion. The decrease in fatty acid oxidation is mediated by down regulation of the gene peroxisome proliferator activated receptor – alpha (PPAR α). Based on the contention that reactivation of PPAR α can prevent cardiac remodeling by restoring the energy status of the heart, studies were carried out in spontaneously hypertensive rat. Reactivation of PPAR α using the synthetic ligand fenofibrate showed that stimulation of fatty acid metabolism in the early stages of hypertrophy reduced oxidative stress and prevented cardiac remodeling, whereas treatment with fenofibrate in older rats with established hypertrophy showed enhanced oxidative stress

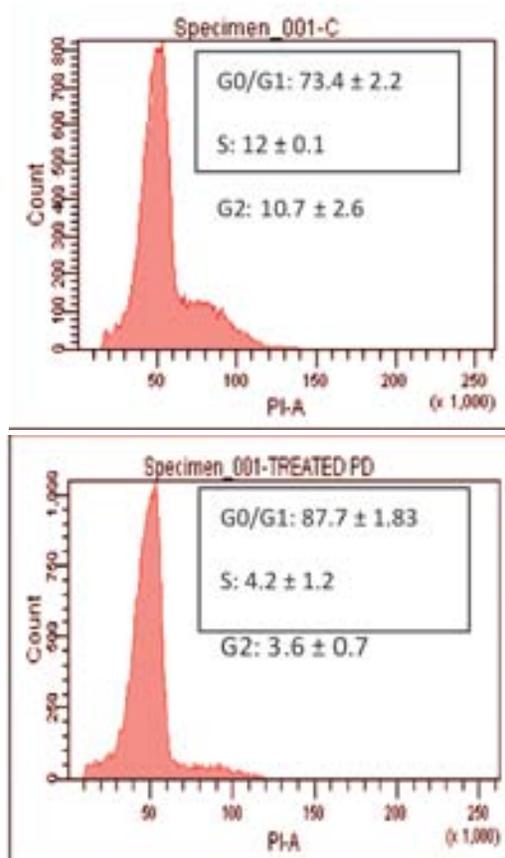


Fig. 1 p44/42 MAPK inhibition in mitogen-stimulated cardiac fibroblasts impaired G1-S transition

and aggravation of hypertrophy. Downregulation of the fatty acid transporter CD36 led us to infer that substrate insufficiency may be the major cause for the adverse remodeling in older animals. Experiments are in progress to examine the cardiac response on supplementing medium chain triglycerides to Spontaneously hypertensive rat.

Autocrine and paracrine mechanisms in human resident cardiac stem cell signaling following hypoxic injury

Stem cells are the mediators of tissue repair in the event of myocardial injury. The presence of scar tissue subsequent to ischemic injury is the consequence of inadequate repair mechanisms. A more profound knowledge of the biology of stem cells and their fate following pathologic insults is essential for promoting the resident cardiac stem cells for in situ repair of the injured myocardium. A study has therefore been designed for delineation of the behavior of cardiac stem cells in the event of hypoxic injury.

Atrial biopsies obtained at the time of insertion of catheter for coronary artery bypass graft in patients with coronary artery disease

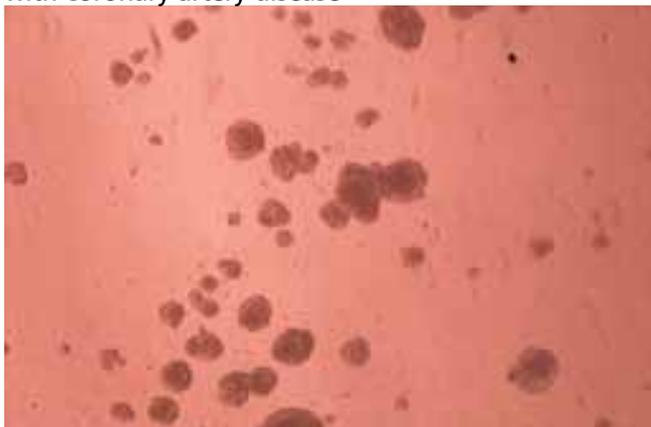


Fig. 2 a. Cardiospheres

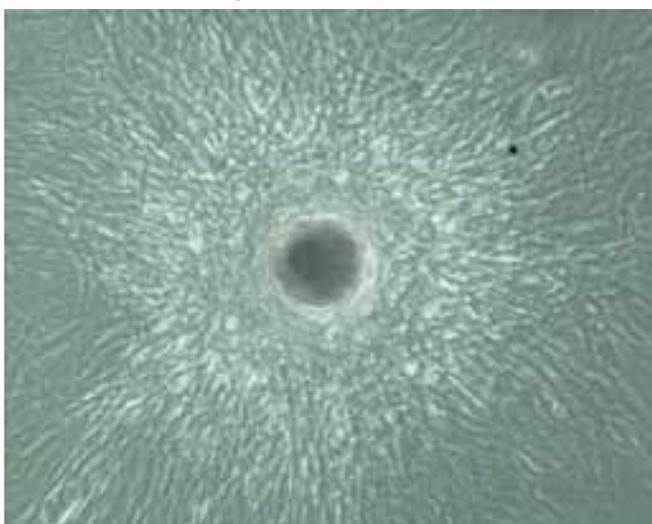


Fig. 2 b. Cardiospheres

The explants were set in culture and cardiospheres were derived from cultured explants (Fig.2a). Cardiospheres were expanded on fibronectin coated dishes. (Fig.2b) Cardiosphere derived cells stained positive for the stem cell markers-c-kit, MDR-1, GATA-4 and MEF-2c and negative for myosin heavy chain and cardiac troponin I. On supplementation with 5 azacytidine, invitro differentiation was apparent, including cellular arrangement and elongation. Immunostaining confirmed the presence of cardiomyocyte specific markers – troponin I and myosin

Culture of mesenchymal stem cells obtained at sternotomy

An invitro angiogenesis assay in matrigel was carried out in both mesenchymal and cardiosphere derived cells. Endothelial tube formation was apparent within 5h in hCDCs and by 12h, these cells involuted to form a central cell cluster from which secondary vascular structures started to migrate out. (Fig. 3a) Tube formation was considerably delayed in mesenchymal stem cells. (Fig. 3b)

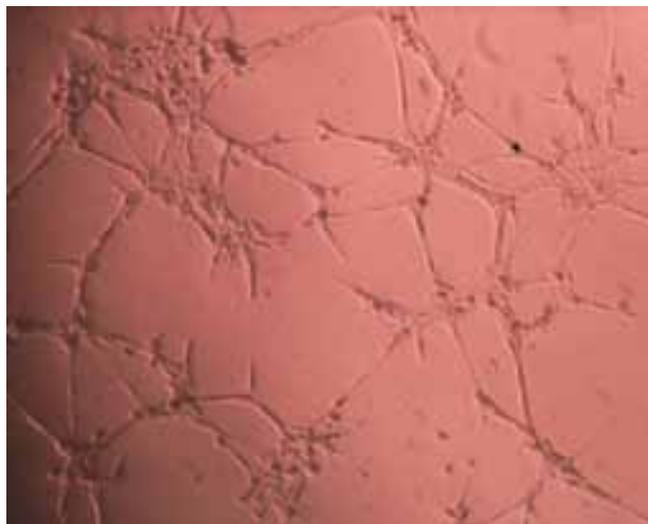
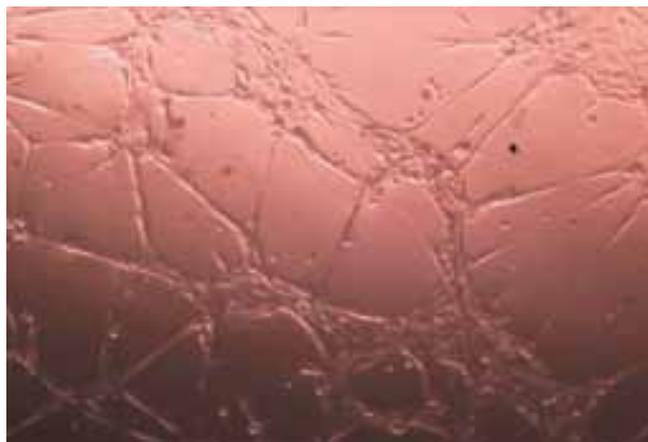


Fig.3- Invitro angiogenesis assay following 12h in culture on matrigel. A. Cardiosphere derived cells, B. Mesenchymal stem cells.

Imaging Sciences and Interventional Radiology

The main areas of research in the department include

1. Advanced functional neuroimaging techniques of functional MRI, DTI, perfusion imaging, susceptibility weighted imaging & spectroscopy
2. Advanced functional and morphologic cardiac MRI
3. Brain computer interface
4. Cerebral vasoreactivity studies
5. Medical image processing: Collaborations have been established with University of Tübingen, Germany, Indian Institute of Information Technology, Kerala, and University of Allahabad. Industrial collaborations exist with Siemens healthcare (MRI research) and Philips healthcare.
6. Multimodality carotid plaque imaging: comparison of USG, CT & MRI
7. Prospective study on the Hypertrophic Cardiomyopathy (HCM): Prospective observational study correlating the MRI patterns with the arrhythmia load and symptoms in patients with HCM

Projects completed

1. Dr. Bejoy Thomas along with Dr. P. Gayatri, Additional Professor, Department of Anaesthesia carried out project on 'Development and evaluation of a non-rebreathing sequential gas delivery circuit to maintain constant end tidal Carbon dioxide (ETCO₂), to be used for Cerebro Vascular Reactivity (CVR) assessment using fMRI and allied techniques'. This was funded by the Institutional Internal fund.
2. Dr. Narendra Bodhey was co-guide for the research project of Mr. Avinash Dhontula, on Design and simulation of Vortex Flow Ventricular Assist Device for the MTech degree awarded jointly by IIT Madras, SCTIMST Trivandrum and CMC Vellore. He is also a core group member for the project titled "Development of the indigenous stent graft for Thoracoabdominal Aneurysm repair" along with the scientists at BMT wing.

Neurology

R. Madhavan Nayar Center for Comprehensive Epilepsy Care (RMNC)

Ongoing research projects include

- a) Study the long-term outcomes of epilepsy surgery

including seizure outcome, psychological outcomes and quality of life outcomes

- b) To study the antiepileptic drug profile of patients following epilepsy surgery
- c) Standardization of neuropsychology test scores through a case-control study in patients with refractory temporal lobe epilepsy
- d) Multimodality imaging in pre surgical evaluation of temporal lobe and extra temporal epilepsy
- e) Positron emission tomography-magnetic resonance imaging (PET-MRI) co-registration
- f) Electroencephalography-functional MRI co-registration (EEG-fMRI)
- g) Role of diffusion tensor imaging tractography (DTIT) in tracking of eloquent areas and aiding in pre-surgical evaluation of drug resistant partial epilepsies
- h) Clinical, electrophysiological and pathological differences within temporal lobe epilepsy
- i) To study the knowledge, attitude and practice of epilepsy in different community groups
- j) To develop cost-effective models of presurgical evaluation suitable to the developing world
- k) Pharmacogenomic research on drug resistance in various epilepsies
- l) Indigenous development of intracranial electrodes

Comprehensive Care Center for Movement Disorders

- Elucidation of molecular interactions between autophagic pathways and alpha-synuclein accumulation in a cell model with endogenous expression: relevance to sporadic PD.
- Study of factors promoting aggregation of alpha synuclein and their influence on the clearance mechanisms in an endogenous cell model with relevance to pathogenesis in Parkinson's disease.
- Non Invasive Cerebellar inhibition by Transcranial Magnetic Stimulation for the treatment of Levodopa-induced dyskinesias in Parkinson's Disease.
- Plasticity of Motor cortex in motor fluctuations and dyskinesias of Parkinson's disease.
- Pattern of impulse control disorders in PD: impact of socio-economic and cultural factors in Indian patients.
- Prevalence and pattern of Non-motor fluctuations and their impact on Quality of life in PD.

- Ten year -outcome of bilateral subthalamic nucleus deep brain stimulation in PD.
- Comparison of sleep disorders in Sporadic vs. Familial Parkinson's Disease.
- A comparative study of transcranial sonography in Parkinson's disease, atypical Parkinsonism and normal controls.

Comprehensive Stroke Care Center

- Prevalence of microbleeds and its correlation with stroke subtypes
- Socioeconomic and caregiver burden of stroke patients
- Quality of life in stroke survivors
- CT angiogram as a predictor of outcome in symptomatic ICA occlusion

Comprehensive Care center for Neuro-muscular Disorders

The section is involved in following broad areas of research:

1. Yield Process (DAC HYP) versus Avonex® (Interferon β 1a) in Patients with Relapsing-Remitting Multiple Sclerosis", (protocol number 205MS301). The study has recruited 4 patients of Multiple sclerosis, after obtaining IEC clearance
2. Standardisation of temperature measurements in the EMG lab
3. Standardisation of F wave parameters in nerve conduction studies
4. Family and genetic studies in myotonic dystrophy patients
5. Review on mortality in the Neuromedical ICU
6. Trigeminal nerve stimulation in diagnosis of Myasthenia gravis
7. Cognitive aspects in multiple sclerosis. MUNE in motor neurone disease
8. The prevalence of Campylobacter jejuni infection associated with Guillain Barre Syndrome: This is a Collaborative project with Department of Neurology at KS Hegde Medical Academy, Mangalore
9. Collaborative nodal center for National Polio Surveillance program for acute flaccid paralysis (AFP) under the aegis of WHO acute flaccid paralysis: Neurology Department of our Institute has been identified as a state nodal centre to periodically report AFP cases so

that accelerated strategies can be adopted to ensure the interruption of wild Poliomyelitis transmission

Comprehensive Centre for Sleep Disorders (CCSD)

Sleep Research Laboratory unit of the CCSD looks into the unresolved questions related to sleep and its functions. The mechanisms for sleep regulation are studied in rat models. Telemetric system is used for recording sleep, body temperature and blood pressure in rats. Different types of transmitters for recording sleep, temperature, blood pressure are chronically implanted into animal's body for recording these parameters in unrestricted natural state. EEG electrodes are implanted using stereotaxic instrument. Along with visual scoring, SleepSign software is employed for analyzing various components of sleep. Simulation studies are carried out in an environmental chamber which provides meticulously controlled experimental conditions essential for study involving interaction of sleep and thermoregulation. The main ongoing projects include:

The effects of maternal sleep deprivation (restriction) on cognition in the offspring in an animal model: Insufficient sleep in pregnant women is a common feature, with growing number of women working not only in offices but also at home. This study aims to evaluate the effects of maternal sleep loss/deprivation on cognition and the mechanisms involved in it. Sleep deprivation is carried out in different groups of pregnant rats using an automated telemetric sleep monitoring system, during the three trimesters. Apart from studying the cognitive parameters in the adult offspring, the anxiety in neonatal pups will be assessed through the ultrasonic vocalizations. The study will also look at the possible alteration theta activity coherence from hippocampus, amygdala and prefrontal cortex.

To investigate the role of rapid eye movement (REM) sleep during development in regulation of sexual arousal and erectile events in adult rats: Sleep and sexual behavior are essential physiological entities. Though it is known that disturbances in REM sleep during early development have a bearing on sexual behavior, it is not known whether it affects erectile dysfunctions in adults. We have standardized the recording of erectile events in free moving animals, and conducting a longitudinal study to study the effect of disturbances in REM sleep during early life on sexual activity during adulthood.

In addition, the center also concentrates on, scientific evaluation of the sleep-wake altering property of a-asarone, an active principle of Acorus Calamus and investigation on the effects of acute sleep restriction on

sleep and body temperature interactions in different age groups of healthy subjects.



Research is also conducted on the following:

- 1) Prevalence of sleep disorders in the general population.
- 2) Epworth sleepiness score standardization in Indian population
- 3) Formulation of new sleep apnea clinical score and its correlation with OSA severity
- 4) Contribution of SDB in the manifestations of ADHD in children
- 5) Neuropsychiatric manifestations of patients with OSA and its improvement after CPAP treatment
- 6) Contribution of sleep apnea in the progression of CHF, systemic hypertension, isolated pulmonary hypertension, COPD and Type 2 DM
- 7) Prevalence of Sleep Disordered Breathing (SDB) in patients with drug resistant epilepsy and seizure control after CPAP treatment- a double blind, placebo controlled prospective trial

Neurosurgery

Use of de-cellularised bovine pericardium as dural substitute. The study has reached preclinical stage and animal trials are in progress.

Pathology

During the year, 3 major lipid antigens of Mycobacterium tuberculosis bacilli were isolated and characterized. These include cord factor (Trehalose 6, 6' dimycolate), lipoarabinomannan and sulphatides. With these antigens immunoassays such as ELISA were standardized for the diagnosis of tuberculous meningitis, tuberculous pleural effusion and tuberculous lymphadenitis.

The role of cord factor in in vitro chemotaxis of neutrophils from patients with pulmonary tuberculosis and tuberculous meningitis were evaluated.

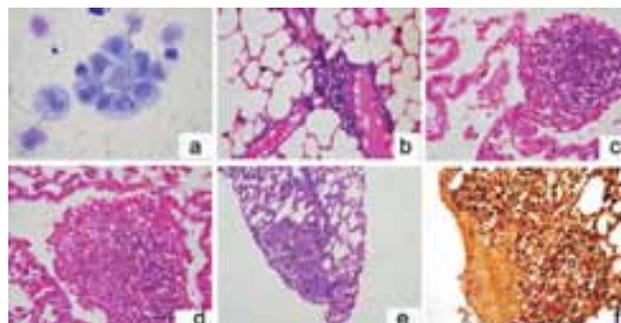
An experimental study was initiated to induce pulmonary granuloma in naïve and lymphopenic mice with cord factor antigen of M tuberculosis: Lymphopenia were induced with the corticosteroids (cortisone acetate). The naïve mice showed well formed pulmonary granulomas following cord factor administration while with the lymphopenic mice did not show any pulmonary granuloma.

A specific immunoassay was developed to estimate the cord factor in intracranial tuberculoma.

A simple dot- immunobinding for the detection of cord factor antigen in body fluids is being developed.

The role of cord factor of M. tuberculosis and its role in the immunodiagnostic and prognosis in pulmonary tuberculosis: (a) Cord factor antigen can be demonstrated in the clinical specimens (sputum, pleural fluid, CSF and sera) of patients with tuberculosis. (b) The concentration of cord factor antigen is directly proportional to the disease severity (c) cord factor antigen is not present in patients with non tuberculous pulmonary diseases and hence the detection of cord factor has a role in the diagnosis of tuberculosis.

Trehalose 6, 6'dimycolate (TDM) induced pulmonary granuloma in naive and lymphopenic mice is shown in the following figure: (a) Cytospin smear showing viable peritoneal macrophages (toluidine blue stain, $\times 400$); (b) perivascular aggregation of lymphomononuclear cells in the lung (H&E stain, $\times 250$); (c) discrete aggregation of lymphomononuclear cells and few histiocytic cells in the lung (H&E, $\times 250$); (d) showing well-formed cohesive histiocytic granulomas in lung (H&E $\times 250$); (e) showing a granuloma located in the sub-pleural region (H&E $\times 100$); (f) showing TDM positive cells in the lung granuloma (ABC immunoassaying, $\times 250$).



Cord factor of M. tuberculosis and its role in the immunopathogenesis of murine tuberculosis:

Cord factor antigen in optimal concentrations induced granuloma formation in lungs in experimental models (mice). The cord factor also promoted chemotaxis of peritoneal macrophages in invitro. Hence cord factor play an important role in the immunopathogenesis of tuberculosis. However under the influence of immunosuppression cord factor did not promote invitro chemotaxis and granuloma formation. The results this experimental observation may have a direct clinical relevance. Patients with immunosuppressant such as AIDS do not manifest granuloma formation and tuberculous lesions in lungs of patients with HIV resemble closely with the lesions seen in lymphopenic mice.

A new finding of lipofuscinosis of the lung was identified in some of the patients reporting to the hospital.

Externally Funded Research Projects

Hospital Wing

| Sl. No | Principal Investigator | Project Title | Funded By | Total cost | Duration | Status |
|--------|--------------------------|---|--|------------------|----------|-------------|
| 1 | Dr. G.Srinivas | Isolation, Characterization of Gliomasphere forming cells from Glioblastoma Multiforme: Correlation with Prognostic Factors and Treatment Outcome | DBT | Rs. 32,84,000/- | 2 years | Ongoing |
| 2 | Dr. S. Harikrishnan | Feasibility study for establishing nationwide network of registries on management of acute coronary event (MACE REGISTRY) | ICMR | Rs. 2,85,890/- | 1 year | Pilot phase |
| 3 | Dr. S. Harikrishnan | Coronary Artery Disease in the Young | KSCSTE | Rs. 13,00,000/- | 3 years | Ongoing |
| 4. | Dr. S. Harikrishnan | Coronary Artery Disease and Its Risk Factors Prevalence Study (CSI Kerala CRP Study) | Cardiological Society of India, Kerala Chapter | Rs.8,22,835 /- | 1 year | Ongoing |
| 5. | Dr. Narayanan Namboodiri | Atrial Fibrillation Registry | IHRS - Indian Heart Rhythm Society | Rs.1,00,000/- | 1 year | Ongoing |
| 6. | Dr. S. Harikrishnan | Does non-regression of pulmonary hypertension following balloon mitral valvotomy correlate with Bmpr2 mutations? | PVRI – Pulmonary vascular research Institute, Canterbury, UK | RS.2,65,650/- | 1 year | Ongoing |
| 7 | Dr. S. Harikrishnan | Use of a <u>Multidrug Pill In Reducing cardiovascular Events(UMPIRE)</u> | Imperial College, London | Rs. 1,392,500/- | 2 years | Ongoing |
| 8. | Dr. S. Harikrishnan | Comprehensive heart failure intervention program | ICMR | Rs. 5,415,301/- | 2 years | Ongoing |
| 9. | Dr. K. Shivakumar | Molecular basis of cardiac fibroblast resistance to oxidative stress | DBT | Rs 45,00,000/- | 3 years | Ongoing |
| 10 | Dr. K Shivakumar | Regulation of the cardiac fibroblast cell cycle by p44/42 MAPK | ICMR | Rs.18,68,571/- | 3 years | Ongoing |
| 11 | Dr. R Renuka Nair | Modulation of energy metabolism in prevention of cardiac remodeling: Stimulation of peroxisome proliferator-activated alpha receptor | LSRB | Rs. 18, 00,000/- | 3 years | Ongoing |
| 12 | Dr. R. Renuka Nair | Autocrine and paracrine mechanisms in human resident cardiac stem cell signaling following hypoxic injury | KSCSTE | Rs.16,00,000/- | 3 years | Ongoing |

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|----|------------------|---|---|-----------------|---------|-------------|
| 13 | Dr. C. Kesavadas | Self-Regulation of Broca's Area (right inferior frontal gyrus) using Real time fMRI in Post Stroke Aphasia patients | DBT | Rs. 9,00,000/- | 2 years | Second year |
| 14 | Dr. C. Kesavadas | Neurobiological Marker for Population Differences: A Neuroeconomic Investigation with Anxiety & Depression Patients contrasted with Normal Population | DBT | Rs.7,00,000/- | 2 years | Ongoing |
| 15 | Dr. R. Ashalatha | Improving localization in lesion negative focal epilepsy: Can EEG-FMRI predict the epileptogenic zone and the likelihood of post-operative seizure freedom? | KSCSTE | Rs.14,85,000/- | 3 years | Ongoing. |
| 16 | Dr. R. Ashalatha | EEG-FMRI as a tool in pre surgical evaluation of Medically refractory epilepsy | DBT | Rs.9,00,000/- | 3 years | Ongoing |
| 17 | Dr. R. Ashalatha | Can EEG-FMRI predict the epileptogenic zone and the likelihood of post-operative seizure freedom? | DST | Rs.21,25,200/- | 3 years | Ongoing |
| 18 | Dr. Asha Kishore | Cerebellum and Cortical Plasticity – The Case of Dystonia" (Indo-French Collaborative Project. | ICMR and INSERM (Paris, France) | Rs.7,00,000/- | 2 years | Ongoing |
| 19 | Dr. Asha Kishore | Developing experimental therapeutics using Transcranial magnetic stimulation for Movement disorders (Indo-French collaborative project): Cerebellum and Cortical Plasticity | Association Center for Neurological Research of the Sal Peteriere | Rs 7,00,000/- | 2 years | Ongoing |
| 20 | Dr. Asha Kishore | Protocol SP921: A multicenter, randomized, double-blind, placebo controlled, 5-arm, parallel-group trial to assess the study drug transdermal system dose response in subjects with advanced-stage Parkinson's disease. | UCB Bioscience GmbH Funding agency | Rs.10,00,000/- | 1 year | Completed |
| 21 | Dr. Asha Kishore | Protocol 28850: Open label trial to determine the long term safety of the study drug in Parkinson's disease patients. | Merck Serono | Rs.10,00,000/- | 1 year | ongoing |
| 22 | Dr. Asha Kishore | Protocol P04938: A phase 3, 12- week, double blind, double-dummy, placebo and active controlled efficacy and safety study of the study drug in subjects with moderate to severe Parkinson's disease | Schering-Plough | Rs. 10,00,000/- | 1 year | ongoing |

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|----|---|--|---|-----------------|-----------|----------|
| 23 | Dr. Asha Kishore | Protocol P05664: A Phase III, double blind, placebo and active controlled, dose – range – finding efficacy and safety study of the study drug in subjects with early Parkinson's disease | Schering-Plough | Rs. 5,00,000/- | 1 year | Ongoing |
| 24 | Dr. P.N Sylaja | Diabetes, prediabetes and insulin resistance in patients with recent transient ischemic attack and ischemic stroke | NIH | \$ 15,000/- | 10 months | Ongoing |
| 25 | Dr. P.N. Sylaja | Indo-US Collaborative Stroke Registry and Infrastructure Development | DBT-NIH | \$ 60,000/- | 2 years | Ongoing |
| 26 | Dr. P. S. Mathuranath | Multi-centric Indo-US collaborative project, the Kerala-Einstein study | National Institute of Health (NIH) USA | \$82,759/- | 5 years | Ongoing |
| 27 | Dr. Kamalesh K. Gulia | The effects of maternal sleep deprivation (restriction) on cognition in the offspring in an animal model | DST-CSI funded project | Rs. 42,47,000/- | 3 years | Ongoing |
| 28 | Dr. Kamalesh K. Gulia | To investigate the effects of short- and long-term administration of alpha-asarone on oxidative stress and anxiety alleviation in insomnia model in rats | CSIR | Rs 24,22,000/- | 3 years | on going |
| 29 | Dr. Kamalesh K. Gulia | To investigate the role of rapid eye movement (REM) sleep during development in regulation of sexual arousal and erectile events in adult rats | DST | Rs. 10,68,000/- | 3 years | Ongoing |
| 30 | Mr.Mendlow, Professor of Neurosurgery, Regional Neurosciences Centre, New Castle Upon Tyne, UK (Principal International Investigator) | Multicentric multinational randomised controlled surgical trial in intracerebral haemorrhage (STICH II), | Sponsored by stroke association and medical research council, University of New Castle, UK. | Rs. 82,293/- | 2.5 years | Ongoing |
| 31 | Dr.V.V.Radhakrishnan | The role of cord factor of M tuberculosis and its role in the immunodiagnostic and prognosis in pulmonary tuberculosis | KSCSTE | Rs.5,63,200/- | 2 years | ongoing |
| 32 | Dr.V.V.Radhakrishnan | Cord factor of M tuberculosis and its role in the immunopathogenesis of murine tuberculosis | DST | Rs.12,49,600/- | 2 years | ongoing |
| 33 | Dr.V.V.Radhakrishnan | Development of an immunodiagnostic system suited to laboratories in developing countries | DBT | Rs.17,03,000/- | 3 years | ongoing |

Biomedical Technology Wing

a. Newly Initiated Projects

| Title | Principal Investigator | Funding Agency | Total Project Cost (in Rs) | Duration |
|--|---------------------------|----------------|----------------------------|----------|
| Visible light induced insitu gelling Multifunctional Hydrogels as Potential Wound Dressings | Dr. C. Radhakumary | DBT | 39.79 lakhs | 3 years |
| Cell Sheet Engineering on Electrospun Scaffolds for Efficient Cell Supply in Skin Tissue Engineering | Dr. P.R. Anil Kumar | DST Fast Track | 19.44 lakhs | 3 years |
| Home based vital signs monitor for screening of sleep disorders | Dr. Niranjana D. Khambete | DST | 29.28 lakhs | 2 years |

b. Ongoing Projects

| Title | Principal Investigator | Funding Agency | Total Project Cost | Duration |
|---|------------------------|--------------------------|--------------------|----------|
| Development of Calcium Sulfate Based Injectable Bone Substitute | Dr. Manoj Komath | DST (SERC) | 12.03 lakhs | 2 years |
| Development of nanodevices for DNA delivery and cell transfection using Elastin Like Polymers (ELPs) coupled to cell interaction motifs | Dr. Chandra P. Sharma | Indo Spanish DST project | 26.14 lakhs | 3 years |
| Pulsed laser Ablation of Bioactive Ceramic Composite on Titanium Bone Implants | Dr. H.K.Varma | KSCSTE | 6.35 lakhs | 3 years |
| Synthesis of oxide based magnetic nanoparticles for biocompatibility studies, magnetic hyperthermia and MRI applications. | Dr. H.K.Varma | DST | 16.39 lakhs | 3 years |
| Development of Coronary Stent System | Mr. C.V. Muraleedharan | NMITLI, CSIR | 184 lakhs | 6 Years |
| Development of iron oxide Nanoparticle probes for organ specific molecular MR imaging | Dr. R.S. Jayasree | BRN, DAE | 28.63 lakhs | |
| Development of smart dental composites consisting of calcium containing resins and fillers | Dr.P.P. Lizymol | KSCSTE | 14.65 lakhs | 3 years |
| Quantum dots for cardio-vascular Applications | Dr.Diksha Painuly | DST | 22 lakhs | 3 years |
| Molecular and immunotoxicological effects of Dextran coated Ferrite and Hydroxylapatite nanomaterials' | Dr. P.V. Mohanan | DST | 49.39 lakhs | 3 years |
| In Vitro alternative test system development for Ocular Irritation | Dr. P.V. Mohanan | ICMR | 40.11 lakhs | 3 years |
| Development of neurons from adult stem cells for the application of regenerative medicine | Dr. Lissy Krishnan | SERC, DST | 29 lakhs | 3 years |

| | | | | |
|--|--|---|--------------|-----------|
| Facility for micro/nanoparticles based biomaterials for Advanced Drug Delivery Systems (FADDS) | Dr. Chandra P. Sharma | DST | 554.79 lakhs | 4 years |
| Ex vivo evaluation of Left Ventricular Assist Devices (LVAD) VSSC-SCTIMST joint project | Mr. D.S. Nagesh | VSSC, Trivandrum | 30 lakhs | |
| Development of a Dura Substitute by Electrospinning of ϵ -Caprolactone-Co-Lactide Polymers | Dr.P. Ramesh | KSCSTE | 9.58 lakhs | 4 years |
| In vitro and Preclinical evaluation of curcumin released from biodegradable drug carriers | ICMR | ICMR | 15 lakhs | |
| Development of National GLP Guidelines & Identification and selection of National Regulatory Guidelines for Testing and Evaluation of Medical Devices | Dr. P.V. Mohanan | National GLP Compliance Monitoring Authority, DST | 10.77 lakhs | 18 months |
| Development of hemostatic scaffold for wound care | Dr. Lissy K. Krishnan | CSIR | 22 lakhs | 3 years |
| Development of neurons from adult stem cells for the application of regenerative medicine | Dr. Lissy K. Krishnan | DST | 29 lakhs | 3 years |
| Bioengineered hybrid skin substitutes for burn wounds | Dr. Lissy K. Krishnan | KSCSTE | 27 lakhs | 3 years |
| In vitro, and Preclinical Evaluation of Curcumin Released from Biodegradable Fibrin Matrix | Dr. Lissy K. Krishnan | ICMR | 15 lakhs | |
| Role of transforming growth factor – alpha in neuronal growth and regeneration | Dr. Anoopkumar Thekkuveetil | STEC | 14.96 lakhs | 3 years |
| Dispensable and biodegradable polymeric bone cement for minimally invasive treatment of bone diseases – product validation | Dr. M. Jayabalan | DST | 32.07 lakhs | 3 years |
| Program support for a Lead program on Centre of excellence in Tissue engineering (COE) program of the (extended for 2 more years) | Dr. Prabha D. Nair – Team Leader & P.I | DBT | 499 lakhs | 5 years |
| Individual project under the COE program - Tissue engineering of cartilage using biomimetic scaffolds under dynamic conditions – (extended for 2 more years) | Dr. Prabha D. Nair | DBT | | |
| Musculoskeletal Tissue engineering | Dr. Prabha D. Nair, SCTIMST and Prof M.Kassem, Odense University | Indo-Danish project jointly funded by the Danish Ministry of Science and Technology and DBT India | 637.89 lakhs | 3 year |
| Epithelial-mesenchymal interactions in tissue engineered hybrid artificial lung role of angiogenic factors | Dr. A.Maya Nandkumar | DBT | 46.101 lakhs | 3 years |

| | | | | |
|--|--------------------------------------|--|-------------|---------|
| Differentiation of foetal progenitor cells and fabrication of a prototype of bioartificial liver | Dr. T.V. Kumary | DBT | 59.56 lakhs | 1 year |
| Development and Feasibility study of Polymeric Scaffolds for Tissue culture under Microgravity | Dr.P.R. Anil Kumar (Co-investigator) | Indian Institute of Space Science and Technology, Trivandrum | 25.00 lakhs | 3 year |
| Medical Device Retrieval Programme | Dr. Mira Mohanty | DBT | 48.65 lakhs | 3 years |
| Atlas of tissue response to Biomaterials | Dr. Mira Mohanty | DST | 5.78 lakhs | 1 year |
| Cell based tissue engineered fabrication of osteochondral grafts | Dr. Annie John | DBT (ANCETE) | 54.57 lakhs | 5 years |
| Tissue engineering of a carrier free corneal endothelial construct towards transplantation for endothelial keratoplasty. | Dr. Bernadette K. Madathil | DST, (Women scientist scheme, WOS-A) | 24.80 lakhs | 2 years |

INDUSTRY sponsored projects 2011-12

d. Ongoing projects

| Title | Principal Investigator | Funding Agency | Total Project Cost | Duration |
|---|--|--|--------------------|----------|
| Setting up a mission mode programme for medical instrumentation and devices development | Dr.V. Kalliyana Krishnan | DST | 28 lakhs | 2 years |
| Evaluation of molecular toxicity of newly developed materials intended for biomedical application | Dr. P.V. Mohanan | ICMR | 18.44 lakhs | 3 years |
| Development of decellularised animal tissue for cardiovascular application' | Dr. S.R. Krishnamanohar/ Dr. P.R. Umashankar | DBT | | |
| Bone Tissue Engineering using adipose stromal cells on 3D porous bioactive ceramic scaffolds | Dr. Annie John | DBT (ANCETE) | 35.00 lakhs | 1 year |
| Bioconjugation of nanomaterials and their applications in cancer therapy | Co-investigator- Dr. Annie John (Collaboration with University of Kerala) | DBT, (Nanoscience & Nanotechnology Task Force) | 25.00 lakhs | 3 years |
| Development of improved tilting disc heart valve | Mr. C.V. Muraleedharan | NMITLI, CSIR | 94.2 lakhs | 4 years |

b. Ongoing Projects

| Title | Principal Investigator | Funding Agency | Total Project Cost | Duration |
|---|--------------------------|-------------------------------|--------------------|----------|
| Development of intrauterine drug releasing system | Dr.V. Kalliyana Krishnan | HLL Lifecare Ltd., Trivandrum | 40 lakhs | 4 years |

INSTITUTE Technology Development Fund Projects 2011-12

e. Newly Initiated projects

| Title | Principal Investigator | Duration | Total project cost (Rs in lakhs) |
|--|-------------------------|-----------|----------------------------------|
| Toxicological evaluation of a new dental restorative composite containing Diphenyl [2,4,6-trimethyl benzoyl] phosphine oxide [TPO] as photoinitiator | Dr.V.Kalliyana Krishnan | 1 year | 9.11 lakhs |
| Production scale-up of Calcium phosphate Cement (Chitra-CPC) | Dr. Manoj Komath | 1 year | 4.30 lakhs |
| Prototyping of skin graft substitutes for wound healing applications using cholecyst - derived extracellular matrix | Dr. T.V. Anilkumar | 2 years | 9 lakhs |
| In vivo evaluation of the efficacy of oral heparin nanoparticles in rabbit models | Dr. Chandra P. Sharma | 10 months | 1.98 lakhs |
| Development of Titanium nitride coatings for medical applications | Mr. Sujesh Sreedharan | 2 years | 2.35 lakhs |

f. Ongoing projects

| Title | Principal Investigator | Duration | Total project cost |
|--|-----------------------------|-------------------------------|--------------------|
| A pilot project on implementation of a medical device safety network portal suitable for Indian scenario | Mr. Arun Anirudhan | 2 years | 8.53 lakhs |
| Preclinical animal evaluation of decellularised bovine pericardium as dura substitute. | Dr. Girish Menon | 18 months | 6.87 lakhs |
| Development of bioactive bone cement based on organically modified ceramic resin | Dr. P.P. Lizymol | 2 years (Jan 2010 – Sep 2012) | 6.33 lakhs |
| RAPID Antibiotic sensitivity kit for UTI | Dr. A. Maya Nandkumar | | 1.95 lakhs |
| Development of Mandibular Advancement Device for the Treatment of Obstructive Sleep Apnea | Dr. Roy Joseph | 2 years | 9.99 lakhs |
| Evaluation of functional efficacy of recombinant TGF alpha and VEGF proteins | Dr. Anoopkumar Thekkuveetil | 2 years | 9.76 lakhs |
| Clinical application of cryo preserved homograft valves in cardiovascular surgery | Dr. K. Jayakumar | 2 years | 8 lakhs |

Achutha Menon Centre for Health Science Studies

| S. No | Principal Investigator/Responsibility | Project Title | Funded By | Total cost | Duration | Status |
|-------|---|--|---|---------------|-----------------------------------|---------|
| 1 | K. R. Thankappan, P. S. Sarma S. Sivasankaran Yamini Thankachi G.K. Mini Sreedevi Padmajam | Building Capacity for Tobacco Cessation in India and Indonesia | Fogarty International Centre of the National Institutes of Health | US \$ 472,500 | Five years Up to 30 June, 2013 | Ongoing |
| 2 | K. R. Thankappan S. Sivasankaran Ravi Prasad Varma Rekha M. Ravindran C. U. Thresia | Community Interventions for Health | Oxford Health Alliance | US \$ 690,000 | Five Years Up to 31 December 2012 | Ongoing |

| | | | | | | |
|----|---|---|---|----------------------|----------------------------------|-----------|
| 3 | K. R. Thankappan Sony Jacob | Partnership for Better Health | European Commission through the BRAC school of Public Health Bangladesh | Euro 180,455 | Four years up to 31 October 2012 | Ongoing |
| 4. | Prof. Brian Oldenburg, Australia Prof. Khalid Kadir, Malaysia Prof. Edwin Fisher, USA Prof. K. R. Thankappan, India Dr. Prasad Katalunda, Sri Lanka | Asian Collaboration for Excellence in Non-Communicable Diseases (ASCEND) | Fogarty International Centre of the National Institutes of Health, USA | US \$ 1.0343 Million | Five years up to June 30, 2015 | Ongoing |
| 5 | K. R. Thankappan S. Sivasankaran T. Sathish Neena Philip Anoop Velayudhan | Kerala Diabetes Prevention Program | National Medical and Health Research Council, Australia | AU \$ 1.03 Million | Five years up to June 30, 2015. | Ongoing |
| 6 | Mala Ramanathan V. Raman Kutty | Prevalence of Type II diabetes in a rural Community: Identification of the Contributing Economic and Socio-cultural factors | | 1.15 lakhs | Two years until October 2012 | Ongoing |
| 7 | V. Raman Kutty Mala Ramanathan | Impact of type 2 Diabetes on women's lives and wellbeing. | Women Component plan of DST | 19.85 lakhs | Two years until July 2012 | Ongoing |
| 8 | Biju Soman Manju Nair S. Harikrishnan | Capacity Building for Women Health workers | Women Component Plan of DST | 10 lakhs | Two years up to July 2012 | Ongoing |
| 9 | Biju Soman K. R. Thankappan P. S. Sarma | A longitudinal study in the tsunami affected areas of Kerala | University of San Francisco, USA | 40 lakhs | Four years up to June 30, 2011 | Completed |
| 10 | K. Srinivasan P.S. Sarma | Workload of Public Health Nurses and Other Women Health Workers | Women Component Plan of DST | 20 lakhs | Two years up to December 2011 | Completed |
| 11 | V. Raman Kutty Mala Ramanathan | Capacity building for Safe Motherhood Programmes | Centre for Studies in Ethics and Rights, Mumbai | 11.36 lakhs | Up to March 31, 2012 | completed |



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Honours, Awards & Visitors



Honours and Awards

- Smt.Sudarsa. K, Ward Sister-B, NeuroSurgery ICU , who has received the prestigious "National Florence Nightingale Award" by the honourable President of India.
- Dr. K. Radhakrishnan, Director, received the prestigious "Asian and Oceanian Outstanding Achievement Epilepsy Award" by the Commission on Asian and Oceanian Affairs (CAOA) of the International League Against Epilepsy (ILAE).
- Dr. Shashidhar K. P., Senior Resident , Cardiovascular and Thoracic Surgery Department who has Won the "1st Best Poster Award " during the INDOVASC 2012 Held at Bangalore on 23rd to 25th March 2012.
- Dr. Shunmugha Sundaram & Dr. Kiron S., Senior Residents, Cardiology Department who has Won the "1st Prize in Echo Quiz " during the 3rd Annual Conference of Indian College of Cardiology Held at Kozhicode.
- Dr. Anil Kumar P.R., Scientist 'C', Division of Implant Biology, BMT Wing who has received "The SAB Young Bioengineer Award 2011" by the Society of Applied Biotechnology (SAB) during the Second National Conference on Biotechnology, Bioinformatics and Bioengineering held at Kolhapur on 24th and 25th February 2012.
- Dr. Thomas Koshy, Professor, Anesthesiology has been Awarded Honorary IACTA Fellowship Award (FIACTA) and Honorary Transesophageal Echocardiography Fellowship By Indian Association of Cardiovascular and Thoracic Anesthesiologists (IACTA).
- Dr. C. Kesavadas, Additional Professor, Department of Imaging Sciences & Interventional Radiology was awarded the Dr.M.L.Aggarwal Memorial Oration Award 2012 at the 65th Annual Scientific Meeting of the Indian Radiological and Imaging Association held in Hyderabad for the topic of oration was "Advanced Magnetic Resonance Imaging of Brain Neoplasms - Moving Closer to Physiology & Pathology".
- Dr. R.Ashalatha, Associate Professor, Department of Neurology was awarded the "Bio Scientist Career Award-2011" by DBT for developing the state-of-the-art investigations in the treatment of drug resistant epilepsy.
- Dr. Prakash Muthusami, Senior Resident, Department of Imaging Sciences & Interventional Radiology won the "Certificate of Merit" for the work entitled "Diffusion Tensor imaging (DTI) and tractography of the language pathways" at the 97th Annual Scientific meeting of the Radiological Society of North America (RSNA), held between 28th November to 3rd December 2011 at Chicago.
- Mr. G.T. Finosh, Ph.D. student in the Biomedical Technology Wing winning the Young Scientist Award Studies on biosynthetic hydrogels for tissue engineering - effect of free water on cell penetration and survival. at the 24th Kerala Science Congress held from 29th to 31st January 2012 organized by the Kerala State Council for Science and Technology & Environment at Kottayam.
- Ms. Ashna U., Junior Research Fellow (JRF) in the Biomedical Technology Wing winning the Best Poster Award Surfactant gene mRNA modulations in three dimensional cultures of alveolar cells. At the 24th Kerala Science Congress held from 29th to 31st January 2012 organized by the Kerala State Council for Science and Technology & Environment at Kottayam.
- Dr. Thomas Titus, Professor of Cardiology has been awarded FRCP (Edinburgh) from the Royal College of Physicians, Edinburgh.
- Dr. Noshir H. Wadia, former President, SCTIMST was awarded Padma Bhushan on the eve of 63rd Republic Day.
- Dr. Shiny Velayudhan, Scientist C (Adhoc) from the Division of Tissue Engineering & Regeneration Technologies (DTERT) won the MAHE Award for the best paper presented by a scientist/academic faculty : "A novel, highly sensitive cell based metabolic assay using honeycomb micro-porous polymer membranes"During 22nd National Conference of the Society for Biomaterials and Artificial Organs, SBAOI & STERMI (India), Jan 6-8, 2012 at Rajalakshmi Engineering College, Chennai.

- Mr. Willi Paul, Jr. Scientific Officer-B, Division of Bio-surface Technology has won the Best Oral Presentation Award for Faculty for the paper "Thermosensitive curcumin stabilized gold nanoparticles: A delivery system for cancer therapy" During the International Conference on Biomaterials Implant Devices and Tissue Engineering, BIDTE-2012 organized jointly by Rajalakshmi Engineering College, Chennai, Society for Biomaterials and Artificial Organs, India and Society for Tissue Engineering and Regenerative Medicine at Rajalakshmi Engineering College, During January 6-8, 2012.
- Ms. Susan M. Alex, PhD Student, (Guide Dr. C.P. Sharma) Biosurface Technology Division has won the Bajpai-Saha Award (First Prize) for the paper "Ligand targeted polyamine substitution in chitosan for efficient nanoparticles mediated gene delivery" During the International Conference on Biomaterials Implant Devices and Tissue Engineering, BIDTE-2012 organized jointly by Rajalakshmi Engineering College, Chennai, Society for Biomaterials and Artificial Organs, India and Society for Tissue Engineering and Regenerative Medicine at Rajalakshmi Engineering College, during January 6-8, 2012.
- Ms. Sidhy Viha CV, Bajpai-Saha Award (Stem Cells and Regenerative Medicine) for the paper presentation entitled "Functional Evaluation of a Polysaccharide-Protein Hydrogel as a Packed Bed Scaffold for Liver Tissue Engineering" co-authored by Ms. Sarika PR, Mr. Sajin Raj RG, Dr. Nirmala Rachel James and Dr. Anil Kumar PR in the International Conference on Biomaterials Implant Devices And Tissue Engineering during 6-8 January 2012 at The Rajalakshmi Engineering College, Chennai.
- Dr. Prakash Muthuswami, PDCC resident in the Department of Imaging Sciences & Interventional Radiology was awarded the "Certificate of Merit" at the Annual Scientific meeting of the Radiological Society of North America (RSNA - one of the most important international Radiology meeting), November 28 - December 3, 2011 at Chicago for the work titled "Diffusion Tensor imaging (DTI) and tractography of language pathways".
- Dr. Sujit Abajirao Jagtap, Senior Resident, Department of Neurology, First Prize for the poster entitled: "Landau-Kleffner Syndrome: natural history and long term outcome" at the Pediatric Epilepsy Symposium organized by the Pediatric Epilepsy Society, Hyderabad, Andhra Pradesh on 5th and 6th November 2011.
- Dr. Gayathri Easwer, working as Institute Research Fellow - A has been awarded IMA KMJ Best Paper Research Award for her publication titled "Incidence of Hypothyroidism in Coastal and non Coastal areas of Kerala in age group 20-25 years". Kerala medical Journal. July(4) .141-148, 2011
- Dr. Meera R, fellow in Cardiac Electrophysiology won the best scientific paper award for the presentation on "Utility of implantable loop recorders in the evaluation of syncope - an initial experience" in the annual conference of Kerala chapter of Cardiological Society of India, held in Kollam on 30th October 2011.
- Dr. Satyajeet Misra, Assistant Professor of Anaesthesiology has won the "KPR Young Anaesthesiologist Award 2011" during the 35th Annual Kerala State Conference of ISA, held at Kerala, Kollam on 8-10-2011
- The 18th National Vascular Society of India Conference (VSICON 2011), was held at Taj Lands End, Mumbai from 29th September to 1st October 2011. SCTIMST winning in the following events.
- Dr. Prakash Muthusami and Dr. Divyata Hingwala, Senior residents in the Department of Radiology were awarded the second & third prize for the Poster presentation at the Annual Conference of Indian Society of Neuroradiology held at PGI, Chandigarh from 22nd to 25th September 2011. The titles of the papers are: "Diffusion tensor metrics in elucidating brain tumor microstructure" & "Delineation of the optic radiations using diffusion tensor imaging and tractography"
- Dr. Ramshekhar N. Menon, Assistant Professor of Neurology has won the "Best Paper on Epilepsy Award" during the 19th Annual Conference of Indian Academy of Neurology (IANCON-2011), held at Pune from 22nd to 25th September 2011 for the paper "Utility of Fluoro-Deoxy Glucose Positron Emission Tomography (FDG-PET) in deciding Surgical Candidacy in Patients with Drug-resistant Partial Epilepsy".
- Dr. Shiva Kumar, Scientist 'G' Division of Cellular &

Molecular Cardiology Selected for the Prestigious Award "Amrut Mody Unichem Prize - 2008" By the Indian Council of Media Research in recognition of the Outstanding Contribution in Biomedical Research.

- Mr.Vishnu S.P., Apprentice Trade Fitter, Division of Clinical Engineering Won the "Gold Medal and selected As the Best Craftsman During the All India Skill Competition For Craftsman held at Kanpur on January 2011 Under the Craftsman Training Scheme.
- Dr. Rohan Vijay Ainchwar, IIIrd year Cardiology Senior Resident won the First Prize in the National level Quiz competition conducted during the 3rd annual conference of the Arrhythmia-Heart Failure Academy held in Madras Medical Mission, Chennai on 3rd and 4th, September 2011.
- Dr. Srujal Shah & Dr. Vikram Patra, IIIrd year Vascular surgery Senior Residents, SCTIMST have won the first prize & "First Rolling Trophy" of Vascular Society of India (VSI) during the 4th mid term conference of VSI held at Goa from 01/07/11 to 03/07/11.



Administration





Message from the Deputy Director

The responsibility of the Administration encompasses organizing and supporting the major activities of the institute, in particular the patient's total medical care in the Hospital Wing as well as overseeing research & technology development programs at the Biomedical Technology Wing. It integrates the various functions and services. Therefore, it is a multifaceted organization having the integrated role of a R & D institution, a medical university & hospital and public health study center comprising many departments, types of personnel, and services. A public not-for-profit superspeciality hospital is run by the Institute as envisaged in the SCTIMST Act 1980. A number of departments perform support functions that help with diagnosis and treatment and also technology development work. It requires highly trained employees, efficient systems and controls, necessary supplies, adequate equipment and facilities, and, of course, physicians/surgeons and scientists & engineers and other technical & supporting staff. It is a patient caring, people-oriented research institution and it has a similar structure and hierarchy of authority as any other large public sector medical and research institution. The apex policymaking body is the Institute Body and the executive body is the Governing Body (GB).

In order to meet the objectives of the Institute, the Administration coordinates activities and creates policies so that all areas of the Institute staff functions efficiently. The Administration recruits, hires and train hospital staff such as doctors, scientists, engineers, nurses and other para-medical and scientific/technical staff for the entire staff requirements of the institute and evaluates the current employees. It always puts in place policies and procedures and make sure that they are adhered to by the staff. Also develop short-term and long-term programs for institute growth and for research and technology development activities, besides overseeing hospital/research operations by supervising other officials and managing budgets and financial operations.

For the physical health sector management and related activities, non-medical administrative services are absolutely. The Director and other senior officers lead these administrative services and is directly responsible for the day-to-day operations of the facility. The Finance & Accounts Division manages financial activities including the hospital's admitting and discharge functions, records charges to a patient's account, and handles accounts receivables. The finance department advises the Director on financial policy and long-range planning, establishes procedures for accounting functions, receives and deposits all monies received by the hospital, and approves the payments of salaries and other expenditures.

Evaluating the staff on a periodical basis and judging the level of their performance and also developing policies and procedures that facilitate the efficiency of daily operations are entrusted with the Administration. These procedures can include how to organize staff work schedules or paperwork. It reviews, implements and analyzes the budget of the institute overall and the budgets of different areas of the Institute to make sure they are realistic and stringently followed. At times, it acts as a moderator for staff complaints and tries to resolve the grievances arising out of patient care services. In addition to a great deal of paperwork and daily administrative tasks, the administration also thinks about the future of the institute and come up with short-range and long-range plans for its growth and development. The administration is always responsible and supports for attaining and maintaining patient care, safety, medical education, research and technology development activities and other service goals. It also ensures that Institute objectives are met through the process of selection, development, organization, motivation, management, evaluation and the promotion of human resources.

The Administration complies with government regulations set out for the Institute and its staff. In an effort to complete this duty, the administration monitors the organization's service and delivery system at all times to ensure optimal operation. Recruitment of employees, training, functioning, setting the salaries and benefits of employees and managing employee-employer relations, are some of the primary duties of the Administration. Staff requirements for each section of the hospital, such as clinical and diagnostic departments, administration & accounts, equipments & building maintenance, logistics, ambulance, nursing, diagnostic labs, paramedics, and R & D staff for the Biomedical Technology development wing are being timely met with. Recruitment guidelines are drawn up for job applicant screenings, as well as, for the recruiting of junior and senior level positions. The Senior and Junior Staff Selection Committees actively participate in the selection of doctors, surgeons, scientists, engineers and undertakes responsibilities in facilitating the selection process and creates offer letters and employment contracts. During the year 2011-12, Personnel Department has conducted 12 interviews for filling up Permanent posts, 97 for temporary/leave substitute positions, 34 project appointment positions besides handling the internal promotional cases of 117 employees under vacancy oriented and flexible complementing promotion schemes. Service Records/Books of an average of 1304 employees (932 permanent employees and 372 project and temporary staff) are maintained and updated and their requirements are met promptly. Running a superspeciality hospital even without bystanders, the institute is able to maintain nursing and para-medical staff ratio well below the national average. The administrative staff strength is also maintained within 10 percent of the total staff strength of the institute, which is a national record in comparison to similar other institutions.



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Kerala State Council for Science,Technology & Environment
Sasthra Bhavan, Pattom
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Top of Form**Dr.K.Radhakrishnan**

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Thiruvananthapuram - 695 011

Dr.G.S. Bhuvaneshwar

Head, Biomedical Technology Wing
Sree Chitra Tirunal Institute for Medical
Sciences and Technology
Poojappura, Thiruvananthapuram - 695 012

Shri.O.S.Neelakantan Nair

Engineer 'G' (Sr.Grade), Biomedical Technology Wing,
Sree Chitra Tirunal Institute for Medical
Sciences and Technology
Poojappura, Thiruvananthapuram - 695 012

STANDING COMMITTEES**Academic Committee****Prof.K.Radhakrishnan (Chairman)**

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SCTIMST, Thiruvananthapuram.

Prof.A.Jayakrishnan

Vice Chancellor
University of Kerala, Thiruvananthapuram

Prof.Jayaprakash Muliyl

Professor of Community Medicine
Christian Medical College, Vellore

Dr.M.Radhakrishna Pillai

Director
Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram.

Dr.G.K.Suraishkumar

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Head, BMT Wing, SCTIMST
Poojappura, Thiruvananthapuram

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Dean (Academic Affairs) & HOD, Cardiology, SCTIMST

Dr.Suresh Nair N.

Professor of Neurosurgery, SCTIMST

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Professor, AMCHSS, SCTIMST

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Scientist 'G', SCTIMST

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Professor of Anaesthesiology, SCTIMST

Dr.Prabha D. Nair

Scientist 'G', SCTIMST

Dr.A.V.George

Registrar, SCTIMST (Convener)

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SCTIMST, Thiruvananthapuram

Secretary to the Government of Kerala

Health & Family Welfare
Thiruvananthapuram

Shri. K.N. S Nair

Head, Engineering Maintenance Division
VSSC (Retd)
"Deepti", Kazhakuttan, Thiruvananthapuram

Dr. G. S. Bhuvaneshwar

Head, BMT Wing, SCTIMST
Poojappura, Thiruvananthapuram

Financial Advisor

SCTIMST, Thiruvananthapuram

A member to be co-opted by the Director as and when necessary

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Dr.K.Radhakrishnan (Chairman)

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SCTIMST, Thiruvananthapuram

Dr. T. Ramasami

Secretary to the Govt. of India
Ministry of Science and Technology
Technology Bhavan
New Delhi – 110016

Financial Advisor

Department of Science & Technology
New Delhi - 110 016

Dr. G.S. Bhuvaneshwar

Head, BMT wing, SCTIMST

Financial Advisor (Ex-Officio Convenor)

SCTIMST, Thiruvananthapuram

Senior Staff Selection Committee

Dr.K.Radhakrishnan (Chairman)

Director
SCTIMST, Thiruvananthapuram

Dr. G. S. Bhuvaneshwar

Head, BMT Wing, SCTIMST, Poojappura
Thiruvananthapuram

Prof. Jayaprakash Muliyl

Professor & Head of Community Medicine
Christian Medical College, Vellore

Nominee of the Secretary

Department 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

Dr. G. S. Bhuvaneshwar

Head, BMT Wing, SCTIMST, Poojappura
Thiruvananthapuram

Shri. P. B. Sourabhan

Deputy Director (Admn)
SCTIMST, 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

Institutional Ethics Committee

Chairman-IEC

Shri.Justice M .R. Hariharan Nair

'LIVRA-57', Link Valley
Kakkanad, Ernakulam ,Cochin-682030

Members

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Director
SCTIMST, Thiruvananthapuram-695011

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Thiruvananthapuram-695041
Dr. P.G. Premila
7 C, Kowdiar Manor , Jawahar Nagar
Thiruvananthapuram-695041

Dr.Meenu Hariharan

"Abha" ,20/1677,no-8
Sasthri Nagar, Karamana
Thiruvananthapuram-695002

Dr.K.A. Kumar

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Pattom Palace P.O.Thiruvananthapuram-695004

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Ex-Director,National Institute of Epidemiology (ICMR)
Chennai – 600 777.

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Director (Engineering)
HSCC (India) limited
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State Project Director
Kerala Mahila Samakhya Society,
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Thiruvananthapuram-695014

Dr.G.S.Bhuvaneshwar

Head, B.M.T. Wing
Satelmond Palace
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Dr. Girish Menon

Additional Professor
Dept. of Neurosurgery, SCTIMST

Member Secretary, IEC

Dr.Anoop Kumar T

Scientist 'F', Molecular Medicine
SCITMST, BMT Wing, Poojappura
Thiruvananthapuram-695012

Co-ordinator, IEC

Ms.Sreepriya C.S

Executive Secretary to the Director.cum.
Ethics Committee Co-ordinator
SCTIMST, Thiruvananthapuram-695011

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Director, SCTIMST

Dr Baldev Raj

Former Director
IGCAR, Kalpakkam

Dr K. Balasubramanian

Director,
NFTDC, Hyderabad

Dr R. Krishna Kumar

Professor
IITMadras, Chennai

Dr S Radhakrishnan

Formerly Scientist-G
NCL, Pune

Dr M. Radhakrishna Pillai

Director
RGCB, Thiruvananthapuram

Dr K.G.Rajendran

Formerly Vice President
USV Ltd, Mumbai

Dr K. Jayakumar

HOD and Sr Prof CVTS
SCTIMST

Dr Sanjeev Thomas

Prof. of Neurology
SCTIMST

Dr V Kalliyankrishnan

Scientist-G
BMT Wing, SCTIMST

Dr G S Bhuvaneshwar- Convenor

Head, BMT Wing

OTHER INTERNAL WORKING COMMITTEES**Biosafety Committee**

Dr. Mira Mohanty, Associate Head, BMT Wing- Chairperson
 Dr Renuka Nair- Scientist G (Senior Grade), Div. of Cellulat & Molecular Cardiology
 Dr. Lissy Kalayana Krishnan- Scientist G, Thrombosis Research Unit
 Dr. P. Ramesh – Scientist F, Polymer Processing
 Dr. Kavita Raja – Professor, Division of Microbioology
 Dr. Jawahar SK- Administrative Medical Officer and Biosafety Officer.
 Dr. Satheesh Mundayoor - Rajiv Gandhi Center for Biotechnology, DBT nominee
 Dr. Moinak Banerjee- Rajiv Gandhi Center for Biotechnology, External expert.
 Dr. A. Maya Nandkumar, Scientist E- Secretary and Convener

Hospital Management Committee

Dr. R. Sankarkumar, Medical Superintendent, SCTIMST
 Dr. Jagan Mohan Tharakan, HOD, Dept. of Cardiology
 Dr. Muralidharan Nair, HOD, Dept. of Neurology
 Dr. Suresh Nair, HOD, Dept. of Neurosurgery
 Dr. Jayakumar K, HOD, Dept. of CVTS
 Dr. Kapilamoorthy. T R., HOD, Dept. of IS & IR
 Dr Ramesh Chandra Rathod, HOD, Dept. of Anesthesiology
 Dr. S. K. Jawahar, Administrative Medical Officer
 Smt. Sudhamani Amma, Nursing Superintendent i/c
 Mr. N. G. Thampi, SMRO

Hospital Infection Control Committee

Dr. R. Sankarkumar, Medical Superintendent
 Dr. Jayakumar K, HOD, Dept. of CVTS
 Dr. Suresh Nair, HOD, Dept. of Neurosurgery
 Dr. Kavita Raja, HOD, Dept. of Microbiology
 Dr. Jaisy Mathai, HOD, Dept. of Transfusion Medicine
 Dr. Sanjeev V. Thomas, Professor, Dept. of Neurology
 Dr. Thomas Koshy, Addl. Professor, Dept. of Anesthesiology
 Dr. Harikrishnan S, Addl Professor, Dept. of Cardiology
 Dr. Kesavadas C, Addl Professor, Dept. of IS & IR
 Dr. S. K. Jawahar, Adminsitrative Medical Officer-Convener
 Dr. Baiju S. Dharan, Assoc. Professor, Dept. of CVTS
 Dr. Krishnakumar K, Assoc. Professor, Dept. of Neurosurgery
 Mr. Mohanlal G, Scientist G, DCE

Hospital Transfusion Committee

| | |
|--|-------------|
| Dr. Jaisy Mathai, Scientist G Dept of Transfusion Medicine | Chiarperson |
| Dr. Shrinivas V.G, Additional Prof, Anaesthesiology | Member |
| Dr. Vivek.V.Pillai, Assistant Prof, CVTS | Member |
| Dr. Krishnakumar, Assistant Prof., Neurosurgery | Member |
| Dr. Bijulal.S, Assistant Prof, Cardiology | Member |
| Dr. Anugya Bhatt, Scientist C, Thrombosis Research unit | Member |
| Smt. Sudhamoni Amma, i/c. Nursing Superintendent | Member |
| Dr. Sathyabhama.S, Scientist F Dept. of Transfusion Medicine | Convener |

Institutional Animal Ethics Committee (IAEC)

Dr. G.S. Bhuvaneshwar, Head, BMT Wing, (Chairman)
 Dr. Renuka Nair, Head, Cellular & molecular Cardiology, Biological Scientist

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Dr. P.R.Umashankar, Scientist E, Veterinarian
Dr. Annie John, Scientist E, Biological Scientist
(Member Secretary, IAEC)
Dr. Robin D Culas – Main CPCSEA Nominee
Dr. Arun George - Link CPCSEA Nominee
Mr. A.G.Babu - Non Scientific Socially Aware Member
Dr. K.R.Chandra Mohan Nair – Scientist from Outside the Institute

Institutional Committee for Stem Cell Research and Therapy (ICSCRT)

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'LIVRA-57' Link Valley, Kakkanad, Ernakulam , Cochin- 682030

Dr. K. Radhakrishnan
Director, SCTIMST, Thiruvananthapuram- 695011

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Chairman Cancer Institute & Institute of Molecular Medicine, Amrita Institute of Medical Sciences, Kochi – 682041

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JKK Hospital, Nalanchira, Thiruvananthapuram,

Dr. Jackson James
Scientist-E1, Neurobiology Division, Rajiv Gandhi Center for Biotechnology, Thiruvananthapuram - 695014

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State Program Director, Kerala Mahila Samakhya Society, Women's College Lane, Vazhuthacaud, Thiruvananthapuram

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Scientist 'G' (Senior Grade), Division of Cellular & Molecular Cardiology, SCTIMST, Thiruvananthapuram-11

Dr. Lissy K. Krishnan
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BMT Wing, SCTIMST, Thiruvananthapuram - 12

Dr. Anoop Kumar T.
Member Secretary, IEC, & Scientist 'F', Molecular Medicine, BMT Wing, SCTIMST, Thiruvananthapuram-12

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Coordinator, Exe. Secretary to the Director-cum-EC.Co., SCTIMST, Thiruvananthapuram-11

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| | |
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| Dr. Srinivas G, Scientist D | Member |
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Shri Balram S, Scientist F
 Shri Suresh Kumar B, Engineer C
 Shri Ljijikumar G, Chief Technician MI
 Smt. Vasanti S, Artist MI
 Smt. Thankamoni S, (Till Feb 2012)
 Shri Phil Roy, Manager, Project Cell

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 Dr. Ramesh.P, Scientist 'F'
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Technical Advisory Committee for Studies on Medical Devices:

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 Shri. C.V. Muraleedharan, Scientist 'G', BMT Wing
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 Dr. Anoop Kumar T., Scientist 'F', BMT Wing (Member Secretary)

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 Dr. Thomas Koshy, Professor, Anaesthesiology
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 Ms. Sudhamani Amma S., Nursing Supdt. i/c.
 Smt. Nalini Nayak, Secretary, SEWA, Thiruvananthapuram

Right to Information

(Published as required under section 41(b), Chapter II of Right to Information Act, 2005.)

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Vigilance officer

Dr. Jaisy Mathai (Part Time Vigilance Officer)

Scientist G, Department of Transfusion Medicine , SCTIMST



Statement of Accounts

Balance Sheet

Income & Expenditure Account

Schedules Forming Part of Accounts

Receipt & Payments Accounts of the year 2011-2012

Provident Fund Account for the year ended 31.03.2012

Accounts of NCMMR, Trivandrum

Separate Audit Report



BALANCE SHEET AS AT 31st MARCH 2012

| | | 2011-12 | 2010-2011 |
|---|-----------|---------------|---------------|
| CORPUS/CAPITAL FUND AND LIABILITIES | Schedules | [Rs.] | [Rs.] |
| CAPITAL FUND | 1 | 2768668378.88 | 2883685259.78 |
| RESERVES & SURPLUS | 2 | 408563899.45 | 355187993.70 |
| EARMARKED ENDOWMENT FUNDS | 3 | 236774177.31 | 172537198.05 |
| SECURED LOANS & BORROWINGS | 4 | 0.00 | 0.00 |
| CURRENT LIABILITIES & PROVISIONS | 7 | 132100430.22 | 139199588.22 |
| TOTAL | | 3546106885.86 | 3550610039.75 |
| ASSETS | | | |
| FIXED ASSETS | 8 | 1469191220.49 | 1394143045.27 |
| INVESTMENTS FROM EARMARKED ENDOWMENT FUNDS | 9 | 517764355.45 | 488222189.70 |
| CURRENT ASSETS , LOANS, ADVANCES ETC | 11 | 1559151309.92 | 1668244804.78 |
| MISCELLANEOUS EXPENDITURE (TO THE EXTENT NOT WRITTEN OFF) | | 0.00 | 0.00 |
| TOTAL | | 3546106885.86 | 3550610039.75 |
| SIGNIFICANT ACCOUNTING POLICIES | 24 | | |
| CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS | 25 | | |

S/d-
FINANCIAL ADVISOR

S/d-
DIRECTOR

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 2012

| INCOME | Schedules | 2011-12 | 2010-2011 |
|--|-----------|---------------|---------------|
| | | [Rs.] | Rs. |
| Income from Sales / Services | 12 | 394775138.50 | 321602172.40 |
| Grants Received from Govt of India(Non Plan) | 13 | 239495165.00 | 258676264.00 |
| Fees/Subscription | 14 | 5053867.00 | 7024222.00 |
| Income from Investments | 15 | 27294531.45 | 29729323.00 |
| (Income on Investment from earmarked/endow.Funds transferred to Funds) | | | |
| Income from Royalty, Publication etc | 16 | 2302598.00 | 877864.00 |
| Interest Earned | 17 | 78409570.91 | 74043322.57 |
| Other Income | 18 | 4296687.70 | 4779831.30 |
| Total | | 751627558.56 | 696732999.27 |
| EXPENDITURE | | | |
| Establishment Expenses | 20 | 873490403.25 | 666986582.60 |
| Other Administrative Expenses | 21 | 458779828.98 | 413918436.44 |
| Bank Charges | 23 | 118974.00 | 114518.25 |
| Depreciation (Net Total at the year-end-corresponding to Schedule 8) | | 143965460.78 | 134965510.39 |
| Total | | 1476354667.01 | 1215985047.68 |
| Balance being Excess Expenditure over Income | | 724727108.45 | 519252048.41 |
| Add: Transfer to Special Reserve Account | | 59744954.45 | 53580274.00 |
| BALANCE BEING DEFICIT CARRIED TO CAPITAL FUND | | 784472062.90 | 572832322.41 |
| SIGNIFICANT ACCOUNTING POLICIES | 24 | | |
| CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS | 25 | | |

S/d-
FINANCIAL ADVISOR

S/d-
DIRECTOR

| SCHEDULES | 2011-12 | 2010-11 |
|--|----------------------|----------------------|
| PARTICULARS | [Rs.] | [Rs.] |
| SCHEDULE 1 - CORPUS/CAPITAL FUND | | |
| Balance as at the beginning of the year | 4056247692.39 | 3853369086.38 |
| Less Depreciation up to the end of the previous year | 1172562432.61 | 1037596922.19 |
| Net balance at the beginning of the year | 2883685259.78 | 2815772164.19 |
| Add: Plan Grants received from Government of India | 670504835.00 | 641323736.00 |
| Add: Grants received from Others for Capital Assets(WCP) | 0.00 | 0.00 |
| Add:Contribution towards Corpus/Capital Fund | 0.00 | 0.00 |
| Deduct: Balance of net expenditure transferred from the Income and Expenditure Account | 784472062.90 | 572832322.41 |
| Less:Value of Assets Written off during the year | 1049653.00 | 578318.00 |
| DeductTransfer to BMT/Add Transfer from CHO | 0.00 | 0.00 |
| BALANCE AS AT THE YEAR-END | 2768668378.88 | 2883685259.78 |
| SCHEDULE 2-RESERVES AND SURPLUS: | | |
| 1. Capital Reserve: | | |
| As per last Account | -- | -- |
| Addition during the year | -- | -- |
| Less:Deduction during the year | -- | -- |
| 2. Revaluation Reserve: | | |
| As per last Account | -- | -- |
| Addition during the year | -- | -- |
| Less: Deductions during the year | -- | -- |
| 3. Special Reserves: | | |
| As per last Account | 355187993.70 | 310546070.70 |
| Addition during the year (Current year transfer + Decrease in provision) | 53375905.75 | 44641923.00 |
| Less: Deductions during the year | | |
| 4. General Reserve: | | |
| As per last Account | -- | -- |
| Addition during the year | -- | -- |
| Less: Deductions during the year | -- | -- |
| TOTAL | 408563899.45 | 355187993.70 |

| | 2011-12 | 2010-11 |
|---|--------------|--------------|
| PARTICULARS | [Rs.] | [Rs.] |
| 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. | 236774177.31 | 172537198.05 |
| - Rent | -- | -- |
| - Other Administrative expenses | -- | -- |
| Total | 236774177.31 | 172537198.05 |
| TOTAL (c) | | |
| NET BALANCE AS AT THE YEAR-END (a+b+c) | 236774177.31 | 172537198.05 |
| | | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMWNNT FUNDS | FUND-WISE BREAK UP | | | TOTAL |
|--------------|---|--------------------|-------------------|----------------|------------|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | |
| | | | GRANTS | OTHER RECEIPTS | |
| 5000 | PROJ-MISCELLANEOUS | 856396.00 | 4264092.00 | 0.00 | 5120488.00 |
| 5008 | DR.C.KESAVADAS | 10916.00 | 0.00 | 0.00 | 10916.00 |
| 5033 | MPH PROGRAMME | 1480.00 | 0.00 | 0.00 | 1480.00 |
| 5040 | PROJ. DR.ASHA VIJAYARAGHAVAN | 1156818.70 | 0.00 | 0.00 | 1156818.70 |
| 5055 | GRANT/ROCKFELLER FOUNDATION,USA | 686120.00 | 0.00 | 0.00 | 686120.00 |
| 5065 | M.D.PHARMA(DR,ASHA) | 398586.50 | 0.00 | 0.00 | 398586.50 |
| 5078 | PROJECT GRANT/DR MALA RAMANATHAN | 5810.00 | 0.00 | 0.00 | 5810.00 |
| 5082 | T V HEMALATHA/HEALTHAWARENESS PROGRAM | 127537.00 | 0.00 | 0.00 | 127537.00 |
| 5088 | DOUBLE BLIND PLACEBO CONT. PARALLEL | 63023.00 | 0.00 | 0.00 | 63023.00 |
| 5091 | EURO REG. OF EPILEPSY & PREGNANCY | 71796.00 | 0.00 | 0.00 | 71796.00 |
| 5094 | KERALA STATE AIDS CONTROL SOCIETY | 45517.00 | 0.00 | 0.00 | 45517.00 |
| 5100 | AMC/MAC ARTHUR FOUNDATION/02-70546 | 46315.05 | 0.00 | 0.00 | 46315.05 |
| 5103 | CLINICAL TRIAL/QUINTAILSPEC/DR.RADHAKRISHNAN | 318638.00 | 0.00 | 0.00 | 318638.00 |
| 5108 | EVAL.SUB-TYPES DEMENTIA/DR.MATHURA | 15800.50 | 0.00 | 0.00 | 15800.50 |
| 5110 | TOBACCO CESSATION & RESEARCH / DR.THANKAP | 2001013.94 | 6012518.00 | 22967.00 | 8036498.94 |
| 5111 | DIFFUSION WEIGHTED IMAGING/DR.GUPT | -26226.00 | 143582.00 | 2197.00 | 119553.00 |
| 5119 | STAKE HOLDER-PERCEPT/INST.REV BO | 151589.73 | 0.00 | 0.00 | 151589.73 |
| 5128 | INDENT. OF MACOBACTERIAL/DST/ V.V.RADHAKRISHN | 136107.00 | 0.00 | 0.00 | 136107.00 |
| 5130 | TELE-HEALTH & MEDICAL EDUCATION/JAWAHAR | 924464.00 | 300000.00 | 0.00 | 1224464.00 |
| 5133 | COMMUNITY BASED INTERVENTION/WHO | 215059.00 | 0.00 | 0.00 | 215059.00 |
| 5135 | A 16-WEEK,DOUBLE BLIND/ASHA KISHORE | 1719592.00 | 0.00 | 0.00 | 1719592.00 |
| 5137 | MECHANISM OF ANTICANCER/DAE, BRS | 2761.00 | 0.00 | 0.00 | 2761.00 |
| 5139 | A 24 WEEK, MULTICENTER/DR. MATHURANATH | 2927181.28 | 773493.50 | 0.00 | 3700674.78 |
| 5140 | HARVARD SCHOOL OF PUBLIC HEALTH | 91794.32 | 0.00 | 0.00 | 91794.32 |
| 5142 | BANKING FOR BETTER HEALTH-MEDISAVE | 240383.36 | 0.00 | 0.00 | 240383.36 |
| 5146 | DEVELOPMENT OF SPECT | 67151.00 | 0.00 | 0.00 | 67151.00 |
| 5147 | DEVELOPMENT OF SPECT | 39137.00 | 0.00 | 0.00 | 39137.00 |
| 5150 | PROTOCOL 6002-INT 001 | 389796.60 | 0.00 | 0.00 | 389796.60 |
| 5153 | DEV REF. MANUAL FOR | 155802.00 | 0.00 | 0.00 | 155802.00 |
| 5155 | COMM BASED DETECTION | 308058.00 | 0.00 | 20306.00 | 328364.00 |
| 5156 | TSUNAMI PROJECT | 539120.50 | 0.00 | 0.00 | 539120.50 |
| 5159 | NCD RISK FACTOR | 71123.00 | 0.00 | 0.00 | 71123.00 |
| 5160 | BRAIN MAPING & BASIC NEUROGENETIC/DR.P.S MATHURANATH | 0.00 | 0.00 | 185925.00 | 185925.00 |
| 5161 | DOSE RANGING STUDY:CGHR | 2134719.00 | 3253.00 | 0.00 | 2137972.00 |
| 5167 | PROJ/SURVIVAL MECHANISM | 209319.00 | 0.00 | 0.00 | 209319.00 |
| 5168 | PROJ/VERMEER STUDY | 1922742.00 | 0.00 | 0.00 | 1922742.00 |
| 5170 | DR.ASHA KISHORE | 2415076.00 | 0.00 | 0.00 | 2415076.00 |
| 5172 | C.KESAVADAS | 79902.00 | 0.00 | 0.00 | 79902.00 |
| 5173 | DR.DINESH NAYAK | 772311.00 | 0.00 | 0.00 | 772311.00 |

| | | UTILISATION | | | | | | | | |
|---------------------|--------|---------------------|----------------|-------------------|---------------|------------|-------------------|-------------|--|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUMABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | | |
| 0.00 | 0.00 | 0.00 | 2991177.00 | 215762.00 | 787408.00 | 3994347.00 | 3994347.00 | 1126141.00 | | |
| 0.00 | 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 | 0.00 | 1480.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10697.00 | 10697.00 | 10697.00 | 1146121.70 | | |
| 0.00 | 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 | 0.00 | 398586.50 | | |
| 0.00 | 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 | 0.00 | 127537.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 63023.00 | | |
| 0.00 | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 71796.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3957.00 | 3957.00 | 3957.00 | 41560.00 | | |
| 0.00 | 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 | 4001.00 | 4001.00 | 4001.00 | 314637.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15800.50 | | |
| 0.00 | 0.00 | 0.00 | 1842555.00 | 334167.00 | 975060.00 | 3151782.00 | 3151782.00 | 4884716.94 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 119553.00 | 119553.00 | 119553.00 | 0.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 151589.73 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 136107.00 | | |
| 0.00 | 0.00 | 0.00 | 149597.00 | 0.00 | 42699.00 | 192296.00 | 192296.00 | 1032168.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 215059.00 | | |
| 0.00 | 0.00 | 0.00 | 40000.00 | 0.00 | 9390.00 | 49390.00 | 49390.00 | 1670202.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2761.00 | | |
| 0.00 | 0.00 | 0.00 | 311435.00 | 158211.00 | 103263.00 | 572909.00 | 572909.00 | 3127765.78 | | |
| 0.00 | 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 | 86472.00 | 86472.00 | 86472.00 | 153911.36 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 56125.00 | 56125.00 | 56125.00 | 11026.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 39137.00 | | |
| 0.00 | 0.00 | 0.00 | 30000.00 | 0.00 | 0.00 | 30000.00 | 30000.00 | 359796.60 | | |
| 0.00 | 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 | 119049.00 | 119049.00 | 119049.00 | 209315.00 | | |
| 0.00 | 0.00 | 0.00 | 130935.00 | 0.00 | 0.00 | 130935.00 | 130935.00 | 408185.50 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 71123.00 | | |
| 24738.00 | 0.00 | 24738.00 | 0.00 | 0.00 | 33.00 | 33.00 | 24771.00 | 161154.00 | | |
| 0.00 | 0.00 | 0.00 | 132398.00 | 0.00 | 29703.00 | 162101.00 | 162101.00 | 1975871.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 209319.00 | | |
| 0.00 | 0.00 | 0.00 | 171430.00 | 0.00 | 220398.00 | 391828.00 | 391828.00 | 1530914.00 | | |
| 0.00 | 0.00 | 0.00 | 200324.00 | 0.00 | 217491.00 | 417815.00 | 417815.00 | 1997261.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 79902.00 | 79902.00 | 79902.00 | 0.00 | | |
| 0.00 | 0.00 | 0.00 | 129209.00 | 0.00 | 2411.00 | 131620.00 | 131620.00 | 640691.00 | | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMWNT FUNDS | FUND-WISE BREAK UP | | | TOTAL |
|--------------|--|--------------------|-------------------|----------------|-------------|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | |
| | | | GRANTS | OTHER RECEIPTS | |
| 5174 | CHANGES IN SLEEP WAKEFULNESS-Dr.Mohanku. | 139062.00 | 0.00 | 0.00 | 139062.00 |
| 5175 | SURGICAL TRAIL IN LOBAR INTRACEREBRAL | 39125.27 | 0.00 | 0.00 | 39125.27 |
| 5176 | WOMENT COMPONENT PLAN | 59065.25 | 0.00 | 0.00 | 59065.25 |
| 5180 | DR.KANNAN SRINIVASAN | 18308.00 | 0.00 | 0.00 | 18308.00 |
| 5181 | DR.ASHA KISHORE | -14350.00 | 0.00 | 0.00 | -14350.00 |
| 5182 | DR.SANJEEV.V.THOMAS | 4463816.00 | 0.00 | 14001.00 | 4477817.00 |
| 5183 | DR.K.R.THANKAPPAN | 11723513.92 | 0.00 | 85110.00 | 11808623.92 |
| 5184 | DR.JAWAHAR | 1958204.00 | 0.00 | 0.00 | 1958204.00 |
| 5187 | DR.SANJEEV.V.THOMAS | 181383.00 | 0.00 | 0.00 | 181383.00 |
| 5188 | DR.K.RADHAKRISHNAN | 361822.00 | 398242.00 | 0.00 | 760064.00 |
| 5189 | DR.HARIKRISHNAN | 1012.00 | 0.00 | 0.00 | 1012.00 |
| 5190 | DR.MALARAMANATHAN | 76339.00 | 0.00 | 0.00 | 76339.00 |
| 5191 | DR.ASHA KISHORE | 670946.00 | 0.00 | 0.00 | 670946.00 |
| 5192 | DR.K.R.THANKAPPAN | 344696.50 | 0.00 | 0.00 | 344696.50 |
| 5193 | DR.MALARAMANATHAN | 78537.00 | 0.00 | 0.00 | 78537.00 |
| 5194 | DR.K.R.THANKAPPAN | 378589.00 | 2341235.00 | 0.00 | 2719824.00 |
| 5196 | DR.SHIVKUMAR | 160030.00 | 511000.00 | 10000.00 | 681030.00 |
| 5198 | DR.RENUKA NAIR | 13418.00 | 1417950.00 | 0.00 | 1431368.00 |
| 5199 | DR.JAYAKUMAR | 271712.00 | 800000.00 | 14677.00 | 1086389.00 |
| 5201 | DR.ASHA KISHORE | 2170617.50 | 2050896.00 | 0.00 | 4221513.50 |
| 5202 | DR.JAYASREE | -24043.00 | 0.00 | 24043.00 | 0.00 |
| 5203 | STUDY IN MRI - ISIR | 0.00 | 27365.00 | 54416.00 | 81781.00 |
| 5205 | DR.SURESH NAIR | 229876.00 | 49635.00 | 0.00 | 279511.00 |
| 5207 | DR.JAYSREE/A.K.GUPTA | 6692.00 | 0.00 | 0.00 | 6692.00 |
| 5208 | DR.K.SRINIVASAN | 437863.00 | 0.00 | 0.00 | 437863.00 |
| 5209 | DR.S.HARIKRISHNAN | 20540.00 | 0.00 | 0.00 | 20540.00 |
| 5210 | DR.K.R.THANKAPPAN | 993906.00 | 0.00 | 0.00 | 993906.00 |
| 5212 | DR.S.HARIKRISHNAN | 397020.00 | 577796.00 | 0.00 | 974816.00 |
| 5213 | AMC FUND | 1475000.00 | 0.00 | 0.00 | 1475000.00 |
| 5214 | DR.ASHA GOPINATHAN | 338526.00 | 350000.00 | 0.00 | 688526.00 |
| 5215 | DR.V.V.RADHAKRISHNAN | 252414.00 | 135123.00 | 5000.00 | 392537.00 |
| 5216 | DR.ASHA KISHORE | 776652.60 | 511065.50 | 5000.00 | 1292718.10 |
| 5217 | DR.K.SRINIVASAN | 1399716.50 | 0.00 | 0.00 | 1399716.50 |
| 5219 | DR.BIJU SOMAN | 1745968.00 | 0.00 | 0.00 | 1745968.00 |
| 5220 | DR.BIJU SOMAN | 897060.00 | 0.00 | 0.00 | 897060.00 |
| 5221 | DR.V.RAMANKUTTY | 1582542.00 | 0.00 | 0.00 | 1582542.00 |
| 5224 | DR.C.KESAVADAS | 300000.00 | 0.00 | 0.00 | 300000.00 |
| 5226 | DR.G.SRINIVAS | 1323000.00 | 0.00 | 13464.00 | 1336464.00 |
| 5227 | DR.MURALIDHARAN NAIR | 134129.00 | 356762.00 | 0.00 | 490891.00 |
| 5228 | DR.S.HARIKRISHNAN | 130756.00 | 368000.00 | 0.00 | 498756.00 |

| | | UTILISATION | | | | | | | |
|---------------------|--------|---------------------|-------------------|----------------------|------------------|------------|----------------------|----------------|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUMABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | |
| 29894.00 | 0.00 | 29894.00 | 28054.00 | 31500.00 | 297.00 | 59851.00 | 89745.00 | 49317.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 39125.27 | |
| 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 | 0.00 | 18308.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -14350.00 | |
| 0.00 | 0.00 | 0.00 | 1352617.00 | 52695.00 | 331925.00 | 1737237.00 | 1737237.00 | 2740580.00 | |
| 0.00 | 0.00 | 0.00 | 1789070.00 | 1312506.00 | 2342202.00 | 5443778.00 | 5443778.00 | 6364845.92 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 328032.00 | 328032.00 | 328032.00 | 1630172.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 797.00 | 797.00 | 797.00 | 180586.00 | |
| 0.00 | 0.00 | 0.00 | 33000.00 | 0.00 | 512841.00 | 545841.00 | 545841.00 | 214223.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1012.00 | |
| 0.00 | 0.00 | 0.00 | 30000.00 | 0.00 | 4129.00 | 34129.00 | 34129.00 | 42210.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 436302.00 | 82.00 | 436384.00 | 436384.00 | 234562.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 25521.00 | 25521.00 | 25521.00 | 319175.50 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6741.00 | 6741.00 | 6741.00 | 71796.00 | |
| 0.00 | 0.00 | 0.00 | 373226.00 | 0.00 | 1135387.00 | 1508613.00 | 1508613.00 | 1211211.00 | |
| 121012.00 | 0.00 | 121012.00 | 25968.00 | 141810.00 | 76973.00 | 244751.00 | 365763.00 | 315267.00 | |
| 295576.00 | 0.00 | 295576.00 | 397284.00 | 222264.00 | 304439.00 | 923987.00 | 1219563.00 | 211805.00 | |
| 0.00 | 0.00 | 0.00 | 340259.00 | 0.00 | 101638.00 | 441897.00 | 441897.00 | 644492.00 | |
| 0.00 | 0.00 | 0.00 | 96452.00 | 0.00 | 292133.00 | 388585.00 | 388585.00 | 3832928.50 | |
| 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 | 12452.00 | 12452.00 | 12452.00 | 69329.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 61167.00 | 61167.00 | 61167.00 | 218344.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6692.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 328.00 | 328.00 | 328.00 | 437535.00 | |
| 0.00 | 0.00 | 0.00 | 6250.00 | 0.00 | 0.00 | 6250.00 | 6250.00 | 14290.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 993906.00 | |
| 0.00 | 0.00 | 0.00 | 67097.00 | 365186.00 | 7672.00 | 439955.00 | 439955.00 | 534861.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1475000.00 | |
| 0.00 | 0.00 | 0.00 | 420000.00 | 0.00 | 96027.00 | 516027.00 | 516027.00 | 172499.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 45150.00 | 48856.00 | 94006.00 | 94006.00 | 298531.00 | |
| 0.00 | 0.00 | 0.00 | 137742.00 | 0.00 | 32601.00 | 170343.00 | 170343.00 | 1122375.10 | |
| 0.00 | 0.00 | 0.00 | 192710.00 | 0.00 | 196645.00 | 389355.00 | 389355.00 | 1010361.50 | |
| 0.00 | 0.00 | 0.00 | 177904.00 | 0.00 | 97484.00 | 275388.00 | 275388.00 | 1470580.00 | |
| 0.00 | 0.00 | 0.00 | 43226.00 | 0.00 | 18616.00 | 61842.00 | 61842.00 | 835218.00 | |
| 0.00 | 0.00 | 0.00 | 180000.00 | 0.00 | 453386.00 | 633386.00 | 633386.00 | 949156.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 44588.00 | 392.00 | 44980.00 | 44980.00 | 255020.00 | |
| 466879.00 | 0.00 | 466879.00 | 210340.00 | 209300.00 | 220000.00 | 639640.00 | 1106519.00 | 229945.00 | |
| 0.00 | 0.00 | 0.00 | 176613.00 | 0.00 | 124203.00 | 300816.00 | 300816.00 | 190075.00 | |
| 0.00 | 0.00 | 0.00 | 69032.00 | 0.00 | 88858.00 | 157890.00 | 157890.00 | 340866.00 | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMWNT FUNDS | FUND-WISE BREAK UP | | | TOTAL |
|--------------|---|--------------------|-------------------|----------------|------------|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | |
| | | | GRANTS | OTHER RECEIPTS | |
| 5229 | DR.C.KESAVADAS | 560839.00 | 0.00 | 0.00 | 560839.00 |
| 5230 | DR.SUNDARI RAVINDRAN | 76862.25 | 421077.25 | 0.00 | 497939.50 |
| 5231 | DR.V.V.RADHAKRISHNAN | 628047.00 | 0.00 | 28688.00 | 656735.00 |
| 5232 | DR.ASHA KISHORE | 434383.00 | 0.00 | 88204.00 | 522587.00 |
| 5233 | DR. BEJOY THOMAS/DR.C.KESAVADAS | 106822.00 | 0.00 | 0.00 | 106822.00 |
| 5234 | DR.R.ASHA LATHA | 1058333.00 | 0.00 | 0.00 | 1058333.00 |
| 5235 | REGULATION OF THE CARDIAC FIBROBLAST C.. | 0.00 | 636190.00 | 0.00 | 636190.00 |
| 5237 | KERALA DIABETES PREVENTION PROGRAM(K-DPP | 0.00 | 1473790.41 | 0.00 | 1473790.41 |
| 5238 | IMPROVING LOCALIZATION IN LESION NEGA... | 0.00 | 300000.00 | 0.00 | 300000.00 |
| 5239 | BUILDING THE ASIAN NCD RESEARCH NETWORK. | 0.00 | 0.00 | 35752.00 | 35752.00 |
| 5240 | AUTOCRINE AND PARACRINE MECHANISMS IN .. | 0.00 | 911334.00 | 0.00 | 911334.00 |
| 5241 | DEVELOPMENT OF LIPID ANTIGEN BASED | 0.00 | 671000.00 | 0.00 | 671000.00 |
| 5243 | STEROIDS IN CARDIAC SURGERY | 0.00 | 545886.00 | 0.00 | 545886.00 |
| 5244 | MOLECULAR BASIS OF CARDIAC FIBROBLAST .. | 0.00 | 2553000.00 | 0.00 | 2553000.00 |
| 5245 | IMPROVING LOCALIZATION IN LESION N.. | 0.00 | 1253400.00 | 0.00 | 1253400.00 |
| 5247 | A PHASE 3, 12-WEEK, DOUBLE BLIND, PLA... | 0.00 | 161775.00 | 0.00 | 161775.00 |
| 5248 | A PHASE 3, DOUBLE BLIND, PLACEBO AND A.. | 0.00 | 161775.00 | 0.00 | 161775.00 |
| 5249 | CNRS-INDO-FRENCH PROJECT | 0.00 | 683850.00 | 100000.00 | 783850.00 |
| 5250 | DIABETES, PREDIABETES AND INSU | 0.00 | 37000.00 | 0.00 | 37000.00 |
| 5251 | NEUROBIOLOGICAL MARKER OF POPULATION D.. | 0.00 | 380000.00 | 0.00 | 380000.00 |
| 5253 | INDO-SWISS SYMPOSIUM ON COHORT | 0.00 | 800000.00 | 0.00 | 800000.00 |
| 5255 | PRIVATIZATION OF HEALTHCARE | 0.00 | 353882.50 | 0.00 | 353882.50 |
| 5256 | HEALTHY LIFE STYLE | | 672903.00 | 0.00 | 672903.00 |
| 5257 | PULMONARY HYPERTENSION,BMPRII | 0.00 | 287448.00 | 0.00 | 287448.00 |
| 6054 | PROJ/DR RADHAKRISHNAN NEUROLOGY | 544284.54 | 0.00 | 8800.00 | 553084.54 |
| 6055 | MOVEMENT/DR. ASHA KISHORE | 58819.00 | 0.00 | 0.00 | 58819.00 |
| 6057 | PUBLISHING JOURNAL ARTICLE/DR. THANKAPPAN | 93412.00 | 0.00 | 0.00 | 93412.00 |
| 6058 | ATHIYANNOOR SCT ACTION/DR.K.R.T | 21006.00 | 0.00 | 0.00 | 21006.00 |
| 6064 | SPEECH THERAPY | -612931.00 | 0.00 | 0.00 | -612931.00 |
| 6065 | COMPREHENSIVE CENTRE FOR SLEEP DIS ORD. | -226179.00 | 0.00 | 268711.00 | 42532.00 |
| 6066 | DR.SANJEEV V THOMAS | 50000.00 | 0.00 | 0.00 | 50000.00 |
| 6067 | DR.JAGANMOHAN THARAKAN | 103160.00 | 0.00 | 0.00 | 103160.00 |
| 6068 | DR.SAJITH.S | 150000.00 | 0.00 | 0.00 | 150000.00 |
| 6069 | DR.SYAM.K | 31520.00 | 0.00 | 0.00 | 31520.00 |
| 6070 | DR.BEJOY THOMAS/DR.GAYATHRI.P | 150000.00 | 0.00 | 0.00 | 150000.00 |
| 6071 | DR.S.K.JAWAHAR | 136071.00 | 0.00 | 0.00 | 136071.00 |
| 6072 | COMPREHENSIVE STROKE CARE | -681730.00 | 0.00 | 0.00 | -681730.00 |
| 6073 | DR.KIRON.S | 50000.00 | 0.00 | 0.00 | 50000.00 |
| 6074 | DR.DIVYATA FANJENDR HINGWALA | 50000.00 | 0.00 | 0.00 | 50000.00 |
| 6075 | DR.BIJULAL.S | 150000.00 | 0.00 | 0.00 | 150000.00 |

| | | UTILISATION | | | | | | | |
|---------------------|--------|---------------------|----------------|-------------------|---------------|------------|-------------------|-------------|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUMABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | |
| 0.00 | 0.00 | 0.00 | 154209.00 | 0.00 | 184872.00 | 339081.00 | 339081.00 | 221758.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 497939.50 | 497939.50 | 497939.50 | 0.00 | |
| 0.00 | 0.00 | 0.00 | 119761.00 | 156447.00 | 118956.00 | 395164.00 | 395164.00 | 261571.00 | |
| 0.00 | 0.00 | 0.00 | 179188.00 | 0.00 | 245793.00 | 424981.00 | 424981.00 | 97606.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 84949.00 | 84949.00 | 84949.00 | 21873.00 | |
| 0.00 | 0.00 | 0.00 | 110001.00 | 0.00 | 43207.00 | 153208.00 | 153208.00 | 905125.00 | |
| 176323.00 | 0.00 | 176323.00 | 116556.00 | 194606.00 | 17055.00 | 328217.00 | 504540.00 | 131650.00 | |
| 0.00 | 0.00 | 0.00 | 280000.00 | 0.00 | 401941.00 | 681941.00 | 681941.00 | 791849.41 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 26055.00 | 26055.00 | 26055.00 | 273945.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35752.00 | 35752.00 | 35752.00 | 0.00 | |
| 0.00 | 0.00 | 0.00 | 42774.00 | 762094.00 | 66.00 | 804934.00 | 804934.00 | 106400.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 42806.00 | 78776.00 | 121582.00 | 121582.00 | 549418.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10506.00 | 10506.00 | 10506.00 | 535380.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 259887.00 | 7760.00 | 267647.00 | 267647.00 | 2285353.00 | |
| 1800.00 | 0.00 | 1800.00 | 113177.00 | 0.00 | 5305.00 | 118482.00 | 120282.00 | 1133118.00 | |
| 0.00 | 0.00 | 0.00 | 12069.00 | 0.00 | 56427.00 | 68496.00 | 68496.00 | 93279.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 40459.00 | 40459.00 | 40459.00 | 121316.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 800.00 | 800.00 | 800.00 | 783050.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21077.00 | 21077.00 | 21077.00 | 15923.00 | |
| 0.00 | 0.00 | 0.00 | 38400.00 | 0.00 | 18083.00 | 56483.00 | 56483.00 | 323517.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 569827.00 | 569827.00 | 569827.00 | 230173.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 353882.50 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 546.00 | 546.00 | 546.00 | 672357.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 319.00 | 319.00 | 319.00 | 287129.00 | |
| 0.00 | 0.00 | 0.00 | 110310.00 | 0.00 | 0.00 | 110310.00 | 110310.00 | 442774.54 | |
| 0.00 | 0.00 | 0.00 | 80000.00 | 58500.00 | 3800.00 | 142300.00 | 142300.00 | -83481.00 | |
| 0.00 | 0.00 | 0.00 | 65000.00 | 0.00 | 15710.00 | 80710.00 | 80710.00 | 12702.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21006.00 | |
| 0.00 | 0.00 | 0.00 | 143062.00 | 0.00 | 0.00 | 143062.00 | 143062.00 | -755993.00 | |
| 0.00 | 0.00 | 0.00 | 766200.00 | 57121.00 | 242399.00 | 1065720.00 | 1065720.00 | -1023188.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 42900.00 | 42900.00 | 42900.00 | 7100.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 103160.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 150000.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 29390.00 | 29390.00 | 29390.00 | 2130.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 76062.00 | 77.00 | 76139.00 | 76139.00 | 73861.00 | |
| 0.00 | 0.00 | 0.00 | 97742.00 | 0.00 | 685.00 | 98427.00 | 98427.00 | 37644.00 | |
| 0.00 | 0.00 | 0.00 | 3596033.00 | 556678.00 | 40968.00 | 4193679.00 | 4193679.00 | -4875409.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24981.00 | 24981.00 | 24981.00 | 25019.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 25010.00 | 25010.00 | 25010.00 | 24990.00 | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15006.00 | 15006.00 | 15006.00 | 134994.00 | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS | FUND-WISE BREAK UP | | | TOTAL |
|--------------|--|--------------------|-------------------|----------------|--------------|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | |
| | | | GRANTS | OTHER RECEIPTS | |
| 6076 | SCANNING THE MEDICAL RECORDS AS PART .. | 0.00 | 795000.00 | 40.00 | 795040.00 |
| 6077 | TAC | -10000.00 | 0.00 | 0.00 | -10000.00 |
| 6078 | DESIGN & DEVELOPMENT OF MINIMALLY INV... | 0.00 | 90000.00 | 0.00 | 90000.00 |
| 7101 | ADVANCES TO PI | -80257.00 | 0.00 | 1486380.00 | 1406123.00 |
| 7102 | AMT.PAYABLE TO PROJECT STAFF | 4618.00 | 0.00 | 115457.00 | 120075.00 |
| 2721 | ADVANCE FOR SUPPLIES PROJECT | -223910.00 | 0.00 | 744482.00 | 520572.00 |
| | TOTAL | 59429364.81 | 34581319.16 | 3333620.00 | 97344303.97 |
| | EARMARKED FUNDS | -- | -- | -- | -- |
| 1014 | NEW PENSION SCHEME | 61060548.00 | -- | 44872732.00 | 105933280.00 |
| 1301 | EMPLOYEES PENSION FUND | -7667131.35 | -- | 234584769.00 | 226917637.65 |
| 1075 | PATIENT WELFARE FUND | 1914090.35 | -- | 359497.00 | 2273587.35 |
| 1077 | INSTITUTIONAL ETHICS COMMITTEE FUND | 3938845.00 | -- | 2136833.00 | 6075678.00 |
| 1078 | DR. RICHARD A CASH & DR K MOHANDS AWARD | 15000.00 | -- | 44457.00 | 59457.00 |
| 1080 | STAFF BENEVOLENT FUND | 2472762.25 | -- | 2498954.00 | 4971716.25 |
| 1079 | VICE CHANCELLORS CONFERENCE FUND | 178233.00 | -- | -- | 178233.00 |
| 1081 | CONTINUUM - SPECIAL CME PUBLICATION FUND | 51707.00 | -- | -- | 51707.00 |
| | | 61964054.25 | 0.00 | 284497242.00 | 346461296.25 |
| | | | | | |
| | | | | | |

| | | UTILISATION | | | | | | | | |
|---------------------|--------|---------------------|-------------------|----------------------|------------------|--------------|----------------------|----------------|--|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUMABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | | |
| 0.00 | 0.00 | 0.00 | 431216.00 | 0.00 | 121799.00 | 553015.00 | 553015.00 | 242025.00 | | |
| 0.00 | 0.00 | 0.00 | 120000.00 | 0.00 | 0.00 | 120000.00 | 120000.00 | -130000.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 90000.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1410303.00 | 1410303.00 | 1410303.00 | -4180.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 117922.00 | 117922.00 | 117922.00 | 2153.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1189545.00 | 1189545.00 | 1189545.00 | -668973.00 | | |
| 1116222.00 | 0.00 | 1116222.00 | 18851602.00 | 5733642.00 | 15536401.50 | 40121645.50 | 41237867.50 | 56106436.47 | | |
| -- | -- | | -- | -- | | | | | | |
| -- | -- | 0.00 | -- | -- | 94917459.00 | 94917459.00 | 94917459.00 | 11015821.00 | | |
| -- | -- | 0.00 | -- | -- | 113846641.00 | 113846641.00 | 113846641.00 | 113070996.65 | | |
| -- | -- | 0.00 | -- | -- | 83498.00 | 83498.00 | 83498.00 | 2190089.35 | | |
| -- | -- | 0.00 | -- | -- | 270825.00 | 270825.00 | 270825.00 | 5804853.00 | | |
| -- | -- | 0.00 | -- | -- | 15000.00 | 15000.00 | 15000.00 | 44457.00 | | |
| -- | -- | 0.00 | -- | -- | 4273993.00 | 4273993.00 | 4273993.00 | 697723.25 | | |
| -- | -- | 0.00 | -- | -- | 9796.00 | 9796.00 | 9796.00 | 168437.00 | | |
| -- | -- | 0.00 | -- | -- | | 0.00 | 0.00 | 51707.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 213417212.00 | 213417212.00 | 213417212.00 | 133044084.25 | | |
| | | | | | | | | | | |
| | | | | | | TOTAL | | 189150520.72 | | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMMENT FUNDS | FUND-WISE BREAK UP | | | TOTAL | |
|--------------|--|--------------------|-------------------|-------------------|------------|--|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | | |
| | | | GRANTS | OTHER RECEIPTS | | |
| 5000 | PROJECT SUSPENSE | 473001.00 | 4760592.00 | - | 5233593.00 | |
| 5057 | DYNAMIC ORTHOPAEDIC PVT LTD, HYDROXY | 28787.55 | 0.00 | 0.00 | 28787.55 | |
| 5089 | DETEC & TREAT OF CANCER BY LASER | 3959.00 | 0.00 | -- | 3959.00 | |
| 6045 | ROLE OF PLATELET PROTEINS ON THE ENDOTHE | 0.00 | 150000.00 | -- | 150000.00 | |
| 7000 | MISCELLENEOUS PROJECT | 30944.09 | 0.00 | -- | 30944.09 | |
| 7001 | PRO;SAHAJANAND VASCU;DR.AURTHUR | 3737995.75 | 493551.00 | -- | 4231546.75 | |
| 7002 | Dr.TOMS LABORATORY, Dr. K.KRISHNAN | 13876.00 | 0.00 | -- | 13876.00 | |
| 7003 | PROJ:D.S.T. DR.P.V. MOHANAN | 2537.40 | 0.00 | -- | 2537.40 | |
| 7004 | PROJ:ATMRF:DR LISSY KRISHNAN | 551.25 | 0.00 | -- | 551.25 | |
| 7005 | PROJECT:DYNAMIC ORTHOPAEDICS | 13656.00 | 0.00 | -- | 13656.00 | |
| 7006 | PROJ: D.S.T. D.S.NAGESH | 213382.00 | 0.00 | -- | 213382.00 | |
| 7008 | NMITLI, PROJECT C.S.I.R | 399311.90 | 0.00 | -- | 399311.90 | |
| 7009 | CHITOSAN BASED WAINED DRESSING | 7702.75 | 0.00 | -- | 7702.75 | |
| 7011 | DST-FAB: CLINICALLY/SIG:SHAPE OF HEVA | 140028.00 | 73798.00 | 0.00 | 213826.00 | |
| 7012 | DST-DBSOMC FOR MEDICAL APPLICATION | -11500.00 | 0.00 | 11500.00 | 0.00 | |
| 7014 | AUROLAB,ARAVIND EYE HOSPITAL | 13674.00 | 0.00 | -- | 13674.00 | |
| 7015 | TTK.HEALTHCARE.DEVELOPMENT OF VALV | 39888.00 | 0.00 | -- | 39888.00 | |
| 7016 | INDO-GERMAN COMMITTEE MEETING-DST | 5407.00 | 0.00 | -- | 5407.00 | |
| 7017 | HINDUSTAN LATEX.EVALU:BLOOD BAG | 1204338.50 | 298856.00 | -- | 1503194.50 | |
| 7018 | ALL INDIA COUNCIL FOR TECHNI:EDU:SH | 218719.00 | 124087.00 | 0.00 | 342806.00 | |
| 7019 | DST.NIRANJAN | 69847.00 | 0.00 | -- | 69847.00 | |
| 7020 | IFCPAR-DR.JAYAKRISHNAN | 188.00 | 0.00 | 0.00 | 188.00 | |
| 7022 | DST-LBFDPSBC-DR.SHARMA | 79385.00 | 0.00 | -- | 79385.00 | |
| 7023 | DEV: HYDRO-CEPHALUS-HINDUSTAN LATEX | 45510.00 | 0.00 | -- | 45510.00 | |
| 7026 | DEV.HEART VALVE-DST.MURALEE | 811.00 | 0.00 | 1711.00 | 2522.00 | |
| 7027 | STED-DR T V KUMARY-INVITRO | 5089.00 | 0.00 | | 5089.00 | |
| 7029 | DONERG/LIFE SCIENCE BOARD | 6876.00 | 0.00 | 0.00 | 6876.00 | |
| 7031 | DBT/DR P V MOHAN/DEV INVITROPYRO | 80564.00 | 0.00 | | 80564.00 | |
| 7032 | DST. DR. ANNINE/BONE REGENERATION | 29166.00 | 0.00 | 0.00 | 29166.00 | |
| 7033 | BIOFUNCTIONAL EVALUATION DR. UMASANKER | 72581.00 | 0.00 | -- | 72581.00 | |
| 7034 | DST. DR. NIRMALA RACHEL | 14664.00 | 0.00 | -- | 14664.00 | |
| 7035 | DST-H.K.VARMA | 95433.00 | 0.00 | -- | 95433.00 | |
| 7036 | INVITRO HEMO CAMPABILITY/ DR. LISSY | 216221.00 | 0.00 | -- | 216221.00 | |
| 7037 | INVIVO EVALUATION/ STED/DR. LISSY | 6205.00 | 0.00 | -- | 6205.00 | |
| 7039 | JNC/ASR/DR. MOHANAN/STUDY OF ACCUTE..... | 44684.00 | 0.00 | -- | 44684.00 | |
| 7040 | BIOMED/ C.V. MURALEEDHARAN | 44000.00 | 0.00 | -- | 44000.00 | |
| 7041 | CSIR-GRANT-ASHA S MATHEW,PHD STUDENT | 62073.00 | 0.00 | -- | 62073.00 | |
| 7042 | CSIR-GRANT-BERNADETTE K. MADATHIL,PHD | 25870.00 | 0.00 | -- | 25870.00 | |
| 7043 | CSIR-GRANT-SAILAJA.G.S.SRF | 9067.00 | 192000.00 | -- | 201067.00 | |
| 7044 | LISI NO TRIAL TRIAL MERIND | 21672.65 | 0.00 | -- | 21672.65 | |
| 7045 | NIRMALA RACHEL, CSIR | 14063.00 | 0.00 | -- | 14063.00 | |

| | | UTILISATION | | | | | | | | |
|---------------------|--------|---------------------|----------------|---------------------|---------------|------------|-------------------|-------------|--|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUM- ABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | | |
| -- | -- | 0.00 | 0.00 | -- | 3086399.00 | 3086399.00 | 3086399.00 | 2147194.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 22000.00 | 22000.00 | 22000.00 | 6787.55 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 3959.00 | | |
| -- | -- | 0.00 | 3300.00 | -- | 0.00 | 3300.00 | 3300.00 | 146700.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 30944.09 | | |
| -- | -- | 0.00 | 0.00 | -- | 55668.00 | 55668.00 | 55668.00 | 4175878.75 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 13876.00 | | |
| -- | -- | 0.00 | 0.00 | -- | -- | 0.00 | 0.00 | 2537.40 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 551.25 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 13656.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 20100.00 | 20100.00 | 20100.00 | 193282.00 | | |
| 0.00 | -- | 0.00 | 0.00 | -- | 103983.00 | 103983.00 | 103983.00 | 295328.90 | | |
| -- | -- | 0.00 | 0.00 | -- | 2941.00 | 2941.00 | 2941.00 | 4761.75 | | |
| -- | -- | 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 | 0.00 | -- | -- | 0.00 | 0.00 | 13674.00 | | |
| -- | -- | 0.00 | 0.00 | -- | -- | 0.00 | 0.00 | 39888.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 5407.00 | | |
| -- | -- | 0.00 | 150767.00 | -- | 192615.00 | 343382.00 | 343382.00 | 1159812.50 | | |
| -- | -- | 0.00 | 0.00 | -- | 68060.00 | 68060.00 | 68060.00 | 274746.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 69847.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 188.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 79385.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 45510.00 | | |
| 0.00 | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 2522.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 5089.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 6876.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 1500.00 | 1500.00 | 1500.00 | 79064.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 29166.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 72581.00 | | |
| 0.00 | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 14664.00 | | |
| -- | -- | 0.00 | 0.00 | -- | -- | 0.00 | 0.00 | 95433.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 19823.00 | 19823.00 | 19823.00 | 196398.00 | | |
| -- | -- | 0.00 | 0.00 | -- | -- | 0.00 | 0.00 | 6205.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 44684.00 | | |
| -- | -- | 0.00 | 0.00 | -- | -- | 0.00 | 0.00 | 44000.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 6100.00 | 6100.00 | 6100.00 | 55973.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 25870.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 192000.00 | 192000.00 | 192000.00 | 9067.00 | | |
| -- | -- | 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 | 14063.00 | | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS | FUND-WISE BREAK UP | | | TOTAL | |
|--------------|--|--------------------|-------------------|-------------------|------------|--|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | | |
| | | | GRANTS | OTHER RECEIPTS | | |
| 7047 | U.G.C. GRANT- RESEARCH FELLOW | 74689.00 | 623246.00 | -- | 697935.00 | |
| 7048 | CSIR GRANT- JOSENA JOSEPH | 47473.00 | 0.00 | -- | 47473.00 | |
| 7049 | CSIR GRANT - MARY VARGHESE | 35837.00 | 0.00 | -- | 35837.00 | |
| 7051 | CSIR GRANT - MANITHA B NAIR | 12062.00 | 0.00 | -- | 12062.00 | |
| 7052 | DBT/DR.PRABHA/DEV. OF TEMP - RES - CO-OPLY | -229010.25 | 0.00 | -- | -229010.25 | |
| 7053 | DR.SREENIVASAN/DEVEL.OF TEMP.RES.CO-OPLY | 22619.00 | 0.00 | -- | 22619.00 | |
| 7054 | DST-DR.ANOOP-DIFF:EXPR:RAT BRAIN..... | 44434.00 | 0.00 | -- | 44434.00 | |
| 7055 | CSIR-NMITLI SCHEME-C.V.MURALEEDHARAN | 5338110.00 | 0.00 | -- | 5338110.00 | |
| 7056 | D.S.T.ROYJOSEPH, BONE GRAFT SUB:SPINAL | 110047.00 | 0.00 | -- | 110047.00 | |
| 7057 | DST - PROJECT.DR.JAYABALAN | 16071.00 | 0.00 | -- | 16071.00 | |
| 7059 | DBT-DR. PRABHA D NAIR, ISLET IMMUN..... | 72870.00 | 0.00 | -- | 72870.00 | |
| 7060 | ICMR PROJECT/ SUDHAKAR MUTHALEE | 134495.00 | 139600.00 | 0.00 | 274095.00 | |
| 7061 | DR. UMASANKAR/PRELIMI:EVALU:BIODEGRADABLE | 125923.00 | 0.00 | -- | 125923.00 | |
| 7062 | DR. LIZY-SAHAJA:EVA "STENT"INVITRO..... | -140253.00 | 0.00 | -- | -140253.00 | |
| 7063 | DR.P.V.MOHAN, SHAJANAD | -10824.00 | 0.00 | -- | -10824.00 | |
| 7065 | DR.T.V.KUMARI, DBT.BIOGENE | 38713.00 | 0.00 | -- | 38713.00 | |
| 7066 | DR.B.S.GEETHA.PDF,STED | 15321.00 | 0.00 | -- | 15321.00 | |
| 7067 | DBT.DR.JAYABALAN,DEV:&STUDIES..... | -27459.00 | 0.00 | -- | -27459.00 | |
| 7069 | VSSC - PROJECT. D.S. NAGESH | 364905.00 | 0.00 | -- | 364905.00 | |
| 7070 | CHO PROJECT - 5146 JAYASREE | -872.00 | 0.00 | -- | -872.00 | |
| 7071 | STEC-PROJECT: DR.MAYA NANDKUMAR | -2164.00 | 0.00 | -- | -2164.00 | |
| 7072 | SAHAJANAND MED.TECH. C.V.MURALIDHARAN | 76292.00 | 0.00 | -- | 76292.00 | |
| 7073 | STUDY PROJECT:DR.P.V.MOHANAN | -95386.00 | 0.00 | 0.00 | -95386.00 | |
| 7074 | STUDY PROJECT: CLRI- DR.MOHAN | 289303.00 | 0.00 | -- | 289303.00 | |
| 7075 | STUDY PROJECT - BIOSYNC SCI | 11935.00 | 0.00 | -- | 11935.00 | |
| 7076 | ARROW INTERNATIONAL : DR.UMASHANKAR | 399773.00 | 0.00 | -- | 399773.00 | |
| 7077 | UMHOU SENEMBYU:DR.UMASHANKAR | 603714.00 | 0.00 | -- | 603714.00 | |
| 7080 | DBT-DR.MAYA- TISSUE ENGINEERING HYBRID | -391887.00 | 0.00 | -- | -391887.00 | |
| 7081 | USV LTD. MUMBAI - DR.MOHAN | 88349.00 | 0.00 | -- | 88349.00 | |
| 7082 | INDO-US JOINT PROJECT | 878.00 | 0.00 | 0.00 | 878.00 | |
| 7083 | ARROW HAEMO DIALYSIS | 30882.00 | 0.00 | -- | 30882.00 | |
| 7085 | DR.R.V.THAMPAN - CSIR | 26381.00 | 0.00 | -- | 26381.00 | |
| 7086 | HORMONE RELEASING INTRA DEVICES | -67934.00 | 0.00 | -- | -67934.00 | |
| 7087 | CSIR - KALADHAR - BST | 39103.00 | 0.00 | -- | 39103.00 | |
| 7088 | FEASIBILITY STUDY | 0.00 | 0.00 | -- | 0.00 | |
| 7089 | PROJ/7089/DEV.PORTABLE SAFETY | 0.00 | 0.00 | -- | 0.00 | |
| 7090 | PROJ/7090/TISSUE ENGINEERS VASCULAR | 288679.00 | 255000.00 | -- | 543679.00 | |
| 7091 | PROJ/7091/NOVEL MICROPHORES | -302731.00 | 0.00 | -- | -302731.00 | |
| 7092 | PROJ/7092/SEA FOOD | 143803.00 | 0.00 | -- | 143803.00 | |

| | | UTILISATION | | | | | | | | |
|---------------------|--------|---------------------|----------------|---------------------|---------------|------------|-------------------|-------------|--|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUM- ABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 386746.00 | 386746.00 | 386746.00 | 311189.00 | | |
| -- | -- | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | 47473.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35837.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12062.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -229010.25 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 22619.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 44434.00 | | |
| 0.00 | -- | 0.00 | 266748.00 | -- | 601754.00 | 868502.00 | 868502.00 | 4469608.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 110047.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 1944521.00 | 1944521.00 | 1944521.00 | -1928450.00 | | |
| 0.00 | -- | 0.00 | 0.00 | -- | 5096.00 | 5096.00 | 5096.00 | 67774.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 136048.00 | 136048.00 | 136048.00 | 138047.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 125682.00 | 125682.00 | 125682.00 | 241.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 192987.00 | 192987.00 | 192987.00 | -333240.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -10824.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 38713.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 15321.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -27459.00 | | |
| -- | -- | 0.00 | 194326.00 | -- | 10203.00 | 204529.00 | 204529.00 | 160376.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -872.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -2164.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 76292.00 | | |
| -- | -- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -95386.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 289303.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 11935.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 399773.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 603714.00 | | |
| 0.00 | 0.00 | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -391887.00 | | |
| -- | -- | 0.00 | 0.00 | -- | | 0.00 | 0.00 | 88349.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 878.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 30882.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 26381.00 | | |
| 0.00 | -- | 0.00 | 10868.00 | -- | 7225.00 | 18093.00 | 18093.00 | -86027.00 | | |
| -- | -- | 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 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 0.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 131702.00 | 131702.00 | 131702.00 | 411977.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | -302731.00 | | |
| -- | -- | 0.00 | 0.00 | -- | 11925.00 | 11925.00 | 11925.00 | 131878.00 | | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMWT FUNDS | FUND-WISE BREAK UP | | | TOTAL | |
|--------------|---|--------------------|-------------------|-------------------|------------|--|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | | |
| | | | GRANTS | OTHER RECEIPTS | | |
| 7093 | PROJ/7093/CSIR GRANT-LPA | 33281.00 | 755486.00 | -- | 788767.00 | |
| 7095 | PROJ/7095/CSIR GRANT-VIOLA.B.MORRIS | 34204.00 | 56516.00 | -- | 90720.00 | |
| 7097 | PROJ/7097/ACCELERATED AGEING | 318243.00 | 0.00 | -- | 318243.00 | |
| 7098 | PROJ/7098/EVALN OF NTU DRUG | 1355655.00 | 0.00 | -- | 1355655.00 | |
| 7099 | PROJ/7099/BCL | 7011.00 | 0.00 | -- | 7011.00 | |
| 7100 | PROJ/7100/ITR PROGRAMME | 31619.00 | 8750.00 | -- | 40369.00 | |
| 7101 | PROJ/7101/CSIR/SONIA.T.A | 32436.00 | 57600.00 | -- | 90036.00 | |
| 7102 | PROJ/7102/CSIR/LYNDA THOMAS | 24999.00 | 19200.00 | -- | 44199.00 | |
| 7103 | PROJ/7103/CSIR/VIDYARAJ | 7348.00 | 46534.00 | -- | 53882.00 | |
| 7104 | PROJ/7104/CSIR/RENJITH.P.NAIR | 38889.00 | 503000.00 | -- | 541889.00 | |
| 7105 | PROJ/7105/CSIR/ARJUN NAMBOODIRI | 17841.00 | 351200.00 | -- | 369041.00 | |
| 7106 | PROJ/7106/CSIR/NITHYA JOSEPH | 0.00 | 0.00 | -- | 0.00 | |
| 7107 | PROJ/7107/CSIR/NEENA & 2 FELLOWS | 34863.00 | 48000.00 | -- | 82863.00 | |
| 7108 | PROJ/7108/CSIR/FRANCIS.B.FERNANDEZ | 38957.00 | 327200.00 | -- | 366157.00 | |
| 7109 | PROJ/7109/CSIR/TARA.S | 35342.00 | 57600.00 | -- | 92942.00 | |
| 7110 | PROJ/7110/CSIR/DEEPA.R | 30822.00 | 115364.00 | -- | 146186.00 | |
| 7111 | PROJ/7111/CSIR/SHEEJA LIZA EASO | -808.00 | 221600.00 | -- | 220792.00 | |
| 7112 | PROJ/7112/ICMR/JASEER MOHAMMED | 22041.00 | 250400.00 | -- | 272441.00 | |
| 7113 | PROJ/7113/KSCSTE/RATHIKALA | 110992.00 | 0.00 | -- | 110992.00 | |
| 7200 | JOINT PROGRAME/M.TECH | 3362295.00 | 0.00 | -- | 3362295.00 | |
| 7210 | PROJ/7210/CSIR/SOMA DEY | 4932.00 | 250400.00 | -- | 255332.00 | |
| 7220 | COST OF ANIMAL FEED | 1386419.00 | 90300.00 | -- | 1476719.00 | |
| 7230 | PROJ/7230/CSIR/MANJU.S | 10212.00 | 336534.00 | -- | 346746.00 | |
| 7240 | PROJ/7240/CSIR/SUNITHA CHANDRAN | 20932.00 | 308000.00 | -- | 328932.00 | |
| 7250 | PROJ/7250/CSIR/KIRAN.S.NAIR | 5699.00 | 317445.00 | -- | 323144.00 | |
| 7260 | PROJ/7260/STOX083Y09/DR.P.V.MOHANAN | 410000.00 | 66000.00 | -- | 476000.00 | |
| 7270 | PROJ/7270/KSCSTE/MAYURI.P.V. | 114000.00 | 0.00 | -- | 114000.00 | |
| 7280 | PROJ/7280/CSIR/SUSAN.M.ALEX | 7812.00 | 323044.00 | -- | 330856.00 | |
| 7290 | PROJ/7290/CSIR/RAKHI.A | 0.00 | 337686.00 | -- | 337686.00 | |
| 7300 | PROJ/7300/CSIR/ARIYA SARASWATHY | 0.00 | 183117.00 | -- | 183117.00 | |
| 8001 | PROJ/8001/PROGRAM SUPPORT & TISSUE | -38291.00 | 2552412.00 | -- | 2514121.00 | |
| 8002 | PROJ/8002/PROGRAM SUPPORT & TISSUE | 70428.00 | 1591000.00 | 0.00 | 1661428.00 | |
| 8003 | PROJ/8003/PROGRAM SUPPORT & TISSUE | -119735.00 | 1109000.00 | -- | 989265.00 | |
| 8004 | PROJ/8004/PROGRAM SUPPORT & TISSUE | -65414.00 | 0.00 | 0.00 | -65414.00 | |
| 8005 | PROJ/8005/PROGRAM SUPPORT & TISSUE | -171788.00 | 1525486.00 | 0.00 | 1353698.00 | |
| 8006 | PROJ/8006/BIOCONJUGATION NANO MAT. | -226843.00 | 0.00 | -- | -226843.00 | |
| 8007 | PROJ/8007/PRODUCTS OF POLYMER | 517198.00 | 0.00 | -- | 517198.00 | |
| 8008 | PROJ/8008/CSIR GRANT-PADMAJA.P.NAMBI | 2990.00 | 204155.00 | -- | 207145.00 | |
| 8009 | PROJ/8009/DBT/DR.T.V.ANILKUMAR/DE... TISSUE | -719313.00 | 0.00 | -- | -719313.00 | |
| 8010 | PROJ/8010/DBT/DR.NIRANJAN/IMPLATED....CONTROL | 403725.00 | 0.00 | -- | 403725.00 | |

| | | UTILISATION | | | | | | | |
|---------------------|--------|---------------------|----------------|---------------------|---------------|------------|-------------------|-------------|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUM- ABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | |
| -- | -- | 0.00 | 0.00 | -- | 749140.00 | 749140.00 | 749140.00 | 39627.00 | |
| -- | -- | 0.00 | 0.00 | -- | 68648.00 | 68648.00 | 68648.00 | 22072.00 | |
| -- | -- | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | 318243.00 | |
| -- | -- | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | 1355655.00 | |
| -- | -- | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | 7011.00 | |
| -- | -- | 0.00 | 0.00 | | 36290.00 | 36290.00 | 36290.00 | 4079.00 | |
| -- | -- | 0.00 | 0.00 | | 87386.00 | 87386.00 | 87386.00 | 2650.00 | |
| -- | -- | 0.00 | 0.00 | | 44199.00 | 44199.00 | 44199.00 | 0.00 | |
| -- | -- | 0.00 | 0.00 | | 48200.00 | 48200.00 | 48200.00 | 5682.00 | |
| -- | -- | 0.00 | 0.00 | | 473891.00 | 473891.00 | 473891.00 | 67998.00 | |
| -- | -- | 0.00 | 0.00 | | 362220.00 | 362220.00 | 362220.00 | 6821.00 | |
| -- | -- | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | |
| -- | -- | 0.00 | 0.00 | | 48000.00 | 48000.00 | 48000.00 | 34863.00 | |
| -- | -- | 0.00 | 0.00 | | 318650.00 | 318650.00 | 318650.00 | 47507.00 | |
| -- | -- | 0.00 | 0.00 | | 64050.00 | 64050.00 | 64050.00 | 28892.00 | |
| -- | -- | 0.00 | 0.00 | | 118737.00 | 118737.00 | 118737.00 | 27449.00 | |
| -- | -- | 0.00 | 0.00 | | 228566.00 | 228566.00 | 228566.00 | -7774.00 | |
| -- | -- | -- | 0.00 | | 270232.00 | 270232.00 | 270232.00 | 2209.00 | |
| -- | -- | -- | 0.00 | | 106465.00 | 106465.00 | 106465.00 | 4527.00 | |
| -- | -- | 0.00 | 1894646.00 | | 263673.00 | 2158319.00 | 2158319.00 | 1203976.00 | |
| -- | -- | -- | 0.00 | | 231160.00 | 231160.00 | 231160.00 | 24172.00 | |
| -- | -- | -- | 0.00 | | 819625.00 | 819625.00 | 819625.00 | 657094.00 | |
| -- | -- | -- | 0.00 | | 304440.00 | 304440.00 | 304440.00 | 42306.00 | |
| -- | -- | -- | 0.00 | | 279200.00 | 279200.00 | 279200.00 | 49732.00 | |
| -- | -- | -- | 0.00 | | 285303.00 | 285303.00 | 285303.00 | 37841.00 | |
| -- | -- | -- | 130416.00 | | 66000.00 | 196416.00 | 196416.00 | 279584.00 | |
| -- | -- | -- | 0.00 | | 29700.00 | 29700.00 | 29700.00 | 84300.00 | |
| -- | -- | -- | 0.00 | | 284473.00 | 284473.00 | 284473.00 | 46383.00 | |
| -- | -- | -- | -- | | 263883.00 | 263883.00 | 263883.00 | 73803.00 | |
| -- | -- | -- | -- | | 148413.00 | 148413.00 | 148413.00 | 34704.00 | |
| 0.00 | -- | 0.00 | 2215781.00 | | 909552.00 | 3125333.00 | 3125333.00 | -611212.00 | |
| 0.00 | -- | 0.00 | 643280.00 | | 576327.00 | 1219607.00 | 1219607.00 | 441821.00 | |
| 0.00 | -- | 0.00 | 201381.00 | | 438922.00 | 640303.00 | 640303.00 | 348962.00 | |
| 0.00 | -- | 0.00 | 0.00 | | 11601.00 | 11601.00 | 11601.00 | -77015.00 | |
| 0.00 | -- | 0.00 | 240708.00 | | 782602.00 | 1023310.00 | 1023310.00 | 330388.00 | |
| -- | -- | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | -226843.00 | |
| 0.00 | -- | 0.00 | 0.00 | | 517198.00 | 517198.00 | 517198.00 | 0.00 | |
| -- | -- | 0.00 | 0.00 | | 194155.00 | 194155.00 | 194155.00 | 12990.00 | |
| 0.00 | -- | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | -719313.00 | |
| 0.00 | -- | 0.00 | 0.00 | | 120033.00 | 120033.00 | 120033.00 | 283692.00 | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS | FUND-WISE BREAK UP | | | TOTAL | |
|--------------|--|--------------------|-------------------|-------------------|------------|--|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | | |
| | | | GRANTS | OTHER RECEIPTS | | |
| 8011 | PROJ/8011/NANOFONT/DR.NIRANJAN/INTRAMAS | 139900.00 | 0.00 | | 139900.00 | |
| 8012 | PROJ/8012/VSSC/DR.NIRANJAN/DESIGN STUDIES | 2469340.00 | 0.00 | | 2469340.00 | |
| 8013 | PROJ/8013/DST/DR.C.P.SHARMA/ FADDS | 5281843.00 | 24643.00 | 0.00 | 5306486.00 | |
| 8014 | PROJ/8014/DBT/DR.ROY JOSEPH/DEV....V.GRAFT | -17063.00 | 0.00 | | -17063.00 | |
| 8015 | PROJ/8015/DR.ANOOPKUMAR/PROGRAMME... | 4566.00 | 0.00 | | 4566.00 | |
| 8016 | PROJ/8016/DBT/DR.UMASHANKAR/DEVE....APPLN. | 111618.00 | 0.00 | 0.00 | 111618.00 | |
| 8017 | PROJ/8017/AYUTECH/DR.UMASANKAR | 365050.00 | 0.00 | -- | 365050.00 | |
| 8018 | PROJ/8018/ICMR/DR.P.V.MOHANAN | 126563.00 | 444661.00 | -- | 571224.00 | |
| 8019 | PROJ/8019/STEC/DR.P.RAMESH | 69661.00 | 215000.00 | -- | 284661.00 | |
| 8020 | PROJ/8020/CSIR/DR.LISSY KRISHNAN | -23920.00 | 634314.00 | -- | 610394.00 | |
| 8021 | PROJ/8021/ANGIOGENESIS EXP/DR.UMASHANKAR | 171814.00 | 0.00 | -- | 171814.00 | |
| 8022 | PROJ/8022/AIR POLLUTION/SUJESH SREEDHAR | 96433.00 | 0.00 | -- | 96433.00 | |
| 8023 | PROJ/8023/KSCSTE/DR.H.K.VARMA | 4649.00 | 0.00 | -- | 4649.00 | |
| 8024 | PROJ/8024/IIT/DR.P.R.ANILKUMAR | -68280.00 | 472224.00 | -- | 403944.00 | |
| 8025 | PROJ/8025/ | 357503.00 | 0.00 | -- | 357503.00 | |
| 8026 | PROJ/8026/ | -6137.00 | 12000.00 | -- | 5863.00 | |
| 8027 | PROJ/8027/DR.P.V.MOHANAN | 321446.00 | 0.00 | -- | 321446.00 | |
| 8028 | PROJ/8028/DR.DIKSHA PAINULY | 111903.00 | 921112.00 | -- | 1033015.00 | |
| 8029 | PROJ/8029/INDO-JAPAN | 153083.00 | 0.00 | -- | 153083.00 | |
| 8030 | PROJ/STUDY/DR.UMASHANKAR | 441083.00 | 697410.00 | -- | 1138493.00 | |
| 8031 | PROJ/8031 | 381754.00 | 0.00 | -- | 381754.00 | |
| 8032 | PROJ/8032/O.S.N.NAIR | 200000.00 | 0.00 | -- | 200000.00 | |
| 8033 | PROJ/8033/DEV. OF IRON OXIDE-DR.R.S.JAYASREE | 499346.00 | 718220.00 | -- | 1217566.00 | |
| 8034 | PROJ/8034/FLURO PASSI...DR.ROY JOSEPH | 954424.00 | 744525.00 | -- | 1698949.00 | |
| 8035 | PROJ/EVALN OF SEWING RING-DR.UMASHANKAR | 57960.00 | 0.00 | -- | 57960.00 | |
| 8036 | PROJ/DEV OF CALCIUM SULPHATE-DR.MANOJ | 788410.00 | 0.00 | -- | 788410.00 | |
| 8037 | PROJ/MEDICAL DEVICE RET - DR.MIRA MOHANTY | 2548870.00 | 920000.00 | -- | 3468870.00 | |
| 8038 | PROJ/DEV OF MISSION PROGRAM - DR.GSB | 1800000.00 | 0.00 | -- | 1800000.00 | |
| 8039 | PROJ/DISPENSABLE & BIODEGR- DR.JAYABALAN | 2234348.00 | 0.00 | -- | 2234348.00 | |
| 8040 | PROJ/SYNTHESIS OF OXIDE-DR.H.K.VARMA | 721952.00 | 0.00 | -- | 721952.00 | |
| 8041 | PROJ/DEV OF NANO DEVICES DNA-DR.C.P.SHARMA | 1500000.00 | 50460.00 | -- | 1550460.00 | |
| 8042 | PROJ/BIOENGINEERED HYBRID -DR.LISSY KRISH | 1026836.00 | 0.00 | -- | 1026836.00 | |
| 8043 | PROJ/MOLECULAR IMMUNOTOX-DR.P.V.MOHANAN | 1847219.00 | 1500000.00 | -- | 3347219.00 | |
| 8044 | PROJ/TISSUE ENGINEERING-BERNADETTE | 564967.00 | 0.00 | -- | 564967.00 | |
| 8045 | PROJ/COLOUR ATLAS OF TISSUE-DR.MIRA | 439584.00 | 0.00 | -- | 439584.00 | |
| 8046 | PROJ/DIFF. OF ADULT PRO - DR.ASHA.S.MATHEW | 739755.00 | 0.00 | -- | 739755.00 | |
| 8047 | PROJ/INVIVO GENOTOXICITY-DR.P.V.MOHANAN | 646316.00 | 0.00 | -- | 646316.00 | |
| 8048 | PROJ/STUDIES DR.KAMALESH GULIA | 230480.00 | 0.00 | -- | 230480.00 | |
| 8049 | PROJ/NEW VISION BIOMAT-DR.C.P.SHARMA | 4530.00 | 0.00 | -- | 4530.00 | |
| 8050 | PROJ/GENOTOXICITY STUDY-DR.P.V.MOHANAN | 330900.00 | 0.00 | -- | 330900.00 | |

| CAPITAL EXPENDITURE | | UTILISATION | | | | | REVENUE EXPENDITURE | | NET BALANCE |
|---------------------|--------|-------------|----------------|---------------------|---------------|------------|---------------------|-------------|-------------|
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUM- ABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 139900.00 | |
| -- | -- | 0.00 | 0.00 | -- | 309688.00 | 309688.00 | 309688.00 | 2159652.00 | |
| 0.00 | -- | 0.00 | 961925.00 | -- | 4344561.00 | 5306486.00 | 5306486.00 | 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 | 4566.00 | |
| 0.00 | -- | 0.00 | 68400.00 | -- | 224283.00 | 292683.00 | 292683.00 | -181065.00 | |
| -- | -- | 0.00 | 0.00 | -- | 0.00 | 0.00 | 0.00 | 365050.00 | |
| -- | -- | 0.00 | 150600.00 | -- | 475815.00 | 626415.00 | 626415.00 | -55191.00 | |
| -- | -- | -- | 102571.00 | -- | 46985.00 | 149556.00 | 149556.00 | 135105.00 | |
| -- | -- | -- | 84929.00 | -- | 223385.00 | 308314.00 | 308314.00 | 302080.00 | |
| -- | -- | -- | 6150.00 | -- | 86628.00 | 92778.00 | 92778.00 | 79036.00 | |
| -- | -- | -- | 0.00 | -- | 0.00 | 0.00 | 0.00 | 96433.00 | |
| -- | -- | -- | 0.00 | -- | 34.00 | 34.00 | 34.00 | 4615.00 | |
| -- | -- | -- | 82662.00 | -- | 267467.00 | 350129.00 | 350129.00 | 53815.00 | |
| -- | -- | -- | 172800.00 | -- | 57957.00 | 230757.00 | 230757.00 | 126746.00 | |
| -- | -- | -- | 0.00 | -- | 2524.00 | 2524.00 | 2524.00 | 3339.00 | |
| -- | -- | -- | 76839.00 | -- | 163975.00 | 240814.00 | 240814.00 | 80632.00 | |
| -- | -- | -- | 600000.00 | -- | 189729.00 | 789729.00 | 789729.00 | 243286.00 | |
| -- | -- | -- | 0.00 | -- | 63020.00 | 63020.00 | 63020.00 | 90063.00 | |
| -- | -- | -- | 271806.00 | -- | 445626.00 | 717432.00 | 717432.00 | 421061.00 | |
| -- | -- | -- | 237600.00 | -- | 556889.00 | 794489.00 | 794489.00 | -412735.00 | |
| -- | -- | -- | 0.00 | 0.00 | 34000.00 | 34000.00 | 34000.00 | 166000.00 | |
| -- | -- | -- | 337155.00 | -- | 412202.00 | 749357.00 | 749357.00 | 468209.00 | |
| -- | -- | -- | 367243.00 | -- | 423127.00 | 790370.00 | 790370.00 | 908579.00 | |
| -- | -- | -- | 0.00 | -- | 136560.00 | 136560.00 | 136560.00 | -78600.00 | |
| -- | -- | -- | 38452.00 | -- | 573465.00 | 611917.00 | 611917.00 | 176493.00 | |
| -- | -- | -- | 405703.00 | -- | 2178334.00 | 2584037.00 | 2584037.00 | 884833.00 | |
| -- | -- | -- | 0.00 | -- | 601966.00 | 601966.00 | 601966.00 | 1198034.00 | |
| -- | -- | -- | 222400.00 | -- | 166609.00 | 389009.00 | 389009.00 | 1845339.00 | |
| -- | -- | -- | 221600.00 | -- | 524992.00 | 746592.00 | 746592.00 | -24640.00 | |
| -- | -- | -- | 0.00 | -- | 1358348.00 | 1358348.00 | 1358348.00 | 192112.00 | |
| -- | -- | -- | 239677.00 | -- | 536210.00 | 775887.00 | 775887.00 | 250949.00 | |
| -- | -- | -- | 501645.00 | -- | 1259165.00 | 1760810.00 | 1760810.00 | 1586409.00 | |
| -- | -- | -- | 420000.00 | -- | 189590.00 | 609590.00 | 609590.00 | -44623.00 | |
| -- | -- | -- | 203200.00 | -- | 257951.00 | 461151.00 | 461151.00 | -21567.00 | |
| -- | -- | -- | 0.00 | -- | 0.00 | 0.00 | 0.00 | 739755.00 | |
| -- | -- | -- | 165000.00 | -- | 6407.00 | 171407.00 | 171407.00 | 474909.00 | |
| -- | -- | -- | 0.00 | -- | 63881.00 | 63881.00 | 63881.00 | 166599.00 | |
| -- | -- | -- | 0.00 | -- | 49391.00 | 49391.00 | 49391.00 | -44861.00 | |
| -- | -- | -- | 0.00 | -- | 28245.00 | 28245.00 | 28245.00 | 302655.00 | |

| PROJ Code | SCHEDULE 3-EARMARKED/ENDOWM/WNT FUNDS | FUND-WISE BREAK UP | | | TOTAL |
|--------------|---|--------------------|-------------------|-------------------|-------------|
| | NAME OF GRANTEE/PRINCIPAL INVESTIGATOR | OPENING BALANCE | ADDITIONS TO FUND | | |
| | | | GRANTS | OTHER RECEIPTS | |
| 8051 | PROJ/INVITRO ALTE.TEST-DR.P.V.MOHANAN | 1700000.00 | 591724.00 | -- | 2291724.00 |
| 8052 | PROJ/ROLL OF TRANSFORMN GROWTH-DR.ANOOP | 0.00 | 458333.00 | -- | 458333.00 |
| 8053 | PROJ/DEVELOPMENT OF SMART../DR.LIZYMOL.PP | 0.00 | 488334.00 | -- | 488334.00 |
| 8054 | PROJ/MUSCULASKELETAL STEM CELL/DR.PDNAIR | 0.00 | 7881000.00 | -- | 7881000.00 |
| 8055 | PROJ/MUSCULASKELETAL STEM /DR.H.K.VARMA | 0.00 | 1037000.00 | -- | 1037000.00 |
| 8056 | PROJ/DR.A.C.JAYALEKSHMI | 0.00 | 289000.00 | -- | 289000.00 |
| 8057 | PROJ/INVITRO PRECLINICAL / DR.LISSY | 0.00 | 911522.00 | -- | 911522.00 |
| 8058 | PROJ/AORC FELLOWSHIP/MAYURI.P.V. | 0.00 | 500800.00 | -- | 500800.00 |
| 8059 | PROJ/CELL SHEET ENGG-DR.P.R.ANILKUMAR | 0.00 | 808000.00 | -- | 808000.00 |
| 8060 | PROJ/DEVELOPMENT OF SKIN GRAFT | 0.00 | 2239800.00 | -- | 2239800.00 |
| 8061 | PROJ/VISIBLE LIGHT INDUCED../DR.RADHAKUMARI | 0.00 | 2189058.00 | -- | 2189058.00 |
| 8062 | PROJ/ACCELERATED AREING../MR.C.V.MURALI | 0.00 | 213728.00 | -- | 213728.00 |
| 8063 | PROJ/EFFECTS OF MATERIAL SLEEP/DR.K.GULIA | 0.00 | 2385000.00 | -- | 2385000.00 |
| | Total | 51142068.59 | 46471627.00 | 13211.00 | 97626906.59 |
| | | | | | |
| | | | | | |
| | | | | | |

| | | UTILISATION | | | | | | | |
|---------------------|--------|---------------------|----------------|---------------------|---------------|-------------|-------------------|--------------|--|
| CAPITAL EXPENDITURE | | REVENUE EXPENDITURE | | | | | | | |
| FIXED ASSETS | OTHERS | TOTAL | SALARIES WAGES | RENT/ CONSUM- ABLES | OTHER ADM EXP | TOTAL | TOTAL EXPENDITURE | NET BALANCE | |
| -- | -- | -- | 183019.00 | -- | 729927.00 | 912946.00 | 912946.00 | 1378778.00 | |
| -- | -- | -- | 121290.00 | -- | 103328.00 | 224618.00 | 224618.00 | 233715.00 | |
| -- | -- | -- | 77742.00 | -- | 88973.00 | 166715.00 | 166715.00 | 321619.00 | |
| -- | -- | -- | 432129.00 | -- | 1699831.00 | 2131960.00 | 2131960.00 | 5749040.00 | |
| -- | -- | -- | 110400.00 | -- | 168696.00 | 279096.00 | 279096.00 | 757904.00 | |
| -- | -- | -- | 0.00 | -- | 236856.00 | 236856.00 | 236856.00 | 52144.00 | |
| -- | -- | -- | 461610.00 | -- | 113625.00 | 575235.00 | 575235.00 | 336287.00 | |
| -- | -- | -- | 0.00 | -- | 409425.00 | 409425.00 | 409425.00 | 91375.00 | |
| -- | -- | -- | 14400.00 | -- | 0.00 | 14400.00 | 14400.00 | 793600.00 | |
| -- | -- | -- | 26400.00 | -- | 0.00 | 26400.00 | 26400.00 | 2213400.00 | |
| -- | -- | -- | 0.00 | -- | 0.00 | 0.00 | 0.00 | 2189058.00 | |
| -- | -- | -- | 0.00 | -- | 0.00 | 0.00 | 0.00 | 213728.00 | |
| -- | -- | -- | 0.00 | -- | 0.00 | 0.00 | 0.00 | 2385000.00 | |
| 0.00 | 0.00 | 0.00 | 13317568.00 | 0.00 | 36685682.00 | 50003250.00 | 50003250.00 | 47623656.59 | |
| | | | | | | | | | |
| | | | | | Grand Total | | | 236774177.31 | |

| | 2011-12 | 2010-11 |
|---|-------------|-------------|
| PARTICULARS | [Rs.] | [Rs.] |
| SCHEDULE 4-SECURED LOANS AND BORROWINGS: | | |
| 1. Central Government | -- | -- |
| 2. State Government (Specify) | -- | -- |
| 3. Financial Institutions | -- | -- |
| a) Term Loans | -- | -- |
| b) Interest accrued and due | -- | -- |
| 4. Banks: | -- | -- |
| a) Term Loans-Interest accrued and due | -- | -- |
| b) Other Loans(specify)- Interest accrued 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 | 25773109.00 | 45418956.00 |
| b) Others | 1678641.00 | 1127360.00 |
| 3. Advances Received | 33695568.93 | 33206734.93 |
| 4. Interest accrued but not due on: | 0.00 | 0.00 |

| SCHEDULE 8- FIXED ASSETS PARTICULARS | GROSS BLOCK | | |
|---|---|-----------------------------------|------------------------------------|
| | Cost/valuation as at the beginning of the year (01.04.2011) | Additions during the year 2011-12 | Deductions during the year 2011-12 |
| A. FIXED ASSETS: | | | |
| 1. LAND: | | | |
| a) Freehold | 16894605.51 | 0.00 | 0.00 |
| b) Leasehold | | | |
| 2. BUILDINGS: | | | |
| a) On Freehold Land * | 43438708.88 | 169388.00 | 0.00 |
| b) On Leasehold Land | | | |
| c) Ownership Flats/Premises | | | |
| d) Superstructures on Land not belonging to the entity | 124216260.88 | 0.00 | |
| 3. PLANT MACHINERY & EQUIPMENT | 1564324968.18 | 172716611.00 | 1049653.00 |
| 4. VEHICLES | 7474233.74 | 0.00 | 0.00 |
| 5. FURNITURE, FIXTURES | 42286050.61 | 1240419.00 | |
| 6. OFFICE EQUIPMENT | 976203.54 | 0.00 | |
| 7. COMPUTER/PERIPHERALS | | | |
| 8. ELECTRIC INSTALLATIONS | 37939698.67 | 7037936.00 | |
| 9. LIBRARY BOOKS | 127980921.57 | 11021960.00 | |
| 10. TUBEWELLS & W.SUPPLY | 174615.00 | 0.00 | |
| 11. OTHER FIXED ASSETS | | | |
| a) OXYGEN CYLINDERS | 234319.42 | 0.00 | |
| b) AIR CONDITIONERS | 24559897.91 | 1408096.00 | |
| c) TELEPHONE INSTALLATIONS | 2151441.94 | 0.00 | |
| d) COLD ROOM INSTALLATION | 341700.00 | | |
| e) WATER COOLERS | 62866.50 | | |
| f) LIFT INSTALLATION | 11250942.10 | 0.00 | |
| g) KITCHEN EQUIPMENTS | 1405978.22 | | |
| h) CANTEEN EQUIPMENTS | 151482.59 | 49376.00 | |
| i) PAINTINGS | 382715.63 | 67500.00 | |
| k) LIVESTOCK | 31848.00 | | |
| l) GAS PLANT INSTALLATIONS | | | |
| m) AMC AIR CONDITIONERS | | | |
| Total for the year (Total -A) | 2006279458.89 | 193711286.00 | 1049653.00 |
| Total for the previous year | 1723751268.89 | 283106508.00 | 578318.00 |
| Capital Work in Progress (B) | 560426019.00 | 26352003.00 | |
| Total for the year (A+B) | 2566705477.89 | 220063289.00 | 1049653.00 |
| * Depreciation for item2(a) has been provided along with depreciation on 2(d) | | | |

| | Cost/valuation at the year end (31.03.2012) | Depreciation | | | NET BLOCK | |
|--|---|---|-------------------------|---------------------------------------|--|--|
| | | Depreciation as at the beginning of the year (01.04.2011) | During the year 2011-12 | Total up to the year end (31.03.2012) | As at the end of current year end (31.03.2012) | As at the previous year end (31.03.2011) |
| | | | | | | |
| | 16894605.51 | 0.00 | 0.00 | 0.00 | 16894605.51 | 16894605.51 |
| | | | | | | |
| | 43608096.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | |
| | 124216260.88 | 91777516.03 | 3802342.09 | 95579858.12 | 72244499.64 | 75877453.73 |
| | 1735991926.18 | 908167738.51 | 124173628.15 | 1032341366.66 | 703650559.52 | 656157229.67 |
| | 7474233.74 | 4523496.00 | 590147.55 | 5113643.55 | 2360590.19 | 2950737.74 |
| | 43526469.61 | 28295532.14 | 2284640.62 | 30580172.76 | 12946296.85 | 13990518.47 |
| | 976203.54 | 893455.01 | 12412.28 | 905867.29 | 70336.25 | 82748.53 |
| | | | | | | |
| | 44977634.67 | 18772853.60 | 3930717.16 | 22703570.76 | 22274063.91 | 19166845.07 |
| | 139002881.57 | 90531241.08 | 7270746.07 | 97801987.15 | 41200894.42 | 37449680.49 |
| | 174615.00 | 159361.64 | 2288.00 | 161649.64 | 12965.36 | 15253.36 |
| | | | | | | |
| | 234319.42 | 219984.92 | 2150.18 | 222135.10 | 12184.32 | 14334.50 |
| | 25967993.91 | 19269796.34 | 1004729.64 | 20274525.98 | 5693467.93 | 5290101.57 |
| | 2151441.94 | 1899022.57 | 37862.91 | 1936885.48 | 214556.46 | 252419.37 |
| | 341700.00 | 339404.08 | 344.39 | 339748.47 | 1951.53 | 2295.92 |
| | 62866.50 | 62651.93 | 32.19 | 62684.12 | 182.38 | 214.57 |
| | 11250942.10 | 6299368.05 | 742736.11 | 7042104.16 | 4208837.94 | 4951574.05 |
| | 1405978.22 | 854038.51 | 82790.96 | 936829.47 | 469148.75 | 551939.71 |
| | 200858.59 | 122642.88 | 11732.36 | 134375.24 | 66483.35 | 28839.71 |
| | 450215.63 | 345967.97 | 15637.15 | 361605.12 | 88610.51 | 36747.66 |
| | 31848.00 | 28361.32 | 523.00 | 28884.32 | 2963.68 | 3486.68 |
| | | | | | | |
| | | | | | | |
| | 2198941091.89 | 1172562432.58 | 143965460.78 | 1316527893.36 | 882413198.53 | 833717026.31 |
| | 2006279458.89 | 1037596922.19 | 134965510.39 | 1172562432.58 | 833717026.31 | 686154346.68 |
| | 586778022.00 | 0.00 | 0.00 | 0.00 | 586778022.00 | 560426019.00 |
| | 2785719113.89 | 1172562432.58 | 143965460.78 | 1316527893.36 | 1469191220.53 | 1394143045.31 |
| | | | | | | |

| | 2011-12 | 2010-11 |
|--|---------------------|---------------------|
| PARTICULARS | [Rs.] | [Rs.] |
| SCHEDULE 9 - INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS | | |
| 1. In Government Securities | 50414956.00 | 76690331.00 |
| 2. Other approved Securities | 5685391.00 | 5685391.00 |
| 3. Shares | 0.00 | 0.00 |
| 4. Debentures and Bonds | 0.00 | 0.00 |
| 5. Subsidiaries and Joint Ventures | 0.00 | 0.00 |
| 6. Others (to be specified) Sinking Fund Investments | 350059901.00 | 303995127.00 |
| Technology Fund | 60682967.45 | 51192866.70 |
| Pension & staff funds | 50921140.00 | 50658474.00 |
| TOTAL | 517764355.45 | 488222189.70 |
| 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 | 226753215.13 | 224274225.51 |
| b) Loose Tools | 6731530.00 | 5399533.00 |
| c) Stock-in trade | | |
| Finished Goods | | |
| Work-in-progress | | |
| Medicine | 8782277.00 | 8354623.00 |
| 2. Sundry Debtors: | | |
| a) Debts Outstanding for a period exceeding six months | | |
| b) Others | 77268199.00 | 39629987.00 |
| 3. Cash balances in hand(including cheques/drafts and imprest) | 868645.18 | 801568.18 |
| 4. Bank Balances: | | |
| a) With Scheduled Banks: | | |

| | 2011-12 | 2010-11 |
|---|---------------|---------------|
| PARTICULARS | [Rs.] | [Rs.] |
| -On Current Account | 1.15 | 1.15 |
| -On Deposit Accounts(L.C. margin & Commitment deposit) | 788406645.00 | 861111471.00 |
| -On Savings Accounts | 201042234.83 | 231896817.31 |
| b) With non-Scheduled Banks: | | |
| -On Current Account | 0.00 | 0.00 |
| -On Deposit Accounts | 0.00 | 0.00 |
| -On Savings Accounts | 0.00 | 0.00 |
| 5. Post-Office-Savings Accounts | 0.00 | 0.00 |
| TOTAL(A) | 1309852747.29 | 1371468226.15 |
| B.LOANS, ADVANCES AND OTHER ASSETS | | |
| 1. Loans: | | |
| a) Staff | 13378624.00 | 11736597.00 |
| b) Other Entities engaged in activities/objectives similar to that of the Entity | 0.00 | 0.00 |
| c) Other(specify) | | |
| 2. Advances and other amounts recoverable in cash or in kind or for value to be received: | | |
| a) On Capital Account | 217851647.10 | 199074305.10 |
| b) Prepayments | 18068291.53 | 85965676.53 |
| c) Others | | |
| 3. Income Accrued: | | |
| a) On Investments from Earmarked/endowment Funds | 0.00 | 0.00 |
| b) On Investments-Others | 0.00 | 0.00 |
| c) On Loans and Advances | 0.00 | 0.00 |
| d) Others | 0.00 | 0.00 |
| (includes income due unrealised Rs) | | |
| 4. Claims Receivable | | |
| From Govt of India on Plan Funds | 0.00 | 0.00 |
| TOTAL(B) | 249298562.63 | 296776578.63 |
| TOTAL(A+B) | 1559151309.92 | 1668244804.78 |
| 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 | 0.00 | 0.00 |
| b) Sale of Raw Material | 0.00 | 0.00 |

| | 2011-12 | 2010-11 |
|--|--------------|--------------|
| PARTICULARS | [Rs.] | [Rs.] |
| c) Sale of Scraps | 0.00 | 0.00 |
| 2. Income from Services | | |
| a) Labour and processing charges | 0.00 | 0.00 |
| b) Professional/Consultancy Services | 0.00 | 0.00 |
| c) Agency Commission and Brokerage | 0.00 | 0.00 |
| d) Maintenance Services | 0.00 | 0.00 |
| e) Others (Specify) | 0.00 | 0.00 |
| From Hospital Services-Gross Income Rs.57,73,65,295.00 | 0.00 | 0.00 |
| Less concession to poor Patients Rs.19,08,95,165.00 | 386470130.00 | 311949503.40 |
| From Projects | 3972145.00 | 4814785.00 |
| Testing & Facility charges received | 4332863.50 | 4837884.00 |
| TOTAL | 394775138.50 | 321602172.40 |
| SCHEDULE 13- GRANTS/SUBSIDIES | | |
| (Irrevocable Grants & Subsidies Received) | | |
| 1. Central Government | 239495165.00 | 258676264.00 |
| 2. State Government(s) | 0.00 | 0.00 |
| 3. Government Agencies | 0.00 | 0.00 |
| 4. Institution/Welfare Bodies | 0.00 | 0.00 |
| 5. International Organisations | 0.00 | 0.00 |
| 6. Others(Specify) | 0.00 | 0.00 |
| TOTAL | 239495165.00 | 258676264.00 |
| SCHEDULE 14-FEES/SUBSCRIPTIONS | | |
| 1. Entrance Fees | 1210330.00 | 1483500.00 |
| 2. Annual Fees/ Subscriptions | 2707370.00 | 5016910.00 |
| 3. Seminar/Program Fees | 0.00 | 0.00 |
| 4. Consultancy Fees | 0.00 | 0.00 |
| 5. Others(Specify) Examination Fees | 1136167.00 | 523812.00 |
| TOTAL | 5053867.00 | 7024222.00 |
| SCHEDULE 15- INCOME FROM INVESTMENTS | | |
| (Income on Invest.from Earmarked/Endowment Funds transferred to Funds) | | |
| 1) Interest | | |
| a) On Govt. Securities | 0.00 | 0.00 |

| | 2011-12 | 2010-11 |
|--|-------------|-------------|
| PARTICULARS | [Rs.] | [Rs.] |
| b) Other Bonds/Debentures | 0.00 | 0.00 |
| 2) Dividends: | | |
| a) On Shares | 0.00 | 0.00 |
| b) On Mutual Fund Securities | 0.00 | 0.00 |
| 3) Rents | 0.00 | 0.00 |
| 4) Others(Specify) On Sinking Fund | 22648562.00 | 26776447.00 |
| On Technology Fund | 4645969.45 | 2952876.00 |
| TOTAL | 27294531.45 | 29729323.00 |
| TRANSFERRED TO EARMARKED/ENDOWMENT FUNDS | | |
| | | |
| SCHEDULE 16- INCOME FROM ROYALTY,PUBLICATION ETC | | |
| 1) Income from Royalty | 2302598.00 | 877864.00 |
| 2) Income from Publications | 0.00 | 0.00 |
| 3)Others(Specify) | | |
| TOTAL | 2302598.00 | 877864.00 |
| | | |
| SCHEDULE 17- INTEREST EARNED | | |
| 1) On Term Deposit | | |
| a) With Scheduled Banks | 72531466.00 | 68936301.00 |
| b) With non-scheduled banks | 0.00 | 0.00 |
| c) With Institutions | 0.00 | 0.00 |
| d) Others | 0.00 | 0.00 |
| 2) On Savings Account | 0.00 | 0.00 |
| a) With Scheduled Banks | 4564117.91 | 3006204.57 |
| b) With non-scheduled banks | 0.00 | 0.00 |
| c) Post Office Savings Account | 0.00 | 0.00 |
| d) Others | 0.00 | 0.00 |
| 3) On Loans | | |
| a) Employees/Staff | 1313987.00 | 2100817.00 |
| b) Others | 0.00 | 0.00 |
| 4) Interest on Debtors and other Receivables | | |
| TOTAL | 78409570.91 | 74043322.57 |
| | | |

| | 2011-12 | 2010-11 |
|--|---------------------|---------------------|
| PARTICULARS | [Rs.] | [Rs.] |
| SCHEDULE 18- OTHER INCOME | | |
| 1. Profit on Sale/disposal of Assets: | | |
| a) Owned assets | 0.00 | 0.00 |
| b) Assets acquired out of grants, or received free of cost | 0.00 | 0.00 |
| 2. Rent | 1491644.50 | 1324049.00 |
| 3. Fees for Miscellaneous Services | 0.00 | 0.00 |
| 4. Miscellaneous Income (income from Projects) | 170000.00 | 130000.00 |
| Other Income | 2635043.20 | 3325782.30 |
| TOTAL | 4296687.70 | 4779831.30 |
| SCHEDULE 20-ESTABLISHMENT EXPENSES | | |
| a) Salaries and Wages | 540690563.90 | 524813718.00 |
| b) Allowances and Bonus | 6264537.00 | 2874948.00 |
| c) Contribution to Provident Fund | 0.00 | 0.00 |
| d) Contribution to other fund(specify) | 0.00 | 0.00 |
| e) Staff Welfare Expenses | 11630183.35 | 12761048.60 |
| f) Expenses on Employee's Retirement and Terminal Benefits | 214525802.00 | 40004589.00 |
| g) Others(Specify) PG Training & Accademic payments | 100379317.00 | 86532279.00 |
| TOTAL | 873490403.25 | 666986582.60 |
| SCHEDULES 21- ADMINISTRATIVE EXPENSES | | |
| a) Purchases | 359413265.00 | 305173543.82 |
| b) Labour and processing expenses | 0.00 | 0.00 |
| c) Cartage and Carriage Inwards | 148927.00 | 97184.00 |
| d) Electricity and power | 29029302.00 | 29202681.00 |
| e) Water charges | 3753342.00 | 3645050.00 |
| f) Insurance | 379832.00 | 238405.00 |
| g) Repairs and maintenance | 30040706.00 | 42759598.00 |
| h) Excise duty | 0.00 | 0.00 |
| i) Rent,Rates and Taxes | 378726.00 | 515853.00 |
| j) Vehicles Running and Maintenance | 866496.00 | 643382.11 |
| k) Postage,Telephone and Communication Charges | 3112683.00 | 2922051.00 |
| l) Printing and Stationary | 2587599.00 | 2924400.00 |

| | 2011-12 | 2010-11 |
|--|--------------|--------------|
| PARTICULARS | [Rs.] | [Rs.] |
| m) Travelling and Conveyance Expenses | 2456262.00 | 2064721.00 |
| n) Expenses on Seminar/Workshop | 2423045.00 | 1464035.00 |
| o) Subscription Expenses | 71060.00 | 87060.00 |
| p) Expenses on Fees | 0.00 | 0.00 |
| q) Auditors Renumeration | 0.00 | 0.00 |
| r) Hospitality Expenses | 0.00 | 0.00 |
| s) Professional Charges | 0.00 | 0.00 |
| t) Provision for Bad and Doubtful Debts/Advances | 0.00 | 0.00 |
| u) Irrecoverable Balances Written-off | 0.00 | 0.00 |
| v) Packing Charges | 0.00 | 0.00 |
| w) Freight and Forwarding Expenses | 0.00 | 0.00 |
| x) Distribution Expenses | 0.00 | 0.00 |
| y) Advertisement and Publicity | 5659801.00 | 5486929.00 |
| z) Others(specify) | 18458782.98 | 16693543.51 |
| TOTAL | 458779828.98 | 413918436.44 |
| SCHEDULE 23-INTEREST | | |
| a) On Fixed Loans | | |
| b) Bank Charges) | 118974.00 | 114518.25 |
| c) Others(specify) | 0.00 | 0.00 |
| TOTAL | 118974.00 | 114518.25 |

S/d-
FINANCIAL ADVISOR

S/d-
DIRECTOR

RECEIPTS & PAYMENTS ACCOUNTS FOR THE

| | RECEIPTS | 2011-12 | 2010-11 | |
|-----|---|---------------|---------------|--|
| | | Rs. | Rs. | |
| I | Opening Balances | | | |
| a) | Cash In Hand | 801568.18 | 602186.38 | |
| b) | Bank Balances | | | |
| | i) In Current Account | 1.15 | 1.15 | |
| | ii) In deposit Account | | | |
| | iii) Savings Account * | 231896817.31 | 196850834.31 | |
| II | Grant Received | | | |
| | From Government of India | | | |
| | Under Plan scheme | 861400000.00 | 838500000.00 | |
| | Under Plan scheme - NCMMR/Nurses Training | 2500000.00 | 661200.00 | |
| | Non-Plan scheme | 48600000.00 | 61500000.00 | |
| III | Receipts against Earmarked Funds | | | |
| | a) Earmarked funds | 65755355.00 | 106453161.00 | |
| | b) Own funds | | | |
| IV | Interest Received | | | |
| | a) On Bank deposits | 57176127.50 | 59495788.78 | |
| | b) Loans Advances etc | 417789.00 | 282785.00 | |
| V | Receipts from services | | | |
| | Receipts from Patient services | 445075179.00 | 387114139.40 | |
| | Other receipts including Royalty | 19057254.40 | 21546782.30 | |
| VI | Other receipts | | | |
| | Grant received for Projects | 86834139.66 | 90388446.96 | |
| | Refund of Deposits(LC Margin) | | | |
| | Other receipts | 268749286.75 | 265359733.41 | |
| | Total | 2088263517.95 | 2028755058.69 | |
| | *Closing balance of Bank include grant amount received from DST for setting up of NCMMR, Thiruvananthapuram | | | |

Sd/-
FINANCIAL ADVISOR

PERIOD FROM 01-04-2011 TO 31-03-2012

| | Payments | 2011-12 | 2010-11 |
|------|--|---------------|---------------|
| | | Rs. | Rs. |
| I | Expenses | | |
| | a) Establishment expenses | 512148996.60 | 510470294.70 |
| | b) Administrative Expenses | | |
| | For Purchases | 329055435.00 | 302784635.50 |
| | Other expenses | 49146667.00 | 46374588.75 |
| II | Payments made against funds for various Projects | | |
| | As Per schedule | 77680338.00 | 84850937.40 |
| III | Investments & Deposits made | | |
| | a) Out of Earmarked funds | 246830140.00 | 177178908.00 |
| | b) Out of own funds | | |
| IV | Expenditure on Fixed Assets & Capital work -in- progress | | |
| | a) Purchase of Fixed Assets | 113533276.00 | 85347072.00 |
| | b)Capital work-in-progress | | |
| V | Refund of Loans | | |
| VI | Finance Charges(Bank charges) | 98743.00 | 122711.00 |
| VII | Other Payments | | |
| | To Funds/Deposit- refunds | 555359041.19 | 588927539.70 |
| VIII | Closing Balance | | |
| | a) Cash in hand | 868645.18 | 801568.18 |
| | b) Bank Balances | | |
| | I) In current Account | 1.15 | 1.15 |
| | ii) In Deposit Account | | |
| | iii) Savings Account * | 203542234.83 | 231896802.31 |
| | Total | 2088263517.95 | 2028755058.69 |

S/d-
DIRECTOR

SCHEDULES FORMING PART OF ACCOUNTS AS AT 31-03-2012

SCHEDULE 24- SIGNIFICANT ACCOUNTING POLICIES

1. ACCOUNTING CONVENTION

Financial Statements are prepared on the basis of historical cost convention unless otherwise stated and on the accrual method of accounting.

2. INVENTORY VALUATION

Stores and spares including machinery spares are valued at cost.

3. INVESTMENTS

Investment 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 (Pre Amended ie. Upto AY 2002-03). In respect of additions to/deductions from fixed assets, during the year depreciation is provided for full year.

6. GOVERNMENT GRANTS/SUBSIDIES

Government Grant from Plan fund are 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/relying is treated as Institute expenses and accounted on actual payment basis.

Pension : From the year 2004, (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 account 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 are transferred to a Fund for meeting unexpected requirements for Fixed assets.

11. TECHNOLOGY DEVELOPMENT FUND

Receipts against technology developed by the Institute are transferred to the above fund for meeting additional expenses on Improvement of technologies already developed.

SCHEDULE 25- CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS

1. CONTINGENT LIABILITIES

| | Rs. In lakhs | |
|--|--------------|---------|
| | 2011-12 | 2010-11 |
| Claims against the Institute not acknowledged as debts | NIL | NIL |
| Bank Guarantee given by Institute | 22.12 | 22.24 |
| Letters of credit opened on behalf of Institute | 46.00 | 81.87 |
| Disputed demands on Income tax etc | NIL | NIL |
| In respect of claims from parties for non- execution of orders | NIL | NIL |

2. UNEXPIRED CAPITAL COMMITMENTS

| | Rs. In lakhs | |
|--|--------------|---------|
| | 2011-12 | 2010-11 |
| Estimated value of orders remaining to be executed on Capital Account including Construction under vision 2020 | 2365.37 | 2323.53 |
| 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 | |
|-------------------------------------|--------------|----------|
| | 2011-12 | 2010-11 |
| 5.1 Value of Imports | | |
| Capital Goods | 133.40 | 275.19 |
| Stores Spare & Consumables | 57.71 | 54.94 |
| 5.2 Expenditure in foreign currency | | |
| Travel Expenses | NIL | USD 2000 |
| Earnings: | | |
| 5.3. Earnings: | | |
| Value of Exports | NIL | NIL |

6. Other items :

6.1 Transfer to Emergency Reserve Fund & Technology Development Fund

During the year an amount of Rs.516.34 lakhs (previous year Rs. 501.72 lakhs) and Rs.81.11 lakhs (previous year Rs. 34.07 lakhs) was transferred to Emergency Reserve Fund & Technology Development Fund. During the year Rs.28.81 lakhs has been spent from Technology Development Fund.

6.2 Gratuity and Pension Contribution

Subsequent to the change in the accounting policy on account of the implementation of the 6th Pay Commission and approved by

Governing Body with regard to Gratuity and Pension payments, an amount of Rs.731.42 lakhs has been charged to Institute Account. Similarly an amount of Rs.1161.42 lakhs has been transferred from Institute Account to the Pension Fund.

6.3 Setting up of NCMMR, Thiruvananthapuram

Institute received an amount of Rs.25.00 lakhs as grant from DST for the setting up of National Centre For Molecular Materials Research (NCMMR), Thiruvananthapuram, and the same has been accounted separately and annexed to the Balance Sheet.

7. Corresponding figures for previous years have been regrouped, where ever necessary.

Schedules 1 to 25 are annexed to and form integral part of the Balance Sheet as at 31-03-2012, and Income & Expenditure Account for the year ended on that date.

Sd/-
Financial Advisor

Sd/-
Director

PROVIDENT FUND ACCOUNT FOR THE YEAR ENDED 31-03-2012

| Particulars | 2011-12 | 2010-11 |
|---------------------------------------|--------------|--------------|
| | [Rupees] | [Rupees] |
| LIABILITIES | | |
| MEMBERS BALANCE | 244354602.00 | 231250745.00 |
| MEMBERS CREDITS [for march] | 3854740.00 | 3812417.00 |
| BALANCE DUE TO MEMBERS NOT IN SERVICE | | |
| Under EPF scheme | 8371886.00 | 7751746.00 |
| " GPF " | 532055.00 | 532055.00 |
| PENSION FUND DUES | 51168169.00 | 47377934.00 |
| RESERVES&SURPLUS-INTEREST | 10079095.39 | 7173407.39 |
| TOTAL | 318360547.39 | 297898304.39 |
| ASSETS | | |
| INVESTMENT AT COST | 287659515.00 | 273726256.00 |
| DUES TO PF ACCOUNT | | |
| FROM INSTITUTE | 3854740.00 | 3812417.00 |
| FROM PF COMMISSIONER | 8403467.00 | 12969487.00 |
| INTEREST ACCRUED NOT DUE | 1000280.00 | 1000280.00 |
| BALANCE WITH BANKS | | |
| SBT -GPF A/C | 17442545.39 | 6389864.39 |
| TOTAL | 318360547.39 | 297898304.39 |

Financial Advisor

Sd/-
Director

**NATIONAL CENTRE FOR MOLECULAR MATERIALS
RESEARCH ACCOUNT FOR THE YEAR ENDED 31-03-2012**

| Particulars | 2011-12 | |
|--|------------|--|
| | [Rupees] | |
| LIABILITIES | | |
| GRANT RECEIVED | 2500000.00 | |
| (Grant received from DST for the setting up of the National Centre for Molecular Materials Research (NCMMR), Thiruvananthapuram, vide order No.AI/NCMM/003/2011/2 & 4 dt.19.01.2012) | | |
| TOTAL | 2500000.00 | |
| ASSETS | | |
| BANK BALANCE | 2500000.00 | |
| (Union Bank of India Account No.541502010002675) | | |
| TOTAL | 2500000.00 | |

Financial Advisor

Sd/-
Director

Separate Audit Report on the Comptroller and Auditor General of India
on the Accounts of Sree Chitra Tirunal Institute of Medical Sciences and
Technology (SCTIMST), Thiruvananthapuram for the year ended
31 March 2012

1. We have audited the Balance Sheet of Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST) Thiruvananthapuram as at 31 March 2012, the Income & Expenditure Account and the Receipts & Payments Accounts 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 Audit Report contains the comments on the accounting treatment 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. Accounts furnished by SCTIMST were audited and based on the observations made by Audit, following revisions were made by SCTIMST in their Accounts: An amount of ₹2.19 crore paid as advance to the suppliers contractors which were booked under 'Repairs and Maintenance' under Schedule 21 of Income & Expenditure account this expenditure was rechecked and classified correctly under advances paid to the supplier's contractors for capital works under Schedule II-current assets, loans and advances as per the common format of accounts. Similarly, the year '2006' was corrected as '2004' in the 'Schedule 24 - Significant Accounting Policies (Item no.8), in the Revised Accounts.

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:

5 Comments on Accounts

5.1 Asset Registers: In terms of Rule 190 (2) of the General Financial Rules, 2005 (GFR) fixed assets such as plant, machinery, equipment, furniture, fixtures etc. should be maintained in the Form GFR-40. On scrutiny it was observed that the Institute is not maintaining Asset Register for fixed assets. The value of Fixed Assets shown in the annual accounts (Schedule- 8) could not be verified in the absence of an Asset register and audit

could not vouch the correctness of value of fixed assets shown in the annual accounts (Schedule-8) as regards their existence/ownership as well as valuation in the absence of proper records.

Income & Expenditure Account

6.1 Understatement of Depreciation account: As per Paragraph 5 of Schedule 24-Significant Accounting Policies, depreciation is provided on reducing balance method at the rates specified by the Income Tax Act 1961 (Pre amended i.e. up to AY 2002-03). In respect of additions to/ deductions from fixed assets, during the year depreciation is provided for full year. The scrutiny of the balance sheet and schedule 8-Fixed Assets for the year ending 31 March 2012 revealed that the depreciation was not charged as per the accounting policies declared by the institute. The fixed assets account was thus overstated by ₹ 65.34 crore and depreciation account in the expenditure side of the Income & Expenditure account was understated by the same amount.

7. General

7.1 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 of accounting. As per the significant policies (Schedule 24) of SCTIMST, financial statements are prepared on the accrual method of accounting. However, it was observed that the institute recognized its income such as income from projects, testing charges, facility utilization charges, fees, subscriptions, royalty, interest on fixed deposits etc. on cash basis. The income receivable, claims receivable, income accrued etc. were not accounted and not shown under current assets, loans and advances (Schedule-II). Since the institute did not compute the amount receivable, monetary impact of such items could not be quantified in Audit.

8. Grants in aid

Out of Grant-in-aid of ₹ 91.00 crore received during the year, the organisation utilised the entire sum.

9. Management letter

Deficiencies which have not been included in the Audit Report have been brought to the notice of the SC-TIMST through a Management letter issued separately for remedial/corrective action.

- i) Subject to our observations in the preceding paragraphs, we report that the Balance Sheet and Income & Expenditure Account Receipt & Payment Account dealt with by this report are in agreement with the books of accounts.
- ii) In our opinion and to the best of our information and according to the explanations given to us, said financial statements read together with the Accounting Policies and Notes on Accounts, subject to the significant matters stated above and other matters mentioned in Annexure I to this Audit Report give a true and fair view in conformity with accounting principles generally accepted in India.
 - a. 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 2012; and
 - b. In so far as it relates to Income & Expenditure Account of the deficit for the year ended on that date.

Other Matters

Annexure-1 to Draft Separate Audit Report

1. Internal Control

1.1. Internal control in purchases

A grant of ₹ 23.55 crore was received under Plan head for creation of capital assets during 2011-12. Expenditure incurred on the same was 27.33 per cent of overall release of the Plan Funds. Purchases/ procurement are made by institute from foreign and indigenous suppliers for equipments and other fixed assets.

In terms of General Instructions relating to purchase of imported items as per Institute's Store Purchase Procedure of April 1996, when a letter of credit (L/c) is opened with the bank, the institute is committed to make the payment to supplier on submission of shipping documents by the supplier to the bank. The banks make payment to the supplier after verification of documents and send the debit advice to the institute. Such L/c applications have to be routed through accounts division. Similar procedures have to be followed for sight draft payments also. The L/c margin and commitment deposit with the bank was to the extent of ₹ 78.84 crore and almost equivalent Annual Grant received by the institute.

The internal control mechanism existing in the Institute was test checked in Audit. Audit observed that the internal control, which the Accounts Division had to exercise over commitment of funds, was not being exercised. Even receipt vouchers of final payments and clearance of supplies received were missing. Further, the details of list of purchase orders, the funds committed there against aggregating to ₹ 78.84 crore, the pendency of purchase orders, L/cs and revised delivery schedule of the supplies were also not available with the Accounts Division. Audit could not vouch for the amount of ₹ 78.84 crore held in L/c margin and Commitment Deposits against the Foreign, Import purchase orders placed. Institute stated that a proper register showing L/c margin and commitment deposit would be maintained jointly by the purchase division, accounts division and other divisions from next year onwards.

1.2. Bank Guarantee Register/ Performance Bank Guarantee

As per Rule 159 (1) of GFR, 2005 regarding Advance payment to supplier: and Rule 158 of GFR, 2005 on Performance Security, the GFR provisions stipulate that as and when a Bank Guarantee is received the Accounts Officer concerned has to confirm the genuineness of the instrument from the issuing Bank and keep under his safe custody until the Bank Guarantee is valid. Due to non-maintenance of Bank Guarantee/ Performance Bank Guarantee Register, Audit could not verify and ascertain the validity of Bank Guarantees, Bank Guarantees expired and Bank Guarantee revoked for not fulfilling the contractual obligation. Institute admitted that BG/ PBG are maintained by concerned departments and assured that internal steps to confirm the genuineness of the instrument from the issuing bank would be taken up.

1.3. Lack of Internal control in CHIS Plus scheme

SCTIMST is having an MoU dated 12 November 2011 with Executive Director, CHIAK, Government of Kerala wherein a BPL family holding smart card under RSBY scheme will be eligible for reimbursement upto ₹ 70,000/- per year for medical treatment. The institute claimed a balance of ₹ 30 lakh due to the institute from CHIAK in April 2011. The Executive Director intimated the institute in May 2012 that there was a mismatch between the claims raised through online and billed amount which had resulted in ₹ 13.91 lakh

payable by the institute to CHIAK authorities. The differences between the claims raised by the institute and reimbursable by CHIAK authorities clearly point towards lack of internal control. Institute replied on 24 July 2012 that CHIAK Authority assured that as a onetime measure they would settle dues of ₹ 5.40 lakh. It was however, observed that SCTIMST had claimed a balance of ₹ 30 lakh.

1.4. Internal Audit

The Internal Audit Division (IAD) is functioning under an Internal Audit Officer assisted by one UDC of the Institute for regular periodical Audit of Hospital wing and BMT wing; the observations are not converted in Report format. Though the same was highlighted in the earlier Reports, no action has been initiated for strengthening the said Division. Institute replied on 24 July 2012 that action would be taken to settle the observations of IAD.

2. Physical verification of assets and inventories

In terms of Rule 192(nand 192(2) of GFRs, Fixed Assets, consumables goods and materials should be verified at least once in a year, the outcome of the verification need to be recorded in the register and the discrepancies should be promptly investigated. The records made available to Audit, however revealed that the latest annual Physical Stock Verification of 42 divisions/sections of Hospital wing for the year 2009-10 was conducted. Physical verification of assets and inventories for the year 2010-11 & 2011-12 is yet to be carried out. Further, latest annual Physical Stock Verification of BMT wing also having 42 divisions/sections for the year 2009-10 was conducted. On verification of the report, some discrepancies were found. The store & purchase division requested the divisions concerned to look into the matter and offer their remarks latest by 10.08.2011. Institute replied on 24 July 2012 that the stock verification report would be submitted during next year.

3. Non maintenance of Broadsheets/ Registers

In respect of accounts which did not close at the financial year end, a broadsheet containing details of previous year transactions were to be maintained and a certificate of reconciliation of the balances of broadsheets with that of ledger balances was to be recorded on the broadsheet/ registers. The broadsheets/ Registers were not maintained for (i) Sinking Fund Reserve (ii) Project Registers/ Broadsheets of Hospital wing and BMT wing (iv) Registers of. new pension scheme (GL Code 1014) (v) Patient Welfare fund (GL Code 1075) (vi) Institute Ethics Committee Fund (GL Code 1077) (vii) Staff Benevolent Funds (GL Code 1080) (viii) Employee Pension Fund (GL Code 1301) (ix) Sundry creditors (x) Advances received (xi) Statutory liabilities (xii) other current liabilities (xiii) Sundry Debtors (xiv) Loans to staff (xv) Recoverable advances to examine outstanding transactions of the previous years (xvi) Land (xvii) Building (xviii) Plant & Machinery (xix) Vehicles' (xx) Furniture and Fixtures (xxi) Office equipment (xxii) Computer Peripherals (xxiii) Electric installations (xxiv) Library books (xxv) Tube wells & water supply (xxvi) Other fixed assets.

Though institute is having computerised broadsheets for SD (GL 1335), EMD (GL 1330) of Hospital wing and amount receivable from PMF (GL 1317) for the period 2011-12, details pertaining to previous years are not available. Institute replied on 24 July 2012 that GL accounts schedules would be prepared and submitted to Audit next year.

4. Accounting of inventories

The accounting policy of the Institute stipulated accrual method of accounting. Further, as per the common

format of accounting prescribed for autonomous bodies also stipulate accrual method of accounting. Audit however observed that inventories issued from general store/pharmacy to departments and divisions were treated as consumed in inventory account when the inventories were lying in departments/divisions. Thus inventories under Schedule: 11 Current Assets was understated. Since divisional stock register of inventories are not maintained audit is not able to quantify the amount understated.

Institute stated that now it has developed a computerised management system and the issues from the stores/ pharmacy to department/ division have also been computerised. Institute assured that from next year onwards the stock available in the department/ division would also be included in the stock in hand.

5. Self sustenance and diversion of plan funds for non plan activities

According to Rule 208(iii) of GFR 2005, all Autonomous Organizations, should be encouraged to maximize generation of internal resources and eventually attain self sufficiency. According to Rule 208(iv) of GFR 2005, instead of giving recurring grants, wherever possible, the Ministry or Department may consider creating a Corpus Fund, the return on investment of which should enable the Autonomous Organization to meet its revenue expenditure. The scrutiny of final accounts of SCTIMST for the year ending March 2012, however revealed that institute has not only spent its entire non-plan grant of ₹ 23.95 crore but also utilized ₹ 60.26 crore¹ of plan funds for non plan expenditure. Institute replied that the patient care charge was revised on an ad-hoc basis during the year 2010-11. Institute added that it is thriving to maximize internal generation of income with a view to attain self sufficiency

6. Plan and non-plan categorisation

According to Rule 209 6(xiii) of GFR, 2005, Central Autonomous Organisations which receive Plan as well as Non-Plan Grants, should account for expenditure (Capital and Revenue) separately under Plan and Non-Plan Heads. The central autonomous bodies are required to ₹ 60.26 crore¹ being the debit balance of Income & Expenditure account for the year ending March 2012 of ₹ 74.66 crore reduced by depreciation amount of Rs.14.40 crore during the year. compile their accounts in the Common Format of accounts prescribed by the Govt. of India, Ministry of Finance. It was however observed that the accounts of SCTIMST, did not reflect grants and expenditure separately for Plan and Non-Plan category. Institute replied that this would be taken up with DST.

Place : New Delhi
Dated : 15-11-2012

S/d-
Principal Director of Audit
Scientific Departments

¹ ₹60.26 crore being the debit balance of Income & Expenditure account for the year ending March 2012 of ₹ 74.66 crore reduced by depreciation amount of ₹14.40 crore during the year.

REPLY OF THE INSTITUTE

| Para No. | Reply of SCTIMST |
|--|--|
| 5.1. Assets Register | Institute is developing a new coding system to identify the various equipments (Electrical/Electronics), vehicles etc. Based on this coding system a fixed asset format has also been designed. After completing the above process a fixed assets register to show the value, depreciation, WDV. etc. will be prepared. The Register will be submitted to audit during the year 2012-13. |
| 6.1 Understatement of Depreciation Account | Proper disclosure were made in the Significant accounting policies that the rates of depreciation applied on the fixed assets are the rates as per the Income Tax Act 1961 (Pre-amended ie upto AY 2002-03). Kindly note that Institute adopted the rates for charging depreciation on fixed assets. From the year 2012-13 Institute will adopt new depreciation rates and charged to fixed assets based on the recommendations of the committee which is formed by the Governing Body of the Institute. |
| 7.1 Revenue Recognition | Income like Royalty, Interest on Investments etc will be accounted accrual basis from the Year 2012-13 onwards. |
| 8. | The facts stated that grant of ₹91 crores received to be utilized during the year has been noted. |

