

Annual Report 2010-11



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
TRIVANDRUM – 695011, KERALA



Annual Report

2010-2011

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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 Travencore gifted a multistoried building for the people and Government of Kerala. Sri P.N. Haskar, the then Deputy Chairman, 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. Dr. Murali Manohar Joshi, the then Honorable Minister of Science and Technology and Human Resource Development, Government of India, dedicated the AMCHSS to the nation on January 30, 2000.

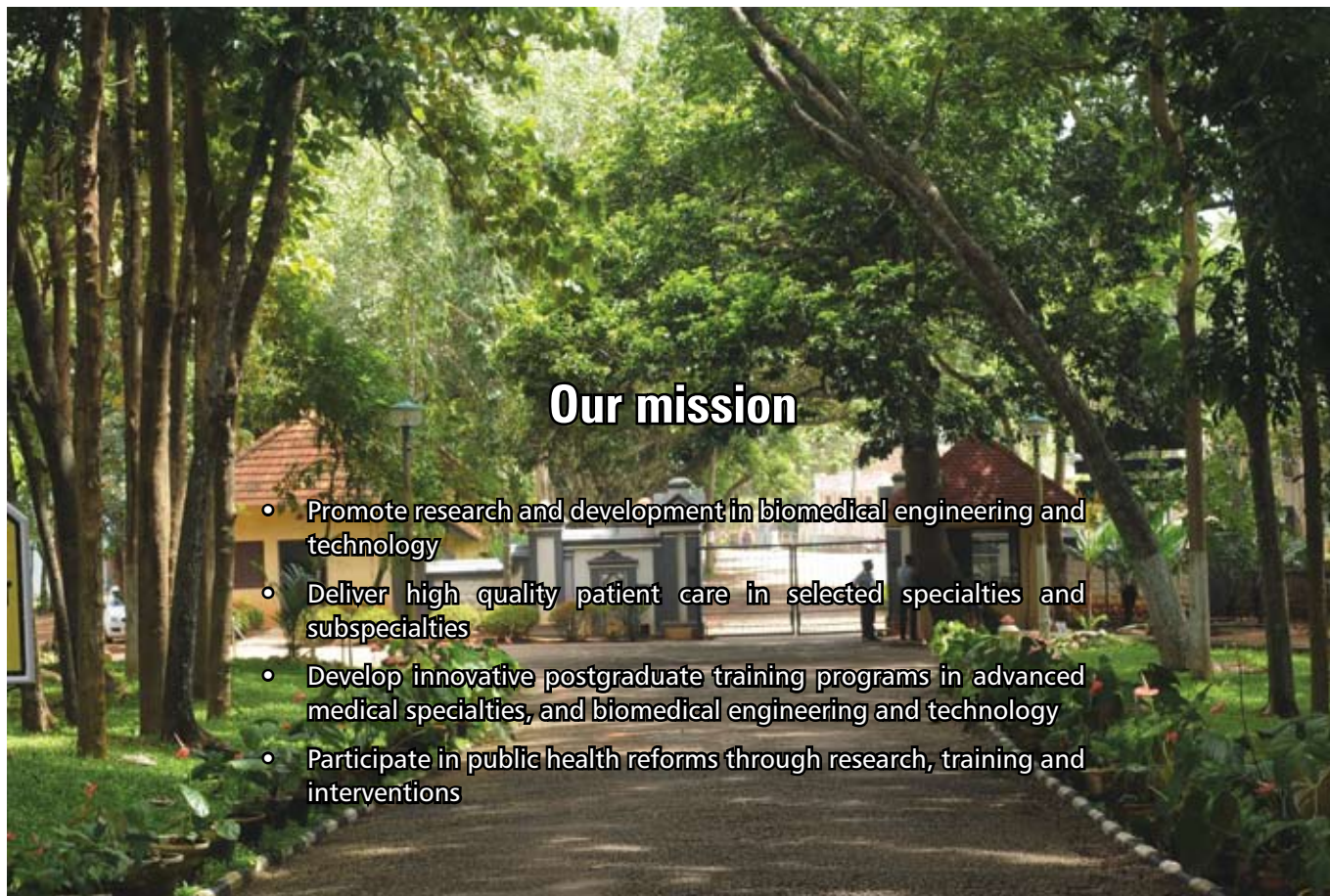


BMT Wing

Hospital 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

The Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum, under the Department of Science and Technology, Government of India is one of the premier medical institutions of our country in patient care, academic, research and development activities, combining them uniquely with a strong biomedical technology programme. The significance of this integration was recognized by the Government of India by formulating a legislation to make SCTIMST an 'Institution of national importance' with the status of a University.

The Hospital Wing has successfully developed several subspecialty areas for the first time in India, and they include epilepsy, movement disorders, interventional radiology, neuro-endoscopic surgery, congenial cardiac surgery, sleep disorder, stroke and acute coronary problem. I am sure the Comprehensive Stroke Program with state-of-the-art facility for hyperacute, acute, intermediary and chronic care of stroke patients which was established in the Institute recently will be beneficial to the patients as well as researchers in the field.

The Biomedical Technology Wing pioneered the indigenous development of medical devices and implants, which led to the establishment of a medical device industry based on indigenous technology in the country. This unique facility also provides the industrial partner with the opportunity 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. Two new products launched by M/S IFGL Bioceramics Ltd under the brand name names "Biograft HA-New" and "Biograft HABG Active", based on the technologies transferred from the Institute are a milestone in the R&D activities of the Institute. The launching of the field kit for testing antibiotic sensitivity of mastitis in farm animals by M/s Himedia Laboratories, Mumbai under the brand name MASTITEST ABST Kit is also commendable.

Besides the regular postdoctoral, doctoral and postgraduate courses in medical specialties, public health, nursing, basic sciences and health care technology, the Academic Division of the Institute is offering off-campus programmes like Master in Epidemiology (MAE). The M.Phil in Biomedical Technology, M.Tech programme in Clinical Engineering in collaboration with IIT Madras and CMC, Vellore and Ph.D. in Biomedical Devices and Technology are important initiatives. With a view to give more stress to academic activities, the Institute has established a Board of Studies during the year under report, which is a significant step.

The School of Public Health, Achutha Menon Centre for Health Science Studies (AMCHSS), was set up for research, training and consultation in public health and the country's first Master's programme in Public Health (MPH) was started in 1997. There are also other diploma courses and an off-campus programme. The Centre conducts several short courses in subjects which have growing significance on healthcare, such as research and professional ethics, gender sensitization, maternal and child health, etc., in addition to research and providing consultancy services to national and international agencies. Within a decade, this model has received wide national acceptance and set the trend for public health education in the country. The Ministry of Health, Government of India, has recognized the AMCHSS as a Centre of Excellence for Public Health Training. It is quite heartening to note that the National AIDS Control Organization (NACO) has identified AMCHSS to implement the Data Triangulation exercise in the State of Kerala. Preparation of a Monograph on Women and Health in the Western Pacific Region by the AMCHSS is indeed a unique venture.

As the President of the Institute, I am very happy that the doctors, scientists, engineers, nurses, paramedical staff, administrative staff and the students of the Institute are working hard to fulfill the mandate assigned to the Institute by Parliament. I am sure the Institute will be able to achieve newer heights in the coming days and serve the society more effectively with increased facilities and an enhanced R&D thrust.

I convey my best wishes for the success of all activities of the Institute in the days to come.



(R. Chidambaram)

16th August, 2011



From Director's Desk

It gives me great pleasure to present the Annual Report of the Institute for the period 2010-2011. The annual report for any scientific institution is an important document because it helps to chronicle the progress and, being a publicly funded institution, it is a document of our accountability. It has been a productive year for us in all spheres of our activities, and I wish to thank all members of the staff who have made it possible.

The institute was privileged to have Dr. Shashi Tharoor, Honorable Member of Parliament of Thiruvananthapuram, as the Chief Guest on the occasion of the Annual Convocation of the 26th Batch and address the students and staff on May 2, 2010. While appreciating the good work being done at the Institute, Dr. Tharoor urged the doctors, scientists and engineers to concentrate on innovations that would help to address at improving the health care of the people of the country. Dr. Tharoor appreciated the steps we have initiated in improving interdisciplinary cross linking between various departments and divisions of the Institute that will help us make more significant contributions in medical device development, high quality patient care and human resource development.

Dr. G.S. Bhuvaneshwar, Head, Biomedical Technology Wing, Dr. Sankar Kumar, Medical Superintendent, Hospital Wing, Dr. K.R. Thankappan, Head, Achutha Menon Center for Health Sciences Studies, Dr. Jagan Mohan Tharakan, Dean (Academic Affairs) have highlighted the achievements during 2010-2011. More facilities for research, patient care have been added or upgraded to increase the functioning of various departments, details of which are available in the individual departmental reports.

The Institute expresses its deep sense of gratitude to the Departments of Science and Technology for generous funding that allowed us in expanding our academic and research

activities. I am deeply indebted to the members of Institute Body, Governing Body, and Academic, Finance and Building Committees for their guidance, sound advice and proactive policy. The Institute has also strengthened its internal management through the formation of advisory committees, which help the Director in decision-making process.

I am indeed grateful to all members of the staff for giving me enough reason to feel happy and proud about the high level of our accomplishments. Finally, I wish to congratulate all recipients of awards and honors for having brought laurels to the Institute.



K. Radhakrishnan

16th August 2011

HIGHLIGHTS OF THE YEAR



The Annual Convocation of the 26th Batch of graduates was held on May 2, 2010. Dr. Shashi Tharoor, Honorable Member of Parliament, Thiruvananthapuram, Chief Guest on the occasion is giving the convocation address.



An MOU for academic and research collaboration between Queensland University of Technology, Queensland, Australia and SCTIMST was signed on May 12, 2010.



Dr. K. Radhakrishnan, Director, SCTIMST inaugurated the International Nurses Day function on May 12, 2010



The SCTIMST celebrated the National Technology Day on June 9, 2010.



The SCTIMST celebrated the World Blood Donor Day on June 14, 2010.



Dr. K. Radhakrishnan, Director, SCTIMST giving the inaugural speech on a short course for health managers "Making Pregnancy Safer" organized by AMCHSS from July 13 to 17, 2010



Dr Paul Sebastian, Director, Regional Cancer Center, Thiruvananthapuram is releasing the revised version of the "Service and Personnel Conduct Rules" and handing over the first copy to Dr. K. Radhakrishnan Director, SCTIMST on August 4, 2010.



Dr Jagamohan Tharakan, Dean is releasing the book 'My Bibliography: 1976-2009" on August 4, 2010, which is a compilation of the publications of Dr. K. Radhakrishnan, Director, SCTIMST.



His Excellency the Governor of Kerala Shri R. S. Gawai inaugurated the National Conference on Hospital Administration, August 7-8, 2010.



The outreach Epilepsy Clinic for Women at the General Hospital, Thycaud, Thiruvananthapuram, was inaugurated on September 7, 2010 by Smt Sreemathi Teacher, Honorable Minister of Health and Family Welfare, Government of Kerala



During his visit to the Institute on September 8, 2010, Dr. Shashi Taroor, Honorable Member of Parliament, Thiruvanthapuram is having a discussion with Dr. K. Radhakrishnan, Director, SCTIMST.



Smt. Sreemathi Teacher, Honorable Health Minister, Government of Kerala is inaugurating the Thalolam health support scheme of the Government of Kerala in the presence of Dr. K. Radhakrishnan, Director, SCTIMST and Dr. Ramdas Pisharody, Principal, Medical College, Thiruvanthapuram on September, 9, 2010.



The Students Day "Speranza 2010" was celebrated on October 30, 2010.
Dr. K. Radhakrishnan, Director, SCTIMST and Venugopal, the noted singer addressing students.



On the World Stroke Day, October 30, 2010, 2010, Dr K. Radhakrishnan, Director, SCTIMST inaugurated the seminar "Stroke Update 2010".



An MOU between SCTIMST and HLL Lifecare Ltd, Trivandrum on January 3, 2011 for cooperation and knowledge partnership in the HLL Medipark was signed by Dr. K. Radhakrishna, Director, SCTIMST and Shri M. Ayyappan, Chairman and Managing Director, HLL Lifecare Ltd.



Workshop on Education of Medical Students on Epilepsy "EPICS 2011" was held on January 2011



Sri. V. V. Bhat, Member (Finance), Atomic Energy Commission, Government of India visited SCTIMST on January 19, 2011



Mr. Jagadeesh Kumar, Film Celebrity giving talk to public during the family get together of Women with Epilepsy organized by KREP, SCTIMST on January 22, 2011.



The Valedictory Function of Joint Hindi Fortnight of TOLIC was held in SCTIMST on January 24, 2011.



Dr. Jagan Mohan Tharakan, Dean inaugurating the National Science Day on February 28, 2011



Dr. Craig Anderson, Director, Neurological and Mental Health Division and Professor of Neurology, Royal Prince Alfred Hospital, Perth, Australia inaugurated the Comprehensive Stroke Care Center on March 10, 2011 in the presence of Dr. K. Radhakrishnan, Director, SCTIMST, Dr. R. Sankar Kumar, Medical Superintendent, SCTIMST and Dr. P.N. Sylaja, In-Charge of the Stroke Program



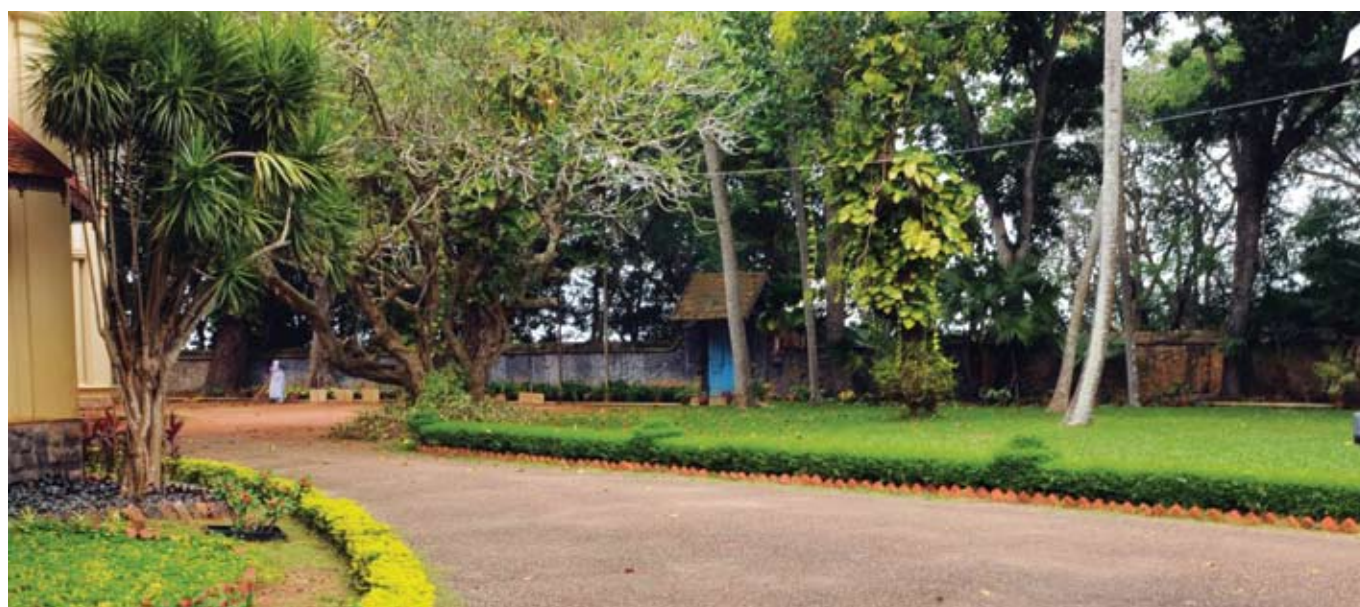
Dr. K. Radhakrishnan, Director, SCTIMST handed over the book of "Sleep Disorders" to Dr. Alexander Jacob, IPS on the World Sleep Day on March 18, 2011.



The Institute Day "Chitrolsav" was celebrated on March 19, 2011. Smt. Sugathakumari, the renowned poet and social activist and Mr. Suresh Gopi the famous Malayalam film actor were the chief guests.



Prof. David Williams, President-elect, TERMIS, delivering the key note address on New Visions on Biomaterials for Regenerative Medicine organized by Biomaterial Group, BMT Wing, March 16-17, 2011.





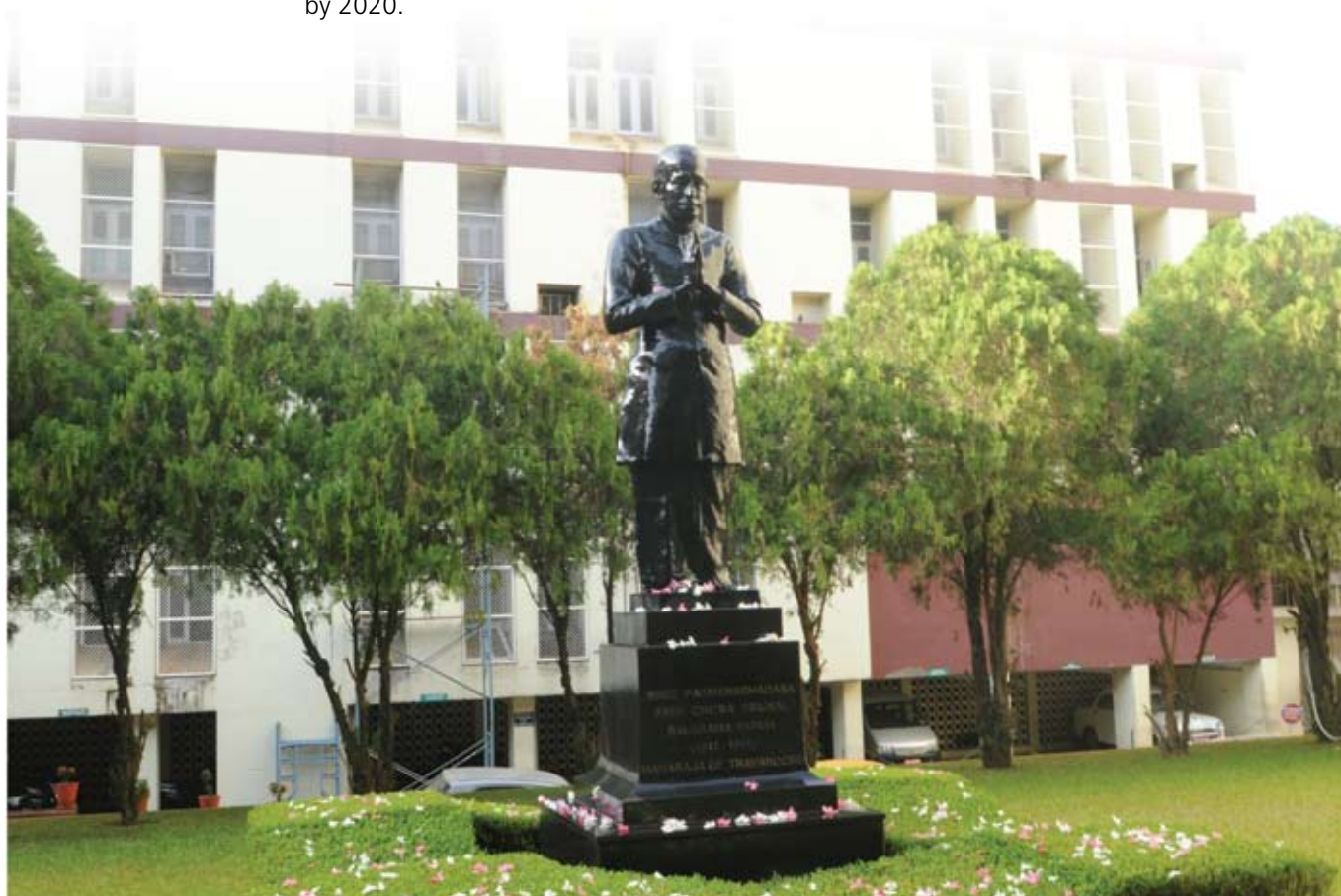
HOSPITAL WING

Mission

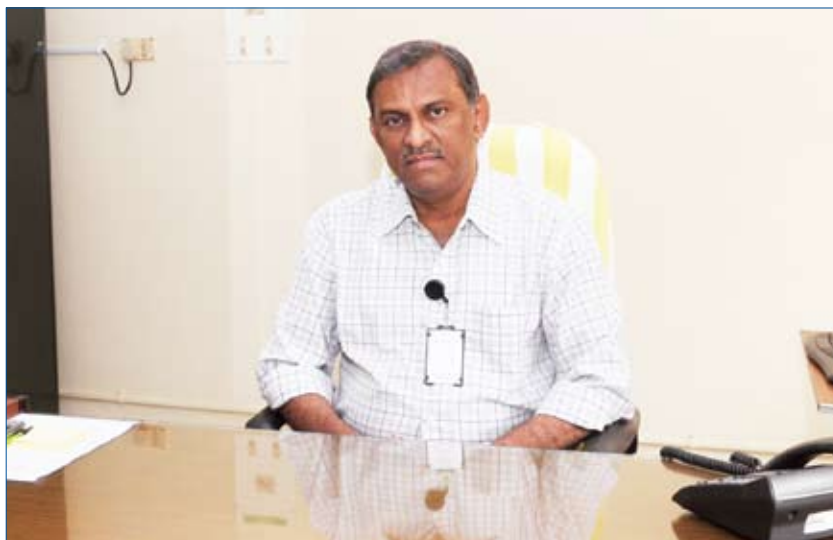
- Improve patient health outcomes
- Increase patient satisfaction
- Decrease medical errors, costs and waste
- Serve the underserved

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

Being a tertiary referral hospital, we strive to fulfill the Parliamentary mandate of excellence in patient care by offering state-of-the-art and high quality facilities for diagnosis and treatment for cardio-vascular, thoracic and neurologic diseases. Our dedicated and highly qualified personnel, including doctors, nurses and other para-medical staff work tirelessly to achieve this goal.

With the active co-operation of various departments like Neurology, Cardiology, Neurosurgery, Cardiac Vascular and Thoracic Surgery, Imaging Sciences and Interventional Radiology, Anesthesiology, Biochemistry, Transfusion Medicine, Microbiology and Pathology, the hospital is setting new standards in highly specialized patient care. The increasing number of patients every year offers ample proof of the faith patients have in us. Supportive services like Clinical Engineering and Construction Wing lay the bricks on which our Institute functions effectively. The Administrative machinery lends its helpful hands to ensure that manpower, facilities and financial needs of the hospital are met without delay.

We could add another feather in our cap by opening a separate Stroke unit last year which, in a short span of time, has proved its worth by establishing fast assessment and timely treatment to these unfortunate persons, with excellent results.

Our hospital has been in the forefront in effectively using appropriate technologies to satisfy the expectations of patients and relatives. With a view to ease the work-load of the staff and to ensure efficient & faster service, computerization and automation are being implemented wherever possible. We have already launched computerization of hospital services, including that of the medical records. We hope to achieve comprehensive automated services in a year.

Our Medico-Social Workers lend yeoman service to the patients, helping them to avail various subsidized / free treatment options. They also help many to get financial aid from Government or Private Sources. Many of our satisfied patients / relatives have now turned sponsors to other needy persons in their time of despair.

The Institute provides free treatment to people who belong to Scheduled Tribe community with the support of the Government of Kerala. With the assistance of Government of Kerala, the Institute offers free / subsidized treatment to children below the age of 18 years under the scheme "Thalolam". Government of Kerala's initiatives 'Snehasanthwanam' Scheme (for treatment of endosulphan-affected patients) and CHIS Plus scheme (for the benefit of Cardiology and Neurology patients) were launched this year.

The wholehearted support of Pharmacy, Security Wing, Medical Illustration Wing, Motor Transport Wing, Dietary and Laundry had helped us in no small measure in our service to the patients.

16th August 2011


R. Sankarkumar

Hospital Services:

Dr.Sankarkumar. R, MS, MCh
Medical Superintendent

Dr. S.K. Jawahar, MBBS, Dip NB, LLB, MHA
Administrative Medical Officer

Mrs. Vijayamma Harikrishnan, B.Sc. Nursing (Post-basic), M.A.(Public Administration)
Nursing Superintendent

Mrs. S. Sudhamani Amma, M.Sc. Nursing, PGDHRM
Deputy Nursing Superintendent

Overview

During the year 2010-11, various services in Cardiology, Neurology, Cardiac surgery, Neurosurgery and Imaging Sciences & Interventional Radiology registered 15,818 new patients (Chart 1). A total of 9,540 patients were admitted for treatment including surgical and interventional procedures (Fig. 1). It is noted that the number of new registrations and admissions have increased during this year compared to the previous year. The outpatient services OPD attracted 1,16,453 patients for review in various departments, including speciality clinics (Fig. 2).

Ten percent of the patients were provided free treatment and 50% 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 ie, 40 (slight increase over the previous year) (Fig. 4)and the reduction of average length of stay from 8 to 7 (Fig. 5). The bed occupancy rate increased to 87.54% (slight increase over the previous year (Fig. 6).

Fig.1. New Registration and admission

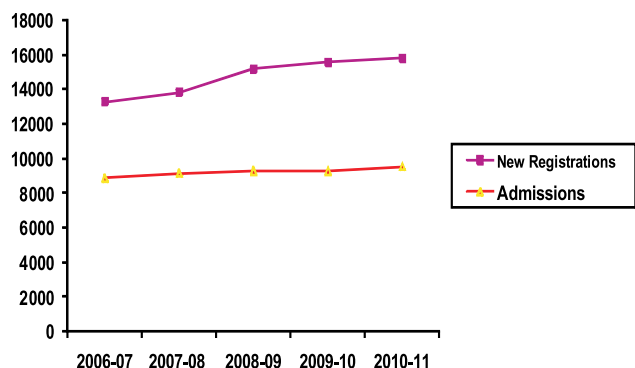


Fig 2. Follow-up

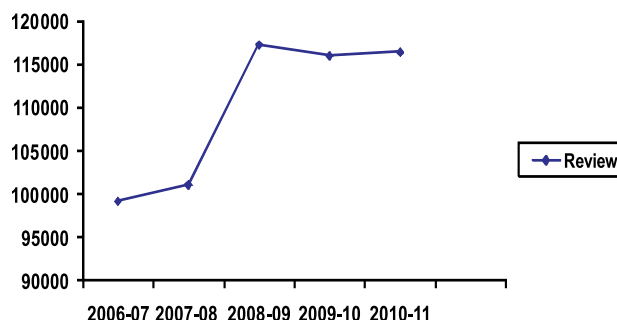


Fig. 3. Free and subsidized Treatment

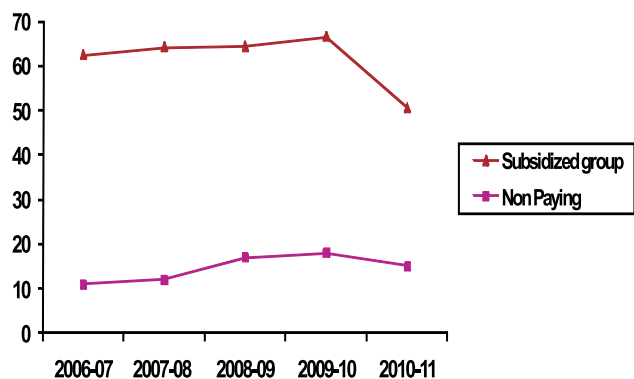


Fig. 4. Bed Turn over rate

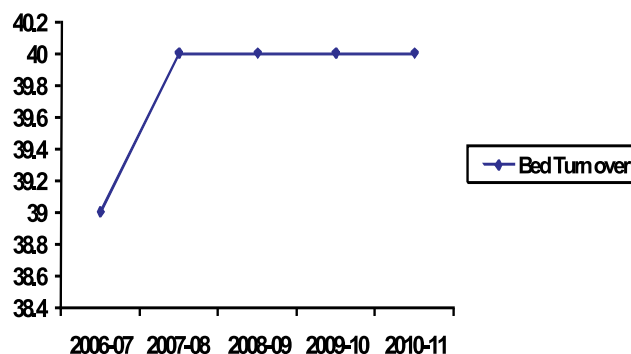
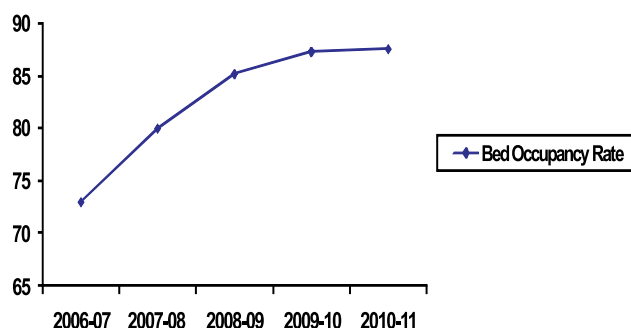


Fig 5. Average length of hospital stay



Fig. 6. Average bed occupancy rate



New Initiatives During the year

- A comprehensive stroke programme was started and a modern stroke unit with 5 ICU beds and 2 intermediary care beds was commissioned.
- State of the art DSA lab for neuro and cardiac interventions was started.
- Two CT Scans (256 slice & 64 slice) were installed.
- The electrical substation was upgraded with state of the art transformers, electronic relay systems etc.
- The Central Sterile Department was modified with state of the art autoclaving machines manufactured by CISSA.
- Construction of a canteen building for the staff and the patients was started.
- Various financial schemes for the benefit for the poor

patients were started in the Institute in collaboration with Govt. of Kerala:

- Thalolam Scheme for treatment of children
- Snehasanthwanam Scheme for treatment of endosulphan affected patients
- Comprehensive Health Scheme for Scheduled Tribes was made to start CHIS Plus scheme for the benefit of the cardiology and neurology patients.

Tele-Education

CME Programmes organized at Medical Colleges, Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST) and Regional Cancer Centre (RCC) to doctors present in various Hospitals of the state

Tele-consultation

Teleconsultation services provided to the patients attending

District Hospitals through the telemedicine network. In addition it has also provided a forum for scientific interaction for 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. Dr. Krishnakumar. K, Assistant Professor, Department of Neurosurgery delivered a Tele Talk on "Back Ache" and Dr. Sulochana. P.V, Scientist –G, Dept. of Transfusion Medicine delivered a talk on "Blood –The lifeline" to the community at Block Panchayats in Wayanad District as a part of Village Resource center programme of ISRO.

Clinical Application of Cryopreserved Homograft Valves in Cardiovascular Surgery

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.

Homograft valve is the only effective way to achieve cost effective hemodynamically efficient hazard minimizing programmes in some valve recipient patient groups.

Anesthesiology

- Dr. R.C.Rathod, MD
Professor & Head of Department
- Dr. (Mrs.) Rupa Shrinivas, MD, Dip.NB
Professor
- Dr. Thomas Koshy, MD
Professor
- Dr. Shrinivas V. Gadhinglajkar, MD
Additional Professor
- Dr. Prasant kumar Dash, MD
Additional Professor
- Dr. P.K.Neema, MD
Additional Professor
- Dr. S.Manikandan, MD
Additional Professor

Dr. P.Gayatri, MD, FRCA
Associate Professor

Dr. P.R.Suneel, MD
Associate Professor

Dr. K.P.Unnikrishnan, MD
Associate Professor

Dr.Subrata kumar Singha, M.D
Assistant Professor

Dr.Satyajeet Misra, M.D
Assistant Professor

Dr. Smita P, MD, DM
Assistant professor

Mrs. K.V.Bhuvaneshwary
Scientific Assistant

The Department of Anesthesia was functionally divided into Cardiac- anesthesia. and Neuro-anesthesia.

Table 1. Anesthesia support provided

Procedures	No. of cases
Cardio-vascular & thoracic surgery	1900
Neurosurgery	1320
Neuro & cardiac radiological procedures	650

Biochemistry

- Dr P.S.Appukuttan, Ph.D
Professor & Head
- Dr.N.Jayakumari, Ph.D
Professor
- Dr.G.Sreenivas, Ph.D
Scientist D
- K.I.Annamma, B.Sc.,
Junior Scientific Officer
- B.Sasikumar, M.Sc.,
Junior Scientific Officer
- T.A.Thomas, MSc.
Scientific Assistant

The department of Biochemistry comprises mainly of two wings: a) Central Clinical Laboratory (CCL) where patients samples are analyzed round the clock for hematology, clinical pathology and biochemistry parameters and b) research laboratories where externally funded research

program and Ph.D program are undertaken. During the year the department had ten Ph.D students.

Table. Tests performed in the Central Clinical Laboratory

Tests	Number of samples
Biochemistry	2,75,916
Hematology	1,71,288
Coagulation parameters	42,398
Blood gas and electrolytes	30,004
Miscellaneous	1,32,673
Total	6,52,278

Cardiology

Dr. Jaganmohan A Tharakan, MD, DM
Professor (Senior Grade) & Head

Dr. Thomas Titus, MD, DM
Professor

Dr. V. K. Ajithkumar, MD, DM
Professor

Dr. S. Sivasankaran, MD, DM, DIP NB
Professor

Dr. K M. Krishnamoorthy, MD, DM
Additional Professor

Dr. S. Harikrishnan, MD, DM
Additional Professor

Dr. Narayanan Namboodri
Associate Professor

Dr. Bijulal
Assistant Professor

Dr. Anees T
Assistant Professor

Dr. Sanjay G
Assistant Professor

Dr. Krishnakumar M
Adhoc Consultant

Overview

In the academic year 2010-2011 the department of Cardiology continued to provide state-of-the art patient care, along with research and academic programmes. Apart from the ongoing training programmes (4 DM trainees, 3 post-DM trainees and 3 Diploma in Cardiac

Laboratory Technology trainees/year), during this period, the department conducted 2 workshops and a conference, initiated new research programmes, and had scientific publications in national / international journals.

Ongoing routine activities

7327 new patients attended the cardiology outpatient services and 42220 patients attended the review outpatient services. 3772 patients were treated as inpatients during the year for an average bed occupancy rate 92.3% and mortality rate 1.4%.

The non invasive labs performed 34802 ECGs, 1574 treadmill exercise tests, 1462 Holter tests, more than 7603 special echo Doppler investigations and 506 transeophageal echo studies.

The department performed close to 3000 invasive procedures including 392 angioplasties, 210 EP procedures (including 133 radiofrequency ablations for tachyarrhythmias) and 176 permanent pacemaker implantations. More than 30 cases of complex cardiac arrhythmias were mapped and ablated with the assistance of EnSite, the 3-D electroanatomical mapping system. 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 205 ASD and 75 PDA device closures.

Invasive and Interventional Procedures 2010-2011	
Diagnostic Studies	
Coronary Angiography	1440
Cardiac Catheterization	194
EPS	79
Total diagnostic studies	1713
Interventions	
PTCA	392
ASD DEVICE CLOSURE	205
Balloon Atrial Septostomy	12
Balloon pulmonary valvotomy	15
PTMC	194
PDA COIL CLOSURE	10
PDA DEVICE CLOSURE	78

VSD, CoA, BAV	7
Pacemaker implants	176
ICD	17
CRT	13
EPS + RFA	133
Total interventions	1252
TOTAL PROCEDURES	2965

New Equipments installed –

1. IVUS with Virtual Histology (Volcano Inc.): Used for coronary artery lesion assessment and optimizing stenting. Also used for research purposes- assessing plaque morphology in diabetic patients.
2. FFR and CFR System (Volcano Inc. Stand alone system): Fractional flow reserve and Coronary Flow reserve measurement can be now done using this equipment. This is inducted into routine clinical practice where FFR is used to assess borderline coronary lesions.
3. 3-D echo color Doppler machine (IE 33 Philips) : 3-D reconstruction of cardiac valves and cardiac defects complemented interventions like atrial septal defect device closure and balloon mitral valvuloplasty. A new digital flat panel Philips cath lab was commissioned and the department has 3 fully functional interventional cardiac catheterization laboratories.

Cardiovascular and Thoracic Surgery

Dr.K.Jayakumar M.S; M.Ch

Professor and Head of Department

Dr.R.Sankarkumar M.S; M.Ch.

Professor (Senior Grade)

Dr. K G Shyamkrishnan. M.S; M.Ch

Professor

Dr. M. Unnikrishnan M.S; M.Ch

Professor(Senior Grade)

Dr.P.K.Praveen Varma M.S;MCh

Additional Professor

Dr. Manoranjan Misra M.S; M.Ch

Assistant Professor (on leave)

Dr. Baiju.S. Dharan M.S; M.Ch

Assistant Professor

Dr. Vivek V Pillai M.S; M.Ch

Assistant Professor

Dr. Varghese T Panicker M.S; M.Ch

Assistant Professor

Dr.Thomas Mathew M.S;M.Ch

Adhoc Consultant

Dr.Sivananda S, M.S;MCh

Adhoc Consultant

Surgeries

In the year 2010-2011, 1743 Cardio Vascular and Thoracic operations were performed, of this 1452 were open-heart procedures. The details are furnished below.

Procedures	No. of cases
ADULT CARDIAC SURGERIES	
Open heart surgeries	990
Closed heart surgeries	261
COMPLICATED CARDIAC SURGERIES OF INFANTS AND CHILDREN	514

Division of Clinical Engineering

K.Vijayakumar. B.Sc; B.Sc(Engg); MHA
Engineer G and Head

Koruthu P Varughese. B. Sc(Engg);
PGDEDT; PGDCA; MBA
Engineer G

G.Mohanlal. B.Sc(Engg); MBA
Engineer G

B.Madhusoodanan Pillai.
B.Sc(Engg); PGDCA, MBA
Scientist Engineer F

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

P. Ganesh
J.E. (Electrical)

As in previous years, the activities of the Clinical Engineering Division included installation of new equipments, and maintenance of equipment and utilities, keeping maximum uptime.

With the commissioning of modern 600 TR AC plant last year, the air conditioning system in general has significant improvement. Some of the vital areas like the new Electro physiology Cath lab, 256 Slice CT room, Stroke Clinic, ICU and Ward etc are now provided AC from the central plant. The second phase of the project in which replacement of all the outdated air handling units and associated accessories are planned has already been taken over. Air conditioning of 5th and 6th floor of AMCHSS with the modern technology VRF system is in progress. Commissioning of the precision AC system for the new PACS Server room, Split units for Library conference hall, reading rooms, 2 slice CT room, Cardiac surgery ICU and Neursurgery ICU have been completed.

On the electrical side, the major work of capacity enhancement & modernization of substation has been completed during the year. By the modernization, distribution system of hospital wing has been improved considerably. The transformer capacity has been increased to meet present as well as future demand for electricity. The available generator sets have been synchronized and hence entire hospital and associated buildings get generator support during failure of electricity board supply rather than provided to selected areas until then. Electricity power factor has been improved by adding capacitors resulting in reduced electricity bill. All obsolete equipments of substation have been replaced by state of art ones and through this more reliable power supply and safety are assured. Substation operations, monitoring etc. have been computerized. Feeder wise load details system condition etc. can be made available on computer remotely and locally. The Director formally inaugurated the modernized substation.

One new lift for the nurses' hostel was commissioned in this year. Purchase procedures for procurement of two lifts as replacement of the duplex lifts in SPBSC Block is in progress.

Regarding academic activities, demonstration and practical classes for the M.Tech (Clinical Engineering) students of the Institute, Training of Apprenticeship Trainees at various levels (Graduate, Diploma and ITI), training of Observer trainees etc were conducted successfully.

Computer Division

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

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

Mr. Rejith.L.R. MCA
Junior Programmer

Mr. Saji.K.S. B.Tech(Computer Science)

Programmer Assistant Routine activities involved in the areas of Graphical User Interface based Software development, Installation, Web Site development & updation, Network Management, Tender Publishing, Training for students/staff, Hardware and Software maintenance of all the user programs including the maintenance of PACS clients and storage backup. Hardware includes maintenance of 12 higher end servers with a remarkable uptime of 99.98% and around 1100 computer hardware devices including Servers, PCs, Thin Clients, Printers, Routers, Wireless Access Points, Gateway Security Appliance and Switches.

Division made major progress with the expansion of system environments as follows: -

I. New Initiatives

- Online application and processing for the recruitment of Sr. Residents in Academic Wing - New Software development and implementation
- Intranet website renovation and its implementation
- Online Lab Investigation request (paperless requests) from OPDs, its tracking, and integration with cash counter, blood collection room and all investigation departments including Biochemistry, microbiology and Pathology. Its software development and implementation
- Renovation of internet website
- Software development for File tracking and online Leave Management.
- OMR Based written examination for Staff recruitment

II. Major Activities

New Software Developments and Hardware Implementations

- Salary, Pension, Arrears –6th pay implementation in continuation – Modifications in GUI based program was made for revised pay fixation calculation of temporary/permanent staff
- Centralized controller for Wireless Access points - Integration of wireless access controller with access points installed at various locations in hospital campus.
- Dual monitor system installation for class rooms and auditoriums
- Implementation of Laser printers for printing Discharge summaries in Wards and ICUs
- Modifications of existing live softwares running in various departments as per user requirements.
- Bulk Stock label printing for all stock register items in the Hospital Wing
- Network cabling for AMC 5th and 6th floors

Imaging Sciences & Interventional Radiology

Dr.A.K.Gupta, MD, PDCC
Professor & Head

Dr.T.R.Kapilamoorthy, DMRD, MD
Additional Professor

Dr.C.Kesavadas, DMRD, MD
Additional Professor

Dr.Bejoy Thomas, MD, DNB
Associate Professor

Dr.Narendra.K.Bodhey, MD, DNB
Associate Professor

Dr. Hima S Pendharkar, MD, DM
Assistant Professor

Overview

Department of Imaging Sciences & Interventional Radiology (old name Dept. of Radiology) is providing Diagnostic Imaging and Interventional Radiology services in Neuro and Vascular diseases and of other systems. Department runs it's Interventional Radiology OPD and has started specialty clinic in Peripheral Endovascular and Interventional Backache clinic. Department has inpatient admission facility and intensive care management.

Department provides imaging facilities such as CT, MRI and Ultrasound to the Institute's OP patients and inpatients. This is the only department in our Institute, which provides imaging services to all patients referred from anywhere on OPD basis.

Interventions are done for difficult cases of intracranial aneurysms, cerebral AVMs, cerebral dural fistulas, Vein of Galen aneurysms, spinal AVMs; thoracic and abdominal aortic aneurysms etc. are referred to our department from across the country.

Department provides excellent state of the art imaging services with currently available latest technologies in MRI, Helical CT and colour Doppler. Portable colour Doppler, CR system and PACS are the other advanced techniques available in the department. PACS is linked with HIS. CT Angio, 3D CT, Virtual Endoscopy, Virtual Angioscopy, Vascular Doppler, Transcranial Doppler and MRI of Epilepsy, Stroke, Brain Tumours and Spine are routinely done.

Various invasive procedures done are listed under interventional procedure in the Table.

Noninvasive Diagnostic Procedures

No.	Procedures	No. Of Cases
1	Plain X-rays	32879
2	MRI Scans	4838
3	CT Scans	3812
4	US Scans	3687

Invasive Diagnostic Procedures

No.	Procedures	No. of Cases
1	4 Vessel Angiogram	421
2	Peripheral Angio	16
3	Aortogram	86
4	Spinal Angiogram	15
5	Renal Angiogram	2
6	Barium swallow	7
7	Fluoroscopy	4
8	Venogram	4
9	Percutaneous Transhepatic Biliary Drainage (PTBD)	3
10	Balloon Occlusion Test (BOT)	8
11	WADA test	8
12	3D CT	2
	Total	576

Interventional Procedures

No	Interventional Procedures	Total(No.of cases / Procedures done)
1	AVM Embolisation	22
2	Scalp AVM Embolisation	2
3	Intracranial AVM embolisation	31
4	Extracranial AVM embolisation	5
5	Spinal AVM embolisation	1
6	Body AVM embolisation	1
7	Intracranial coil embolisation	4
8	Intracranial tumor embolisation	4
9	Peripheral embolisation	7
10	Uterine artery embolisation	8
11	Bronchial artery embolisation	11
12	CCF embolisation	15
13	Coil embolisation	2
14	Tumor embolisation	2
15	Spinal artery embolisation	4
16	GI embolisation	2
17	DAVF embolisation	9
18	Spinal DAVF embolisation	3
19	DAVF coil embolisation	2
20	Intracranial DAVF	2
21	Vertebro vertebral AVF coil embolisation	1
22	Vertebral haemangioma embolisation	1
23	Carotid body tumour	8
24	JNF tumor embolisation	1
25	Angioplasty	8
26	Renal angioplasty	3
27	Peripheral Angioplasty	11
28	Carotid angioplasty	1
29	Sinusogram	1
30	Thrombolysis	1
31	Intracranial thrombolysis	2
32	Peripheral thrombolysis	1
33	Tracheal stenting	1
34	Renal stenting	4
35	Carotid stenting	1
36	ICA stenting	1
37	Aneurysm coiling	4

38	Pseudoaneurysm coiling	1
39	Peripheral aneurysm coiling	2
40	Peripheral Stent Grafting	1
41	Nasal angio fibroma	1
42	Gastric intervention	4
43	Laser ablation	1
44	IVC filter	2
45	Vertebral biopsy	1
46	Aortic fenestration	1
47	Fenestration	2
48	Barium meal follow through	1
49	Aortic stent grafting	1
50	Vertebroplasty	2
51	TACE	4
52	Bronchogram	1
53	EVAR	2
	Total	214

Library

S.Jayachandradas

Librarian-cum-Information Officer – I

Sudha T

Librarian-cum Documentation Officer – B

N.Suresh

Senior Librarian-cum-Documentation Assistant

Joy Vithayathil

Librarian-cum-Documentation Assistant – C

Anilkumar C

Librarian-cum-Documentation Assistant – B

Dimple Gopi

Librarian-cum-Documentation Assistant – A

The Hospital Wing library has a collection of 14204 books and 14628 back volumes of journals. During the current year, 464 books and 283 back volumes were added and 103 journals were subscribed. Electronic access to most of the journals, we subscribe also 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, ASTM and Indian Standards, ISI Web of Knowledge, Delphion Patents Database, etc.

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.

Microbiology

Dr.Kavita Raja, DCP, MD, MPhil(Clin.Epidem) –
Professor and Head

Smt.Molly Antony, MSc, DMV –
Scientist F

Dr.Muraleedhar Katti MSc,PhD, FISCD –
Associate Professor

Smt.Naseema K, MSc MLT –
Scientific Assistant

Smt.Gracy Varghese BSc, MLT(CMAI) –
Scientific Assistant

Overview:

The Department has started functioning 24hrs with a technician/apprentice trainee in the lab, instead of the on-call facility. This has resulted in a more rapid turnover of specimens.

New initiatives during the year:

- 24hrs Clinical Microbiology laboratory, proposal accepted in April and started functioning from October 1st 2010.
- Computer at entry to Dept. with a reception area for specimens and calling bell facility.
- Infection Control Team meetings and dissemination of accurate data
- Introduced PCR for Herpes.
- National Initiative for patient safety- Committee formed and a study on existing practices has been started.

Special programmes:

HOMOGRAFT project is continuing- The team, consisting of MsMolly Antony and Ms Beena visited the Homograft valve bank at AIIMS, New Delhi.

- Dr.Kavita Raja took classes on Prevention and Control of Hospital Acquired Infections –8 classes over 6months for Unit helpers and cleaners

Neurology

Dr. K. Radhakrishanan, M.D, D.M, FAMS, FAAN
Director & Professor (Senior Grade)

Dr Muralidharan Nair MD DM
Professor and Head

Dr C Sarada MD DM
Professor

Dr Sanjeev Thomas MD DM
Professor

Dr Asha Kishore MD DM
Professor

Dr P S Mathuranath MD DM
Additional Professor

Dr.P.N.Sylaja,
Additional Professor

Dr Abraham Kuruvilla MD Dip Am Boards
Neurology
Additional Professor

Dr. Ashalatha.R, M.D, D.M
Associate Professor

Dr. C. Rathore, M.D, D.M
Assistant Professor

Dr S Sajith MD DM
Assistant Professor

Dr Shyam MD DM
Assistant Professor

Dr. Ramsekhar Menon,
Assistant Professor

Dr.Sapna ES,
Adhoc Consultant

Dr.Mahesh Kate,
Adhoc Consultant

The department provides comprehensive patient care services (out patient and inpatient services) to the multitude of referral patients with the additional help of subspecialty divisions including Epilepsy, Movement disorders, Neuromuscular diseases, Sleep disorders, Cognitive neurology and Stroke. The number of new patients attending Neurology clinics showed a 10% increase from 4751 last year to 5276 and the number of admissions also rose by 10.7% in the current year(out of

the total bed strength of 60 including the neuromedicine and stroke ICU beds). We had a bed occupancy rate of 82.09% with an average hospital stay of 6 days and a mortality of 1.44%.

Epilepsy

Clinic attendance	5283
EEG	3487
VEEG	899
ECOG	85
Intracranialelectrode placement	5
VNS	3
Wada test	3
Epilepsy surgery	86

R Madhavan Nayar Centre for Comprehensive Epilepsy (RMNC) care, first of its kind in India manages complex and refractory epilepsy patients referred from all over the country. It runs six long-term video telemetry units running round the clock all throughout the year which is the investigative modality utilized to diagnose and classify various epilepsies and epilepsy syndromes. A thorough presurgical evaluation of patient is undertaken for difficult-to-treat epilepsies and after discussion in a multi disciplinary team comprising of epileptologists, neurosurgeons, neuroradiologists, psychologist, speech pathologist and occupational therapist, each patient is chosen for surgery. Two to three such surgeries are done per week. In addition, two specialty clinics run every week in the Institute (on Wednesday and Friday). This subspecialty also runs two outreach epilepsy clinics one at Ansar Hospital, Perumpilavu and PHC, Changaramkulam on first and third sundays of every month. Also the department periodically runs epilepsy camps in different districts in collaboration with local health authorities. RMNC currently recruit 3 post doctoral fellows every year who undergo advanced training in epileptology. The four neurotechnologists recruited every year also are trained in various technologies related to the diagnosis and management of patients with epilepsy like EEG, video-EEG, intra-operative ECoG, chronic ECoG after implantation of intra cranial electrodes, VNS programing, EEG-functional MRI coregistration technique etc. Various new initiatives like application of newer investigative modalities like diffusion tensor imaging and EEG-functional MRI coregistration in diagnosis and management of refractory epilepsies, and

also newer genetic studies in epilepsy were initiated. All research and clinical data are presented at various national and international conferences. They are also published in various peer reviewed international journals (with an impact factor more than 2) regularly.

Movement disorders

Clinic attendance	1530
Botulinum toxin treatment sessions	137
Deep brain stimulation surgeries	12
DBS programming	50
TMS evaluation	150
Tremor analysis	42
Neuropsychology evaluation	60

Movement disorder program conducts weekly out patient clinics on Mondays and botulinum clinic on Saturdays. Also runs a well-organized surgical program for patients with the help of functional Neurosurgeon. Movement Disorder program expanded its activities to initiate experimental therapeutics using transcranial magnetic stimulation for movement disorders. The motor physiology laboratory became fully operational and initiated several novel research projects including international collaborative projects to examine the pathophysiology of Parkinson's disease and dystonia. Two research fellows joined the TMS program.

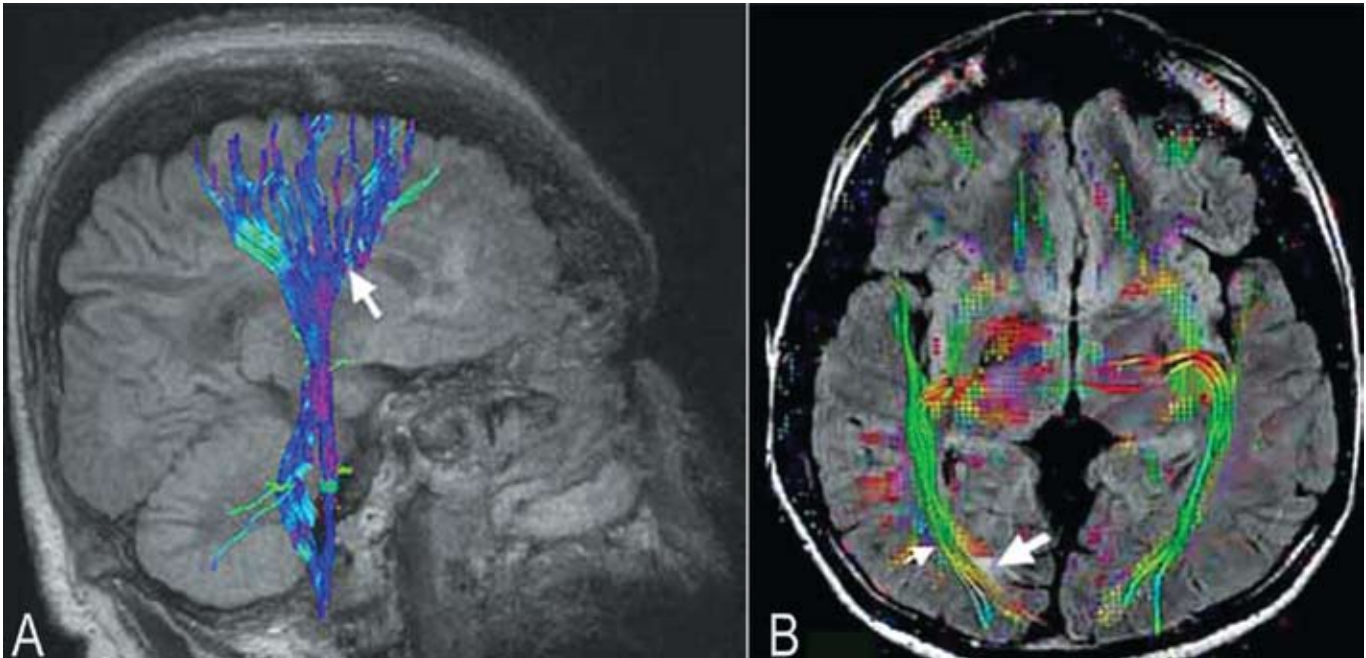
A summer project was completed by Dr. Bikas K. Arya from IIT, Kharagpur. Two PhD scholars were enrolled and the first candidate was admitted to the post doctoral course. The program received research teams from Hospital Sal Petriere, Paris and Indira Gandhi Centre for Atomic research, Kalpakam, Chennai . All regular activities of the program saw rising numbers of patients who were served from across the country. The results of research projects completed were presented at international conferences and published.

Cognitive and behavioral neurosciences

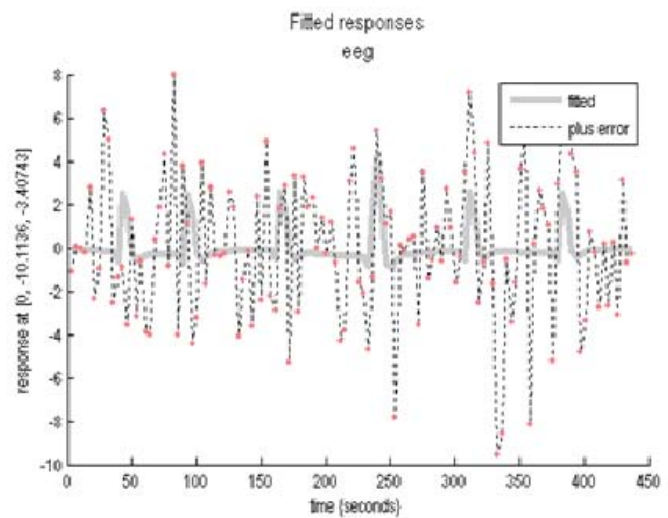
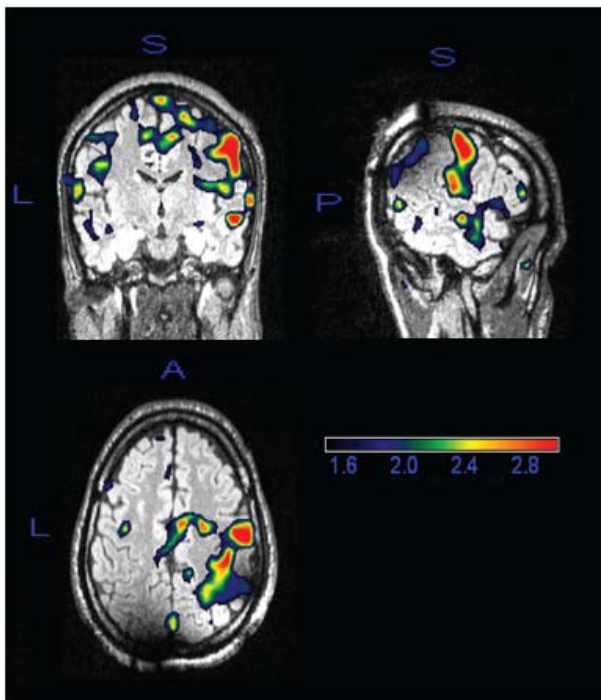
Memory & Neurobehavioral Clinic Attendance	310
Speech Evaluation	1158
Speech therapy	644
Audiogram	300
Neuropsychological Testing	961
IQ assessment	127
Counseling sessions	158

The section provides clinical services to patients with

First in India



The value of diffusion tensor imaging tractography (DTIT) is being evaluated in SCTIMST to make epilepsy surgery safe
A) Arrow shows corona radiata, and B) Arrow shows optic radiation.



The integration of EEG and functional MRI is undergoing study in localization of epileptogenic focus.

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 carers. The section also carries out clinical and basic science research in the field of Dementia, Cognition and Behaviour.

Neuromuscular Disorders Subsection

The NM subsection caters to 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.

Neuromuscular Review Clinic (1097 patients)

This clinic is conducted on every Tuesday for four hours. This has 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 based on the disease activity are reviewed at 3 months, 6 months or 1 yearly interval.

Procedures	Number
Laboratory Investigations	
Nerve conduction studies	1142
Needle Electromyography	441
Repetitive Nerve Stimulation test	110
Visual Evoked Potentials	119
Brainstem Auditory evoked Response	46
Somato sensory evoked Potentials	38
Muscle Biopsy	51
Nerve Biopsy	19
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

Clinic attendance	523
Polysomnography (PSG)	276
Multiple sleep latency test (MSLT)	14
Neuropsychology evaluation	121
Psychiatric intervention	111

The Comprehensive centre for sleep disorders (CCSD) offer excellent care to patients with sleep disorders through state of the art treatment, continued feedback, ongoing staff education, and adherence to quality assurance programs. Also empower patients and their family in their knowledge of sleep, sleep disorders, as well as on treatment options and compliance. It also promotes continued research and exploration on the diagnosis and treatment of sleep related disorders. Around 20 patients are evaluated at the CCSD, which run once a week. The focus is to channel appropriate patient investigations, management and counsel patients regarding their disorder and cater to psychosocial issues related to the same by expert psychiatrist/psychologist/medical social worker. Patients after being subjected to polysomnography or the respective diagnostic tests are instituted with appropriate treatment and are followed up regularly. Continuous positive airway pressure installation (CPAP) is another treatment strategy that is offered to patients with sleep apnea syndromes and they are then followed up regularly in the clinic.

Stroke

Clinic attendance	1852
TCD	60
Thrombolysis	6
Carotid endarterectomy	17
Moya moya revascularization	3

The major achievement of stroke section in the current year was the inauguration of Comprehensive Stroke Care Center, a 7-bedded unit with facilities for intensive care for hyperacute ischemic and hemorrhagic strokes on 14th March 2011. The new unit was inaugurated by the Director Dr. K.Radhakrishnan and Dr Craig Anderson, a renowned stroke neurologist from Australia. The division has also recruited one medical social worker, one physiotherapist, one occupational therapist and speech therapist for ensuring comprehensive care and rehabilitation of patients. Stroke outpatient clinic is conducted every Fridays from 10 PM to 1 PM. We have a patient management conference every

Sleep disorders

thursday attended by neurologists, neurosurgeon, vascular surgeon, cardiologist and interventional radiologists in the stroke program. A 24-hour stroke helpline has been started from September 2010 where patients/relatives/ other medical personnel can call for acute stroke referral.

Neurosurgery

Suresh Nair MCh

Professor (Senior grade) & Head of the Department

Ravi Mohan Rao MS, MCh, Dip N B

Professor(on leave for 1 year from 1.1.2010)

Girish Menon MCh, Dip N B

Additional Professor

Mathew Abraham MS,FRCS, MCh

Associate Professor

H V Easwer MCh

Associate Professor

K. Krishnakumar MS,MCh

Assistant Professor

CV Gopalakrishnan MS, MCh

Assistant Professor

George Vilanilam MS, MRCS, MCh

Assistant Professor

Vikas V. MS.MCh

Assistant Professor(adhoc)

Jayanand Sudhir B.

Assistant Professor(adhoc)

Overview

The department of neurosurgery continued to maintain high standards in patient care and academic pursuits as in previous years.

Operative:

Thrust was given to subspecialty oriented development and the major areas of operative focus were microvascular surgery, surgery of the skull base, endoscopic surgery, epilepsy surgery, movement disorder surgery and spinal instrumentation. Emphasis was given to minimally invasive procedures with the aid of neuronavigation equipment. A total of 1364 cases were operated with an overall mortality

of 1.60 % , results which are comparable with the best centres of the world.

Outpatient: There has been a steady increase in our patient load and our drainage area now extends to neighbouring states as well.

Academic :

The faculty and the students maintained the high standards and our institute was well represented in all major national and international conferences symposiums & seminars. Four candidates successfully completed their MCh training and four new residents joined the department.

Status of ongoing activities: Departmental activities:

Day to day activities of the department include OPD and the operation theatre functioning five days a week. The weekend is the academic day wherein regular Neuroradiology meetings are held followed by grand rounds and case discussion or seminars. The total number of cases operated during the year 2010-11 and their distribution is as follows. [Construct a Table]

A Vascular	155
Intracranial aneurysms	137
AVMs	07
Cavernomas	07
Moya Moya	04
b Skull base	151
Vestibular schwannomas	55
Skull base meningiomas	79
Others	17
C. Epilepsy	
Epilepsy surgery	95
ATL-AH	56
Hemisphereotomy	6
Callosotomy	1
Lesionectomy	16
VNS	1
Others (grid placement).	15
D. Movement disorder	17
E. Sellar suprasellar	109

Pituitary tumors	82
Craniopharyngiomas	22
Others	5
F. Spinal surgeries	147
Spinal tumours	36
Cervical degenerative disease	69
Lumbar degenerative disease	42
G. CV junction anomalies	43
AAD	10
Chiari	33
H. Neurooncology	317
Meningiomas	76
Gliomas	134
Pediatric posterior fossa	37
Others	60
I. Endoscopy	67
J. Others	263
Total	1364

Pathology

Dr V.V Radhakrishnan
Professor (Senior grade) and Head

Dr Sandhyamani
Professor

Dr Annamma Mathai
Scientist D

Dr Neelima Radhakrishnan
Ad-Hoc- Consultant

Mr. N.S Radhakrishnan
Scientific Assistant

During the year (April 2010 to March 2011), the division has performed histopathological analysis in 1700 surgical specimens in patients undergoing surgical treatment for neuro and cardiac diseases. Intra-operative tissue diagnosis was performed in 580 patients. Enzyme histochemical and immunohistochemical studies were performed in 70 muscle biopsies. Immunopathological investigations were performed in 2500 cases. 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 and neuro- surgery and neuroradiology. The division also undertook training programmes for postgraduate students in Pathology from Medical College, Trivandrum, Kottayam and AIMS Kochi

Cellular and Molecular Cardiology

Dr. Renuka Nair, PhD, MNAMS, MNASc
Scientist- G(Senior Grade)

Dr. K. Shivakumar, PhD
Scientist-F

Research on the cardiac response to injurious and protective agents remains the focus of the Division. The major areas of research are: isolation, expansion and application of stem cells; modulation of energy metabolism for prevention of cardiac hypertrophy and cellular response to hypoxia and hypertrophy-stimulating factors. The studies are supported by externally-funded research projects. Two projects were completed during the year in focus. There are two ongoing projects. Productive collaboration with the NIH, USA, was sustained during the year.

Transfusion Medicine

Dr Jaisy Mathai
Scientist G & HOD

Dr Sulochana PV
Scientist G

Dr Sathyabhama S
Scientist F

Dr Usha Kandaswamy
Senior MSW

Sr Nirmala N
Senior Staff Nurse

Ms Sheela Devi KS
Chief Technician

Overview

Department continues to provide quality and safe blood products to patients of SCTIMST and outside hospitals. Awareness programs are created periodically through Hospital Transfusion Committee on sound Clinical Transfusion Practice for doctors and nurses. Training for Doctors from DHS is held twice in a year. Continuous efforts

are put for mobilization of 100% voluntary donations and mobile camps are increased to six numbers monthly. Takes part in External Quality Programs of CMC Vellore in Immunohaematology and Transfusion transmissible infections (EQAs program of KSACs).

New initiatives

- Irradiated blood was added to the list of blood components available for prevention of post transfusion Graft Versus Host Disease in immunocompromised patients
- Guideline on blood transfusion was prepared for nurses.

Programs

1. World Blood Donor Day was celebrated on June 14 th 2010 at AMC Auditorium. 170 repeat regular blood donors and 25 organizations with voluntary donor program were felicitated. Dr. Jaisy Mathai gave the welcome address. The program was inaugurated by Dr. K Radhakrishnan Director, SCTIMST. Keynote address was given by Sri. Manoj Joshi IAS Secretary Health and Family Welfare, Govt of Kerala. Felicitation was offered by Dr. Indira V, Chief Medical Officer, VSSC. Dr. P.V Sulochana gave vote of thanks. The program was followed by a health talk by Dr. Jawahar S.K, AMO SCTIMST.
2. At the CME on 'Recent advances in Transfusion', Dr. R.K Choudary, Prof and HOD and Dr. Prashant Agarwal, Associate Professor, SGPGI gave talks on 'Leucoreduced Blood Components' and 'Bacterial Contamination in Platelets' respectively.
3. Organized a CME on Clinical Transfusion Practice for Clinicians and Nurses of SCTIMST on 18 Dec. 2010. Dr. Vijayalakshmi, HOD RCC Blood Bank, Dr. K.C Usha Professor & HOD Transfusion Medicine, MCH Trivandrum, Dr. Shrinivas G Addl. Prof. Anaesthesiology SCTIMST, Dr. Sathyabhama S Scientist F, Dept. of Transfusion Medicine SCTIMST spoke on Blood groups, Clinical Transfusion Practice, Blood Conservation strategies in cardiac surgical patients and Hazards of blood transfusion

respectively.

Training

1. 30 Drug Inspectors had orientation in blood bank procedures as part of their training in Modern Blood Banking Technology in two batches
2. Eleven Medical Officers from State Govt. Service and private institutions attended six days training program in two batches organized by KSACS
3. Mr. Sarat Thalukdar Lab technician from Guwahati Neurological Research Center is undergoing training in the department as an observer for one year.

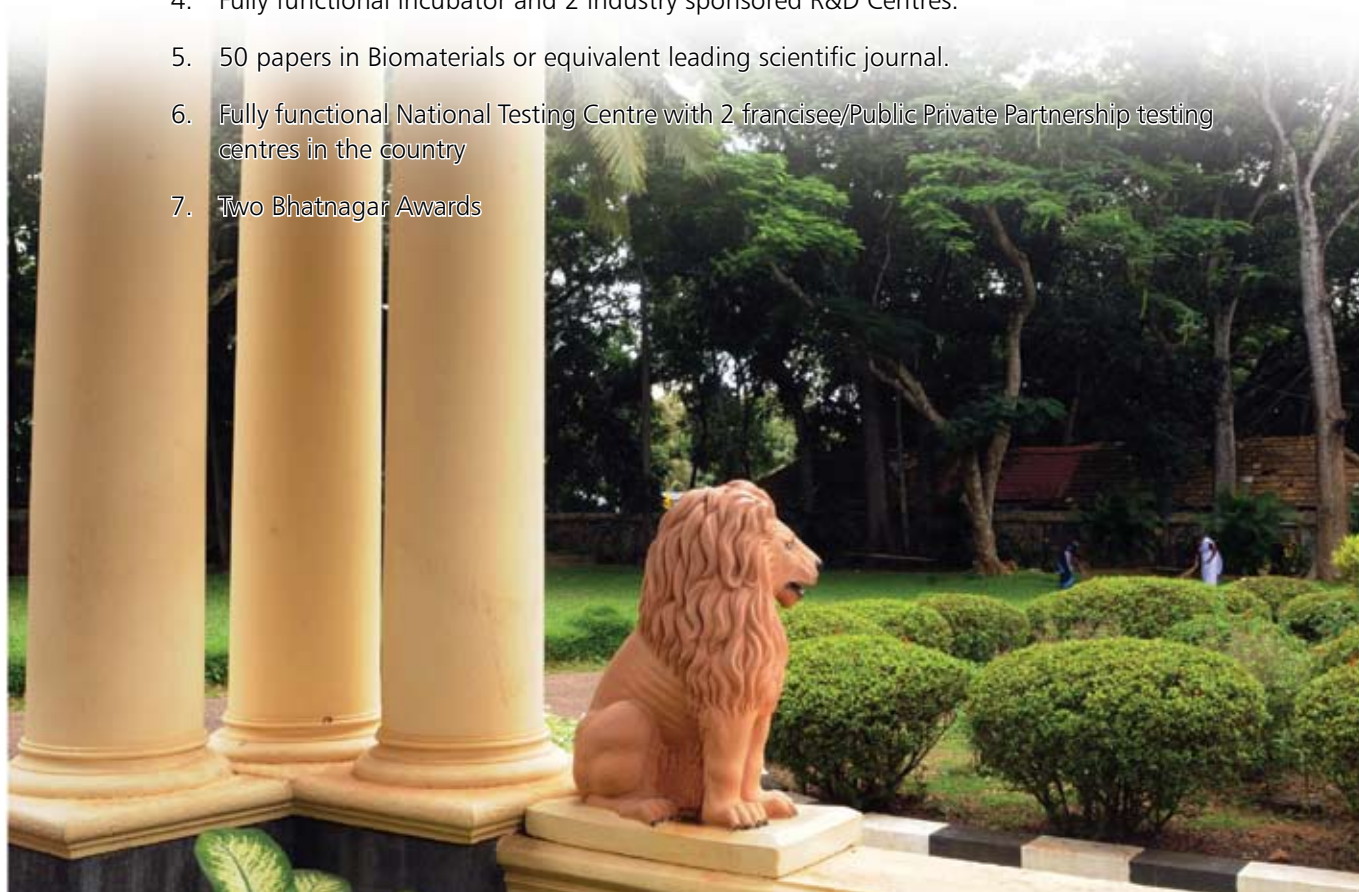
BIOMEDICAL TECHNOLOGY WING

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 leading scientific journal.
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 various programs are synergized with the mandate of enabling the indigenous growth of Biomedical Technology in the country and advanced training of human resources. An overview of the achievements the BMT Wing during the year is briefly described below.

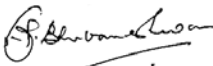
The collaboration with industry is an effective way to reach out to the market. The year 2010-11 was one in which, we had the opportunity to collaborate with half a dozen industrial partners in terms of launching of products, technology transfers, research and training. The Institute's customer base has steadily grown in terms of the testing services on biocompatibility and physicochemical tests of medical devices & biomaterials.

The year saw the addition of three new brands to our product list viz, Biograft HA-New" and "Biograft HABG Active" from our industrial partner M/S IFGL Bioceramics Ltd., Kolkata and the MASTITEST ABST Kit for testing antibiotic sensitivity of mastitis in farm animals from M/S Himedia Laboratories, Mumbai. The technology transfer of polyurethane resin compound to M/S Makim Med-Aids and Polyurethane based potting compound to M/s NAL Medical Devices India Pvt Ltd are other technology transfers carried out.

M/S HLL Lifecare Ltd., Trivanrum, one of our long standing industrial partners has identified us as "the knowledge partner" in the establishment of the Medipark in Chennai and a MOU has been signed for this. Major research initiatives were activated with industrial partners Reliance Lifesciences, Mumbai (bioartificial liver development) and Vinvish Technologies, Trivandrum (laser based medical devices). MOUs have also been signed other teaching and research institutes. We continue to impart training to the industry on medical devices & biomaterials development by way of 5 days workshops.

All the staff are highly tuned to maintain the quality mindset and adhere to continuous improvement through regular internal audits and those by COFRAC, France and NABL. The programme on implementation of ISO 9001 and 13485 is moving ahead. The projects aimed at product development are moving through the various stages of development and the research projects are trying to capture the findings and lessons through publications in high impact journals and by filing of patents. The year witnessed a record number of research publications, many of them in high impact journals, while the first batch of M.Tech in Clinical Engineering and MPhil in Biomedical Technology students successfully passed out.

On an overall review, I am happy to report that the BMT Wing of the Institute is growing from strength to strength in the development of biomedical technology and training of human resources for the advancement of the country.


G.S. Bhuvaneshwar

16th August 2011



BIOMEDICAL TECHNOLOGY DEVELOPMENT

The year 2010-11 was yet another excellent year of progress, which saw the initiation of many new projects and programs. The industry interactions in terms of technology collaborations and quality testing service moved forward energetically.

HIGHLIGHTS

Launching of new products: The year saw the launching of two products by M/s IFGL Bioceramics Ltd under the brand name names "Biograft HA-New" and "Biograft HABG Active" based on the technology transferred from the Institute. The field kit for testing antibiotic sensitivity of mastitis in farm animals was also launched by M/s Himedia Laboratories, Mumbai under the brand name MASTITEST ABST Kit.

Technology transfers: The Technology for Water curable polyurethane resin compound for the fabrication of orthopedic casting tapes was transferred to M/s Makim Med-Aids, Vadodara and that for Polyurethane based potting compound to M/s NAL Medical Devices India Pvt Ltd, Shertalai. Discussions are ongoing with prospective industrial partners for other technologies that are in the pipeline.

Collaborations: The institute strengthened its links with HLL Lifecare Ltd., Trivandrum by signing an MOU for collaboration as a knowledge partner in the Medipark being established by them at Chennai. Many other industry collaborations have been initiated with the signing of MOUs for academic and research collaboration with Central Electrochemical Research Institute, Vinvish Technologies Pvt. Ltd, Reliance Life Sciences, Queensland University (QUT) of Australia, NIPER-Ahmedabad, National Institute of Technology, Trichy and Intellectual Ventures, Bangalore. Interactions with industry continued in terms of imparting training (as part of technology transfer) and special workshops organized by the IIPC.

Quality: The quality management system was strengthened with the COFRAC Surveillance audit conducted during 10-11th January 2011 and also the NABL audit during 17-18th January 2011. The Quality Manual was also revised incorporating the changes required for implementing ISO 9001 & ISO 13485.

Research & Development: There was substantial progress with regard to the projects. Many of the product development projects are progressing towards technology transfer and the research projects have contributed significantly through high impact publications and patents, which are very evident from their growth in numbers.

Publications – 72 publications in indexed journals during the year from BMT Wing. The table below shows a healthy growth during the last 3 years.

Year	Publications in indexed journals	Average Impact Factor
2008-09	30	2.03
2009-10	55	3.01
2010-11	72	2.99

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, ensuring MRI compatibility and improved performance characteristics. The preclinical evaluation has been completed and the product is found to be safe and functionally superior to the current model of the TTK-Chitra valve. 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 Systems for PTCA stenting - Various tests systems required for the evaluation of coronary stents have been installed and validated. The preclinical evaluation of the final prototype is in the final stages. Animal trials of the titanium nitride coated stents are planned the current year.

Vascular Graft: The project (executed in collaboration with Division of Polymer Processing) aims at imparting a thrombo-resistant fluoro polymer coating on the fabric along with closure of the graft pores using hydrogel. After the standardisation of the processes, a set of forty grafts were produced for conducting the preclinical animal trials.

(b) Modelling & Prototyping Lab

Centrifugal Blood pump for cardiopulmonary bypass

– major milestones:-

- Technology Transferred to SIDD Life Sciences Pvt. Ltd and commercialisation is ongoing under TDB funding.
- Developed a process of vapour polishing the components to attain a better surface finish.
- Surface finish is studied using Optical Profilometry and Atomic force microscopy.
- Designed an apparatus for vapour polishing of polymer samples.
- Carried out In-vitro evaluation on samples received to qualify them for next phase.
- An Electromagnetic flow meter development is in progress.
- A stepper motor based flow control device is designed for use in the In-vitro evaluation of Bloodpump.



In-vitro evaluation with Bovine blood in progress

Left Ventricular Assist Device (LVAD)

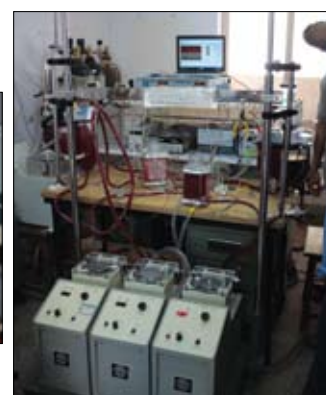
- Preliminary Ex-vivo evaluation of the first SCTIMST-VSSC LVAD prototype is ongoing.
- One Ex-vivo experiment of LVAD was conducted on swine model during the year.
- Developed a modified evaluation set up using sterile clinical pressure transducer for measurement.
- VSSC is developing a completely sealed pump for the next phase of the project.
- In-vitro evaluations were conducted on pumps to select devices for ex-vivo evaluations.



Ex-vivo evaluation of SCTIMST-VSSC LVAD is in progress

Membrane Oxygenator

- Modified evaluation setup was realised with membrane Oxygenator as De-Oxygenator, which could save cost and time of experiment compared to the earlier one.
- A series of In-vitro evaluations carried out to evaluate the Oxygen transfer efficiency of different devices with modifications.
- The modifications carried out to avoid blood short circuit at corners and reinstating the cross winding pattern of fibre the device resulted in significant improvement in Oxygenation.



In-vitro evaluation with Bovine blood in progress

Biomaterial and Biological Products

Bioceramics lab

During the year 2010, IFGL REFRACTORIES LIMITED (IFGL), brought out two products based on the technology transferred from the lab. They are Biograft HA-new and Biograft –HABG Active. Now discussion is going on with the company to transfer two more technologies based on HAP, HABG and CPC cements for Orthopaedic Applications.

Biosurface Technology

Using Caco2 cells the tight junction opening capability of oral heparin nanoparticles (prepared with 50000IU of heparin) were demonstrated. In vivo experiments with these nanoparticles were performed on rats and a dose dependent variation of heparin level in plasma was demonstrated. To investigate the batch to batch variations of heparin nanoparticle formulation, four different batches were prepared. The particle size, loading and its in vivo efficacy of these batches were evaluated. All four batches prepared had a similar heparin loading. Further studies on in vitro-in vivo correlation, establishing batch to batch reproducibility is being done. After optimizing the bioavailability and dose, studies with low molecular weight heparin will be initiated.

Studies on VEGF (growth factor) loaded PLGA nanoparticles in a rabbit ear model were conducted. Visual pictures demonstrated the qualitative changes in angiogenesis compared to the controls. Quantification of angiogenesis by UTHSCSA image tool demonstrated a significant increase in angiogenesis with VEGF loaded PLGA nanoparticles compared to PLGA nanoparticles alone. In vitro angiogenesis potential of these nanoparticles was evaluated in Human Umbilical Vein Endothelial Cells (HUVEC cell monolayer – in vitro model) for tube formation. These VEGF loaded PLGA nanoparticles are useful in inducing angiogenesis.

Chitosan sponge for wound healing: Fibroblast cell seeded sponges were grafted on rabbits and its wound healing property was studied for 7, 14 and 21 days. Observation on 7th day showed similar healing, while 14 day and 21 day results of wound healing with histopathological data showed that the extent of re-epithelialisation was similar for chitosan sponge with and without cells. Chitosan sponge has been demonstrated to be an excellent matrix

as a tissue scaffold. Although the epithelialisation was similar, studies related to cell cultured chitosan sponge are relevant since the final application is for burn cases where there is a complete absence of tissue. Keratinocyte cell culturing has been shown to reduce collagen production. Therefore, an attempt was made to co-culture of keratinocyte cells with fibroblast cells. It has been found that cells co cultured (12 hours keratinocytes first and later 12 hours fibroblasts) had a collagen production, while with keratinocyte alone showed significantly low collagen production. Therefore, further studies on optimization of co culturing of keratinocyte cells and fibroblasts cells are planned to optimize collagen production and healing.

Development of a nanoceramic matrix from a combination of calcium phosphate, zinc phosphate and magnesium phosphate was attempted towards tissue-engineered bone. 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 (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. Further studies with different ratios of Ca, Zn and Mg were done on the nanoceramic matrix. Compressive strength was similar for all matrices which were comparable to various matrices 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 being planned.

Dental products

The industry funded project on development of intrauterine drug releasing system was completed this year successfully. Prototype VI was developed and design finalized for technology transfer and further clinical evaluation. All stipulated toxicological evaluation including genotoxicity was completed successfully. It was decided to carry out limited scale-up at the HLL's facility and test manufacture the device in their clean-room facility. Clinical trials are planned for late 2011.



IUD developed at Dental Products Lab in collaboration with HLL Lifecare Ltd

Technology Transfer of Glass Ionomer Cement gained momentum again this year after a brief lull in 2009 due to the trained manpower leaving the industry. Three scientists including head of the R&D of the industry got trained in the technology during Jan-Feb 2011. Toxicology evaluation of the material manufactured by the industry in their plant is planned for second half of 2011. A survey on handling characteristics of glass ionomer cements was also carried out among clinicians in Trivandrum in liaison with industry partner.

In vivo Models & Testing

Preclinical evaluation of decellularised bovine pericardium developed for cardiac patch application is in the final stages of preclinical trial. A patent was filed on this technology. The process of identifying an Industrial partner has been initiated. With our technical help, Kerala Livestock development Board (KLDB), Government of Kerala has been upgraded to supply animal tissue of biomedical quality. Efforts to develop a fully cross-linked bovine pericardium suitable for application in biological valve were also carried out. Attempts to develop a minimum calcifying, biologically inert and durable bovine pericardium is in progress.

Laboratory Animal Sciences

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

Polymer Division

Under the programme 'Dispensable and biodegradable polymeric bone cement for minimally invasive treatment of bone diseases', the shelf life of the two component formulation of the candidate bone cement has been studied. It has been found that shelf life is appreciably good. The setting characteristics of the stored bone cement are within the acceptable limit as per the standard ISO 5833/1-1999 E. The studies reveal that the present candidate bone cement is a promising clinical product. With the release of the DST project funds for the second phase of the project, clinical trials are planned.

In continuation of research in this area, the effect of comonomer, poly ethylene glycol diacrylate (PEGDA) on the setting character of polypropylene fumarate-nVP and polypropylene fumarate-MMA composites was investigated. Novel poly glycerol fumarate (PGF) unsaturated polyester resin with higher functionalities was also synthesized. The effect of concentration of reactants, PGF and NVP on the setting characteristics and mechanical characteristics was studied. The studies on the biodegradation of cured PGF polyester in PBS was carried out.

Technology transfer/scale up

1. Technology on water curable polyurethane resin compound for the fabrication of orthopedic casting tapes was transferred to Makim Med-Aids, Vadodara-390 024
2. Technology transfer on polyurethane potting compound for the fabrication of arterial filter to M/S NAL Medical Devices India private Limited, Cherthala South, Alappuzha, Kerala is under process.

Thrombosis Research Unit

Small pool fractionation of fresh frozen plasma obtained from our blood bank has resulted in production of more than 300 sets fibrin glue components (fibrinogen concentrate and affinity purified thrombin). Continuous flow centrifugation procedure has been standardized for processing up to 5 litres plasma in a single batch. Forty percent of the product prepared was used for quality assurance of the product and tissue engineering research in the lab. Sixty percent were given to the Neurosurgery and Cardiovascular surgery departments of our hospital for clinical use.

Preclinical evaluation of anti snake venom antibodies was completed in rabbit models, which mimicked the conditions of snakebite poisoning. Purified chicken egg yolk derived immunoglobulin (IgY) raised against viper venom was found to be safe and efficient for neutralization of effects of envenomation. Technology profile was prepared and handed over to Technology Business Division for identifying appropriate industrial partner for technology transfer and commercialization.

Diagnostics and Instrumentation

Instrumentation lab

Development of Disposable ECG electrodes

Technology development for disposable ECG electrodes is being carried out in collaboration with an industrial partner. The toxicological evaluation of raw materials and functional electrical testing of prototype electrodes has been completed. The prototype electrodes are being assembled by the industrial partner to make them available for the first phase of clinical evaluation.

Development of Portable Medical Electrical Safety Analyser

This project in collaboration with CDAC, Thiruvananthapuram is aimed at development of portable equipment to enable periodic electrical safety testing of medical equipment in hospitals.

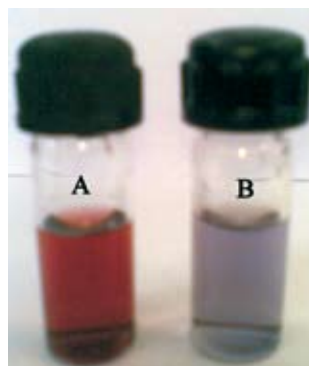
The required number of prototypes were fabricated and tested at ERTL (South) laboratory for their functional performance and ease of use. Based on the inputs obtained during these trials, further modifications were made to the equipment. Identification of the industrial partner for commercialization for this equipment is under progress.



Portable Medical Electrical Safety Analyser

Laboratory for Polymer Analysis

Chemically modified gold nanoparticles capable of selectively binding glucose from aqueous fluids such as tear and urine was generated. The approach is sensitive, cost effective and easy to perform in rural areas where high tech clinical facilities are rare. A molecularly imprinted fluorescent polymer formulation selective to glucose was also synthesised and characterized. These polymers were found to bind glucose with a proportional decrease in the intensity of fluorescence.



“Naked eye” sensing of glucose. The colour of the gold nanoparticles (A) turns to blue (B) when the glucose concentration exceeds 100 $\mu\text{g/mL}$

Microbiology

Rapid urinary tract infection identification kit with antibiotic sensitivity profile has been developed. Initial screening for efficacy is over and pilot-scale kit preparation (approximately 200 kits) is being organised for the next phase in efficacy testing.

Toxicology

The development of an **In vitro pyrogen test kit** for the evaluation of pyrogenicity using human whole blood is completed and is under validation. This new development is 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.

Technology transfer & project coordination

Technology Business Division:

The Technology Business Division (TBD) has the mandate to coordinate the activities related to Technology Transfer and Industrial Coordination as well as testing services to medical device industry. The highlights of the year include:

- Signing of MOU with HLL Lifecare Ltd on 3rd January 2011 for collaboration as a knowledge partner in the Medipark being established by HLL Lifecare Ltd at Chennai
- Transfer of Technology agreement signed with M/s Makim Med-Aids, Vadodara for polyurethane resin which finds application in orthopedic casting tapes
- Transfer of Technology agreement signed with M/s NAL Medical Devices India Pvt Ltd, Shertalai, Kerala for polyurethane based potting compound.

The following products licensed by the Institute were launched in the market this year:

- "Biograft HA-New" and "Biograft HABG Active" by M/s.IFGL, Kolkata
- MASTITEST ABST Kit by M/s Himedia Laboratories, Mumbai

The following Memorandum of Understanding (MoUs) was signed during the year for academic and research collaborations:

- With Central Electrochemical Research Institute (CECRI), Karaikkudi to facilitate the collaboration between the Institutes in the area of PVD coatings for biomedical applications.
- With Vinvish Technologies Pvt. Ltd., Technopark, Trivandrum for collaboration in the area of Medical Lasers and other Opto-electronic devices for medical applications.
- With Reliance Life Sciences, Mumbai for use of polymeric scaffolds for research activities.
- With Queensland University (QUT) of Australia, Brisbane for cooperation in academic matters of mutual interest.
- With NIPER-Ahmedabad for collaboration in academic, scientific research and technical fields in the medical devices sector.
- With National Institute of Technology, Trichy for collaboration in academic, scientific research and technical fields.
- With Intellectual Ventures Asia Pte Ltd., for IPR commercialisation.

New exploratory interactions with various industries included the following:

- Lucas TVS group, Chennai on strategies for affordable haemodialysis

- Kerala Livestock Development Board (KLDB) for bovine calf serum
- National Burns centre, Vashi and Himedia Labs, Mumbai for TGF-alpha growth factors and wound dressings
- Tree Land Biotech, Trivandrum for TGF-alpha growth factors
- Vinvish Technologies for novel dental composites with light source
- Biopore Surgicals, Mumbai for various projects
- Lifecare Innovation, Delhi and Sud-chemie, Kochi for IPN capsules for islet like cell encapsulation
- L&T IES for affordable medical devices
- Trivitron, Chennai for collaboration in new product development

Commercial partners for the following were explored:

- Medical Electrical safety Analyser jointly with CDAC, Trivandrum
- Injectable Calcium Phosphate Cements for dental and orthopaedic applications
- Animal bedding material for laboratory animals

A Training programme on "Medical devices & Biomaterials" for engineers from L&T IES was organised in June 2010 which included orientation in the hospital wing.

Apart from these industrial interactions, the division coordinated project related activities such as:

- RESCON for review of research projects
- Facilitate TDF projects and external project submissions
- Annual report, monthly and reports for DST
- Organising the TDC and TTC meetings

Biomaterials Research & Development Bioceramics Laboratory

The main research program of the laboratory are:-

1. Nano porous bioceramic substrates having capacity to carry drugs and biologics for the treatment of refractory osteomyelitis and osteonecrosis.
2. Coating of hydroxyapatite layers on to titanium implant surface using Pulsed Laser Deposition technique, so as to increase the integration with bone.

3. Silica-based biosensors for the detection of markers in blood for diagnostic applications.

Biosurface Technology

Bhasma preparations in India have not been well characterized in terms of their physical and toxicological properties. Therefore, an attempt has been made to evaluate two batches of gold bhasma (purchased from IMPCOPS) for its physicochemical characteristics and blood compatibility; and compared with gold nanoparticles and PEGylated gold nanoparticles. Physicochemical results were similar between two batches. Aggregation of blood cells and protein adsorption was insignificant and was comparable in all cases. Gold bhasma was also non-cytotoxic. Similar studies on Naga-parpam and Rasa-chenduram were attempted. These preparations were characterized utilizing XRD, DLS, SEM and EDAX. Biological studies like blood compatibility, cytotoxicity, hemolysis, platelet adhesion, complement activation and protein adsorption were also done. Although protein adsorption and complement activation were negligible, Rasa chenduram preparations were cytotoxic, activating the platelets and causing hemolysis. Blood cell aggregation was also found with Rasa-chenduram.

A new gene delivery vector (pullulan-PEI-transferrin) was studied for potential application in the treatment of Gliomas. Transferrin conjugated pullulan-PEI was developed and its blood cell compatibility studies and the efficacy towards gene delivery was investigated. The complexes formed were of size less than 180 nm and were stable in presence of plasma and cytosolic proteins as established by the gel retardation assay. In vitro transfection on C6 glioma cells using pGL3 and p53 demonstrated good transfection efficiency. Transfection with p53 plasmid expressed anti-proliferative property and also induced apoptotic cell death as evidenced by the live dead assay.

Elucidation of the mechanism of DNA unpacking and separation from cationic polymers can lead to development of new materials for clinical applications. Preliminary experiments indicate that the DNA and the polymeric vectors are getting separated in 5 to 7 hours after endocytosis by the cells. Further studies are in progress in this direction and towards the demonstration of the elimination of polymer particles from the cells. Tf-conjugated Pullulan-PEI is able to achieve preferential receptor-mediated targeting of C6 glioma in vitro. The suitability of hemocompatible, non-toxic PPETf, the over

expression of transferrin receptor (TfR) on glioma cells and the potential for TfR-mediated transport across the BBB make this system attractive. Preliminary studies on the uptake of PHA-PEI particles have been demonstrated. Polyhydroxyalkanoates (PHA) is a biodegradable polymer that is less studied as a gene delivery vector.

Bovine serum albumin capped fluorescent gold clusters were demonstrated as nanosensors for Cu^{2+} ions. Results on the quenching of the fluorescence by addition of Cu^{2+} ions and recovering the fluorescence by addition of glycine were demonstrated. The fluorescent probe was found to be useful to sense the free copper ions in live cells up to a concentration of $50 \mu\text{M}$. The fluorescent probe can potentially be used for cancer cell imaging and targeted drug delivery applications.

Dental Products lab

Development of quantum dots for medical applications

Under Women's scientist scheme, a new project was initiated on development of quantum dots for cardiovascular applications. A patent application was filed for novel quantum dots based on cadmium selenide, which is protected with a sheathing of ZnS. The core and the sheath were characterized by TEM, particle size analyser and XRD. Cytotoxicity evaluation was also initiated this year.

Development of small development vascular grafts

Polycaprolactone scaffolds with appropriate porosity was prepared and they successfully completed toxicology evaluation. Sub-chronic toxicity studies of PCL scaffolds were completed. Muscular implantation studies on accelerated degraded PCL samples commenced along with control materials. One-year degradation study of the PCL scaffolds was completed. Effect of degradation upon mechanical strength, molecular weight was monitored. Animal trials started in January 2011 and initial results have been encouraging.



PCL control scaffold developed in DPL implanted in animal model

Development of a hemostatic scaffold using biodegradable scaffold and biomimetic ECM

Methodology was developed to synthesize lactide and glycolide in the lab under extreme conditions and characterized. Polymers were prepared using these monomers to prepare scaffolds for burn wound dressings.

Development of bioactive bone cement based on organically modified ceramic resin

TDF project on ormocer based bone cements was successfully completed and extension has been sought for toxicity evaluation. Novel calcium 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. Self-cure bioactive bone cement formulations with novel calcium containing resin and HAP/PMMA-PS copolymer filler combinations were prepared and optimised after evaluating working time, setting time and compressive strength. The material was found to be non-cytotoxic. Pulp and dentine test of organically modified ceramic resin based dental restorative composite was carried out.

Development of drug releasing intrauterine device

Progress details on TT activity have been detailed above for IUD development. Monitoring of drug release using HPLC continued throughout the year and was maintained at 20 micrograms per day.

Development of Light Cure unit for TPO based dental composites

Discussions were held with Vinvish technologies, Trivandrum regarding development of appropriate light source for TPO containing dental composites which were developed in the laboratory. They supplied us with 460 nm and 410 nm light sources, the efficiency of which we compared with imported brands. The TPO based composites cured with indigenous light sources were found to exhibit better mechanical and sorption properties compared to CQ initiated composites.



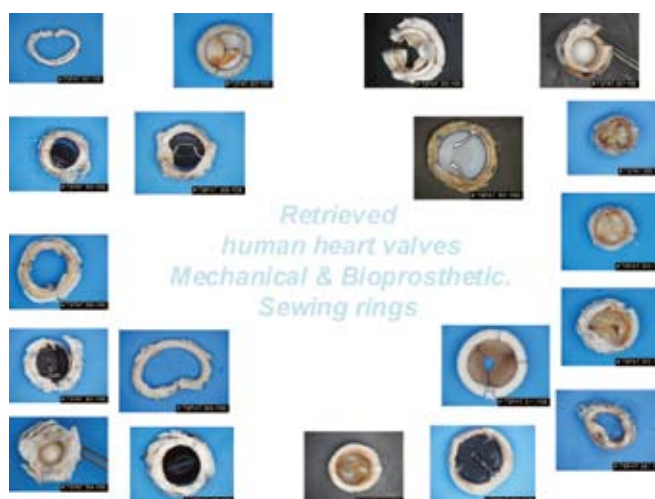
Novel dental light cure unit developed as per our request (410 nm wavelength)

Studies on contrast enhanced Micro-CT imaging

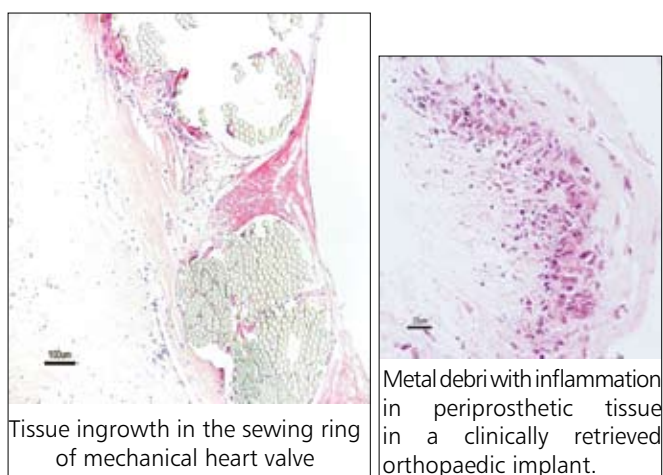
The study was mainly aimed at the development of an appropriate contrast enhancement method for soft biological materials and low attenuating polymers in order to facilitate their 3D visualization using micro CT. Gold nanoparticles of 20 nm were synthesized and characterized using TEM and UV-VIS spectrophotometer. PTA stained cell seeded scaffolds was found to exhibit significant cell volume and distribution than GNP stained scaffolds. Both PTA and GNP stained scaffolds cultured in dynamic mode showed prominent cell volume and distribution compared to static mode.

Histopathology Laboratory:

Study on clinically retrieved heart valves and orthopaedic periprosthetic tissue continued as part of research.



Tissue ingrowth in the sewing ring

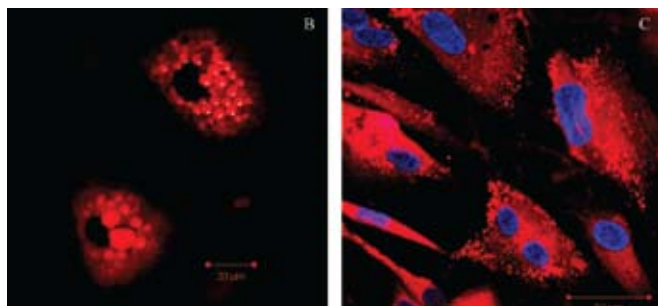


Tissue ingrowth in the sewing ring of mechanical heart valve

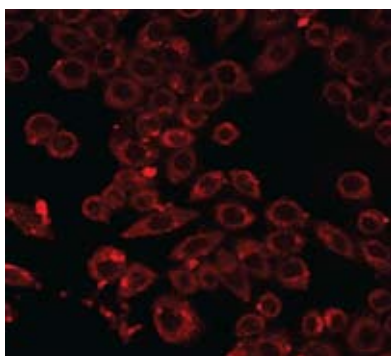
Metal debris with inflammation in periprosthetic tissue in a clinically retrieved orthopaedic implant.

Transmission Electron Microscopy laboratory

- ❖ Specific Area of Tissue Engineering Research: Ceramics as Bone substitutes - Bone Tissue engineering; Adult Stem Cell Research (MSCs) from Bone marrow and Adipose tissue; Cartilage Tissue Engineering and Adipose Tissue Engineering.



CLSM image of induced rat adipose - derived mesenchymal stem cells displaying the attained spherical morphology with red lipid globules within the cell.



CLSM image of cultured HeLa cells stained with Silica coated Cd - Se quantum dots with a peak uptake time of 4.5 hrs.

Polymer Processing

Combination Products of Polymer-Ceramic Nanocomposites with Cells and Growth Factors for Bone Tissue Engineering Applications

The major achievements made in the project are:

- Electrospun nano hydroxyapatite filled poly(ϵ -caprolactone) (PCL) and PCL- polycaprolactone-polyethyleneglycol-polycaprolactone triblock copolymer (CEC) blends were evaluated for cell adhesion and proliferation. Cell attachment studies revealed that all the electrospun nanofibrous composites scaffolds support cell growth.
- PCL/CEC/HAP scaffold showed overall better performance in cell culture studies than the other scaffolds which were reflected by the LDH assay and picogreen test.
- The degradation behaviour of the composites were evaluated.

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

The main objective is to develop porous degradable polymer scaffolds with tailored properties and to explore the interaction at nanoscale between the cells and porous membranes/scaffolds. It is planned that this material will be an ideal dura substitute for neurosurgery applications. The work carried out in the project:

- Synthesis and characterization of caprolactone-co-lactide polymers
- Optimization of the ratio of the monomers in the copolymers
- Preparation and evaluation of nanofibrous mats of polycaprolactone blended with caprolactone-co-lactide polymers.

Development of fluoropassivated and gel sealed vascular graft

A suitable gel-forming formulation which could be spray-coated on polyethylene terephthalate vascular graft was developed. The coating will cure during the drying process. When the graft is immersed in water, the coating absorbs water, forms a hydrogel and seals the pores of the fabric graft. Several coating parameters were standardized

and optimized. The coated grafts were tested for water permeability and the permeability was found to be very low, indicating that the hydrogel sealing is effective.

A semi automated spray coating set up was developed for the gel coating and the process standardized for preclinical evaluation in pigs. The aldehyde content in the hydrogel was estimated to ensure that on very low concentrations are remaining. Degradation studies of the hydrogel in PBS at 37°C was conducted and found that hydrogel undergoes hydrolytic degradation and goes into solution within two weeks. It was also found that burst strength of the graft remain unaffected by hydrogel coating.

Controlled release of curcumin from non-degradable polymer matrices

Nanoparticulate curcumin loaded ethylene vinyl acetate (EVA) copolymer composite system is under development as a coating for coronary stent. Different concentrations of curcumin, ranging from 2.5% to 10%, were loaded in EVA matrix and studied the release profile over a period of three months. The presence of nanoparticles in the composite was confirmed by TEM. Composite materials were characterized for mechanical properties, dynamic mechanical properties, etc. and found that curcumin has a substantial influence on all these properties. Addition of curcumin and other additives had a tremendous influence of water absorption characteristics of the EVA matrix. These effects were studied in detail.

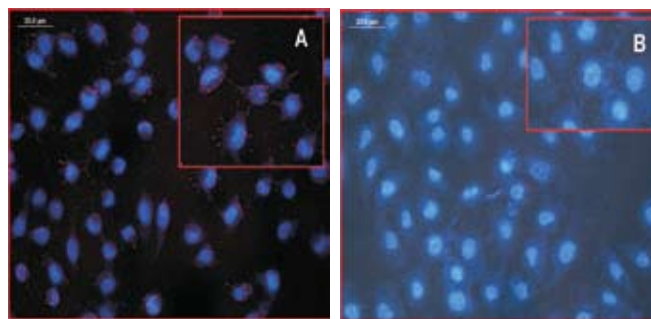
Laboratory for Polymer Analysis

The main focus in this year was on the design and development of novel methodologies based on nanomaterials for sensing and drug delivery applications. Attempts for the creation of smart visible light curable polymeric formulations, which could be removed from a site by temperature manipulations were made. Such systems are suitable for wound closure and antibacterial applications.

Simple, cost effective test systems in an easy to read out format for the detection of clinically relevant molecules to aid in diagnosis are in great demand. Such approaches are extremely important particularly in third world countries where high-tech diagnostics aids are inaccessible to bulk of the population. Simple procedures, which could be performed at home without the need for expensive instrumentation, can bring radical changes in health care

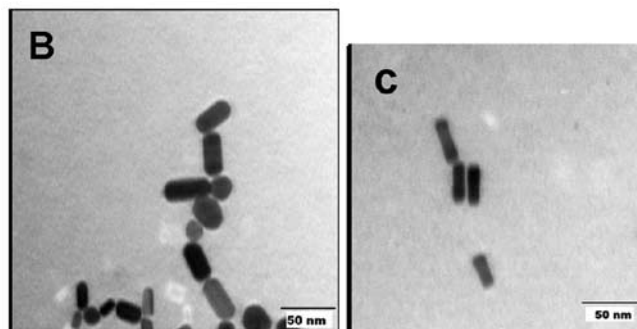
management. Visual detection of disease specific marker molecules in biological fluids such as urine, saliva, blood or tear is an attractive approach to address these issues. A colour change observable by naked eye in response to the concentration of an analyte can be an indication of a disease condition warranting further medical attention.

Dually functionalized gold nanoparticles to pick up glucose selectively from tear fluid were synthesized. The extent of binding of glucose was found to correlate with the increase in fluorescence of the functionalized nanoparticles with good sensitivity and selectivity. Highly fluorescent gold clusters were synthesized and used as nanosensors for the detection of copper ions in live cells.



Cells with gold clusters (red color). Red color vanishes from the cells in the presence of Cu ions

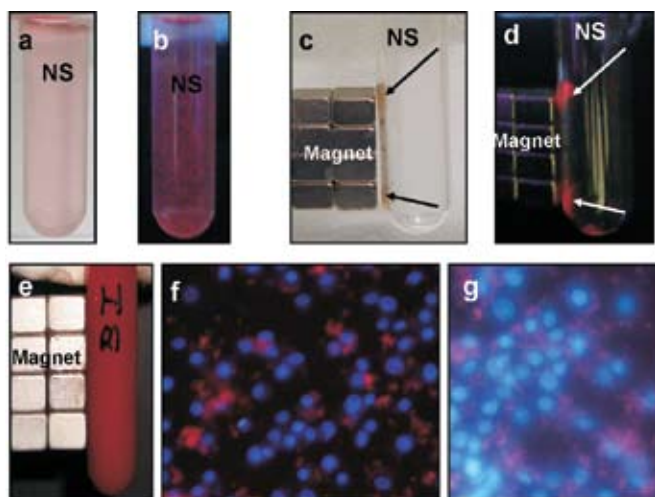
Novel methods were developed for the detection of toxic metal ions (Hg^{2+} and Pb^{2+}) and organic molecules such as aldehydes. Glutathione induced assembly of gold nanorods were used for the detection of Pb^{2+} . The linear assembly was found to disassemble by Pb^{2+} leading to a variation in the sizes and optical properties of the assembly.



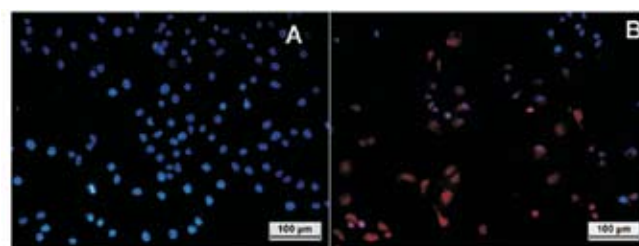
The chained rods (B) break in the presence of Pb^{2+} ions (C)

The recent interests of the colloidal chemists are in tuning the strategies to generate multifunctional nanocrystals. In particular, enhanced attention has been given in the

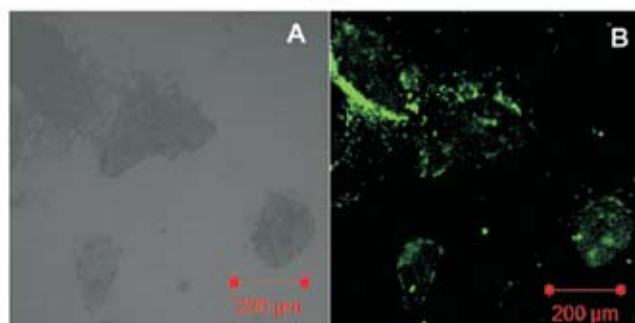
creation of hybrid nanomaterials by fusing quantum dots with superparamagnetic iron oxide nanoparticles (SPION). Such systems find wide application including cell sorting and separation. Biocompatible hybrid quantum clusters with dual features of fluorescence and superparamagnetism were synthesized and characterized. These hybrid probes were used for the selective removal of cancer cells from blood and also demonstrated magnetically controlled fluorescence patterning.



Figures f and g are the microscopic images (scale bar 20µm) of the cell lines separated from the normal saline and blood respectively using hybrid nanoprobe.



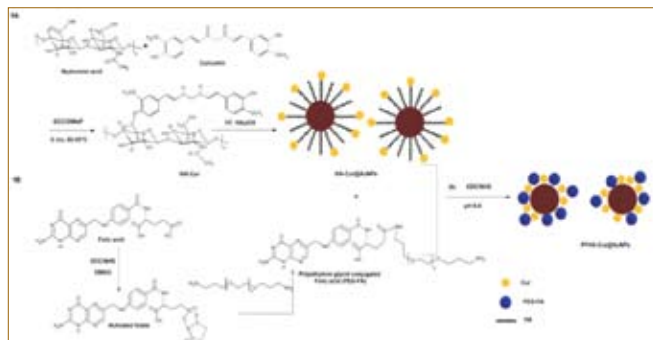
(b)



मल्टीफंक्शनल नैनोकणों के साथ रखते के बाद हेला कोशिकाओं की फ्लोरोसेन्ट सूक्ष्म आकृति (a) ह्यूसट 33342 द्वारा रंगित हेला सेल का न्यूक्लीयस (b) हेलासेल एवं नैनोपार्टिकल के जुड़ते से बनी आकृति (b) कॉन्फोकल सूक्ष्म फ्लोरोसेन्ट आकृति (सी ए सी ओ कोशिका)



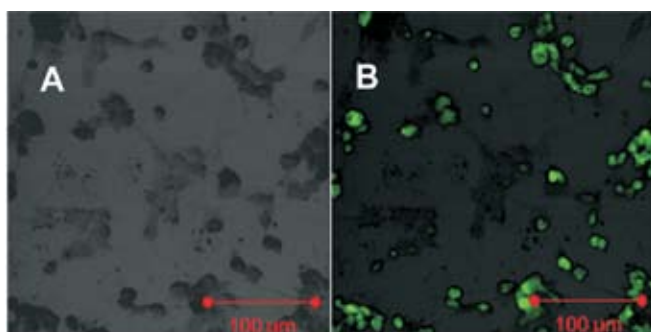
Cyclodextrin/folic acid conjugated Magnetic Nanoparticle (FCD@MNPs).



Folate conjugated HA-Curcumin gold nanoparticles

Targeting efficacy of HA-Cur AuNPs was assessed using HeLa cells. The confocal and fluorescence microscopic studies showed effective uptake of the particles by the cells.

Methotrexate conjugated HA-AuNPs for the selective targeting of cancer cells were developed and the results indicated internalization of the particles effectively.



The figure shows the uptake of the drug conjugated particles by the cells

We also initiated the synthesis and evaluation of biodegradable, photoluminescent polymers for drug delivery application with a view to address many of the drawbacks of organic fluorescent polymers and quantum dots. This kind of polymers possesses better biodegradability, cytocompatibility, clearance from the body and controllability over photoluminescence. A series of polymers were synthesized and characterized.

Polymer Division

Biodegradable polymeric hydrogel materials the amphiphilic PPF-PEG-PCL hydrogels were prepared and setting studies with N-VP and HEMA monomers were carried out. The swelling coefficient and crosslink density of the cured amphiphilic hydrogel based on PPF-PEG-PCL resin and HEMA were determined. Two component injectable hydrogel based on PPF-PEG-PCL resin, sodium alginate and N-VP monomer was also prepared.

Biodegradable polymeric composite materials for orthopaedic fixation devices A sheet-moulding compound with polypropylene fumarate- magnesium oxide was prepared. The effect of hydroxyl apatite and calcium carbonate on the complexation of polypropylene fumarate- magnesium oxide and setting properties of the sheet-moulding compound were studied.

Studies on radiopaque polymers for biomedical applications different radiopaque polyurethanes were prepared using chain extenders like trans-2,3-diiodo-2-butene-1,4-diol and bishydroxyethyl ether of iodinated bisphenol-A and characterized. The degradation in physiological fluids and mechanical properties were evaluated. The long-term biostability was evaluated under accelerated conditions. The polyurethane elastomer based on iodinated bishydroxy ethyl ether of bis-phenol-A

can induce reversible and adaptable surface properties in response to change in environment. The in vitro cytotoxicity, blood compatibility and in vivo toxicological studies were carried out and showed the material to be biocompatible.

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. Systems have been developed and the validation studies on these bioreactors have been completed.



Cartilage Bioreactor



Vascular graft Bioreactor

Biological Tissue Development : This program initiated by the Division of In vivo Models and Testing for the development of functionally characterised biological tissue for medical applications, in collaboration with the Kerala State Live Stock Development Board (KLDB). The division is supporting the program by way of carrying out mechanical characterisation and application development.

Implant Retrieval program: A program for implant retrieval analysis has been initiated by Division of Implant Biology to

analyse retrieved metallic implants for their failure modes and failure characteristics. The division is supporting the program by way of carrying out physicochemical characterisation of the retrieved implants.

The division is supporting the Department of Radiology in the standardization of event related fMRI technique for developing spike triggered fMRI. This program focuses on the activation of specific brain areas by providing cognitive or motor stimuli in synchrony with the MRI scan.

In-Vivo Models & Testing

Decellularised bovine pericardium was developed as part of a DBT funded project. Different surface modifications of this decellularised pericardium was attempted to improve the biological response such as reduced calcification, reduced immunogenicity and better tissue ingrowth and compatibility. The modifications tried were, PEG-PPG modification, 10K PEG modification and Dextran modifications. The above modifications were compared using in-vitro macrophage activation studies as well as by various animal models. Profound differences were noted among the groups in their biological response.

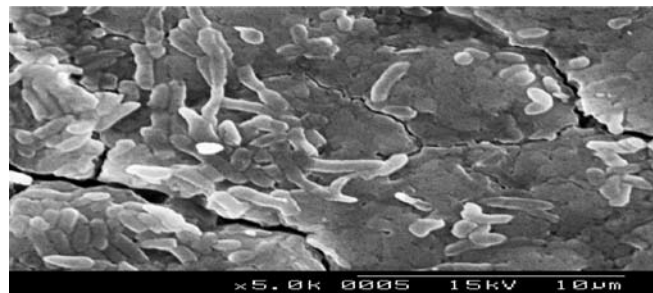
Microbiology

Microbial disease diagnostics, Microbial biofilm infections associated with the use of medical devices and tissue based and development of tissue engineered Hybrid artificial lung model for use as a testing modality for pollutants, drugs etc and understanding the trigonal interactions between biomaterial/ medical devices and pathogens continued to be the focus of the division.

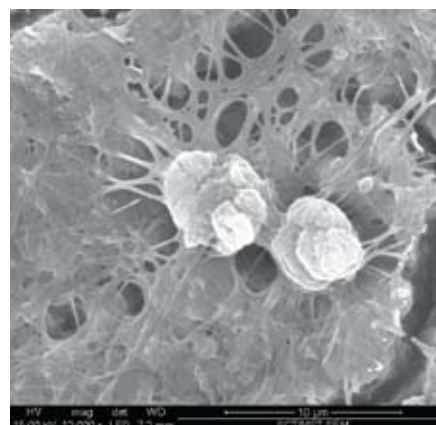
'Delineating mechanism of biofilm formation in urinary catheters: characterisation of role of E.coli secretory proteins and influence of environmental signals' funded by Kerala State council for Science Engineering technology & environment has been completed.

E.coli is the commonest cause of catheter associated urinary tract infection (CAUTI) and in majority of cases the first to colonise the catheter surface followed by others like Klebsiella, Proteus, Enterococcus, Pseudomonas, Enterobacter, Serratia, and Candida. In order to study the interactions of Foley catheter to E.coli and understand dynamics of biofilm formation three different biofilm reactors were designed with the help of Precision Fabrication Facility and were used to analyse biofilm formation on internal and external surface of Foley

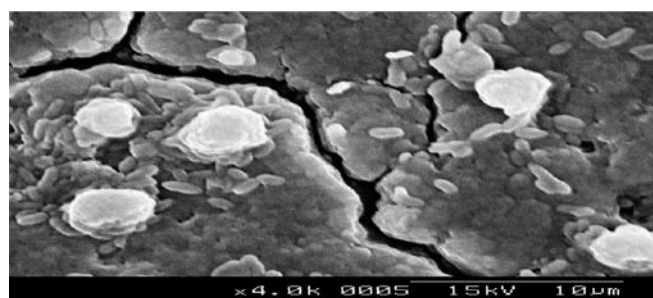
catheter. The modulation of Biofilm specific genes was analyzed by qRT-PCR under nutrient limiting conditions and in the presence of antibiotics like gentamicin. Further to understand immune evasion and mechanism of prevalence of biofilms on catheters in vivo and the interaction of catheters, E.coli biofilms and peripheral blood mononuclear cells were studied.



SEM of E.coli biofilm on Foley urinary catheter



SEM of Peripheral Blood mononuclear cells (PBMC) attaching onto Foley catheter



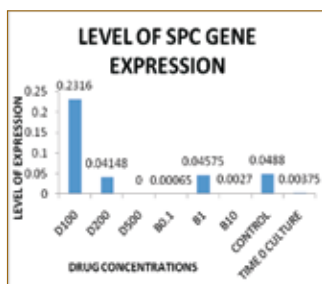
SEM of PBMC interaction with E.coli biofilm on Foley catheter

'Tissue engineered hybrid artificial lung model for testing pollutants and drugs' funded by Department of Biotechnology, Govt. of India also completed.

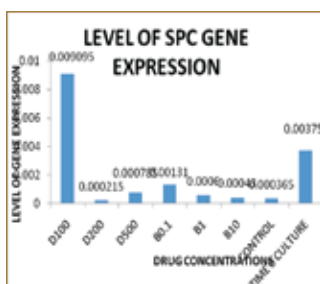


Minucell system used to develop the dynamic culture condition for Hybrid artificial lung model.

Several scaffolds were tested for suitability to support different lung cell types in the development of Hybrid artificial lung model. The chief lung cell types tested included alveolar epithelial cells Type I & II, pneumocytes and the fibroblasts. Of these, the one that proved most suitable as a system for testing pollutants and drugs. For this, these systems were exposed to drugs like dexamethasone and Bleomycin and surfactant protein expressions were analysed by qRT-PCR and fluorescent microscopic studies. Surfactant proteins in the lungs have multitude of functions of which the most important is lowering of surface tension at the air-liquid interphase during each expiration – inspiration cycle to facilitate respiration.



SPC mRNA expression on day 2 of culture on challenge with Bleomycin and dexamethasone.



SPC mRNA expression on day 8 of culture on challenge with Bleomycin and dexamethasone.

The expression level of each mRNA was normalized to that of GAPDH [Δ CT], a housekeeping gene, using the mathematical expression $C(t)$ of housekeeping gene – $C(t)$ of gene of interest, to obtain the Δ CT value.

Epithelial-mesenchymal interactions in Tissue engineered hybrid artificial lung - role of angiogenic factors Epithelial-mesenchymal conversions (EMC) in organs are critical in the repair process and also in disease pathologies. Three-dimensional models developed using suitable scaffolds are being used to study EMC conversion in the lung to understand mechanism of fibrosis in the lung.

Molecular medicine

Neuronal regeneration - Regeneration of central nervous system (CNS) neurons after injury is very limited, compared to peripheral nervous system. This is mainly due to various glial inhibitory factors including NOGO, NI-35, MAG, Omgp, Ephrin B3, Semaphorin 3A and 4D, and lack of growth factors within the injured site. It has been hypothesized that a slow release of growth factors and inhibiting NOGO could help the injured neurons to recover from damage to a some extent. To test this hypothesis, we have developed a sodium alginate based porous scaffold having recombinant transformation growth factor alpha (TGF α) protein. TGF α has shown to induce axonal sprouting and growth. To help guided axonal growth we have modified the sodium alginate polymerization and porosity, having parallel micro channels, using copper as the polymerizing cation. PC-12 cells, a neuronal cell model, were able to attach over the biopolymer coated with chitosan. The channels help in aligning the axonal growth in a predefined direction. We are currently modeling scaffolds for controlled release of TGF α .

Axonal growth dynamics has been studied to understand changes actin-tubulin polymerization levels as well as how the synaptic vesicles are migrated along with the new axon and develops an active zone for neuronal communication. This information is critical to find whether regenerated axons could be functionally stable. Besides, sprouting of axons provide an excellent opportunity to study how various synaptic proteins are migrated. Fluorescently labeled synaptotagmin, syntaxin and SNAP-25 were used as a marker protein to visualize the protein migration in living primary neurons and PC12 cells.

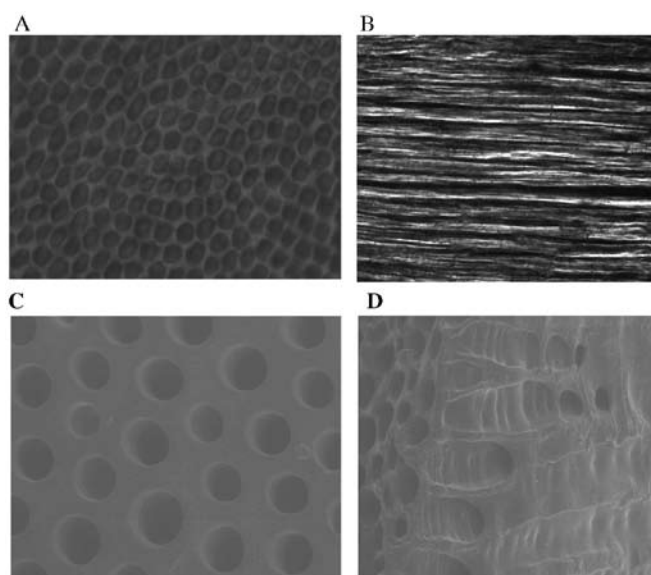


Figure: A, Sodium alginate scaffold with porous surface (20X). B, vertical section of the scaffold showing parallel grooves (20X). Electron micrograph of the scaffold showing the surface pores (C) and the parallel grooves in the vertical section (D); 400X

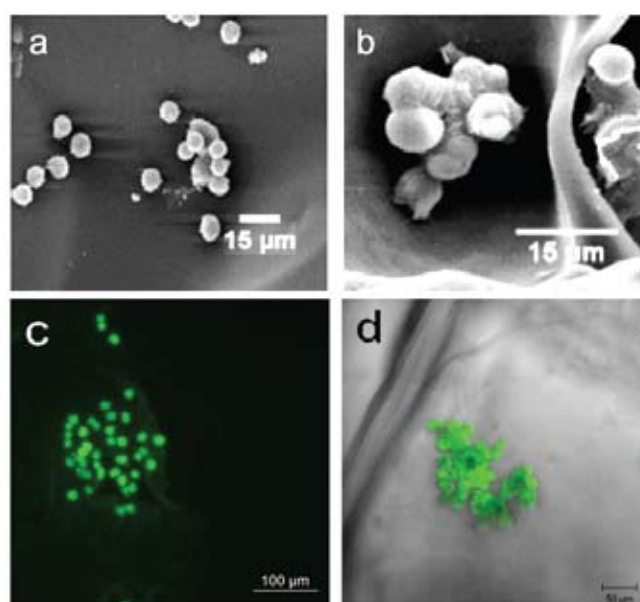
Development of recombinant proteins - Recombinant proteins have the advantage of designing and isolating functionally active proteins in a larger quantity without depending on a tissue/animal source. Two growth factors, which are critical in accelerated wound healing, TGF and VEGF were cloned and expressed in a eukaryotic system. These proteins were isolated in large quantities and purified using affinity column chromatography. Functional assays including wound healing and formation of vasculatures were undertaken to characterize the growth factors.

Tissue Culture Laboratory

The tissue culture laboratory has two major long term research area in the field of tissue engineering and regenerative medicine, viz., Ocular Surface Regeneration and Liver Tissue Engineering.

Ocular Surface Regeneration: 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 evolution 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 invitro 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, invitro culture conditions and characterization of cells is being conducted.



Cell adhesion on gum arabic aldehyde-gelatin scaffold
a. L929 cells and b. HepG2 cells on scaffold observed under SEM
FDA staining shows live c. L929 cells and d. HepG2 cells on scaffold

The laboratory addresses ocular surface regeneration by developing bioengineered living substitutes for the repair or restoration of corneal damage. The limitations of conventional methods such as cell retrieval and subsequent growth on scaffolds can be addressed by creating cell sheet constructs using temperature responsive culture surface. Several formulations of thermoresponsive copolymers based on N-isopropylacrylamide were synthesized. Cells adhere, spread and proliferate on thermoresponsive culture surface and spontaneously lift up retaining the newly deposited extracellular matrix from the surface when incubated below its lower critical solution temperature. Rabbit limbal stem cells were successfully cultured on NGMA polymer that expressed stem cell markers such as

p63 and ABCG2. The corneal construct also expressed intact tissue architecture and cell–cell contact with epithelial and differentiated corneal characters. The pre-clinical evaluation of bioengineered corneal cell sheet in rabbit limbal stem cell deficiency model showed the feasibility of using NGMA as a substrate for generating corneal cell sheet for ocular surface regeneration.

Ocular cell surface disorders are handled by transplantation of cultured corneal epithelial cells obtained from healthy eye for unilateral cases or from allogenic tissue in the case of bilateral condition. Both methods have major disadvantage as the unavailability of donor cells. An alternate source for corneal epithelial cells could serve as a potential treatment regimen for congenital and/or acquired ocular surface disease. Hence rabbit MSCs were differentiated into corneal epithelial cells in vitro by simulating corneal niche factors.

Liver tissue engineering research falls under two categories - fabrication of a prototype bioreactor for bioartificial liver and to find alternate cell source for hepatocytes. The fabrication of bioreactor prototype is progressing by collaborating with Device Testing Lab. The design modification and in vitro cell culture inside the module is being evaluated using primary hepatocytes. To identify a stem cell source for hepatocytes, mesenchymal stem cells (MSCs) of rat bone marrow were differentiated to hepatocyte lineage.

Tissue culture laboratory carried out other short term research projects such as cell culture under microgravity and alternate stem cell source for corneal lineage. Rotating wall bioreactor is used to simulate microgravity with low shear force and high-mass transfer to enable cells to self-assemble into functional tissues.

Toxicology

Toxicology division is a premier laboratory in the country in the field of biomaterial toxicology, and has a full-fledged facility for the **pre-clinical evaluation of various materials and medical devices** as per International Standards such as ISO, USP and ASTM. The main aim of the division is the toxicity evaluation of materials, intended for the fabrication of medical devices and to investigate the potential biological hazards by careful observation for unexpected adverse reactions or events in humans during clinical use of the medical device.

Evaluation of molecular toxicity of newly developed materials intended for biomedical applications - The objective of this 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 expected outcome of the project will be 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.

Evaluation of haematological and cytokine release from cryopreserved blood in response to lipopolysaccharide - The result of study indicated that the cryopreserved blood especially from multiple donors (screened and pooled) can be used as an alternative to the existing fresh human whole blood after validation. This will definitely help to provide a continuous supply of blood with non allergic and pathogen free conditions and will be readily available to the various segments of health care industries for evaluating the in vitro pyrogenicity using ELISA method.

Development of National GLP Guidelines & Identification and selection of National Regulatory Guidelines for Testing and Evaluation of Medical Devices - A Road map for this has been made and drafting of the guidelines in ongoing.

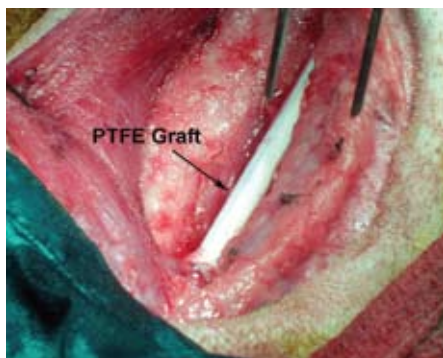
New technique/methods were established and routinely doing for different projects;

1. Calverial defects, segmental defects and bone cartilage (knee joint) implantation
2. Isolation of DNA and identification of DNA damage from whole blood and tissues using HPLC method.
3. In vitro human lymphocyte culture for chromosomal and micronucleus studies
4. Immunotoxicological studies using T and B lymphocyte proliferation assay (completed).
5. Immunotoxicological studies using splenocytes (ongoing).

Thrombosis Research Unit

Tissue engineered vascular graft program progressed to experimental surgery in sheep carotid artery to test efficacy of the graft. This is a major program with 4 co-investigators and each group has successfully completed

major part of the objectives. The final phase of the project is experimental surgery in large animals, which has been implanted in few animals. No animal is sacrificed yet but grafts are found to be patent so far as per the Doppler measurements.



Implanted PTFE graft. Image taken immediately after taking the clamp off.

Silver nanoparticles (SNP) as an antiplatelet agent to be used in cardiovascular implants were evaluated. It was found that low amounts of SNP induce strong inhibition of platelet function in response to all physiological agonists tested. It also inhibited cyclo oxygenase pathway as demonstrated by malonaldehyde (MDA) measurement. When SNP was incorporated with polymer and the mixture was coated on metal device surface, platelet adhesion to the surface was inhibited completely. Thus controlled quantities of SNP are found to be beneficial if used as antimicrobial, anti platelet and are yet non toxic to cells around the implant.

Neural regeneration program focused on isolation of olfactory ensheathing cell (OEC) and bone marrow derived MSC from rats, standardization of culture conditions to expand cell number and their in vitro trans differentiation for neural regeneration. Culture matrix proven in vitro may be useful for cell transplantation. Spinal cord injury (SCI) model was developed and experiment was standardized for testing transplantation of in vitro expanded OECs. Concept of cell delivery on a matrix composition standardized in-house for neural cell growth was tested and found to be effective using the model. More number of transplanted cells survived when they were delivered with the composed matrix.

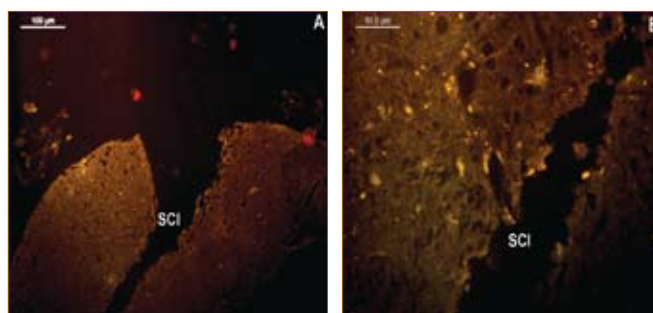


Fig 2 A & B. During in vitro culture OECs were fed with BrdU. One week after transplantation tissue was analyzed after immunostaining the sections for BrdU. In A, site of SCI transplanted with cells in culture medium: B, site where cells in standardized matrix was transplanted. Green fluorescence indicates the presence of transplanted cells

Purification of "Actinokinase" from crude protein supplied by Agharkar Research Institute Pune was achieved. Evaluation of its fibrinolytic activity in vitro using fibrin clots showed that the enzyme is as potent as urokinase and is nonhemolytic and cleaves fibrin clot specifically with out any adverse effect on plasma proteins.

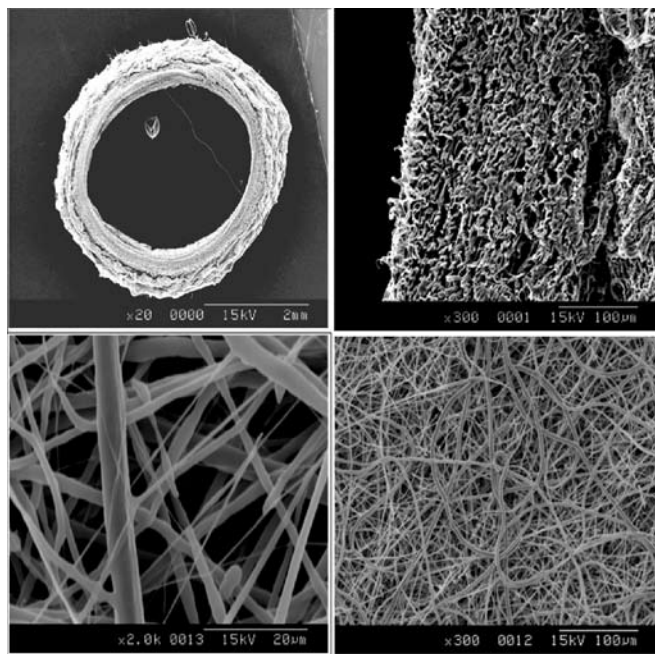
Tissue Engineering & Regenerative Medicine

The Centre of excellence in Tissue engineering (COE) program of the DBT - the first phase of 3 years was completed and involved addressing the issues of cartilage, bone, hepatocyte tissue engineering by the laboratories DTERT, TIC and TEM. The research was well appreciated by DBT Task Force and extension accorded to the research programs for an additional 2 years. The highlights are:-

- Bioreactors for TE of liver and cartilage tissue engineering were 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- polymers, bioceramics and injectable and photopolymerisable gels as well as composites have been prepared for the 4 programs on cartilage, bone and liver and which have additional uses in programs such as small diameter vascular graft, lung, skin etc.
- Honeycomb structured polymer membranes using breath figure technique were fabricated under different conditions of temperature and humidity.

- Animal models for disease and standard implantation methods are being developed as part of core activity and in individual projects.
- One international conference and some international academic exchanges were conducted by the P.Is from the current grant and allied grants
- Early leads to clinical translation and commercialisation are obtained
- 5 PhD students are being trained in specific parts of the program.
- Industry Reliance Life sciences have signed an NDA and MTA for use of some of our scaffolds- PVA-PCL and electrospun materials for collaborative activity in some of their ongoing programs with the ultimate goal of technology transfer

Cartilage tissue engineering program - Differentiation of RA_{MSC} (rabbit adipose stem cells) to chondrocytes on 3D scaffold (PVA-PCL) and study the effect of IGF1, TGF 3, BMP2 (individual and in combination) supplementation for 28 day under static and dynamic conditions initiated. Bilayered osteochondral scaffolds were prepared and dynamic culture for cartilage using various mesenchymal stem cells carried out.



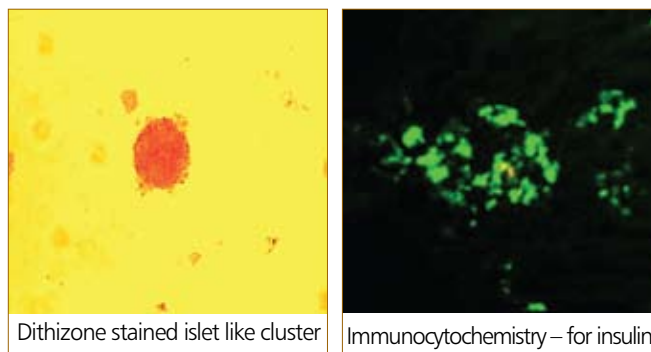
Some electrospun structures

Islet Immuno Isolation with XenoTransplantation and Stem Cell Regeneration to Islets as Strategies for Treatment of Diabetes

Our goals have been to practice multiple strategies for treatment of diabetes without immunosuppression, namely

1. Immunoisolation – that allows for allo/xeno transplantation
2. Stem cell differentiation toward pancreas regeneration

Pancreatic progenitor (PP) stem cells were transdifferentiate to insulin producing cells on 3D scaffold (2 scaffolds). The comparative in vivo experiments of PP cells in macrocapsules, PP on scaffold in microcapsule to assess their potential for reversing diabetes indicate that cells on scaffold and further in macrocapsules performed better. Human adipose stem cell were also isolated and characterised and their differentiation to islets was standardised



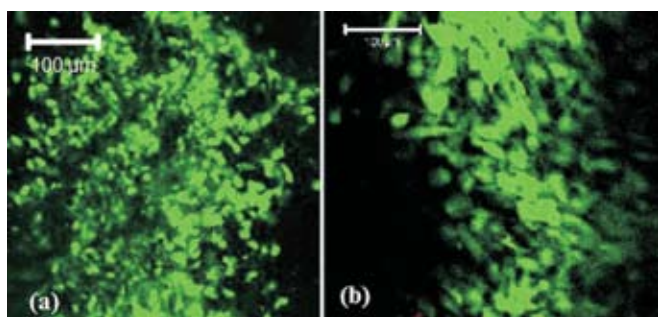
There was increased insulin production of islet like cells derived from adipose stem cells on a 3D scaffold in comparison to that on 2D plates. Further work is ongoing toward translation to larger animal models and therapeutic usages.

Lung tissue engineering, which is a collaborative effort with Department of Microbiology, BMT Wing, -- porous scaffolds and electrospun materials for growing lung cells, were supplied. A new project on epithelial cell mesenchymal interactions and a role of angiogenesis was also sanctioned by DBT and a plasma polymerisation facility was added to DTERT under this program.

Ongoing lab program of **Biopolymer Composites for medical applications** - Several biopolymer injectable and fast setting and biodegradable gels were prepared.

The gels were non-cytotoxic and some of the gels were useful for encapsulation of living cells and others could be modified to form scaffold within which cells could be seeded and grown. Mesenchymal stem cells of different origins could also be grown and differentiated to adult cell types on these scaffolds.

Tissue Engineered vascular graft – an elastic small-diameter vessel wall (4 mm in diameter) with improved biomechanical strength could be engineered by in vitro culture of rat aortic SMCs on a novel 3-dimensional biohybrid scaffold, using dynamic mechanical stimulation. The cells maintained their contractile smooth muscle phenotype and secreted the appropriate ECM moieties. Thus the scaffold material could be useful for the development of a fully functional tissue engineered small diameter vascular graft.



Viable smooth muscle cells within scaffold



Tissue engineered vascular construct

Quality Management Systems, Testing & Technical Services

Quality Systems

Calibration Cell addresses the equipment calibration, maintaining traceability in measurements, reference material requirements and coordination of inter laboratory comparisons of the BMT Wing. During 2010-11 period, the

Cell carried out 300 calibrations for internal customers and 25 calibrations to healthcare industries and clinical laboratories. About 60% of the calibrations were under the scope of NABL accreditation.

LIST OF ACCREDITED TESTS

No	Name of Test	Reference
	Animal skin irritation test	ISO 10993-10: 6.3
	Intracutaneous reactivity test	ISO 10993-10 B-2/ USP 28(88)
	Test for local effects after implantation: implantation in subcutaneous tissue implantation in muscles and in bone(s)	ISO 10993-6: 4, 5, 6
	Acute systemic toxicity: acute intravenous application	ISO 10993-11: 6.5.4/ USP 28(88)
	Acute systemic toxicity: acute intraperitoneal application	ISO 10993-11: 6.5.5/ USP 28(88)
	Standard practice for assessment of haemolytic properties of material	ISO 10993-4 ASTM 756
	Maximisation test for delayed hypersensitivity	ISO 10993-10: 7.4
	Closed patch test for delayed hypersensitivity	ISO 10993-10: 7.5
	Penile irritation test	ISO 10993-10 B-5
	Vaginal irritation test	ISO 10993-10: B-7
	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)
	Medical-surgical material. Medical devices and materials biocompatibility. Extraction methods	ISO 10993-12
	Standardised method for extraction of medical plastics	ASTM F 619-03
	Invivo test for genotoxicity-- Micronuclei test	ISO 10993-3: 4.4.2/ OECD n° 474
	Invivo test for genotoxicity -Metaphase analysis in rodent bone marrow	ISO 10993-3: 4.4.2/ OECD n° 475
	Invitro test for genotoxicity- carcinogenicity and reproductive toxicity	ISO 10993-3: 4.4 / OECD n° 471
	Sterility test to check particularly the date of “end of use” of the product - Medical device	USP 28(71)
	Partial thromboplastin time (PTT)	ISO 10993-4
	Fibrinogen Assay	ISO 10993-4
	Prothrombin Time (PT)	ISO 10993-4
	Quantification of platelet aggregates	ISO 10993-4
	Compliment Activation test	ISO 10993-4 B.6
	Haematology- Leucocyte Count	ISO 10993-4 C.6.1.2.1

No	Name of Test	Reference
	Leucocyte adhesion on materials- Light microscopy	ISO 10993-4 , Table 3 &4-B2.7
	Tests for in vitro cytotoxicity	ISO 10993-5
	Estimation of ATP in Red Cell & Platelets	ISO 10993-4 C.6.2
	Estimation of 2, 3-DPG in Red Cell concentrate	ISO 10993-4 C.6.2
	Estimation of Plasma Glucose	ISO 10993-4 C.6.2
	Estimation of Plasma Lactate	ISO 10993-4 C.6.2
	Estimation of Plasma Potassium	ISO 10993-4 C.6.2
	Estimation of Plasma Sodium	ISO 10993-4 C.6.2

Quality Cell

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

Following are the major activities of the quality cell

- a. Quality Manual was revised w.e.f 01.03.2011 including changes required for implementing ISO 9001 & ISO 13485. It was renamed QMBMT001 (Old QMQUC001) with Issue No. 007 and revision number 000.
- All common system procedures have been renamed to SPBMT series incorporating the changes needed for ISO 9001 & ISO 13485 implementation.
- b. COFRAC surveillance assessment was carried out on January 10th & 11th 2011. There were seven non conformances reported.
- c. Training: The following training programmes were organised by Quality Cell
 - ISO/IEC 17025:2005 Quality Management System & Internal Auditor training for three personnel were arranged from 3rd -6th January, 2011 at Centre for Electronics test Engineering, Bangalore..
- d. NABL Assessment
 - NABL assessment- was conducted on 17th & 18th January, 2011 at Calibration Cell. There were 8 non-conformities observed during the audit. Corrective actions have been taken on these and has been reported to NABL

e. Management review

- A Management Review Committee meeting was held on 07th July 2010.
- Two Technical Management Committee meetings were held on 24th May 2010 and 29th November 2010.

f. Internal Audits carried out:

- (i) 06th -18th May 2010. Total of 34 Non-conformities reported.
- (ii) 08th – 16th November 2010. Total of 30 Non-conformities reported.

g. Document initiated/revised

- System Procedures: 14 procedures were also revised
- 15 new common system procedures were introduced.
- Work Procedures: 119 Nos
- Quality related forms: 38 Nos of forms were revised.

h. Corrective/ preventive actions/ Accident reports.

- A total of 37 CAR's were generated in this period by different laboratories
- Three preventive actions were raised this year.
- Six accidents were reported and appropriate corrective actions were taken to prevent recurrence.

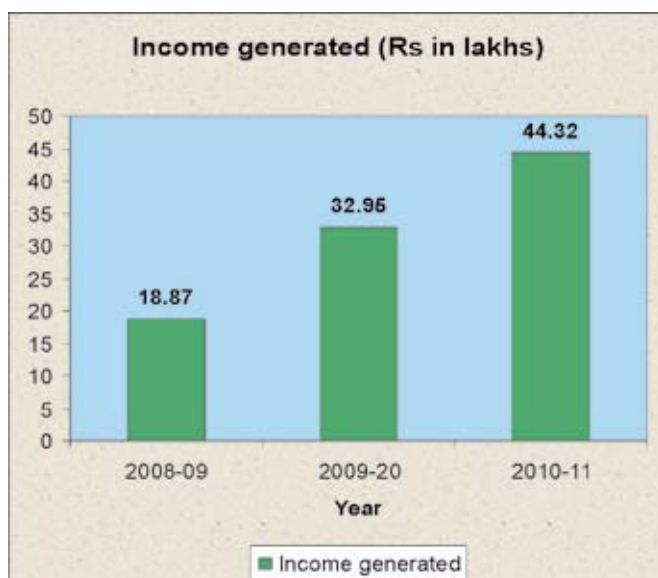
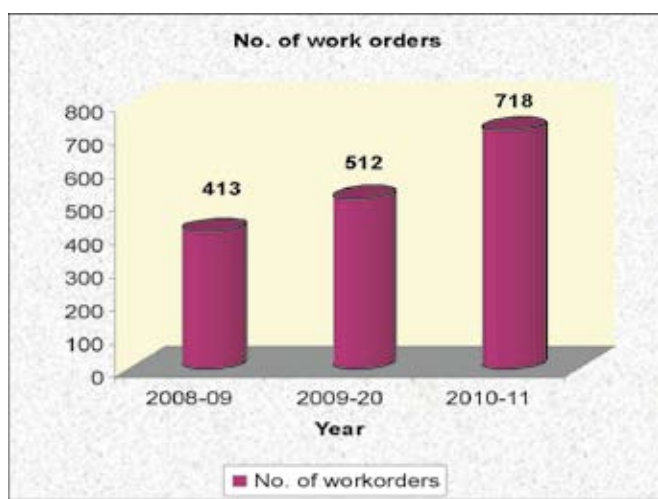
TESTING SERVICES

Customer Service Cell- Testing & Evaluation Activity

The Customer Service Cell continued its activities by offering testing services for medical devices and biomaterials to the external customers especially the medical device industry. The year saw a substantial increase in external work-orders.

Description	External			Internal		
	2008-09	2009-10	2010-11	2008-09	2009-10	2010-11
Work orders	400	512	718	388	413	304
No. of test materials handled	1380	2060	3278	1627	1523	1144
Income (Rs)	18,87,300	32,95,378	44,32,572	20,22,000	19,96,495	21,36,875

The testing services had 15 new industrial customers this year.



Study based device evaluation services

Study based requests are ongoing for biofunctional and pharmacokinetic evaluations for stents, evaluation of mechanical heart valve, evaluation of storage efficiency of blood bags, genotoxicity studies etc. The budget for the various studies was Rs 20.91 lakhs.

SUMMARY OF TESTING SERVICES OFFERED BY VARIOUS LABORATORIES

Bioceramics

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

1. X-Ray Powder Diffraction

2. Scanning Electron Microscopy, Environmental Scanning electron Microscopy and EDS analysis.
3. Inductively coupled plasma Emission Spectroscopy for elemental analysis

Dental Products

The lab continued to generate good revenue by extending the services of equipments such as micro CT, FT-Raman spectrometer, thermocycler and UTM to internal and external customers throughout the year. Already around 4.5 lakhs have been generated by our lab through testing services alone this year.

Device Tesing Lab

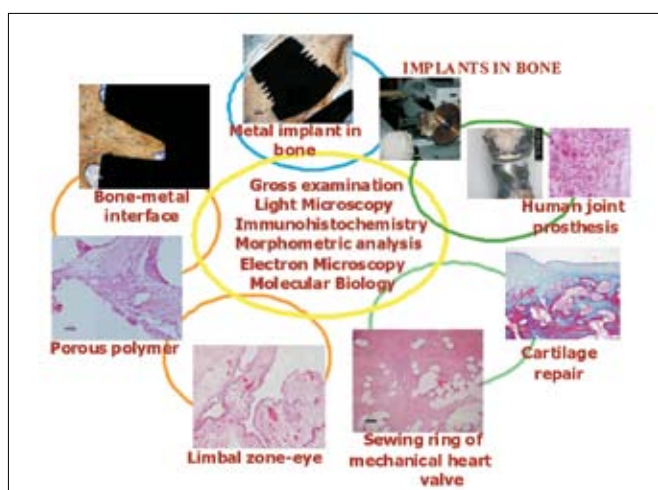
Five accelerated ageing studies on various medical devices were completed and Two new studies taken up during the year.

Experimental Pathology

- Converted the present free-service system to a payment-mode, through the Customer Service Cell
- Initiated training on Histotechnology

Histopathology laboratory

The laboratory is unique in the country as a histopathology laboratory having facilities to undertake routine as well as a wide range of specialized techniques for evaluation of biocompatibility of various materials as per International standards and pre-clinical evaluation of medical devices as per approved protocols. The laboratory is well equipped for evaluation in soft and hard undecalcified tissues, with and without materials. A record number of samples for evaluation of biocompatibility as per ISO 10993-6 and large study based requests for evaluation in pre-clinical studies from both Indian Industry and research groups were received. These included studies on bare and drug coated stents, heart valves and surface modified bone implants. Student based studies from National Institutes and histopathological studies on cartilage constructs, decellularised tissue as aortic patches and corneal substitutes were also carried out.



In Vivo Models & Testing

- Preclinical evaluation of decellularised bovine pericardium in pig model: This testing was done as part of a DBT projects 'Development of decellularised animal tissue for cardiovascular application'. This work is completed.
- Biofunctional evaluation of SUN drug eluting coronary stent in porcine coronary artery model: Part A animal study: This is an Industry sponsored project where a drug eluting stent is evaluated in Porcine coronary artery model for its probable safety and efficacy. Attempts are made in this study to meet GLP requirements. Project is ongoing.
- Evaluation of sewing ring modified mechanical heart valve in pig orthotopic model: is an externally sponsored project where a modified mechanical heart valve is studied for its improvements in tissue and thrombotic response in pig orthotopic implantation model. The implantations in the project are over.
- In vivo evaluation of left ventricular assist device: This project is sponsored by VSSC. The centrifugal pump developed by VSSC is tested in pig model by LA to descending aorta and LV to descending aorta profile. The pump was tested up to 6 hours successfully. This [project is ongoing.
- Animal evaluation of tissue engineered small diameter vascular graft: 4mm TE graft developed in house was tested in sheep carotid artery model. This project is ongoing.

Microbiology

The Division continued the implementation and maintenance of quality system as per ISO 17025. As in the previous years a number of tests conforming to ISO 10993 and USP as per table below were extended to both external and internal customers.

Tests done in 2010

SI No	NAME OF TEST	Number of requests [number of samples]
	Sterility Test	80[95]
	Air monitoring	36[99]
	Water Analysis	20[43]
	Spore Viability Test	18[18]
	Anti microbial activity testing	6[16]
	Culture/ Staining	16[28]
	Ames Test	4[4]
	Growth Promotion Study in Media Validation	2[7]

Polymer Analysis

As in pervious years, considerable efforts were expended to maintain the quality system in the laboratory. The laboratory generated good revenue during this period by extending its analytical facilities to external organizations. Almost all groups in the Biomedical Technology Wing also used the service of the laboratory.

Polymer processing

The laboratory offers testing services such as mechanical testing, dynamic mechanical analysis and impact testing to external and internal customers. Among these mechanical testing service is offered almost on a routine basis. About 130 external samples were tested and 37 external test reports were prepared during the year.

Tissue culture laboratory

The quality system was maintained as per ISO 17025 in the tissue culture laboratory. Surveillance by the French team evaluated the conformity to the quality requirement. Around 166 test samples were evaluated for cytotoxicity and cytocompatibility.

Thrombosis Research Unit

- Evaluations of blood bags and platelet bags (3 manufacturers) for effect of storage on stability of

various components were carried out. This involved standardization and introduction of several new tests, identification of rare reagents etc. to meet the regulatory/standard requirements.

- Evaluations of coronary stent for in vitro blood compatibility for various manufacturers were carried out.
- Evaluations of drug eluting stents (DES) for efficacy of the eluted drug for inducing apoptosis/necrosis in in vitro cultures of smooth muscle cells and endothelial cells were carried out.
- New tests (biochemical assays) were presented for COFRAC scope which underwent evaluation and thus 4 tests more were included in the list of accredited tests.
- Study was completed for post transfusion recovery of stored RBC using ⁵¹Cr labelling technique in rabbit model. This was a new study design which was done successfully for evaluation of PVC bags manufactured by the industry.
- Many varied requirements of the customers from industry and academia were reviewed and required suggestions/discussions resulted in educating them on various aspects of blood compatibility.

Tissue engineering & Regeneration technologies

Contact angle analysis facility was extended to faculty of other labs and external labs such as NIIST, NPOL etc. Extended UV and Fluorescence spectrophotometer, inverted and upright fluorescence microscopes, lyophiliser, viscometer, gel doc, rotovacs etc facilities of lab to members of many labs on campus – free complimentary basis. Extended electrospinning help with polymer samples to some labs within campus and to some investigators elsewhere- Reliance, CMC Vellore, ANSA Bangalore.

Toxicology

Toxicity testing (April 2010 to March 2011)

No	Name of test	No of samples
Accredited tests		
1	Closed patch test for delayed hypersensitivity	10
2	Maximization test for delayed hypersensitivity	10
3	Intracutaneous Test	11

4	Acute systemic toxicity test	18
5	Test for local effects after Implantation in muscle	02
6	Pyrogen Test	07
7	Vaginal irritation Test	1
8	Penile irritation	1
9	In vivo Mammalian chromosomal Aberration test	3
10	In vivo Mammalian erythrocyte micronucleus test	3
12	Test for local effects after implantation in subcutaneous tissue	2
13	Bone Implantation	3
14	Animal skin irritation Test	13
Non accredited Tests		
1	Haemolysis	2
2	In Vitro Pyrogen (LAL test)	14

COLLABORATIVE WORK

Knee joint implantation DTERT	20 Rabbits
Explantation of islet's capsule DTERT	2 Rats
Bleeding of Guinea pigs and injection in mice	15 Guinea pigs & 14 Mice
Calvareal defect for TEM	22 Rats
Chronic toxicity GLP Study	90 Rats
Sub Chronic toxicity GLP Study	40Rats
Long term Implantation GLP study	36 Rabbits

PROJECT STUDY

Intramuscular Implantation (ICMR Project 8018)	14 Rats
Implantation in Bone (ICMR Project 8018)	19 Rabbits
Implantation in subcutaneous tissue(ICMR Project 8018)	30 Rats
Wound healing study for BST	10 Rabbits

WATER ANALYSIS

Physico Chemical Analysis of Potable Water for various Divisions	33 Samples.
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GLP STUDIES

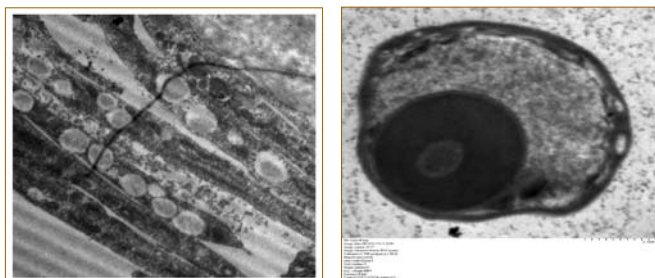
No	Title
1	Evaluation of Chronic toxicity (12 months) by intraperitoneal implantation of degradable Polycaprolactone (PCL) based scaffold in wistar rats
2	90 day sub-chronic toxicity by intraperitoneal implantation of degradable Polycaprolactone (PCL) based scaffold in wistar rats
3.	Evaluation of long term biocompatibility of degradable Polycaprolactone (PCL) based scaffold in albino rabbits

4	Chromosomal aberration study of P.Saline extract of ECSIL
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
8	Mammalian erythrocyte Micronucleus test of UHMWPE
9	Mammalian Bone marrow chromosome aberration UHMWPE

Transmission Electron Microscopy

Samples for analyses are received from research students

- ❖ Biological Samples received and prepared (fixed, embedded, sectioned, stained and photographed) for evaluation under Transmission Electron microscopy (TEM).
- ❖ Inorganic samples - analyzed and photographed under TEM.



Transmission Electron Micrographs of (Fig 1) crab sperm. (Fig 2) induced rat adipose - derived mesenchymal stem cells showing lipid globular structures within the cell.

TECHNICAL SERVICES

Laboratory Animal Science

Quality research animals are supplied for testing and research. In-house animal care and management is based on CPCSEA guidelines and ISO-10993 Part-2 Guidelines.

Library

The BMT Wing Library has a collection of 10572 books and 5498 back volumes of journals and subscribes to 60 journals. The collection includes 2235 standards specifications and 275 patent specifications. Electronic access to most of the journals which we subscribe in print format 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, ASTM and Indian Standards, ISI Web of Knowledge, Delphion Patents Database, etc.

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

As a part of support to the Quality Systems, the library updates all relevant national and international standards and maintains an archival cell for storing documents related to Quality Systems. The working hours of the library has been extended to 7.30 PM on weekdays.

Precision Fabrication facility

Nearly 83 work orders were executed during the year 2010-11 relating to fabrication, machining and designing of Jigs & Fixtures, mould making, prototype component machining for the various projects and for other department R&D activities.

Work orders were executed for the major programs of the wing like the hemispherical cap for the endoscopy project, coupler components for package validation, machining of UHMW control sample, acrylic centrifugal blood pump fixtures, blood pump bottom bearing, precision components for the bioreactors developed in the wing, graft coating fixtures, compaction die for hemolysis and implantation test, etc.

BIOMEDICAL TECHNOLOGY WING 2010-11

Dr. G. S. Bhuvaneshwar, MS, PhD
Head, BMT Wing
Dr. Chandra P. Sharma, FBSE
Associate Head, BMT Wing (till 15th October 2010)
Dr. Mira Mohanty, MD. Pathology
Associate Head, BMT Wing (from 16th October 2010 till date)

Artificial Organs

Dr. G. S. Bhuvaneshwar, M.S., Ph.D.
Leader, DAO & Head, BMT Wing

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

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

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

Mr. Sujesh Sreedharan, ME
Engineer C

Mr. V. Arun Anirudhan, B.Tech.
Engineer C

Mr. M. K. Sajithlal, B.Tech.
Engineer B

Mr. G. Renjith, B.Tech.
Engineer B

Mr. C.V. Muraleedharan, Dip in Mech. Engg
Scientific Assistant

Mr. A. Rajeev, B.Tech
Technical Assistant-B

Mr. S. L. Sreekanth, B.Tech
Technical Assistant

Bioceramics and SEM Laboratory

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

Dr. Manoj Komath, PhD
Scientist E

Mr. R. Sreekumar, BSc
Junior Scientific Officer

Mr. S. Vijayan, MSc
Junior Scientific Officer

Mr. S. Suresh Babu, M.Sc
Scientific Assistant A

Biosurface Technology Division

Dr. Chandra P. Sharma, MTech, MS, DSc, MEBE, F.B.S.E
Senior Scientist G

Dr. M. R. Rekha, PhD
Scientist C

Mr. Willi Paul, MSc
Junior Scientific Officer

Calibration Cell

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

Mrs. Leena Joseph, BTech
Engineer C

Mr. Armugham V, Dip. Elec. Engg.
Scientific Assistant

Mr. Rajesh R.P, BTech
Scientific Assistant

Dental Products Laboratory

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

Dr. P. P. Lizymol, PhD
Scientist C

Mr. R. Satheesh, MSc., BEd., MPhil
Technical Assistant (Instruments)-A

Division of In-vivo Models and Testing

Dr. P. R. Umashankar, MVSc
Scientist E & Scientist In Charge

Dr. Sachin J. Shenoy, MVSc
Scientist C

Ms. P. Smitha, Dip (Electronics eng), Dip (OTT)
Technical Assistant (Anaesthesia)-A

Mr. Prem Mohan M, B.Sc. MLT
Technical Assistant (LAB)-A

Division Of Laboratory Animal Science

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

Dr. Harikrishnan V. S, BVSc & AH
Scientist B

Ms. Sreeja.K.R, BSc MLT
Technical Assistant

Engineering Services

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

Mr. K Rajan, Dip. Electrical Engg.
Junior Engineer(Instrumentation)-A

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

Mr. Binu.C.P, Dip.Mechanical Engg.
Junior Engineer (Incinerator & AC)

Implant Biology

Dr. Mira Mohanty, MD (Pathology)
Senior Scientist G, Head, Division of Implant Biology & SIC
Histopathology Laboratory

Dr. T. V. Kumary, PhD
Scientist G & SIC Tissue Culture Laboratory

Dr. Annie John, PhD
Scientist E & SIC Transmission Electron Microscopy Lab

Dr. A. Sabareeswaran, MVSc
Scientist C

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

Mrs. Sulekha Baby, BSc, MLT
Junior Scientific Officer

Mrs. Usha Vasudev, BSc, MLT
Junior Scientific Officer

Mr. Joseph Sebastian, BSc MLT
Technical Assistant - A

Ms. Deepa K Raj, M.Sc. D.MLT
Technical Assistant – A

Mr. Vinod D, B.Sc. MLT
Technical Assistant – A

Instrumentation Laboratory

Dr. Niranjan D. Khambete, MTech, PhD
Engineer F & Scientist In Charge

Division of Microbiology

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

Mr. Pradeep Kumar SS, BSc, BSc MLT
Technical Assistant (Lab)- B

Laboratory for Confocal Microscopy and Experimental Pathology

Dr. T. V. Anil Kumar, PhD
Scientist E & Scientist in charge

Mr. Thulaseedharan N K, BSc, MLT
Senior Technical Assistant (Lab)

Molecular Medicine Laboratory

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

Mr. Jose Jacob, BSc
Senior Scientific Assistant

Polymer Analysis

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

Mr. P. R. Hari, BSc, AIE
Junior Scientific Officer

Dr. C. Radhakumari, PhD
Senior Scientific Assistant

Polymer Division

Dr. M. Jayabalan, MSc, BEd, PhD, PGDIPRL, D.Sc
Scientist F & Scientist In Charge

Polymer Processing Laboratory

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

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

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

Precision Fabrication Facility

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

Mr. S.Rajalingam, Diploma in Mech.Engg
Jr. Tech.Officer-A

Quality Cell

Mr. D. S. Nagesh, M.Tech
Quality Manager

Dr. P. Ramesh, PhD
Scientist F

Technology Business Division

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

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

Mr.Rajkrishna Rajan,B.E,MBA
Engineer C

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

Technical Co-ordination Cell

Mr. D. Ranjit, BE
Scientist F & Scientist In Charge

Technology Proving Facility

Dr. G. S. Bhuvaneshwar, MS, PhD
Head, BMT Wing

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

Tissue Engineering and Regenerative Technologies

Dr. Prabha D. Nair, PhD
Scientist G & Scientist In Charge

Thrombosis Research Unit

Dr. Lissy K. Krishnan, MSc, PhD
Scientist G & Scientist In Charge

Dr. Anugya Bhatt, MSc, PhD
Scientist C

Ms. Mary Vasantha Bai,BSc,DMLT
Scientific Assistant

Ms. Priyanka A, B.Sc.MLT
Technical Assistant A

Ms. Smitha M, B.Sc.MLT
Technical Assistant A

Toxicology

Dr. P. V. Mohanan, MSc, PhD
Scientist E & Scientist In Charge

Ms. Geetha. C. S, MSc, M.Phil
Scientific Assistant





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 desk of Head, AMCHSS

The activities of the Achutha Menon Centre for Health Science Studies (AMCHSS) continued to focus on training of highly competent and socially committed health professionals, research related to public health and consultancies for national and international organizations.

Two PhD students were awarded the degree: one in chronic disease epidemiology and the other in Health Systems. Both of them are placed in reputed public health organizations in India. One of the 2010 batch PhD students who was awarded the prestigious EMECW (Erasmus Mundus External Cooperation Window) scholarship from Sweden for her PhD in our Institute with committed financial and technical support from the Karolinska Institute spent two weeks training in Sweden as part of her PhD program. She was selected as an 'Emerging Voice 2010' from the Global South through an essay competition based on original work organized by the Institute of Tropical Medicine (ITM), Antwerp, Belgium on the theme "Towards Universal Health Coverage in Developing Countries". Her essay, 'Health Systems and the Common Man: Is there a Trade-off?' was awarded a scholarship to a three week package which included coaching on scientific writing and presentation skills. She also presented her essay at the ITM colloquium 2010 and was one among the finalists who were selected to make their presentation at the Global Symposium organised by the World Health Organization and partners in Montreux, Switzerland in November 2010.

Master of Public Health (MPH) program, the main degree program of AMCHSS, remains the only MPH program in the country recognized by the medial council of India. As a part of capacity building for public health training programs in India and elsewhere the AMCHSS continued its support to other Institutions that recently started MPH programs. The head of the AMCHSS continued as a member of the board of studies of the Tata Institute of Social Sciences, Mumbai, National Institute of Epidemiology Chennai, Christian Medical College Vellore for their MPH programs and a member of the School Advisory board of the Graduate school of International health development, Nagasaki University, Japan. Fifteen MPH students successfully completed their program this year. In addition 13 MPH students graduated from our off-campus Institute, the National Institute of Epidemiology Chennai. Our off-campus MPH program started in the Christian Medical College Vellore enrolled five students this year. AMCHSS has strong collaboration with various national and international

public health schools. Under one such collaboration with the Bielefeld University, Germany, three MPH Students from our Institute completed their two months mandatory field placement in that University during November-December 2010 fully supported by the German University. Two other MPH students were supported by this University to participate in the one week Summer School on 'Emergency Aid vs. Development Aid - Health Care in Humanitarian Crises' during September 2011 in Bielefeld Germany.

Master of Applied Epidemiology (MAE), a two year degree program focusing on field epidemiology recognized by the medical council of India, is offered from the National Institute of Epidemiology as an off campus program of our Institute. Eighteen MAE students completed their program this year. All the candidates were deputed by various state governments and they joined back the respective state governments which is very likely to strengthen their public health systems as has been reported by many state governments early. Diploma in public health (DPH) is being offered to MBBS doctors with at least three years experience in state government health system. Ten DPH students joined the program this year from the state of Gujarat.

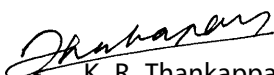
The short course on "Making Pregnancy Safer" was held during 13-17 July 2010. The goal of the course was "To build commitment, knowledge and leadership skills at various levels of the public health delivery system for action to improve pregnancy related health care". There were 21 participants, 20 from government health services in Chhattisgarh, Jharkhand, Orissa, Assam, Karnataka and Kerala.

The nine core faculty members of AMCHSS published 25 papers in indexed journals averaging 2.8 publications per faculty with a mean impact factor of 2.25. In addition a report written by one of the faculty members "Redefining Rights: Pathways to Universal Access to Reproductive Health Care in Asia- Thematic Studies Series 2' was published by the Asia-Pacific Resource & Research Centre for Women (ARROW), Kuala Lumpur, Malaysia. Faculty members of AMCHSS served as reviewers for several prestigious medical and public health journals including the Lancet. Faculty members of AMCHSS were invited speakers for several international public health conferences.

AMCHSS completed two consultancies this year. The first one was on the epidemiological profiling using data triangulation for Kerala state. We submitted 14 district reports and a state report as deliverables. The second one was to prepare a monograph on Women and Health in the Western Pacific Region. The completed monograph was submitted on 31 March, 2011.

Research in the area of health sciences has been one of the major activities of AMCHSS. We have a National Institute of Health (NIH) USA grant through the University of Arizona on "Building capacity for tobacco cessation in India and Indonesia". The major objective of this project is to incorporate anti-tobacco education in five selected medical colleges in South India. Twelve modules related to tobacco related health problems were developed and implemented in the above five medical colleges. An experience sharing meeting with all the 23 medical Colleges in Kerala is scheduled on the World No Tobacco Day on May 31, 2011. Another major research project is the Community Interventions for health which is a pilot project supported by the Oxford Health Alliance, UK. In addition to the Kerala site there are three more pilot sites: China, Mexico and the UK. The major objective of this pilot project is to address the three major risk factors of chronic non-communicable diseases namely tobacco use, unhealthy diet and physical inactivity in community based settings. Two of our junior faculty members are undergoing advanced training at the London school of Hygiene and Tropical Medicine, UK under the European Commission project on "Partnership for better health". This one year Masters training in infectious diseases and environmental health will strengthen these core areas of public health in AMCHSS.

16th August 2011


K. R. Thankappan

Achutha Menon Centre for Health Science Studies

Overview

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RESEARCH PROJECTS

Completed Projects

Capacity building for Safe Motherhood Programs

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 of the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. This was a collaborative initiative to develop evidence based models for Safe Motherhood and Newborn care in India. The objectives of the project were to examine existing evidence in order to develop publishable material for advocacy through joint publications with SEWA Rural and CSER and also jointly identifying problems that require further research.

Two faculty members from AMCHSS developed various papers collaboratively with SEWA-Rural and CSER. In addition one MPH student has completed a dissertation using data from SEWA-Rural's project area. Three papers are in the process of submission to journals. 1) The impact of distance and physical access on the utilization of institutional care for child birth in Jhagadia Block, Gujarat, 2) The social determinants of infant mortality in Jhagadia Block, Gujarat, 3) Barriers to seeking care for Post partum morbidity in Jhagadia Block, Gujarat.

Epidemiological Profiling using Data Triangulation

The epidemiological profiling using data triangulation for Kerala state was given to the Achutha Menon Centre for Health Science Studies by NACO, Government of India. The exercise involved two state level workshops for capacity building among the different functionaries in district level. We submitted 14 district reports and a state report as deliverables. The project ended in March 2010 and extended to April 2010. A final report along with the financial statement was submitted in 2011.

Monograph on Women and Health in the WHO Western Pacific Region

The research project completed during the reporting year is the WHO project to prepare a monograph on Women and Health in the Western Pacific Region. The project duration was 1 December 2010 to 31 March 2011 and the second draft of the completed monograph was submitted on 31 March. This monograph consolidates available data from the WHO Western Pacific Region on women's health through the life cycle. There are seven chapters: an introductory chapter giving an overview of factors affecting women's health in the Region, chapters on the girl child, adolescent girls and young women, reproductive years, adult women, and older women; and a concluding chapter making policy recommendations.

Making Pregnancy Safer – Short course

The short course on “Making Pregnancy Safer” was held during 13-17 July 2010. The goal of the course was *“To build commitment, knowledge and leadership skills at various levels of the public health delivery system for action to improve pregnancy related health care”*.

There were 21 participants, 20 from government health services in Chhattisgarh, Jharkhand, Orissa, Assam, Karnataka and Kerala. The course was of five days’ duration, Tuesday through Saturday. There were five modules: social, gender and human rights dimensions of maternal health; monitoring and assessing the performance of maternal health programs; policies for making pregnancies safer; health systems barriers; and making change happen.

Ongoing Projects

Athiyannur Sree Chitra Action (ASA)

This is the ongoing initiative of SCTIMST in collaboration with Athiyannur Block Panchayat. Two new projects got started in the area, one on capacity building of women health workers and another on public health impact of technology use by women. One MPH student has done an assessment of Dementia among the elderly in the community and another MPH student has done a follow up survey to assess the incidence of NCD risk factors in this population. The experimental project of Sub-Centre Data Reporting through Mobile handsets is progressing well.

The preliminary work to incorporate the baseline socio-demographic data along with the spatial attributes of households into multi-touch screen computer stations has been completed. It will be made functional soon and this will help us to study its usefulness in harnessing community involvement in the updating of the database.

ASA specialty clinics

Cardiology clinics were conducted on all fourth Saturdays in the designated clinic at Community Health Center (CHC) Vizhinjam. A total of 208 patients (106 new and 102 review cases) referred by the local practitioners had availed the services of our cardiologists at the clinic and of them 74 patients were advised to come to SCTIMST for further check up. A total of 10 cardiology clinics were conducted. (Two clinics were cancelled due to hartal and X’mas holiday) Neurology clinics were conducted on every second month on the second Saturday. A total of

six Neurology clinics were conducted and 55 patients (38 new and 17 review cases) referred by the local practitioners availed services of our Neurologists at the clinic. Of them 13 patients were advised to come to SCTIMST for further check ups.

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. Three medical colleges have been identified as partner medical colleges in Kerala: The Academy of Medical Sciences, Pariyaram Kannur, Amrita Institute of Medical Sciences Kochi and the Government Medical College Alappuzha. Two medical Colleges in Karnataka were also identified as partner medical colleges: Bangalore Medical College and Kasturba Medical College Mangalore. 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. These modules will be presented in the national conference on the World NO Tobacco day on May 31, 2011 at the Achutha Menon Centre for Health Science Studies of our Institute.

A paper based on the baseline survey findings of student and faculty survey in all the five medical colleges is submitted for publication. 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. After implementation of the modules another survey will be conducted in all the five medical colleges to find the impact of intervention.

Capacity building of women health workers

This project aims at capacity building of Junior Public Health Nurses (JPHNs) in the study area in the monitoring of cardiovascular diseases with optimal adaptation of health care technology. A series of sensitization workshops were conducted for the women health workers. A total of

55 JPHNs in the block were trained where cardiologists and public health experts took classes on the importance of dealing with the emerging issues of cardiovascular diseases and the role of prevention in the control of CVDs. Good rapport and networking was established with all the six health care centres and Panchayats in the area. In the coming months, we shall be selecting 10 study areas and 10 control areas from within the 55 JPHN units (health sub-centres).

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 will be conducted in both the intervention and the control sites. The anticipated outcome is a reduction in the risk factors in the intervention site compared to the control site. Such community based interventions to control non-communicable disease risk factors are rare in developing country settings. If the pilot project is successful this could be implemented in many countries where chronic non-communicable diseases are emerging in epidemic proportions. Two major publications are planned comparing all the four sites.

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

A no-cost extension of the project for action research program on alcohol addiction in the community was successfully completed this year. Detailed information on alcohol addiction in the community, in a sample of households (750 in number) that were identified through

GIS based cluster-sampling method, was completed with the initial cohort of 15 youth volunteers from the community. They had been given training on health and social aspects of alcohol use with the help of a psychiatrist prior to this study. Bit notices and flip charts are being prepared for helping them to give education sessions to the women's groups. On preliminary analysis of the data, alcohol addiction was found to be the major reason for psycho-social distress in the community.

Subsequently education intervention sessions were conducted for the women-folk in the community on how to deal with drinking among their husbands and other family members. Eighty six small group sessions were conducted and around 1600 women got benefited from the sessions. Women were also encouraged to harness support for anti-alcohol campaigns by influencing political and community leaders.

Writing up of the research experience of the project for publication, a joint venture with the US collaborators is progressing well. GIS mapping of Alappad Panchayat is nearing completion.

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

Background: Women experience diabetes in three ways – one as the patient of diabetes, the second as being a primary care giver for a patient with diabetes and therefore having to provide for the dietary and other needs and lastly as a person living in a household with a patient. In all these situations, the subordinate position of women in society in general and within the household in particular may render them particularly vulnerable in a myriad ways. Gender intersects with social and economic factors; it is likely that the combined effects of gender and poor socio-economic status may actually enhance this vulnerability. There is a need to document the consequences of gender mediated factors because this would facilitate an identification of potential points for intervention.

Objectives: This study aims 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: The study will be undertaken in two phases. The first is an analysis of secondary sources such as the 60th Round of the National Sample Survey Organisation – Health care and condition of the Aged 2004 to understand the nature of treatment

options available to women with diabetes and this will be followed by a qualitative study to identify the differences in the experiences of diabetes by women using 20 case studies of men and women. Phase 2 consists of a hospital based survey of 300 patients, 150 men and 150 women; at the Medical Trust Hospital, Kulanada to examine the differences in men and women experiences of treatment of type 2 diabetes. Expected Outcomes: (1) Development of at least three papers for submission to relevant peer reviewed journals and (2) 20 case studies of men and women's experiences of type 2 diabetes.

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 Sweden and the University of Amsterdam, The Netherlands. Two faculty members from the BRAC School of public health and one from AMCHSS were identified for PhD training in European Schools. Two faculty members from the BRAC School have already joined for the PhD program. Two faculty members from AMCHSS were sent for one year masters training at the LSHTM: one in infectious disease epidemiology and the other in Environment and health. These were the two areas where we were inviting visiting faculty for teaching the MPH and DPH students. Once these faculty members return after their training they will take over teaching of the above subjects from the visiting faculty. 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

A cross-sectional survey was conducted among 1990 adults (women: 1149; men: 841) in Venmony Panchayat, Alappuzha district, Kerala, India to estimate the prevalence of DM and impaired fasting glycaemia (IFG), and to explore the predictors of hyperglycemia (DM and/or IFG). The age-adjusted prevalence of DM was 12.5 percent and that of IFG was 4.6 percent. Adjusted for age, sex and family

history of DM, hyperglycemia was significantly associated with high socioeconomic status [Odds ratio: 1.36 (1.01 – 1.86)], central obesity (waist to hip ratio ≥ 0.80 for women and ≥ 0.90 for men) [3.17 (1.73 – 5.79)], high cholesterol (fasting serum cholesterol ≥ 200 mg/dl) [1.88 (1.43 – 2.46)], and hypertension (blood pressure $\geq 140/90$) [1.52 (1.14 – 2.03)].

In spite of the high prevalence, very few socio-economic determinants have been identified directly in the study and most of the predictors are clinical markers. Central Travancore is characterized by rapid life style changes which could be clear markers for high risk status. The present study is an attempt to identify lifestyle markers of high risk for Type II diabetes.

This study proposed to document the perceptions of diabetes in a rural community in Central Travancore and examine the economic and social-cultural determinants of life style modifications over the last 15 years in the same Panchayat.

Qualitative methods were used for this purpose. The perceptions regarding diabetes were obtained using focus group discussions, 4 each among men and women respectively, with appropriate discussion guidelines. The community perceptions of life style changes over the past 15 years were obtained using in depth interviews with about 32 residents of the study area, again using guidelines for the interview.

Study on the Workload of Public Health Nurses and Other Women Health Workers

The overall objective of the study is to explore the workload of public health nurses and other women health workers in Kerala. It also aims to assess the factors associated with this by analyzing the data from the five selected districts of Kerala namely Thiruvananthapuram, Alappuzha, Ernakulam, Malappuram and Wayanad. Five categories of women health workers are included as respondents (JPHN, JHI, staff nurse, LHI and LHS) for getting a perspective regarding the work allocation and work load.

Study intends to collect data from 1000 respondents by administering a self-reported questionnaire including a pre-existing scale. A pre-test of the survey module was conducted in one of the CHCs in Thiruvananthapuram and on the basis of its response; questionnaire was modified in a way to avoid ambiguities. Each agency from five selected

districts was identified for engaging data collection and signed agreements with them. Training was conducted by the researchers for the selected field investigators and supervisors in five districts before sending them to field for data collection. Though the study is primarily quantitative certain qualitative data collection methods like key informant interview and case study are also used for getting a clear picture about the research problem. Apart from these, time and motion study of the activities at the sub-centre is also done in the five districts. Data collection in three districts is nearing completion and both quantitative and qualitative data collection has been progressively going on in the two other districts.

STAFF DETAILS

Dr. K R. Thankappan, MD, MPH	- Professor and Head
Dr. V Raman Kutty, MD, MPH	- Professor
Dr. T K Sundari Ravindran, PhD	- Professor (Joined on October 31, 2010)
Dr. P Sankara Sarma, PhD	- Additional Professor
Dr. Mala Ramanathan, PhD, MA	- Additional Professor
Dr. K Srinivasan	- Associate Professor
Dr. Biju Soman, MD, DPH	- Associate Professor
Dr Ravi Prasad Varma MD (From August 18, 2010)	- Assistant Professor
Dr. Manju R Nair MBBS MPH	- Scientist C

STATUS OF ONGOING/ROUTINE ACTIVITIES:

Ph.D. PROGRAM

The Achutha Menon Centre for Health Science Studies (AMCHSS) continued its training of highly competent and socially committed health professionals in the current year also. Two PhD students completed their program this year and they were awarded the degree: one in chronic disease epidemiology and the other in Health Systems. Both of them are placed in reputed public health organizations in India. One of the 2010 batch PhD students Dr Meena Daivadanam was awarded the prestigious EMECW (Erasmus Mundus External Cooperation Window) scholarship from Sweden for her PhD program in our Institute with committed financial and technical support from the Karolinska Institute spent two weeks training in Sweden as part of her PhD program. She was selected as

an 'Emerging Voice 2010' from the Global South through an essay competition based on original work organized by the Institute of Tropical Medicine (ITM), Antwerp, Belgium on the theme "Towards Universal Health Coverage in Developing Countries". Her essay, 'Health Systems and the Common Man: Is there a Trade-off?' was awarded a scholarship to a three week package which included coaching on scientific writing and presentation skills. She also presented her essay at the ITM colloquium 2010 and was one among the finalists who were selected to make their presentation at the Global Symposium organised by the World Health Organization and partners in Montreux, Switzerland in November 2010.

Master of Public Health (MPH) PROGRAM

Master of Public Health (MPH) program, the main degree program of AMCHSS, remains the only MPH program in the country recognized by the medial council of India. As a part of capacity building for public health training programs in India and elsewhere the AMCHSS continued its support to other Institutions that recently started MPH programs. The head of the AMCHSS continued as a member of the board of studies of the Tata Institute of Social Sciences, Mumbai, National Institute of Epidemiology Chennai, Christian Medical College Vellore for their MPH programs and a member of the School Advisory board of the Graduate school of International health development, Nagasaki University, Japan. Fifteen MPH students successfully completed their program this year. In addition 13 MPH students graduated from our off-campus Institute, the National Institute of Epidemiology Chennai. Our off-campus MPH program that we started in the Christian Medical College Vellore enrolled five students this year. AMCHSS has strong collaboration with various national and international public health schools. Under one such collaboration with the Bielefeld University, Germany, three MPH Students from our Institute completed their two months mandatory field placement in that University during November-December 2010 fully supported by the German University. Two other MPH students were supported by this University to participate in the one week Summer School on 'Emergency Aid vs. Development Aid - Health Care in Humanitarian Crises' during September 2011.

List of MPH students who successfully completed their MPH program in December 2010 is given below.

Master of Applied Epidemiology (MAE), a two year degree program focusing on field epidemiology recognized by the medical council of India, is offered from the National Institute of Epidemiology as an off campus program of our Institute. Eighteen MAE students completed their program this year. All the candidates were deputed by various state governments and they joined back the respective state governments which will strengthen their public health systems as has been reported by many state governments early.

Short Courses

The short course on "Making Pregnancy Safer" was held during 13-17 July 2010. The goal of the course was *"To build commitment, knowledge and leadership skills at various levels of the public health delivery system for action to improve pregnancy related health care"*.

There were 21 participants, 20 from government health services in Chhattisgarh, Jharkhand, Orissa, Assam,

Karnataka and Kerala. The course was of five days' duration, Tuesday through Saturday. There were five modules: social, gender and human rights dimensions of maternal health; monitoring and assessing the performance of maternal health programs; policies for making pregnancies safer; health systems barriers; and making change happen.

The following are some excerpts from the end-of-course evaluation by participants.

AMC Seminar Series

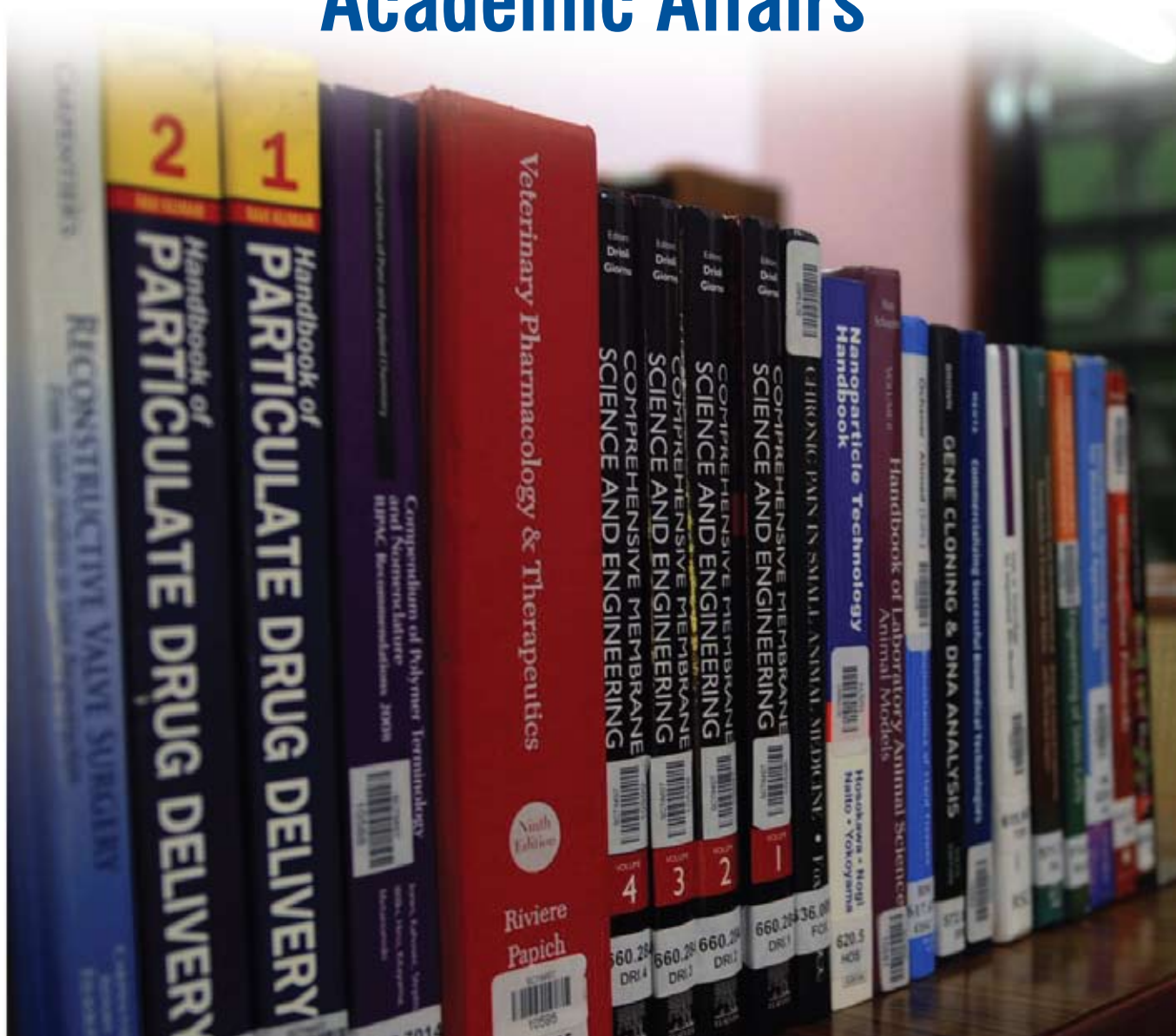
Dr Beatrice Godard, Professor, Department of Social and Preventive Medicine, Bioethics Programs, University of Montreal, Canada gave an AMC Seminar (Series 10.c) on the topic "Fairness and equity in research participation: the case of nutrition and genomics research" at AMC Seminar Hall on 3rd August 2010.

Dr Sundari Ravindran joined as professor on October 31, 2010.





Division of Academic Affairs







From the Dean's Desk


The annual report of the institute for the year 2010-2011, reflects the aspirations of its staff, its highly commendable work ethos and its commitment to delivering high quality medical care to even the least affordable section in the society, high quality training to generate a highly skilled workforce for the Nation's health delivery sector, and high quality research and innovations which directly benefit the common man.

The Division of Academic Affairs has taken several initiatives to respond to the ever increasing demand to start new academic programs and restructuring and updating the existing course curriculum and evaluation process. The Board of Studies is constituted to advise and guide the 5 broad specialties namely Cardiac sciences, Neurosciences, Allied medical sciences, Public Health sciences and Biomedical Sciences, and to specifically address the issues of updating the curriculum and evaluation process of various academic programs and to evaluate proposals for new programs. All the proposals pertaining to academic programs are vetted by the Board of Studies before it is presented to the Institute Academic committee .

The Annual Convocation held on May 2, 2010 was a momentous occasion for the Academic staff with overwhelming response and participation from the graduates. The Convocation address was delivered by Dr. Shashi Tharoor, Honrable Member of Parliament, Thiruvananthapuram.

Every Annual report is an important document which becomes the bench mark to evaluate the institute's performance every subsequent year. This will be an impetus to the academic community to further enhance one's contribution to the institute's performance, to make it more relevant to the society and help the Nation to achieve its goal of imparting high quality and affordable medical care to all its citizens.

16th August 2011


 Jagan Mohan Tharakan



Academic Programmes

The institute currently offers 25 academic (diploma, post-graduate, 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 as well.

Division of Academic Affairs

Dean : Dr.J.M.Tharakan
Professor & HOD, Cardiology

Associate Deans

(a) Students Affairs : Dr. , Professor
Cardiovascular & thoracic surgery

(b) PhD Programme : Dr.C.P.Sharma
Scientist G, BMT Wing

(c) Faculty Affairs : Dr.V.Ramankutty
Professor, AMCHSS

(d) Examination & Curriculum Development :

Dr.Asha Kishore
Professor, Neurology

Hostel Warden : Dr.K.K.Narayanan Namboodri,
Associate Professor, Cardiology

Registrar : Dr.A.V.George

Deputy Registrar : Shri S.Sudar Jayasingh

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.

*Academic Programs 2010-2011
(Copy from page 93 of Annual Report 2009-10)*

LIST OF Ph.D. GRADUATES- ANNUAL CONVOCATION (26th BATCH)

Sl. No.	Name of the student	Title of Thesis	Name of the Guide
1	Sumi S	Molecular and Immunological Approaches in the Diagnosis of Human Tuberculosis	Dr. VV Radhakrishnan
2	Anie Y	Isolation and Characterization of Lipid Antigens of Mycobacterium Tuberculosis and their Applications for the Immunodiagnosis of Human Tuberculosis	Dr. VV Radhakrishnan
3	Manitha B Nair	Bone Reconstruction of Goat Femur Segmental Defects using Tissue-engineered Bioceramic Scaffolds with Osteogenically-Induced Mesenchymal Stem Cells and Platelet – Rich Plasma	Dr. Annie John
4	Deepa D	Fetal Malformations and Oxidative Stress in Women with Epilepsy	Dr. Sanjeev V Thomas
5	Vandana Sankar	Delineation of Mechanism of Action of an Ayurvedic Antihypertensive Formulation and Assessment of its Efficacy in Prevention of Cardiac Remodeling	Dr. R Renuka Nair
6	Sangeetha Mohan	NF-KB Plays a Role in Cardiac Fibroblast Survival Under Hypoxia	Dr. K. Shivakumar
7	Sumith R Panicker	Regulation of High Glucose Induced Monocyte Chemoattractant Protein – 1 Gene in Endothelial Cells	Dr. CC Kartha
8	Viji Mary Varghese	Molecular Level Cytocompatibility Evaluation of a Thermoresponsive Substrate for Bioengineering of Corneal Construct Towards Ocular Surface Regeneration	Dr. TV Kumary
9	Siddharth Banerjee	Understanding the Jerky Gene and its Involvement in the Molecular Pathways associated with Seizure	Dr. T. Anoopkumar
10	Pradeep Kumar AS	Smoking Cessation Intervention Program in Primary Health Centers in Palakkad District, Kerala	Dr. KR Thankappan
11	Godwin.S.K	Financial Burden of Treating Non-fatal Road Traffic Injuries: A Decomposition Analysis of its Causal Factors in Kerala	Dr. D Varatharajan
12	Aghila Rani KG	Regulatory Signal for Expansion of Human Adult Cardiac Stem Cells	Dr. CC Kartha



The 26th batch of graduates at the Annual Convocation ceremony.



Mr. Venugopal, the noted singer and Mr. Shyamaprasad the noted film Director at the Students' day 'Speranza 2010'



Research Activities



Clinical Research

Biochemistry

A. Relationship of Lp(a) immune complex concentration to Lp(a) size: Lp(a) is strongly implicated in atherosclerosis and stroke. Analysis of Lp(a) immune complexes (IC) revealed that i) IC- Lp(a) and free Lp(a) have the same distribution of different apo(a) isoforms and ii) the fraction of Lp(a) that went into IC Lp(a) was inversely proportional to the serum concentration of Lp(a) . As Lp(a) size is larger in low Lp(a) titre individuals, these results suggest that IC formation may be a mechanism to keep serum titre of Lp(a) lower.

B. Dysfunctional high-density lipoprotein and atherogenesis

High Density Lipoprotein(HDL), a typical cardioprotective particle, can become dysfunctional in the vessel wall and promote progression of cardiovascular disease. The ongoing studies include the structural and functional characterization of HDL, standardization of reliable techniques to measure dysfunctional HDL and the mechanism for rendering HDL dysfunctional. We also focus on how the intrinsic function of macrophages, the key cell type in the development of atherosclerotic lesion, might be influenced by the interaction of HDL with macrophages and subsequent cell signaling events. The preliminary findings indicate that modified HDL influence macrophage function relevant to atherogenesis by promoting lipid influx and production of pro-inflammatory cytokines, TNF- α , in macrophages.

C. Coronary artery disease in the young [collaborative research project with the Dept. of Cardiology, commencement January 2010]

The current 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. Although women in the reproductive age group are normally protected from the development of CAD, there are a remarkable number of females in this age group (30-40 years) affected with the disease. Further studies are also aimed at defining novel thrombotic and

inflammatory biomarkers of cardiovascular disease and their potential utility as indicators of risk in the young people.

Detection of Lp(a) – LDL adduct in plasma.

A new method for the purification of Lp(a) from serum was standardized, involving precipitation by the O-glycan-specific lectin jacalin followed by electrophoresis and electro elution; and was found to be superior to all existing methods of Lp(a) purification since jacalin does not recognize any non-O glycosylated protein. This method was also found to be effective for the isolation of all Lp(a) isoforms from serum.

During the purification steps it was also found that LDL co-precipitates with Lp(a) and later it was confirmed that the co precipitated LDL was not a contaminant, but was non-covalently attached to Lp(a) to form Lp(a)-LDL adduct. Large Lp(a) isoforms were found to have greater tendency to get associated with LDL compared to the smaller one. This result also offers another route for larger apo(a) isoform to be more pathogenic by their increased capacity to get associated with LDL molecules and consequent increased delivery of LDL to macrophages. Among lipoproteins Lp(a) is most prone to form immune complex

Apo(a) / apo(B) ratio of IC is close to that of Lp(a) showing dominance of the latter in IC. Immunoglobulin prevalence is in the order IgM > IgA > IgG, i.e. Reverse of serum in general.

This, as well as presence of desialylated Lp(a) in IC (detected using the lectin from peanut) suggest anti-T antibody binding to desialylated Lp(a) as cause for IC formation. More importantly the results imply that high IgA content of Lp(a) IC may facilitate their recognition by O-glycan-specific tissue lectins.

Mediators and modulators of cancer cell biology.

The expression of MMP2 and MMP9 were modulated by NO via the ERK signaling pathway in a cGMP- PKG - AP-1 dependent manner thereby indicating the molecular mechanisms of NO in tumor invasion and metastases of colon adenocarcinoma cells. Parallel studies also revealed that in vitro anticancer activity of plant derived quinone

derivative, aloe emodin on colon cancer cells depends mainly on the ability of the compound to induce apoptosis, inhibit cell migration and angiogenesis by altering key regulatory molecules such as MMPs, Rho-GTPases, VEGF-A which are involved in the process of tumour metastasis. Apoptosis and autophagy are two programmed pathways operating in tumor cells in response to cellular stress. It was observed that CT-LC4, a synthetic lignan with DNA intercalating properties was inducing autophagy along with apoptosis in colon cancer cells. Studying the interrelation between the autophagy and apoptosis induced by CT-LC4 can help to increase the antitumor activity of this drug and current research is focussed on this area.

The relationship between the ability to form gliomaspheres (in culture), or their presence (as determined by the expression of CD133+/- or CD15) in the tumor *per se* (in tissue sections) of tumor stem cells is also being examined. Neurosphere formation of these stem cells was observed. Immunocytochemistry (ICC) using CD15 antibody was performed on these neurospheres and these neurospheres are found to be positive for this particular stem cell marker.

Cellular and Molecular Cardiology

1. Cardiac fibroblasts in myocardial remodeling – molecular mechanisms

Unlike cardiac myocytes that have limited replicative capacity after birth, cardiac fibroblasts retain their proliferative potential throughout adult life. Further, unlike fibroblasts in non-cardiac tissues, cardiac fibroblasts are resistant to apoptosis and persist in the infarct scar long after the healing response is completed, without going through apoptosis, which can potentially contribute to inappropriate matrix deposition and pump dysfunction. Replicative capacity 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*. Mechanisms regulating the cardiac fibroblast cell cycle and relative resistance to apoptosis, which remain unclear, have been the focus of investigations in this Division over the past few years.

In this regard, the possibility that NF- κ B, the stress-related transcription factor, protects cardiac fibroblasts from hypoxia-induced cell death explored. Electrophoretic Mobility Shift Assay showed that hypoxia activates NF-

κ B in cardiac fibroblasts. Supershift assay indicated that the active NF- κ B complex is a p65/p50 heterodimer. NF- κ B inhibition was found to compromise cell viability under hypoxic but not normoxic conditions. Western blot analysis showed constitutive levels of Bcl-2 and hypoxic induction of cIAP-2 in these cells. NF- κ B inhibition reduced cIAP-2 but not Bcl-2 levels in hypoxic cardiac fibroblasts. The results showed that NF- κ B is an important effector of survival in cardiac fibroblasts under hypoxic stress and that regulation of cIAP-2 expression may contribute to its pro-survival role.

Regulation of the cardiac fibroblast cell cycle by hypoxia, a major constituent of myocardial ischemia, was another important area of investigation in the Division. Significant reductions in DNA synthesis and cell number, and flow cytometry indicated decreased G1/S progression in hypoxic adult rat cardiac fibroblasts. Western blot analysis showed reduced levels of cyclin D and cyclin A, induction of p27 and hypophosphorylation of Rb under hypoxia. Skp2, which targets p27 for degradation, was significantly lower and inversely related to p27 protein levels in hypoxic cells. Marked p38 MAPK activation was observed under hypoxia and its inhibition using SB203580 reversed the effects of hypoxia on DNA synthesis, cell cycle phase distribution, p27, and cyclin D1 but not cyclin A. Interestingly, a 2-fold increase in p27 mRNA in hypoxic cells, demonstrated by Real-Time PCR, was unaffected by SB203580, which, however, reversed the hypoxic inhibition of Skp2. In summary, p38 MAPK is an important determinant of hypoxia-induced G0/G1 block in cardiac fibroblasts. p27 induction in hypoxic cardiac fibroblasts may involve direct transcriptional regulation, independent of p38 MAPK, and post-translational regulation via p38 MAPK-dependent suppression of its degradation by Skp2. The study identifies Skp2 as a potential downstream target of p38 MAPK, suggesting a novel mechanism of G1-S regulation in cardiac fibroblasts exposed to stress conditions.

Gene polymorphisms associated with hypertension and cardiac hypertrophy.

Systemic hypertension is inherited mainly as a multifactorial disorder. A study was carried out to examine the association of polymorphic genes involved in oxidative stress, angiotensinogen and fatty acid metabolism with hypertrophy. Angiotensinogen, a gene associated with the regulation of blood pressure, PPAR \pm a regulator of energy metabolism and NADPH oxidase were the genes

selected for studies of association with hypertension and hypertrophy. The markers chosen were: AGTM235T polymorphism, *PPAR* \pm intronic polymorphism and 930A/G p22 phox polymorphism. The study was carried out in patients registered in the Cardiology Department of the Institute. Among the polymorphic markers screened, the C allele in intron 7 of peroxisome proliferator receptor alpha (*PPAR* α) showed a positive association with coronary artery disease and dislipidemia. The *PPAR* α 7C allele is associated with reduced expression of the *PPAR* α gene. *PPAR* α is a key regulator of fatty acid metabolism. Hence it is decided to examine polymorphisms of genes involved in fatty acid metabolism. One of the genes proposed to be studied is the fatty acid transporter CD36.

Modulation of energy metabolism for prevention of cardiac remodeling: Cardiac hypertrophy is a prominent risk factor for myocardial infarction, congestive cardiac failure and sudden death. Hence prevention of hypertrophy is expected to reduce the risk of adverse cardiovascular events. Examination of the temporal sequence of expression of hypertrophy and associated parameters showed that oxidative stress precedes and metabolic remodeling succeeds the development of hypertrophy in spontaneously hypertensive rat. Hypertrophy is associated with a shift in energy metabolism from predominantly fatty acid to glucose. Though beneficial initially, a shift in energy metabolism from predominantly fatty acid to glucose, in the long run this leads to energy depletion. Hence it was hypothesized that prevention of energy deficit by stimulation of fatty acid metabolism will prevent progression to failure. Fatty acid metabolism was stimulated by reactivation of *PPAR* α , based on the premise that it can prevent cardiac remodeling. Reactivation of *PPAR* α using the synthetic ligand fenofibrate showed an age dependent paradoxical effect. 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 and aggravation of hypertrophy. The stimulation of *PPAR* α in older animals was accompanied by reduction in the expression of the fatty acid transporter CD36. Hence it is inferred that reduced substrate availability despite stimulation of fatty acid metabolism is responsible for the aggravation of hypertrophy and oxidative stress. Further studies are to be carried out by supplementation of medium chain triglycerides.

Autocrine and paracrine mechanisms in human resident cardiac stem cell signaling following hypoxic injury: Cell based therapy for myocardial tissue repair has recently gained importance. Replacement of injured myocardium by tissue engineered grafts can be associated with a number of problems. An ideal strategy would be to facilitate the resident cardiac stem cells to repair the injured tissue. Migration, proliferation and differentiation are the major factors that can mediate *in situ* tissue repair. Autocrine as well as paracrine mechanisms can mediate mobilization and differentiation of resident stem cells. Acquisition of more profound knowledge of the biology of stem cells and their fate following pathologic insults is essential for promoting *in situ* repair of injured myocardium. A study has therefore been initiated for examining the behavior of cardiac stem cells using specific *in vitro* conditions. Stem cells are isolated from atrial biopsies obtained at the time of insertion of catheter for coronary artery bypass graft in patients with coronary artery disease. Parallely the role of mesenchymal stem cells in cardiac tissue repair is also under investigation.

Pathology

1. 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 sulpatides. With these antigens immunoassays such as ELISA were standardized for the diagnosis of tuberculous meningitis, tuberculous pleural effusion, tuberculous lymphadenitis. These assays are extremely useful in culture negative patients with tuberculosis.
2. The role of cord factor in *in vitro* chemotaxis of neutrophils from patients with pulmonary tuberculosis and tuberculous meningitis were evaluated. As an extension of this study, a research project has been recently submitted to DBT for funding.
3. Four recombinant mycobacterial antigens – Esat-6, HspX, Tb8.4 and PlcA were isolated and characterized. A cocktail containing these four recombinant mycobacterial antigens were applied in an immunoassay and it was found to be extremely useful in the serodiagnosis of pulmonary tuberculosis.
4. With these recombinant mycobacterial antigens we could distinguish patients with latent tuberculosis.

from those with BCG vaccinated individuals. This observation has great epidemiological application as well as in tuberculosis control programmes.

5. A specific immunohistochemical techniques have been introduced to detect mycobacterial antigens in tuberculous lesions.

Cardiology

Projects completed

1. Economic impact of ACS in household economic well-being. (5189) Harikrishnan S. Funded by ICHHealth, New Delhi and World bank. (In collaboration with AMCHSS, Co-PIs, Dr KR Thankappan, Dr. S Sarma, Dr. V Ramankutty)
2. Impact of inflammatory markers and pulmonary Hypertension in the development of restenosis in Juvenile Mitral stenosis (5204) Harikrishnan S Funded by the Pulmonary vascular research Institute(PVRI), Canterbury, United Kingdom.
1. Kerala Acute Coronary Syndrome Registry – Largest registry of acute coronary syndromes in India (25000+ patients) (5225) Harikrishnan S Funded by the Cardiological Society of India.

Ongoing projects

1. National Acute Coronary syndrome registry : Pilot project (5209) Funded by ICMR – Indian Council for Medical Research. Data collection completed, follow-up data being collected.
2. Coronary artery disease in the Young – (5212). Funded by Kerala State Council for Science Technology and Environment (KSCSTE). Kerala Government.
3. UMPIRE – Use of a Multidrug Pill in Reducing Cardiovascular events- 5220 Funded by European Commission , through Imperial College, London
4. Mechanisms and Modulations of in-stent restenosis: possible role of circulating Progenitor Cells – Sponsor – ICMR, New Delhi. Along with TRU, BMT Wing.
5. Empowering female health workers with electronic gadgets – 5228 Pilot project funded by DST, Govt of India – Women Component plan – Along with AMCHSS.

6. Kerala Cardiac Risk Factor Profile study (Kerala CRP study). Funded by the Cardiological Society of India
7. Detection of asymptomatic intracranial microemboli in patients with mitral stenosis at high risk for thromboembolism using transcranial Doppler evaluation. JA Tharakan, Sapna ES, Sajith S, Namboodiri N. (Received funding from the institute)
8. PALLAS (Permanent Atrial Fibrillation Outcome Study using Dronaderone on top of standard therapy) Study. This is a Prospective, randomized, double blind, parallel group, international, multicenter trial evaluating the effects of MULTAQ® 400 mg BID (Dronaderone 400 mg) versus placebo (ratio 1:1) in patients with permanent atrial fibrillation and additional risk factors . The study is a Worldwide study planning to recruit 10800 subjects in 700 centres. Externally funded by Clinical research unit, Sanofi-aventis, India | 54/A, Sir Mathuradas VasANJI Rd | Andheri (E), Mumbai-400093
9. PhD Project – Identifying the systemic blood monocytes associated with atherosclerotic processes depending on the expression of membrane surface antigens (CD14, CD16, CD45RA and $\alpha 1$ - $\alpha 2$ integrins), release of cytokines and phagocytic activity.

Neurology

1. Kerala-Einstein Study: Risk factors for cognitive decline. RO1 grant. Dr. Mathuranath Co- Principal investigator, National Institute of Health (NIH), USA, \$ 282640. June 2008 to 2010. To study the age related motoric, cognitive and other risk factors associated with cognitive decline and dementia
PI: Dr PS Mathuranath.
2. "Multicenter, Double-blind, Randomized, Parallel-group, Monotherapy, Active-control Study to Determine the Efficacy and Safety of Daclizumab High Yield Process (DAC HYP) versus Avonex® (Interferon α -1a) in Patients with Relapsing-Remitting Multiple Sclerosis", (protocol number 205MS301)
PI: Dr MD Nair.
3. SAVE study- an international multicentre open parallel group prospective randomized controlled trial to determine the effectiveness of treatment with CPAP in addition to standard care in reducing cardiovascular

morbidity and mortality in patients with coexisting cerebrovascular disease and moderate to severe OSA has been approved by TAC and IEC.

PI: Dr P.N Sylaja

Status: will start in June 2011.

4. Indo –French international Collaborative Project: Cerebellum and Cortical Plasticity – The Case of Dystonia.

Duration of study 2 years

Status ; ongoing

Funding: INSERM-ICMR

Funds: 10lakhs

PI: Asha Kishore

5. Improving localization in lesion negative focal epilepsy: "Can EEG-FMRI predict the epileptogenic zone and the likelihood of post-operative seizure freedom"?

Duration :3 years

Funds:30 lakhs

Funded by Kerala state Council for Science, Technology and environment(STEC) and Cognitive Science Research Initiative, DBT.

PI: Ashalatha. R.

Nuerosurgery

- Title: Multicentric multinational randomised controlled surgical trial in intracerebral haemorrhage (STICH II), sponsored by stroke association and medical research council, University of New Castle, UK.

Status: ongoing

Principal International Investigator: Mr.Mendlow, Professor of Neurosurgery, Regional Neurosciences Centre, New Castle Upon Tyne, UK

- Title: Multinational clinical study to evaluate "Efficacy & Safety of AP 12009 in adult patients with recurrent or refractory anaplastic astrocytoma (WHO Grade 3) as compared to standard treatment with temozolamide or BCNU: A randomized, actively controlled, open label clinical phase III study, AP 12009-G005"

Status: ongoing

Sponsors: Anti Sense Pharma, GmbH, Regensburg, Germany

- Title: Decellularised bovine pericardium as dural substitute –animal trials

Principal investigator: Girish Menon

Status: Ongoing

Funding agency : SCTIMST - TDF

- Title: Development of Dura Substitute by electrospinning of ϵ -caprolactone –co –lactide polymers.

Principal Investigator : Dr. P Ramesh, Scientist F, SCTIMST

Funding Agency : STEC, Department of Science and Technology, Kerala

- Title: Isolation, characterization of glioma stem cells from different grades of glioma: correlation with microRNA profile, prognostic factors and treatment outcome

Principal Investigator Dr.Radhakrishna Pillai, Director, RGCB, Trivandrum & Dr Srinivas G, SCTIMST, Trivandrum

Funding agency : Department of Biotechnology, Government of India

- Title: Analysis of SG2NA profile in brain tumour biopsies

Principal Investigator : Girish Menon

Co PI – Dr. Shyamal Goswami

Funding agency : School of life Sciences, JNU, New Delhi

Biomedical Technology Wing

Externally Funded Research Projects

Newly Initiated Projects

Title	Principal Investigator	Funding Agency
Synthesis of oxide based magnetic nanoparticles for biocompatibility studies, magnetic hyperthermia and MRI applications.	Dr. H.K.Varma	DST
Development of Calcium Sulfate Based Injectable Bone Substitute	Dr. Manoj Komath	DST (SERC)
Indo-Spain project entitled "Development of nanodevices for DNA delivery and cell transfection using Elastin Like Polymers (ELPs) coupled to cell interaction motifs"	Dr. Chandra P Sharma	DST
A proposal for development of recommendations for setting up a Mission mode programme for Medical Instrumentation and devices development through Science & Technology	Dr. V.Kalliyana Krishnan - PI Dr. G.S.Bhuvaneshwar –Project Co-ordinator & Advisor	DST
Role of transforming growth factor – alpha in neuronal growth and regeneration	Dr.Anoopkumar Thekkuveetil	STEC
Dispensable and biodegradable polymeric bone cement for minimally invasive treatment of bone diseases – product validation	Dr. M. Jayabalan	DST
Molecular and immunotoxi-cological effects of Dextran coated Ferrite and Hydroxylapitite nanomaterials'	Dr. P.V. Mohanan	DST
In Vitro alternative test system development for Ocular Irritation'	Dr. P.V. Mohanan	ICMR
Bioengineered hybrid skin substitutes for burn wounds (36 months;2 months completed)	Dr.Lissy K Krishnan	Kerala State Council for Science, Technology and Environment (KSCSTE)
Differentiation of adult progenitor cells and in vitro construction of a cardiac patch using biodegradable scaffolds for myocardial regeneration after heart failure	Dr.Asha S Mathews	Women Scientist Scheme, DST
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
Tissue engineering of a carrier free corneal endothelial construct towards transplantation for endothelial keratoplasty.	Dr. Bernadette K. Madathil	DST, (Women scientist scheme, WOS-A)
Bone Tissue Engineering: Preclinical evaluation of osteointegration of titanium diaphyseal implant "grown" on a metal rapid prototyping machine and transplanted with mesenchymal stem cells in animal model.	Dr.A Sabareeswaran (Co-investigator)	Tata Memorial Centre, Mumbai. Funded by Terry Fox Research Institute

Ongoing Projects

Title	Principal Investigator	Funding Agency
Pulsed laser Ablation of Bioactive Ceramic Composite on Titanium Bone Implants	Dr. H.K.Varma	KSCSTE
Facility for micro/nanoparticles based biomaterials for Advanced Drug Delivery Systems (FADDS)	Dr. Chandra P Sharma	DST
Oral Insulin Delivery	Dr. Chandra P Sharma	CSIR under NMITLI
Development of decellularised animal tissue for cardiovascular application'	Dr. S.R. Krishnamanohar/ Dr. P.R. Umashankar	DBT
Commercialisation of Centrifugal blood pump for extracorporeal applications	Mr. D.S.Nagesh	SIDD Life Sciences Pvt Ltd/ Technology Development Board (TDB) Govt of India
Development of Left Ventricular Assist Devices (LVAD) VSSC-SCTIMST joint project	Mr. D.S.Nagesh	VSSC, Trivandrum
Development of a Dura Substitute by Electrospinning of -Caprolactone-Co-Lactide Polymers	Dr.P.Ramesh	KSCSTE
Bone Tissue Engineering using adipose stromal cells on 3D porous bioactive ceramic scaffolds	Dr. Annie John	DBT (ANCETE)
Cell based tissue engineered fabrication of osteochondral grafts	Dr. Annie John	DBT (ANCETE)
Bioconjugation of nanomaterials and their applications in cancer therapy	Co – investigator – Dr. Annie John (Collaboration with University of Kerala)	DBT, (Nanoscience & Nanotechnology Task Force)
Evaluation of molecular toxicity of newly developed materials intended for biomedical application	Dr. P.V. Mohanan	ICMR
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
Development of hemostatic scaffold for wound care	Dr. Lissy K Krishnan	CSIR
Differentiation of circulating adult stem cells to neurons for regenerative therapy	Dr. Lissy K Krishnan	DST
In vitro, and Preclinical Evaluation of Curcumin Released from Biodegradable Fibrin Matrix	Dr. Lissy K Krishnan	ICMR
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
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

Epithelial-mesenchymal interactions in tissue engineered hybrid artificial lung role of angiogenic factors	Dr. A.Maya Nandkumar	DBT
Development of coronary stent system	Mr. C.V. Muraleedharan	NMITLI, CSIR
Differentiation of foetal progenitor cells and fabrication of a prototype of bioartificial liver	Dr. T.V. Kumary	DBT
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
Medical Device Retrieval Programme	Dr. Mira Mohanty	DBT
Atlas of tissue response to Biomaterials	Dr. Mira Mohanty	DST
Effect of cation substitution on the structure and biocompatibility of ionomer glasses and glass ceramics.	Dr. A. Sabareeswaran (Co-investigator)	UKIERI Research award 2008 in a collaborative project between IIT, Kharagpur, India and University of Birmingham, UK
Molecular and immunotoxicological effects of dextran coated ferrite and hydroxylapatite nanomaterials	Dr. A. Sabareeswaran (Co-investigator)	DBT
Bone Tissue Engineering using adipose stromal cells on 3D porous bioactive ceramic scaffolds	Dr.Annie John	DBT (ANCETE)
Cell based tissue engineered fabrication of osteochondral grafts	Dr.Annie John	DBT (ANCETE)
Bioconjugation of nanomaterials and their applications in cancer therapy	Co – investigator – Dr.Annie John (Collaboration with University of Kerala)	DBT, (Nanoscience & Nanotechnology Task Force)
Novel ceramic collagen composite for bone regeneration	Dr.Annie John	Joint research project DST-DAAD PPP-2008 - International
Development of a Portable Medical Electrical Safety Analyser*	Dr.Niranjan D Khambete	Department of Information Technology
Development of Medical Investigation Camera for Endoscopy (In collaboration with CDAC, Trivandrum)	Dr. Niranjan D Khambete	Department of Information Technology
Implanted neural interface and control schemes for artificial hand control (In collaboration with CMC, Vellore)	Dr. Niranjan D Khambete	Department of Biotechnology
Assessment of Electrical Impedance Spectroscopy as a Technique for Early Detection of Cervical Cancer in Developing Countries: A pilot Study { In collaboration with Tata Memorial Hospital, Mumbai, and The University of Sheffield, UK)	Dr. Niranjan D Khambete	Women's Cancer Initiative, Mumbai

Completed Projects

Title	Principal Investigator	Funding Agency
Combination Products of Polymer-Ceramic Nanocomposites with Cells and Growth Factors for Bone Tissue Engineering Applications	Dr.P.Ramesh	DBT
Tissue Engineered Small Diameter Vascular Graft (TEVG): Fabrication and Evaluation	Dr.Lissy K Krishnan	DBT
"Delineating Mechanisms of biofilm formation in urinary catheters: Characterization of the role of E.coli secretory proteins and influence of environmental signals".	Dr.A.Maya Nandkumar	KSCSTE
Tissue engineered hybrid artificial lung model for testing pollutant and drugs	Dr.A.Maya Nandkumar	DBT

INSTITUTE Technology Development Fund Projects

Newly Initiated projects

Title	Principal Investigator	Duration
Preclinical animal evaluation of decellularised bovine pericardium as dura substitute.	Dr. Girish Menon	18 months
Evaluation of functional efficacy of recombinant TGF alpha and VEGF proteins	Dr.AnoopkumarThekkuveetil	2 years
A pilot project on implementation of a medical device safety network portal suitable for Indian scenario	Mr.Arun Anirudhan	2 years
Technology development of a portable resuscitation trolley	Dr.Shrinivas Gandhinglajkar	1 year

Ongoing projects

Title	Principal Investigator	Duration
Development of bioactive bone cement based on organically modified ceramic resin	Dr.P.P.Lizymol	1 year
Scale-up and Small-scale Production of Fibrinogen Concentrate, Thrombin and Factor VIII for Clinical Use	Dr. Lissy K Krishnan	1 year

Completed projects

Title	Principal Investigator	Duration
Production Of Drug-Loaded Nanoporous Bioceramic Spheres For Orthopedic Applications	Dr.H.KVarma	12 months
Biological Evaluation Of Fluoropassivated and Gel Sealed Vascular Graft	Dr. Roy Joseph	One year
Pre clinical/efficacy studies of bioengineered cell sheet for ocular surface regeneration	Dr. T.V. Kumary	One year

INDUSTRY sponsored projects

Newly Initiated projects

Title	Principal Investigator	Funding Agency
Preclinical evaluation of Fluoropassivated and hydrogel sealed vascular graft	Dr. Roy Joseph	TTK HealthCare Ltd., Thiruvananthapuram
Bioengineered hybrid skin substitutes for burn wounds	Lissy Krishnan	KSCSTE (90%) Hindustan Life care Limited (10%)

Completed projects

Title	Principal Investigator	Funding Agency
Development of intrauterine drug releasing system	Dr.V.Kalliyana Krishnan	HLL Lifecare Ltd., Trivandrum

Achutha Menon Centre for Health Science Studies

Completed Projects

Capacity building for Safe Motherhood Programs

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 of the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. This was a collaborative initiative to develop evidence based models for Safe Motherhood and Newborn care in India. The objectives of the project were to examine existing evidence in order to develop publishable material for advocacy through joint publications with SEWA Rural and CSER and also jointly identifying problems that require further research. Two faculty members from AMCHSS developed various papers collaboratively with SEWA-Rural and CSER. In addition one MPH student has completed a dissertation using data from SEWA-Rural's project area. Three papers are in the process of submission to journals. 1) The impact of distance and physical access on the utilization of institutional care for child birth in Jhagadia Block, Gujarat, 2) The social determinants of infant mortality in Jhagadia Block, Gujarat, 3) Barriers to seeking care for Post partum morbidity in Jhagadia Block, Gujarat.

Epidemiological Profiling using Data Triangulation

The epidemiological profiling using data triangulation for Kerala state was given to the Achutha Menon Centre for Health Science Studies by NACO, Government of India. The exercise involved two state level workshops for capacity building among the different functionaries in district level. We submitted 14 district reports and a state report as deliverables. The project ended in March 2010 and extended to April 2010. A final report along with the financial statement was submitted in 2011.

Monograph on Women and Health in the WHO Western Pacific Region

The research project completed during the reporting year is the WHO project to prepare a monograph on Women and Health in the Western Pacific Region. The project duration was 1 December 2010 to 31 March 2011 and

the second draft of the completed monograph was submitted on 31 March. This monograph consolidates available data from the WHO Western Pacific Region on women's health through the life cycle. There are seven chapters: an introductory chapter giving an overview of factors affecting women's health in the Region, chapters on the girl child, adolescent girls and young women, reproductive years, adult women, and older women; and a concluding chapter making policy recommendations.

Making Pregnancy Safer – Short course

The short course on "Making Pregnancy Safer" was held during 13-17 July 2010. The goal of the course was "To build commitment, knowledge and leadership skills at various levels of the public health delivery system for action to improve pregnancy related health care".

There were 21 participants, 20 from government health services in Chhattisgarh, Jharkhand, Orissa, Assam, Karnataka and Kerala. The course was of five days' duration, Tuesday through Saturday. There were five modules: social, gender and human rights dimensions of maternal health; monitoring and assessing the performance of maternal health programs; policies for making pregnancies safer; health systems barriers; and making change happen.

Ongoing Projects

Athiyannur Sree Chitra Action (ASA)

This is the ongoing initiative of SCTIMST in collaboration with Athiyannur Block Panchayat. Two new projects got started in the area, one on capacity building of women health workers and another on public health impact of technology use by women. One MPH student has done an assessment of Dementia among the elderly in the community and another MPH student has done a follow up survey to assess the incidence of NCD risk factors in this population. The experimental project of Sub-Centre Data Reporting through Mobile handsets is progressing well.

The preliminary work to incorporate the baseline socio-demographic data along with the spatial attributes of households into multi-touch screen computer stations has been completed. It will be made functional soon and this

will help us to study its usefulness in harnessing community involvement in the updating of the database.

ASA specialty clinics

Cardiology clinics were conducted on all fourth Saturdays in the designated clinic at Community Health Center (CHC) Vizhinjam. A total of 208 patients (106 new and 102 review cases) referred by the local practitioners had availed the services of our cardiologists at the clinic and of them 74 patients were advised to come to SCTIMST for further check up. A total of 10 cardiology clinics were conducted. (Two clinics were cancelled due to hartal and X'mas holiday) Neurology clinics were conducted on every second month on the second Saturday. A total of six Neurology clinics were conducted and 55 patients (38 new and 17 review cases) referred by the local practitioners availed services of our Neurologists at the clinic. Of them 13 patients were advised to come to SCTIMST for further check ups.

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. Three medical colleges have been identified as partner medical colleges in Kerala: The Academy of Medical Sciences, Pariyaram Kannur, Amrita Institute of Medical Sciences Kochi and the Government Medical College Alappuzha. Two medical Colleges in Karnataka were also identified as partner medical colleges: Bangalore Medical College and Kasturba Medical College Mangalore. 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. These modules will be presented in the national conference on the World NO Tobacco day on May 31, 2011 at the Achutha Menon Centre for Health Science Studies of our Institute. A paper based on the baseline survey findings of student and faculty survey in all the five medical colleges is submitted for publication. 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. After implementation of the modules another survey will be conducted in all the five medical colleges to find the impact of intervention.

Capacity building of women health workers

This project aims at capacity building of Junior Public Health Nurses (JPHNs) in the study area in the monitoring of cardiovascular diseases with optimal adaptation of health care technology. A series of sensitization workshops were conducted for the women health workers. A total of 55 JPHNs in the block were trained where cardiologists and public health experts took classes on the importance of dealing with the emerging issues of cardiovascular diseases and the role of prevention in the control of CVDs. Good rapport and networking was established with all the six health care centres and Panchayats in the area. In the coming months, we shall be selecting 10 study areas and 10 control areas from within the 55 JPHN units (health sub-centres).

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 will be conducted in both the intervention and the control sites. The anticipated outcome is a reduction in the risk factors in the intervention site compared to the control site. Such community based interventions to control non-communicable disease risk factors are rare in developing country settings. If the pilot project is successful this could be implemented in many countries where chronic non-communicable diseases are emerging

in epidemic proportions. Two major publications are planned comparing all the four sites.

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

A no-cost extension of the project for action research program on alcohol addiction in the community was successfully completed this year. Detailed information on alcohol addiction in the community, in a sample of households (750 in number) that were identified through GIS based cluster-sampling method, was completed with the initial cohort of 15 youth volunteers from the community. They had been given training on health and social aspects of alcohol use with the help of a psychiatrist prior to this study. Bit notices and flip charts are being prepared for helping them to give education sessions to the women's groups. On preliminary analysis of the data, alcohol addiction was found to be the major reason for psycho-social distress in the community. Subsequently education intervention sessions were conducted for the women-folk in the community on how to deal with drinking among their husbands and other family members. Eighty six small group sessions were conducted and around 1600 women got benefited from the sessions. Women were also encouraged to harness support for anti-alcohol campaigns by influencing political and community leaders.

Writing up of the research experience of the project for publication, a joint venture with the US collaborators is progressing well. GIS mapping of Alappad Panchayat is nearing completion.

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

Background: Women experience diabetes in three ways – one as the patient of diabetes, the second as being a primary care giver for a patient with diabetes and therefore having to provide for the dietary and other needs and lastly as a person living in a household with a patient. In all these situations, the subordinate position of women in society in general and within the household in particular may render them particularly vulnerable in a myriad ways. Gender intersects with social and economic factors; it is likely that the combined effects of gender and poor socio-economic status may actually enhance this vulnerability. There is a need to document the consequences of gender mediated

factors because this would facilitate an identification of potential points for intervention.

Objectives: This study aims 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: The study will be undertaken in two phases. The first is an analysis of secondary sources such as the 60th Round of the National Sample Survey Organisation – Health care and condition of the Aged 2004 to understand the nature of treatment options available to women with diabetes and this will be followed by a qualitative study to identify the differences in the experiences of diabetes by women using 20 cases studies of men and women. Phase 2 consists of a hospital based survey of 300 patients, 150 men and 150 women; at the Medical Trust Hospital, Kulanada to examine the differences in men and women experiences of treatment of type 2 diabetes. Expected Outcomes: (1) Development of at least three papers for submission to relevant peer reviewed journals and (2) 20 case studies of men and women's experiences of type 2 diabetes.

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 Sweden and the University of Amsterdam, The Netherlands. Two faculty members from the BRAC School of public health and one from AMCHSS were identified for PhD training in European Schools. Two faculty members from the BRAC School have already joined for the PhD program. Two faculty members from AMCHSS were sent for one year masters training at the LSHTM: one in infectious disease epidemiology and the other in Environment and health. These were the two areas where we were inviting visiting faculty for teaching the MPH and DPH students. Once these faulty members return after their training they will take over teaching of the above subjects from the visiting faculty. 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

A cross-sectional survey was conducted among 1990 adults (women: 1149; men: 841) in Venmony Panchayat, Alappuzha district, Kerala, India to estimate the prevalence of DM and impaired fasting glycaemia (IFG), and to explore the predictors of hyperglycemia (DM and/or IFG).

The age-adjusted prevalence of DM was 12.5 percent and that of IFG was 4.6 percent. Adjusted for age, sex and family history of DM, hyperglycemia was significantly associated with high socioeconomic status [Odds ratio: 1.36 (1.01 – 1.86)], central obesity (waist to hip ratio \geq 0.80 for women and \geq 0.90 for men) [3.17 (1.73 – 5.79)], high cholesterol (fasting serum cholesterol \geq 200 mg/dl) [1.88 (1.43 – 2.46)], and hypertension (blood pressure \geq 140/90) [1.52 (1.14 – 2.03)].

In spite of the high prevalence, very few socio-economic determinants have been identified directly in the study and most of the predictors are clinical markers. Central Travancore is characterized by rapid life style changes which could be clear markers for high risk status. The present study is an attempt to identify lifestyle markers of high risk for Type II diabetes.

This study proposed to document the perceptions of diabetes in a rural community in Central Travancore and examine the economic and social-cultural determinants of life style modifications over the last 15 years in the same Panchayat.

Qualitative methods were used for this purpose. The perceptions regarding diabetes were obtained using focus group discussions, 4 each among men and women respectively, with appropriate discussion guidelines. The community perceptions of life style changes over the past 15 years were obtained using in depth interviews with about 32 residents of the study area, again using guidelines for the interview.

Study on the Workload of Public Health Nurses and Other Women Health Workers

The overall objective of the study is to explore the workload of public health nurses and other women health workers in Kerala. It also aims to assess the factors associated with this by analyzing the data from the five selected districts of Kerala namely Thiruvananthapuram, Alappuzha,

Ernakulam, Malappuram and Wayanad. Five categories of women health workers are included as respondents (JPHN, JHI, staff nurse, LHI and LHS) for getting a perspective regarding the work allocation and work load.

Study intends to collect data from 1000 respondents by administering a self-reported questionnaire including a pre-existing scale. A pre-test of the survey module was conducted in one of the CHCs in Thiruvananthapuram and on the basis of its response; questionnaire was modified in a way to avoid ambiguities. Each agency from five selected districts was identified for engaging data collection and signed agreements with them. Training was conducted by the researchers for the selected field investigators and supervisors in five districts before sending them to field for data collection. Though the study is primarily quantitative certain qualitative data collection methods like key informant interview and case study are also used for getting a clear picture about the research problem. Apart from these, time and motion study of the activities at the sub-centre is also done in the five districts. Data collection in three districts is nearing completion and both quantitative and qualitative data collection has been progressively going on in the two other districts.





SCIENTIFIC PUBLICATIONS



JOURNAL ARTICLES

- Abraham TN, Vidya R, Tilak P, Kumar PR, Sreenivasan K, Kumary TV. A novel thermoresponsive graft copolymer containing phosphorylated HEMA for generating detachable cell layers. *J Appl Polym Sci*. 2010;115:52–62.
- Acharya NK, Mahajan CV, Kumar RJ, Varma HK, Menon KV. Can iliac crest reconstruction reduce donor site morbidity?: a study using degradable hydroxyapatite-bioactive glass ceramic composite. *J Spinal Disord Tech*. 2010;23: 266-271.
- Ajeesh M, Francis BF, Annie J, Harikrishna Varma PR. Nano iron oxide–hydroxyapatite composite ceramics with enhanced radiopacity. *J Mater Sci Mater Med*. 2010;21:1427-1434.
- Alex A, Paul W, Chacko AJ, Sharma CP. Enhanced delivery of Lopinavir to central nervous system using Compritol based solid lipid nanoparticles. *Therapeutic Delivery* 2011;2:25-35.
- Alex SM, Rekha MR, Sharma CP. Spermine grafted galactosylated chitosan for improved nanoparticle mediated gene delivery. *Int J Pharm*. 2011;410: 125-137
- Anilkumar TV, Muhamed J, Jose A, Jyothi A, Mohanan PV, Krishnan LK. Advantages of Hyaluronic acid as a component of fibrin sheet for care of acute wound. *Biologicals* 2011;39:81-88.
- Aswathy PM, Jairani PS, Mathuranath PS. Genetics of frontotemporal lobar degeneration. *Ann Indian Acad Neurol*. 2010;13(Suppl 2):S55-62.
- Baheti NN, Krishnan S, Thomas B, Kesavadas C, Radhakrishnan A. Stroke like episodes in Sturge-Weber syndrome. *Neurology India* 2010;58:797-799.
- Baheti NN, Manuel D, Shinde PD, Radhakrishnan A, Nair M. Hyperreflexic Guillain-Barre syndrome. *Ann Ind Acad Neurol*. 2010;13:305-307.
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Honours, Awards & Visitors



Honours and Awards

- Dr. C. Kesavadas was awarded the 27th Calicut Medical College Alumni Association Oration Award 2011 on 23rd January 2011.
- Dr. Kesavadas have been selected for the National Bioscience Award for Career Development for the year 2009 by Ministry of Science & Technology, Department of Biotechnology, Government of India. The Award would be conferred by the Hon'ble Minister for Science & Technology and Earth Sciences in a function to be organized on DBT's Foundation Day, 2010.
- Dr Sanjeev Thomas was Elected Fellow of National Academy of Medical Sciences (FAMS).
- Dr Sanjeev Thomas was selected as Fulbright Nehru Visiting Lecturer to teach one semester at Ohio State University, Columbus, OH, USA.
- Dr. Asha Kishore nominated as executive committee member of the international society of movement disorders "Movement Disorder Society- Asian Oceanian Subsection".
- Dr. Asha Kishore nominated as member of the international consortium on genetic epidemiology of PD (GEO PD).
- Dr. Asha Kishore re-nominated as member of Scientific committee of World Federation of Neurology.
- Dr Ashalatha R received the travel Bursary for Young Investigators, 8th Asian-Oceanic International Conference on Epilepsy, Melbourne, Australia, 21st-24th October, 2010.
- Dr Ashalatha R received the "National Bioscience Award for Career development 2010" (DBT, Rs 10 lakhs) for outstanding contribution in the development of state of the art technologies in the management of refractory epilepsy patients.
- Dr.G.K. Dash, Post doctoral fellow in epilepsy received the best paper award in epilepsy for the scientific paper "Effect of lesion status in the diagnosis and management of extra temporal partial epilepsy" at the National epilepsy conference (ECON-2011) in Ludhiana, 25th- 27th February,2010
- Special Appreciation award was presented to Dr. Jaisy Mathai by Indian Society of Blood Transfusion & Immunohematology (ISBTI) for exemplary work done for promoting the speciality of Transfusion Medicine. The award was presented at the National Conference at Hyderabad on 12th Nov 2010.
- New NIH Grant "Building the Asian Chronic Disease NCD Research Network for Regional Research Capacity" the millennium promise award was granted to Brian Oldenburg of Monash University Australia. AMCHSS and SCTIMST are part of the project team.
- Dr.Srujal Shah & Dr Vikram Patra , Illrd year Vascular surgery Senior Residents won the "First Prize & 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.
- Ms. Lynda V Thomas, PhD student at the Division for Tissue Engineering and Regeneration Technologies" , SCTIMST has won the prestigious "Young Scientist Award" at the Kerala Science Congress 2011 held at Centre for Earth Science studies, Trivandrum from January 29th to 31st 2011. Her presentation was on "Development of a small diameter tissue engineered vascular construct using a novel biohybrid polymer scaffolds subjected to dynamic stimulation
- Ms.Soumya Columbus has won the best Oral Presentation Award in the recent National Seminar on Polymers in Medicine and Biology held at Bannari Amman Institute of Technology, Coimbatore from January 7-8, 2011 which was sponsored by DRDO and ICMR. Her presentation was on 'Biodegradable polyester scaffolds for potential small diameter vascular graft applications'
- Dr. Satyajeet Misra has won the KOPS Award in Neuro Anaesthesia for the year 2010, from the Indian Society of Anaesthesiologists (Member of the World Federation of Societies of Anaesthesiologists) on the 58th annual national conference held at SGPGI, Lucknow .
- Dr.Saramma.P.P has been awarded the Best Nurse Educator Award by TNAI 2010,at the Annual Conference of TNAI Kerala State Branch held on September 18th 2010
- Smt.Sudarsa, K has been awarded the Best Nurse Award by TNAI 2010,at the Annual Conference of TNAI Kerala State Branch held on September 18th 2010

- Sri. Sreekumar.R, Jr. Scientific Officer (Instruments)-B, Scanning Electron Microscope Division, Biomedical Technology Wing, has been awarded “Hitachi Best Poster award “ in the International Conference on Advances in Electron Microscopy and Related Techniques in the Annual meeting of EMSI organized by Electron Microscope Society of India & Bhaba Atomic Research Centre during March 8-10, 2010.”

Visitors

- K S Sreekumaran Nair, MD, PhD, Professor of Medicine, Division of Endocrinology, Diabetes, Metabolism and Nutrition, Mayo Clinic and Foundation, Rochester, MN, USA visited SCTIMST on 27/01/2011 and gave a talk on “Slow down Aging”.
- Dr. Rajendra Choudary & Dr. Prasanth Agarwal from SGPGI visited the Transfusion Medicine department on 9/10 /2010.

- Dr. Rajesh B.Sawant Medical Director Rajkot voluntary Blood Bank and Resarch Centre Rajkot visited the Transfusion Medicine department on 28/1/2011.
- Dr.Vani Santhosh Dept. Of Neuropathology ,NIMHANS Bangalore visited the Transfusion Medicine department on 24/2/2011.
- Dr. Mark W. Kroll, Ph.D., FACC, FHRS, Professor of Biomedical Engineering, California Polytechnic University gave a lecture on optimisation of defibrillator shocks on August 5, 2010. . Dr. Kroll is the discoverer of the “burping” effect explaining biphasic defibrillation waveforms, and holder of over 300 issued U.S. patents.

Dr. Subramaniam C. Krishnan, MD, Director, Electrophysiology Laboratory & Arrhythmia Services, UC Irvine Medical Center, Orange, CA delivered a talk on 6-07-2010, on the recent renaissance in cardiac anatomy triggered by Clinical Cardiac Electrophysiology







Administration







From the Desk of Deputy Director (Admn)

The Human Resource Department has the responsibility of organizing and supporting all 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 is responsible for integrating 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 patients, 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 policy making body is the Institute Body and the executive body is the Governing Body (GB).

The Chief Executive Officer of the Institute is the Director, who reports to the GB and provides leadership in implementing the strategic goals and decisions set by the GB. The Director also represents the hospital to the external environment and the scientific research community. In these tasks, the Director coordinate the collective effort of the institute's personnel and delegates the clinical care, R & D activities and administrative duties to highly trained individuals and teams.

The HRD coordinates activities and create polices so that all areas of the Institute staff function according to objectives of the institute precepts. 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.

Non-medical administrative services are necessary to the Institute's activity and physical plant management. The Director and other senior officers leads these administrative services and is directly responsible for the day-to-day operations of the facility. The Finance & Accounts Division manages 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.

With a modern superspeciality hospital at the institute, the functional environments in the institute provides innumerable organizational and administrative challenges. These includes staff hiring and coordinating institute support activities including financial functions. The administration is responsible for and oversees each function of the working of the institute. There are doctors, scientists, engineers, research scholars, doctoral and postdoctoral students, scientific and technical staff, nurses, para-medical staff, accounts & administrative staff that all have to work in tandem to make sure that the institute is run as efficiently and smoothly as possible. It is the administration's job to ensure the utmost efficiency in this process and to maintain discipline in the entire organization.

The HRD evaluates the staff on a periodical basis and judge the level of their performance and also develops policies and procedures that facilitate the efficiency of daily operations. 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 HRD interacts with all departments in the hospital and R & D wing to ensure the quality and motivation of personnel working there. Human resources performs job analyses, develops job descriptions, and establishes competitive compensation for specific positions as per central government pay structures, as well as providing training to new employees and opportunities for growth and self-actualization for all employees. Other important administrative functions may include planning, organizing, co-ordination, training, public relations, plant and materials management, budgeting & fund-raising, housekeeping, and security.

The HRD 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 2010-11, Personnel Department has conducted interviews for filling up 51 permanent posts, 74 temporary/leave substitute positions, 57 project appointment positions besides handling the internal promotional cases of 18 employees (both under vacancy oriented and flexible complementing promotion schemes). Service Records/Books of an average of >1200 employees (948 permanent employees and rest project/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.

The fiscal aspect of the Institute is regulated by the Administration and Finance Division under the control of the Director, who maintains financial stability by promoting services produced in a cost-effective manner. This includes procuring cost-efficient products and services for the hospital and the R & D wing. In this way the Institute achieves and maintains the financial health of the institute. The Institute had got a grant of ~ Rs 90 crores during the year 2010-11 from the Central Government and the Institute has generated an income of Rs.51.43 crores from patient care services and royalty of technologies transferred. Against this total receipts, the Institute incurred a total expenditure of Rs.159.95 crores during 2010-11, and the break-up for various major heads are : (i) Non-Plan expenses : Rs. 122.16crores and (ii) Plan expenses: Rs. 37.79 crores. Accounting is centralized to the Institute's financial activities for both the Hospital and Biomedical Technology Wings. Detailed and sound accounting practices are fundamental to maintaining important organizational statistics for administrative decision-making. The accounting department is responsible for maintaining the general ledger and summarizing all the financial transactions performed by the Institute, particularly at the hospital, preparing and dispensing the payroll, tracking and recording costs to enable appropriate reimbursement for services from creditors, and preparing the capital and operating budgets. The sensitivity and efficiency of this department greatly influence the patient's perception of the quality of care received. Information services and medical record maintenance are core functions of hospital management.

Sometimes the HRD had to resolve critical issues related to employee unions, alleged discrimination/discontentment/negligence etc and to ensure a safe working environment. A sense of diplomacy is a quality that is essential to human resources management. The Administration also possess strategic functional insight and interpersonal skills and is able to negotiate difficult situations. The ability to communicate succinctly verbally and in writing is well mandated. The Administration is having a good sense of all aspects of the institute's operation and the specifics of all positions necessary to carry out its mission and goals.

The HR Division also have the ability to train and mentor staff, seek out and schedule staff development trainings and is able to pinpoint specific individualized training needs of the staff. It also possess the ability to act as an impartial evaluator. Evaluation is a significant part of the Institute's HR job, insuring that employees are on target, working to the best of their potential and recognizing specific training and development of an individual. The HR executive of the Institute plans and implements the steps for on-the-job training including periodical orientation/induction training programs.

16th August 2011


P.B. Sourabhan



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Ministry of Health & Family Welfare, Nirman Bhavan,
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Secretary to Government of India

Department of Education, Ministry of Education
Ministry of Human Resource Development, New Delhi

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Head, BMT Wing, 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

Financial Advisor (Ex-officio Convener)
SCTIMST, Thiruvananthapuram

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

FINANCE COMMITTEE

Prof. K. Radhakrishnan(Chairman)
Director, SCTIMST, Thiruvananthapuram

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 Convener)
SCTIMST, Thiruvananthapuram

SENIOR STAFF SELECTION COMMITTEE

Director (Chairman)
SCTIMST, Thiruvananthapuram

Head, BMT Wing, SCTIMST
Poojappura, Thiruvananthapuram

A Scientist nominated by the President from among the members of the Institute Body
(Prof. Jayaprakash Muliyl, Professor & Head of Community Medicine Christian Medical College, Vellore)

A Nominee of the Secretary
Department of Science & Technology,
Govt. of India, New Delhi - 110 016

A Senior Academic Staff of the Institute not below the rank of Professor/Scientist G/Engineer G

An External Expert nominated by the President of the Institute

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Thiruvananthapuram

Head, BMT Wing, SCTIMST
Poojappura, Thiruvananthapuram

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

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Judge, (Retd) High Court of Kerala, Kochi

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Former Prof. of Pharmacology & Director of Medical Education
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Ulloor, Thiruvananthapuram - 695 011

Smt. J. Lalithambika IAS

"Abhilash" Golf Links Road, Kowdiar,
Thiruvananthapuram-695043

Prof. K.A Kumar

Professor of Psychiatry, "Koikal", T.C 13/598, Pattom,
Thiruvananthapuram

Dr. P.G. Premila

Professor of Pediatrics (Rtd.), 7C, Kowdiar Manor, Kowdiar,
Thiruvananthapuram

Dr. Meenu Hariharan

(Former Director of Medical Education Govt. of Kerala)
Abha, 20/1677, No.8, Sasthi Nagar, Karamana,
Thiruvananthapuram – 695002.

Dr. Dr. V. Kumaraswami

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Dr. S.N. Pal

Director (Engineering) HSCC (India) limited
E-6 (A), Sector -1, NOIDA (U.P)-201301

Dr. K. Radhakrishnan

Director, SCTIMST, Thiruvananthapuram

Dr. G. S. Bhuvaneshwar

Head, BMT Wing, SCTIMST, Thiruvananthapuram

Dr. Anoop Kumar T.

(Member Secretary IEC), Scientist 'E', Molecular Medicine
SCTIMST, BMT Wing, Poojappura, Thiruvananthapuram

Dr. Girish Menon

Additional Professor of Neurosurgery, SCTIMST, Trivandrum

Ms. Sreepriya.CS

Executive Secretary to the Director cum Coordinator, IEC
SCTIMST, Thiruvananthapuram

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Head, BMT Wing, SCTIMST
Poojappura, Thiruvananthapuram

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Director, Nonferrous Materials
Technology Development Centre, Hyderabad

Dr. M. Radhakrishna Pillai

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Rajiv Gandhi Centre for Biotechnology, Trivandrum

Dr. K.G. Rajendran

Vice President, USV Ltd., Mumbai

Prof. R. Krishnakumar

Department of Engineering Design, I.I.T. Madras

Dr. S. Radhakrishnan

Scientist – G, Polymer Science & Engineering
National Chemical Laboratory, Pune

Dr. Baldev Raj, (Institute Body)

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Indira Gandhi Centre for Atomic Research, (IGCAR), Kalpakkam

Dr. A K. Gupta

Professor & Head, Dept. of IS&IR, SCTIMST

Dr. K. Jayakumar

Professor of Cardio Vascular & Thoracic Surgery, SCTIMST

Dr. Kalliyana Krishnan V.

Scientist 'G', BMT Wing, SCTIMST

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Dr Lissy K Krishnan

Scientist F, Expert – Biological safety, Blood

Dr Molly Antony

Scientist F, Expert – Microbiology

Dr Omkumar, Scientist

Rajiv Gandhi Centre for Biotechnology- External Expert

Dr Sathish Mundayoor

Scientist, Rajiv Gandhi Centre for Biotechnology – DBT Nominee

Dr K.S.Jawahar

AMO, - Biosafety Officer of SCTIMST

Dr Maya NandkumarScientist E, (*Secretary & Convener*)**HOSPITAL MANAGEMENT COMMITTEE****Dr.Sankarkumar**Medical Superintendent and Professor Sr.Grade CVTS (*Chairman*)**Dr.Jaganmohan Tharakan**

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Dr.N.Suresh Nair

Professor Sr.Grade & HOD, Dept. of Neurosurgery

Dr.R.C.Rathod

Professor Sr.Grade & HOD, Dept. of Anaesthesiology

Dr.M.D.Nair

Prof. & HOD of Neurology

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Professor & HOD, Dept. of CVTS

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Mr.N.G.Thampi

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Professor & HOD, Dept. of IS & IR

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Professor, Dept. of Neurology

Dr.Thomas Koshy

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Dr.Harikrishnan.S

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Dr.Kesavadas.C

Addl. Professor, Dept. of IS & IR

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Engineer, F, Dept.of Clinical Engineering

Smt.Vijayamma Harikrishnan

Nursing Superintendent

Smt.Sudhamani Amma.S

Deputy Nursing Superintendent

Smt.Elizabeth.C.D

Theatre Sister NOT

Smt.Elizabeth P.George

Sr.Theatre Sister COT

Smt.Padmaja Devi S.S

Sr.Theatre Sister, PSOT

Smt. Gracyamma Bridget

Sr.Staff Nurse, Infection Control Unit

Smt.Usha.O.K

Technical Asst.– Repr: from Construction Wing

Smt.Deepa K Nair

Pharmacist Gr.II - Repr: from Pharmacy

Mr.Hemanth Kumar.R.P

Asst. Security Officer, Repr. from House Keeping

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Smt.Sudarsa.K

Sr.W/S, NSICU

Smt.Thresiamma John

Sr.W/S, NMICU

Smt.Pennamma.K.J

Sr.W/S, CHICU

Smt.Aleyamma John

Sr.W/S, CCU

Smt.Saraswathy Amma.C

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Sr.Tech. Asst. (Lab) Dept.of Pathology

Mr.Thomas.T.A

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Assistant Professor, Neurosurgery

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Scientist 'C', Thrombosis Research Unit

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Head, BMT Wing (*Chairman*)

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Dr. Anoop Kumar T.
Scientist 'F', BMT Wing (*Member Secretary*)

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Associate Professor, Cardiology

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Dr. S. Sivasankaran
Additional Professor, Cardiology

Dr. Lissy K. Krishnan
Scientist 'F', BMT Wing

Dr. Mala Ramanathan
Additional Professor, AMCHSS (*Member Secretary*)

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Professor (Chairperson)

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Scientist 'G'

Dr. Mala Ramanathan
Addl. Professor

Dr. Lissy K. Krishnan
Scientist 'F'

Ms. Sudhamani Amma S.,

Deputy Nursing Supdt.

Smt. Nalini Nayak

Secretary, SEWA, Thiruvananthapuram

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(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

KEY ADMINISTRATIVE STAFFS

Deputy Director:
P. B. Sourabhan M.A.
L.L.B., PGDMM, DCA

Financial Adviser:
Radha Devi P.

Chief Accounts Officer:
Mahadevan R.

Administrative Officer (Grade I):
Sasikumar S.



Statement of Accounts

Balance sheet

Income & Expenditure Account

Schedule Forming Part of Assets

Schedule Forming Part of Income & Expenditure Account

Receipt & Payments Accounts of the year 2010-2011

Provident Fund Account for the year ended 31.03.2011

Separate Audit Report



**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY,
THIRUVANANTHAPURAM
BALANCE SHEET AS AT 31st MARCH 2011**

		2010-2011	2009-2010
CORPUS/CAPITAL FUND AND LIABILITIES	Schedules	Rs.	Rs.
CAPITAL FUND	1	2883685259.78	2815772164.19
RESERVES & SURPLUS	2	355187993.70	310546070.70
EARMARKED ENDOWMENT FUNDS	3	172537198.05	185502379.09
SECURED LOANS & BORROWINGS	4	0.00	0.00
CURRENT LIABILITIES & PROVISIONS	7	139199588.22	129610816.22
TOTAL		3550610039.75	3441431430.20
ASSETS			
FIXED ASSETS	8	1394143045.27	1212201058.64
INVESTMENTS FROM EARMARKED ENDOWMENT FUNDS	9	488222189.70	443872589.70
CURRENT ASSETS , LOANS, ADVANCES ETC	11	1668244804.78	1785357781.86
MISCELLANEOUS EXPENDITURE (TO THE EXTENT NOT WRITTEN OFF)			
TOTAL		3550610039.75	3441431430.20
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY,
THIRUVANANTHAPURAM**

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 2011

INCOME	Schedules	2010-2011	2009-2010
		Rs.	Rs.
Income from Sales / Services	12	321602172.40	292944869.00
Grants Received from Govt of India(Non Plan)	13	258676264.00	253900000.00
Fees/Subscription	14	7024222.00	5099450.00
Income from Investments	15	31053372.00	27895546.00
(Income on Investment from earmarked/endow.Funds transferred to Funds)			
Income from Royalty, Publication etc	16	877864.00	4649575.00
Interest Earned	17	74043322.57	104013645.96
Other Income	18	3455782.30	2150693.08
Total		696732999.27	690653779.04
EXPENDITURE			
Establishment Expenses	20	666986582.60	624234687.28
Other Administrative Expenses	21	413918436.44	348437663.17
Bank Charges	23	114518.25	320839.40
Depreciation (Net Total at the year-end-corresponding to Schedule 8)		134965510.39	111658615.15
Total		1215985047.68	1084651805.00
Balance being Excess Expenditure over Income		519252048.41	393998025.96
Add: Transfer to Special Reserve Account		53580274.00	45844996.00
BALANCE BEING DEFICIT CARRIED TO CAPITAL FUND		572832322.41	439843021.96
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

SCHEDULES		
	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
SCHEDULE 1 - CORPUS/CAPITAL FUND		
Balance as at the beginning of the year	3853369086.38	3452174357.21
Less Depreciation up to the end of the previous year	1037596922.19	925938307.06
Net balance at the beginning of the year	2815772164.19	2526236050.15
Add: Plan Grants received from Government of India	641323736.00	704700000.00
Add: Grants received from Others for Capital Assets(WCP)	0.00	27100000.00
Add:Contribution towards Corpus/Capital Fund		
Deduct: Balance of net expenditure transferred from the Income and Expenditure Account	572832322.41	439843021.96
Less:Value of Assets Written off during the year	578318.00	2420864.00
DeductTransfer to BMT/Add Transfer from CHO	0.00	0.00
BALANCE AS AT THE YEAR-END	2883685259.78	2815772164.19
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	310546070.70	271488083.70
Addition during the year (Current year transfer +Decrease in provision)	44641923.00	39057987.00
Less: Deductions during the year		
4. General Reserve:		
As per last Account		
Addition during the year		
Less: Deductions during the year		
TOTAL	355187993.70	310546070.70

	2010-11	2009-10
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)		0.00
c) Utilisation / Expenditure towards objective of funds		
i. Capital Expenditure		
- Fixed Assets		
- Others		
Total (Detailed Schedule Attached)		0.00
ii. Revenue Expenditure		
- Salaries, Wages and allowances etc.	172537198.05	185502379.09
- Rent		
- Other Administrative expenses		
Total	172537198.05	185502379.09
TOTAL (c)		
NET BALANCE AS AT THE YEAR-END (a+b+c)	172537198.05	185502379.09

SCHEDULE 3-EARMARKED/ENDOWMWNT FUNDS		FUND-WISE BREAK UP			TOTAL
PROJ Code	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
5000	PROJ-MISCELLANEOUS	818040.00	4470147.00	0.00	5288187.00
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	1652779.70	0.00	0.00	1652779.70
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	92647.00	0.00	0.00	92647.00
5094	KERALA STATE AIDS CONTROL SOCIETY	491883.00	0.00	0.00	491883.00
5100	AMC/MAC ARTHUR FOUNDATION/02-70546	46315.05	0.00	0.00	46315.05
5103	CLINICAL TRIAL/QUINTAILSPEC/DR.RADHAKRISHNAN	410584.00	0.00	0.00	410584.00
5108	EVAL.SUB-TYPES DEMENTIA/DR.MATHURA	15800.50	0.00	0.00	15800.50
5110	TOBACCO CESSATION & RESEARCH / DR.THANKAP	2771594.65	3967331.00	223748.29	6962673.94
5111	DIFFUSION WEIGHTED IMAGING/DR.GUPT	-26226.00	0.00	0.00	-26226.00
5119	STAKE HOLDER-PERCEPT/INST.REV BO	201990.73	0.00	0.00	201990.73
5125	PILOT STUDY/HEMOGRAFT HARVEST	185.00	0.00	0.00	185.00
5126	A MULTI NATIONAL, MULTI-CENTER/SIRO	111215.00	0.00	0.00	111215.00
5128	INDENT. OF MACOBACTERIAL/DST/V.V.RADHAKRISHN	136107.00	0.00	0.00	136107.00
5130	TELE-HEALTH & MEDICAL EDUCATION/JAWAHAR	1010105.00	250000.00	265000.00	1525105.00
5132	STUDIES ON MATRIX METALLOPROTEINASE	23179.00	0.00	21409.00	44588.00
5133	COMMUNITY BASED INTERVENTION/WHO	215059.00	0.00	0.00	215059.00
5135	A 16-WEEK,DOUBLE BLIND/ASHA KISHORE	1743062.00	0.00	0.00	1743062.00
5137	MECHANISM OF ANTICANCER/DAE, BRS	2761.00	0.00	0.00	2761.00
5139	A 24 WEEK, MULTICENTER/DR. MATHURANATH	2586136.28	864904.00	0.00	3451040.28
5140	HARVARD SCHOOL OF PUBLIC HEALTH	96580.32	0.00	0.00	96580.32
5142	BANKING FOR BETTER HEALTH-MEDISAVE	240383.36	0.00	0.00	240383.36
5146	DEVELOPMENT OF SPECT	138671.00	0.00	0.00	138671.00
5147	DEVELOPMENT OF SPECT	39137.00	0.00	0.00	39137.00
5150	PROTOCOL 6002-INT 001	428796.60	0.00	0.00	428796.60
5153	DEV REF. MANUAL FOR	233660.00	0.00	0.00	233660.00
5155	COMM BASED DETECTION	354383.00	0.00	0.00	354383.00
5156	TSUNAMI PROJECT	870573.50	0.00	105000.00	975573.50
5159	NCD RISK FACTOR	71123.00	0.00	0.00	71123.00
5160	BRAIN MAPING & BASIC NEUROGENETIC/DR.P.S MATHURANATH	545912.00	0.00	185000.00	730912.00
5161	DOSE RANGING STUDY:CGHR	2156226.00	865809.00	0.00	3022035.00
5167	PROJ/SURVIVAL MECHANISM	208486.00	0.00	35525.00	244011.00
5168	PROJ/VERMEER STUDY	1319030.00	0.00	603712.00	1922742.00

		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	3065728.00	247454.00	1118609.00	4431791.00	4431791.00	856396.00	
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	165000.00	0.00	330961.00	495961.00	495961.00	1156818.70	
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	20851.00	20851.00	20851.00	71796.00	
0.00	0.00	0.00	0.00	446366.00	0.00	446366.00	446366.00	45517.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46315.05	
0.00	0.00	0.00	77143.00	0.00	14803.00	91946.00	91946.00	318638.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15800.50	
0.00	0.00	0.00	1771554.00	198269.00	2991837.00	4961660.00	4961660.00	2001013.94	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-26226.00	
0.00	0.00	0.00	0.00	50401.00	0.00	50401.00	50401.00	151589.73	
0.00	0.00	0.00	0.00	0.00	185.00	185.00	185.00	0.00	
0.00	0.00	0.00	0.00	110520.00	695.00	111215.00	111215.00	0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	136107.00	
437035.00	0.00	437035.00	126329.00	0.00	37277.00	163606.00	600641.00	924464.00	
0.00	0.00	0.00	0.00	44588.00	0.00	44588.00	44588.00	0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	215059.00	
0.00	0.00	0.00	0.00	0.00	23470.00	23470.00	23470.00	1719592.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2761.00	
0.00	0.00	0.00	251526.00	0.00	272333.00	523859.00	523859.00	2927181.28	
0.00	0.00	0.00	0.00	0.00	4786.00	4786.00	4786.00	91794.32	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	240383.36	
0.00	0.00	0.00	0.00	67046.00	4474.00	71520.00	71520.00	67151.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39137.00	
0.00	0.00	0.00	39000.00	0.00	0.00	39000.00	39000.00	389796.60	
0.00	0.00	0.00	0.00	77858.00	0.00	77858.00	77858.00	155802.00	
0.00	0.00	0.00	0.00	0.00	46325.00	46325.00	46325.00	308058.00	
0.00	0.00	0.00	166395.00	40949.00	229109.00	436453.00	436453.00	539120.50	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71123.00	
458294.00	0.00	458294.00	0.00	86098.00	186520.00	272618.00	730912.00	0.00	
0.00	0.00	0.00	120000.00	198252.00	569064.00	887316.00	887316.00	2134719.00	
0.00	0.00	0.00	0.00	0.00	34692.00	34692.00	34692.00	209319.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1922742.00	

PROJ Code	SCHEDULE 3-EARMARKED/ENDOWMWNT FUNDS NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	FUND-WISE BREAK UP			TOTAL
		OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
5169	SAFETY OF MELPERONE	323248.00	0.00	0.00	323248.00
5170	DR.ASHA KISHORE	2470919.00	0.00	0.00	2470919.00
5172	C.KESAVADAS	49323.00	86733.00	0.00	136056.00
5173	DR.DINESH NAYAK	583158.00	303770.00	20000.00	906928.00
5174	CHANGES IN SLEEP WAKEFULNESS-Dr.Mohanku.	19765.00	991616.00	20000.00	1031381.00
5175	SURGICAL TRAIL IN LOBAR INTRACEREBRAL	39125.27	0.00	0.00	39125.27
5176	WOMENT COMPONANT PLAN	146144.25	0.00	0.00	146144.25
5177	DR.KRISHNAMANO HAR	66278.00	97650.00	63.00	163991.00
5180	DR.KANNAN SRINIVASAN	69649.00	0.00	0.00	69649.00
5181	DR.ASHA KISHORE	-14350.00	0.00	0.00	-14350.00
5182	DR.SANJEEV.V.THOMAS	7033729.00	0.00	16500.00	7050229.00
5183	DR.K.R.THANKAPPAN	15652632.00	0.00	49168.92	15701800.92
5184	DR.JAWAHAR	1280649.00	1000000.00	0.00	2280649.00
5185	A MULTICENTRE DOUBLE BLIND..DR.ASHA KISHORE	236834.00	70425.00	0.00	307259.00
5187	DR.SANJEEV.V.THOMAS	183225.00	0.00	0.00	183225.00
5188	DR.K.RADHAKRISHNAN	791926.00	0.00	0.00	791926.00
5189	DR.HARIKRISHNAN	195255.00	0.00	0.00	195255.00
5190	DR.MALARAMANATHAN	83056.00	0.00	0.00	83056.00
5191	DR.ASHA KISHORE	776731.00	0.00	0.00	776731.00
5192	DR.K.R.THANKAPPAN	471209.50	0.00	117.00	471326.50
5193	DR.MALARAMANATHAN	272386.00	0.00	0.00	272386.00
5194	DR.K.R.THANKAPPAN	2892223.00	0.00	2547672.00	5439895.00
5195	DR.ASHA KISHORE	9932.00	0.00	0.00	9932.00
5196	DR.SHIVKUMAR	45002.00	497000.00	0.00	542002.00
5198	DR.RENUKA NAIR	93374.00	0.00	69600.00	162974.00
5199	DR.JAYAKUMAR	374347.00	0.00	163957.00	538304.00
5200	DR.KANNAN SRINIVASAN	160.00	38585.00	0.00	38745.00
5201	DR.ASHA KISHORE	1300018.50	487337.00	519996.00	2307351.50
5202	DR.JAYASREE	487854.00	0.00	0.00	487854.00
5205	DR.SURESH NAIR	224163.00	100350.00	0.00	324513.00
5207	DR.JAYSREE/A.K.GUPTA	6692.00	0.00	0.00	6692.00
5208	DR.K.SRINIVASAN	319720.00	235785.00	0.00	555505.00
5209	DR.S.HARIKRISHNAN	0.00	33750.00	0.00	33750.00
5210	DR.K.R.THANKAPPAN	8854091.00	0.00	8239161.00	17093252.00
5212	DR.S.HARIKRISHNAN	526600.00	0.00	0.00	526600.00
5213	AMC FUND	0.00	1475000.00	0.00	1475000.00
5214	DR.ASHA GOPINATHAN	396000.00	525000.00	4000.00	925000.00
5215	DR.V.V.RADHAKRISHNAN	0.00	309100.00	0.00	309100.00
5216	DR.ASHA KISHORE	0.00	1022656.00	0.00	1022656.00
5217	DR.K.SRINIVASAN	0.00	2000000.00	0.00	2000000.00

		UTILISATION						
CAPITAL EXPENDITURE		REVENUE EXPENDITURE						
FIXED ASSETS	OTHERS	TOTAL	SALARI ES WAGES	RENT/CON-SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE
0.00	0.00	0.00	106250.00	0.00	216998.00	323248.00	323248.00	0.00
55843.00	0.00	55843.00	0.00	0.00	0.00	0.00	55843.00	2415076.00
0.00	0.00	0.00	0.00	0.00	56154.00	56154.00	56154.00	79902.00
0.00	0.00	0.00	95692.00	0.00	38925.00	134617.00	134617.00	772311.00
459526.00	0.00	459526.00	176953.00	0.00	255840.00	432793.00	892319.00	139062.00
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	87079.00	87079.00	87079.00	59065.25
0.00	0.00	0.00	0.00	0.00	163991.00	163991.00	163991.00	0.00
0.00	0.00	0.00	0.00	0.00	51341.00	51341.00	51341.00	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	0.00	0.00	2586413.00	2586413.00	2586413.00	4463816.00
0.00	0.00	0.00	1669148.00	1142317.00	1166822.00	3978287.00	3978287.00	11723513.92
0.00	0.00	0.00	0.00	322445.00	0.00	322445.00	322445.00	1958204.00
0.00	0.00	0.00	0.00	0.00	307259.00	307259.00	307259.00	0.00
0.00	0.00	0.00	0.00	0.00	1842.00	1842.00	1842.00	181383.00
0.00	0.00	0.00	6000.00	0.00	424104.00	430104.00	430104.00	361822.00
0.00	0.00	0.00	0.00	0.00	194243.00	194243.00	194243.00	1012.00
0.00	0.00	0.00	0.00	0.00	6717.00	6717.00	6717.00	76339.00
0.00	0.00	0.00	0.00	105718.00	67.00	105785.00	105785.00	670946.00
44904.00	0.00	44904.00	0.00	0.00	81726.00	81726.00	126630.00	344696.50
0.00	0.00	0.00	44000.00	0.00	149849.00	193849.00	193849.00	78537.00
0.00	0.00	0.00	382414.00	0.00	4678892.00	5061306.00	5061306.00	378589.00
0.00	0.00	0.00	0.00	0.00	9932.00	9932.00	9932.00	0.00
0.00	0.00	0.00	135953.00	215634.00	30385.00	381972.00	381972.00	160030.00
0.00	0.00	0.00	113907.00	0.00	35649.00	149556.00	149556.00	13418.00
0.00	0.00	0.00	191472.00	0.00	75120.00	266592.00	266592.00	271712.00
0.00	0.00	0.00	0.00	0.00	38745.00	38745.00	38745.00	0.00
0.00	0.00	0.00	88000.00	0.00	48734.00	136734.00	136734.00	2170617.50
0.00	0.00	0.00	0.00	0.00	511897.00	511897.00	511897.00	-24043.00
0.00	0.00	0.00	0.00	0.00	94637.00	94637.00	94637.00	229876.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6692.00
31000.00	0.00	31000.00	69120.00	0.00	17522.00	86642.00	117642.00	437863.00
0.00	0.00	0.00	6250.00	0.00	6960.00	13210.00	13210.00	20540.00
0.00	0.00	0.00	0.00	0.00	16099346.00	16099346.00	16099346.00	993906.00
0.00	0.00	0.00	80000.00	0.00	49580.00	129580.00	129580.00	397020.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1475000.00
48850.00	0.00	48850.00	435484.00	3220.00	98920.00	537624.00	586474.00	338526.00
0.00	0.00	0.00	0.00	0.00	56686.00	56686.00	56686.00	252414.00
0.00	0.00	0.00	95333.00	0.00	150671.00	246004.00	246004.00	776652.00
99800.00	0.00	99800.00	378645.00	0.00	121838.50	500483.50	600283.50	1399716.50

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS		FUND-WISE BREAK UP			TOTAL
PROJ Code	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
5218	DR.SUNDARI RAVINDRAN	0.00	1000000.00	1300.00	1001300.00
5219	DR.BIJU SOMAN	0.00	1996000.00	0.00	1996000.00
5220	DR.BIJU SOMAN	0.00	999000.00	0.00	999000.00
5221	DR.V.RAMANKUTTY	0.00	1984818.00	0.00	1984818.00
5224	DR.C.KESAVADAS	0.00	300000.00	0.00	300000.00
5226	DR.G.SRINIVAS	0.00	2167000.00	0.00	2167000.00
5227	DR.MURALIDHARAN NAIR	0.00	168000.00	0.00	168000.00
5228	DR.S.HARIKRISHNAN	0.00	150000.00	0.00	150000.00
5229	DR.C.KESAVADAS	0.00	598000.00	0.00	598000.00
5230	DR.SUNDARI RAVINDRAN	0.00	421077.25	0.00	421077.25
5231	DR.V.V.RADHAKRISHNAN	0.00	650000.00	16349.00	666349.00
5232	DR.ASHA KISHORE	0.00	483100.00	0.00	483100.00
5233	DR. BEJOY THOMAS/DR.C.KESAVADAS	0.00	360000.00	50000.00	410000.00
5234	DR.R.ASHA LATHA	0.00	1058333.00	0.00	1058333.00
6054	PROJ/DR RADHAKRISHNAN NEUROLOGY	622884.54	0.00	11400.00	634284.54
6055	MOVEMENT/DR. ASHA KISHORE	-258413.00	0.00	418020.00	159607.00
6057	PUBLISHING JOURNAL ARTICLE/DR. THANKAPPAN	186550.00	0.00	0.00	186550.00
6058	ATHIYANOOR SCT ACTION/DR.K.R.T	21006.00	0.00	0.00	21006.00
6064	SPEECH THERAPY	-391407.00	0.00	0.00	-391407.00
6065	COMPREHENSIVE CENTRE FOR SLEEP DIS ORD.	618121.00	0.00	295230.00	913351.00
6066	DR.SANJEEV V THOMAS	0.00	50000.00	0.00	50000.00
6067	DR.JAGANMOHAN THARAKAN	0.00	106000.00	0.00	106000.00
6068	DR.SAJITH.S	0.00	150000.00	0.00	150000.00
6069	DR.SYAM.K	0.00	50000.00	0.00	50000.00
6070	DR.BEJOY THOMAS/DR.GAYATHRI.P	0.00	150000.00	0.00	150000.00
6071	DR.S.K.JAWAHAR	0.00	150000.00	0.00	150000.00
6072	COMPREHENSIVE STROKE CARE	0.00	0.00	0.00	0.00
6073	DR.KIRON.S	0.00	50000.00	0.00	50000.00
6074	DR.DIVYATA FANJENDR HINGWALA	0.00	50000.00	0.00	50000.00
6075	DR.BIJULAL.S	0.00	150000.00	0.00	150000.00
6077	TAC	0.00	0.00	26667.00	26667.00
7101	ADVANCES TO PI	-80297.00	0.00	1680810.00	1600513.00
7102	AMT.PAYABLE TO PROJECT STAFF	2153.00	0.00	146161.00	148314.00
2721	ADVANCE FOR SUPPLIES PROJECT	-63712.00	0.00	1404007.00	1340295.00

		UTILISATION						
CAPITAL EXPENDITURE		REVENUE EXPENDITURE						
FIXED ASSETS	OTHERS	TOTAL	SALARIES WAGES	RENT/CON-SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE
0.00	0.00	0.00	0.00	0.00	1001300.00	1001300.00	1001300.00	0.00
49800.00	0.00	49800.00	129677.00	0.00	70555.00	200232.00	250032.00	1745968.00
0.00	0.00	0.00	64089.00	0.00	37851.00	101940.00	101940.00	897060.00
122341.00	0.00	122341.00	119516.00	0.00	160419.00	279935.00	402276.00	1582542.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	300000.00
573811.00	0.00	573811.00	122400.00	122039.00	25750.00	270189.00	844000.00	1323000.00
0.00	0.00	0.00	33871.00	0.00	0.00	33871.00	33871.00	134129.00
0.00	0.00	0.00	0.00	0.00	19244.00	19244.00	19244.00	130756.00
0.00	0.00	0.00	37161.00	0.00	0.00	37161.00	37161.00	560839.00
0.00	0.00	0.00	90000.00	0.00	254215.00	344215.00	344215.00	76862.25
0.00	0.00	0.00	0.00	0.00	38302.00	38302.00	38302.00	628047.00
0.00	0.00	0.00	16607.00	0.00	32110.00	48717.00	48717.00	434383.00
0.00	0.00	0.00	0.00	0.00	303178.00	303178.00	303178.00	106822.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1058333.00
0.00	0.00	0.00	90000.00	0.00	0.00	90000.00	90000.00	544284.54
0.00	0.00	0.00	93572.00	0.00	7216.00	100788.00	100788.00	58819.00
0.00	0.00	0.00	73000.00	8251.00	11887.00	93138.00	93138.00	93412.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21006.00
0.00	0.00	0.00	221524.00	0.00	0.00	221524.00	221524.00	-612931.00
435878.00	0.00	435878.00	620657.00	7358.00	75637.00	703652.00	1139530.00	-226179.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50000.00
0.00	0.00	0.00	0.00	0.00	2840.00	2840.00	2840.00	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	18480.00	18480.00	18480.00	31520.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	150000.00
0.00	0.00	0.00	13929.00	0.00	0.00	13929.00	13929.00	136071.00
0.00	0.00	0.00	681730.00	0.00	0.00	681730.00	681730.00	-681730.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	150000.00
0.00	0.00	0.00	36667.00	0.00	0.00	36667.00	36667.00	-10000.00
0.00	0.00	0.00	0.00	0.00	1680770.00	1680770.00	1680770.00	-80257.00
0.00	0.00	0.00	0.00	0.00	143696.00	143696.00	143696.00	4618.00
0.00	0.00	0.00	0.00	0.00	1564205.00	1564205.00	1564205.00	-223910.00

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS		FUND-WISE BREAK UP			TOTAL
PROJ Code	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
1014	NEW PENSION SCHEME	35820673.00		37600890.00	73421563.00
1301	EMPLOYEES PENSION FUND	27585539.65		117774034.00	145359573.65
1075	PATIENT WELFARE FUND	1913284.00		158952.00	2072236.00
1077	INSTITUTIONAL ETHICS COMMITTEE FUND	3941365.00		1025529.00	4966894.00
1078	DR. RICHARD A CASH & DR K MOHANDS AWARD	0.00		36215.00	36215.00
1080	STAFF BENEVOLENT FUND	2115517.25		3822580.00	5938097.25
1079	VICE CHANCELLORS CONFERENCE FUND - Hospital	267425.00		51211.00	318636.00
1081	CONTINUUM - SPECIAL CME PUBLICATION FUND - Hospital	0.00		67217.00	67217.00
5000	PROJECT SUSPENSE	455988.00	3556532.00	-	4012520.00
5057	DYNAMIC ORTHOPAEDIC PVT LTD, HYDROXY	35191.55	0.00	0.00	35191.55
5089	DETEC & TREAT OF CANCER BY LASER	3959.00	0.00		3959.00
7000	MISCELLANEOUS PROJECT	30944.09	0.00		30944.09
7001	PRO;SAHAJANAND VASCU;DR.AURTHUR	4008326.75	0.00		4008326.75
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	254008.00	25877.00		279885.00
7008	NMITLI, PROJECT C.S.I.R	368703.90	50000.00		418703.90
7009	CHITOSAN BASED WAINED DRESSING	20938.75	0.00		20938.75
7011	DST-FAB: CLINICALLY/SIG:SHAPE OF HEVA	140028.00	43435.00	0.00	183463.00
7012	DST-DBSOMC FOR MEDICAL APPLICATION	0.00	0.00	0.00	0.00
7014	AUROLAB,ARAVIND EYE HOSPITAL	13674.00	0.00		13674.00
7015	TTK.HEALTHCARE.DEVELOPMENT OF VALV	47988.00	0.00		47988.00
7016	INDO-GERMAN COMMITTEE MEETING-DST	5407.00	0.00		5407.00
7017	HINDUSTAN LATEX.EVALU:BLOOD BAG	1121970.50	1004520.00		2126490.50
7018	ALL INDIA COUNCIL FOR TECHN:EDU:SH	162303.00	90000.00	0.00	252303.00
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	233633.00	0.00		233633.00

		UTILISATION						
CAPITAL EXPENDITURE		REVENUE EXPENDITURE						
FIXED ASSETS	OTHERS	TOTAL	SALARIES WAGES	RENT/CON-SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE
					12361015.00	12361015.00	12361015.00	61060548.00
					153026705.00	153026705.00	153026705.00	-7667131.35
					158145.65	158145.65	158145.65	1914090.35
					1028049.00	1028049.00	1028049.00	3938845.00
					21215.00	21215.00	21215.00	15000.00
					3465335.00	3465335.00	3465335.00	2472762.25
					140403.00	140403.00	140403.00	178233.00
					15510.00	15510.00	15510.00	51707.00
-	-	0.00	0.00		3539519.00	3539519.00	3539519.00	473001.00
		0.00	0.00		6404.00	6404.00	6404.00	28787.55
		0.00	0.00		0.00	0.00	0.00	3959.00
		0.00	0.00		0.00	0.00	0.00	30944.09
		0.00	25200.00		245131.00	270331.00	270331.00	3737995.75
		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		66503.00	66503.00	66503.00	213382.00
0.00		0.00	0.00		19392.00	19392.00	19392.00	399311.90
		0.00	0.00		13236.00	13236.00	13236.00	7702.75
		0.00	0.00		43435.00	43435.00	43435.00	140028.00
		0.00	0.00		11500.00	11500.00	11500.00	-11500.00
		0.00	0.00			0.00	0.00	13674.00
		0.00	0.00		8100.00	8100.00	8100.00	39888.00
		0.00	0.00		0.00	0.00	0.00	5407.00
		0.00	225814.00		696338.00	922152.00	922152.00	1204338.50
		0.00	0.00		33584.00	33584.00	33584.00	218719.00
		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		0.00	0.00	0.00	80564.00
		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		17412.00	17412.00	17412.00	216221.00

PROJ Code	SCHEDULE 3-EARMARKED/ENDOWMWNT FUNDS NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	FUND-WISE BREAK UP			TOTAL
		OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
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	81830.00	373909.00		455739.00
7042	CSIR-GRANT-BERNADETTE K. MADATHIL,PHD	25870.00	0.00		25870.00
7043	CSIR-GRANT-SAILAJA.G.S.SRF	9067.00	0.00		9067.00
7044	LISI NO TRIAL TRIAL MERIND	26672.65	0.00		26672.65
7045	NIRMALA RACHEL, CSIR	14063.00	110800.00		124863.00
7047	U.G.C. GRANT- RESEARCH FELLOW	50240.00	156495.00		206735.00
7048	CSIR GRANT- JOSENA JOSEPH	47473.00	0.00		47473.00
7049	CSIR GRANT - MARY VARGHESE	152353.00	0.00		152353.00
7051	CSIR GRANT - MANITHA B NAIR	15982.00	0.00		15982.00
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	8448148.00	0.00		8448148.00
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	99129.00	659936.00	0.00	759065.00
7061	DR. UMASANKAR/PRELI: EVALU:BIODEGRADABLE	553077.00	11000.00		564077.00
7062	DR. LIZY-SAHAJA:EVA "STENT"INVITRO.....	455934.00	22554.00		478488.00
7063	DR.P.V.MOHAN, SHAJANAD	0.00	0.00		0.00
7065	DR.T.V.KUMARI, DBT.BIOGENE	-421750.00	460463.00		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	-119623.00	941055.00		821432.00
7070	CHO PROJECT - 5146 JAYASREE	-872.00	0.00		-872.00
7071	STEC-PROJECT: DR.MAYA NANDKUMAR	6227.00	0.00		6227.00
7072	SAHAJANAND MED.TECH. C.V.MURALIDHARAN	76292.00	0.00		76292.00
7073	STUDY PROJECT:DR.P.V.MOHANAN	-3386.00	0.00	0.00	-3386.00
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
7079	DBT- DR.SREENIVASAN	253301.00	0.00		253301.00
7080	DBT-DR.MAYA- TISSUE ENGINEERING HYBRID	-945299.00	600000.00		-345299.00
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

		UTILISATION						
CAPITAL EXPENDITURE		REVENUE EXPENDITURE						
FIXED ASSETS	OTHERS	TOTAL	SALARIES WAGES	RENT/CON- SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE
		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	393666.00	393666.00	393666.00	62073.00
		0.00	0.00		0.00	0.00	0.00	25870.00
		0.00	0.00	0.00	0.00	0.00	0.00	9067.00
		0.00	0.00	0.00	5000.00	5000.00	5000.00	21672.65
		0.00	0.00	0.00	110800.00	110800.00	110800.00	14063.00
		0.00	0.00	0.00	132046.00	132046.00	132046.00	74689.00
		0.00	0.00		0.00	0.00	0.00	47473.00
		0.00	0.00	0.00	116516.00	116516.00	116516.00	35837.00
		0.00	0.00	0.00	3920.00	3920.00	3920.00	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	445065.00		2664973.00	3110038.00	3110038.00	5338110.00
		0.00	0.00		0.00	0.00	0.00	110047.00
		0.00	0.00		0.00	0.00	0.00	16071.00
0.00		0.00	0.00		0.00	0.00	0.00	72870.00
		0.00	0.00		624570.00	624570.00	624570.00	134495.00
		0.00	0.00		438154.00	438154.00	438154.00	125923.00
		0.00	43472.00		575269.00	618741.00	618741.00	-140253.00
		0.00	0.00		10824.00	10824.00	10824.00	-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	252526.00		204001.00	456527.00	456527.00	364905.00
		0.00	0.00		0.00	0.00	0.00	-872.00
		0.00	0.00		8391.00	8391.00	8391.00	-2164.00
		0.00	0.00		0.00	0.00	0.00	76292.00
		0.00	92000.00	0.00	0.00	92000.00	92000.00	-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		253301.00	253301.00	253301.00	0.00
0.00	0.00	0.00	0.00		46588.00	46588.00	46588.00	-391887.00
		0.00	0.00			0.00	0.00	88349.00
		0.00	0.00		0.00	0.00	0.00	878.00

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS		FUND-WISE BREAK UP			TOTAL
PROJ Code	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
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	229898.00	216962.00		446860.00
7087	CSIR - KALADHAR - BST	39103.00	0.00		39103.00
7088	FEASIBILITY STUDY	1000000.00	0.00		1000000.00
7089	PROJ/7089/DEV.PORTABLE SAFETY	1286450.00	0.00		1286450.00
7090	PROJ/7090/TISSUE ENGINEERS VASCULAR	3069880.00	0.00		3069880.00
7091	PROJ/7091/NOVEL MICROPHORES	-302731.00	0.00		-302731.00
7092	PROJ/7092/SEA FOOD	146479.00	0.00		146479.00
7093	PROJ/7093/CSIR GRANT-LPA	69729.00	221597.00		291326.00
7095	PROJ/7095/CSIR GRANT-VIOLA.B.MORRIS	6002.00	524971.00		530973.00
7097	PROJ/7097/ACCELERATED AGEING	442093.00	0.00		442093.00
7098	PROJ/7098/EVALN OF NTU DRUG	1355655.00	0.00		1355655.00
7099	PROJ/7099/BCL	21946.00	797.00		22743.00
7100	PROJ/7100/ITR PROGRAMME	60000.00	116129.00		176129.00
7101	PROJ/7101/CSIR/SONIA.T.A	24436.00	241600.00		266036.00
7102	PROJ/7102/CSIR/LYNDA THOMAS	103866.00	70533.00		174399.00
7103	PROJ/7103/CSIR/VIDYARAJ	35132.00	0.00		35132.00
7104	PROJ/7104/CSIR/RENJITH.P.NAIR	33889.00	48200.00		82089.00
7105	PROJ/7105/CSIR/ARJUN NAMBOODIRI	19560.00	166200.00		185760.00
7106	PROJ/7106/CSIR/NITHYA JOSEPH	97258.00	0.00		97258.00
7107	PROJ/7107/CSIR/NEENA & 2 FELLOWS	24548.00	160670.00		185218.00
7108	PROJ/7108/CSIR/FRANCIS.B.FERNANDEZ	24658.00	160667.00		185325.00
7109	PROJ/7109/CSIR/TARA.S	15342.00	192800.00		208142.00
7110	PROJ/7110/CSIR/DEEPA.R	13097.00	192800.00		205897.00
7111	PROJ/7111/CSIR/SHEEJA LIZA EASO	6630.00	0.00		6630.00
7112	PROJ/7112/ICMR/JASEER MOHAMMED	0.00	293805.00		293805.00
7113	PROJ/7113/KSCSTE/RATHIKALA	0.00	268500.00		268500.00
7200	JOINT PROGRAME/M.TECH	8024763.00	0.00		8024763.00
7210	PROJ/7210/CSIR/SOMA DEY	0.00	48132.00		48132.00
7220	COST OF ANIMAL FEED	0.00	1700000.00		1700000.00
7230	PROJ/7230/CSIR/MANJU.S	0.00	220491.00		220491.00
7240	PROJ/7240/CSIR/SUNITHA CHANDRAN	0.00	201629.00		201629.00
7250	PROJ/7250/CSIR/KIRAN.S.NAIR	0.00	147191.00		147191.00
7260	PROJ/7260/ST0X083Y09/DR.P.V.MOHANAN	0.00	410000.00		410000.00
7270	PROJ/7270/KSCSTE/MAYURI.P.V.	0.00	133800.00		133800.00
7280	PROJ/7280/CSIR/SUSAN.M.ALEX	0.00	141670.00		141670.00
8001	PROJ/8001/PROGRAM SUPPORT & TISSUE	949234.00	1432000.00		2381234.00
8002	PROJ/8002/PROGRAM SUPPORT & TISSUE	-521257.00	2073856.00	0.00	1552599.00
8003	PROJ/8003/PROGRAM SUPPORT & TISSUE	314332.00	487521.00		801853.00

		UTILISATION						
CAPITAL EXPENDITURE		REVENUE EXPENDITURE						
FIXED ASSETS	OTHERS	TOTAL	SALARIES WAGES	RENT/CON-SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE
		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	431315.00		83479.00	514794.00	514794.00	-67934.00
		0.00	0.00		0.00	0.00	0.00	39103.00
		0.00	0.00		1000000.00	1000000.00	1000000.00	0.00
		0.00	0.00		1286450.00	1286450.00	1286450.00	0.00
		0.00	426569.00		2354632.00	2781201.00	2781201.00	288679.00
		0.00	0.00		0.00	0.00	0.00	-302731.00
		0.00	0.00		2676.00	2676.00	2676.00	143803.00
		0.00	0.00		258045.00	258045.00	258045.00	33281.00
		0.00	0.00		496769.00	496769.00	496769.00	34204.00
		0.00	112551.00		11299.00	123850.00	123850.00	318243.00
		0.00	0.00		0.00	0.00	0.00	1355655.00
		0.00	0.00		15732.00	15732.00	15732.00	7011.00
			0.00		144510.00	144510.00	144510.00	31619.00
		0.00	0.00		233600.00	233600.00	233600.00	32436.00
		0.00	0.00		149400.00	149400.00	149400.00	24999.00
		0.00	0.00		27784.00	27784.00	27784.00	7348.00
		0.00	0.00		43200.00	43200.00	43200.00	38889.00
		0.00	0.00		167919.00	167919.00	167919.00	17841.00
			0.00		97258.00	97258.00	97258.00	0.00
		0.00	0.00		150355.00	150355.00	150355.00	34863.00
		0.00	0.00		146368.00	146368.00	146368.00	38957.00
		0.00	0.00		172800.00	172800.00	172800.00	35342.00
		0.00	0.00		175075.00	175075.00	175075.00	30822.00
		0.00	0.00		7438.00	7438.00	7438.00	-808.00
			0.00		271764.00	271764.00	271764.00	22041.00
			0.00		157508.00	157508.00	157508.00	110992.00
		0.00	2178535.00		2483933.00	4662468.00	4662468.00	3362295.00
			0.00		43200.00	43200.00	43200.00	4932.00
			0.00		313581.00	313581.00	313581.00	1386419.00
			0.00		210279.00	210279.00	210279.00	10212.00
			0.00		180697.00	180697.00	180697.00	20932.00
			0.00		141492.00	141492.00	141492.00	5699.00
			0.00		0.00	0.00	0.00	410000.00
			0.00		19800.00	19800.00	19800.00	114000.00
			0.00		133858.00	133858.00	133858.00	7812.00
0.00		0.00	1022049.00		1397476.00	2419525.00	2419525.00	-38291.00
0.00		0.00	484150.00		998021.00	1482171.00	1482171.00	70428.00
0.00		0.00	166800.00		754788.00	921588.00	921588.00	-119735.00

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS		FUND-WISE BREAK UP			TOTAL
PROJ Code	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
8004	PROJ/8004/PROGRAM SUPPORT & TISSUE	423934.00	152397.00	0.00	576331.00
8005	PROJ/8005/PROGRAM SUPPORT & TISSUE	50858.00	176000.00	0.00	226858.00
8006	PROJ/8006/BIOCONJUGATION NANO MAT.	69303.00	0.00		69303.00
8007	PROJ/8007/PRODUCTS OF POLYMER	487968.00	313000.00		800968.00
8008	PROJ/8008/CSIR GRANT-PADMAJA.P.NAMBI	5573.00	231130.00		236703.00
8009	PROJ/8009/DBT/DR.T.V.ANILKUMAR/DE...TISSUE	-496895.00	0.00		-496895.00
8010	PROJ/8010/DBT/DR.NIRANJAN/IMPLATED....CONTROL	-72688.00	670000.00		597312.00
8011	PROJ/8011/NANOFRONT/DR.NIRANJAN/INTRAMAS	139900.00	0.00		139900.00
8012	PROJ/8012/VSSC/DR.NIRANJAN/DESIGN STUDIES	1362914.00	1170400.00		2533314.00
8013	PROJ/8013/DST/DR.C.P.SHARMA/ FADDS	193329.00	12570180.00	0.00	12763509.00
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.	104622.00	1133795.00	0.00	1238417.00
8017	PROJ/8017/AYUTECH/DR.UMASANKAR	365300.00			365300.00
8018	PROJ/8018/ICMR/DR.P.V.MOHANAN	185072.00	461569.00		646641.00
8019	PROJ/8019/STEC/DR.P.RAMESH	269168.00	66165.00		335333.00
8020	PROJ/8020/CSIR/DR.LISSY KRISHNAN	691529.00	47531.00		739060.00
8021	PROJ/8021/ANGIOGENESIS EXP/DR.UMASHANKAR	731942.00	0.00		731942.00
8022	PROJ/8022/AIR POLLUTION/SUJESH SREEDHAR	266000.00	0.00		266000.00
8023	PROJ/8023/KSCSTE/DR.H.K.VARMA	178954.00	0.00		178954.00
8024	PROJ/8024/IIT/DR.P.R.ANILKUMAR	142079.00	443528.00		585607.00
8025	PROJ/8025/	2742080.00	899645.00		3641725.00
8026	PROJ/8026/	91400.00	150000.00		241400.00
8027	PROJ/8027/DR.P.V.MOHANAN	950000.00	0.00		950000.00
8028	PROJ/8028/DR.DIKSHA PAINULY	531019.00	0.00		531019.00
8029	PROJ/8029/INDO-JAPAN	194000.00	0.00		194000.00
8030	PROJ/STUDY/DR.UMASHANKAR	1162350.00	0.00		1162350.00
8031	PROJ/8031	1330542.00	0.00		1330542.00
8032	PROJ/8032/O.S.N.NAIR	0.00	200000.00		200000.00
8033	PROJ/8033/DEV. OF IRON OXIDE-DR.R.S.JAYASREE	0.00	1063079.00		1063079.00
8034	PROJ/8034/FLURO PASSI...DR.ROY JOSEPH	0.00	1985400.00		1985400.00
8035	PROJ/EVALN OF SEWING RING-DR.UMASHANKAR	0.00	520000.00		520000.00
8036	PROJ/DEV OF CALCIUM SULPHATE-DR.MANOJ	0.00	855621.00		855621.00
8037	PROJ/MEDICAL DEVICE RET - DR.MIRA MOHANTY	0.00	2795300.00		2795300.00
8038	PROJ/DEV OF MISSION PROGRAM - DR.GSB	0.00	1800000.00		1800000.00
8039	PROJ/DISPENSABLE & BIODEGR- DR.JAYABALAN	0.00	2300000.00		2300000.00
8040	PROJ/SYNTHESIS OF OXIDE-DR.H.K.VARMA	0.00	791451.00		791451.00
8041	PROJ/DEV OF NANO DEVICES DNA-DR.C.P.SHARMA	0.00	1500000.00		1500000.00
8042	PROJ/BIOENGINEERED HYBRID -DR.LISSY KRISH	0.00	1085000.00		1085000.00

		UTILISATION						
CAPITAL EXPENDITURE		REVENUE EXPENDITURE						
FIXED ASSETS	OTHERS	TOTAL	SALARIES WAGES	RENT/CON-SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE
0.00		0.00	30155.00		611590.00	641745.00	641745.00	-65414.00
0.00		0.00	210829.00		187817.00	398646.00	398646.00	-171788.00
		0.00	184810.00		111336.00	296146.00	296146.00	-226843.00
0.00		0.00	220800.00		62970.00	283770.00	283770.00	517198.00
		0.00	0.00		233713.00	233713.00	233713.00	2990.00
0.00		0.00	55200.00		167218.00	222418.00	222418.00	-719313.00
0.00		0.00	110400.00		83187.00	193587.00	193587.00	403725.00
		0.00	0.00			0.00	0.00	139900.00
		0.00	0.00		63974.00	63974.00	63974.00	2469340.00
0.00		0.00	1927321.00		5554345.00	7481666.00	7481666.00	5281843.00
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	339026.00		787773.00	1126799.00	1126799.00	111618.00
		0.00	0.00		250.00	250.00	250.00	365050.00
		0.00	243896.00		276182.00	520078.00	520078.00	126563.00
			49512.00		216160.00	265672.00	265672.00	69661.00
			144900.00		618080.00	762980.00	762980.00	-23920.00
			76689.00		483439.00	560128.00	560128.00	171814.00
			0.00		169567.00	169567.00	169567.00	96433.00
			32000.00		142305.00	174305.00	174305.00	4649.00
			144911.00		508976.00	653887.00	653887.00	-68280.00
			113535.00		3170687.00	3284222.00	3284222.00	357503.00
			0.00		247537.00	247537.00	247537.00	-6137.00
			270000.00		358554.00	628554.00	628554.00	321446.00
			240000.00		179116.00	419116.00	419116.00	111903.00
			0.00		40917.00	40917.00	40917.00	153083.00
			318099.00		403168.00	721267.00	721267.00	441083.00
			175587.00		773201.00	948788.00	948788.00	381754.00
			0.00	0.00	0.00	0.00	0.00	200000.00
			211200.00		352533.00	563733.00	563733.00	499346.00
			285906.00		745070.00	1030976.00	1030976.00	954424.00
			0.00		462040.00	462040.00	462040.00	57960.00
			40258.00		26953.00	67211.00	67211.00	788410.00
			216947.00		29483.00	246430.00	246430.00	2548870.00
			0.00			0.00	0.00	1800000.00
			52026.00		13626.00	65652.00	65652.00	2234348.00
			34971.00		34528.00	69499.00	69499.00	721952.00
			0.00			0.00	0.00	1500000.00
			45806.00		12358.00	58164.00	58164.00	1026836.00

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS		FUND-WISE BREAK UP			TOTAL
PROJ Code	NAME OF GRANTEE/PRINCIPAL INVESTIGATOR	OPENING BALANCE	ADDITIONS TO FUND		
			GRANTS	OTHER RECEIPTS	
8043	PROJ/MOLECULAR IMMUNOTOX-DR.P.V.MOHANAN	0.00	2390000.00		2390000.00
8044	PROJ/TISSUE ENGINEERING-BERNADETTE	0.00	830000.00		830000.00
8045	PROJ/COLOUR ATLAS OF TISSUE-DR.MIRA	0.00	500000.00		500000.00
8046	PROJ/DIFF. OF ADULT PRO - DR.ASHA.S.MATHEW	0.00	760000.00		760000.00
8047	PROJ/INVIVO GENOTOXICITY-DR.P.V.MOHANAN	0.00	661800.00		661800.00
8048	PROJ/STUDIES DR.KAMALESH GULIA	0.00	231000.00		231000.00
8049	PROJ/NEW VISION BIOMAT-DR.C.P.SHARMA	0.00	110000.00		110000.00
8050	PROJ/GENOTOXICITY STUDY-DR.P.V.MOHANAN	0.00	330900.00		330900.00
8051	PROF/INVITRO ALTE.TEST-DR.P.V.MOHANAN	0.00	1700000.00		1700000.00
	Grand Total	185368681.60	69398713.25	177677912.49	432445307.10

		UTILISATION							
CAPITAL EXPENDITURE		REVENUE EXPENDITURE							
FIXED ASSETS	OTHERS	TOTAL	SALARIES WAGES	RENT/CON-SUMABLES	OTHER ADM EXP	TOTAL	TOTAL EXPENDITURE	NET BALANCE	
			130890.00		411891.00	542781.00	542781.00	1847219.00	
			175000.00		90033.00	265033.00	265033.00	564967.00	
			60416.00		0.00	60416.00	60416.00	439584.00	
			0.00		20245.00	20245.00	20245.00	739755.00	
			7742.00		7742.00	15484.00	15484.00	646316.00	
			0.00		520.00	520.00	520.00	230480.00	
			0.00		105470.00	105470.00	105470.00	4530.00	
			0.00		0.00	0.00	0.00	330900.00	
			0.00		0.00	0.00	0.00	1700000.00	
2817082.00	0.00	2817082.00	24356574.00	3494783.00	240676977.20	270092539.20	278744006.20	172537198.05	

	2010-11	2009-2010
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	45418956.00	49719088.00
b) Others	1127360.00	3510117.00
3. Advances Received	33206734.93	30533245.93
4. Interest accrued but not due on:		
a) Secured Loans / borrowings	0.00	0.00
b) Unsecured Loans / borrowings	0.00	0.00

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
5. Statutory Liabilities:	0.00	0.00
a) Overdue	8186845.35	3859160.85
b) Others	27843479.94	27511343.44
6. Other current Liabilities	0.00	0.00
TOTAL(A)	115783376.22	115132955.22
B.PROVISIONS		
1. For Taxation		--
2. Gratuity		--
3. Superannuation / Pension (New Pension Scheme)		--
4. Accumulated Leave Encashment		--
5. Trade Warranties/Claims		--
6. Others(Specify) Audit fee		--
Sinking fund contribution to invest	23416212.00	14477861.00
TOTAL(B)	23416212.00	14477861.00
TOTAL(A+B)	139199588.22	129610816.22

SCHEDULE 8- FIXED ASSETS	GROSS BLOCK			
	PARTICULARS	Cost/valuation as at the beginning of the year (01.04.2010)	Additions during the year 2010-11	Deductions during the year 2010-11
A. FIXED ASSETS:				
1. LAND:				
a) Freehold	1600169.51	15294436.00	0.00	
b) Leasehold				
2. BUILDINGS:				
a) On Freehold Land *	41395983.88	2042725.00	0.00	
b) On Leasehold Land				
c) Ownership Flats/Premises				
d) Superstructures on Land not belonging to the entity	122178574.88	2037686.00		
3. PLANT MACHINERY & EQUIPMENT	1321498852.18	243404434.00	578318.00	
4. VEHICLES	7060266.74	413967.00	0.00	
5. FURNITURE, FIXTURES	40080504.61	2205546.00		
6. OFFICE EQUIPMENT	958478.54	17725.00		
7. COMPUTER/PERIPHERALS				
8. ELECTRIC INSTALLATIONS	29520929.67	8418769.00		
9. LIBRARY BOOKS	119397183.57	8583738.00		
10. TUBEWELLS & W.SUPPLY	174615.00	0.00		
11. OTHER FIXED ASSETS				
a) OXYGEN CYLINDERS	234319.42	0.00		
b) AIR CONDITIONERS	23882535.91	677362.00		
c) TELEPHONE INSTALLATIONS	2141321.94	10120.00		
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			
i) PAINTINGS	382715.63			
k) LIVESTOCK	31848.00			
l) GAS PLANT INSTALLATIONS				
m) AMC AIR CONDITIONERS				
Total for the year (Total -A)	1723751268.89	283106508.00	578318.00	
Total for the previous year	1450156329.44	276092543.43	2497604.00	
Capital Work in Progress (B)	526046712.00	34379307.00		
Total for the year (A+B)	2249797980.89	317485815.00	578318.00	
* Depreciation for item 2(a) has been provided along with depreciation on 2(d)				

Cost/valuation at the year end (31.03.2011)	Depreciation			NET BLOCK	
	Depreciation as at the beginning of the year (01.04.2010)	During the year 2010-11	Total up to the year end (31.03.2011)	As at the end of current year end (31.03.2011)	As at the previous year end (31.03.2010)
16894605.51	0.00	0.00	0.00	16894605.51	1600169.51
43438708.88	0.00	0.00	0.00		
124216260.88	87783965.83	3993550.20	91777516.03	75877453.73	75790592.93
1564324968.18	792375286.21	115792452.30	908167738.51	656157229.67	529123565.95
7474233.74	3785811.57	737684.43	4523496.00	2950737.74	3274455.17
42286050.61	25826617.12	2468915.02	28295532.14	13990518.47	14253887.49
976203.54	878852.33	14602.68	893455.01	82748.53	79626.21
37939698.67	15390469.18	3382384.42	18772853.60	19166845.07	14130460.49
127980921.57	83922473.93	6608767.15	90531241.08	37449680.49	35474709.64
174615.00	156669.87	2691.77	159361.64	15253.36	17945.13
234319.42	217455.30	2529.62	219984.92	14334.50	16864.12
24559897.91	18336249.00	933547.34	19269796.34	5290101.57	5546286.91
2151441.94	1854477.98	44544.59	1899022.57	252419.37	286843.96
341700.00	338998.92	405.16	339404.08	2295.92	2701.08
62866.50	62614.07	37.86	62651.93	214.57	252.43
11250942.10	5425560.86	873807.19	6299368.05	4951574.05	5825381.24
1405978.22	756637.39	97401.12	854038.51	551939.71	649340.83
151482.59	117553.52	5089.36	122642.88	28839.71	33929.07
382715.63	339483.09	6484.88	345967.97	36747.66	43232.54
31848.00	27746.02	615.30	28361.32	3486.68	4101.98
2006279458.89	1037596922.19	134965510.39	1172562432.58	833717026.31	686154346.68
1723751268.87	925938307.05	111658615.15	1037596922.19	686154346.68	524218022.14
560426019.00	0.00	0.00	0.00	560426019.00	526046712.00
2566705477.89	1037596922.19	134965510.39	1172562432.58	1394143045.31	1212201058.68

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
SCHEDULE 9 - INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS		
1. In Government Securities	76690331.00	78218349.00
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	303995127.00	262760819.00
Technology Fund	51192866.70	47785251.70
Pension & staff funds	50658474.00	49422779.00
TOTAL	488222189.70	443872589.70
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	--	--
A. CURRENT ASSETS		
1. Inventories:		
a) Stores and Spares	224274225.51	218394920.13
b) Loose Tools	5399533.00	4532543.00
c) Stock-in trade		
Finished Goods		
Work-in-progress		
Medicine	8354623.00	9097021.00
2. Sundry Debtors:		
a) Debts Outstanding for a period exceeding six months		
b) Others	39629987.00	33603646.00
3. Cash balances in hand(including cheques/drafts and imprest)	801568.18	602186.38
4. Bank Balances:		
a) With Scheduled Banks:		
-On Current Account	1.15	1.15
-On Deposit Accounts(L.C. margin & Commitment deposit)	861111471.00	999816436.00
-On Savings Accounts	231896817.31	196847544.57

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
b) With non-Scheduled Banks:		
-On Current Account		
-On Deposit Accounts		
-On Savings Accounts		
5. Post-Office-Savings Accounts		
TOTAL(A)	1371468226.15	1462894298.23
B.LOANS, ADVANCES AND OTHER ASSETS		
1. Loans:		
a) Staff	11736597.00	13349823.00
b) Other Entities engaged in activities/objectives similar to that of the Entity		
c) Other(specify)		
2. Advances and other amounts recoverable in cash or in kind or for value to be received:		
a) On Capital Account	202893869.35	228107766.35
b) Prepayments	82146112.28	81005894.28
c) Others		
3. Income Accured:		
a) On Investments from Earmarked/endowment Funds		
b) On Investments-Others		
c) On Loans and Advances		
d) Others		
(includes income due unrealised Rs)		
4. Claims Receivable		
From Govt of India on Plan Funds		
TOTAL(B)	296776578.63	322463483.63
TOTAL(A+B)	1668244804.78	1785357781.86
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		
b) Sale of Raw Material		
c) Sale of Scraps		
2. Income from Services		
a) Labour and processing charges		
b) Professional/Consultancy Services		
c) Agency Commission and Brokerage		
d) Maintenance Services		
e) Others (Specify)		

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
From Hospital Services-Gross Income Rs.50,91,25,767.40	0.00	0.00
Less concession to poor Patients Rs.19,71,76,264.00	311949503.40	289157210.00
From Projects	4814785.00	490889.00
Testing & Facility charges received	4837884.00	3296770.00
TOTAL	321602172.40	292944869.00
SCHEDULE 13- GRANTS/SUBSIDIES		
(Irrevocable Grants & Subsidies Received)		
1. Central Government	258676264.00	253900000.00
2. State Government(s)		
3. Government Agencies		
4. Institution/Welfare Bodies		
5. International Organisations		
6. Others(Specify)		
TOTAL	258676264.00	253900000.00
SCHEDULE 14-FEES/SUBSCRIPTIONS		
1. Entrance Fees	1483500.00	874550.00
2. Annual Fees/ Subscriptions	5016910.00	3877500.00
3. Seminar/Program Fees	0.00	0.00
4. Consultancy Fees	0.00	0.00
5. Others(Specify) Examination Fees	523812.00	347400.00
TOTAL	7024222.00	5099450.00
SCHEDULE 15- INCOME FROM INVESTMENTS		
(Income on Invest.from Earmarked/Endowment Funds transferred to Funds)		
1) Interest		
a) On Govt. Securities		
b) Other Bonds/Debentures		
2) Dividends:		
a) On Shares		
b) On Mutual Fund Securities		
3) Rents	1324049.00	766069.00
4) Others(Specify) On Sinking Fund	26776447.00	24327732.00
On Technology Fund	2952876.00	2801745.00
TOTAL	31053372.00	27895546.00
TRANSFERRED TO EARMARKED/ENDOWMENT FUNDS		

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
SCHEDULE 16- INCOME FROM ROYALTY,PUBLICATION ETC		
1) Income from Royalty	877864.00	4649575.00
2) Income from Publications		
3)Others(Specify)		
TOTAL	877864.00	4649575.00
SCHEDULE 17- INTEREST EARNED		
1) On Term Deposit		
a) With Scheduled Banks	68936301.00	102266814.00
b) With non-scheduled banks		
c) With Institutions		
d) Others		
2) On Savings Account		
a) With Scheduled Banks	3006204.57	337526.96
b) With non-scheduled banks		
c) Post Office Savings Account		
d) Others		
3) On Loans		
a) Employees/Staff	2100817.00	1409305.00
b) Others		
4) Interest on Debtors and other Receivables		
TOTAL	74043322.57	104013645.96
SCHEDULE 18- OTHER INCOME		
1. Profit on Sale/disposal of Assets:		
a) Owned assets		
b) Assets acquired out of grants, or received free of cost		
2. Export Incentives realized		
3. Fees for Miscellaneous Services		
4. Miscellaneous Income (income from Projects)	130000.00	613918.00
Other Income	3325782.30	1536775.08
TOTAL	3455782.30	2150693.08
SCHEDULE 20-ESTABLISHMENT EXPENSES		
a) Salaries and Wages	524813718.00	495202933.00
b) Allowances and Bonus	2874948.00	2259497.00
c) Contribution to Provident Fund	0.00	0.00

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
d) Contribution to other fund(specify)	0.00	0.00
e) Staff Welfare Expenses	12761048.60	10927478.28
f) Expenses on Employee's Retirement and Terminal Benefits	40004589.00	34751024.00
g) Others(Specify) PG Training & Accademic payments	86532279.00	81093755.00
TOTAL	666986582.60	624234687.28
SCHEDULES 21- ADMINISTRATIVE EXPENSES		
a) Purchases	305173543.82	250477960.84
b) Labour and processing expenses	0.00	0.00
c) Cartage and Carriage Inwards	97184.00	165298.00
d) Electricity and power	29202681.00	28666972.00
e) Water charges	3645050.00	1712398.00
f) Insurance	238405.00	552.00
g) Repairs and maintenance	42759598.00	34056603.00
h) Excise duty	0.00	0.00
i) Rent,Rates and Taxes	515853.00	972059.00
j) Vehicles Running and Maintenance	643382.11	718442.00
k) Postage,Telephone and Communication Charges	2922051.00	1947694.00
l) Printing and Stationary	2924400.00	2374991.00
m) Travelling and Conveyence Expenses	2064721.00	930803.00
n) Expenses on Seminar/Workshop	1464035.00	3467387.00
o) Subscription Expenses	87060.00	104000.00
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

	2010-11	2009-2010
PARTICULARS	[Rs.]	[Rs.]
y) Advertisement and Publicity	5486929.00	3656452.00
z) Others(specify)	16693543.51	19186051.33
TOTAL	413918436.44	348437663.17
SCHEDULE 23-INTEREST		
a) On Fixed Loans		
b) Bank Charges)	114518.25	320839.40
c) Others(specify)		
TOTAL	114518.25	320839.40

**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY,
THIRUVANANTHAPURAM.**

RECEIPTS & PAYMENTS ACCOUNTS FOR THE PERIOD FROM 01-04-2010 TO 31-03-2011

RECEIPTS		2010-11	2009-10
		Rs.	Rs.
I	Opening Balances		
a)	Cash In Hand	602186.38	979541.58
b)	Bank Balances		
	i) In Current Account	1.15	1.15
	ii) In deposit Account		
	iii) Savings Account *	196850834.31	185640331.36
II	Grant Received		
	From Government of India		
	Under Plan scheme	838500000.00	813000000.00
	Under Plan scheme - Nurses training	661200.00	0.00
	Non-Plan scheme	61500000.00	67700000.00
	Women Comp. Plan	0.00	105000000.00
III	Receipts against Earmarked Funds		
	a) Earmarked funds	106453161.00	94355433.00
	b) Own funds		
IV	Interest Received		
	a) On Bank deposits	59495788.78	88537871.96
	b) Loans Advances etc	282785.00	52841.00
V	Receipts from services		
	Receipts from Patient services	387114139.40	361291362.95
	Other receipts including Royalty	21546782.30	18239180.80
VI	Other receipts		
	Grant received for Projects	90388446.96	97161601.50
	Refund of Deposits(LC Margin)		
	Other receipts	265359733.41	274039839.60
	Total	2028755058.69	2105998004.90
	* Opening Balance in Savings Account for the year 2010-11 includes Rs.52498.12 [GL Code 2417 - Kerala State Co-op Bank]		

	Payments	2010-11	2009-10
		Rs.	Rs.
I	Expenses		
	a) Establishment expenses	510470294.70	716349013.18
	b) Administrative Expenses		
	For Purchases	302784635.50	503897465.60
	Other expenses	46374588.75	150084948.00
II	Payments made against funds for various Projects		
	As Per schedule	84850937.40	103842682.00
III	Investments & Deposits made		
	a) Out of Earmarked funds	177178908.00	11691573.00
	b) Out of own funds		0.00
IV	Expenditure on Fixed Assets & Capital work -in- progress		
	a) Purchase of Fixed Assets	85347072.00	98875678.00
	b) Capital work-in-progress		
V	Refund of Loans		
VI	Finance Charges(Bank charges)	122711.00	273387.40
VII	Other Payments		
	To Funds/Deposit- refunds	588927539.70	323582734.00
VIII	Closing Balance		
	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	231896802.31	196798336.19
	Total	2028755058.69	2105998004.90

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY, THIRUVANANTHAPURAM

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2011

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. 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

An amount equal to one month salary every year is transferred to Pension Fund Account to meet liability on account of Pension payments. An amount of Rs.4 lakh is transferred every year to above fund for meeting liabilities on account of Gratuity payments. Leave encashment eligible at the time of retirement/reliving is accounted on actual payment basis.

9. PROVIDENT FUND

Liabilities and assets of Provident fund account were separated from Balance sheet of Institute and shown as separate statement.

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	
	2010-11	2009-10
Claims against the Institute not acknowledged as debts	NIL	Nil
Bank Guarantee given by Institute	22.24	17.75
Letters of credit opened on behalf of Institute	81.87	1123.30
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	
	2010-11	2009-10
Estimated value of orders remaining to be executed on Capital Account including Construction under vision 2020	2323.53	2750.86
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	
	2010-11	2009-10
5.1 Value of Imports		
Capital Goods	275.19	657.41
Stores Spare & Consumables	54.94	355.30
5.2 Expenditure in foreign currency		
Travel Expenses	USD 2000	14500
	Euro Nil	1360
	Pound Nil	500
	Aus \$ Nil	Nil
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.501.72 lakhs (previous year Rs.387.86 lakhs) and Rs.34.07 lakhs (previous year Rs.70.59 lakhs) was transferred to Emergency Reserve Fund & Technology Development Fund. During the preceding two years no amount has been spent from Technology Development Fund.

6.2 Depreciation :

Institute has been consistently applying the depreciation to fixed assets based on the rates specified in the Income Tax Act, 1961. Eventhough the rates were revised during the financial year 2002-03 & 2005-06, Institute has been charging depreciation at the pre revised rates since it was found to be appropriate. Hence these rates were also applied during the year 2010-11.

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 31-03-2011, and Income & Expenditure Account for the year ended on that date.

Sd/-
Financial Adviser

Sd/-
Director

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY,
THIRUVANANTHAPURAM

PROVIDENT FUND ACCOUNT FOR THE YEAR ENDED 31-03-2011

Particulars	2010-2011	2009-10
	[Rupees]	[Rupees]
LIABILITIES		
MEMBERS BALANCE	231250745.00	205642088.00
MEMBERS CREDITS [for march]	3812417.00	3165180.00
BALANCE DUE TO MEMBERS		
NOT IN SERVICE		
Under EPF scheme	7751746.00	7144466.00
,, GPF ,,	532055.00	532055.00
PENSION FUND DUES	47377934.00	43868457.00
RESERVES&SURPLUS-INTEREST	7173407.39	0.00
TOTAL	297898304.39	260352246.00
ASSETS		
INVESTMENT AT COST	273726256.00	224114739.00
DUES TO PF ACCOUNT		
FROM INSTITUTE	3812417.00	3165180.00
FROM PF COMMISSIONER	12969487.00	12969487.00
Transfer	0.00	0.00
INTEREST ACCRUED NOT DUE	1000280.00	1000280.00
BALANCE WITH BANKS		
SBT -GPF A/C	6389864.39	4877573.39
INTEREST ACCRUED	0.00	14224986.61
TOTAL	297898304.39	260352246.00

Sd/-
FINANCIAL ADVISOR

Sd/-
DIRECTOR

GPF Account - Trial Balance as on 31.03.2011			
			[Rs.]
GL code	Particulars	Debit	Credit
1001	SCTIMST	3812417.00	
1005	Dues form PF Commissioner	12969487.00	
1010	Members Balance		353870647.00
1011	Other receipts not credited to Members		3812417.00
1012	Old members EPF scheme		7751746.00
1013	Old members GPF		532055.00
1015	Dues to Pension Fund		47377934.00
1030	Loan payment	89934168.00	
1040	Interest		7173407.39
1050	Investments	273726256.00	
1090	Final Settlement	32685734.00	
1100	Transfer		
1120	Interest Accrued not due	1000280.00	
18	Bank Balance	6389864.39	
		420518206.39	420518206.39

Separate Audit Report of the Comptroller & Auditor General of India on the Accounts of Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Thiruvananthapuram for the year ended 31st March 2011

We have audited the attached Balance Sheet of Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Thiruvananthapuram as at 31st March 2011 and the Income & Expenditure Account/ Receipts & Payment Account for the year ended on that date under Section 19(2) of the Comptroller & Auditor General's (Duties, Powers & Conditions of Service) Act, 1971 read with Section 18(2) of the SCTIMST Act, 1980, These financial statement include the accounts of Bio Medical Technology (BMT) Wing of the SCTIMST. These financial statement are the responsibility of the SCTIMST's management. Our responsibility is to express an opinion on these financial statement based on our audit.

2. This Separate Audit report contains the comments of the Comptroller & Auditor General of India (CAG) on the accounting treatment only with regard to classification. conformity with the best accounting practices, accounting standards and disclosure norms, etc. Audit observations on financial transactions with regard to compliance with the Law, Rules & regulations (Propriety and Regularity) and efficiency-cum-performance aspects, etc. if any, are reported through inspection Reports/ CAG's Audit Reports separately.
 3. We have conducted our audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements. An audit includes examining on a test basis, evidences supporting the amounts and disclosure in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of financial statements. We believe that our audit provides a reasonable basis for our opinion.
 4. Based 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 and Income & Expenditure Account/Receipt & Payment Account dealt with by this report have been drawn up in the format prescribed by Ministry of Finance New Delhi.
 - (iii) In our opinion, proper books of accounts and other relevant records have been maintain by SCTIMST as required under Section 18(1) of the SCTIMST Act 1980 in so far as it appears from our examination of such books.
 - (iv) we further report that :
2. Comments on Accounts
 - 2.1 Income and Expenditure Account
 - 2.1.1 Depreciation

The accounting policy of the Institute stipulated that depreciation was provided on reducing balance method at the rates specified by the Income Tax Act,1961. Audit scrutiny revealed that rates of depreciation charged by the Institute was different from the rates prescribed in the IT Act from the assessment year 2003-04. This is against the Accounting policy of the Institute. Due to difference in rates applied, the accumulated depreciation was understated by Rs.54.12 crore and fixed asset was overstated by the same amount.

2.1.2 Revenue recognition

Revenue recognition of the institute from various income such as hospital services, projects, testing charges, facility utilization charges, fees/subscription, interest earned etc, were accounted on cash basis and not an accrual basis which is not consistent with the uniform format of Account.

3. Grant-in-Aid

Out of Grant in Aid of Rs.90.00 crore received during the year, the organization utilized the entire sum.

6. Management letter

Deficiencies which have not been included in the Audit Report have been brought to the notice of the SCTIMST 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 explanation given to us, the said financial statements read together with the Accounting Policies and Notes on Accounts, and 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 2011 ; and
 - b. In so far as it relates to Income & Expenditure Account of the deficit for the year ended on that date.

Sd/-
Principal Director of Audit
Scientific Departments

Place : New Delhi

Dated :

IN REPLY OF THE INSTITUTE

Para No.	Reply of SCTIMST
2.Comments on accounts 2.1 Income & Expenditure account 2.1.1 Depreciation	As pointed out by Audit, Governing Body of the Institute has decided to suitably modify the depreciation rates on fixed assets. A Committee has been constituted for the above purpose
2.1.2 Revenue Recognition	Suitable modification, with the approval of competent authority, will made in the accounting policies and disclosed in the Annual Accounts

