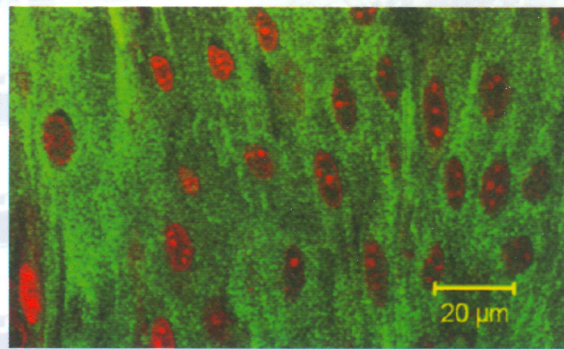
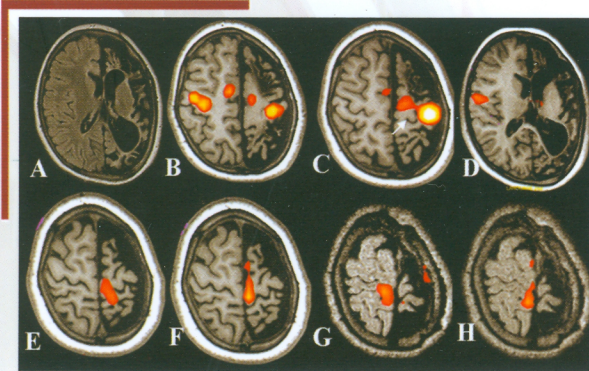




# Sree Chitra Tirunal Institute for Medical Sciences and Technology

Thiruvananthapuram



## Annual Report 2006-2007

SREE CHITRA TIRUNAL  
INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY  
(An Institute of National Importance under the Government of India)  
THIRUVANANTHAPURAM-695011

ശ്രീ ചിത്രതിരുനാൾ  
മെഡിക്കൽ സയൻസ് & ടെക്നോളജി  
ഇൻസ്റ്റിറ്റ്യൂട്ട്  
0950-695011  
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ഇൻസ്റ്റിറ്റ്യൂട്ട്  
0950-695011



# Annual Report

## 2006-2007

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY  
THIRUVANANTHAPURAM - 695 011  
KERALA, INDIA

*Layout and Design by Project and Publication Cell, AMCHSS, SCTIMST*

*Graphics & Illustrations by Medical Illustration Unit, SCTIMST*

**Cover Page:**

1. *A Magnetic Resonance Image (MRI) of the brain of 13-year-old left-handed boy with left brain atrophy (wasting) secondary to massive collection of clotted blood in between the membranous envelopes of the brain.*
2. *His Excellency the President of India Dr. A.P.J. Abdul Kalam visited the Institute in September 2006 in connection with the Silver Jubilee Celebrations. Director Dr. Mohandas briefs him on the recent developmental activities of the Institute.*
3. *A Laser Scanning Confocal Microscope photograph of a corneal cell sheet construct developed at Biomedical Technology Wing of the Institute.*

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## ORIGINS

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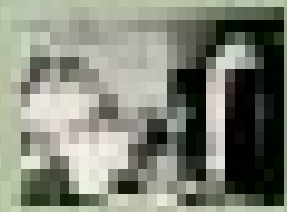
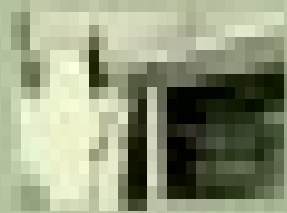
The origins of the Institute reach back to 1973 when the Royal family of Travancore gifted a multi-storied building for the people and the Government of Kerala resolved to develop the gift as the Sree Chitra Tirunal Medical Center for medical specialties.

Sri. P.N. Haksar inaugurated the Medical Center in 1976 and the growth of a Biomedical Engineering and Technology Wing followed quickly at the Satelmond Palace, Poojappura, 11 kilometers away from the hospital campus.

The concept and achievement of uniting technology and medical sciences within a single institutional framework was regarded sufficiently important by the Government of India to declare it as an *Institute of National Importance* by an Act of Parliament in 1980.

The objectives of the Institute as laid down in the Act are

1. promotion of biomedical engineering and technology
2. demonstration of high standards of patient care and
3. development of post-graduate training programs of the highest quality in advanced medical specialties and biomedical engineering and technology.







## INSTITUTE BODY

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**Prof. R. Chidambaram**

Principal Scientific Advisor to the Govt. of India, 318, Vigyan Bhavan Annexe  
Maulana Azad Road, New Delhi - 110 011

*President*

**Prof. P. N. Tandon**

1, Jagriti Enclave, Vikas Marg Extension, New Delhi - 110 092

**Dr. A.E. Muthunayagam**

Exec-Vice President, State Council for Science, Technology & Environment, Govt. of Kerala & Ex-Officio  
Secretary to Govt. of Kerala, Sasthra Bhavan, Thiruvananthapuram

**Prof. P. Ramachandra Rao**

Former Director, Institute of Armament Technology, PUNE  
Plot No: A-288, Road No: 5, Green Park Colony, Karman Ghat  
Hyderabad, Andhra Pradesh – 500 079

**Prof. M.K. Ramachandran Nair**

Vice Chancellor, University of Kerala, Thiruvananthapuram

**Dr. K. A. Dinshaw**

Director, Tata Memorial Hospital & Cancer Research Institute, Parel, Mumbai – 400 012

**Prof. Chitra Sarkar**

Department of Pathology, All India Institute of Medical Sciences, Ansari Nagar  
New Delhi - 110 016

**Dr. T. Ramasami**

Secretary to Govt. of India, Department of Science & Technology, Technology Bhavan  
New Mehrauli Road, New Delhi - 110 016

**Prof. P. Rama Rao**

Dr. Brahm Prakash Distinguished Professor of ISRO, International Centre for Advanced Research in Powder  
Metallurgy & New Materials, RCI Road, RR District, Hyderabad

**Dr. R.K. Srivastava**

Director General of Health Services, Nirman Bhavan, New Delhi - 110 001



**Shri. P. C. Thomas**

Member of Parliament (Lok Sabha), 67, Kumaranasan Nagar  
Kadavanthra, Eranakulam, Kerala

**Shri. Thennala Balakrishna Pillai**

Member of Parliament (Rajya Sabha), Ambadi, Yamuna Nagar,  
Karakulam, Thiruvananthapuram

**Dr. G. Mohan Gopal**

Director, National Judicial Academy, Bhopal  
(Former Director, National Law School of India, Bangalore)  
Sreedhanya Castle, Flat No: 7-B, Kowdiar, Thiruvananthapuram-695 003

**Prof. S. K. Sharma**

(Former Director, PGIMER, Chandigarh), House No: 58, Sector V, Chandigarh

**Prof. K. K. Talwar**

Director, PG Institute of Medical Education and Research, Chandigarh - 160 012

**Secretary to the Govt. of India**

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

**Secretary to the Govt. of India**

Ministry of Health & Family Welfare, Nirman Bhavan, New Delhi - 110 001

**Dr. Vishwas Mehta IAS**

**Principal Secretary to the Govt. of Kerala**

Department of Health & Family Welfare, Secretariat, Thiruvananthapuram - 695 001

**Shri. K. P. Pandian**

Joint Secretary and Financial Adviser to the Government of India, Department of Science and Technology,  
Technology Bhavan, New Mehrauli Road, New Delhi - 110 016

**Prof. K. Mohandas**

Director, Sree Chitra Tirunal Institute for Medical Sciences and Technology  
Thiruvananthapuram- 695011

**Dr. G. S. Bhuvaneshwar**

Head, Biomedical Technology Wing, SCTIMST, Thiruvananthapuram - 695 012

## GOVERNING BODY

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**Prof. R. Chidambaram**

Principal Scientific Advisor to the Govt. of India, 318, Vigyan Bhavan Annexe  
Maulana Azad Road, New Delhi - 110 011

**Chairman**

**Dr. T. Ramasami**

Secretary to Govt. of India, Dept. of Science & Technology, Technology Bhavan  
New Mehrauli Road, New Delhi - 110 016

**Dr. R.K. Srivastava**

Director General of Health Services, Nirman Bhavan  
New Delhi - 110 001

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New Delhi - 110 016

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Mumbai - 400 012

**Prof. K. Mohandas**

Director, Sree Chitra Tirunal Institute for Medical Sciences and Technology  
Thiruvananthapuram - 695 011

**Dr. G.S. Bhuvaneshwar**

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

**Prof. K. Jayakumar**

Head of Cardiovascular and Thoracic Surgery  
Sree Chitra Tirunal Institute for Medical Sciences and Technology  
Thiruvananthapuram- 695 011



## OVERVIEW

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The Institute embarked on its second quarter century of service during the reporting year. The year was marked by all round progress in technology development, hospital services and new academic initiatives.

Two technologies were transferred for commercial production and two agreements were signed for joint R&D programmes during the year under review. While the technology for single solution dental bonding agent, transferred to Anabond Stedman Ltd, Chennai has already been successfully marketed, the bioceramic products taken up by Basic Health Sciences Ltd, Punjab are expected to do so before the end of 2007. The Institute signed a MoU with the Vikram Sarabhai Space Centre for developing Left Ventricular Assist Device and another with the Hindustan Latex Ltd to develop a hormone releasing intrauterine contraceptive device. Pre-clinical safety evaluation of the centrifugal blood pump, the new model of the Chitra heart valve and the oral insulin delivery system were nearing completion, even as the haemo-concentrator, on successful completion of safety tests, was ready for clinical trials. The sanctioning of an Indo-US Joint R&D Networked Centre for Stem cells and Tissue Engineering and a number of DBT sponsored projects further strengthened the initiative in this area.

With the steady rise in research and business collaborations with industry and other agencies – both national and international – the Technology Transfer Cell was recognized as Technology Business Division in order to streamline technology transfer, research, device evaluation and other customer services. Implementation of e-governance facilities and the Laboratory Information Management System were expected to significantly contribute to the quality management and administrative efficiency. The Institute also extended technical support and advice to the Drugs Controller of India for implementing medical devices regulatory provisions, particularly in the area of cardiovascular implants. The Institute submitted a draft legislation to set up an independent Indian Medical Devices Regulatory Agency to the Minister for Science and Technology.

The Institute's efforts for quality assurance was further reinforced by accrediting 7 more tests to ISO 17025:2005 and initiating Good Laboratory Practices (GLP) conforming to OECD guidelines for safety evaluation studies for the industry. The Institute is also assisting the National GLP authority of India to develop GLP certification guidelines for medical devices testing laboratories.

The implementation of Vision 2020 programme, despite delays in securing building permission from local authorities, progressed satisfactorily. Among the new facilities commissioned were India's first Micro.CT, as well as Environmental SEM and Inductively coupled Plasma Emission Spectroscope.

The hospital continued to provide tertiary care to an increasing number of patients, particularly from outside the State. As a result of reorganization, up-gradation and commissioning of state-of-the-art equipments, the quality, efficiency and throughput of the hospital increased significantly. Several new diagnostic and therapeutic programmes were started which included complex tachy-arrhythmia management, trans-cranial magnetic stimulation for functional localization, sleep disorder management, diffusion tensor imaging and fiber trachography using MRI, and an increasing trend towards endoscopic approach to deep seated and relatively inaccessible areas of the brain. Ancillary services, especially blood transfusion, clinical laboratory and computer division supported and enabled the smooth functioning of the hospital. In its commitment to extend affordable care to the socio-economically disadvantaged sections of the public, the Institute further reduced the user charges, despite unrelenting financial constraints due to steady decline in non-plan grants.

The Public Health initiative of the Institute, the Achutha Menon Centre for Health Science Studies, begun in the early 1990s, has proved to be both a milestone and a trendsetter in public health training and research in this country. The starting of the Masters programme in Public Health for the first time in India and its continued success encouraged several agencies and governments, including the WHO, to sponsor candidates for the course from all over the

world. This was followed, half a decade later, by the starting of the National initiative, the Public Health Foundation of India, the ICMR School of Public Health, and plans by several Universities and institutions to begin Public Health courses. The curriculum of all these proposed courses are modeled on that of the Institute, while the ICMR programmes will be the *off campus* courses of the Institute.

The Achutha Menon Centre, in addition to running DPH, MPH and PhD programmes, continued to conduct several short-term courses in non-communicable diseases, maternal health, and ethical and gender dimensions in health care for national and international students. The Centre continued its research in various aspects of public health, the impact of political and economic policies on health care delivery, and the consequences of natural calamities on the physical and psychological health of the affected population. The faculty of the Centre also provided consultation to NGOs, governments and international bodies on a wide range of public health, gender and ethical issues, and served on the editorial boards of Indian and Overseas journals.

In addition to clinical evaluation of the technologies developed by the Institute, several international multi-centric trials on drugs, techniques and therapeutic strategies were being conducted by the clinical faculty. Other significant avenues of research included the study of isolation and cloning of human adult cardiac stem cells, endothelial progenitor cells and determination of the genetic component in hypertension and cardiac hypertrophy. Studies on Lp (a), antiepileptic drug induced oxidative stress in pregnant women and on cancer biology were progressing well. Genetic studies on epilepsy and myotonic dystrophy, and new diagnostic approaches

in atypical Parkinsonism and dementia were some of the other ongoing clinical research, while the WHO (SEARO) project on the demographic data and the magnitude of Stroke burden in the region, was expected to lead to the setting up of a Trivandrum Stroke Registry. The degree and diploma courses of the Institute continued to be sought after by candidates from all over India.

His Excellency, the President of India, commended the Institute's contributions to National development, and exhorted us to greater efforts, during his visit to the Institute on 21<sup>st</sup> September 2006. The Institute is indeed all set to serve the Nation with greater commitment and confidence for the next 25 years .....*and beyond.*





## HIGHLIGHTS OF THE YEAR

1. His Excellency the President of India visited the Institute and interacted with students & faculty.
2. Technology transfer agreement signed for five bioceramic products and a single-solution bonding agent for dental applications.
3. Memorandum of Understanding signed with VSSC, Trivandrum for joint development of Left Ventricular Assist Device (LVAD), and with Hindusthan Latex to develop a hormone releasing intrauterine contraceptive device.
4. An Indo-US joint R&D Networked Centre for Stem Cell and Tissue Engineering sanctioned by the Indo-US S&T Forum
5. A Good Laboratory Practice (GLP) based quality system for safety studies of medical devices implemented.
6. India's first micro – CT installed.
7. Hospital charges revised to maximize benefits of subsidy to patients from lower income groups
8. Hospital Infection Control and biomedical waste management activities strengthened.
9. Stroke care services reorganised to provide comprehensive stroke care programme



## BIOMEDICAL TECHNOLOGY DEVELOPMENT

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The implementation of the **VISION 2020** expansion programme progressed with the completion of the second phase of purchase of major equipment, such as Micro-CT (first one in India), Environmental SEM and an Inductively coupled plasma emission spectroscope. These will considerably support and extend the current scope of testing services, targeted device development and tissue engineering. Construction of the students hostel and floor-additions to the existing buildings have reached the final stages of completion. The construction of the two major blocks, which will cater to the need for increased laboratory space, will enable the Biomedical Technology Wing to reach its full potential in the coming two to three years.

Two technology transfer agreements and two MOUs for collaborative development were signed during the year. In August 2006, the know-how for the preparation single-solution bonding agent for dental applications was transferred to M/s. Anabond Stedman Research Pharma Ltd., (ASPR) Chennai to complement the four products transferred earlier in 2005. The product is already in the market. The second agreement for Bioceramic products was transferred to a company in Punjab and is expected to hit the market in July-Aug 2007.

The joint development of a Left Ventricular Assist Device (LVAD) with Vikram Sarabhai Space Centre, Trivandrum was taken up under an MOU. This device supports the failing heart. Different models of LVADs are still under development internationally and a few are in extended clinical trials. With the growing incidence of coronary artery disease in the country, the need for the device, either as a bridge to heart transplant or as a bridge to regenerative therapy of the heart is expected to grow substantially during the coming 10 to 20 years. The second MOU with Hindustan Latex Ltd., Trivandrum is for a joint collaborative project to develop a hormone releasing intrauterine system. At present the entire requirement for this fertility control device is imported and a low cost indigenous product will go a long way in supporting the nation's family planning initiatives.

The Hemoconcentrator is ready to enter the clinical trial phase in May-June 2007, with the completion of its preclinical safety evaluation. The Centrifugal blood-pump, the new model of the Chitra heart valve and Oral insulin delivery system made substantial progress during the year. All three products are in the final stages of preclinical safety testing and are expected to reach the clinical evaluation stage

during the last quarter of 2007. The know-how for all the four products have already been transferred to the corresponding collaborating industry.

The Tissue Engineering initiative moved forward with a fourth project being sanctioned by DBT to the 3 already started last year. The sanctioning of a 'Indo-US Joint R&D Networked Centre for Stem Cell and Tissue engineering' by the Indo-US S&T Forum will give an additional boost to this young program. It involves bilateral collaborative partnership with the Parker H. Petit Institute for Bioengineering and Biosciences, Georgia Institute of Technology, Atlanta, the University of Washington Engineered Biomaterials, Seattle, and KMC Life Sciences, Manipal Academy of Higher Education, Bangalore.

The BMT wing witnessed increased interaction with external organizations from within the country and outside, encompassing both industry and academia, in the areas of medical device evaluations as well as collaborative research and development. In order to streamline and manage all such external interactions effectively, the Technology Transfer Cell was reorganized as the TECHNOLOGY BUSINESS Division in August 2006.

The Technology Business Division would cater to the effective management of:-

- a. Technology transfer and related activities
- b. Industry sponsored and collaborative research
- c. Coordinating study based projects for medical devices evaluation
- d. Customer service support for routine testing

The institute is actively supporting the Drugs Controller General (India) in the implementation of medical device regulation in the area of cardiovascular

implants like heart valves and drug eluting stents. Detailed guidelines for submission of data for drug eluting coronary stents were developed and made available to the expert committee of the DCG(I); the safety and efficacy data submitted by industries for licensing are reviewed and technical opinion provided by our biomedical engineers.

The third surveillance audit of the quality system was carried out by the audit team of Comité Français D'Accreditation (COFRAC) of France on 19<sup>th</sup> and 20<sup>th</sup> of March 2007. The audit also ensured compliance with the latest revision of the standard ISO 17025:2005. During the year, 7 new tests were validated and covered in the audit, the most important being the group of tests for genotoxicity. As there were no major non-conformities raised by the auditors, it is expected that the final report from COFRAC will include the new tests in the list of accredited tests. The quality system for the testing services continues to be maintained at its high standard as attested to by the continuous increase in demand for testing and device evaluation studies.

Another important initiative taken up was the implementation of GLP based quality system conforming to OECD guidelines for safety studies of devices being carried out for industries. The system is being expanded to cover all in-vitro and in-vivo safety studies. Along with this, the development of guidelines for certification of GLP systems in medical device test laboratories has been initiated together with the National GLP Authority of India.

Implementation of "e-governance" in the BMT Wing campus was taken up in two major fronts. The first was an ERPMS started during Nov 2006 and is expected to be over in about 18 months. This will enable almost all administrative aspects covering

project management, purchase and accounting to be computerised. The second is the implementation of a Laboratory Information Management system (LIMS), which is in the final stages of procurement and the implementation is likely to start during mid 2007. The LIMS will cater to the needs of the testing services and its quality management. The campus network BMTLAN was upgraded and augmented by adding 150 nodes to cater to the increasing demands of network enabled services.

The report highlights the overall growth in the support provided to the medical devices industry of the country in terms of new technologies transferred, old technologies supported and testing and evaluation services rendered. R&D projects made good and steady progress while the new “tissue engineering initiative” gathered further momentum. The following sections give more details on all these aspects of work carried out during the year.

## PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER

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### (A) ARTIFICIAL ORGANS

Division of Artificial Organs consisting of the Devices Testing lab and Modelling & Prototyping lab made steady progress towards successful development of critical cardiovascular devices.

#### *Devices Testing Laboratory*

Development of Improved Tilting Disc Heart Valve with objectives of reducing thrombotic potential, MRI compatibility and improved hemodynamics made considerable progress. The preclinical animal evaluation in a sheep model is almost complete and early results are very encouraging. With the completion of other in-vitro tests to meet the requirements of international standard ISO 5840, the product is expected to reach clinical trials during the last quarter of 2007. M/s. TTK Healthcare Ltd. is the industrial partner in this major project.



Improved Tilting Disc Heart Valve

**Development of Coronary Stent Systems:** the project sponsored under the NMITLI scheme of CSIR aims at the development of both bare metal and drug eluting stents. Various tests systems required for their evaluation have been installed and validated. The design validation using finite element analysis and other analytical studies are mostly over. Prototyping and vendor qualification are in progress.

### **Modelling & Prototyping Lab**

**Hemoconcentrator:** With the completion of the ex-vivo evaluation of adult and paediatric models in sheep, the device is in the process of securing ethics committee approval for commencement of clinical trials.

Centrifugal Blood pump for cardio-pulmonary bypass reached the advanced stage of final development validation with the know-how being transferred to SIDD Life Sciences Pvt Ltd., Chennai. This scale-up and commercialisation phase has received financial support from Technology Development Board (TDB). Development of precision plastic injection moulds is in progress, with a few initial samples already received and tested leading to final modifications / correction of the moulds. Vendor development for the drive unit and flow meter are also on-going. The product should enter clinical trial phase before the end of this year.

**LVA D:** An MOU was signed with the Vikram Sarabhai Space Centre, Trivandrum for the joint development of a Left Ventricular Assist Device. With the growing incidence of coronary artery disease in the country,

the need for the device either as a bridge to heart transplant or as a bridge to regenerative therapy of the heart is expected to grow substantially during the coming 10 to 20 years. VSSC will design and develop the hardware, while the detailed in-vitro and in-vivo evaluation of the device, providing feedback for improvements and ensure its efficacy and safety will be our responsibility. The first set of prototype pumps were tested in-vitro using freshly collected bovine blood and based on results, further improvements to the pump are in progress.

### **(B) BIOMATERIALS AND DEVICES**

#### ***Bioceramics***

A Technology Transfer agreement was signed in November 2006 with M/s. Basic Healthcare Products, Chandigarh for 5 products, viz., Hydroxyapatite Porous Granules, Graded Porosity Buttons for Burr-Hole Closure, Ceramic Spacer for Vertebral Laminoplasty, Bioactive Composite Fast Integrating Blocks for Iliac Crest Repair and Bioactive Ceramic Composite Porous Blocks and Rods. The plant is expected to be ready in July 2007 and commercial production to start with the approval of the Drugs Controller General (India).



Technology transfer agreement signing with M/S Basic Healthcare Products for 5 Bioceramic products



The clinical trial of bilayer HAP burr hole buttons for cranioplasty was completed at the Department of Neurosurgery under Prof. R. N. Bhattacharya. Clinical trials of customised bioactive ceramic composites for various other clinical applications are in progress at Department of Orthopaedics, Amrita Institute of Medical Sciences, Cochin. The clinical trials of "Chitra Calcium Phosphate Cement" for dental applications started at three centres.

The Pilot production of 2 Kg. of Radio Opaque Glass Filler for use in the production of radiopaque dental composite was completed. This know-how has also been transferred to M/s Anabond-Stedman of Chennai.

### **Biosurface Technology**

Following the transfer of know-how to USV Ltd., Mumbai for the preparation of insulin loaded nanoparticles for oral insulin delivery during the previous year, the project moved further with the development of oral insulin formulation capsules by USV Ltd., Mumbai. Its efficacy was tested and results of the preliminary experiments are positive.

Silver ion concentration and method of loading silver nanoparticles were optimized. The optimized chitosan wound dressing sample i.e. SC-0.15AgCl has passed the cytotoxicity test and the sample was effective against wound microbes *S. aureus* for 7 days and *P. aeruginosa* for 3 days. The toxicology studies of the sample will be taken up very soon.

### **Dental Products lab**

In August 2006, a second technology transfer agreement was signed M/s. Anabond Stedman Research Pharma Ltd., (ASPR) Chennai for the commercialisation of single solution bonding agent. The product is marketed under the brand name

Stedbond-S. Dental composite technology transferred in 2005 is being marketed by ASPRL in 6 shades and the products are being exported to Kenya and Mozambique after Nairobi University approved products. The main competitor for this product "3M" reduced their prices by 30% in the Indian market, giving an idea of the impact of the institute's contribution to this segment of healthcare.



ASPR pamphlets / dental kit



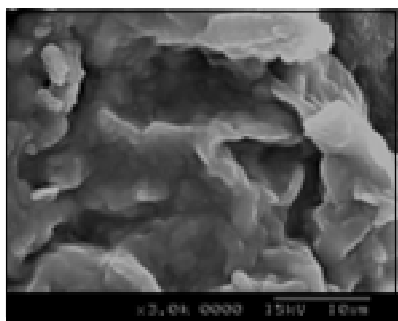
Technology Transfer Agreement signing with M/s. Anabond Stedman Research Pharma Ltd., (ASPR) Chennai, for the transfer of Single solution bonding agent



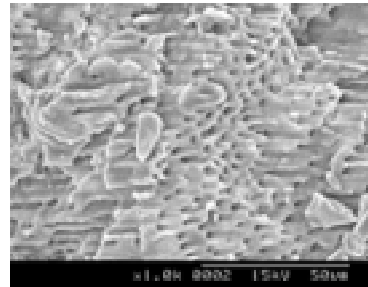
MoU signing with M/s. Hindustan Latex Ltd, for the development of Intra Uterine Device (IUD)

An MOU for a joint collaborative project to develop a drug releasing intrauterine system was signed with Hindustan Latex Ltd., Trivandrum at the BMT Wing in Dec 2006. At present the entire requirement for this fertility control device is imported and a low cost indigenous product will go a long way in supporting the nation's family planning initiatives.

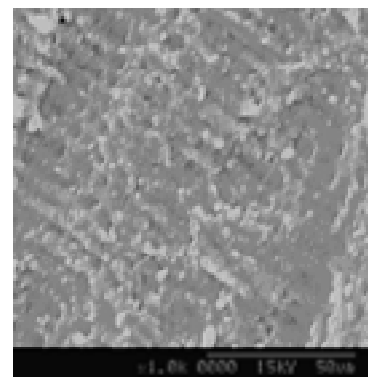
Development of caries dissolving agent 'Chitrasolv' funded by Dr. Toms International, Calicut reached the final stages. A two-component system was developed which was found to dissolve the caries very efficiently and had properties comparable with the imported control. The product passed the dermal irritation test and is currently undergoing further toxicological evaluation.



Carious dentine



After applying Chitrasolv



After conventional drilling



Chitrasolv kit

### ***Laboratory for Polymer Analysis***

The process developed for the heparinization of PMMA intra ocular lenses was transferred to M/S Aurolab, Madurai. Commercialisation of the product by the industry is awaited.

### ***Polymer Division***

Polyurethane potting compound development based on indigenous raw materials for the fabrication of

disposable hollow fibre biomedical devices has progressed well. This compound has favourable curing characteristics (hardening time and mould shrinkage), potting characteristics (pot life, optimised centrifugal rotation for bubble free potting and non-wicking), mechanical properties (hardness and compressive strength), biostability and shelf life. Industrial trials are in progress with M/S SIDD Life Sciences Pvt. Ltd, Chennai.

### **(C) BIOLOGICAL PRODUCTS**

#### ***Thrombosis Research Unit***

The technology document for Fibrin Glue preparation was prepared and was handed over to ATMRF, Ahmedabad. Commercialisation by the partner is awaited. Pending this, a decision has been taken to set-up a pilot-scale unit in-house, for the fibrin glue production (human fibrinogen and human thrombin) was prepared. The plan was submitted to Drug Controller for approval. Infrastructure development for the GMP area for this activity under the Technoprove facility of the institute has been initiated.

Development of anti-viper venom antibodies in chicken and purification of IgY has been completed and the yield per egg was estimated. In vitro reactivity of purified antibodies with different batches of venom was established. Effective dose (ED50) of purified IgY was determined in Balb/c mice. Minimum haemorrhagic dose (MHD) is the dose of venom that produces a 1cm diameter hemorrhagic patch at the back of the rabbit; the anti-hemorrhagic dose for this was also determined. Both ED50 and anti-haemorrhagic dose (AMHD50) of IgY were compared against that for commercially available equine IgG. This IgY was found to be marginally better.

#### ***Molecular Medicine Lab***

#### ***Recombinant proteins for clinical application***

The initiative to develop recombinant proteins, starting with TGF alpha made slow but steady progress. As described in earlier reports, the use of Transformation Growth Factor alpha (TGF alpha) is found to augment wound healing in cases of burns, diabetes wounds, and chronic ulcers. The recombinant human TGF alpha developed and tested for its wound healing ability has been found to enhance the healing by 20-30%. Experiments are underway to evaluate its stability when used along with the Chitosan based wound dressing materials, which are under development in the institute.

The lab is also working on other growth factors like TGF beta and Vascular Endothelial Growth Factor (VEGF) to improve the tissue healing process by combination of these growth factors.

### **(D) DIAGNOSTICS AND INSTRUMENTATION**

#### ***Division of In vivo Models & Testing***

Following the inking of a memorandum of understanding in December 2005 with the Institute of Animal Health and Veterinary Biologicals, Department of Animal Husbandry, Govt. of Kerala, the know-how for the for production of the Milk Test Kit was transferred. They produced 1200 kits during the year and distributed to 105 centres in Kerala covering all the districts of the state. 873 feed backs were received (75.25% of total distributed). Of these, 743 (85.1%) feedbacks reported that the kits were very user friendly and effective whereas only 83 (9.5%) opined that the kit was not effective or less effective. Most of the reports of non-effectiveness were

from urban dwellings where, routine culture and sensitivity methods were available at a very competitive cost. In the suggestion column of the feedback forms, above 80% users demanded more number of kits to be made available at the earliest. After this phenomenal success of the kit, signing of a licence agreement and commercial production of the kits are under processing.

**Instrumentation Lab** Development of Disposable ECG electrodes is in its final stages. The electrical characteristics of the disposable ECG electrodes satisfy the requirements of international standards. The toxicological evaluation of materials is being carried out and once they pass these tests, the electrodes would be subjected to clinical evaluation.

Development of **artefact free breathing monitor** progressed with further improvements being incorporated like the use of microcontroller for impedance measurements at more than one frequency. The preliminary results indicated that this could also effectively reduce movement artefacts. The display and user interface has been designed based on a hand held computer. A final prototype is being fabricated, which after passing the electrical safety requirements would be evaluated clinically.

Development of instrumentation for **bio-impedance measurements** to carry out multi-frequency impedance measurements typically required for clinical applications such as early detection of cancers of epithelial tissues progressed well. The preliminary results were encouraging; further miniaturisation of the circuit has been found necessary to improve accuracy and is under development.

## **(E) TECHNOLOGY TRANSFER & PROJECT COORDINATION**

### ***Technology Business Division:***

In August 2006, a technology transfer agreement for single-solution bonding agent developed by the Dental Materials Laboratory was signed with M/s. Anabond Stedman Research Pharma Ltd., (ASPR) Chennai.

The technology for Hydroxyapatite (HAP) and Bioactive Bioglass (HABG) bonegraft materials were licensed to M/s Basic Healthcare Products Private Limited, Punjab on 11th November 2006. As part of technology transfer, training cum demonstration was provided to the company. Necessary technical information and assistance was also provided to the company in preparing technical documents for getting regulatory approval and finalization of the company's plant. The products covered by the agreement for orthopaedic applications are:-

- Hydroxyapatite porous granules
- Graded porosity buttons for burr hole closure
- Ceramic spacer for vertebral laminoplasty
- Bioactive ceramic composite fast integrating blocks for iliac crest repair
- Bioactive ceramic composite porous blocks and rods

### ***Sponsored and Collaborative research***

An MOU was signed with Vikram Sarabhai Space Centre, Trivandrum for the joint development of a Left Ventricular Assist Device (LVAD) as mentioned earlier. This is a high technology high risk device. VSSC will be responsible for the development of the hardware, while the group in the institute will be responsible for providing performance requirements, its complete testing and feedback for improvements.

An agreement for a joint collaborative project to develop a hormone releasing intrauterine system was signed with Hindustan Latex Ltd., Trivandrum on 4th December 2006. At present the entire requirement in the country is imported and a low cost indigenous product will go a long way in supporting the nation's family planning initiatives.

### ***Non-disclosure agreements***

The division coordinated the signing of 8 Non-disclosure agreements with various industries and

sponsoring groups as a part of testing, research collaboration and technology transfer during the year.

### ***Project coordination services***

The division organised two RESCONS for the regular review of the various research and development projects being carried out - the first in April 2006 and the second in March 2007. The aim is not only to review the progress, but also to ensure co-ordination between the various laboratories and divisions of the BMT Wing and help overcome difficulties.

## TESTING, QUALITY SYSTEM MANAGEMENT & TECHNICAL SERVICES

### (A) TESTING SERVICES

The scope of COFRAC accredited tests was expanded with the addition of Genotoxicity test and a few others as given below. With this, the most important tests that are frequently required for the safety evaluation of biomaterials and medical devices as per ISO 10993 set of standards is covered.

#### NEW TESTS ADDED TO THE SCOPE OF ACCREDITATION

	New Test added	Applicable Standard(s)	Lab
1	Animal skin irritation test	ISO 10993-10: 2002 (E), clause 6.3	Toxicology
2	Vaginal irritation test	ISO 10993-10: 2002 (E), AMD 1, 2006 (E), clause B.7	Toxicology
3	Penile irritation test	ISO 10993-10: 2002 (E), AMD 1, 2006 (E), clause B.5	Toxicology
4	In vivo genotoxicity test: Micronuclei test	ISO 10993-3 2003 (E), clause 4.4.2, OECD 474	Toxicology
5	In vivo Genotoxicity test : Metaphase analysis in rodent bone marrow	ISO 10993-3: 2003 (E), clause 4.4.2, OECD 475	Toxicology
6	Quantification of platelet activation by flow cytometry (P-selectin)	ISO 10993-4	Thrombosis Res
7	Ames Test - Bacterial reverse mutation assay using Salmonella typhimurium strains.	ISO 10993 -3 clause 4.4 - In vitro Genotoxicity test	Microbiology

The Customer Service Cell (CSC) of the Institute handles all the Test Request(s) from both Internal and External customers that include medical device industries, research institutions, and academia. CSC also makes available the necessary



Description	External			Internal		
	2004-05	2005-06	2006-07	2004-05	2005-06	2006-07
Work orders	316	402	381	293	278	233
No. of test materials handled	2181	1096	1385	1311	1148	802
Income generated (Rs)	10,51,225	11,82,420	11,01,957	3,83,899	7,11,050	8,70,950

information and assistance for proper selection of tests and offering reasonable access to the laboratories. Customers are regularly contacted for their feedback and obtaining suggestions and opinions.

Due to the new requirements for regulatory approvals for medical devices in the country, there was a sudden interest in biocompatibility testing and evaluation and the tests under quality system accredited by Le Comite Francais d'Accreditation (COFRAC) of France (accreditation NO 1-1433) to meet the requirements of ISO/IEC:10993 standard was in great demand by medical device companies.

The test charges were revised with effect from 1st Jan 2007 as a periodical exercise and new requirements of statutory service tax collection was implemented. In addition, the customer service cell also coordinated the various study-based projects for customers for various device evaluations. It includes 3 international customers. An amount of about Rs 50 lakhs was received as part payment for the various ongoing studies during this period

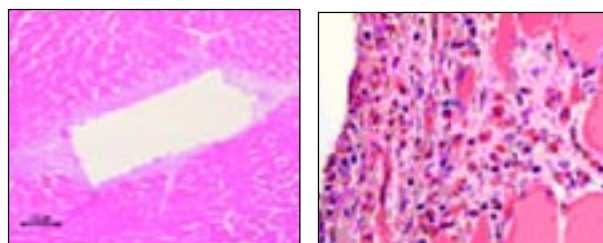
### SUMMARY OF TESTING SERVICES OFFERED BY VARIOUS LABORATORIES

**Bioceramics:** Three tests are offered - X-Ray Powder Diffraction and Vicker's Microindentation Hardness Test, Scanning Electron Microscopy and EDS analysis.

**Dental Products:** Mechanical testing (tensile, shear and flexural strength), FT-IR, thermocycling, Microhardness and FT-Raman tests were carried out.

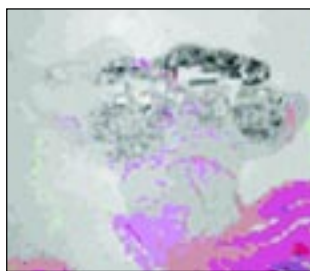
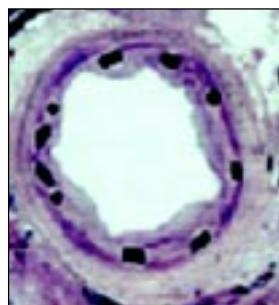
**Devices Testing:** Three new accelerated ageing studies for industries were completed during the period. The laboratory also supported the testing activities of the BMT Wing by providing service on sample preparation, cleaning, packaging and sterilisation of the materials from customers.

**Histopathology:** The laboratory is unique in the country having facilities to undertake evaluation of biocompatibility of various materials and pre-clinical evaluation of medical devices. It is well equipped for evaluation of soft and hard calcified tissues (without decalcification) and also with and without materials. Pre clinical evaluation of devices as per mutually agreed protocols with the industry were also carried out. They included Polymer coated and Drug coated coronary stents, Ureteric stent in sheep, Mechanical heart valve, Bioprosthetic heart valve in swine, Haemodialysis catheter deployed in jugular vein in rabbit, Wound healing study in skin. Other research studies were tissue response to dental bonding agents and pulpal response to dental capping materials.

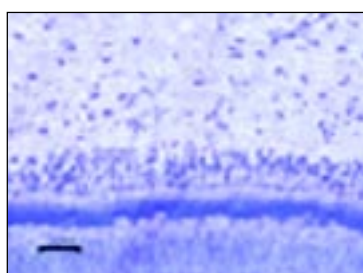


Testing for biocompatibility of materials





Pre-clinical evaluation of devices (Vascular)



Evaluation of materials (Dental)

### ***In vivo Models & Testing***

Major device evaluation studies carried out under the new GLP system of quality assurance:

- 1) Biofunctional evaluation of Paclitaxel and Sirolimus eluting coronary stents for industry.
- 2) Evaluation of biodegradable ureteric stent and a preclinical evaluation of heart valve substitute in sheep model - both studies sponsored by Nanyang Technological University, Singapore.
- 3) Evaluation of an improved Chitra Tilting Disc Heart Valve Prosthesis in a sheep model.

### ***Microbiology***

The Sterility test as per United States Pharmacopoeia and the Salmonella typhimurium reverse mutation (Ames) Assay was validated and introduced this year. These tests were included in the expanded scope of

accreditation during the surveillance audit by COFRAC. Other routine support services provided included (i) Microbiological monitoring of controlled environment (ii) Microbiological analysis of water (iii) Antimicrobial activity testing of new materials under development (iv) Spore viability; culture and sensitivity. The lab also carried out a GLP study for The South India Textile Research Association (SITRA), Coimbatore, India on anti-microbial property of woven Bamboo derived textiles.

Polymer analysis made substantial effort to maintain the quality system in the laboratory and the analytical services. The services are continually availed by almost all the labs of the BMT Wing apart from external customers.

### ***Polymer Processing***

Test offered include mechanical properties (tension, compression, impact properties, dynamic mechanical analysis) and Gas permeability through sheets and films.

Scanning Electron Microscopy: The facility has been expanded with the installation of an Environmental Scanning Electron Microscope. The routine support extended is SEM and EDS analysis.

### ***Thrombosis Research Unit***

Major Blood bag manufacturers in the country availed the testing services of the lab to carry out efficacy studies on special bags intended for platelet storage and RBC storage. In vitro hemocompatibility of bare and drug eluting stents (4 types of stents) was evaluated for another medical device industry in the country.

The lab standardised a new cytocompatibility assay based on the regulation of growth/apoptosis of

smooth muscle cells (SMC) and endothelial cells (EC) in in-vitro cultures. Studies carried out using this system included:

- a. cytocompatibility of drug coated stent materials and dose ranging studies for studying the effect of potential new drugs to be used with drug eluting stents - for a coronary stent manufacturer in the country.
- b. Effect of herbal extracts on endothelial cell (EC) proliferation and NO synthesis for another industry.

### Tissue Culture

In vitro cytotoxicity tests as per ISO10993-5, 1999 for 197 samples which included cell adhesion and cell material interaction studies using HOS cells and MTT assay.

### Toxicology

Toxicity tests carried out during the reporting period:

No	Name of test	No of Tests
<b>Accredited tests</b>		
1	Closed patch test for delayed hypersensitivity	2
2	Maximization test for delayed hypersensitivity	14
3	Intracutaneous test	22
4	Acute systemic toxicity test	09
5	Implantation in muscle	13
6	Implantation in Subcutaneous Tissue	1
7	Pyrogen test	2
8	Haemolysis test	2

<b>Non accredited Tests</b>		
1	Bone Implantation	2
2	In vitro antioxidant studies	1
3.	Animal skin irritation test	12
4.	Vaginal irritation test	5
5.	Penile irritation test	1
6	Haemolysis (O'Leary)	1
7	Oral toxicity as per OECD	1
8	In vivo chromosomal aberrations	1
9	In vivo micronucleus test	1

### GLP Studies

No	Name of the study
1.	Biological evaluation of collagen based Biomaterials
2.	Toxicity study of Stent materials
3.	Evaluation of the efficacy of Recombinant platelet-derived growth factor on healing of experimentally induced surgical wounds in Sprague-dawley rats.
4	Repeated dose 90 day Oral toxicity study of Polymeric nanoparticle - NMITLI -BST001 in rats

The in vivo micronucleus test and chromosomal aberration studies were standardized validated and are now available for routine testing. Following additional tests as per ISO 10993 were included in the scope of COFRAC accreditation during the surveillance audit in March 2007.

- a. In vivo bone marrow chromosomal aberration
- b. In vivo bone marrow micronucleus test
- c. Animal skin irritation
- d. Penile irritation and
- e. Vaginal irritation

The division also supported a number of small animal studies of other laboratories for research like gluteal

muscle implantation; calverial defects bone implantation, lethal dose & effective dose for the anti-venom study; bioavailability of Amphotericin B - Gum Arabic conjugate, etc.

**Transmission Electron Microscopy Laboratory** continued providing support for sample preparation and imaging of inorganic (micro- and nano- particles) samples (62); evaluation of the ultra-structure of tissue response to materials.

## **(B) QUALITY SYSTEM MANAGEMENT**

The quality system was upgraded during the year to conform to the revised standard ISO/IEC 17025: 2005(E) and reviewed by regular internal audits and technical meetings. Comite' Francais D'Accreditation (COFRAC) of France conducted their third SURVEILLANCE AUDIT on 19th& 20th of March 2007. The purpose of the surveillance audit was to ensure that the laboratory continued to maintain its technical competence related to the scope of accreditation and to assess the effectiveness of the quality management system. During this audit, the scope of accreditation was expanded with the addition of 7 new tests as stated earlier. The final report on the audit from COFRAC is awaited.

### **Calibration**

The Calibration Cell addresses the calibration of equipment, maintaining traceability in measurements and reference material requirements of the BMT Wing. During the last year the Cell carried out 320 calibrations. Of these, 220 were directly related to the testing services under the scope of COFRAC accreditation. Applications have been filed with the National Accreditation Board for Testing and Calibration Laboratories (NABL), New Delhi for the accreditation of the calibration cell as per the ISO 17025 standard.

### **Quality Cell**

The quality system conforms to "ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories" and has been accredited by Comité Français d'Accréditation (COFRAC) of France. The system covers the evaluation of materials for biocompatibility and physicochemical characterisation. ISO/IEC 17025 was revised in 2005 and the Quality Manual and related System Procedures were revised to meet the requirements. The cell organised the regular internal audits, technical management meetings and management reviews to ensure continuous improvement of the system.

CORFAC conducted their third surveillance audit on 19th & 20th of March 2007. The purpose of the surveillance audit is to ensure that the laboratory maintains its technical competence related to accreditation scope and to assess the application and effectiveness of the Quality System. Conformance of the system to the new revision of 17025 was also verified. The team expressed their appreciation about the Quality System and recommended continued accreditation. Final audit report from COFRAC is awaited.

One of the major introductions during the year was implementation of the quality system conforming to OECD "GOOD LABORATORY PRACTICES". As a part of this, 10 study based safety evaluation of devices and materials were audited and a training program for internal auditors organised. Further expansion of this quality system to all in-vitro and in-vivo safety studies has been planned.

## **(C) TECHNICAL SERVICES**

The service units of the BMT Wing continued to extend their high quality service to the maintenance and

support of the different activities, especially meeting the requirements of the quality system.

### ***Devices Testing***

The division continued to support the information management activities of the BMT Wing. During the year, two major IT enabled services have been initiated. The first one aimed at implementation of a Enterprise Resource Planning and Management Information System (ERPMS) and the other focuses on the automation of testing services through a Laboratory Information Management System (LIMS). The implementation of the ERPMS was started during Nov 2006 and is expected to be over in about 18 months. The procurement of the LIMS system is in the final stages and the implementation is likely to start during 2007. The campus network BMTLAN was upgraded and augmented by adding 150 nodes to cater to the increasing demands of network enabled services.

### ***Engineering Services***

The purchase of major equipment during the last two years have necessitated a large amount of restructuring of the available space, to enable them to be installed and commissioned. About 320 sq.m of new laboratory space was created by converting the car-parking and TPF areas. Partitioning, air-conditioning, electrical and water supply requirements in the two floors that have been added during the year are in progress. This will immediately make available another 1300 sq.m. Maintenance of electrical supply, water, sanitation, air-conditioning and incinerator were carried out diligently to ensure uninterrupted supply/ availability of the utilities.

### ***IPR & Technical Co-Ordination***

Patents application filing and maintenance in consultation with the institute's patent attorney are

the major responsibilities. The cell coordinates the visits by a large number of college student groups from various technical colleges in South India.

The cell supported the participation of the Institute in two major expositions abroad:

- 1) Institute participated as a part of the science exposition of the Ministry of Science & Technology at the "The MESSE -2006, Trade Fair, Hannover," Germany. organised by the 'Govt. of India" in conjunction with Engineering Export Promotion Council (India) at the Hannover International Trade Fair complex, Germany from March 24 to 28, 2006.
- 2) The National Science Exposition "Made in India" held at Beijing - China, organised jointly by Govt of India & the CII from Sept 08 to 11, 2006; at the International Exhibition centre at Beijing. SCTIMST was a part of the Science Exposition by the Govt. of India.



The MESSE -2006, Trade Fair, Hannover," Germany



The National Science Exposition "Made in India" held at Beijing - China,

The status of patents held by the institute and those filed and pending is as given below.

Patents held (sealed)	=	67 Nos.
Patents filed and pending	=	44 Nos.
Designs held (sealed)	=	13 Nos.
New Patent applications filed during 2005 - 2006	=	6
Patents granted / sealed during 2005 - 2006	=	4

**Division of Laboratory-Animal Science** is responsible for the breeding, care and management of small animals and ensures consistent supply of quality animals for both testing and research. Assistance is provided to researchers for bleeding, harvesting of tissues, etc. The table below give the current level of support provided. Four White Leghorn Hens were maintained through out the year for the viper anti-venom project.

Species	Toxicological Testing	Research
Rabbits New Zealand white -	232	32
Guinea pigs Hartley-	257	
Rats Wistar-	52	620
Rats Sprague Dawley	-	8
Rats Spontaneously Hypertensive	-	110
Mice Swiss Albino-	455	29
Mice Balb/c-	-	70
Hamsters Golden syrian	-	20

Timely conduct of the Institutional Animal Ethics Committee meetings, documentation, communicating with scientists and with CPCSEA for major issues in connection with animal experimentation of the institute is managed by the division. A one week training for post-graduate students in the handling of laboratory animals was started and 4 batches haven been trained. A training workshop for Animal House Managers covering general awareness on the ethical issues, rules and regulations of CPCSEA, registration with CPCSEA, etc was organised. The participants included sponsored candidates from various national institutes.

### **Laboratory for Confocal Microscopy and Experimental Pathology**

This new laboratory took shape with the installation and commissioning of a full-fledged confocal microscopy facility. Dr. Krishnamurthy of the National Centre for Biological Sciences, Bangalore, an expert in this area, carried out a performance evaluation of microscope to ensure that the installation had been carried out, correctly and fully.



With the demand for histopathology services outstripping capacity, a second histopathology facility has been added to this lab to support the requirements of research studies with a full-time trained pathologist. A modular Confocal Microscopy User Training Programme has been developed and about 40 students and faculty have been trained to ensure optimum use of the facility. The lab has also taken the lead in organising a 'Confocal Microscopy Interest Group' for fostering advances in its use in Tissue engineering and biomedical research. The group has about 50 members

### ***Precision Fabrication Facility***

A number of moulds and dies were fabricated for moulding various components and test samples; jigs and fixtures were fabricated to support the testing in various labs. Special cutting fixtures were made for the preparation of control samples as part of our initiative in Reference material development. A major initiative of the year was the development of a set up for fabricating intricate and small titanium orthodontic screws.

### ***Library, BMT Wing***

The library has a collection of 9734 books and 5298 back volumes of journals. During the current year, 121 books were added and 60 journals were subscribed. The collection also includes 2116 standards and 275 patent specifications. As a part of support to the Quality Systems, the library updates all relevant national and international standards. During this year 51 standards specifications were added to the collection of the library. The library has accounts with Patents Information System, Nagpur, NISCAIR, DELNET and STN-Easy for the easy retrieval of information.

The library subscribes to Current Contents databases (Engineering and Computing, Physical Chemical and Earth Sciences, Life Sciences). The information management system and library automation is based on the UNESCO software, CDS/ISIS. The library information and the CD-ROM collection are available to both the wings through intranet.

## BIOMATERIALS RESEARCH AND DEVELOPMENT

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### *Bioceramics*

Micro and nano-porous bioceramic substrates having capacity to carry drugs and biologics for the treatment of refractory osteomyelitis and osteo-necrosis are being developed. Research in the areas of biomimetic coatings was continued.

### *Biosurface Technology*

Polymethacrylic acid based nano /microparticles were developed, and their application towards oral insulin delivery evaluated. Different polymer combinations were tried to enhance the physico-chemical properties of these particles. Methacrylic acid-vinyl pyrrolidone, methacrylic acid-ethylene glycol microparticles were developed recently and polymer composition were optimised to achieve better protein loading and release properties. Further protease inhibition, muco-adhesion, divalent-ion binding properties of the microparticles was investigated under in vitro conditions. In order to enhance the insulin stability and absorption, several modification strategies were proposed. Some novel hydrophobic/hydrophobic derivatives were developed and their insulin complexes were prepared. Chemically modified insulin with polyethylene glycol based polymers was also developed as part of the investigation. Biological activity of PEGylated insulin was evaluated using ELISA technique. Further studies are planned with modified insulin entrapped polymeric particles. Efforts are on to develop an in vitro cell culture system based on caco 2 cells to evaluate the intestinal permeability of oral insulin delivery systems.

An attempt has been made to develop protein like polymeric nanoparticles and characterized it by its thermo-responsiveness and photo-sensitiveness. 2D monolayer studies of the developed polymer were carried out. Further immobilization of these nanoparticles over a polymeric substrate was carried out and their thermoresponsive properties studied. Utilisation of these novel nanoparticles and pendant polymers are being attempted towards drug targeting and improvement in the circulation time of liposomes.

### *Caliberation*

The Cell is involved in the development of in house reference materials suitable for biological evaluation in collaboration with the divisions of Toxicology and Tissue Culture.

## Dental Products

Glass ionomer formulations for luting cements were developed during the year. Properties such as working and setting times, compressive strength were evaluated. Procedure for synthesis of polyacid and radiopaque glass formulations were standardised by varying the amount of polyacid ratio, amount of chain transfer agent and silica/alumina ratio respectively. The product is expected to be ready for clinical trials during early 2008.

### **Genotoxicity tests of dental materials**

Organically modified ceramic material developed in the lab cleared the genotoxicity test. Currently Chitrasolv material is undergoing the genotoxicity tests. With the completion of these preclinical tests, the products should be ready for clinical trials during the last quarter of 2007.

**Development of polymer scaffolds** Polymer scaffolds were made from Polycaprolactone using a porogen which gave a porosity of 50-200 microns. It was characterised for its degradation properties, molecular weight and porosity. The polymer was coated with a fibrin composite coat and the behaviour of endothelial cell proliferation on its surfaces was studied. The work was carried out in collaboration with Thrombosis Research Lab.

## Devices Testing Lab

**Vascular Graft:** Subsequent to the technology transfer of the product to the industry, continued R&D aimed at the elimination of the need for pre-clotting and enhancing blood compatibility have been taken up. Two pilot programs with active cooperation of the divisions of Polymer Processing and Polymer Chemistry aimed at the feasibility of using flouro-passivation and hydrogel preclotting has been

successful. A program for generating preclinical data for ethics committee approval is planned for the coming years.

The division is supporting the Department of Radiology in the standardization of event related fMRI techniques 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.

## Polymer Analysis Lab

The laboratory has made significant research efforts during this year. A new sensing approach for the detection and estimation of clinically relevant C - reactive protein was developed. The novelty of the method is the elimination of biologically derived entities like antibodies. Smart polymeric formulations were also synthesised for tissue engineering applications. The newly developed polymers enabled the removal of cell sheets just by altering the temperature. Using the concept of molecular imprinting, polymeric entities capable of recognizing molecules such as creatinine and glucose were synthesised. The feasibility of employing these materials in sensing applications is underway.

In an ongoing program of "*Biopolymer Composites for medical applications*", the drug release property of the chitosan and chitosan/chitosan-g-PMMA microspheres were studied. Antibacterial activity of these microspheres was also studied using two bacterial strains, *S.aureus* (ATCC 25923) and *E.coli* (ATCC 25922). It was observed that the drug loaded chitosan-g-PMMA microspheres exhibit enhanced drug release characteristics than the drug loaded virgin chitosan microspheres. Further research in this direction is on-going.



## Polymer Chemistry

The work on water-soluble conjugates of Amphotericin B with gum-arabic has increased the armamentarium of therapeutic possibilities of this antibiotic against Leishmaniasis. Work on rapidly gelling polymer systems based on gelatin and alginic acid dialdehyde, continued to receive attention from various international groups working on cell encapsulation and drug delivery. This material is presently being evaluated as an injectable scaffold for tissue engineering applications at EPFL, Switzerland and based on the outcome of their preliminary investigations; a collaborative project might become feasible.

The one year exploratory project in using the above rapidly gelling hydrogel system as a coating on woven PET vascular grafts for reducing the permeability showed very promising results. The coated graft was evaluated for permeability characteristics, burst strength and its biological behaviour. The data obtained showed that coating the graft with this hydrogel might be a promising route to reduce the permeability of the graft. This project carried out with Dr. Roy Joseph as the principal investigator was completed and a detailed progress report has now been submitted.

Work on the project on 'Radiopaque Polyurethanes' sanctioned by the State Council for Science and Technology, Kerala made good progress. A new class of polyurethanes based on iodinated bisphenol-A has been synthesized and the characterization of these polymers is in progress

## Polymer Division

Dispensable and biodegradable polymeric bone cement based on polypropylene fumarate for

minimally invasive treatment of bone diseases, vertebral compression fractures etc has been prepared under a DST project. Biocompatibility tests have been carried out successfully. Histopathological analysis on bone-implant retrieved after 3 months implantation in rabbits, reveals direct contact of host bone with the cement and cancellous bone formation at the material host bone interface with growth of periosteal bone to cover the defect. Six-month results are awaited.

Poly (propylene fumarate-co-ethylene glycol) gel scaffold material was prepared and the physical properties were evaluated under a DBT project. Studies on cardiac fibroblast cell response to the scaffold material were carried out to evaluate the growth and proliferation of cardiac cells on the scaffold materials. The test materials were biocompatible to cardiac cells. These scaffold materials enable adhesion and proliferation of these cells.

Biodegradable Poly (propylene fumarate) and Hydroxyapatite nano particles were prepared under DST-BMBF project 'Biodegradable molecularly reinforced polymeric nano composite bone fixation devices'. The composite was evaluated for mechanical properties. Further work is in progress.

## Polymer Processing Lab

**Development of bone graft substitutes for spinal fusion surgery:** Aim of this project is to develop a new composite material that has bioactivity (both osteoconductive and osteoinductive properties) and mechanical and biological compatibility with the host bone tissue. The approach adopted was to incorporate bioactive glass in a suitable polymer matrix, thus making the resultant composite bioactive. Toughness and ease of shaping by a scalpel in the

theatre are considered as added advantages of this material. An optimised composite has proved to be non-cytotoxic. Cell adhesion studies revealed that the osteoblasts proliferate on the composite surface. Further development is in progress.

***Coating and characterization of vascular graft with hydrogel derived from oxidized alginate and gelatin:*** A hydrogel developed from oxidized alginate and gelatine by the Polymer Chemistry division was coated on large diameter PET vascular grafts in order to seal its pores. The material was found to be efficient in sealing the graft and the water permeability of the uncoated graft was reduced from

over 450 ml/min/cm<sup>2</sup> to under 7.6 ml/min/cm<sup>2</sup>. Preliminary studies showed that the hydrogel degrades within a month *in vitro*. Simulated pulsatile testing (pressure range 80 to 120mm of mercury, frequency: 3 hertz, temperature 37°C) on hydrogel sealed vascular graft showed that the coating effectively seal the graft up to a period of 5 days. Burst pressure measurement, cytotoxicity test, *in vitro* Haemocompatibility and *in vitro* cytocompatibility studies of the hydrogel coated graft revealed that hydrogel coating would not adversely affect above properties. Safety evaluation of the material in large animal implantation studies is being planned.

## TISSUE ENGINEERING AND BIOLOGICAL RESEARCH

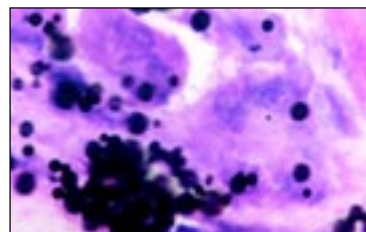
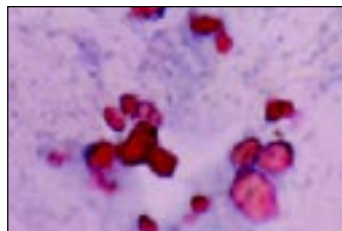
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### *(a) Histopathology laboratory:*

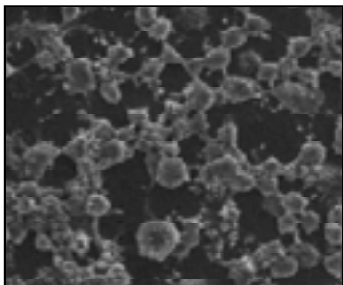
The major areas of research focus continues to be:

- a. Molecular mechanisms of cellular response to particulate form of the biomaterial Cobalt Chromium Alloy: An investigative study using *in vivo* and *in vitro* models.
- b. Cellular and molecular mechanisms of polymer degradation - Cellular and molecular mechanisms of *in vitro* and *in vivo* interactions of macrophages with the biomaterial, poly (ether urethane) urea.
- b. Immune response and regulation of fibrosis around implants- an *in vivo* and *in vitro* investigation of cell-material interactions between silicone and macrophages and fibroblasts with reference to material degradation.
- c. Immune mechanisms of polyurethane degradation - a qualitative and quantitative *in vivo* investigation into immunological cell response to metals and polymers with reference to polyurethane degradation.

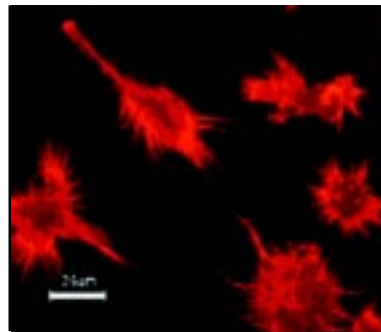
Other activities that were continued were Quantitative immunophenotyping of inflammatory cells in biocompatibility assessment of materials and the study of retrieved human implants, which included light and Scanning electron microscopy observations on tissue and implant material.



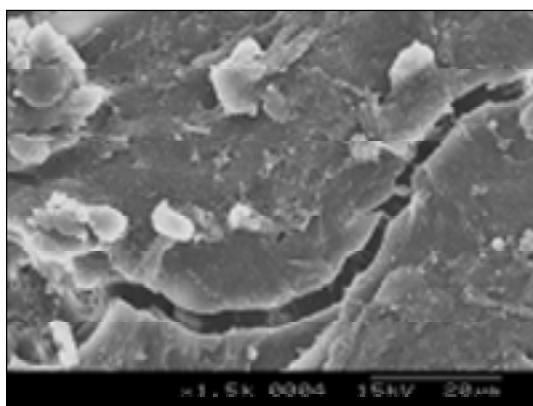
Molecular mechanisms of cellular response to particulate form of the biomaterial Cobalt Chromium Alloy: An investigative study using *in vivo* and *in vitro* models



ESEM of macrophages on PEUU



Fluorescence of macrophages on commercial Polyurethane

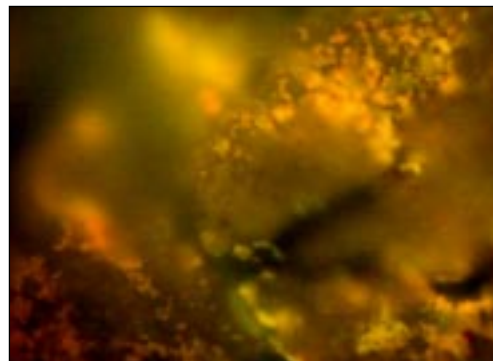
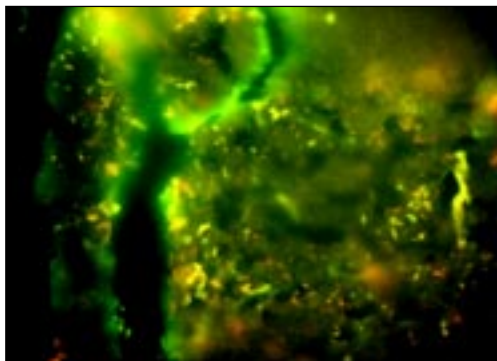


Immune mechanisms of polyurethane degradation - a qualitative and quantitative in vivo investigation into immunological cell response to polymers with reference to polyurethane degradation

### Microbiology

The lab supported the biomaterials development in various other groups of the BMT Wing with different tests and evaluations. One major area of research focus is in delineating the mechanisms of *E.coli* biofilms in causing catheter associated urinary tract infections under a project funded by KSCETE. In addition, the

studies on mechanisms of pathogenesis of *Staphylococcus* in development of implant-associated infection are being carried out. The various approaches adopted are role of nutrition factor, iron and hemagglutinating property. The second research focus is on Tissue engineering of the lungs under a DBT project.



Fluorescent microscopic pictures of *E.coli* and *Staphylococcus aureus* biofilms on latex Foley's catheter under experimental conditions.

### ***Molecular Medicine Lab***

***Epilepsy research:*** The focus of research is on the basic molecular mechanisms underlying with the development of temporal lobe epilepsy (TLE). Excessive neurotransmitter release is considered as one of the fundamental reasons for the hyper activation of the neurons. This pathway is mediated through a series of protein-protein interaction that include SNARE, synaptotagmin and syntaxin. A novel mechanism through with Syt can regulate its expression level during seizure has been identified. In addition to the basic neurotransmitter pathway, we are looking at a candidate gene for temporal lobe epilepsy known as Jerky. The focus is to find the RNA targets for this RNA binding protein during seizure. Our results suggest that there is a translational inhibition of Jerky during status epilepticus. We are also focusing on the single nucleotide polymorphism (SNP) in TLE patients within the Jerky gene.

### ***Laboratory for Polymer Analysis***

A novel biodegradable polyester material was synthesised in several compositions under a DBT sponsored project on the "Development of smart biomaterials for cardiovascular tissue engineering". Their characteristic properties were evaluated and the most suitable one was identified. The isolation of vascular endothelial cells, smooth muscle cells and mesenchymal stem cells from umbilical cords as well as from various animal models have been standardized. The cells have been characterized for their morphological features using various standard techniques.

The protocol for isolation of pig islets and porcine ductal cell has been standardised under a DBT sponsored project. Different polymeric materials synthesized and characterized were checked for their

potential to support the growth of mice and porcine islet cells. PU-PVP IPN tubes were prepared for immunoisolation and pilot experiments for the encapsulation of porcine islets in PU-PVP IPN macro capsules with xenotransplantation in rats was carried out. Isolation of goat bone marrow mesenchymal stem cells (GBMSC) and efforts to differentiate them in to pancreatic islets is under progress.

In the cartilage tissue-engineering program, porcine chondrocytes were grown in vitro on biodegradable synthetic novel PVA-PCL IPN scaffold and a protein base for up to 2 months and characterized for cartilage formation. The effect of growth factors in mediating the mesenchymal stem cell differentiation to chondrocytes in 3D scaffold and finally chondrogenesis was also studied.

In a KSTEC postdoctoral fellow project, effect of plant derived growth factors is being studied. Effect of different extracts of plant *Hemigraphis alternata* on fibroblast cells L929 was assayed. The effect of aqueous extracts on Cell proliferation and cell migration over a concentration range between 0.1 - 5 mg/ml was assayed. The potential of this protein fraction in the differentiation of mesenchymal stem cells to other lineages and as a growth factor in tissue engineering are under further investigation.

### ***Tissue Culture Laboratory***

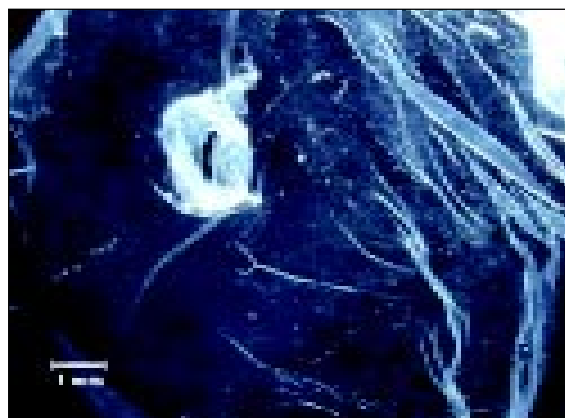
Three dimensional organotypical construct was generated using a thermoresponsive culture surface. Milestones reached with this in vitro construct are:

- a. Primary culture of corneal cells has been standardized
- b. Multilayered corneal cell sheets can be obtained within 5 - 7 days after initiation of culture.

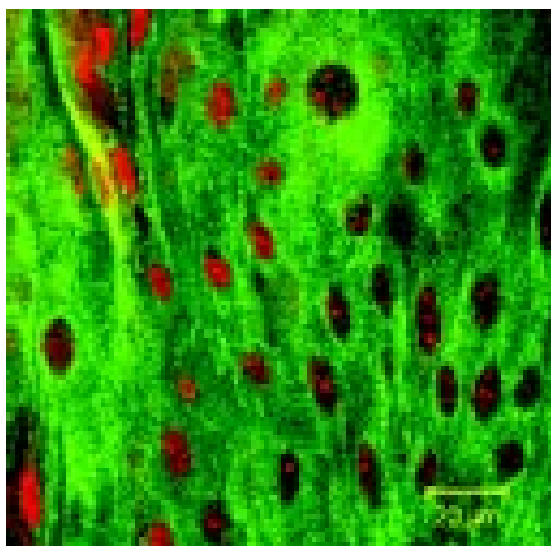
- c. Cells in the in vitro tissue construct expressed intact tissue architecture and characteristic protein expression of cytokeratin-3/12

Synthetic materials possessing the functional features of biological substrates are having interesting applications in the rapidly evolving area of tissue engineering. A graft copolymer of hydroxyl ethyl methacrylate and N-isopropylacrylamide was synthesized and characterized using different techniques like FTIR, LCST, Water contact angle and X ray diffraction analysis. The temperature responsiveness and in vitro cell construct manipulation using the reversible thermoresponsive copolymer was studied using different cell lines like L929, NRK and SIRC. A novel graft copolymer consisting of hydroxyl ethylmethacrylate and NIPAAm was synthesized and characterised. While maintaining the non-cytotoxic nature, the material was found to repel cell adhesion. Development of a corneal construct for treating corneal epithelial damage and for the development of an in-vitro assay as an alternate to the "Rabbit eye irritation test" made good progress.

- a. Isolation of limbal stem cells from different sources was standardized
- b. Cells have been characterized with respect to different stem cell markers and differentiation markers
- c. Limbal cells have been cultured on thermoresponsive copolymer for multilayer formation and cell sheet retrieval
- d. Efficacy testing of the cell sheet is in progress.



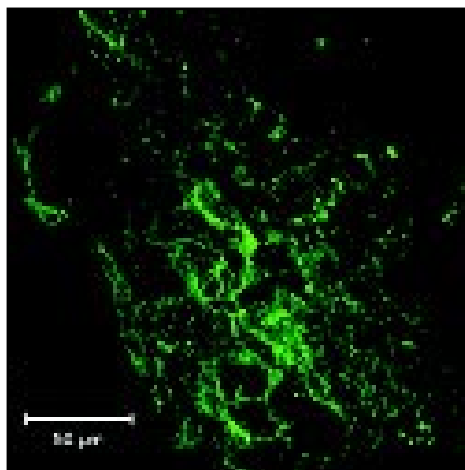
Corneal cell construct developed in vitro from cultured corneal cells



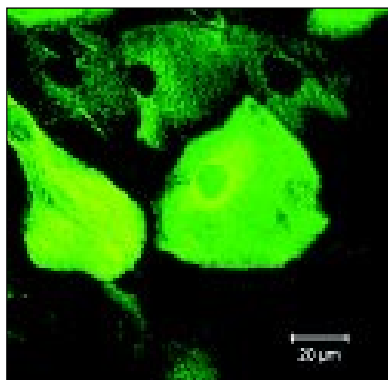
Cell sheet construct observed under Laser Scanning Confocal Microscope. Green portion represent cells in reflectance mode and Red bodies represents propidium iodide stained nucleus in confocal mode



In vitro developed corneal cell sheet demonstrating transparent character. The letters BMT on a transparency sheet is clearly visible through the corneal sheet placed over it as when observed under 3D stereo microscope.



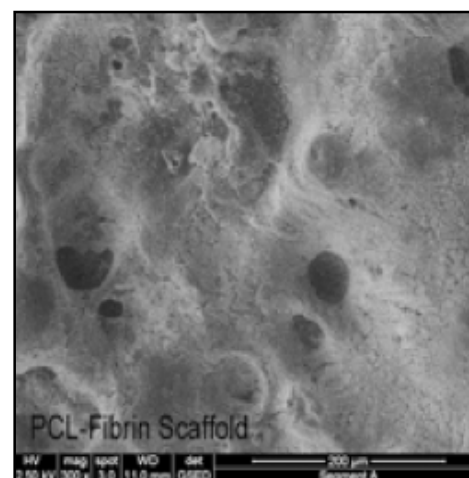
Tight junction protein (ZO-1) expression by corneal cells in cell sheet



Cytokeratin expression (CK3/12) of corneal cells in cell sheet

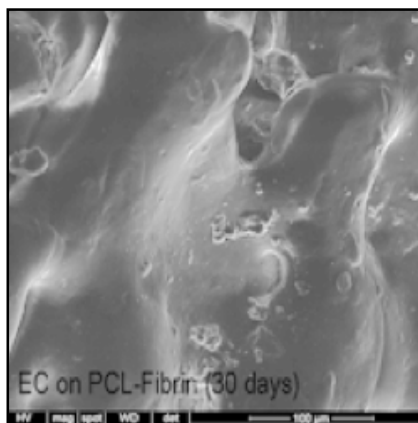
### *Thrombosis Research Unit*

Significant progress was made in collaboration with Dental Products division towards the ongoing vascular tissue engineering program. Major focus was to develop a hybrid scaffold using a biodegradable polymer and a bio mimetic composition of extra cellular matrix (ECM) that consisted of fibrin, gelatin, fibronectin, growth factors and proteoglycans. The process has successfully produced porous PCL scaffold on which the composite was coated (Fig1). Long term (30days) culture of endothelial cells on this hybrid scaffold and using environmental scanning electron microscope (ESEM) analysis shows that cells proliferate and survive on the scaffold; they also form continuous cell lining on the surface owing to the presence of the bio mimetic ECM. Synthesis and deposition of elastin and collagen into the pores of the scaffold was demonstrated by immunostaining of the recovered matrix. (Fig 3&4). The results suggest that the ECM is remodelled during in vitro EC culture on the scaffold and that the hybrid scaffold is a very good candidate for further development in this area.

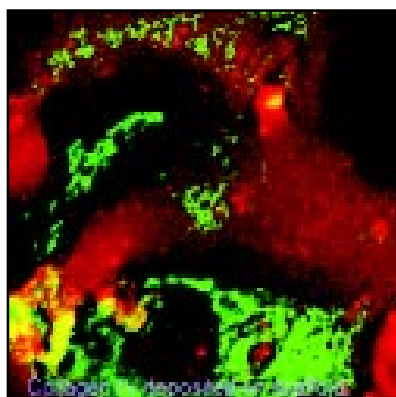


Porous hybrid scaffold PCL scaffold was coated with a composite of fibrin, gelatine, fibronectin, growth factors and proteoglycans to fabricate the extracellular mimetic scaffold for tissue construction

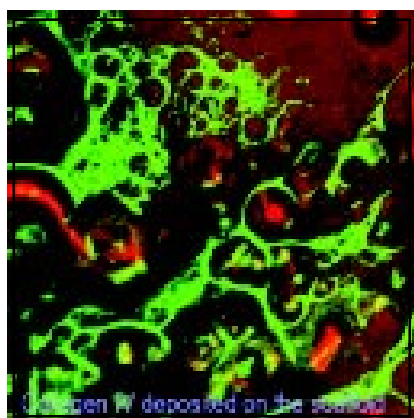




On PCL-composite scaffold endothelial cells (EC) was cultured for 30 days. EC is seen as a continuous layer covering the scaffold surface.



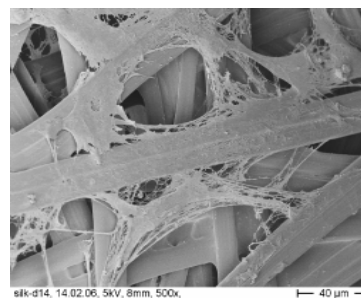
Confocal image showing elastin deposition on the scaffold after 30 days of EC culture. Red is the scaffold and green is FITC -Ab bound to deposited elastin



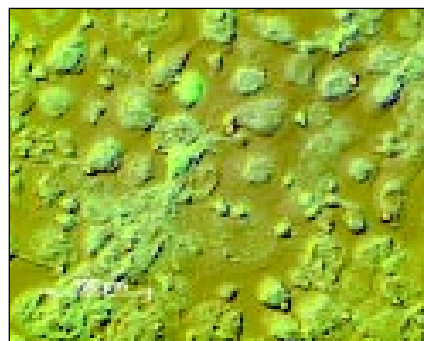
Confocal image showing collagen IV deposition on the scaffold after 30 days of EC culture. Red is the scaffold and green is FITC - Ab used to identify collagen.

### **Transmission Electron Microscopy Laboratory**

The biological evaluation (in vitro and in vivo experiments) of the various bioactive ceramics developed in the Bioceramics Lab was carried out under the major research focus in Bone Tissue Engineering. Cultures of bone marrow-derived mesenchymal stem cells and their differentiation into the cells of the bone lineage have been successfully attempted on these bioactive ceramics, resulting in "living bone constructs". These are intended for repair of large-segment bone defects. Another exploratory work carried out was the use of natural silk as a biomaterial, taking advantage of its biological and mechanical properties for hard tissue repair. Further work is on-going on these problems.



Silky Bony Scaffolds - Scanning Electron Micrograph of silk fibers (Silk worm - Bombyx mori) seeded with human Mesenchymal Stem Cells (Day 14) for Bone Tissue Engineering Applications



Fluorescent image in DIC mode of osteoclast cells differentiated from human monocytes seeded on coverslips supplemented with RANK-L and macrophage Colony Stimulating factor (mCSF) - Tartrate-Resistant Acid



## PATENTS GRANTED

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- 1) **A radiopaque glass powder for use in dental composites.**  
Patent Appln. No.772/MAS/2002; Dt: 21-10-2002  
Inventors: Harikrishna Varma, V. Kalliyana Krishnan, P.P.Lizymol & S. Sureshbabu.
  
- 2) **A process for the preparation of Bisphenol A-Glycidyl methacrylate.**  
Patent Appln. No: 1615/MAS/97; Dt: 21-07-'97.  
Inventors: S.N.Pal, VKalliyana Krishnan.
  
- 3) **Modified biocompatible sponge for improved absorption of tissue fluids and surgical reconstruction.**  
Patent Appln. No:1296/MAS/1997; Dt:16-06-'97.  
Inventors: Prabha D. Nair & R. Sivakumar.
  
- 4) **A field kit for testing antibiotic sensitivity of Mastitic milk.**  
Patent Appln. No: 942/MAS/2001; Dt: 2-11-2001.  
Inventors: Umashanker P.R., & Arthur Vijayan Lal.

## HEALTH SCIENCE STUDIES

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The Achutha Menon Centre for Health Science Studies (AMCHSS) has completed 10 years of training, research and consultancy in public health. Our Institute's crucial decision to start India's first MPH program has created enormous demand for similar programs by several other reputed institutions in the country. Such a high demand has resulted in an increase in the number of applicants for our MPH program requiring an entrance examination for screening applicants for the first time. Applicants for our MPH program this year included candidates from the Indian Administrative Service (IAS) who usually preferred to undergo such training in overseas Universities.

Most of the new initiatives in public health such as the public health foundation of India and the ICMR schools of public health are developing curriculum for their MPH program based mostly on the MPH curriculum of SCTIMST.

Considering the experience of AMCHSS in running the MPH program for a period of ten years AMCHSS is on a high demand for guiding new schools of public health not only in India but in other countries in the South East Asia Region. The head of AMCHSS along with experts from the public health schools of Indonesia and Thailand was invited to refine the draft MPH curriculum of the upcoming public health school in Myanmar. Similar support from AMCHSS was requested from Nepal when the first public health school was started there. All these developments in India and globally underscores the value of the critical decision of SCTIMST in 1996 to initiate the first MPH program in the country. Continuing excellence in the quality of training program and research in public health is therefore becoming increasingly important for AMCHSS. Convincing the central government and state governments to create career paths for public health professionals is extremely important to increase demand for the training program. This will be one of the major challenges of all the existing and upcoming public health schools in the country.

The short course on prevention and control of non-communicable diseases developed by AMCHSS with the support of the WHO is widely accepted. Short courses developed by AMCHSS on Making Pregnancy Safer and Gender and Medical Education were offered in many states of India in the reporting year. Another short course on Ethical issues in health research is widely accepted among the academia.

The ongoing research programs of the centre are 1). Athiyannoor Sree Chitra Action (ASA) which is joint program of the Athiyannoor block Panchayat and SCTIMST to develop certain model public health programs in the community 2). Banking for better health, a pilot project in Karnataka state looking at the possibility of economic empowerment of women through savings habit that enhances their chance to seek medical help for their illnesses, 3). Research, training and advocacy for gender sensitization of medical education and Capacity building of health professionals for reduction of Maternal Mortality and Morbidity, 4). Stakeholders' perceptions of Institutional Review Boards (IRBs) in India, 5). Tobacco Cessation Training and Research in India and Indonesia, 6). Development of a manual for primary health care institutions in Kerala, and 7). a prospective study looking at the psychosocial impacts on people in the tsunami affected areas of Kerala.

Faculty members of AMCHSS have worked as consultants for several international and national organizations. The head of AMCHSS has been selected as a member of the core advisory group of the Lancet series on India and a member of the curriculum committee of the Public Health Foundation of India. Faculty members of the centre have been invited as consultants to several organizations such as the World Health Organization, United Nations Population Fund, Asian Development Bank, School of Public Health in South Africa and the Asia-Pacific Research and Resource Centre for Women, Malaysia.

Faculty members of AMCHSS have served as members of the editorial board of Indian as well as foreign public health and social science journals in addition to serving as peer reviewers for several journals.

### *Dissertations submitted in December 2006*

Sl. No	Name of the students	Title
1	Ashis Kumar Das	Factors affecting prompt treatment of malaria in a tribal district of Orissa.
2	Arun. R	Prevalence and correlates of depressive symptoms among inmates of old age homes in Kottayam.
3	Ruth Vivek. V	Healthcare seeking behavior among Female Adolescents for Reproductive Morbidities in the Urban Slums of Chandigarh
4	Tivendra Kumar	Factors associated with post-neonatal mortality in rural parts of Faridabad District, Haryana.
5	Sumit Shirmali	User fee experience in Madhya Pradesh under <i>Rogi Kalyan Samiti</i> .
6	Aravind R. Menon	Males having sex with males in Kerala: Sexual health and health care access.

Sl. No	Name of the students	Title
7	Preetha Menon	Assessment of respiratory morbidity among poultry farm workers in two districts of Kerala.
8	Mohammed Shameel. O	Tobacco use pattern among dental students and their attitudes and practices towards tobacco control in Kerala.
9	Ashwani Kumar Singh	Performance of private health insurance in New Delhi: An analysis of content, coverage and outcome.
10	Lalnuntlangi	Low birth weight and maternal smokeless tobacco use.
11	Brady Dutton Beecham	Ethics variations among clinical drug trial sites.
12	Rajesh Kumar	Assessment of awareness and hygienic practices among poultry butchers in Patna city, Bihar

## RESEARCH PROJECTS

### Completed Projects

#### *Political decentralization and status of reproductive health in Kerala.*

This was a project supported by CHANGE, Washington USA.

### Ongoing Projects

#### *Athiyannur Sree Chitra Action (ASA)*

This is the ongoing initiative of SCTIMST in collaboration with Athiyannur Block Panchayat. It has a spectrum of activities under its umbrella. Athiyannur block panchayat has a population of 1.86 lakhs and spreads over an area of 60 sq km. A comprehensive household survey of the entire Vengannur Grama-panchayat is completed. Global Positioning System (GPS) parameters of the houses, public utilities, road network, water bodies and other physiographic features of the village are captured.

Information of the entire households (9410 in number) in this area of 10.14 sq km and the demographic details of all the 33,400 individuals in the area are computerized. Data cleaning is going on. This database is currently being used for giving exposure on Geographic Information System (GIS) to MPH scholars. With the technical help of scientists at Centre for Earth Science Studies (CESS), Trivandrum, a touch screen is being developed for dissemination of this information to the panchayat leaders. Meanwhile monthly planning meetings are being organized in all the eight sub centre areas and the people are encouraged to use the data

**ASA specialty clinics** Every month, on second and fourth Saturdays respectively, Cardiologists and Neurologists from the institute see the referred patients at the ASA clinic, which was set up as part of the initiative. With the sincere support from Cardiology and Neurology Departments, we could ensure regularity and we have conducted the clinic

even during institute holidays. Till now we had 222 patients for Cardiology clinics and 117 for Neurology clinics and a good percentage of the patients are referred to SCTIMST for further investigations or treatment. As part of the clinic we organized two Continuing Medical Education sessions (CMEs) for the doctors in the area. Recently we have introduced a filing system at the clinic to ensure continuity of the records. The present Block Panchayat body also has expressed keen interest in the running of the clinics but many promises are yet to be fulfilled. Some issues needing immediate attention are the restoration of electric supply, furniture, equipments, medicines etc. Dissemination of relevant health information to motivate more people to avail this facility should also be taken up in future.

### ***Banking for Better Health: Medisave for Rural Women in Karnataka, India***

This is a collaborative project between SCTIMST, and Vijaya Bank funded by the Ford Foundation, New Delhi. Besides, there are three NGO partners at Dharwad, Haveri and Mandhya in Karnataka. Overall objective of this project is to empower rural women to access basic health care. It seeks to establish a medical saving program for rural women in 3 districts of Karnataka. The program will cover women who do not have a bank account in their names and who express their willingness to join the program in 25 backward villages. Basic premise behind this project is that economic empowerment of women through savings habit enhances their chance to seek medical help for their illnesses. The study has three components – research to analyse health care needs of women, intervention in the form of *medisave* account and group health insurance, and evaluation of the intervention to develop a policy package.

### ***Development of a Reference Manual for Primary Health Care Institutions in Kerala***

The project undertaken for the Kerala State Health Services Department, funded by the European Commission Sector Reforms Cell aims to develop a reference manual for the Primary Health Care Institutions in Kerala. The total budget is Rs 18.938 lakhs. The structural framework, content and layout of the manual were completed through a participatory process, through three regional workshops and stakeholder meetings with the various categories of staff of the Health Services Department at Trivandrum, Ernakulam and Palakkad districts. In addition to the regional workshops, self-administered questionnaires were sent to fourteen institutions in five districts, which were randomly selected. Experts were then identified to develop the specific contents of each topic and an initial draft has been prepared. In the next phase the draft manual will be presented for review and critical appraisal by experts and beneficiaries followed by the preparation of the final version, printing and dispatch of manuals to all the primary health centers and other health institutions in Kerala.

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

This two-country, three-region population study, in Kerala and Tamil Nadu, India and Batticaloa, Sri Lanka, addresses gaps in the disaster literature and inform those who work in disaster relief, public health, and health behavior research on methods to improve culturally appropriate disaster response planning, assessment, and early- and long term intervention to aid future disaster victims. This collaboration between

the Achutha Menon Centre for Health Science Studies (AMCHSS), the National Institute of Epidemiology (NIE), Eastern University, Sri Lanka (EUSL), and the University of Southern California Institute for Health Promotion and Disease Prevention Research (USC/IPR), brings together U.S. investigators and researchers from tsunami-affected regions of India and Sri Lanka, thus providing a unique opportunity to study the longitudinal impact of the 2004 tsunami across cultures and countries.

The preliminary activities of the project are completed. Wards 4, 6 and 10 of Alappadu Grama Panchayat in Karunagapally block of Kollam district is selected for the study after assessing the impact score of the disaster. Fifteen graduates from the area were identified with the help of panchayat authorities and they were trained in psychosocial counseling and data collection. Piloting of the study tools was done with the help of MPH students from University of Southern California and SCTIMST. The selected volunteers were given extensive training sessions with the help of local professionals. Household roster of the selected wards were collated with the help of local people. A field office is established in the Alappadu Grama Panchayat and one staff is recruited as project manager.

### ***Research, Training and Advocacy for Gender Sensitization of Medical Education and Capacity Building of Health Professionals for Reduction of Maternal Mortality and Morbidity***

The objectives of the project, supported by the MacArthur Foundation and the WHO-SEARO, were to work in the field of medical education, research and advocacy, focusing on medical schools, associations of health professionals and also NGOs. The project has completed three years of effective

action encompassing a review of medical texts published in a special issue of the Economic and Political Weekly (April 30, 2005) and a study of sexual harassment in the workplace published in the *Indian Journal of Medical Ethics* (April-June 2005). Two courses of two weeks duration on Gender mainstreaming in medical education – for medical educators and Making Pregnancies Safer for programme personnel were developed and two rounds of training were completed. The project has also developed a shorter three-day gender sensitisation curriculum for medical educators and conducted six rounds of training in Karnataka, Gujarat, Goa, Maharashtra and Kerala. Senior faculty, Deans, Vice-chancellors and policy makers has also been sensitised as part of the advocacy initiative.

The project is in the final phase where the various trainees will be meeting to develop action plans of their own to move the efforts of mainstreaming gender into research, training and advocacy agendas in medical education.

### ***Stakeholders' Perceptions of IRBs in India***

This is a study of Institute Ethics Committee members and others involved in reviews of proposals submitted by researchers. It aims to understand the various perceptions of appropriate review processes and their salience. There are three phases to this study, involving a survey of medical institutions in six states as to the functioning of IRBs, the second phase involves an in-depth review of selected IRBs and researchers within those institutions and the third involves discussions of IRB review processes with the last group of stakeholders, the potential participants in various research studies. The data collection for this project is complete and the analysis is ongoing.

### ***Tobacco Cessation Training and Research 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 three Universities in the US namely Minnesota, Arizona and University of Missouri Kansas City. The overall objective of this project is to strengthen the capacity for cessation training and research in India and Indonesia. The specific objectives of the project are 1). To develop knowledge capacity through intensive training in state of the art research in tobacco cessation for selected researchers from India and Indonesia (Four researchers are selected from India), 2). Foster experimental capacity through formative research focusing on topics essential for the appropriate and successful adaptation of cessation interventions shown to be efficacious in high-income countries and

3). Expand educational system capacity through the development of a culturally – tailored tobacco curriculum. The researchers were trained in the US for one week during January 2004. Preliminary data collection from medical students, nursing students, engineering college students, faculty of engineering college and clinicians of medical college is completed. After assessing the demand for tobacco cessation, a few cessation clinics were started in SCTIMST, and two private hospitals in Malappuram district. These clinics were started as pilot project and the results of these projects are being analyzed. One paper on this project has been published in the journal “Tobacco Control” and another one in addictive behaviors. Other papers are being written for different journals. The project is supported by the Fogarty International centre of the National Institutes of Health, USA.

## PATIENT CARE

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During the year 2006-2007, the out patients and the in-patients statistics showed that both the out-patients and in-patients increased during the year 2006-2007 compared to 2005-2006. The number of in-patients increased to 8891 in 2006-07 from 8387 in 2005-06. The number of outpatients increased to 13,286 from 13,223 in 2005-2006. It is also noted that the average length of stay is reduced to 7 days in this year from 8 days in the last year. It is also noted that the proportion of patients getting registered from out side Kerala is increasing compared to the previous year *i.e.* from 20.91% to 21.63%. This shows that the hospital is providing patient care to more number of patients with lesser stay in the hospital and a significant number of patients from outside Kerala are depending on this institute for patient care.

In order to maximize the benefit of patient care with regard to the cost of the treatment, the hospital charges were revised with effect from 1<sup>st</sup> April 2006. As per the new charging system, the 'A' category patients are given totally free treatment. The subsidy offered to B1 category patients was increased to 70% from 50% in the previous years. The subsidy charges for B and C categories were also revised for the benefit of patients.

In order to augment the services, plans for improving the infrastructure by constructing an additional building and private wards are finalized. The hospital information system is also undergoing periodic modifications to improve the efficiency of the system.

In order to develop human resources in the field of Central Sterilization Room Technology, an apprentice-training program was started. The stipend offered to apprentice trainees was also revised.

Hospital Infection Control activities were strengthened by periodic evaluations. In order to develop human resources in the area of Hospital Infection Control, the Infection Control nurse was deputed for the certificate course in the hospital infection control at Tata Memorial Hospital

In order to have efficient control of management of Bio Medical Waste, the Institute entered into an agreement with the Centralized Biomedical Waste Management facility of Indian Medical Association and corporation of Trivandrum.





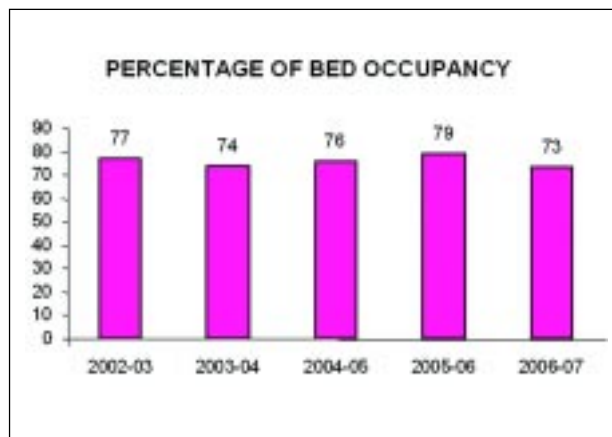
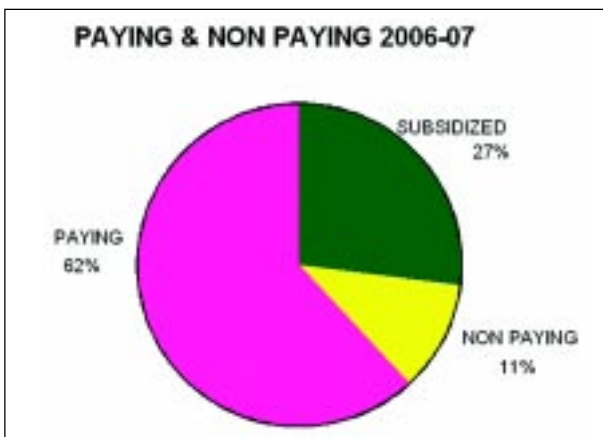
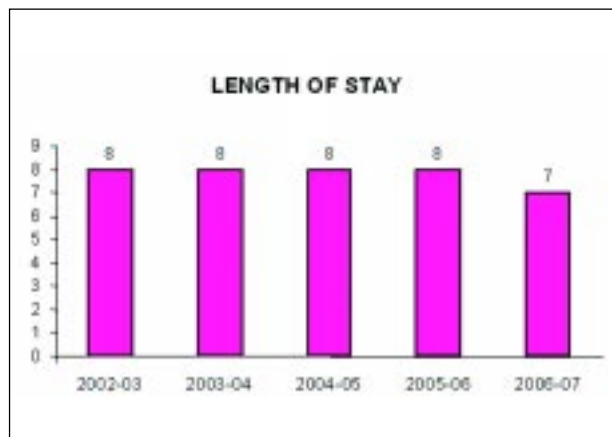
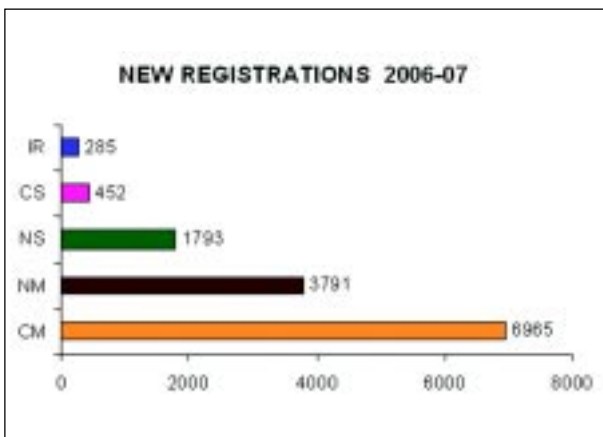
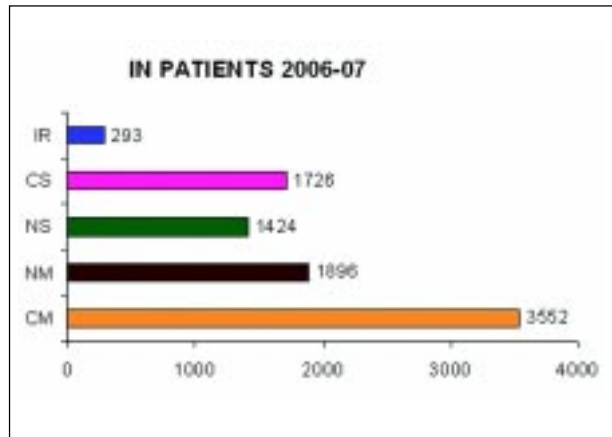
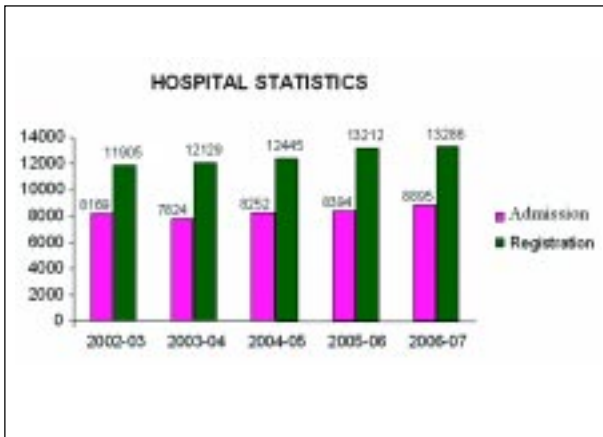
Inauguration of the Homograft Valve Bank by Smt. Sreemathy, Hon. Minister for Health and Family Welfare, Govt. of Kerala and Exchange of MoU

The institute signed the MOU with Medical College Trivandrum for the harvesting of homografts for the establishment of homograft valve Bank at SCTIMST on 14th July 2006 and this institute was issued license by the Government of Kerala for establishing the homograft valve bank.

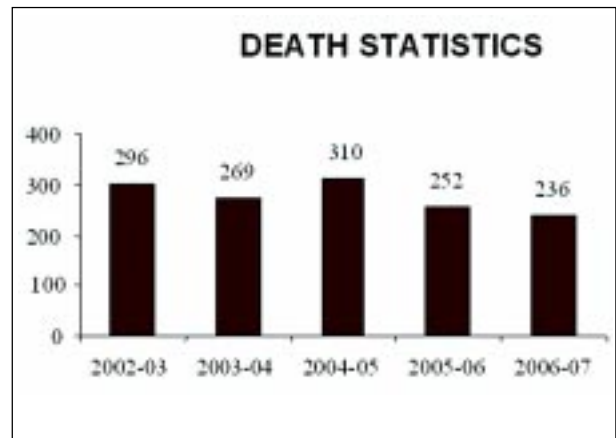
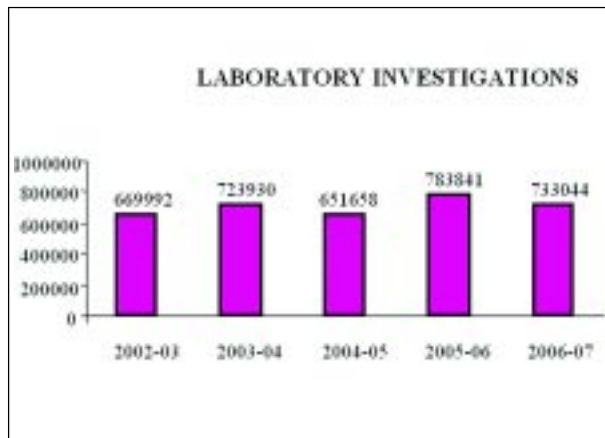
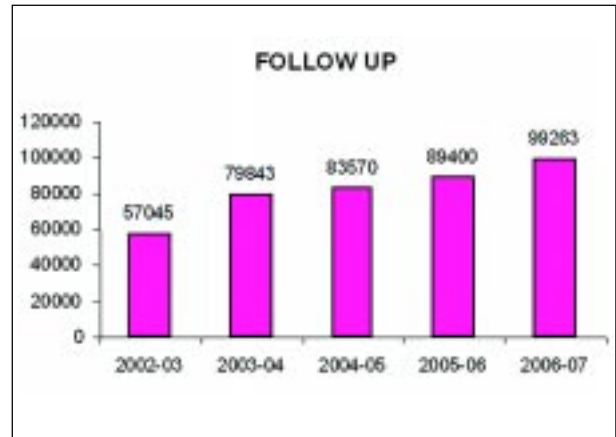
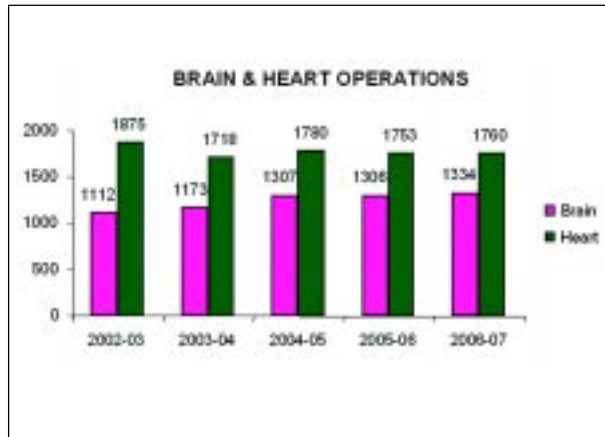
The Tele Health and Medical Education project by Govt. of Kerala was inaugurated during the year and this institute is one of the referral centers in the project Till date, more than 50 Tele consultations have already taken place through this facility.

### ***Medical Records***

There was an increase of 10 to 15 percentage of Registration, Admission, Discharge, Operation and Reviews than previous year. The facts to be pointed out that the average length of stay of the patient is reduced to 7 from 8 and Death rate to 3% from 4%. The without appointment is heavily increased which resulted the workload of MRD has tremendously increased. For want of space in the filing areas, the charts were rearranged and kept in the available space. 10,004 certificates were issued for financial assistance/ advance, and Train Concession and treatment.



- IR - Interventional Radiology
- CS - Cardiac Surgery
- NS - Neurosurgery
- NM - Neuro Medical
- CM - Cardio Medical



**CHARTS RETRIEVED**

a) Patient's reviews	99,263
b) New Registration	13,286
c) Doctor's Study Purpose	6,040
d) Doctor Patients Correspondence	2,210
e) Deactivating	21,113
f) Charts pruned and rearranged	9,000
<b>Total</b>	<b>1,50,912</b>

**IMPORTANT HOSPITAL STATISTICS 2006-2007**

Sanctioned beds	239
Percentage of bed occupancy	73
Cardiac surgery	1760
Neurosurgery	1334
New registrations	13286
Repeat cases	99263
Admissions	8895
Discharges	8891
Deaths	236
Free and Subsidised	38%
Paying	62%
Average length of stay	7 days
Bed turn over rate	39
Percentage of mortality	3
Percentage of post operation mortality	3
Sophisticated investigation	46110
Lab investigations	733044
X-RAYS	41638
CT Scans	3823
MRI Scans	3371
Ultra Sound Scans	286
Physiotherapy	15257
Holter	815
ECG	21840
TMT	1501
Echo Cardiography	26095
Pacemaker Implantations	176
EMG	829
EEG	3191
VEEG	538
Perfusion	1374

**Physiotherapy**

The rehabilitation work of the section was aimed at achieving early independence for inpatients with active and passive physiotherapy. In addition out patients were also given physiotherapy using the specialized equipments available to the unit

**PATIENTS TREATED BY PHYSIOTHERAPY**

Patients	Number
Cardio Thoracic Surgery	4455
Paediatric Cardiac Surgery	2520
Cardiology	22
Neurosurgery	2133
Neurology	2453
O.P	3674

The unit also contributed to the teaching and training of observer ship trainees physiotherapists and post basic nursing course students in physiotherapy and rehabilitation.

**Anesthesiology**

Anaesthesia and peri-procedural care were provided for the following number of cases during the period - 1/4/2006 to 31/3/2007:

Adult patients undergoing Open-heart, Thoracic, and Vascular procedures	:1174
Paediatric patients undergoing cardiac surgery	: 590
Patients undergoing Neurosurgery	:1192
Procedures in Cardiac Catheterisation laboratory	: 216
Procedures in Neuro-Radiology laboratory	: 114
Magnetic Resonance Imaging of the heart	: 36
Magnetic Resonance Imaging of the brain	: 228

**Anesthesiologists as perioperative physicians:** Anaesthetists provided medical care to all patients before, during, and after their surgical experience. This included a preoperative medical evaluation of each patient before surgery, consultation and planning of the surgery with the surgical team, creating a plan for the anesthesia tailored to each individual patient, airway management, intraoperative life support and provision of pain control, intraoperative diagnostic evaluations as needed, provision of postoperative pain management, and critical postoperative life support. This also included medical management of preexisting medical conditions, stabilizing and preparing patients for emergency surgery, care and management of medical or surgical complications, providing mechanical ventilation, sedation and analgesia, neuromuscular blockade, intravascular volume replacement, management of electrolytes, hemodynamic support and monitoring, as well as monitoring of and replacement of blood and coagulation factors.

**Cardiopulmonary Resuscitation and post-resuscitation care:** Management, direction of, and performance of cardio-pulmonary resuscitation and advanced life support as well as post-resuscitation care was rendered by anaesthetists for all inpatient cardio-pulmonary arrests.

**Ventilator Therapy:** Anaesthetists managed ventilator therapy of all patients who required artificial ventilation in the 5 intensive care units of the hospital.

**Use of Intraoperative Transesophageal Echocardiography (TEE):** The introduction of TEE in the operating rooms of the Institute has enabled the anaesthetists to look at on-line dynamic images of heart dimensions and function. The placement of TEE probe and the acquisition as well as interpretation

of information obtained from TEE are now included in the medical services provided by anaesthesiologists during the intraoperative period. This new role of the cardiac anaesthesiologist was achieved in a close and fruitful cooperation with the cardiologist. TEE has very soon become an indispensable part of cardiac surgery, with cardiac surgeons increasingly relying on it, to form the basis of important intraoperative decisions. The anaesthesiologist utilizes the haemodynamic data derived from the TEE to choose the best pharmacological intervention for the patient.

**The Magnetic Resonance Imaging Anesthesia Station and recovery room:** A primary anesthesia station and recovery room was set up in an adjacent area just outside the magnet room. This room is being utilized for inducing anaesthesia in those patients who require general anaesthesia for Magnetic Resonance Imaging (MRI). It is in the same room that these patients recover from the anaesthetic under monitored care following the MRI. When taking the patient from the primary station into the magnet room, all physiological monitoring devices used are MRI-compatible. The MRI-compatible monitoring and anaesthetic equipment used in the magnet room is really a second anesthesia station. If a potentially life-threatening problem arises, it is now possible to briskly take the patient out of the magnet to the primary anesthesia station where everything is ready for optimum care.

***General anaesthesia for infants and small children undergoing anaesthesia for cardiac magnetic resonance (Cardiac MRI):***

Anaesthetizing paediatric patients with congenital heart disease for cardiac MRI poses many challenges for the anaesthetist. 36 such patients were

anaesthetised after the setting up of the new anaesthesia station and recovery room.

**Pulmonary function testing:** The Department acquired a new pulmonary function diagnostic testing device (Koko legend Spirometer) for use in the diagnosis and monitoring of respiratory diseases. This desktop portable device was used to perform forced and slow expiratory maneuvers and to calculate standard spirometric indices in patients. 63 patients admitted in the Institute underwent pulmonary function testing in the last year.

**Percutaneous tracheostomy:** Percutaneous tracheostomy is a minimally invasive alternative to conventional tracheostomy. All adult tracheostomies in the hospital are now performed by the anaesthetist percutaneously using the Seldinger technique with fiberoptic bronchoscopic control at the bedside in the intensive care unit.

**Mini-tracheostomy:** Anaesthetists helped patients with sputum retention by performing percutaneous mini-tracheostomy. It is a simple procedure in which a small bore cannula of 4 mm internal diameter (with a spigot to protect the airway when the tube is not in use) is inserted into the trachea through the cricothyroid membrane. When placed, the tracheal cannula allows suction to be performed as often as required. The cannula is also suitable for administration of oxygen, nebulized drugs and bronchial lavage.

**The Site- Rite Ultrasound system:** The Department acquired a new portable ultrasound scanner, which provides ultrasound imaging of vascular and other structures of the body. We are using this system for ultrasound guided vascular cannulation.

**Fiberoptic Bronchoscope in Neuro Surgical Operation Theatre and Intensive Care Unit:**

In addition to the fiberoptic bronchoscope (FOB) that we have been using in the Cardiac Surgical Operation Theatre and ICU for evaluation and management of the compromised airway, fiberoptic tracheal intubation, tracheobronchial toilet, and accurate positioning of double-lumen endobronchial tube, we also acquired a fiberoptic bronchoscope for use in the Neurosurgical Operation Theatre and Intensive Care Unit. We used it for awake endotracheal intubations in situations where extension of the neck is not desirable and neurologic examination is to be done after endotracheal intubation as in unstable cervical spine and vertebrobasilar insufficiency. We also used the FOB whenever roentgenologically observed postoperative lobar or segmental collapse was resistant to other standard therapy including vigorous physiotherapy.

**'Interactive Symposium on Clinical Monitoring':**

On 2<sup>nd</sup> July 2006, an 'Interactive Symposium on Clinical Monitoring' organised by the Department of Anaesthesia at the Achutha Menon Centre Auditorium of SCTIMST. 6 hours of Continuing Medical Education Credit was awarded to 113 anaesthesiologists who attended the symposium.

**The first DM Neuro Anaesthesia and DM Cardiac Anaesthesia Examinations at the Institute:**

In December 2006, examinations were conducted for the first batch of students who underwent the 3-year DM Neuro Anaesthesia and DM Cardiac Anaesthesia courses (one student for each course). Dr. Shashi Rao passed the DM Neuro Anaesthesia examination and Dr. Arun Vijaya Kumar passed the DM Cardiac Anaesthesia examination.

**Dean:**

Our Head of the Department, Dr. Ramesh Chandra Rathod became the Dean of the Institute.

**New initiative during the year:**

Anaesthetists served as clinical investigators for a Department of Science & Technology supported project titled, 'Evaluation of indigenously developed bioimpedance based cardiac output monitor perioperatively in open heart surgery cases'. Data was compared with cardiac output values derived using intermittent Thermodilution technique.

Dr. Prasanta Dash (Additional Professor, Anaesthesia) is the study co-ordinator of a multicentric, randomized, double blind, placebo controlled, dose escalation trial on safety and efficacy of activated recombinant Factor VII in the treatment of postoperative bleeding in patients following cardiac surgery requiring cardio-pulmonary bypass.

Dr. Smitha, DM Neuroanaesthesia student, initiated a study on Evaluation of Cerebral Autoregulation in patients with supratentorial tumours using transcranial Doppler by the transient hyperemic response method. This study aims to find out whether autoregulation is preserved or impaired in patients with supratentorial tumours and whether the impairment is related to the volume of the tumour, its vascularity, the presence of cerebral oedema, the type of tumour, and its histological grading.

**Observers:** Students undergoing the Doctor of Medicine course in Respiratory Medicine at Medical College, Trivandrum, underwent observership for one-month periods in our Department to study airway management and ventilator therapy.

**Biochemistry**

New initiatives during the year:

- A state-of-the-art coagulation analyzer (AMAX, Germany) was procured and commissioned into service in the central clinical laboratory.
- A fluorescent attachment (100W) up-gradation was made for the Olympus IX 51 inverted microscope in cell culture laboratory

The department activities include clinical laboratory services (including clinical biochemistry, clinical pathology and hematology) and research on disease pathology.

**Clinical laboratory services**

Central clinical laboratory is a 24 hour facility for investigative support in the above disciplines. The total number of investigations / estimations undertaken during the year crossed 6.26 lakhs which represented a nearly 10% increase from previous year. The break-up of investigations is given below:-

Investigation	Total Number Undertaken
Lipids	15,702
Electrolytes	1,45,007
Enzymes	36,839
Liver Function Tests	41,495
BUN	29,848
Blood sugar	20,318
Blood Gas Analysis	32,695
Hematology	1,44,080
Coagulation Tests	34,936
CSF Examination	5010
Electrophoresis	114
Miscellaneous	46,955
Urine Analysis	72,921
Faeces Examination	144
<b>Total no. of investigations:</b>	<b>6,26, 064</b>



## Biomedical Engineering

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

This year the Biomedical Engineering Department was involved in the installation of considerably large number of most modern, sophisticated hi-tech equipments in various departments of the hospital complex.

## Blood Transfusion Services

Division continues to provide round the clock blood support for surgical and medical requirements as well as to standby interventional procedures. Demand for blood component support to outside hospitals is on the increase. Awareness classes and blood group sessions for augmenting voluntary blood donation through mobile camps is showing a positive response.

### New Initiatives

- Rapid antigen testing for malarial parasite screening was introduced.
- Software program for computer generated blood requests is in the process of development.
- Discrepant immuno- haematology samples are being received for detailed work up from nearby hospitals.
- Awareness programs and consultancy services are provided for Clinicians on Blood Component indications and usage.

As part of DBBT students curriculum, following short term projects are underway:

1. Determination of ideal blood inventory management

2. Screening first time donors for high haemocrit –a risk factor for increased cardiovascular accidents Donor Hb content for optimization of rbc transfusions.

### Special programs

Blood Bank participates regularly in EQAS programme of CMC Vellore in Transfusion Medicine

Dr S Sathyabhama and Ms G Baby Saritha attended the EQAS programme for transfusion-transmitted infections conducted by KSACS& Microbiology, MCH, Trivandrum on 29/06/06.

Evaluated Terumo Penpol and HLL PVC blood bags for Platelets and RBC storage in collaboration with TRU, BMT wing.

World Blood Donor day was celebrated by felicitating the organizations who promoted voluntary blood donation during 2004-2006 at SCTIMST. Director Dr K Mohandas presided, Dr M K Ramachandran Nair VC, Kerala University, inaugurated and Rev Fr MK George Principal, Layola College, Trivandrum felicitated the function followed by talk by Dr Amer S Fettle, State PRAM on 'High risk behavior and blood safety'.

### Academic

Nine doctors from DHS underwent one month training in Modern Blood Banking Technology as part of licensing of blood banks.

Blood bank was identified as a training center for the State of Kerala & Lakshadweep by NACO on blood safety for doctors, nurses and technicians (Sept 2006-march 2007). 15 doctors, 57 technicians, and 34 nurses underwent training. Dr Jaisy Mathai was the nodal officer for the same.



Blood Bank on behalf of HTC organized a talk by Dr KG Syamkrishnan on 'Transfusion practice in Cardiac surgery with special reference to paediatric patients'

## Cardiology

During the year, 6965 new patients were registered as out patients and 3552 patients were treated as inpatients. All newly registered patients undergo complete cardiac evaluation including 2D echo Doppler study the same day. 39000 patients were seen at review follow upD. 21000 echo Doppler studies and 815 Holter studies were done during the year. The thrust area during the past year was cardiac electrophysiology and RF ablation for serious tachyarrhythmias. The electrophysiology and pacing laboratory routinely implants heart failure devices (cardiac resynchronization) and cardioverter defibrillators (ICD). After acquiring the Ensite electro anatomic mapping system three EP workshops have been organized and several complex tachyarrhythmia RF ablations were done successfully. The total number of PTCA stenting and RF ablation procedures showed a significant increase over the previous year.

### INVASIVE AND INTERVENTIONAL PROCEDURES DURING 2006-2007

	2006-07
<b>Diagnostic</b>	
Coronary Angiography	1493
Cardiac Catheterization	103
EPS	37
Total – Diagnostic	1633
<b>Interventional</b>	
PTCA + Coronary Stent	518
Balloon / Metal Mitral Commissurotomy	161
Coil Embolisation – PDA	23
VSD Device Closure	4

Others	6
ASD Closure With Device	39
PDA Closure With Blockaid Device	62
Balloon Pulmonary Valvotomy	19
Balloon Aortic Valvotomy	2
Balloon Atrial Septostomy	13
EPS + RFA	189
Pacemaker Implantations	166
Total – Interventions	1209
Total Procedures	2839

## Cardio Vascular and Thoracic Surgery

### Surgeries

In the year 2006-2007, **1638** Cardio Vascular and Thoracic operations were performed, of this 1370 were open heart procedure. The details are furnished below.

### Adult Cardiac Operations

Open Heart	873
Closed Heart	229

### Congenital Heart Surgeries

#### Open Heart

Acyanotic	:	276
Cyanotic	:	221
Closed Heart	:	39

## Computer Division

Routine activities here in the areas of graphical user interface based software development, installation, hardware maintenance, and software maintenance of all the user programs including the PACS client maintenance. Maintaining 12 higher end servers with a remarkable uptime of 99.9995%.

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

## I. New Purchases

### Hardware

Internet/Intranet Security Gateway	-	1 No
Server X 346 dual Xeon	-	2 Nos
LaserJet	-	8 Nos
Barcode Printers TLP2844	-	30Nos
Barcode Scanners	-	10Nos
PC Pentium IV, 512 MB RAM, 80 GB HD	-	25 Nos

### Software

Windows 2003 server licence	-	1 No
Antivirus Software Corporate Edition	-	1 No
Replacement of old PC's & Printers		
PC Pentium IV, 256 MB RAM, 80GB HD	-	20 Nos
Thin Client	-	22 Nos

## Major Activities

### New Software Developments

Accounts – New GUI based program developed & successfully implemented for accounts division including cash counters & IP-Billing, and converted old data to the new format.

Personnel & Administration – New GUI based program was developed and implemented for recording personnel information & report printing and converted all old data to new format.

Medical Records - New GUI based program was made for recording patient registration, admission and integrated barcode printing & scanning for fast data entry.

CCL – New GUI based program was made for laboratory data entry.

## New Proposals

TSIK & TMAS -Submitted technical proposal for implementing “Touchscreen Information Kiosk” & “Television Message Alert System”

FPAM - Submitted technical proposal for implementing “Finger Print based Attendance Marking System”

Storage & Tape - Tender was prepared for the purchase of 20 TB SAN storage & tape backup system.

Efforts were also made to familiarize the faculty, Newly joined students and staff on the best utilization of the machine and software. System expansion grouped toward closer application with increasing LAN interlinks.

## Microbiology

There has been an increase in the diagnostic investigations of the department.

Bact alert automation along with Mini API identification was introduced in the Bacteriology section mainly for Blood culture and Body fluids.

MB Bact automation was introduced for Mycobacterium culture to enhance isolation rate and reduce the incubation period

## Neurology

### Epilepsy Section

The R. Madhavan Nayar Center for Comprehensive Epilepsy Care saw an increase in number of video-EEG admissions by 30% over the previous year. Two out-patient clinics are run, on Wednesdays and Fridays. The rural outreach epilepsy clinics on the first and third Sundays of every month also functions smoothly. Two epilepsy surgeries are carried out every

week. Vagus nerve stimulation implantation program has been initiated, and 5 patients have been implanted so far. All aspects of epilepsy care are provided, including psychosocial counseling and occupational therapy.

### *New initiatives during the year*

1. Transcranial magnetic stimulation for functional localization
2. Sleep disorders program with polysomnography vagus nerve stimulation for pharmacoresistant epilepsy

### *Special Programmes*

Sleep Disorder Program

#### DESIGNATED ACTIVITIES

Total number of Surgeries	91
Temporal	75
Extra temporal	11
Callosotomy	1
Hemispherectomy	4
VNS Implantation	5
Invasive Monitoring	6
Cortical Stimulation & Mapping (CSMP)	1
Electrocorticography	86
Epilepsy Clinic attendance	5382 cases
Sleep Disorder Clinic attendance	36 cases
Polysomnography (PSG)	14 cases
Ward Admissions	713 cases
VEEG Admissions	575 cases
SEEG	3191 cases
Outreach Clinic Attendance	1425 cases
Group Sessions	2485

### MOVEMENT DISORDERS

Patients seen and Procedures undertaken

Movement disorders clinic attendance	1183
Movement Disorders Surgeries	16
Botulinum toxin therapy	105
Neuropsychological evaluations	64
Conduct of international trials	4

### Stroke Section

The major initiative this year has been the reorganization of the stroke care services with the formation of the Comprehensive Stroke Care Program. A dedicated 2-bedded acute stroke unit will become functional, and will be utilized for intravenous and intra-arterial thrombolytic therapy for acute stroke victims.

New initiatives during the year

1. Started routine application of Transcranial Doppler studies including embolic detection in the evaluation of stroke patients.
2. Assured in-house availability of thrombolytic medicine and ICU infrastructure to treat patients with hyperacute ischaemic stroke (Intravenous Thrombolysis).
3. Intra Arterial Thrombolysis in selected cases.

### Special programmes

Comprehensive Stroke Care program

Designated Activities

1. Stroke outpatient clinic: In addition to the routine services, attempts are ongoing to streamline various services at the OPD level – speech and physiotherapy and occupational

therapy (full time stroke occupational therapist will be appointed)

2. Acute stroke care facility, including intensive care facility for thrombolytic therapy.
3. Intermediate stroke care and
4. Rehabilitation of stroke victims through speech therapy, physiotherapy and occupational therapy. Patient management conference

### Neuromuscular Diseases

Neuro Muscular Clinic attendance	- 836
Nerve Conduction study	- 838
Needle EMG study	- 654
Nerve biopsy	- 22
Muscle biopsy	- 32
Skin biopsy	- 13
Large Volume Plasma Exchange	- 84
Small Volume Plasma Exchange	- 103
Thymectomy for Myasthenia gravis	- 15
Optometry	- 1322
Evoked Potential Study	- 53

### Cognition & Behavioural Neurology (CBNC) Section

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

Brain Mapping Laboratory with an advanced workstation and storage server and two client machines, funded by KSCSTE, was set up.

A Computerized Equipment for Diagnostic Voice Recording and Speech Therapy was purchased and installed.

### Neurosurgery

Our department is trying to keep pace with the emerging trends in neurosurgery, and has been

successful to a significant extent. Our thrust areas at present include skull base surgeries, complex vascular lesions, minimally invasive neurosurgery and functional neurosurgery.

*Skull base surgery:* Our Statistics are comparable to the best centers in the world both in terms of quantity and quality. Routine use of intraoperative recordings and nerve monitoring and use of shorter and newer trajectories has helped to improve our surgical outcome. The department has experienced a quantum leap in the number of Cerebello pontine lesions operated last year and we have retained our primacy in surgery for lesions located in this relatively inaccessible location, an area fraught with high risk of neurological deterioration following intervention.

*Complex vascular lesions:* Our focus is shifting and now concentrate more on giant aneurysms, posterior circulation aneurysms and arteriovenous malformations. With the assistance of our neurointervention radiologists the department have adopted a comprehensive team approach to tackle all complex vascular lesions.

*Minimally invasive neurosurgery and neuroendoscopy:* Neuroendoscopy has revolutionised neurosurgery and we are proud to be part of this evolving trend. The number of shunt surgeries have reduced and almost all intraventricular lesions are tackled with the aid of neuroendoscope through a small 12 mm burr hole. Our institute was early to realize the merits of neuroendoscopy and we have now acquired two endoscopes and are in the process of venturing into spinal endoscopy. Pituitary surgeries are now being routinely done with the aid of neuroendoscopes and we shall soon be achieving our aim of converting pituitary surgeries into “day-care” surgeries thereby reducing hospital stay and increasing turnover.

*Functional neurosurgery:* Our institute has been able to maintain its position as the leading center for epilepsy surgery in India. We have shifted our focus to extratemporal epilepsy surgeries and lesional epilepsy surgeries. The neurosurgery department is one of the pioneers in our country in functional surgery and we have maintained this trend by venturing into VAGAL NERVE STIMULATION for certain forms of refractory epilepsy. Number of surgeries for movement disorders too has increased and we remain one of the few centres offering this form of surgery in the whole of South India.

In spite of the mushrooming number of neurosurgical centers in its neighbourhood as well as in the rest of the country, our Outpatient and surgical services have not registered any drop in our caseload. Our referral pattern has witnessed a subtle shift with patients reporting with more difficult-to-operate lesions than ever before. Also, neurosurgeons in our country are turning to us for counsel on certain difficult cases. A total of 1332 cases were operated with an overall mortality figure less than 3%.

The total number of cases operated during the year 2005-2006 was 1332 and their distribution is as follows.

Vascular	153
Aneurysms	115
AVM& others	38
Cerebello pontine angle tumours	71
Sellar/ Suprasellar	64
Skull base	81
Epilepsy	104
Movement disorder	20
Endoscopic surgeries	98
Spine	176
CVJ	40
Tumours	320
<b>Total</b>	<b>1332</b>

## Pathology

During the year (April 2006 to March 2007), the division performed histopathological analysis in 1600 surgical specimens in patients undergoing surgical procedures for neuro and cardiac diseases. Intra-operative tissue diagnosis (frozen section) was offered in 474 patients. Enzyme histochemical and immunohistochemical studies were performed in 48 muscle biopsies. Immunopathological investigations were performed in over 2000 patients. Apart from the service oriented diagnostic work, the department also conducted fortnightly teaching programmes (case demonstration, CPC and seminars) for the postgraduate students in neurology and neurosurgery. The division also conducted training programme for (a) D.M students in Neurology from Madras Medical college Madras (b) Postgraduate students in Pathology from Medical College, Trivandrum and Pushpagiri Medical College Tiruvalla and Amrita Institute of Medical Sciences, Kochi.

## Imaging Sciences & Interventional Radiology

Department of Imaging Sciences & Interventional Radiology has been an established center for Diagnostic Imaging and Interventions in Neuro and Vascular diseases and problems of other systems. Department runs its Interventional Radiology OPD, have inpatient admission facility and intensive care management. Department provides imaging facilities of CT, MRI and Ultrasound to the OP patients and inpatients. This is the only department in our Institute, which provides imaging services to each and every one from out side unregistered to the Institute.

Department is pioneering in subspecialty Interventional Radiology and Imaging. Interventional

Vascular Neuroradiology, Interventional Vascular Radiology and General Interventions are routinely done. Difficult cases of intracranial aneurysms, cerebral AVMs, cerebral dural fistulas, Vein of Galen aneurysms, spinal AVMs, abdominal aortic aneurysms etc. are referred to our department from across the country.

Department is equipped with State of the art top of the line 1.5T Avanto TIM with Syngo VD 20N (Siemens) with facilities for doing Diffusion - Perfusion Imaging, MR Spectroscopy and Functional Imaging, MR Angiography (both neuro and peripheral angiography). For fMRI following paradigms are being used motor, sensory; Language: Verbal fluency, Semantic fluency, Passive listening, Memory and, Music. This year we have acquired software for clinical application of Diffusion Tensor Imaging and fiber tractography and the same is used as routine imaging procedure.

Thus department provides excellent imaging services with currently available latest technologies in MRI. Helic CT, colour Doppler, Portable colour Doppler, CR system, PACS are the other equipments in the department which makes it an advanced 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.

Department provides various interventional radiology services. Various vascular lesions of the brain, spine, peripheral vascular diseases etc are routinely treated in the department. Various invasive procedures done are listed under interventional procedure in the Table.

Investigation Procedures Done (From April 1, 2006 to March 31, 2007)

#### A. DIAGNOSTIC PROCEDURES

No.	Procedures	No.of Cases
1	Plain X-rays	41638
2	MRI Scans	3371
3	CT Scans	3823
4	US Scans	2863

#### B. INVASIVE DIAGNOSTIC PROCEDURES

No.	Procedures	No.of Cases
1	Peripheral Angio & Aortogram	90
2	4 Vessel Angiogram	429
3	Spinal Angiogram	19
4	Renal Angiogram	24
5	Bronchial Angiogram	3
7	Sinogram	11
8	Aortogram	48
9	Barium Swallow	3
10	Miscellaneous	3

#### C. INTERVENTIONAL PROCEDURES

No	Interventional Procedures	Total No. of Patients/ No. of Procedures
1	Cerebral AVM embolisation – Glue & Onyx	43/125
3	Intra Cranial Ethanol Embolisation	1
4	CCF	11
5	Thrombolysis	14
6	Tumor Embolisation	6
7	Glomus Jugular Embolisation	3
8	Uterine Artery Embolisation	8
9	ICA Trapping	1
10	Vertebroplasty	17
11	PTA	9
12	Thrombectomy	3

13	PT.B.D	1
14	Carotid Stenting	9
15	Peripheral Cutting Balloon PTA	5
16	SVC Stenting	1
17	Renal Stenting	1
18	Spinal Embolisation	10
19	Spinal Heamangioma Embolization	3
20	Iliac Stenting	3
21	Aneurysm Coiling	10
22	Bronchogram	1
23	Bronchial artery Embolisation	7
24	DAVF	10
25	Intracranial stenting & coiling	1
26	Chemoembolisation	1
27	Balloon Occlusion test	8
28	Renal Embolisation	3
29	Percutaneous Biopsies	27
30	Other Peripheral Interventions	26
31	Other Neuro Interventions	27
TOTAL		270/395

**A. Interventional Radiology services:**

i. OP Registrations	- 285
ii. IP Admissions	- 293
iii. Interventional Radiology Patients/ Procedures	- 270/395

A total of 395 Interventional Radiological procedures were done. Two hundred ninety three patients were admitted under interventional radiology.

**New Initiative During the Year**

A new procedure of Diffusion Tensor Imaging and fiber tractography using MRI has been introduced for clinical use.



## CLINICAL RESEARCH

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### Biochemistry

#### *i A possible mechanism for Lp(a)-mediated vascular injury following infections*

Though Lp(a) has been shown to be an independent risk factor for atherosclerosis and thrombosis, mechanism of its action remains unknown. Lp(a), however, is unique in possessing O-linked oligosaccharides. In in vitro trials we have shown that desialylated, but not native Lp(a) forms immune complexes with serum anti-T antibody. Anti-T was also shown to sugar-specifically adhere to desialylated Lp(a) on Western and dot blots. Infectious history as well as high circulating immune complexes has been strongly associated with coronary artery disease (CAD). Since most infectious pathogens secrete desialylating enzyme neuraminidase, the above observation has strong implications for immune-mediated vascular injury leading to CAD.

#### *ii. Polymeric IgA has high specific activity against plant and human tissue lectins*

A much higher ratio of polymeric to monomeric IgA had been reported from this laboratory to be a hall mark of human serum anti-b-galactoside antibody which reacts with most fungal and bacterial pathogens. Recently we observed that reactivity of oligosaccharide groups per unit protein of IgA against peanut and human placenta lectin (galectin-1) was respectively 98% and 152% more for polymeric IgA compared to monomeric. Enhancement of reactivity to the two lectins following desialylation of the antibody was also substantially higher for polymeric than for monomeric IgA. These results signify the high pathogenic potential of immune complexes resulting from these antibodies in the context of pathogen mediated desialylation.

#### *iii. Lipoprotein(a) -tissue galectin-1 interaction*

Lipoprotein (a), a macromolecular complex found in human plasma, is a risk factor for the development of atherosclerotic vascular disease. The in vitro characterization of purified Lp(a) using enzyme-linked lectin assays revealed that Lp(a) which is rich in O-linked sugars bears strong ligands for galectin-1, an endogenous lectin. Further, immunohistochemical analysis of arterial segments treated with Lp(a) showed the co-localization of galectin-1 and Lp(a), indicating a potential role for endogenous galectin-1 in the accumulation of Lp(a) in arterial wall.



#### *iv. Oxidative stress and epilepsy*

Pregnancy in epileptic women is associated with increased obstetric risks and adverse neonatal outcomes probably due to drug-induced oxidative stress. Serum total antioxidant capacity, lipid peroxides, glutathione and other important antioxidant enzymes were assayed in pregnant women with and without epilepsy and age matched non-pregnant women to explore the contribution of oxidative stress towards fetal malformation so that additional information for better therapeutic management may be obtained.

#### *Cancer Biology Research*

As part of ongoing research projects, anti-cancer activities of plant -derived quinone derivatives are screened. Mechanism of matrix metalloproteinase activation in colon cancer metastasis is also investigated.

#### *Cellular and Molecular Cardiology*

During the year under review, the division initiated three new projects: (i) isolation, cloning and genetic modification of human circulating endothelial progenitor cells (ii) determination of genetic component in hypertension and cardiac hypertrophy and (iii) studies on survival mechanisms in cardiac fibroblasts. Investigations on the molecular mechanisms and efficacy of Cardoguard, cloning of adult human cardiac stem cells, studies on the modulation of high glucose induced monocyte chemoattractant protein-1 (MCP-1) gene expression in aortic endothelial cells and the studies on the effects of hypoxia on cardiac fibroblasts were continued. A study on the angiogenic potential of endocardial endothelial cells transfected with vascular endothelial growth factor (VEGF) was completed in the year under review.

#### *Does endocardial endothelial cells transfected with VEGF gene promote capillary growth?*

A combination of gene therapy and transmyocardial laser revascularization is an attractive possibility for revascularisation of ischemic myocardium. If the vascular endothelial growth factor (VEGF) gene can be delivered directly to the endocardial endothelial cells, this may have a favorable impact on revascularisation, augmenting nutrient perfusion through neovascularisation to induce collateral blood vessel development that will constitute endogenous bypass conduits around the damaged areas in the myocardium. If the endocardial endothelial cells can take up the VEGF gene and secrete the protein in the required levels, it may promote capillary growth. This would represent a novel therapeutic modality for conditions that are refractory to conservative measures and unresponsive to pharmacological therapy. The preliminary step to this combination therapy for angiogenesis is the transfection of endocardial endothelial cells with VEGF gene, in vitro.

Endocardial endothelial cells were successfully transfected with the human telomerase reverse transcriptase gene and the cells were characterized as endothelial cells by their cobblestone pattern, positive staining for vWF and uptake of DiI-Ac-LDL. The cells were considered immortal by their ability to divide indefinitely and by their expression of hTERT at the protein and transcript levels. The immortalized cells were then transfected with the mammalian expression vector pWZL Blast VEGF containing the insert for VEGF-120 (VEGF-A) gene. The VEGF transfected cells when co-cultured with primary rat aortic endothelial cells (AECs) on matrigel induced a higher rate of angiogenesis, compared to AECs seeded alone on matrigel.

These initial results from in vitro investigations suggest that myocardial vascularisation can be attempted by VEGF induction in endocardial endothelial cells.

### *Isolation and cloning of human resident adult cardiac stem cells*

Given the increasing interest in developing cell-based therapies to regenerate functional muscle and blood vessels in infarcted dysfunctional myocardium using resident stem cells in the adult heart, the project is aimed at developing a strategy for the isolation and expansion of adult cardiac stem cells (CSCs) for potential use as cell-based therapy for myocardial infarction and/or end stage heart disease in humans.

We have identified an easy and cost effective method for the isolation of resident cardiac stem cells from atrial biopsies from patients with coronary artery disease and expansion of these cells in culture employing selected growth factors. Our results suggest that ckit positive stem cells can be isolated and grown into cardiospheres (CSs) by simple explant culture methods. The CS cells stained positive for the endothelial marker, vWF and also for cardiac differentiation markers MHC and cTN1 demonstrating the ability to differentiate into distinctive lineages under proper stimulus.

A noteworthy achievement during the last year was the standardization of methods for the successful isolation of cardiac stem cells from porcine hearts as well. Isolated stem cells could be expanded in a growth factor supplemented medium to cardiospheres (CSs). The CS cells showed 40% expression for both ckit and MDR 1 stem cell markers. Immediate goal is to develop a porcine model of myocardial ischemia for the optimization of cell transplantation therapy.

### *Isolation and cloning of human circulating endothelial progenitor cells (EPCs)*

EPCs have been isolated from the peripheral blood of patients with coronary artery disease (CAD) and cultured for seven days in growth factor containing medium. Morphological and functional characterization of the cells have been done by FACS analysis, immunocytochemistry and ac-LDL uptake assay. These cells revealed a high expression of EPC-specific surface markers such as Flk-1, CD34, VE-cadherin and eNOS, CD31 and vWF. The ability of EPCs to form colonies (EPC-CFUs) in culture constitutes an important functional characteristic of these cells. Hence, we correlated the functional ability of EPCs to form colonies (EPC-CFUs), with important CAD risk factors, viz, age, smoking, hypertension and diabetes as well as severity of coronary artery occlusion and NYHA functional class in patients with CAD. The results have revealed that patients with diabetes, hypertension and smoking had significant reduction in the number of EPC-CFUs as compared to patients without these risk factors. A correlation analysis between total vascular risk score (TVRS) and the number of functional EPC clusters have shown a significant negative correlation. The EPC-CFUs also showed a significant decline in patients with triple vessel disease as compared to patients with normal coronary arteries. On multivariate analysis, TVRS appeared to be a significant predictor of the reduced formation of EPC-CFUs. Though EPCs offer a promising option for neovascularization of ischemic myocardium, the results of the present study along with previously published data demonstrate that in humans, cardiovascular risk factors impair the number and function of EPCs, potentially restricting the therapeutic potential of these cells. To address this limitation, currently, we are exploring the possibility

of genetic modification of EPCs with angiogenic and cardioprotective genes such as endothelial nitric oxide synthase (eNOS).

### ***Modulation of high glucose induced Monocyte Chemoattractant Protein-1 (MCP-1) gene expression in aortic endothelial cells***

Objectives of our studies are to determine whether high glucose concentration up regulates MCP-1 gene expression in aortic endothelial cells and to delineate the molecular mechanisms involved in the induction of MCP-1 gene expression in aortic endothelial cells. Studies carried out during the year have shown increased synthesis of MCP-1 when exposed high ambient glucose in a dose and time dependent manner. Studies using D-mannitol as osmotic control suggest that MCP-1 expression is not because of osmolality changes but is the effect of glucose.

Angiotensin II has been demonstrated, at least in animal models, to stimulate MCP-1 expression. Angiotensin II type 1 (AT1) receptor antagonist losartan has been shown to inhibit basal MCP-1 production in a dose-dependent manner. Losartan, dose dependently also blocks LDL-stimulated MCP-1 as well as platelet activating factor (PAF) stimulation of MCP-1 in freshly isolated human monocytes. We investigated whether losartan would inhibit high glucose induced MCP-1 synthesis in aortic endothelial cells and found that losartan does not inhibit high glucose stimulated MCP-1 production.

### ***Determination of genetic component in hypertension and cardiac hypertrophy***

Hypertension is an important risk factor for cardiac hypertrophy leading to cardiac failure and sudden death. Susceptibility to the debilitating consequences

of hypertension and the response to anti hypertensives in the prevention of cardiovascular sequelae vary between individuals. A study is in progress to identify the gene polymorphisms that are associated with cardiac hypertrophy in hypertension.

Left ventricular hypertrophy is the first visible sign of cardiac damage in hypertensives and a leading predictor of cardiac complications such as myocardial infarction, arrhythmia and sudden death. Hypertensive heart disease develops in response to mutually shared genetic determinants, environmental risk factors and hemodynamic and non-hemodynamic mechanisms. The primary determinants of hypertension and the morbid sequelae remain unknown in a vast majority of subjects. Ethnic variation in the prevalence and consequence of hypertension necessitates a population-based assessment. The proposal is designed to examine the prevalence of cardiac complications in hypertensives by retrospective analysis of data, determine the genetic component in hypertension and hypertrophy, and identify biomarkers associated with cardiac complications in hypertensives. The observation of this study is expected to facilitate preclinical identification of susceptible individuals and provide opportunity to tailor therapy to specific underlying abnormalities.

### ***Cardoguard Tablet-delineation of molecular mechanism of action and its efficacy in the regression of ventricular hypertrophy***

One of the factors affecting the acceptance of Ayurvedic medicines is the lack of scientific validation of the efficacy of the preparations. An antihypertensive formulation of Nagarjuna Herbal Concentrates Ltd. is being examined in Spontaneously Hypertensive rats, to delineate the mechanism of action and its efficacy

in the regression of ventricular hypertrophy. Cardoguard tablet is a new anti-hypertensive combination drug prepared by Nagarjuna Herbal Concentrates Ltd. In addition to the reduction of blood pressure, an ideal anti-hypertensive drug is expected to exert beneficial effects on the heart by prevention and regression of ventricular hypertrophy without compromising myocardial function. The myocardial response to this drug has not been characterized. The major objective of this project is therefore to study the effect of the drug on myocardial mechanics and examine using in-vitro and in-vivo models, the effectiveness of the drug in the regression of myocardial hypertrophy. A clear understanding of the mechanism of action and the cardiac consequences of the preparation is expected to facilitate commercialization and international acceptance of the product.

### *Regulation of cardiac fibroblasts by hypoxia*

Cardiac fibroblasts contribute to multiple aspects of myocardial function and pathophysiology. Regulation of cardiac fibroblast activity by hypoxia, a major component of myocardial ischemia, has been a subject of intensive study in this laboratory over the past few years. Investigations during the current year generated three important leads in relation to the response of cardiac fibroblasts to hypoxia.

(i) Hypoxia was found to delay G1? S transition in adult rat cardiac fibroblasts, and experiments to uncover the underlying molecular mechanisms made considerable progress. Notably, p38 MAPK mediated the delay in cell cycle progression under hypoxic conditions. Hypoxia induced the expression of p27, a cyclin-dependent kinase inhibitor that is known to delay progression of the cell cycle through the G1-S

checkpoint. Further, p27 induction in hypoxic cardiac fibroblasts was mediated by p38 MAPK. p38 MAPK and p42/44 MAPK were found to be negative and positive modulators of cardiac fibroblast proliferation, respectively. As cycling cells are more vulnerable to apoptotic cell death, the finding that hypoxia causes delayed cell cycle progression in cardiac fibroblasts may represent a mechanism integral to cell survival under hypoxic conditions to ensure their role in post-infarct repair and remodeling.

(ii) It was found that hypoxic fibroblast-derived factors exert autocrine/paracrine effects on cardiac cells. Specifically, conditioned medium from hypoxic fibroblast cultures reduced proliferation of cardiac fibroblasts even under normoxic conditions. The effects of hypoxic fibroblast-conditioned medium were similar to the effects of hypoxia per se on these cells, showing that hypoxic fibroblast-derived factors may amplify the direct effects of the primary stimulus. TNF- $\alpha$  mediated, at least in part, the effects of conditioned medium from hypoxic fibroblasts.

(iii) Hypoxia was shown to influence the expression of modulators of inflammation in cardiac fibroblasts. A significant increase in the production of soluble intercellular adhesion molecule-1 (sICAM-1) in response to hypoxia was observed. The increase was a post-transcriptional event as RT-PCR showed no increase in the transcript levels of cell surface ICAM-1 from which sICAM-1 is proteolytically derived. The stimulatory effect of hypoxia was mediated by p42/p44MAPK and protein kinase C. N-acetyl cysteine and PDTC, two clinically used anti-oxidants, caused a striking increase in the production of sICAM-1 by p42/p44 MAPK- and protein kinase C-independent mechanisms. The findings are consistent with the postulation that cardiac fibroblasts may contribute to

an inflammatory cascade within the heart under conditions such as myocardial ischemia and infarction, and in response to changes in redox status.

## **Imaging Sciences and Interventional Radiology**

Projects and Research Programme:

**Indo - Italian Collaborative project (2005-2008)**

**Characterization of brain tumors using advanced MR imaging techniques.**

### **Indian Collaborator**

Prof. A.K. Gupta  
Head, Dept. of Imaging Sciences and Interventional Radiology  
Sree Chitra Tirunal Institute for Medical Sciences and Technology  
(SCTIMST) Trivandrum-695 011  
Kerala

### **Italian Collaborator**

Prof. Giuseppe Scotti  
Prof and Head  
Dept. of Neuroradiology  
Scientific Institute & University  
Hospital San Raffael  
Via Olgettina, 60  
20/ 32 Milan, Italy

## **Pathology**

During the year, the division was involved the following ongoing research project.

Isolation and characterization of major lipid antigens from the liquid cultures of M tuberculosis: During the year the following lipid antigens from the liquid

cultures of M tuberculosis were isolated (a) total glycolipid (b) Trehalose 6'6' dimycolate (TDM- cord factor) (c) Lipoarabinomannan (LAM) (d) Phosphoinositol Mannosides (PIM). These lipids of M tuberculosis play a significant role in the immunopathogenesis and prognosis in patients with tuberculosis. Hence the results of this study are not only relevant but also have great clinical relevance.

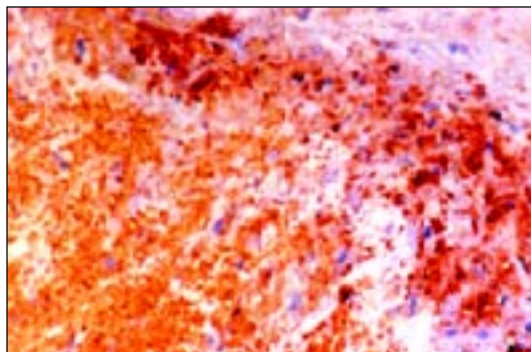
Status of ongoing/routine work: In addition to routine diagnostic histopathology to the patients with cardiac and neurological diseases, the department also introduced the following newer techniques (a) immunohistochemical techniques for the demonstration of sarcoglycans in the muscle biopsies of patients with Limb girdle muscular dystrophy (b) introduced cytochrome oxidase enzyme histochemical techniques for the diagnosis of mitochondrial myopathies. Both these techniques have diagnostic significance in patients with the above muscular diseases.

## **Mucoid Vasculopathy**

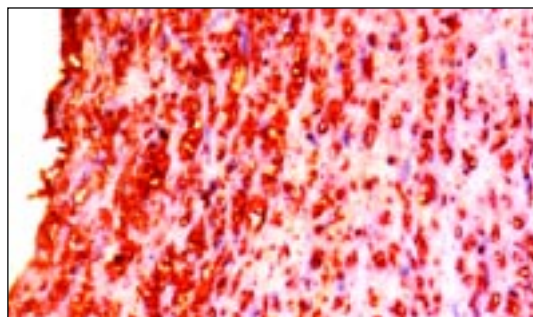
As part of a project funded by STEC Kerala (KSCSTE) a modified technique was standardized for getting better yield of serum glycosaminoglycans for analysis. This may be used as a screening test for mucoid vasculopathy and metabolic syndrome. Investigations showed increased levels of serum glycosaminoglycans, rather than hyperlipidemia in patients with coronary and cerebrovascular diseases, particularly in those with aneurysms having mucoid vasculopathic changes. Immunohistochemistry using specific monoclonal antibodies showed large deposits of abnormal proteoglycans in cerebral aneurysms, suggestive of abnormal reparative processes in cerebral aneurysms (Fig. 1A, 1B).



Large deposits of mucoid material with a paucity of inflammatory infiltrates and Aschoff bodies have been observed in excised rheumatic valves and an association of rheumatic heart disease with mucoid vasculopathy in cases from Kerala. Similar features were described in autopsy studies carried out on acute rheumatic fever rampant in Europe and North America in the early half of the last century. Immunohistochemistry showed "fibrinoid material" within Aschoff bodies to be degenerated proteoglycans, not necrotic collagen as generally understood. A modified technique demonstrated the presence of Gram-positive cocci-like structures within the valves, contrary to the current theory of immunological cross-reactivity for rheumatic valvulitis. The lesions encountered in Kerala cases provide a better understanding of the etiopathogenesis of this disease.



Heparin sulfate proteoglycan is found in abundance in the early granulation tissue in an aneurysm



Large amounts of Chondroitin 4 sulfate are seen in the persistent myxomatous plaque lining the aneurysm sac.

## Neurology

### Epilepsy Section

- 1) Evaluation of patients with medically refractory temporal lobe epilepsy based on MDR 1 polymorphism. In collaboration with Rajiv Gandhi Center for Biotechnology, Trivandrum
- 2) Mutational Analysis of JRK/JH8 gene in Refractory Mesial Temporal Lobe Epilepsy
- 3) Phase 111 trial of a new antiepileptic drug, Brivaracetam titled 'A multicenter, double-blind, parallel-group, placebo-controlled, randomized study: evaluation of the efficacy and safety of brivaracetam in subjects (=16 to 70 years old) Partial Onset Seizures' (Protocol N01252, UCB, Belgium) will begin shortly
- 4) A multi-level wavelet approach for automatic detection of epileptic spikes in the EEG during prolonged video-EEG monitoring, in collaboration with REC, Kozhikode.

### Movement Disorder Section

Protocol 6002-INT-001: " A long term, multicentre, open label safety study with oral 20 or 40 mg/day doses of KW-6002 as treatment for Parkinson's disease in patients with motor response complications on levodopa therapy

ProtocolSs308.3.003: A multi centre, randomized, double blind, parallel group placebo and pramipexole controlled study to assess efficacy and safety of SILV 308 monotherapy in the treatment of patients with early stage Parkinson's disease.

Protocol OV-1003: Safety and efficacy of Melperone in the treatment of patients with psychosis associated with Parkinson's disease

Protocol NW 1015/016/III/2006. A phase III, double blind, placebo-controlled study to determine the efficacy and safety of a low (50mg/day) and high (100mg/day) dose of safinamide as add-on therapy in patients with idiopathic Parkinson's disease with motor fluctuations, treated with a stable dose of levodopa and who may be receiving concomitant treatment with stable doses of dopamine agonist and or an anticholinergic"

Intramural Funding

Multimodality MRI in the differential diagnosis of a typical Parkinsonism

### Neuromuscular Diseases Section

Standardisation of temperature measurements in the EMG lab

Standardisation of F wave parameters in nerve conduction studies

Family and genetic studies in Myotonic dystrophy patients

Autonomic function studies in Diabetic neuropathy patients

Mortality studies in the neuro medical ICU

### Stroke Section

1. SEARO Project based on WHO protocol: Collection and analysis of data completed. The study was intended to assess the magnitude of stroke burden in the region and to obtain the basic demographic data. This is the pioneering step for the setting-up a population-based stroke registry in a defined population in this region: The Trivandrum Stroke Registry.
2. Knowledge, Attitude and Practice of stroke among the general population (KAP Study).

Completed the population-based study to ascertain the existing level of knowledge in the community about stroke, risk factors, and newer modalities of treatment.

### Cognition & Behavioural Neurology (CBNC) Section (includes data on Neuropsychology & Speech Therapy)

Dr. Mathuranath, along with co-PIs, Drs. Kesavadas and Kaimal received a grant to set up a multi-disciplinary brain-mapping unit to develop an MRI Atlas for the Indian Brain and to initiate fMRI studies in cognition as well as setting up of a basic neurogenetics laboratory for studying neurogenetics of degenerative diseases, with emphasis on dementia.

Dr. Mathuranath, has an ongoing project on the evaluation of the sub-types of dementia in the cognitively impaired elderly subjects in Urban Kerala. The project is aimed at studying the prevalence of different subtypes of dementia in the in cognitively impaired elders in the community in Kerala.

### Research programmes and collaborative programmes

A 20-week study of efficacy of a combination of cholinesterase inhibitors and memantine in patients with Alzheimer's disease was carried out at the center as a part of PG in Pharmacology by Ms. Twinkle Nelson.

### Neurosurgery

#### Ongoing research projects

- 1 Human trial of hydroxyapetite Burr hole caps
- 2 Drug trial: Epicentric therapy for gliomas "an international multicentric study for treatment

- of recurrent cerebral high-grade gliomas with AP 12009" project. The principal investigator for the trial from our centre is Prof Suresh Nair
- 3 Open Label, Dose confirmation study of Interstitial 131I-ch TNT 1/B Mab(COTARA) for the treatment of Recurrent Glioblastoma Multiforme
- 4 Surgical Trial in Intracerebral hematoma (STICH II), funded by MRC, UK and coordinated from Newcastle.



## MAJOR EQUIPMENTS PURCHASED DURING THE YEAR

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Mb/Bact240 Microbacterial Culture System  
Bact /Alert 240 & Mini Api Culture System  
VNS Neuro Stimulation System Model: 102  
Opx-mobilis Rc 40l Operation Table (Electro Hydraulic)  
Amax Destiny Plus Automated Coagulation Analyser.  
Stealth Station Treon Plus Image Guided Neurosurgical Navigation System.  
Sonosite Complete Colour Ultrasound System.  
Ventilator Servo-I, Maquet With Base Unit  
Acuson Cv70 Cardiac 2D Echo Doppler  
Harmonic Scalpel Ultrasonic Generator  
Advanced Mapping System: Ensite-endocardial Solutions  
Envisor CHD Colour Doppler Echo Machine  
Intellivue Monitor With Touch Capability. Model MP 70.  
Operon B 710 Surgical Table.(Electro Hydraulic).  
Micro computerised tomography system  
Environmental Scanning Electron Microscope  
Langmuir Blodgett Film deposition system  
FT-Raman spectrometer  
FTIR spectrophotometer  
Chamber for laser ablation ceramic coating system  
Microscope with FTIR Spectroscopy  
Surface Profilometer & Micro Scratch Tester  
Flexible surface topography system  
3 Body wear tester  
Universal testing machine with Video extensometer  
Video based contact angle measuring device  
Modulated DSC and SDT  
Dynamic Mechanical Analyser

Liquid extrusion porosimeter  
Charmilles Make CNC Wire cut Electrical Discharge Machine  
Schaublin Make 102 N-VM CF Bench type lathe  
High pressure and high temperature laboratory chemical reactor  
Plasma Polymerization unit  
AKTA Purifier- protein purification system  
Inverted phase contrast fluorescence microscope  
Upright fluorescence microscope  
Motorised microscope with metaphase analyzer  
Metzer metavision reflected light microscope  
Dual chamber temporary pacemaker model  
Aloka Prosound 4000 Echocardiography machine  
Transformer 1250KVA, 11KV/433, 3PH, 50 HZ  
Lift, electric elevator, BED cum passenger – 2 No.s  
Autoclave cylindrical horizontal 75ltr - 6 No.s  
Compressor with 250 Ltrs. air receiver  
Ingersoll-Rand make screw air compressor  
Ceiling shadowless operating lamp  
Ingersoll- Rand make screw air compressor  
750 KVA transformer  
Hotpack large capacity glassware washer  
Static pass box I SS.304 (18 G) Double

## ACADEMIC ACTIVITIES

### Division of Academic Affairs

Admission of students and evaluation of students registered for various programmes are the primary responsibilities entrusted to the division. The division co-ordinates the work of standing Academic Committee of the Institute which has been constituted to make recommendations to the Governing Body on general supervision over the academic policies of the Institute and method of instruction, teaching, training, evaluation of research and improvement in academic standards.

### Programmes on offer - 2007

<i>Post-doctoral</i>	<i>PhD./Master's</i>	<i>Diploma</i>
1. DM Cardiology	13. PhD	16. Cardiac Nursing
2. DM Neurology	14. Master of Public Health (MPH)	17. Neuro Nursing
3. DM Neuroimaging and Interventional Neuroradiology	15. Master of Applied Epidemiology (MAE)	18. Blood Banking Technology
4. DM Cardiac Anaesthesia		19. Cardiac Laboratory Technology
5. DM Neuro Anaesthesia		20. Neuro Technology
6. MCh Cardiovascular & Thoracic Surgery		21. Operation Theatre Technology
7. MCh Neuro Surgery (after M.S)		22. Advanced Medical Imaging Technology
8. MCh Neuro Surgery (after MBBS and 1 year Residency in General Surgery)		23. Clinical Perfusion
9. Certificate course in Anesthesia		24. Medical Records
10. Certificate course in Radiology		
11. Certificate Course in Vascular Surgery		
12. Post DM/MCh Fellowship		
13. Fellowship in Biomedical Technology		

## Students Enrolment

The student strength for DM/MCh degree and Post-doctoral Certificate courses and Post DM/ MCh Fellowships during the year was 72. The Master of Public Health degree programme has 35 scholars and the Master of Applied Epidemiology programme 40 scholars. The Institute has, as of now, 46 students for the PhD programme, 62 scholars for the various Nursing and Technology related Diploma programmes.

### A. List of Post-doctoral students

#### DM (Cardiology)

Rajesh Muralidharan.P  
 Krishna Kumar. M  
 K.J. Prem Kumar  
 Saurabh Kumar Gupta  
 Ali Shafeeq (Sponsored)  
 Ragesh.P  
 Shanmuga Sundaram.R.  
 S.V.K.R.Krishna  
 Haridasan.V  
 Sumanta Shekhar Padhi  
 Anees. T  
 Sanjay. G  
 Sachin Nayyar

#### DM (Neurology)

Abhijit Das  
 Pranav D Shinde  
 Neeraj N Baheti  
 Malini Gopinath  
 Ajith Cherian  
 Atma Ram  
 Deepak Gupta  
 Chandra Mohan Singh

AtamPreet Singh  
 Shiva Kumar.R.  
 Mini.S  
 Sapna Erat Sreedharan

#### DM (Cardiothoracic Anaesthesiology)

Aveek Jayant  
 Ganesh. S

#### DM (Neuro Anesthesiology)

Suparna.B  
 Sriganesh. K  
 Smita. V

#### DM (In Neuroimaging and Interventional Neuroradiology)

Jitender Saini  
 Jolapara Milan Babulal  
 Arvinda.H.R.  
 Periakaruppan.AL  
 Amit Aslam Khan  
 Hima. S. Pendharkar

#### Mch (Cardiovascular & Thoracic Surgery)

Thomas Mathew  
 Saurabh Jaiswal  
 Kirun Gopal  
 Ajoy Menon (Sponsored)  
 Varghese.T.Panicker  
 Sanjay Gandhi  
 Vivek Babu.B.  
 Arul Dominic Furtado  
 Vivek. V. Pillai  
 Suraj Kumar Pradhan  
 Prashanth. Y.M  
 Neerav Bansal  
 Gagandeep Singh Nagi

### **MCh (Neurosurgery)**

Jinendra Kumar.R

Bimal.G

Rahul Jain

Nilesh Jain

Ganesh Divakar

Naren.N.Nayak

Vikas.V

Vishal Jain

C.V. Gopalakrishnan

Dilip. M

Manmeet Singh. S. Chhabra

Gigu Skaria

Manju. S

Ragaseema.VM

Malini . S. Pillai

Devi. R.R

Rajesh. P

Suboj Babykutty

Priya.P. S.

Deepa.D

Sudhakar.M.

Anu.S.Nair

Anu Mol Jose

Dawlee. S

PR.Uma Sankar

Anu Paul

Aghila Rani.K.G.

Manna Jose

Arun.U

Sangeetha Mohan

Sreeja Purushothaman

Vandana Shankar

Arun.B

Sumith.R.Panicker

Manitha.B.Nair

Sailesh Mohan

Anie.Y

Sumi.S.

Josna Joseph

A.Edwin Sam

A.S.Pradeep Kumar

Sajeesh.S

Viji Mary Varghese

Manickam. P

Godwin.S.K.

Neethu Mohan

Kaladhar.K

C. V. Muraleedharan

### **MCh (Neurosurgery) (5 year)**

Jayanand Sudhir. B

### **PDCC (Anaesthesiology)**

Dipanjan Chatterjee

David Jacob

Amit kumar Ahuja

### **PDCC (Radiology)**

Santhosh Kumar. K

Satya Narayana Patro

### **PDCC (Vascular Surgery)**

Ashley Solomon.C

### **Post DM / MCh Fellows**

Shomu Bohoro

Rajiv Agarwal

Ramesha. K. N

Biji. B

### **List of PhD / Master's Programme students**

#### **PhD Students**

Lynda Velutheril

D. S. Nagesh  
Divya. P  
Sailaja.G.S  
Nishi.K.K.  
Anuradha  
Sunitha.S.S.  
Sapna.S.  
Siddharth Banerjee

### **Master of Public Health Students**

Simi Mathew  
Sudeep Kumar  
Muhammed Shaffi  
Manjunatha. R  
Divya Bhagianadh  
Maitraye Basu  
Shah Amar Niranjana  
Doshi Riddhi Prakash  
Shibu Vijayan  
Abhay Kumar Bohera  
Manoj Swaminathan  
Allen Prabhakar Ugargol  
Pratap Kumar Jena  
Rekha. M. Ravindran  
Sheetal Joy  
Deepti Joy  
Meena Daivadanam  
Shyam Swaroop Sharma  
Rajeev Arun Ekka  
Elizebeth Mathews  
Deepak. K.G  
Bhanderi Mitesh Kumar Narsinbhai  
Khalipe Mahesh Mahaling  
Jayant Kumar Panda  
S. S. Rani  
Soumya Sarkar  
Supriya Bonnie Minz  
Mini P Mani

Venkatesh Vinayak Narayan  
Kovid Sharma

### **Diploma in Public Health Students**

Manubhai Hirabhai Solanki  
Prakash Rajnikant Suthar  
Dave Kavita Jagadishchandra  
Madhak Janakkumar Odhavji  
Rangoonwala Rajendra Amrutlal

### **Master of Applied Epidemiology Students**

Prabhdeep Kaur  
Sobhan De  
Dipankar Maji  
Sharmishta Mitra  
Shymili Rudra  
Prasun Kumar Das  
Rama Bhunia  
Somrojit Ningombam  
S. Ibungochouba Singh  
Sushil Chander  
Balraj Singh  
Surender. N. Gupta  
Prunamala Devi  
R. K. Tilotama Devi  
P. K. Mohapatra  
Pawan Kumar Sachan  
Shyam Sundar Singh  
K. Ramasamy  
J. Manjunath  
N.V. Sumathi  
Tana Takum  
Omsh Kumar  
Rajesh Kumar Sood  
Satish Pundir  
Udit Kumar  
Vikram Katoch

M. Dinesh Singh  
Gopal Singh  
Lolee Mao  
Somasundaram  
Stanley Michael  
Parveen Kumar Anand  
Jagannath Sarkar  
Kisalay Datta  
B. P. Mukhopadhyay  
Rita Ray  
Subhranshu Chakraborti  
Susmita Roy  
Tapas Kumar Ray  
Tapan Kumar Saha

### List of Diploma students

#### Cardiac Nursing

Priya.L.  
Timy Santhipalan  
Resmi.M.I.  
Bindhu.V.T.  
Asha.A.  
Aswathy.L.B.  
Rani.R.Nath  
Liji.M.Francis  
Sreelekha.K  
Jayasree.K.P  
Akhila Raveendran  
Sunanda.PK  
Suja.VM  
Tessymol Antony

#### Neuro Nursing

Darsana Rani Vasanthan  
Anjana.P  
Shima.P.A.  
Soumya.S.S.

Sini.S.S  
Ambily.V.V.  
Manjusha Nair.M.L  
Don.T.K  
Jisha.M  
Anu Johnson  
Jansi Selva Mary.R  
Sreeja.T.P  
Prinu. P Koshi  
Surya  
Ciji Thomas

#### Technology Related Programme

Krishnaprasad. R  
Gopikrishnan. PS  
Sapna Varghese  
Deepasree. C. S  
Ampily. R  
Rupesh.V K  
Munavar. T. K  
Manju. R.S  
Vipin Das. PH  
Anees. C.A  
Sreevidya. M  
Mansoor.K  
Indu. S. Ashokan  
Midhun. S.V  
Divyamol .VS  
Rijesh. S.R  
Arunkumar. S  
Ajumol.S.P  
Lakshmi Rajaclosy  
Fatima Mehmood Ahmed  
Gigin Nath.G  
Sajith.VS  
Athira.U.V  
Pradeep.M.P

Sajeesh Kumar.K.V  
 Sree Ranjith.S  
 Praveen Kumar.A  
 Shijil Joseph  
 Ranjith.C  
 Shanu.PS  
 Don Sebastian  
 Suma. B  
 Remya.L. T

### Degrees awarded

Name of Candidates	Degree	Speciality
Amitabh Gupta	MCh	Neurosurgery
Rajiv Agarwal	MCh	Neurosurgery
Nilesh Radheshyam Agarwal	MCh	Neurosurgery
Gulzar Gupta	MCh	Neurosurgery
Adil Sadiq	MCh	Cardiac surgery
Ritwick Raj Bhuyan	MCh	Cardiac surgery
Malempati Amresh Rao	MCh	Cardiac surgery
Arun Kumar Haridas	MCh	Cardiac surgery
Thomas Chemmanam	DM	Neurology
Ramesha K. N	DM	Neurology
Vidya. M. V	DM	Neurology
Raghavendra. S	DM	Neurology
Ramash. K	DM	Cardiology
Shajeem. O	DM	Cardiology
Bijulal.S.	DM	Cardiology
Shomu Rajendrasingh Bohora	DM	Cardiology
D. Pradeep Kumar	DM	Cardiology
Sandeep Kumar Burathoki	DM	Neuroradiology
Arun Vijayakumar	DM	Cardiacanaesthesia
Shasi Rao	DM	Neuroanaesthesia

### Post Doctoral Certificates awarded

Name of Candidates	Specialty
Sivakumar. P	Anaesthesiology
Sivashanmugam. T	Anaesthesiology

Sudhakar. S Anaesthesiology  
 S. Sanjeeb Patro Anaesthesiology  
 Subramanian. C Anaesthesiology  
 Somasundaram Radiology  
 Raja Nazeer Shaikh Radiology

### Post DM/ MCh Fellowships

Name of Candidates	Specialty
Bijulal.S	Cardiology
Nayil Khurshid Malik	Neurosurgery
Rathore Chathurbhuj	
Gopal Sing	Neurology

### Diploma awarded

Name of Candidates	Specialty
Prasad.K	Cardiac Laboratory Technology
Sethu Parvathy. V. K	Cardiac Laboratory Technology
Aneesh.S	Cardiac Laboratory Technology
Niju Jacob	Neuro Technology
Pradeep. M.J	Neuro Technology
Lalitha .R.S	Medical Imaging Technology
Geo Joseph	Medical Imaging Technology
Nishad. V.U	Medical Imaging Technology
Anchana Unni	Medical Records Science
Asha Krishna. R. O	Medical Records Science
Ragesh D.V	Medical Records Science
Anila Aravind	Operation Theatre Technology
Sumesh. T.M	Operation Theatre Technology
Shibin. C.V	Blood Banking Technology
Sajitha. K.S	Clinical Perfusion
Krishnaraj. K.M	Clinical Perfusion

Short-term training/ Observer ship upto period of six months

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



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



Visit of MPH Students from University of Southern California (USC) 2006

Around 500 observers from 81 institutions all over the country spent varying periods from two weeks to six months in different department of the Institute.

### Library

Library has a collection of 22405 books and 19297 back volumes and subscribes to 184 periodicals. 413 books and 282 back volumes are added during the year 2006-07.

### Nursing Education

The 2005 batch students of the newly initiated 2-year Diploma Programmes in Speciality Nursing have graduated in December 2006. There were four graduates in the Diploma Programme in Cardiovascular

and Thoracic Nursing and five graduates in the Diploma Programme in Neuro Nursing. Ten candidates could not complete the 2-year programme due to various reasons. Currently thirteen students of 2006 batch and fifteen students of 2007 batch are undergoing these two speciality nursing programmes. So far 150 cardiac nurses and 100 neuronurses had undergone speciality training from this Institute.



Director, Dr. K. Mohandas inaugurating the training course for staff nurses

Three Neuro nursing students attended the 27th annual conference of the Society of Indian Neuroscience Nurses held at Madurai, during December 2006. They presented papers, posters and participated in Neuro written quiz, Essay writing, and Elocution competition and secured various prizes including one first prize.

Regular interactive sessions on cardiopulmonary resuscitation based on AHA guidelines 2005, using Heartsim 4000 ACLS mannequin were given to 156 Nursing staff and students.

## EXTERNALLY FUNDED RESEARCH PROJECTS

### ACHUTHA MENON CENTRE FOR HEALTH SCIENCE STUDIES

#### NEWLY INITIATED PROJECTS

Sl. No.	Title	Principal Investigator	Funding Agency
1.	Knowledge, attitudes, and perceived Barriers Regarding Implementation of FCTC Provisions and Tobacco Control Measures Among Representatives of Local Self Government Bodies in Kerala (India)	Dr. K.R. Thankappan	IDRC (International Development Research Centre)

#### ON GOING

1.	Research, training and advocacy for gender sensitization of medical education and capacity building of health professionals for reduction of maternal mortality and morbidity	Dr. Mala Ramanathan	MacArthur Foundation
2.	Tobacco cessation research and training in India and Indonesia	Dr. K R Thankappan	Fogarty International Centre of the National Institutes of Health, USA through University of Minnesota
3.	Banking for better health: Medisave for rural women in Karnataka, India	Dr.D. Varatharajan	Ford Foundation
4.	Stakeholders' perceptions of IRBs in India	Dr. Mala Ramanathan	NIH through Harvard University
5.	Development of a reference manual for primary health care workers (through Government of Kerala)	Dr. K R Thankappan	European Commission
6.	A longitudinal study in the tsunami affected areas of Kerala	Dr. K R Thankappan	University of Southern California, USA.

Sl. No.	Title	Principal Investigator	Funding Agency
7.	Athiyannoor Sree Chitra Action (ASA) project	Dr. Biju Soman	Partly funded by Swiss Agency for Development and Cooperation.

## COMPLETED PROJECTS

1.	Political Decentralisation and status of RH in Kerala.	Dr. Mala Ramanathan,	CHANGE, Washington
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**BIOMEDICAL TECHNOLOGY WING****INDUSTRY SPONSORED PROJECTS****NEWLY INITIATED**

Sl. No.	Title	Principal Investigator	Funding Agency
1.	Development of a drug relasing intrauterine system	Dr. V. Kalliyana krishnan	Hindustan Latex Ltd., Trivandrum
2.	Preclinical evaluation of heart valve substitute in sheep model	Dr. P.R. Umashankar	School of Mechanical and Aerospace engineering, Nanyang Avenue, Singapore
3.	Haemocompatibility evaluation of arrows haemodialysis catheters in rabbit model.	Dr. P.R. Umashankar Dr.VS. Harikrishnan	Arrow International, USA.

**ONGOING PROJECTS**

1.	Pilot level production of HAP granules	Dr.H.K.Varma	Dynamic Techno Medicals Pvt.Ltd., Alweye
2.	Development of a two component caries dissolving agent	Dr. V.Kalliyana Krishnan	Dr. Toms International, Calicut
3.	Preliminary evaluation of biodegradable ureteric stent	Dr. P.R. Umashankar	Nanyang Technology University, Singapore
4.	Evaluation of efficacy of Recombinant PDF on healing of experimentally induced surgical wounds in Sprague Dawley rats	Dr. P.V. Mohanan	USV Limited, B.S.D Marg, Govandi Mumbai 400 088

**COMPLETED PROJECTS**

1.	Biofunctional evaluation of paclitaxel eluting and sirolimus eluting coronary stents- Preclinical evaluation in porcine model	Dr. P.R. Umashankar	M/s Sahajanand Medical technologies Pvt. Ltd
2.	Wound healing studies of growth factor	Dr. P.V. Mohanan	Professor Bruce Milthorpe GSBME, University of New South Wales, Australia

**BIOMEDICAL TECHNOLOGY WING****NEWLY INITIATED PROJECTS**

Sl. No.	Title	Principal Investigator	Funding Agency
1.	Tissue engineered hybrid artificial lung model for testing pollutants and drugs	Dr A. Maya Nandkumar	Department of Biotechnology, Govt. of India
2.	Biomimetic Processing of inorganic –organic composites for biomedical applications	Dr. H.K. Varma	DST (INDO –Japanese S&T Cooperation Joint Project)
3.	Evaluation of the pro and anti inflammatory profile of cells onto bio- material surface	Dr. C.P. Sharma in collaboration with Prof. Dr. Herald Renz, Department of Clinical Chemistry and Molecular Diagnostics-Central Laboratory, Philipps-University, Marburg, Germany.	Indo-German (DST- DAAD) Project based Personnel exchange Programme.
4.	Portable medical safety analyser	Niranjan D. Khambete (in collaboration with CDAC Trivandrum)	Department of Information Technology, Govt. of India
5.	Designing molecularly imprinted polymers as substrate for glucose	Dr. K. Sreenivasan	DBT (Department of Biotechnology)
6.	Development of left ventricular assist devices (LVAD) VSSC-SCTIMST joint project	D.S. Nagesh	VSSC (Vikram Sarabai Space Centre)
7.	Commercialisation of centrifugal blood pump for extracorporeal applications	D.S. Nagesh	TDB (Technology Development Board)
8.	Evaluation of a new Chitra bone cement in rabbit model.	Dr. A.C. Fernandez and Dr. VS. Harikrishnan	Dr. M. Jayabalan, Polymer Division.

Sl. No.	Title	Principal Investigator	Funding Agency
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## ONGOING PROJECTS

1.	Oral insulin delivery	Dr. C.P. Sharma	CSIR under NMITLI
2.	Langmuir blodgett Film Deposition: blood compatibility	Dr. C.P. Sharma	DST
3.	Development of coronary stent system	C.V. Muraleedharan	NMITLI, CSIR, GOI
4.	Development of improved tilting disc heart valve	C.V. Muraleedharan	PATSER, DSIR, GOI
5.	Development of minitaure camera for medical endoscopy	Niranjan D. Khambete (in collaboration with CDAC, Trivandrum)	Department of Information Technology, Govt. of India
6.	Development of thermoresponsive copolymers as sensing element for C-rective protein.	Dr. K. Sreenivasan	Life Science Research Board, DRDO, New Delhi
7.	Development of smart biomaterials for cardiovascular tissue engineering	Dr. Prabha D. Nair	DBT
	Islet Immuno Isolation with XenoTransplantation And Stem Cell Regeneration to Islets as Strategies for Treatment of Diabetes	Dr. Prabha D. Nair	DBT
8.	Technology development and commercialisation of hemoconcentrators for open heart surgical application (Technology Partner)	D.S. Nagesh	TIFAC
9.	Quantitative immunophenotyping of inflammatory cells in biocompatibility assessment of materials	Dr. Mira Mohanty	DST
10.	Development of an <i>in vitro</i> coculture system of hepatocytes and endothelial cells for bioartificial Liver	Dr. T V Kumari	KSCSTE

Sl. No.	Title	Principal Investigator	Funding Agency
11.	Bioengineered cell sheet for corneal tissue engineering	Dr. TV Kumary	DBT
12.	Bone regeneration in a diabetes-induced rat model	Dr. Annie John	DST
13.	Bone regeneration in large segmental defects using tissue engineered new generation bio-ceramic scaffold	Dr. Annie John	Life Sciences Research Board, DRDO
14.	Resorption and remodeling of novel bioceramics	Dr. Annie John (Indian side) & Dr. Michael gelinsky (German side)	DST-DAAD Joint Research Project (Indo-German)
15.	Synthesis and characterization of radiopaque polyurethanes for medical applications (3 years)	Dr. A. Jayakrishnan	KSCSTE
16.	Process optimization and development of dispensable and biodegradable polymeric bone cement for minimally invasive treatment of bone diseases	Dr. M. Jayabalan	DST
17.	Development and studies on novel biodegradable polymeric materials as functionally active cardiac implant	Dr.M.Jayabalan	DBT
18.	Development of molecularly reinforced biodegradable nanocomposite materials as internal orthopedic fixation devices	Dr.M.Jayabalan	DST-BMBF
19.	Development of bioactive bone graft substitutes for spinal fusion surgery	Dr. Roy Joseph	DST
20.	Differential expression of rat brain RNA during seizure development.	Anoopkumar Thekkuveetil	DST
21.	Delineating mechanism of bio film formation in urinary catheters: characterisation of role of <i>E.coli</i> secretory proteins and influence of environmental signals	Dr A. Maya Nandkumar	KSCSTE

Sl. No.	Title	Principal Investigator	Funding Agency
22.	Cardiogard tablets- delineation of molecular mechanism of action and its efficacy in the regression of ventricular hypertrophy.	Dr.A.C.Fernandez Dr. Renuka Nair	DST

## COMPLETED PROJECTS

1.	Development of Hemoconcentrator	Mr. Nagesh	SIDD Life Sciences Pvt. Ltd
2.	Immune mechanisms of polyurethane degradation.	Dr. Mira Mohanty	Life Sciences Research Board, DRDO
3.	Proteomic study of cytokines and adhesion molecules expression in relation to long term clinical failure of orthopedic devices.	Dr. Mira Mohanty (Indian side) & Prof. Kirkpatrick (German side).	DST-DAAD Projects Based Personnel Exchange Programme (PPP) – 2005. Project closed.
4.	Ultra structural study of the interface between bone and bioactive ceramics – a pre-clinical evaluation	Dr. Annie John	KSTEC
5.	Development of an in vitro pyrogen test kit: evaluation of pyrogenicity using human whole blood	Dr. P.V. Mohanan	Dept. of Biotechnology, New Delhi



## SCTIMST TECHNOLOGY DEVELOPMENT FUNDED PROJECTS

### NEWLY INITIATED PROJECTS

Sl. No.	Title	Principal Investigator	Funding Agency
1.	Development of an <i>in vitro</i> pyrogen test kit: Evaluation of pyrogenicity using human whole blood (2 years funded by DBT, New Delhi)	Dr. P.V. Mohanan	1 year
2.	Development of instrumentation for bio-impedance techniques	Dr Niranjan D Khambete	1 year

### ONGOING

1.	Clinical evaluation of Calcium phosphate cement in dentistry	Manoj Komath	18 months
2.	Development of silverised chitosan wound dressing	Dr. C.P. Sharma	2 years
3.	Development of instrumentation for bio-impedance applications	Niranjan D. Khambete	1 year
4.	Technology development for polyurethane potting compound based on indigenous raw materials.	Dr.M.Jayabalan	1 year
5.	Standardisation of event related fMRI technique so as to develop a spike triggered fMRI	Dr K.C. Kesavadas	2 years
6.	Development of a glass ionomer cement for dental applications	Dr. V. Kalliyana Krishnan	2 years
7.	Development of an alternative <i>in vitro</i> testing system to replace the <i>in vivo</i> ocular test for chemicals/materials – a feasibility study.	Dr. T.V. Kumary	1 year
8.	Technology development for polyurethane potting compound based on indigenous raw materials	Dr M. Jayabalan	2 years

Sl. No.	Title	Principal Investigator	Funding Agency
9.	<i>In vivo</i> evaluation of the efficacy of anti viper venom antibodies to neutralize the effects of venom	Lissy Krishnan	2 years
10.	Toxicological evaluation of a single solution bonding agent	Dr. V.Kalliyana Krishnan	1 year
11.	Coating and characterisation of vascular grafts with hydrogel derived from oxidised alginate and gelatin	Dr. Roy Joseph	1 year
12.	Standardization and evaluation of genotoxicity studies	Dr. P.V. Mohanan	1 year
13.	Transformation growth factor alpha	Anoopkumar Thekkuveetil	Completed

**HOSPITAL WING****NEWLY INITIATED**

Sl. No.	Title	Principal Investigator	Funding Agency
1.	Determination of genetic component in hypertension and cardiac hypertrophy.	Dr. Renuka Nair	KSCST
2.	Setting up of a collaborative brain mapping unit and a neurogenetic unit	Dr. PS. Mathurananath	KSCST
3.	A Phase III, double-blind, placebo controlled study to determine the efficacy and safety of a low (50mg/day) and high (100 mg/day) dose of Safinamide, as add-on therapy, in patients with idiopathic Parkinson's disease with motor fluctuations, treated with a stable dose of levodopa and who may be receiving concomitant treatment with stable doses of dopamine against and/or an anticholinergic.	Dr. Asha Kishore	CliniRx research Pvt. Ltd.
4.	Pharmacogenetic study for evaluating the teratogenic effects of anti epileptic drugs	Dr. Sanjeev V. Thomas	DBT
5.	Survival mechanisms in cardiac fibroblasts.	Dr. Shivakumar	Life Sciences Research Board
6.	A multicenter, randomized, double blind, parallel group placebo and Pramipexole controlled study to assess efficacy and safety of SLV 308 monotherapy in the treatment of patients with early stage Parkinson's Disease.	Dr. Asha Kishore	Quintiles
7.	Safety and efficacy of Melperone in the treatment of patients with psychosis associated with parkinson's disease	Dr. Asha Kishore	Quintiles

Sl. No.	Title	Principal Investigator	Funding Agency
8.	A multicenter, randomized, double blind, placebo and Entacapone-controlled, parallel group study of the efficacy, safety and tolerability of E2007 in levodopa treated Parkinson's Disease patients with motor fluctuations.	Dr. Asha Kishore	Quintiles
9.	A multi-center, randomized, double-blind, placebo-controlled, dose escalation trial on safety and efficacy of activated recombinant factor VII(rFVII/ NovoSeven ®) in the treatment of post-operative bleeding in patients following cardiac surgery requiring cardiopulmonary bypass.	Dr. K. Jayakumar	Novo Nordisk India Pvt. Ltd.

## ON GOING PROJECTS

1.	Development of spectroscopic protocol	Dr. R. S. Jayasree	DST
2.	A Long-Term, multi center, open-label safety study with oral 20 or 40 mg/d doses of KW-6002(Istradefylline) as treatment for parkinson's disease in patients with motor response complications on levodopa therapy	Dr. Asha Kishore	Quintile Spectral
3.	Dose ranging study to evaluate the safety and efficacy olmesartan medoxonil in children and adolescents with hypertension.	Dr. J. M. Tharakan & Dr. Krishnakumar	Quintile Spectral
4.	Effect of leukodepleted blood on post operative complication in CABG.	Dr. Jaisy Mathai	Hindustan Latex Limited.
6.	Evaluation of the subtypes of dementia in the cognitively impaired elderly subjects in urban Kerala.	Dr. P. S. Mathuranath	CBNC
7.	Investigation of serum and urinary mucopolysaccharides in patients with coronary artery and cerebrovascular diseases.	Dr. S. Sandhyamani	KSCSTE

Sl. No.	Title	Principal Investigator	Funding Agency
8.	Group interactions in psycho-social care in epilepsy	Dr. Jayachandran	Indian Epilepsy Association
9.	Indian registry of epilepsy and pregnancy coordination	Dr. Sanjeev V. Thomas	Indian Epilepsy Association
10.	A 24-week, multi-center, randomized, double-blind, placebo-controlled evaluation of the efficacy, safety and tolerability	Dr. P. S. Mathuranath	CBNC
11.	Indian registry of epilepsy and pregnancy	Dr. Sanjeev V. Thomas	European Registry
12.	Blood component separation unit.	Dr. Jaisy Mathai	Kerala State AIDS Control Society
13.	Angiotensin II in the pathogenesis of myocardial lesions in magnesium deficiency	Dr. K. Shivakumar	ICMR
14.	Antiviral principles from indian medicinal plants	Ms. Molly Antony	Terumo Penpol
15.	Evaluation of the subtypes of dementia in the cognitively impaired elderly subjects in urban kerala.	Dr. P. S. Mathuranath	STED
16.	Diffusion weighted imaging and other magnetic resonance based imaging modalities in human stroke.	Dr. A. K. Gupta	DST
17.	Studies on an anti-viral properties of some known medicinal plants vis-à-vis phytomedicine development	Ms. Molly Antony	DBT
18.	Immunological evaluation in myasthenia gravis	Dr. Annamma Mathai	KSCSTE
19.	Registry of pregnancy in women with epilepsy	Dr. Sanjeev V. Thomas	ICMR
20.	Pro-inflammatory cytokine expression in cardiac fibroblasts in response to hypoxia: modulation by substance P	Dr. K. Shivakumar	DBT

Sl. No.	Title	Principal Investigator	Funding Agency
21.	Pilot study for homograft harvesting.	Dr. Krishnamanohar	STEC
22.	A Multi national, multi-center, open-label, active-controlled, randomized parallel-group dose-finding study to evaluate the efficiency and safety of two doses of AP 12009 in adult patients with recurrent high grade glioma, administered intratumorally as continuous high-flow microperfusion over a 7-day period every other week (study protocol no: AP 12009-G004)	Dr. Suresh Nair	SIRO CLINPHARM
23.	<i>Cardoguard</i> tablet- delineation of molecular mechanism of action and its efficacy in the regression of ventricular hypertrophy research programme	Dr. Renuka Nair & A.C. Fernandez	DST and Nagarjuna Herbal Concentrates Ltd,
24.	Identification of mycobacterial tuberculosis by In-situ hybridisation and demonstration of mycobacterial antigen in the CSF cytospin smears by an immunocytochemical for the early laboratory diagnosis of tuberculous meningitis (TMB)	Dr. V. V. Radhakrishnan	DST
25.	Tele-Health & medical education	Dr. Jawahar	STED
26.	Oxidative stress in women with epilepsy and its relationship to fetal malformations	Dr. Sanjeev V. Thomas	KSCSTE
27.	Studies on matrix metalloproteinase (MMP) gene transcription by nitric oxide mechanism of MMP gene induction in human colon cancer cells	Dr. G. Srinivas	DBT
28.	Pilot study of comprehensive stroke care programme	Dr. K. Radhakrishnan	KSCSTE

Sl. No.	Title	Principal Investigator	Funding Agency
29.	A 16 week double-blind, placebo-controlled, randomized, parallel- group, multi-centre, international study to evaluate the efficiency and safety of 40mg/day istradefylline (KW6002) and that of entacapone versus placebo as treatment for parkinson's disease in patients with motor response complications on levodopa therapy	Dr. Asha Kishore	Quintile Spectral
30.	Molecular basis for plumbagin as an anti tumor and chemosensitizing agent in human breast cancer cells	Dr. G. Srinivas	DST
31.	Mechanisms of Anticancer Activity of Emodin /Asle Emodin: Effects on Cell Growth, Angiogenesis and Metastasis in Human Colon Cancer Cells	Dr. G. Srinivas	DAE, BRNS
32.	A 24-week, multi-center, randomized, double-blind, placebo-controlled evaluation of the efficacy, safety and tolerability of donepezil hydrochloride(E2020) in patients with dementia associated with cerebrovascular disease	Dr. P. S. Mathuranath	Sreenath Clinical
33.	Assessing feasibility of setting up a population- based stroke registry in a defined population: The Trivandrum stroke registry	Dr. K. Radhakrishnan	WHO
34.	Modulation of high glucose induced monocyte chemo attractant protein-1 (MCP) gene expression in aortic endothelial cells	Dr. C. C. Kartha	KSCSTE
35.	Adult human resident cardiac stem cells and endothelial progenitor cells: detection of 1 optimum conditions for their therapeutic use	Dr. C. C. Kartha	DBT

## SCIENTIFIC PUBLICATIONS

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### ACHUTHA MENON CENTRE FOR HEALTH SCIENCE STUDIES

Jayakrishnan R, Sarma PS, Thankappan KR. Prevalence of Periodontal Disease among Adults in Trivandrum District, Kerala, India. *Malaysian Dental Journal* 2005; 26: 97-104.

Mohan S, Pradeepkumar AS, Thresia CU, Thankappan KR, Poston WSC, Haddock CK, *et al.* Tobacco use among medical professionals in Kerala, India: The need for enhanced tobacco cessation and control efforts. *Addictive Behaviors* 2006; 31: 2313-318.

Pandian JD, Santhosh D, Kumar TS, Sarma PS, Radhakrishnan K. High School Students' Knowledge, attitude and practice with respect to epilepsy in Kerala, Southern India. *Epilepsy Behav* 2006; 9:492-97.

Ramanathan M, Krishnan S, Bhan A. Reporting on the First National Bioethics Conference. *Indian Journal of Medical Ethics* 2006; 3: 27-30.

Sudha S, Suchindran C, Mutran EJ, Rajan SI, Sarma PS. Marital Status, Family Ties and Self Rated Health Among Elders in South India. *J Cross Cult Gerentol* 2006; 21: 103-110.

Thankappan KR, Sivasankaran S, Khader SA, Padmanabhan PG, Sarma PS, Mini GK, *et al.* Prevalence, Correlates, Awareness, Treatment and Control of Hypertension in Kumarakom, Kerala: Baseline Results of a Community –Based Intervention Program. *Indian Heart J* 2006; 58: 28-33.

Thekkuveetil A, Ramanathan M, Menon GR, Cash RA. Ethical issues in the Development and Use of Biotechnology for Health Care in Developing Countries. *APBN Bioethics* 2006; 10: 1140-143.

Tobgay KJ, Sankara Sarma P, Thankappan KR. Predictors of treatment delays for tuberculosis in Sikkim. *National Medical Journal of India* 2006; 19: 60-3.



## Books

Batista R, Berger M, Devlin M, Haan SD, Djamalova M, Ijsselmuiden C, Iskhakova Z, Khan K, Loff B, Nyamai-Kisia C, Vincent R, Whyte SR, Rusike I, Silva E, Thankappan KR, Varshney V. Can communities influence national health research agendas? A learning process leading to a framework for community engagement in shaping health research policy. Council on Health Research for Development (COHRED), Geneva 2006 (ISBN: 92-9226-005-7).

Ravindran TKS. Gender and rights in maternal and reproductive health: A training manual for health managers. Manila, World Health Organization Western Pacific Region, 2006.

Ravindran TKS Module on Aging. In Integrating poverty and gender in health programmes: A source book for health professionals. Manila, World Health Organization Western Pacific Region, 2006.

## BIOMEDICAL TECHNOLOGY WING

Abraham EK, Ramesh P, Joseph R. Determination of zinc diethyldithiocarbamate released into artificial sweat from natural rubber latex vulcanizates. *J. Chromatographic Sci.* 2007; 45:1-5.

Abraham EK, Ramesh P, Joseph R. Release of dithiocarbamates into artificial sweat from latex vulcanizates: effect of accelerator type and storage time. *Journal of Applied Polymer Science* 2006; 102: 2055-61.

Anil Kumar PR, Varma HK, Kumary TV. Cell patch seeding and functional analysis of cellularized scaffolds for tissue engineering. *Biomed Mater* 2007; 2: 48-54.

Asha SM, Sreenivasan K, Mohan PV, Kumari TV, Mohanty M. Polyurethane Degradation in the biological Milieu. *Trend in Biomaterials & Artificial Organs* 2006; 19: 115-21.

Balakrishnan B, Mohanty M, Fernandez AC, Mohanan PV, Jayakrishnan A. Evaluation of the effect of incorporation of dibutyl cyclic adenosine monophosphate in an in situ-forming hydrogel wound dressing based on oxidized alginate and gelatine. *Biomaterials* 2006, 27:1355-61.

Breen A, Strappe P, Anilkumar, O' Brien T, Pandit A. Optimisation of a Fibrin Scaffold for Sustained Release of an Adenoviral Gene Vector. *Journal of Biomaterials Research* 2006; 78 :702-08.

Brody S, Anilkumar TV, Liliensiek S, Last JA, Murphy CJ, Pandit A. Characterizing Nanoscale Topography of the Aortic Heart Valve Basement Membrane for Tissue Engineering Heart Valve Scaffold Design. *Tissue Engineering* 2006; 12: 413-21.

Fernandez AC, Mohanty M, Varma HK, Manoj Komath. Safety and efficacy of Chitra-CPC calcium phosphate cement as bone substitute. *Current Science* 2006; 91:1678-86.

Harikrishnan VS, Shenoy SJ, Umashankar PR. Anesthetic regimen for coronary stenting in porcine model *Indian Veterinary Journal* 2006; 83: 486-89.

Harikrishnan VS, Umashankar PR. Long duration anaesthesia for experimental surgical procedures in pigs. *Indian Veterinary Journal* 2006: 1173-5.

Joseph R, Martyn MT, Tanner KE, Coates PD. Interfacial stick-slip transition in hydroxyapatite filled high-density polyethylene composite. *Bulletin of Materials Science* 2006; 29: 85-9.

- Kaladhar K, Sharma CP. Cell mimetic lateral stabilization of outer cell mimetic bilayer on polymer surfaces by peptide bonding and their blood compatibility. *J Biomed Mater Res A* 2006; 79: 23-35.
- Mathai J, Resmi KR, Sulochana PV, Sathyabhama S, Saritha B, Krishnan LK. Suitability of measurement of swirling as a marker of platelet shape change in concentrates stored for platelet transfusion. *Platelets* 2006; 17: 393-96.
- Mathews S, Kaladhar K, Sharma CP. Cell mimetic monolayer supported chitosan-haemocompatibility studies. *J Biomed Mater Res A* 2006; 79: 147-52.
- Muraleedharan CV, Bhuvaneshwar GS. Titanium Alloys in implant applications. *Metals Materials and Processes* 2006;18: 441-50.
- Nishi KK, Antony M, Jayakrishnan A. Synthesis and evaluation of ampicillin – conjugated gum arabic microspheres for sustained release. *J. Pharm. Pharmaco* 2007; 59:485-93.
- Nishi KK, Antony M, Mohan PV, Anilkumar TV, Loiseau PM, Jayakrishnan A. Amphotericin B-gum arabic conjugates: synthesis, toxicity, bioavailability and activities against leishmania and fungi. *Pharm Res* 2007; 24:971-80.
- Nishi KK, Jayakrishnan A. Self-gelling primaquine-gum arabic conjugate: An injectable controlled delivery system for primaquine. *Biomacromolecules* 2007; 8: 84-90.
- Paul W, Sharma CP. Nanoceramic Matrices: Biomedical Applications. *American Journal of Biochemistry and Biotechnology* 2006; 2: 41-8.
- Prasad CK, Jayakumar K, Krishnan K. Phenotype Gradation of Human Saphenous Vein Endothelial Cell (HSVEC) from Cardiovascular Disease Subjects. *Endothelium* 2006; 13: 341-52.
- Prasad CK, Muraleedharan CV, Krishnan L. Bio-mimetic Composite Matrix that Promotes Endothelial Cell Growth for Modification of Biomaterial Surface. *J Biomed Mater Res A* 2007; 80:644-54.
- Radhakumary C, Nair PD, Mathew S, Reghunadhan Nair CP. HEMA grafted chitosan for dialysis membrane applications. *Journal of Applied Polymer Sciences* 2006; 101: 2960-966.
- Radhakumary C, Nair PD, Mathew S, Reghunadhan Nair CP. Synthesis, characterization and properties of poly (vinyl acetate) and poly (vinyl alcohol) grafted chitosan. *Journal of Applied Polymer Sciences* 2007; 104: 1852-859.
- Rekha MR, Sharma CP. Pullulan as a promising biomaterial for biomedical applications: A perspective. *Trends Biomater Artif Organs* 2007; 20: 116-21.
- Sailaja GS, Kumary TV, Yokogawa Y, Varma HK. In vitro mineralization and cell adhesion on surface modified poly (2-hydroxy ethyl methacrylate-co-methyl methacrylate). *Key Engineering Materials* 2006; 309: 493-96.
- Sailaja GS, Ramesh P, Kumary TV, Varma HK. HOS Cell Adhesion Behaviour on Hydroxyapatite Integrated Chitosan-Poly (acrylic acid) Polyelectrolyte Complex. *Acta Biomaterialia* 2006; 2: 651-57.
- Sailaja GS, Ramesh P, Varma HK. Swelling behavior of hydroxyapatite-filled chitosan-poly (acrylic acid) polyelectrolyte complexes. *Journal of Applied Polymer Science* 2006; 100: 4716-22.
- Sajeesh S, Sharma CP. Cyclodextrin-insulin complex encapsulated polymethacrylic acid based

nanoparticles for oral insulin delivery. *International Journal of Pharmaceutics* 2006; 325:147-54.

Sajeesh S, Sharma CP. Interpolymer complex microparticles based on polymethacrylic acid - chitosan for oral insulin delivery. *Journal of Applied Polymer Science* 2006; 99: 506-12.

Sajeesh S, Sharma CP. Novel pH responsive Polymethacrylic acid-Chitosan-Polyethylene glycol nanoparticles for oral peptide delivery. *Journal of Biomedical Materials Research: Applied Biomaterials* 2006; 76: 298-305.

Sreenivasan K. Detection of creatinine enriched on a surface imprinted PS film using FT-ATR-IR. *J Mole Recogn* 2006; 19: 408-12.

Sreenivasan K. Identification of salicylic acid using surface modified polyurethane film using an imprinted layer of Polyaniline. *Analytica Chimica Acta* 2007; 583: 284-88.

Sreenivasan K. Surface imprinted polyurethane film as a chiral discriminator *Talanta* 2006; 68:1037.

Sreerexha PR, Divya P, Krishnan LK. Adult Stem Cell Homing and Differentiation in vitro on Composite Fibrin Matrix. *Cell Proliferation* 2006; 36:301-12.

Sunny MC, Ramesh P, George KE. Effect of partial replacement of DEHP, by a polymeric plasticizer, on the permeability and leaching properties of polyvinyl chloride. *Journal of Applied Polymer Science* 2006;102: 4720-727.

Thekkuveetil A, Ramanathan M, Menon GR, Cash R. Ethical issues in the development and use of biotechnology for health care in developing countries. *Asia Pacific Biotech* 2006; 10:1140-143.

Thekkuveetil A. Where is the girl in all the decision making? *Indian J Med Ethics* 2006; 3: 71.

Yamamoto HA, Mohanan PV. A possible mechanism of reactive oxygen species induced brain mitochondrial DNA damage and seizures. *Current Topics in Toxicology* 2005; 2: 67-75.

## Books

PV. Mohanan (ed). Good Laboratory Practice and Regulatory issues. Educational Book Centre, Mumbai, India, 2006.

## HOSPITAL WING

Adiga IK, Nair RR. A positive association between cardiomyocyte volume and serum malondialdehyde levels. *Int J Cardiol* 2007; 115: 246-48.

Aggarwal NR, Krishnamoorthy T, Devasia B, Menon G, Chandrasekhar K. Variant origin of superior thyroid artery, occipital artery and ascending pharyngeal artery from a common trunk from the cervical segment of internal carotid artery. *Surgical and Radiological Anatomy* 2006; 28: 650-53.

Ashalatha R, Radhakrishnan K, Radhakrishnan VV, Mary PR, Kesavadas C, Alexander A, et al. Corpora amylacea in mesial temporal lobe epilepsy: clinico-pathological correlations. *Epilepsy Research* 2007; 74: 81-90.

Bodhey NK, Gupta AK, Krishnamoorthy T, Bhattacharya RN, Thomas B, Radhakrishnan VV. Osteoclastoma of the Sphenoid Sinus: CT and MR Findings. *Rivista di Neuroradiologia* 2006; 19: 257.

Bodhey NK, Gupta AK, Krishnamoorthy T, Bhattacharya RN, Thomas B, Radhakrishnan VV. Osteoclastoma of the Sphenoid sinus: CT and MR findings. *Rivista di Neuroradiologia* 2006; 19: 257-61.

- Bodhey NK, Gupta AK, Sreedhar R, Manohar SR. Retroperitoneal hematoma: an unusual complication after femoral vein cannulation. *J Cardiothorac Vasc Anesth* 2006; 20: 859-61.
- Bodhey NK, Gupta AK, Unnikrishnan M. Demonstration of entrapment in a totally occluded popliteal artery - a case report. *Indian Journal of Radiology & Imaging* 2006; 16 : 59-61.
- Bodhey NK, Gupta AK. Neurofibromatosis Type I with Occipital Encephalocele. *Neurology India* 2006; 54: 103-04.
- Bodhey NK, Purkayastha S, Gupta AK, Radhakrisanan VV. Globlastoma multiforme in the pineal region – a case report. *Rivista di Neuroradiologia* 2006; 19: 229-31.
- Bodhey NK, Purkayastha S, Gupta AK, Somasunderam S. Intracranial changes secondary to prolonged phenytoin therapy. *Rivista di Neuroradiologia* 2006; 19:211-15.
- BodheyNK, Bohora S, Namboodiri KK, Krishnamoorthy KM. Images in cardiology. Thrombus at the junction of the inferior vena cava and right atrium: a contraindication for transfemoral percutaneous mitral commissurotomy. *Heart* 2006; 92: 694.
- Chellan B, Appukuttan PS, Jayakumari N. J. Electroelution of Lipoprotein (a) [Lp (a)] from native polysaccharide gels: a new simple method to purify Lp(a). *Biochem Biophys Methods*.
- Cherian A, Kuruvilla A. Electrodiagnostic approach to carpal tunnel syndrome. *Ann Indian Acad Neurol* 2006; 9: 177-82.
- Divatia R, Khan F, Kishore A. Co-occurrence of radiological features of progressive supranuclear palsy and corticobasal degeneration. *Neurology India* 2007; 55:75-7.
- Dora SK, Namboodiri N, Valaparambil AK, Tharakan JA. Induction of atrioventricular nodal reentry tachycardia with intravenous adenosine. *Singapore Med J* 2007; 48:e130-32.
- Dora SK, Tharakan JA, Valaparambil A, Namboodiri N, Nair K, Peter T. Spontaneous automaticity of an atriofascicular accessory pathway. *Europace* 2006; 8:140-43.
- Geetha M, Annamma KI, Mathai J, Appukuttan PS. Normal human plasma anti-b-glucoside antibody has markedly elevated IgA content and binds fungal and yeast polysaccharides. *Immunological investigations* 2007; 36: 73-4.
- Girish M, Nair S, Muthurethinam T, Krishnakumar K, Bhattacharya RN. Medulloblastoma in children – prognostic factors and predictors of outcome. *Journal of Pediatric Neurosciences* 2006; 1: 16-20.
- Gupta AK, Bodhey NK, Jayasree RS, Kapilamoorthy TR, Kesavadas C, Krishnamoorthy T, et al. Percutaneous laser disc decompression: clinical experience at SCTIMST and long term follow up. *Neurol India* 2006; 54: 164-67.
- Gupta AK, Purkayastha S, Bhattacharya RN, Bodhey NK. Endovascular treatment of ruptured intracranial aneurysms: immediate result and long term follow up. *J Neuroradiol* 2006; 33: 272-74.
- Gupta AK, Purkayastha S, Kapilamoorthy TR, Bodhey NK, Sarma SR. Management of Painful Neoplastic Spinal lesions using Percutaneous Acrylic Cement Injection. *Rivista di Neuroradiologia* 2006; 19: 236-44.
- Gupta AK, Purkayastha S, Kapilamoorthy TR, Krishnamurthy T, Bodhy NK, Thomas B, et al. Carotid Artery Angioplasty and Stenting in symptomatic

- patients – long term follow up. *Neurology India* 2006;56; 68-72.
- Gupta AK, Purkayastha S, Krishnamoorthy T, Bodhey NK, Kapilamoorthy TR, Kesavadas C, *et al.* Endovascular treatment of direct carotid cavernous fistulae: a pictorial review. *Neuroradiology* 2006; 48: 831-39.
- Gupta AK, Rao VR, Varma DR, Kapilamoorthy TR, Kesavadas C, Krishnamoorthy T, *et al.* Evaluation, management, and long-term follow up of vein of Galen malformations. *J Neurosurg* 2006; 105: 26-33.
- Gupta AK, Sonwalkar HA, Purkayastha S, Krishnamoorthy T, Bodhey NK, Kapilamoorthy T *et al.* Endovascular Treatment of Intracranial Aneurysms: Long-Term Follow-up. *The Neuroradiology Journal* 2006; 19: 339.
- Harikrishnan S, Rajeev E, Tharakan JA, Thomas T, Ajith K, Sivasankaran S, *et al.* Acute phase reactants predict mitral regurgitation following mitral valvuloplasty. *Int J Cardiol* 2006; 112:127-29.
- Jacob A, Sarada C, Thomas SV. Painless injuries in a child: Hereditary sensory and autonomic neuropathy. *Annals of Indian Academy of Neurology* 2006; 9: 39- 41.
- Jawahar SK. Health Care Scenario India. *European Journal of ICU Management* 2007; 6: 36-7.
- Kaur S, Kartha CC. Prospects of Biotechnology in Cardiology. *Biotech News* 2006; 1:6-8.
- Kishore A, Espay AE, Marras C, Al-Khairalla T, Arenovich T, Asante A, *et al.* Unilateral vs. bilateral tasks in early asymmetric Parkinson's disease: differential effects on bradykinesia. *Mov Disord* 2007; 22:328-33.
- Koshy T, Sinha PK, Vijayakumar A, Dash PK, Unnikrishnan KP. An unusual cause of high airway pressure and inadequate ventilation because of a defective connector despite accurate placement of a double-lumen tube. *J Cardiothorac Vasc Anesth* 2006; 20: 627-30.
- Koshy T, Sinha PK, Vijayakumar A. Another Defect in Right Angle Double Connector Resulting High Peak Inspiratory Pressure During One Lung Anesthesia: A Simple and Practical Approach for Rapid Detection. *Anesth Analg* 2006; 103: 1057-578.
- Koshy T. Hypoxia during one lung ventilation-strategies to control. *Sri Lanka J of Anaesthesiol* 2006; 14: 85-92.
- Krishnamoorthy KM, Tharakan JA, Titus T, Ajithkumar VK, Sivasankaran S, Harikrishnan SP, *et al.* Is transthoracic echocardiography sufficient to identify left atrial thrombus? *Am J Cardiol* 2006; 98: 1120.
- Krishnan S, Mathuranath PS, Sarma S, Kishore A. Neuropsychological functions in Progressive supranuclear palsy, multiple system atrophy and Parkinson's disease. *Neurology India* 2006; 54: 268-72.
- Krishnan S, Mathuranath PS, Sarma S, Kishore A. Neuropsychological functions in progressive supranuclear palsy, multiple system atrophy and Parkinson's disease. *Neurology India* 2006; 54: 268-72.
- Kuruville A. (Book Review): Clinical Neurophysiology. Eds.U.K.Misra, J.Kalita. 2<sup>nd</sup> Edn, 2006. *Ann Indian Acad Neurol* 2007; 10:63.
- Kuruville L, Kartha CC. Cerium depresses endocardial endothelial cell-mediated proliferation of cardiac fibroblasts. *Biol Trace Elem Res* 2006; 114:85-92.
- Kuruville L, Nair RR, Umashankar PR, Lal AV, Kartha CC. Endocardial endothelial cells stimulate proliferation and collagen synthesis of cardiac fibroblasts. *Cell Biochem Biophys* 2007; 47:65-72.

- Kuruvilla L, Santhosh Kumar TR, Kartha CC. Immortalization and characterization of porcine ventricular endocardial endothelial cells. *Endothelium* 2007; 14:35-43.
- Mathai J, Resmi KR, Sulochana PV, Sathyabhama S, Baby Saritha G, Lissy Krishnan. Suitability of measurement of swirling as a marker of platelet shape change in concentrates stored for transfusion. *Platelets* 2006; 17: 393-96.
- Mathai J. Strategies of HIV testing in Malayalam in Nammude Arogyam. IMA Publication. 2006; 12:26-8.
- Mathuranath PS, George A, Mathew R, Cherian PJ. Profiles of language impairment in progressive nonfluent aphasia. *Annals of Indian Academy of Neurology* 2006; 9: 25-31.
- Menon G, Cash R. Research involving medical record review - an Indian perspective. *Indian Journal of Medical Ethics* 2006; 3: 55 - 7.
- Menon G, Nair S, Krishnamoorthy T, Bhattacharya RN. Bilateral Thalamic Gliomas –report of four cases and review of literature. *Journal of Pediatric Neurosciences* 2006; 1: 66-9.
- Menon G, Nair S, Rajesh BJ, Rao BRM, Easwer HV, Mathew A, et al. Spinal subdural hematoma due to dissecting vertebral artery aneurysm rupture – a rare case presentation. *Indian Journal of Cerebrovascular Surgery* 2006; 2: 45-7.
- Nair S, Rao BRM, Menon G, Easwer HV, Rajesh BJ, Mathew A et al. Incidental intracranial aneurysm: People at risk and issues in management. *Indian Journal of Cerebrovascular Surgery* 2006; 2: 24-32.
- Namboodiri KK, Bohora S. Images in cardiology. Clenched fist appearance in endomyocardial fibrosis. *Heart* 2006; 92: 720.
- Namboodiri N, Bohora S, Tharakan JA. Carbamazepine-induced sinus nodal dysfunction. *Ann Indian Acad Neurol* 2006; 9: 36-9.
- Namboodiri N, Harikrishnan S, Tharakan JA. Single coronary artery from right aortic sinus with septal course of left anterior descending artery and left circumflex artery as continuation of right coronary artery: a hitherto unreported coronary anomaly. *J Invasive Cardiol* 2007; 19: E102-03.
- Namboodiri N, Rajeev E, Dora SK, Tharakan JA. Ebstein's anomaly, Wolff-Parkinson-White syndrome and rheumatic mitral stenosis: role for combined electrophysiological and surgical management. *Singapore Med J* 2007; 48: e133-35.
- Nayak D, Abraham M, Kesavadas C, Radhakrishnan K. Lingual epilepsia partialis continua in Rasmussen's encephalitis. *Epileptic Disorders* 2006; 8:114-17.
- Neema PK, Manikandan S, Rathod RC. Endotracheal Tube Migration following transoesophageal echocardiography probe placement in a Child. *Eur J Anaesthesiol* 2006; 23: 1060-61.
- Neema PK, Manikandan S, Rathod RC. Implications of Intraoperative Transesophageal Echocardiography Detection of Ruptured Sinus of Valsalva in a Patient with Severe Aortic Regurgitation Undergoing Aortic Valve Replacement. *J Cardiothorac Vasc Anesth* 2006; 20: 847-49.
- Neema PK, Manikandan S, Rathod RC. Severe Hypotension And Overflowing Of Venous Reservoir At The Initiation Of Cardiopulmonary Bypass In A Patient Undergoing Repair Of Ruptured Sinus Of Valsalva Aneurysm: Management issues. *Interactive Cardio Vascular Thoracic Surgery* 2006; 5: 448-50.

- Neema PK, Rajnish Duara, Manikandan S, Rathod RC. Total Anomalous Pulmonary Venous Connection In A Patient With Situs Inversus Dextrocardia: Which Internal Jugular Vein To Cannulate Right Or Left? *J Cardiothorac Vasc Anesth* 2006; 20: 632-3.
- Neema PK, Rao S, Manikandan S, Rathod RC. Complications of unrecognized urinary bladder distension. *Anesth Analg* 2007; 104:226-7.
- Neema PK, Sethuraman M, Rathod RC. A simple technique to secure the endotracheal tube over an intubating fibrescope. *Can J Anaesth* 2007; 54: 159-60.
- Neema PK, Varma PK, Sinha PK, Rathod RC. Hypertrophic Obstructive Cardiomyopathy with Severe Mitral Stenosis and Coronary Artery Fistula. *J Cardiothorac Vasc Anesth* 2006; 20: 594-604.
- Pendarkar H, Krishnamoorthy T, Purkayastha S, Gupta AK. Pyogenic cerebral abscess with discharging sinus complicating an embolized arteriovenous malformation. *Journal of Neuroradiology* 2006; 33: 133-38.
- Pendharkar H, Kesavadas C, Thomas B. Occipital Cephalocele With Brain Stem Herniation. *Internet Journal of Paediatrics and Neonatology* 2007; 6: 2.
- Purkayastha S, Bodhey NK, Gupta AK. Massive cysticercal infestation involving brain, orbit and skeletal muscles – a case report. *Revista di Neuroradiologia* 2006; 19: 129-33.
- Purkayastha S, Gupta AK, Kapilamoorthy TR, Kesavadas C, Thomas B, Krishnamoorthy T, et al. Uncommon Variations and Anomalies of Craniocervical Arteries. A pictorial Essay. *Rivista di Neuroradiologia* 2006; 19:193-204.
- Purkayastha S, Gupta AK, Krishnamoorthy T, Bodhey NK. Endovascular treatment of ruptured posterior circulation dissecting aneurysms. *J Neuroradiol* 2006; 33: 329-37.
- Purkayastha S, Gupta AK, Varma DR., Bodhey NK, Vattoth S. Absence of Left Common Carotid Artery With Cervical Origin Of Right Subclavian Artery. *Am J Neuroradiol* 2006; 27: 708-11.
- Purkayastha S, Jayadevan ER, Kapilamoorthy TR, Gupta AK. Suction thrombectomy of thrombotic occlusion of subclavian artery in a case of Takayasu's arteritis - a case report. *CVIR* 2006; 29: 289-93.
- Radhakrishnan A, Abraham M, Radhakrishnan VV, Sarma SP, Radhakrishnan K. Medically refractory epilepsy associated with temporal lobe ganglioglioma: Characteristics and postoperative outcome. *Clin Neurology and Neurosurgery* 2006; 108: 648-54.
- Raghavendra S, Krishnamoorthy T, Ashalatha R, Nayak SD, Radhakrishnan K. Hemimegalencephalic appearance of normal hemisphere in unilateral heterotopia and absent corpus callosum. *Epilepsy Behav* 2006; 9:363-66.
- Raghavendra S, Nair MD, Chemmanam T, Krishnamoorthy T, Radhakrishnan VV, Kuruville A. Disseminated necrotising leukoencephalopathy following low –dose oral methotrexate. *European J Neurology* 2007; 14:309-14.
- Raghavendra, S, Ashalatha R, Krishnamoorthy T, Kesavadas C, Thomas SV, Radhakrishnan K. Reversible periictal MRI abnormalities: Clinical correlates and long-term outcome in 12 patients. *Epilepsy Research* 2007; 73: 129-36.
- Rajesh BJ, Bhattacharya RN, Easwer HV, Nair S, Menon G, Rao BRM, et al. Posterior inferior cerebellar

- artery aneurysms: Technical aspects and outcome. *Indian Journal of Cerebrovascular Surgery* 2006; 2:10-16.
- Rajesh B, Jayachandran D, Mohandas G, Radhakrishnan K. A pilot study of a Yoga meditation protocol for patients with medically refractory epilepsy. *J Altern Complement Med* 2006; 12: 367-71.
- Robert M, Mathuranath PS. Tau and tauopathies. *Neurology India* 2007; 55:11-16.
- Saramma PP, Thomas SV, Sarma PS. Child rearing issues for mothers with epilepsy: A case control study. *Annals of Indian Academy of Neurology* 2006; 9: 158-62.
- Sandhyamani S, V. Balakrishnan, Harishkumar S. Sudhindran AG, Unnikrishnan. Role of dietary factors in the etiology of fibrocalculous pancreatic disease and diabetes. *Chronic pancreatitis and diabetes in* 2006; 315-35.
- Saramma PP, Thomas SV. Parenting issues of mothers with epilepsy: A case study. *The Nursing Journal of India* 2007; 138: 50-3.
- Saramma PP. Innovations in in-service education. *The Journal of Nursing research* 2006; 1: 5-9.
- Sinha PK, Neema PK, Unnikrishnan KP, Varma PK, Jay Kumar K, Rathod RC. Effect of lung ventilation with 50% oxygen in air or nitrous oxide versus 100% oxygen on oxygenation index after cardiopulmonary. *J Cardiothorac Vasc Anesth* 2006; 20: 136-42.
- Sinha PK, Suneel PR, Unnikrishnan KP, Smitha V, Rathod RC. An alternative site for entropy sensor placement. *Anesth Analg* 2006; 102: 1291.
- Sinha PK, Suneel PR, Unnikrishnan KP, Smitha V, Rathod RC. An alternative site for entropy sensor placement. *Anesth Analg* 2006; 102: 1291.
- Sinha PK, Suneel PR, Unnikrishnan KP. Possible explanation of why blue blushed. *J Cardiothorac Vasc Anesth* 2006; 20: 471-2.
- Sivasankaran S, Harikrishnan S, Narayanan N, Jaganmohan T. Laceration of atrial septum during balloon sizing of atrial septal defect. *Eur J Echocardiogr* 2007; 8: 89-90.
- Sivasankaran S, Thankappan KR. Beta cell protection and metabolic syndrome. *Indian J Med Res* 2007; 125: 184-5.
- Sriganesh K, Sinha PK, Koshy T, Rao S. Von hippel lindau syndrome and anaesthetic considerations. *Indian J Anaesth* 2006; 50: 472-5.
- Thomas B, Kesavadas C. An unusual case of pulsatile tinnitus and deafness. *Neurology* 2007; 68: 303.
- Thomas B, Krishnamoorthy T, Kesavadas C, Gupta AK. Every contact leaves a trace —Imaging features in a rare case of isolated complete oculomotor nerve palsy following penetrating injury. *European Journal of Radiology* 2006; 60:1-4.
- Thomas SV, Deetha TD, Nair P, Sarma SP. Fewer women receive tertiary care for epilepsy in Kerala State, India. *Epileptic Disord* 2006; 8:184-9.
- Truelsen T, Heuschmann P, Bonita R, Arjundas G, Dalal P, Damasceno A, et al. Standard method for developing stroke registers in low-income and middle-income countries: experiences from a feasibility study of a stepwise approach to stroke surveillance (STEPS Stroke). *Lancet Neurol* 2007; 6: 134-9.
- Unnikrishnan KP, Sinha PK, Rao S. Mandibular dislocation from yawning during induction of anesthesia. *Can J Anaesth* 2006; 53: 1164-5.
- Varkey B, Sarada C. Clinical features and outcome of Acute Disseminated Encephalomyelitis (ADEM): An



outlook from South India. *Annals of Indian Academy of Neurology* 2006; 9: 20 – 4.

Varma NP, Sylaja PN, George L, Sankara Sarma P, Radhakrishnan K. Employment concerns of people with epilepsy in Kerala, South India. *Epilepsy and Behav* 2007; 10: 250-4.

Varma PK, Neema PK. In reply to Emergency Surgery after Percutaneous Transcatheter Commissurotomy: Operative findings and its comparison with Echocardiography, Mechanism of Complications and Outcome. *J Thorac Cardiovasc Surg* 2006; 131: 927-8.

Varma PK, Padmakumar R, Harikrishnan S, Koshy T, Neelakandhan KS. Holt-oram syndrome with

hemiazygous continuation of inferior vena cava. *Asian Cardiovasc Thorac Ann* 2006; 14: 161-3.

Varma.N.P, Sylaja.P.N, George.L, Sarma.P.S, Radhakrishnan.K. Employment concerns of people with epilepsy in Kerala, South India. *Epilepsy & Behaviour* 2007;10: 250–54.

Vidya MV, Krishnamoorthy T, Kuruville A. Kearns-Sayre syndrome. *Ann Indian Acad Neurol* 2006; 9: 249-50.

### Chapters in books

Nair S, Menon G. Spinal intramedullary glial tumors. In *Minimally Invasive Neurosurgery and Multidisciplinary Neurotraumatology*. Kanno T & Kato Y ed. Springer-Verlag, Tokyo: 2006: 36-46

## HONOURS, AWARDS AND RECOGNITIONS

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Dr T. V. Anilkumar won the Dr. PPGupta Oration Award for outstanding contribution Veterinary Pathology (Indian Association of Veterinary Pathologists).

Dr T. V. Anilkumar was selected as a member of the National Academy of Sciences-India (Allahabad)

Mr. P.R. Anil Kumar won Bajpai-Saha best paper award in the International conference on Design of Biomaterials (BIND-06), held at IIT-Kanpur, India during December 8 – 11, 2006.

Ms Y. Anie, PhD student was the recipient of S S Misra Award instituted by National Academy of Medical Sciences, New Delhi in December 2006 for her work entitled 'Diagnostic approaches in Pleural effusion'.

Dr. Asha Kishore was elected as Executive committee member of the Travancore-Kochi Medical Council

Dr. GS. Bhuvaneshwar, DS. Nagesh, CV. Muraleedharan and Dr. R Sankarkumar received the Meritorious Invention Award (2006) from National Research and Development Corporation, New Delhi for the development of Membrane Oxygenator.

Dr. H V. Easwer won the best paper award for the paper titled "Cosmetic and radiological outcome following the use of hydroxy apatite porous dense bilayer burr hole buttons at the annual conference of the Kerala chapter of the Neurological Society of India at Allepey in 31<sup>st</sup> March 2007.

Mrs. Josna Joseph was awarded the national Jawaharlal Nehru Memorial Fund Scholarship for doctoral Studies to be undertaken at the National University of Singapore, Singapore from September to December, 2007.

Dr. S. K. Jawahar was certified to be an NABH (National Accreditation Board for Hospitals) assessor for Hospitals.

Dr. A. Jayakrishnan was invited by the Indian Academy of Sciences, Bangalore to be a member of the Sectional Committee on "Engineering and Technology" for the year 2007.

Mr. Kaladhar was selected for Senior Research Fellowship of Council for Scientific and Industrial Research (2006) based on project entitled "Drug delivery fortissue engineering of In vivo nerve regeneration in presence of platelet rich plasma".

CC. Kartha was elected as a Member of the Council of Indian Academy of Sciences.

CC. Kartha was nominated as a Member of the Research Advisory Committee for Department of Biotechnology, Indian Institute of Technology, Madras.

CC. Kartha was nominated as a Member of the Department of Biotechnology Task Force on Bioengineering.

Lynda Velutheral Thomas and Prabha D Nair won the best poster award for their presentation titled "A Novel Biomimetic and Biodegradable scaffold For Tissue Engineering of Small Diameter Vascular Grafts" at the INDO-US Workshop on Cardiovascular Prosthetic Devices: In vitro Studies to clinical Implantation, held during 1<sup>st</sup> – 3<sup>rd</sup> February, 2007 at SCTIMST, Thiruvananthapuram.

Dr. K. Mohandas, was nominated by the DST as a member of the Selection Committee for the programme "DST Awards for participation in the Meeting of the Nobel Laureates and Students at Landau, Germany" (February 2007).

Dr. K. Mohandas was nominated as a Member of the Scientific Advisory Board of the International Institute of Biotechnology and Toxicology, Kancheepuram, Tamil Nadu (July 2006)

Dr. K. Mohandas, was nominated as a member of the Committee to study and give a report on the functioning of the five Government Medical Colleges and allied Institutions and recommend various measures to improve their performance and standards (December 2006) by Govt. of Kerala.

Dr. K. Mohandas was nominated by ICMR as a Member of the expert committee to evaluate recommendations on In-house schemes for "Medical

Innovation Fund" for the acceleration of medical innovations (June 2006).

Dr. Mohandas was appointed as a member of the Cadre Review Committee of the Christian Medical College, Vellore (July 2006).

Ms. Manitha B.Nair won the Young Scientist Award - 2007 awarded at Kerala Science Congress, Kannur for the Paper "A novel interconnected porous bioactive ceramic as bone substitute for orthopaedic applications".

Manitha B. Nair, Anne Bernhardt, H. K. Varma, Michael Gelinsky and Annie John won the Best Poster award in Life Sciences at the National Conference on Electron Microscopy and XXVIII Annual Meeting of EMSI for the poster "Bone constructs from a combination of cells and novel ceramics – Scanning Electron Microscopy Study.

Manitha B. Nair, Anne Bernhardt, H. K. Varma, Michael Gelinsky and Annie John won the best photomicrograph award in Life Sciences at the National Conference on Electron Microscopy and XXVIII Annual Meeting of EMSI, held during April 19-21, 2006.

Dr. P.V. Mohanan was elected as the new Secretary-General of the Society of Toxicology India (2006-2007).

Dr. P.V. Mohanan was nominated as the team member of the GLP Inspectors by the National GLP Compliance Monitoring Authority, DST, New Delhi for the GLP Pre, final and surveillance inspection of SGS India Pvt Ltd., Chennai, Jai Research Foundation, Gujrat, International Institute for Biotechnolgy and Toxicology, Chennai, Orchid Phamaceuticals, Chennai and Reliance Life Science, Mumbai.

Dr. Prabha D. Nair won the ISSCR travel award 2006 for the presentation "A Novel Bioresorbable Material

Scaffold With implications for Vascular Tissue Engineering with Stem Cells”, at 4<sup>th</sup> ISSCR Annual Meeting, June 29<sup>th</sup> – July 1<sup>st</sup>, 2006 at Toronto, Canada.

G.S.Sailaja, P.Ramesh, T.VKumary, K.Sreenivasan and H.K.Varma won the second prize for the poster for “In vitro mineralised calium phosphate on surface functionalised poymer substrate- ultra structural and cell adhesion study” presented in the BITE&RM 2007 (INDO-Australian Conference) held at SCTIMST during 9-12<sup>th</sup> January 2007.

Mr. Sajeesh was selected for Lady Tata Memorial Scholarship (Senior Scholarship-Science) by Lady Tata Memorial Trust, Mumbai in the year 2006-07.

Dr. P.K. Sinha got Bhogaraj award during annual conference of ISA- at Mysore from 26-30<sup>th</sup> Dec.2006.

Mrs. S. Sudhamaniamma Deputy Nursing Department received from TNAI the ‘Best Nurse’ award.

Dr. Sundari Ravindran was a WHO Consultant and resource person for the WHO Meeting on “*Integrating Gender into the Curricula for Health Professionals*”, 4-6 December 2006, World Health Organization, Geneva, Switzerland, member of the ‘Women and Gender Equity’ Knowledge Network of the WHO Commission on Social Determinants of Health, external reviewer of the Masters in Public Health Programme of the School of Public Health, University of Witwatersrand, Johannesburg, South Africa, consultant for the School of Public Health, University of Witwatersrand, Johannesburg, to run a Short Course/MPH-MSc Module on *Health Sector Reform and Sexual and Reproductive Health*, 19-23 June, 2006, consultant for Asia-Pacific Research and Resource Centre for Women (ARROW), Malaysia, to run a South-East Asia Regional Workshop for Health

Managers and Human Rights Commissioners on *Health Sector Reform and Sexual and Reproductive Health*, 18-20 August 2006, Jakarta, Indonesia, chair person, Coalition for maternal-neonatal health and safe abortion, India (starting February 2007), member, Editorial Advisory Board, *Reproductive Health Matters*, London and member, Scientific Committee, Fourth Asia-Pacific Conference on Sexual and Reproductive Health and Rights (to be held in India, October 2007).

Dr. N. Suresh Nair was invited as a Visiting Professor to the Department of Neurosurgery of All India Institute for Medical Sciences (AIIMS) in May 2006.

Faculty members of AMCHSS have worked as consultants for several international and national organizations. Dr KR Thankappan has been selected as a member of the curriculum committee of the Public Health Foundation of India and a member of the core advisory group of the editorial committee of the *Lancet* India series, which is going to be edited, by Dr K S Reddy and Dr Vikram Patel.

Dr. Thomas N Abraham won the best poster award in the International Conference on Design of Biomaterials (BIND-06), held at IIT-Kanpur during December 8 – 11, 2006.

Dr Usha Kandaswamy MSW received the Padmasree MR Kurup Endowment award for 2007 instituted by COINPAR to for her outstanding achievement in voluntary blood donations and upholding patients’s rights.

Dr. D. Varatharajan served as a short term consultant to the Thematic Working Group on Health in Asia and the Pacific of the United Nations Population Fund, Bangkok, Thailand during November-December 2006 to prepare a report on equity in access to health care in the Asia-Pacific region.

## VISITORS

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### AMCHSS

Dr. Richard A Cash, Professor, Department of Public Health, Harvard University has visited this center and gave lectures on “Introduction to Epidemiology” and “Infectious Diseases” to the MPH/DPH scholars of this center during January to March 2007.

Dr Paula Palmer of the University of Southern California visited the institute in June 2006.

### HOSPITAL

Dr. Asmahan Farahan Alshubaili (Neurologist) from Ibn Sina Hospital, Kuwait visited the Epilepsy Program from 10.03.2007 to 23.03.2007

Dr. Aongelia Nicoletta, Dept. of Neuroradiology, Scientific Institute & University, Hospital San Raffael, Milan, Italy visited the Institute.

Dr N. Choudhary, Medical Director, Prathama Blood Centre, Ahmedabad & Editor, Asian Journal of Transfusion Science had visited the division of Blood Transfusion Services and had discussions on Blood Bank related matters.

Prof. Martin Bettag, Prof and Chief of Neurosurgery, Hospital of Barmherzige Bruder Trier, Germanys visited department of Neurosurgery and conducted an neuroendoscopy workshop in September 2006

Dr. Marco Fiorelli, Dept of Neurological Sciences, University of Rome ‘La Sapeinza’ Rome, Italy visited the Institute.

Dr. Patresia Panthano, Dept of Neurological Sciences, University of Rome ‘La Sapeinza’ Rome, Italy visited the Institute.

Representatives of Common Wealth Study group visited Blood Bank.

Dr Sundar Periyavar, Head, Blood Bank, NIMHANS Bangalore visited the division of Blood Transfusion Services.

Mr. Ulf Hlobil, observer from Germany is visiting the Epilepsy Program from November 15<sup>th</sup> 2006 to 15<sup>th</sup> February 2007.

**BMT**

Prof. Yoshiyuki Yokogawa visited the Bioceramics Lab during 8<sup>th</sup> to 11<sup>th</sup> January 2007 in connection with the INDO-Japanese Collaborative Programme on Biomimetic materials for clinical applications.

Prof R.K. Rao, University of Tennessee, Memphis (USA), visited the wing during September 18-20, 2006.

Dr. K.G. Rajendran, Dr. Deepak A. Hegde, Dr. Vasant Joshi USV Ltd., Mumbai visited during August and December, 2006 related to technology transfer on “Oral delivery of Insulin” project.

Dr. Sheel Nuna, Australian Education International, New Delhi, visited the lab on Sept 20, 2006 in relation to the organising of Indo-Australian Conference, BITE& RM 2007.

Prof. Harald Renz, Chairman and Professor, Clinical Chemistry and Molecular Diagnostics, Hospital of the University, Baldingerstr, Germany visited the lab during December first week, 2006.

Prof. Vaidyanathan & Prof. Jayanthi Vaidyanathan, University of New York, USA visited the lab and held discussions.

Prof. Malcolm Alison, Professor of Stem Cell Biology, The Bart’s and London School of Medicine visited the Institute 24<sup>th</sup> and 25<sup>th</sup> January 2007.

As part of DST-DAAD Project Based Personnel Exchange Programme (PPP) entitled “Resorption and Remodelling of Novel Bioceramics” Scientists from Max Bergmann centre for Biomaterials, University of Technology, Dresden, visited the Transmission electron microscopy laboratory:

1. Dr. Anne Bernhardt - September 2006
2. Dr. Michael Gelinsky - November 2006
3. Dr. Ulla Koenig - January 2007

Prof. Dr. Matthias Epple, Chair of Inorganic Chemistry and Mr. Kathirvel Ganesan, Graduate student, University of Duisburg, Essen, Germany visited the lab from 10.02.2007 to 13.02.2007 under DST-BMBF Programme.

Dr. Saha, Advisor & Head, National GLP Compliance Monitoring Authority, New Delhi visited the division on 20<sup>th</sup> October 2006.

## VISITS ABROAD OF FACULTY MEMBERS

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Dr. TV. Anilkumar visited the laboratory of Dr. Michael Galenisk at Technical University of Dresden, Germany between 13th December and 17th December 2006.

Dr. TV. Anilkumar attended a training programme entitled 'Confocal LSM in materials research and quality inspection at Carl Zeiss Microimaging GMBH, Jena Germany on 11th and 12th December 2006.

Dr. Annie John visited Kyoto University, Japan, as part of 'FY 2006 JSPS Invitation Fellowship Program for Research in Japan (Short Term - May - July, 2006).

Dr. RN. Bhattacharya & Dr. N. Suresh Nair visited the department of Neurosurgery of the UniversitätsSpital, Zurich in June 2006.

Dr. G.S.Bhuvaneshwar & Dr. C.P.Sharma attended the 2006 Annual Meeting and Exposition of Society for Biomaterials and the Regenerate World Congress of TERMIS at Pittsburgh, Pennsylvania, USA, April 24-29, 2006. Dr. Sharma also attended the IUS-BSE meeting, Society for Biomaterials at Pittsburgh, USA during this period.

Dr. Girish Menon went for 2 month fellowship in endoscopic surgery from October to November 2006 to Hospital of Barmheilige Bruder, Trier, Germany.

Dr.M.Jayabalan visited University of Duisburg, Essen, Germany during 03.7.2006 to 02.8.2006 under DST-BMBF Programme.

Dr.A.Jayakrishnan spent a month at the Biomechanics Laboratory of Prof. Dominique Pioletti at EPFL, Switzerland as a Visiting Professor and carried out preliminary investigations on the possibility of photopolymerizable hydrogels for nucleus pulposus replacement.

Dr. Mira Mohanty visited the, Institute of Pathology, Johannes Gutenberg University in Mainz, Germany as part of a DST-DAAD Projects Based Personnel Exchange Programme in the project 'Proteomic study of cytokines and adhesion molecules expression in relation to long term clinical failure of orthopedic devices', June, 2006 (10 days).

Mr.O.S.Neelakantan Nair and V.Ramesh Babu Visited M/s. Agie Charmilles South East Asia Demo Centre at Singapore for the training on CNC wirecut machine from 29-10-2006 to 11-11-2006.

Dr. Niranjan D. Khambete visited The University of Sheffield, Sheffield, The University of Newcastle, Newcastle-upon-Tyne and University College London, all in the United Kingdom. The purpose of this visit was to develop collaborative research links with the biomedical engineering departments in these universities. He also visited Institute of Physics and Engineering in Medicine to learn about the organisations activities and role in managing the Clinical Engineering Profession in the UK.

Prabha D. Nair attended the 4<sup>th</sup> ISSCR Annual Meeting, June 29<sup>th</sup> – July 1<sup>st</sup>, 2006 at Toronto, Canada and presented the paper “A Novel Bioresorbable Material Scaffold With implications for Vascular Tissue Engineering with Stem Cells”

Dr. K. Sreenivasan visited Osaka City University under the Indo-Japan collaborative project.

Dr. H.K.Varma visited, Max Bergmann Centre for Biomaterials, Institute fur Werstoffwissenschaft, Technical University of Dresden, Germany for a period of one month from 01-11-2006 to 30-11-2006 as part of the DST-DAAD Project based Personal Exchange Programme (India – Germany Joint Research Collaboration)

Mr V. Vinodkumar attended factory training on ‘Confocal LSM in material microscopy’ held at Carl

Zeiss factory at Jena, Germany and visited confocal microscopy lab at Technical University of Dresden.

Dr. M.D.Nair Visited Università degli Studi di Roma ‘La Sapienza’, under the approved MH6 Indo-Italian Joint Research project **“Diffusion weighted Imaging & other magnetic resonance based imaging modalities in human stroke”** with Prof Marco Fiorelli University of Rome ‘La Sapienza’, Rome (June-July 2006).

Dr. M.D. Nair visited the rehabilitation facility at Nomentana Hospital, Fonte Nuova, dedicated to the care of chronic rehabilitation of stroke patients.

Dr. M.D. Nair visited the Electrophysiology lab at ‘La Sapienza’.

Dr. M.D. Nair participated in a 2 day muscle disease workshop, a satellite symposium to the International Neuro muscular diseases conference, at Padova, June 2006

Dr. N. Suresh Nair and Dr. Ravimohan Rao attended the investigators meeting for the glioma project “intratumoural delivery of AP 12009” held at Regensberg, Germany during April 2006

Dr. N. Suresh Nair and Dr. Ravi Mohan Rao attended the investigators meeting on monoclonal I131 tagged antibody treatment in malignant gliomas (COTTARA Trial) at Singapore in October 2006



## **FUNCTIONS, WORKSHOPS AND CONFERENCES**

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### **ACHUTHAMENON CENTRE FOR HEALTH SCIENCE STUDIES**

In July 2006 (from 15<sup>th</sup> to 30<sup>th</sup>), a group of 13 MPH students, two faculty members, three supportive staff from Keck School of Medicine, University of Southern California visited AMCHSS. The purpose of the visit was to expose students to other country experience and to learn more about the unique public health achievements of Kerala. A Seminar on public health achievements and constrains in Kerala was arranged wherein eminent scholars from Kerala interacted with the students. The sessions were combined with the 2006 batch of MPH students of SCTIMST to foster student interaction. Both in-house and visiting faculty had taken sessions in the seminar. Later students were taken to our field training area, where they interacted with community leaders and volunteers. This was followed by piloting of the tsunami study protocol by the students in Alappadu grama panchayat in Kollam district. Foreign students had visited hospitals in northern Kerala and the Kottackal Arya Vaidya Sala before leaving. The feedback shows that whole exercise has given an enriching experience for both batches of students on community participation and helped them to learn from each other.

The short course on “Prevention and control of non-communicable diseases: Turning epidemiology into practice” attracted four participants from Thailand who were sponsored by WHO Thailand.

**Visit of His Excellency the President of India Dr. A P J Abdul Kalam, as a part of the Silver Jubilee Celebrations of the Institute  
21<sup>st</sup> September 2006**



Dr. K. Mohandas, Director, SCTIMST, Shri. M. Vijayakumar, Hon. Minister for Law and Youth Affairs, H.E. the President of India Dr. A.P.J. Abdul Kalam, Prof. R. Chidambaram, President, SCTIMST, Dr.T. Ramasami, Secretary to Govt. of India, Dept. of Science & Technology



His Excellency donates books authored by him to the Institute



Dr. MS. Valiathan inaugurating Indo-US Workshop on 1-3 Feb 2007 (Dr. G. S. Bhuvaneshwar, Dr. K. Mohandas, Director, SCTIMST, Prof. Keefe Manning (Penn State University))

Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram & INDO-US Science and Technology Forum, New Delhi Jointly organized INDO-US Workshop on Cardiovascular Prosthetic Devices: In Vitro Studies to Clinical Implantation in February, 2007.

SCTIMST organized an Indo- Australian Symposium on Stem Cells in Regenerative Medicine in January 2007.

## HOSPITAL WING

The 8th Anniversary of R. Madhavan Nayar Center for Comprehensive Epilepsy Care was conducted in AMC, Auditorium on 16th August 2006.



Dr. Thomas Issac, (Finance Minister of Kerala) inaugurating the Indo-Australian Conference on Biomaterials, Implantable Devices, Tissue Engineering & Regenerative Medicine (BITE&RM 2007) Dr. G.S Bhuvaneshwar (Head, BMT Wing, SCTIMST), Dr. Chandra P. Sharma (Chairman, Organising Committee), Prof.C.Rolfe Howlett (University of New south Wales, Sydney, Australia), Dr.Shell Nuna (Senior Manager, Education, Science and Training, Australian High Commission), Prof.John Webb (Counsellor, Education, Science and Training, Australian High Commission), Prof. K. Mohandas (Director, SCTIMST)



Dr. Thomas Issac, (Minister of Finance, Govt. of Kerala) releasing the souvenir of the Indo-Australian Conference on Biomaterials, Implantable Devices, Tissue Engineering & Regenerative Medicine (BITE&RM 2007)



Dr. K. Mohandas, Director, SCTIMST, inaugurating the National Epilepsy Day on 17/11/2006





Dr K Mohandas, Director, Dr Richard Cash, Professor, Harvard School of Public Health, Dr. Thankappan, Head AMC HSS, students from Harvard and AMCHSS and a few a training program from 4th to 23rd of January 2007.



Dr. K. Mohandas, Director, SCTIMST, Dr. Bhuvaneshwar, Head, BMT, Dr. R.C. Rathod, Dean and Dr K. R. Thankappan, head, AMC along with the visiting Commonwealth study group

Participants of the One-day course in Image processing in Anatomical and Functional Neuroimaging, August 27th, 2006



Air Marshal Ahluwalia C.O, Southern Air Command inaugurating the Students Cultural Fest - Dreamz '06 on 7th October 2006.







Shr. V. Ramachandran, IAS(Retd.) former Chief Secretary inaugurating the National Workshop on Disaster Management on 30th December 2006 (Dr. Sabar Rustomjee (IAGP, Australia), Dr. K.A. Kumar (Retd. DME), Dr. Bonnie Bichule (AAGP, USA), Mr. Shekhavat(Chief General Manager, NABARD) and Prof. K. Mohandas)



Community volunteers and elected members of Kumarakom Panchayat, Kottayam, participated in a training program at AMC on 27-01-07 on community based intervention to control risk factors of non-communicable diseases



Town Official Language Implementation Committee TOLIC - Silver Jubilee Celebration March 2007

**INTERNATIONAL CONFERENCES ATTENDED BY FACULTY**

Name of the participant/ Speaker	Name of the Conference	Date & Venue	Title of the paper/ Participant's Status
Dr. Anoop Kumar Thekkuveettil	3rd International PhDstudent Symposium.	Germany September	Identification of Nedd4 RNA as a target of Jerky, a brain specific protein associated with seizure development
Dr. Anoop Kumar Thekkuveettil	Organized by Scocietede Biologie Cellulaire de France	Paris May	Differential affinity for RNA binding to C2 domains of Synaptotagmin I. Molecular and cell biology of the synapse.
Dr. S. Banerjee	3rd International PhD student Symposium.	Germany September	Identification of Nedd4 RNA as a target of Jerky, a brain specific protein associated with seizure development
Dr. RN. Bhattacharya	International workshop on Image Guidance Surgery	Portugal, June, 2007.	Participant
Dr. Biju Soman	38 <sup>th</sup> Conference of the Asia-Pacific Academic Consortium for Public Health (APACPH)	Bangkok, Thailand Dec, 2006.	Participant
”	Planning meeting of the Fogarty International	Bangkok, Thailand Dec, 2006.	Participant
Dr. Chandra P. Sharma	2006 Annual Meeting and Exposition of Society for Biomaterials	Pennsylvania, USA, April, 2006	Zinc Phosphate-Insulin- Alginate Particles for Oral Insulin Delivery: Feasibility Studies” and “Targeted Drug Delivery with Magnetic Nanoparticles

Name of the participant/ Speaker	Name of the Conference	Date & Venue	Title of the paper/ Participant's Status
Dr S. Dinesh Nayak		London, UK Feb, 2007.	Interictal and ictal EEG during videotelemetry
Dr. Girish Menon	Endoscopic pituitary cadaver workshop.	Germany Nov, 2006	
Dr. K Jayakumar	86 <sup>th</sup> Annual Conference of American Association of Thoracic surgeons	Philadelphia April, 2006	
”	Annual conference of European Society of Cardio Vascular Surgeons	Stockholm.	
Dr. CC. Kartha	Global Symposium on Heart Health and Diseases	Canada Oct, 2006	Does endocardial endothelium modulate ventricular remodeling?
Dr. Mala Ramanathan	Gender and Health Training Workshop	University of Pretoria, Jan, 2007	
Dr. Mala Ramanathan	Meeting on Integrating Gender into the Curricula of Health Professional	Geneva, Dec, 2006	Resource Person
”	Training Seminar for WHO-Regional and Country Offices	Austria Sep, 2006	Regional representative
”	Curriculum Review meeting	University of Pretoria, May, 2006	
Dr. K. Mohandas	International Education Forum	Brisbane, Australia April, 2006	Participant
”	Commonwealth Vice-Chancellors' Conference	Adelaide, Australia April, 2006	President of the Conference and Plenary Session Speaker: “Strategic Alliances – Global Networks”



Name of the participant/ Speaker	Name of the Conference	Date & Venue	Title of the paper/ Participant's Status
”	International Symposium on Issues and Challenges of the 21 <sup>st</sup> Century	University of - Sabaragamuwa Sri Lanka July, 2006.	* Inauguration * Key Note Address
”	EDUCON 2006	Bangkok, Thailand Aug, 2006.	Chairman, Technical Sessions
”	134 <sup>th</sup> Annual Meeting of American Public Health Association's (APHA)	Boston, USA Nov, 2006.	Plenary Session: <i>“Experience of Establishing a School of Public Health in India”</i>
”	Conference of Common wealth Education Ministers	Cape Town, South Africa, Dec, 2006	Leader of the Association of Commonwealth Universities delegation
Dr. P. S. Sarma	International workshop on Regional Public Health Education Standards and Accreditation Guidelines and SEAPHEIN Annual meeting.	Bangkok, Thailand May, 2006	
S S. Sunitha	Organized by Scociete de Biologie Cellulaire de France	Paris May	Differential affinity for RNA binding to C2 domains of Synaptotagmin I. Molecular and cell biology of the synapse.
Dr. N. Suresh Nair	International workshop on Image Guidance Surgery	Portugal, June, 2007	Participant
Dr. N. Suresh Nair	5 <sup>th</sup> International conference on Meningiomas & Cerebral Venous Sinuses	Fujiyoshida, Japan Nov, 2006.	Posterior petrous meningiomas

Name of the participant/ Speaker	Name of the Conference	Date & Venue	Title of the paper/ Participant's Status
”	”	”	Foramen magnum meningiomas
”	”	”	Petroclival meningiomas
”	8 <sup>th</sup> Asian-Oceanian International Conference on Skull Base Surgery	Dubai Nov, 2006	Surgical experience with skull base chordomas/ chondrosarcomas
Dr. N. Suresh Nair	”	”	Surgical experience with skull base paragangliomas.
”	”	”	Trigeminal schwannomas: surgical experience
Dr. K. R. Thankappan	Career development workshop on prevention and control of non-communicable diseases of the Asia Pacific Academic Consortium for Public Health	Bangkok Thailand Dec, 2006	
”	World congress on tobacco and health	Washington DC, USA June, 2006	Quit Tobacco international
Dr. M. Unnikrishnan	7 <sup>th</sup> international congress of Asian Vascular Society for Vascular Surgery	Kulalampur Aug, 2006	
Dr. D. Varatharajan	Conference on Private Sector in Health care delivery: Potentials and Challenges	China, Sep, 2006.	Streamlining private out-of-pocket spending through Medisave: Rural women's willingness and ability to pay for Medisave in the Indian state of Karnataka

## CONFERENCES ATTENDED BY STUDENTS

### INTERNATIONAL CONFERENCES

Name of the participant/ Speaker	Name of the Conference	Date & Venue	Title of the paper/ Participant's Status
Asha S Mathew	20th European Conference on Biomaterials [ESB 2006	Nantes, France, Sep, 2006.	Interleukin-6 imediates inflammatory response to polyether urea urethane implants <i>in vivo</i>
Bernadette K Madathil	20th European Conference on Biomaterials [ESB 2006.	Nantes, France, Sept, 2006	Poster: "Effect of Cobalt Chromium alloy on inflammatory cells as assessed by 2DE and MS
Josna Joseph	Poster: "Effect of Cobalt Chromium alloy on inflammatory cells as assessed by 2DE and MS	Vienna	Poster: "Macrophages and T Lymphocytes as potential modulators of fibroblast mediated collagen deposition around silicon implants"
K. Kaladhar	"Regenerate 2006" World Congress on Tissue Engineering and regenerative Medicine	April, 2006 Pittsburg, Pennsylvania	Effect of phosphatydy l ethanolamine in fibroblast cell adhesion and proliferation <i>Poster presentation</i>
K. Kaladhar	2006 Annual Meeting and Exposition of Society for Biomaterials	Pittsburgh, Pennsylvania, USA, April, 2006.	Novel albumin self assembled liposomes for drug delivery applications <i>Poster Presentation</i>
Manitha B Nair	Regenerate World Congress on Tissue Engineering and Regenerative Medicine April, 2006	Westin Convention Center, Pittsburgh, USA	Indigenous bioglass coated hydroxyapatite in the repair and regeneration of segmental defects in a goat model

Name of the participant/ Speaker	Name of the Conference	Date & Venue	Title of the paper/ Participant's Status
S. Sajeesh	2 <sup>nd</sup> Marie curie cutting edge conference entitled "Recent advances on polymeric based systems for controlled delivery of bioactive agents: Applications in tissue engineering"	Hotel Pestana Delfim Beach & Golf Resort in Alvor, Algarve, Portugal Oct, 2006	"Cyclodextrin-insulin encapsulated polymeric microparticles: A novel oral insulin delivery system"
Sachin Shenoy	Regenerate World Congress on Tissue Engineering and Regenerative Medicine.	Westin Convention Ce Pittsburgh, USA, April, 2006	Indigenous bioglass coated hydroxyapatite in the repair and egeneration of segmental defects in a goat model
P R. Sanjay	Regenerate World Congress on Tissue Engineering and Regenerative Medicine.	Westin Convention Center, Pittsburgh, USA, April, 2006	Indigenous bioglass coated hydroxyapatite in the repair and regeneration of segmental defects in a goat model

## STANDING COMMITTEES

### Academic Committee

1. Prof. K. Mohandas (Chairman)  
Director, SCTIMST  
Thiruvananthapuram
2. Dr. G. S. Bhuvaneshwar  
Head, BMT Wing, SCTIMST  
Poojappura, Thiruvananthapuram
3. Prof. M. K. Ramachandran Nair  
Vice Chancellor  
University of Kerala, Thiruvananthapuram
4. Prof. K. Radhakrishnan  
Dean & Head of the Dept. of Neurology  
SCTIMST, Thiruvananthapuram
5. Dr. S. K. Mahajan  
Ex-Head, Agriculture & Molecular Biology  
Division, BARC, Mumbai - 400 085
6. Prof. J. M. Tharakan  
Head of the Dept. of Cardiology  
SCTIMST, Thiruvananthapuram
7. Dr. A. Jayakrishnan  
Scientist 'G' BMT Wing, SCTIMST  
Poojappura, Thiruvananthapuram
8. Prof. Jayaprakash Muliyl  
Principal, Christian Medical College, Vellore
3. Shri. Viswas Mehta I A S  
Principal Secretary to the Government of Kerala  
Health & Family Welfare, Thiruvananthapuram
4. Shri. K.N. S Nair  
Head, Engineering Maintenance Division,  
VSSC (Retd)  
"Deepti", Kazhakuttan, Thiruvananthapuram
5. Sri.S.Chandrasekharan Nair (Ex-Officio Convenor)  
Financial Advisor & Chief Accounts Officer  
SCTIMST, Thiruvananthapuram
6. A member to be co-opted by the Director as  
and when necessary

### Finance Committee

1. Prof. K. Mohandas (Chairman)  
Director, SCTIMST,  
Thiruvananthapuram
2. Prof. V. S. Ramamurthy,  
Secretary to the Govt. of India  
Ministry of Science and Technology,  
Technology Bhavan, New Delhi - 110016
3. Shri. K.P. Pandian  
Joint Secretary to Govt. of India &  
Financial Advisor,  
Department of Science & Technology,  
New Delhi - 110 016
4. Vice Chancellor  
University of Kerala,  
Thiruvananthapuram
5. Sri.S.Chandrasekharan Nair (Ex-Officio Convenor)  
Financial Advisor & Chief Accounts Officer,  
SCTIMST, Thiruvananthapuram

### Building Committee

1. Prof. K. Mohandas (Chairman)  
Director  
SCTIMST, Thiruvananthapuram
2. Dr. G. S. Bhuvaneshwar  
Head, BMT Wing  
SCTIMST, Poojappura, Thiruvananthapuram

## Senior Staff Selection Committee

1. Prof. K. Mohandas (Chairman)  
Director, SCTIMST, Thiruvananthapuram
2. Dr. G. S. Bhuvaneshwar  
Head, BMT Wing, SCTIMST  
Poojappura, Thiruvananthapuram
3. Dr. K. A. Dinshaw  
Director, Tata Memorial Hospital  
Parel, Mumbai - 400 012
4. A nominee of the Secretary  
Department of Science & Technology  
Govt. of India, New Delhi - 110 016
5. A Senior Professor of SCTIMST
6. An External Expert to be nominated by the  
President of the Institute

## Junior Staff Selection Committee

1. Dr. S.J. Douglas Linsby  
Medical Superintendent,  
SCTIMST, Thiruvananthapuram
2. Dr. G. S. Bhuvaneshwar  
Head, BMT Wing  
SCTIMST, Poojappura, Thiruvananthapuram
3. Shri. P. B. Sourabhan  
Deputy Director (Admn)  
SCTIMST, Thiruvananthapuram
4. Mrs. Vijayamma Harikrishnan  
Nursing Superintendent  
SCTIMST, Thiruvananthapuram
5. Dr. R. Shankar Kumar  
Professor, Cardio Vascular and Thoracic Surgery  
SCTIMST, Thiruvananthapuram
6. Representative of Academic Wing of the  
Institute nominated by the Director of the  
Institute

## Ethics Committee

1. Shri. Justice M.R. Hariharan Nair (Chairman)  
Former Judge, High Court of Kerala, Kochi
2. Prof. G. Santhakumari  
Former Prof. of Pharmacology & Director of  
Medical Education, Government of Kerala,  
R.G. 286, Thriveni, Ulloor  
Thiruvananthapuram - 695 011
3. Smt. J. Lalithambika, I.A.S.  
“Abhilash” Golf Links Road  
Kowdiar, Thiruvananthapuram-695043
4. Prof. K.A Kumar,  
Professor of Psychiatry  
“Koikal”, T.C 13/598, Pattom  
Thiruvananthapuram
5. Dr. P.G. Premila  
Professor of Pediatrics (Rtd.)  
7C, Kowdiar Manor  
Kowdiar, Thiruvananthapuram
6. Dr. B. Ekbal  
(Former Vice Chancellor, University of Kerala)  
Kuzhuvilil House, Arppukkara East, Kottayam-8.
7. Dr. Amar Jesani  
Co ordinator, CSER  
(Centre for Studies in Ethics and Rights)  
Candelar, 4th Floor, 26 St. John Baptist Road  
Bandra West, Mumbai 400 050, India
8. Dr. S.N. Pal  
Director (Engineering)  
HSCC (India) Limited, E-6 (A), Sector -1,  
NOIDA (U.P)-201 301
9. Dr. K. Mohandas  
Director  
SCTIMST, Thiruvananthapuram

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| <p>10. Dr. G.S. Bhuvaneshwar<br/>Head, BMT Wing<br/>SCTIMST, Poojappura, Thiruvananthapuram</p> <p>11. Dr. T. Anoop Kumar (Member Secretary IEC)<br/>Scientist 'E', Molecular Medicine,<br/>SCITMST, BMT Wing, Poojappura<br/>Thiruvananthapuram-12</p> <p>12. One faculty from SCTIMST by rotation from<br/>any of these wings<br/>(Dr. Mala Ramanthan, Associate Professor,<br/>AMCHSS</p> | <p>7. Prof. Ramachandra Rao<br/>(Former Vice Chancellor, Banaras Hindu<br/>University)<br/>Director, Institute of Armament Technology<br/>PUNE- 411 025</p> <p>8. Dr. C. P. Sharma<br/>Scientist 'F',<br/>BMT Wing, SCTIMST<br/>Poojappura, Thiruvananthapuram</p> <p>9. Shri. O. S. Neelakantan Nair<br/>Engineer 'F', BMT Wing<br/>SCTIMST, Poojappura,<br/>Thiruvananthapuram</p> |
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### Technology Development Committee

1. Prof. K. Mohandas (Chairman)  
Director  
SCTIMST, Thiruvananthapuram
2. Dr. G. S. Bhuvaneshwar  
Head, BMT Wing  
SCTIMST, Poojappura, Thiruvananthapuram
3. Dr. A. P. Chauker  
Cardiovascular & Thoracic Surgeon  
19, Nav Nirman Society, Grant Road Bridge,  
Low Parel (South), Mumbai - 400 022
4. Dr. S.N. Pal  
Director (Engineering)  
HSCC (India) limited, E-6 (A), Sector -1  
NOIDA (U.P)-201301
5. The Executive Director  
TIFAC, Dept. of Science & Technology  
Govt. of India, Technology Bhavan,  
New Mehrauli Road, New Delhi-110016
6. Prof. Chitra Sarkar  
Dept. of Pathology  
All India Institute of Medical Sciences  
New Delhi - 110 029

### Technology Transfer Committee

1. Dr. Placid Rodriguez (Chairman)  
(Former Director – IGACR),  
Flat 2B, "Adithya Apartments",  
38, Balakrishna Road, Valmiki Nagar,  
Chennai – 600 041.
2. Mr. V. P. Balagangadharan  
Deputy Head,  
Technology Transfer & Industry Co-ordination  
Division,  
V.S.S.C., Thiruvananthapuram- 695 022
3. Dr. G.C.Gopala Pillai  
(Former Managing Director, KINFRA)  
Chairman, FACT,  
Udyogamandal,  
Kochi - 683 501.
4. Dr. P. Parameswar Iyer  
Principal Research Scientist  
Centre for Scientific & Industrial Consultancy  
Indian Institute of Science,  
Bangalore-560 012

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|----|---|----|--|
| 5. | Dr. G. S. Bhuvaneshwar,<br>Head, BMT Wing (Ex-officio member)<br>SCTIMST, Thiruvananthapuram                            | 7. | Er. D. Ranjit<br>Secretary, Technology Transfer Committee)<br>Engineer 'F', Technology Transfer Cell<br>BMT Wing,<br>SCTIMST,<br>Thiruvananthapuram-12 |
| 6. | Sri. S. Chandrasekharan Nair (Ex-Officio)<br>Financial Advisor & Chief Accounts Officer,<br>SCTIMST, Thiruvananthapuram |    |  |
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## DEPARTMENTS AND PERSONNEL

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Prof. K. Mohandas, MD, FRCA

**Director**

### Academic Division

Dr. K. Radhakrishnan, MD, DM, FAMS

*Dean*

Dr. A.V. George, MA, BEd, PhD

*Registrar*

Sundar Jayasingh, MA, MBA, DLL

*Assistant Registrar*

### Library

S. Jayachandra Das, BSc, MLISc

*Librarian-cum-Documentation Officer - B*  
(Librarian-in-Charge)

T. Sudha, M.A, MLISc.

*Librarian-cum-Documentation Officer - A*

### Nursing Education

P. P. Saramma, BSc, MN

*Lecturer in Nursing*

### Public Relations

T.V. Hemalatha, MA, MPhil, LLB, PGDJ

*Public Relations Officer*

### Achutha Menon Centre for Health Science Studies

Dr. K.R. Thankappan, MD, MPH

*Professor & Head*

Dr. P. Sankara Sarma, PhD

*Additional Professor*

Dr. T.K. Sundari Ravindran, PhD

*Honorary Professor*

Dr. Mala Ramanathan, MA, PhD

*Additional Professor*

Dr. D. Varatharajan, MSc, PhD

*Additional Professor*

Dr. Biju Soman MD, DPH

*Assistant Professor*

Dr. Manju R Nair MBBS, MPH

*Scientist C (Adhoc)*

### Administration

Dr. K. Mohandas, MD, FRCA

**Director**

V. Ambujakshan Nair, BCom, LLB

*Senior Principal Private Secretary to Director*

C.S. Sreepriya, MA, LL.B, PGDHM, PGDT, DJ, DCA.

*Executive Secretary to the Director-Cum-Ethics Committee Coordinator*

PB. Sourabhan, MA, LLB, PGDMM, DCA

*Deputy Director (Administration)*

S. Chandrasekharan Nair, BSc, BCom, SAS

*Financial Advisor & Chief Accounts Officer*

S. Sasikumar, MA (PA), BGL, LLB, PGDIR, PGDIRPM

*Administrative Officer Gr I*

PV. Chandrasekharan BSc, SAS

*Internal Audit Officer*

I.T. Edwin, BA

*Administrative Officer Gr II*

C. Gopinathan, BSc, LLB, SAS  
*Accounts Officer Gr I*

A. Santhakumari, MCom  
*Accounts Officer Gr I*

C.R. Mohandas, BCom  
*Accounts Officer Gr II*

R. Sreekumar, BSc, PGDMM  
*Purchase Officer Gr I*

M. Sudhakara Sharma, BA  
*Stores & Purchase Officer Gr II*

P. Gopalakrishnan Nair, BA  
*Stores & Purchase Officer Gr II*

B. S. Anil Kumar, BA  
*Security Officer*

K. Prasanna Kumar B.Com, DEE  
*Security Officer*

Hemant Kumar R.P  
*Asst. Security Officer- A*

S. Venkitachalam Iyer, BCom  
*Pool Officer*

### **Construction Wing**

PN. Ramachandran BSc (Engg.)  
*Construction Engineer (Contract)*

G. Gopinatha Kurup  
*Junior Engineer (Civil)*

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## BIOMEDICAL TECHNOLOGY WING

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Dr. G.S. Bhuvaneshwar, MS., PhD.

### **Head**

### **Artificial Organs**

Mr. C.V. Muraleedharan, MTech.

*Engineer F & in-charge, Device Testing Laboratory*

Mr. D.S. Nagesh, MTech.

*Engineer F & in-charge, Modelling & Prototyping Lab*

Mr. V. Vinod Kumar, BTech.

*Engineer C*

Mr. V. Arun Anirudhan, BTech.

*Engineer B*

Mr. Sujesh Sreedharan, ME.

*Engineer C*

Sajjith Lal M.K.

*Engineer B*

Renjith G.

*Engineer B*

### **Bioceramics & SEM Laboratory**

Dr. P.R. Harikrishna Varma, PhD.

*Scientist E & in-charge*

Dr. Manoj Komath, PhD.

*Scientist D*

Mr. R. Sreekumar, BSc.

*Jr. Scientific Officer*

Mr. S. Vijayan, MSc.

*Jr. Scientific Officer*

### **Biosurface Technology**

Dr. Chandra P. Sharma, MTech, MS, DSc, MEBE

*Scientist G & Head*

### **Calibration Cell**

Mr. C.V. Muraleedharan, MTech.

*Engineer F & in-charge*

Mrs. Leena Joseph, BTech.

*Engineer C*

### **Customer Service Cell**

Mr. S. Balram

*Engineer E & in-charge*

### **Dental Products Laboratory**

Dr. V. Kalliyana Krishnan, PhD.

*Scientist G & in-charge*

### **Division of In-vivo models and testing**

Dr. P.R. Umashankar, MVSc.

*Scientist D & in-charge*

Dr. Sachin J. Shenoy

*Scientist 'C'*

### **Engineering Services**

Mr. O. S. Neelakantan Nair, BSc. (Engg.)

*Engineer G & in-charge*

Mr. K. Rajan, Dip. Elect. Engg.

*Junior Engineer*

### **Implant Biology**

Dr. Mira Mohanty, MD, FIC Path

*Scientist G & in-charge*

Dr. T.V. Kumary, PhD.

*Scientist F & in-charge Tissue Culture Laboratory*

Dr. Annie John, PhD.

*Scientist D & in-charge TEM*

Dr. T. V. Anilkumar, MVSc., PhD.

*Scientist D & in charge Confocal Microscopy and Experimental Pathology*

Dr. A. Sabareesan, MVSc.

*Scientist 'C', Histopathology Laboratory*

### **Instrumentation Laboratory**

Dr. Niranjana D. Khambete, MTech., PhD.

*Engineer E & in-charge*

### **Laboratory-animal Sciences Division**

Dr. A.C. Fernandez, PhD.

*Scientist F & in-charge*

Dr. V.S. Harikrishnan, BVSc

*Scientist 'B'*

### **Microbiology**

Dr. A. Maya Nandkumar, PhD.

*Scientist D & in-charge*

### **Molecular Medicine**

Dr. T. Anoopkumar, PhD.

*Scientist E & in-charge*

### **Polymer Analysis**

Dr. Prabha D. Nair, PhD.

*Scientist G & joint in-charge*

Dr. K. Sreenivasan, PhD.

*Scientist F & joint in-charge*

Mr. P. R. Hari, BSc, AIE.

*Jr. Scientific Officer A*

### **Polymer Chemistry**

Dr. A. Jayakrishnan, PhD.

*Scientist G & in-charge*

### **Polymer Division**

Dr. M. Jayabalan, PhD.

*Scientist F & Head*

### **Polymer Processing Laboratory**

Dr. Roy Joseph, MSc, MTech., PhD.

*Scientist E & joint in-charge*

Dr. P. Ramesh, MTech., PhD.

*Scientist E & joint in-charge*

Mr. M. C. Sunny, BSc., AIC.

*Jr. Scientific Officer*

### **Precision Fabrication Facility**

Mr. V. Ramesh Babu, MTech.

*Engineer D & in charge*

Mr. E. B. Mohan Raj, Dip. Mech. Engg.

*Foreman B*

### **Quality Cell**

Mr. D.S. Nagesh, MTech.

*Engineer F & Quality Manager*

Dr. P. Ramesh, PhD.

*Scientist E, Deputy Quality Manager*

### **Technology Business Division**

Mr. S. Balram, MTech

*Scientist E & in charge*

### **Technology Proving Facility**

D.S. Nagesh, MTech.

*Engineer F & In charge*

### **Technology Transfer & Co-Ordination Cell**

D. Ranjit BE.

*Engineer F & in-charge*

### **Thrombosis Research**

Dr. Lissy K. Krishnan, PhD.

*Scientist F & in-charge*

### **Toxicology**

Dr. P.V. Mohanan, PhD.

*Scientist D & in-charge*

## HOSPITAL WING

Dr. S.J. Douglas Linsby, MBBS, MS

*Medical Superintendent*

Dr. S.K. Jawahar, MBBS, MHA, DipNB (Health Admn)

*Administrative Medical Officer*

Ms. Vijayamma Harikrishnan, B Sc (N) (Post –Basic),  
M.A; PGDHHM

*Nursing Superintendent*

Ms. Sudhamaniamma, MSc(N), PGDHRM

*Deputy Nursing Superintendent*

### Anaesthesiology

Dr. K. Mohandas, MD

*Professor & Director of the Institute*

Dr. R.C. Rathod, MD

*Professor Senior Grade & Head of Department*

Dr. Raymond Douglas Latimer, MBBS, FFARCS, MA

*Honorary Professor*

Dr. (Mrs.) Rupa Srinivas, MD, Dip NB

*Professor*

Dr. Thomas Koshy, MD

*Additional Professor*

Dr. Srinivas V. Gandhinhaljkar, MD

*Additional Professor*

Dr. Prasantkumar Dash, MD

*Additional Professor*

Dr. P.K. Neema, MD

*Associate Professor*

Dr. S. Manikandan, MD

*Assistant Professor*

Dr. P.K. Sinha, MD

*Associate Professor*

Dr. P. Gayatri, MD, FRCA

*Associate Professor*

Dr. P.R. Suneel, MD

*Assistant Professor*

Dr. K.P. Unnikrishnan, MD

*Assistant Professor*

Dr. Subratakumar Singha, MD

*Ad-hoc Consultant*

Dr. Pradeep Bhaskar, MD

*Adhoc Consultant from 14.11.2005*

Dr. Satyajeet Misra MD

*Ad-hoc Consultant from 02.02.2007*

Mrs. K.V. Bhuvaneshwary

*Scientific Assistant*

### Biochemistry

Dr. P.S. Appukuttan, PhD

*Professor and Head*

Dr. N. Jayakumari, PhD

*Professor*

Dr. G. Srinivas PhD

*Scientist C*

K. I. Annamma, BSc

*Junior Scientific Officer*

B. Sasikumar, MSc

*Junior Scientific Officer*

### Biomedical Engineering

K. Vijayakumar, BSc, BSc (Engg.)

*Engineer & Head*

Koruthu P. Varughese, BSc (Engg.), PGDEDI, PGDCA, MBA

*Engineer*

G. Mohanlal, BSc (Engg.), MBA

*Engineer*

B. Madhusoodanan Pillai, BSc (Engg.), PGDCA, MBA  
*Scientist/ Engineer*

N. Sivanandan  
Junior Engineer (Electrical)

### **Blood Transfusion Services**

Dr. Jaisy Mathai, MBBS, DCP  
*Scientist F and Head*

Dr. P.V. Sulochana, MBBS  
*Scientist F*

Dr. S. Sathyabhama, MBBS  
*Scientist E*

### **Cardiology**

Dr. Jagannathan A Tharakan, MD, DM  
*Professor & Head*

Dr. Thomas Titus, MD, DM  
*Professor*

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

Dr. S. Sivasankaran, MD, DM, Dip NB  
*Additional Professor*

Dr. K. M. Krishnamoorthy, MD, DM  
*Associate Professor*

Dr. S. Harikrishnan, MD, DM  
*Associate Professor*

Dr. Santhoshkumar Dora, MD, DM  
*Assistant Professor*

Dr. Krishnakumar Nair  
*Assistant Professor*

Dr. Narayanan Namboodri  
*Assistant Professor*

Dr. M. S. Harikrishnan  
*Assistant Professor (Adhoc)*

Dr. Biju Lal  
*Adhoc Consultant*

### **Cardiovascular & Thoracic surgery**

Dr. K. Jayakumar, MS, MCh  
*Professor and Head*

Dr. R. Sankar Kumar, MS, MCh  
*Professor*

Dr. K.G. Shyam Krishnan MS, MCh  
*Professor*

Dr. M. Unnikrishnan, MS, MCh  
*Professor*

Dr. S.R. Krishna Manohar, MS, MCh  
*Professor*

Dr. Manoranjan Misra, MS, MCh  
*Assistant Professor*

Dr. Baiju S. Dharan, MS, MCh  
*Assistant Professor*

Dr. Chandrabhanu Parija MS, MCh  
*Adhoc Consultant*

Dr. Adil Sadiq  
*Adhoc Consultant*

### **Cellular and Molecular Cardiology**

Dr. C.C. Kartha, MD, FNASc, FASc, FAMS, FIACS  
*Professor Senior Grade & Head*

Dr. Renuka Nair, PhD, MNAMS, MNASc  
*Scientist- G*

Dr. K. Shivakumar, PhD  
*Scientist-F*

### **Computer Division**

G. Geetha, MTech (Computer Science)  
*Scientist 'F'*

Mr. Suresh Kumar  
*Scientist 'B'*

### **Medical Records**

P. Krishnamoorthia Pillai, MA  
*Senior Medical Records Officer cum Lecturer & Head*

N.G. Thampi MA, BMRSC  
*Medical Records Officer*

P.J. Varghese  
*Assistant Medical Records Officer*

### **Microbiology**

Smt. Molly Antony, MSc, DMV  
*Scientist F*

Dr. Muralidhar K. Katti, M. Sc, PhD, FISCD  
*Associate Professor*

Smt. K. Naseema, MSc, MLT  
*Scientific Assistant*

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

### **Neurology**

Dr. K. Radhakrishnan, MD, DM, FAMS  
*Professor Senior Grade & Head*

Dr. MD. Nair, MD, DM  
*Professor*

Dr. C. Sarada, MD, DM  
*Additional Professor*

Dr. Sanjeev V.Thomas, MD, DM  
*Additional Professor*

Dr. Asha Kishore, MD, DM  
*Additional Professor*

Dr. PA. Suresh, MD, DM  
*Additional Professor (On leave)*

Dr. Abraham Kuruvilla, MD, DNB, DABN (Cl/N Ph)  
*Associate Professor*

Dr. P.S. Mathuranath, DM  
*Associate Professor*

Dr. PN. Sylaja, MD, DM  
*Assistant Professor*

Dr. Ashalatha R., MD, DM  
*Adhoc Consultant*

Dr. Rajesh Iyer, MD, DM  
*Adhoc Consultant*

### **Neurosurgery**

Prof. R N. Bhattacharya, MS, MCh  
*Head of the Department*

Dr. S. Suresh Nair, MCh  
*Professor & Head in Charge*

Dr. Ravi Mohan Rao, MS, MCh, Dip NB Neurosurgery  
*Associate Professor*

Dr. R. Girish Menon, MCh, DipNB Neurosurgery  
*Associate Professor*

Dr. Rajesh B. J., MS, MCh  
*Assistant Professor*

Dr. Mathew Abraham, MS, FRCS, MCh  
*Assistant Professor*

Dr. H.V. Easwer, MCh  
*Assistant Professor*

Dr. K. Krishna Kumar MS, MCh  
*Assistant Professor*

### **Pathology**

Dr. V.V. Radhakrishnan MD, FAMS  
*Professor Senior Grade & Head*

Dr. S. Sandhyamani, MD, FAMS  
*Professor*

Dr. Annamma Mathai, PhD  
*Scientist C*

**Imaging Science and Interventional  
Radiology**

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

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

Dr. C.Kesavadas, DMRD, MD  
*Associate Professor*

Dr. Bejoy Thomas, MD, DNB  
*Assistant Professor*

Dr. Krishnamoorthy, MD, DNB, DM  
*Assistant Professor*

Dr. Narendra K. Bodhey, MD, DNB  
*Assistant Professor*

Dr. Sukalyan Purkayastha, MD, DNB, DM  
*Assistant Professor*

Dr. R. S. Jayasree, PhD  
*Scientist 'C'*

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