

**SREE CHITRA TIRUNAL INSTITUTE
FOR MEDICAL SCIENCES & TECHNOLOGY
TRIVANDRUM**



**ANNUAL REPORT
1995-'96**





Annual Report 1995-96

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

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HIGHLIGHTS OF THE YEAR

- Agreement signed with South India Drugs and Devices to develop hollow fibre based Membrane Oxygenators.
- Clinical trials of ophthalmic sponges, light cured dental composites and concentric needle electrodes make headway.
- Institute takes the lead to establish a Biomedical Engineering Gallery using multimedia technology at the state Science and Technology Museum.
- A comprehensive programme organised for evaluation and care of epileptics.
- Patients with coronary artery disease get benefit of coronary stent implantation.
- A new Digital Subtraction Angiography (DSA) system is made operational.
- Blood Transfusion Services bags Indian Red Cross Society Trophy.
- A Master's Course in Public Health to commence in 1997
- Major initiatives for Official Language Implementation.

Historical

THE ORIGINS of the Institute reach back to 1973 when the Royal Family of Travancore gifted a multi-storeyed building for the people and the Government of Kerala resolved to develop the gift as the Sree Chitra Tirunal Medical Centre for medical specialities.

The Medical Centre was inaugurated by Sri P. N. Haksar in 1976 and the growth of a Biomedical Engineering and Technology Centre followed quickly at the Satelmond Palace, Thiruvananthapuram.

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 act lays down the objectives of the Institute to be the promotion of biomedical engineering and technology, demonstration of high standards of patient care and the development of post-graduate training Programmes of the highest quality in advanced medical specialities and biomedical engineering and technology.

Overview

THE INSTITUTE was able to introduce several new initiatives during the year under review.

A new technology programme to develop a Membrane Oxygenator with financial support from Southern Petroleum Industries Corporation (SPIC), Madras marked the beginning of industrial partnership in R&D work. The cherished goal of fostering symbiotic relationships with other research establishments began to fructify with the commencement of joint collaborative research projects with the Regional Research Laboratory (CSIR), Thiruvananthapuram and the Indira Gandhi Centre for Atomic Research (DAE), Kalpakkam. Ongoing efforts to attract industrial sponsorship and to build lasting linkages with other R&D institutions are expected to usher in an era of cost effective development of medical devices at an accelerated pace. New initiatives in developing biological and biocompatible materials and devices are

poised to enter the clinical trial stage soon.

Patient services were further strengthened with the installation of a new state of the art digital subtraction laboratory to augment the existing diagnostic and interventional facilities.

With 25 patients successfully undergoing temporal lobectomy, the surgical management of intractable epilepsy was established on a regular and firm foundation. The ground work for launching a rural outreach programme early next year was completed. Several steps, including computerisation and a more rational organisation of outpatient clinics, have helped streamline hospital services, and reduce congestion.

The Achutha Menon Centre for Health Science Studies finalised plans to start an ambitious Master's Course in Public Health from the academic year beginning in January 1997. Plans to start extensive epidemiological surveys are also on the anvil.

Investigations on mechanisms of cardiac fibrogenesis, efficacy

of antioxidants in preventing or limiting ischaemic tissue damage and evaluation of cardiac function in a rabbit model of endomyocardial fibrosis were the new research endeavours initiated during the year.

The fresh initiatives in the diverse spheres of its activity, along with those already established, are expected to ensure the continued relevance of the Institute to the society it serves.



Patient Care

DR. (MAJ) K. A. HAMEED BSc, MBBS
Medical Superintendent (Till 31.8.95)

DR. P. R. N. MENON MS, FICS
(assumed charge in September '95)

THE NUMBER of referred patients in Cardiology, Neurology, Surgery and Radiology continued to be on the increase. In order to improve the quality of patient care in the outpatient departments, including review clinics, the number of cases to be seen in each department per day was limited. The appointments per day, for both fresh registrations and review cases, were streamlined with the help of computers. Staggered appointment system was adopted to avoid overcrowding in the out-patient departments. However, the long waiting list for special investigations and operations continued to be a problem.

An integrated approach was introduced in the OPDs by providing the services of medico-social workers, nurses and medical records assistants to ensure better attention to the needs of the patients. Registration of new patients for Cardiology, Neurology and Surgery was done in the respective OPDs to reduce congestion and delay.

Resuscitation rooms with necessary facilities were provided in both the Medical and Surgical OPDs for the

benefit of the seriously ill patients. The refreshment facilities made available to the patients in the OPDs earlier were extended to the Blood Bank also for the benefit of the donors. A strict, yet reasonable, assessment of the family income of the patients enabled to raise the hospital revenue considerably. Charging system was revised in view of the escalation of prices of drugs and consumables used.

To keep pace with the advances in imaging technology, a new Digital Substraction Angiography (DSA) Lab was installed in October 1995. In the surgical block, the X-ray unit was commissioned in February 1996. The old equipments in the Laundry, Kitchen and Dietary were being replaced by new ones in a phased manner.

Weekly meetings of ward sisters were conducted by the Medical Superintendent to review the quality of patient care. The hospital management committee met regularly and reviewed various aspects of hospital services. Three students, doing their post graduate diploma in hospital administration at the Rajiv Gandhi Centre for

Development of Education, Sciences and Technology (RGCDEST), Thiruvananthapuram underwent internship training in the hospital. Short-term observer trainees, sponsored by various hospitals, continued to attend the dietary.

Medico-Social Work

Medico-Social Workers continued to play an active role in patient care. They coordinated the registration of new patients and were involved in activities such as family income assessment for charging purposes, motivation of blood donors and providing guidance to the patients. They were also actively involved in the outstation comprehensive epilepsy care and epidemiological survey organised by the Institute.

In the neurology clinics, psycho-social evaluation was carried out and counselling to selected patients given. The family group session conducted for epilepsy patients and their family members helped in their psycho-social rehabilitation. This novel approach received wide acceptance.

The paper entitled 'Group session - an effective method to promote awareness and positive approach towards epilepsy', presented at the 3rd Annual Conference of the Indian Epilepsy Association in New Delhi in December 1995, secured the special award of the 18th International Epilepsy Congress Trust.

Post graduate students of Loyola College of Social Sciences and Madurai Kamaraj University, specialising in medical and psychiatric social work and management, underwent short-term orientation and training in the Medico-Social Work division.

Medical Records

SRI. P. KRISHNAMOORTHIA PILLAI MA
Senior Medical Records Officer

SRI. N. G. THAMPI MA, BMRSc
Medical Records Officer

This division contributed significantly to the efficient functioning of the hospital services. It supplied scientific data and statistics to doctors and post graduate students. Out of 176,000 charts, 66,574 were taken out for the following purposes.

Table: 1. Number of Charts Handled

1. Follow up in special clinics	34,185
2. Correspondence of patients	15,316
3. Analytical and studies	8,473
4. Pruning of charts	4,000
5. Backlog feeding	3,600
6. Internal audit	100
7. Cardiac surgery scrutiny	900

10,157 new registrations and 5,940 admissions were made during this year with on line computer system. To improve the quality of patient care, the follow-up numbers of special clinics

were reduced in consultation with the Heads of Departments and letters were sent accordingly.

The work of inpatient chart analysis which was done by nursing staff in the ward and ICU was taken over by MRD staff. Doctors and nursing staff came to the MRD room in the surgical block and completed the inpatient charts.

50 requests for surgery from other states were scrutinised in consultation with the Head, Department of Cardio-vascular Thoracic Surgery and same patients were called as per allotment.

The department presented the following statistical information to the Hospital Advisory Committee.

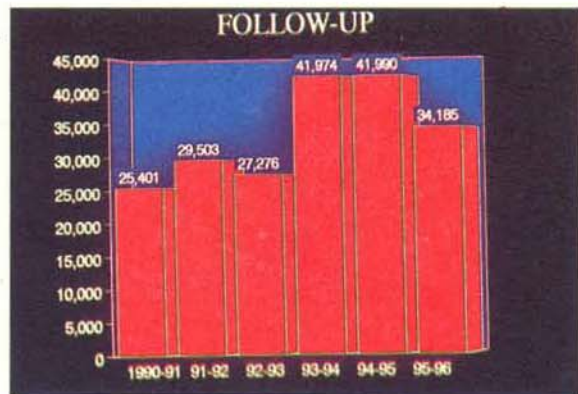
1. Out patient and in patient statistics
2. IP Diagnosis list

3. Death list
4. Prolonged stay list

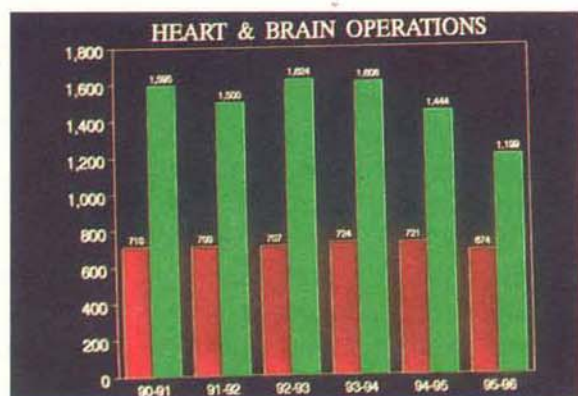
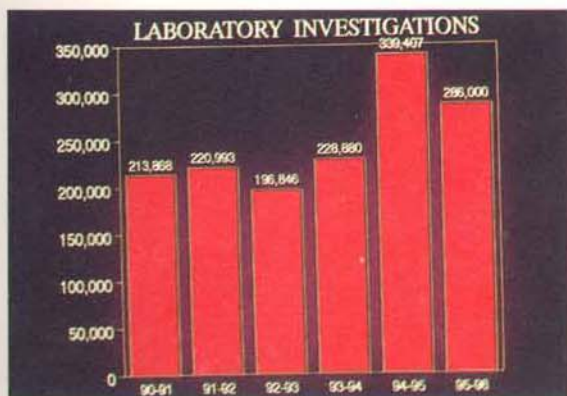
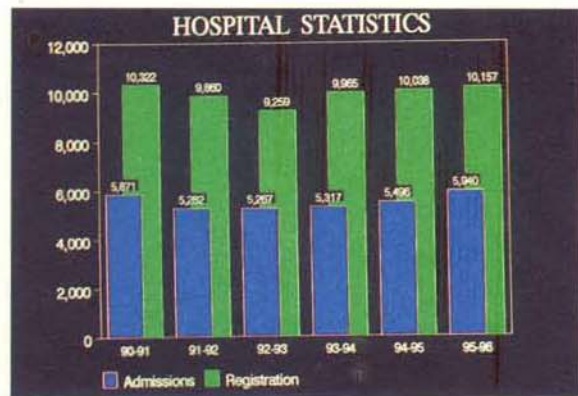
Computer terminals were connected in the OPD for the use of medical social workers and medical records assistants.

Table: 2. Important Statistics

Sanctioned bed	200
Cardiac surgery	1,393
Neuro surgery	674
New cases	10,157
Repeat cases	34,185
Admissions	5,940
Discharges	5,948
Death	229
Non paying %	18
Paying %	82
Mortality %	4
Operation mortality %	5
Lab investigations	295,635
X-ray	17,163
Physiotherapy	19,120
ECG	16,040
Echo	22,454
EMG	663
Pacemaker	85
Perfusion	840
CT Scan	3,130
MRI	2,210
TMT	1,750
Cardiac catheterisation	536
Coronary Angiography	483
Cerebral angiogram	156
Angioplasty	44
Myelogram	7
Brain stem auditory evoked pot.	124
EEG	1,464
Video EEG	127
Visual evoked potential	120
Aortogram	106
B.M.Valvotomy	279
BP Valvotomy	31
Coarctation dilatation	7
PT Coronary angioplasty	53



- CS - CARDIAC SURGERY
- CM - CARDIAC MEDICINE
- NM - NEURO MEDICINE
- TS - THROATIC SURGER
- NS - NEURO SURGERY



Nursing Services

MRS. VIJAYAMMA HARIKRISHNAN RN, RM, BSc (NURSING)
Nursing Superintendent

MRS. ROSAMMA EDWARDS RN, RM, PNA
Deputy Nursing Superintendent

The nursing services continued to provide excellent care to the patients in the Institute. Inservice education on various themes was conducted by nursing supervisors, ward sisters and staff nurses periodically. A national scientific conference on Cardiac and Neuro Nursing was held at the Institute during 6-7th October 1996.

Mrs. R. Edwards,
Mrs. A. Cherian,
Mrs. Lilly Joseph and
Mrs. K. K. Thankamma
attended "Management of
patient care for Nursing
Administrators" during
19.2.96 to 1.3.96
at JIPMER, Pondicherry.

Mrs. Maria Jose
presented a paper on
'Children undergoing Cardiac
Surgery-one protocol'
and Ms. Mini George
presented a paper on
'Stab injury of infant'
in the International Cardiac
Conference at New Delhi
during 23-26 Feb. 1996.

Fourteen Scientific papers
pertaining to Neurology,
Neurosurgery, Cardiovascular
and Thoracic Nursing were
presented by the nursing staff

of the Institute and
medico-legal aspect of
nursing was covered by the
Nursing Superintendent in the
national conference held at the
Institute. ■

Physiotherapy

SMT. M. MEENAKUMARI BSc, DPT
Physiotherapist

Medical and surgical patients
of the Institute were given
intensive physiotherapy by the
therapists, who used the
specialised manual techniques
and equipments available in the
unit. The patient's therapeutic
requirements were met with the
aim of restoring functional
status to their fullest ability.
Teaching and Training
programme in physiotherapy
and rehabilitation for Post -
Basic Nursing students were
also carried out in the Unit. ■

Clinical Engineering

SRI. R. MOHANDAS ME
Biomedical Engineer(On leave)

SRI. K. VIJAYAKUMAR BSc, BSc, (ENGG)
Biomedical Engineer

SRI. KORUTHU P. VARGHESE BSc (ENGG), PG DIP(COMP)
Engineer

SRI. MOHANLAL BSc (ENGG)
Engineer

SRI. MADHUSUDANAN PILLAI BSc (ENGG), PGDCA, MBA
Engineer

Major installations during this year included

1. A highly sophisticated X-ray equipment useful in neuro radiological and interventional cardiology diagnosis (manufactured by M/s. GE Medical Systems, U.S.A.)
2. A modern centrifugal airconditioning plant of capacity 300TR in the place of a twenty year old 165 TR plant.
3. An internal paging system consisting of 20 pagers in the hospital complex.

Mr. Mohandas was granted extension of his secondment leave for one more year to complete his assignment abroad, under the Ministry of Health, U A E.

Mr. K. Vijayakumar visited Milwaukee, USA, for getting trained in GE ADVANTX DLX system.

Mr. Vijayakumar was nominated as a member of the Working Group, constituted by the Planning Commission, on requirements for supportive and diagnostic services at primary, secondary and tertiary care. He continued to be a member of the Board of Studies in Engineering of the Cochin University. As in previous years, training programmes for graduate engineers and diploma holders and ITI certificate holders were conducted.

“Biomedical Engineering Gallery”, the first of its kind in the country implementing Multimedia Technology, was opened to the public at the State Science and Technology Museum, Thiruvananthapuram. This project was conceived and implemented jointly by the Institute and ER & DC, Thiruvananthapuram.
Mr. Koruthu P. Varghese

was the chief coordinator of the project.

Mr. Koruthu P. Varghese was elected Chairman of IEEE Kerala Section. He was nominated as a member of the Regional Examination Board of the Institute of Electronics and Telecommunications Engineers and as Chairman, Division III Computer Society of India. ■

Computer Division

MRS. G. GEETHA M.TECH (COMPUTER SCIENCE)

Systems Manager:

Data processing was sustained with increased application in accounts, medical records, administration, purchase, general stores, pharmacy, microbiology, blood bank, medical illustration and typing pool.

Major achievements were:

1. Implementation of inpatient billing,
2. Internet facility enhanced from library to its nodes and Director's office.
3. Connectivity of Medical records division with the main machine through MODEM and
4. Terminals at surgery O P D and Neurology O P D.

Hardware Expansion:

One number 80586 machine for hospital information system.

Two numbers of 80386SX machine for Achutha Menon Centre.

Three numbers of 80386DX machine for each department use .

Two numbers of EPSON LQ 1170 printers for MRD sticker printing.

One number canon bubble jet printer for Achutha Menon Centre.

One number 80486 machine for punching and time keeping section.

Software expansion:

- SCO open server enterprise rel. 5.0
- SCO open development system rel. 5.0
- Oracle 7.0.16 & developer 2000
- SPSS for windows
- ALP software
- Microsoft office
- Windows 95 upgrade from windows 3.1

System expansion grouped toward more closer application in techno-medical areas, apart from increasing the LAN interlinks. ■

Biomedical Technology Wing

DR. R. SIVAKUMAR B TECH, PH D
Head, BMT Wing

The Technology Wing has continued to concentrate on the development of biomedical devices and implants with improved understanding of the complex relationship between materials, their processing and functional requirements in the biological environment. The knowledge gained in developing materials with appropriate surface to bring about the desired material-tissue interaction would form a base for innovative development.

Taking into consideration of our requirements and the economic potential, we are planning the expansion of technological activities. A brief account on the current status on Technology is given below:

Technology Status

a) Technologies under commercialisation

The clinical evaluation of more than 1000 ophthalmic sponges for different surgeries was completed by Shankara Nethralaya, Madras.

The limited clinical trial of Concentric Needle Electrodes was completed at the Department of Neurology of our Institute.

Based on the current status of development of the above two products, we have initiated discussions with industries for commercialisation.

b) Products Under Development

Animal trials on Vascular Graft Prostheses developed jointly with South India Textile Research Association (SITRA), Coimbatore were completed. The clinical trial is being planned at our Institute.

The hydroxyapatite-based porous granules for dental application were evaluated for biofunctionality in animal models. The controlled clinical trials are expected to be initiated in an year's time.

The work on the development of latex based urinary catheters was in progress. Formulation of the latex chemistry to achieve the required physical, mechanical and biological properties was carried out.

Work was initiated for the development of fibrin glue for cardiovascular and neurosurgical applications.

In the area of surface modification, attempts were made to minimise the migration of plasticizer

from PVC sheets, develop silver oxide coating on catheters to reduce infection and hydrogel based coating to reduce friction.

An industrial collaborative programme was initiated with South India Drugs and Devices (SIDD), Madras to develop the Membrane Oxygenators required for open heart surgery. This is a sequel to our earlier Bubble Oxygenator as a next generation product.

There were a range of exploratory activities by different groups which have potential to become products. An account of those and other related activities is summarised under each group/division.

Division of Academic Affairs

DR. K. G. BALAKRISHNAN MD, DM, FAMS, FACC
Dean (On leave)

SRI. A. V. GEORGE MA, B ED, M PHIL
Registrar

Ph D. Programme

Table: 3. Candidates awarded Ph.D. Degree

Scholar's name	Thesis title	Guide
Mr.VM.Kannan	Studies on membrane bound brain B-galactoside binding lectin gangliosides from grey matter and glycoproteins from brain stem.	Dr.P.S.Appukuttan Addl Prof & Head Neurochemistry
Mr.PL.Jaison	Mammalian Galactose-binding proteins: Studies on human and bovine grey matter glycoproteins recognized by endogenous galactose binding lectin and by human serum anti-oc Galactoside anti-body.	-do-
Mr.K.Rathinam	Studies on interaction between polymer biomaterials and staphylococcus epidermis strains.	Dr.J.Shanmugam Professor & Head of Microbiology

Table: 4. Candidates registered for Ph.D.

Scholar's Name	Area	Guide
Ms.Sakina Farzana Hussain	Anti-viral properties of indigenous medicinal plants against cardio-tropic and neurotropic viruses	Dr.J.Shanmugham Professor&Head, Divn of Micro biology
Ms.Sheela George	Polymer matrices for cell encapsulation.	Dr.Prabha D Nair Scientist
Ms.Preetha R.	Stimulation of cardiac fibroblast proliferation by lanthanides: A superoxide anion mediated response.	Dr. Renuka Nair Scientist Divn.of Cellular and Molecular Cardiology.
Mr. Balu Chacko	Interactions of the human serum anti-alpha-Galactoside antibody with bacteria infecting the human body	Dr.P.S.Appukuttan Addl. Professor Dvn. of Neuro-chemistry

Admission to Post doctoral courses

As in previous years, the postgraduate medical courses evoked enthusiastic response from different parts of the country:

Nation wide response and admission

Table: 5

State/Union Territory	Number applied
Andhra Pradesh	29
Assam	4
Bihar	4
Gujarat	12
Jammu & Kashmir	1
Karnataka	13
Kerala	119
Madhyapradesh	7
Orissa	4
New Delhi	14
Punjab	5
Rajasthan	5
Tamil Nadu	34
West Bengal	8
Haryana	3
Goa	1
Total	263

Table: 6

Course	No. of applicants	No. selected & joined
DM Cardiology	122	4
DM Neurology	23	3
M.Ch Neurosurgery	37	3
M.Ch CVTS	30	4
PDCC-Anaesthesia	24	6
PDCC-Radiology	20	2
PDCC-Vascular surgery	7	1

Postgraduate examinations

All candidates were declared successful in the 1995 examination. The names of the successful candidates are listed below.

Table: 7 List of successful candidates for DM/M Ch

Name of the candidates	Degree	Speciality
Dr. Ravi Narayan	DM	Cardiology
Dr. N. P. Padmaja	DM	"
Dr. A. Gopi	DM	"
Dr. Rajpal K. Abhaichand	DM	"
Dr. K. R. Shyam Sunder	DM	"
Dr. Sunil Baran Roy	DM	"
Dr. Dinesh Nayak	DM	Neurology
Dr. P. Abdurahiman	DM	"
Dr. Rekha Matta	M.Ch	CVTS
Dr. R. Sundar	M.Ch	"
Dr. Sushan Mukhopadhyaya	M.Ch	"
Dr. Kurian N.I.	M.Ch	Neurosurgery
Dr. Sumit Deb	M.Ch	"

Table: 8. List of successful candidates for Post Doctoral Courses

Name of candidates	Speciality
Dr. Arshad Ali	Anaesthesiology
Dr. P. Gayatri	"
Dr. Mahesh Ramachandra Prabhu	"
Dr. Ratan Kumar T. Gupta	"
Dr. V. K. Sathyajith	"
Dr. P. S. Sathyanarayana	"
Dr. Prasanna G. Vibhute	Radiology
Dr. K. Murali	"
Dr. P. Balachandran	Vascular surgery

Table: 9. List of successful candidates for Diploma and Certificate Courses

Name of candidates	Speciality
Mr. Biju Varghese	Advanced Medical Imaging Technology
Mr. Joshi George	"
Mr. Sebi george	Cardiac Laboratory Technology
Ms. P. V. Resmy	"
Ms. Doney Chandy	Neuro-Technology
Ms. V. S. Nandini	"
Ms. V. R. Soori	Blood Banking Technology
Mr. S. Sivakumar	"

Short term training/observership

The demand for short term training/observership in various departments/divisions of the Institute was notably high as shown in Table 10. The Institute responded readily and positively to all requests which came from medical colleges/universities/governmental agencies with no fees charged for the training. Observers from reputed private organisations were also accepted at Rs. 1000/- per month for medical professionals and @ Rs. 500/- per month for others.

**Table: 10.
Number of Trainees/
Observers in Different
Departments**

Department/Division	No.of candidates
Anaesthesiology	10
Cardiology	26
Cardiovascular & Thoracic surgery	8
Microbiology	6
Neurology	5
Neurosurgery	4
Radiology	25

National Science Day

National Science Day was celebrated on 29th February 1996 in the Institute. This year, the students invited were from the Government College of Engineering, Thiruvananthapuram and Model Polytechnic, Badagara. One hundred and ten students, in small batches, were given an overview of the activities in the Biomedical Technology Wing of the Institute.

A team of 21 Central Government officers at the levels of Dy. Secretary/ Joint Secretary, who were participants of a training programme with the Institute of Management in Government, visited the Institute on 16th January 1996. They were taken to various departments/divisions of the Hospital complex and to the Biomedical Technology Wing.

Library

SMT. R. PRASANNA KUMARI MA, MLISc
Librarian cum Documentation Officer

SMT. S. JAYAPRABHA BA, BLISc
Librarian cum Documentation Officer Gr II

SRI. JAYACHANDRA DAS B Sc, MLISc
Librarian cum Documentation Officer Gr II

During the year 95-96, the information, communication and networking technologies made considerable impact on the Institute Library. The INTERNET facility was made available through the Research and Education Network of National Informatics Centre (RENNIC), preparing the library to navigate the Cyberspace and to face the challenges offered by the 21st century. Access to Internet resources was made available to the clientele of the library through tools such as ARCHIE, Electronic Mail, TELNET, HYTELNET, WWW, WAIS, GOPHER, and FTP changing the basic character of scholarly communication. The library, in a constant state of metamorphosis, offered the advantages of Virtual Library to the academics of the Institute.

Collection

The library collection consisted of 16,078 books, and 14,814 bound journals besides video cassettes, patents, standards, microfilms and compact discs.

The library acquired 475 books and subscribed to 252 journals and received 50 journals as gratis during the year.

Information services

The library facilities and services continued to be extended to the doctors, scientists and students of neighbouring institutions as well. The search keyword profile of the users was created and updated to enhance the SDI service. This resulted in an improved hit rate for searches. The NIC-SCTIMST Biomedical Information Services of the library showed qualitative and quantitative improvement. The databases searched during the year were MEDLINE, AIDSLINE, Science Citation Index, Excerpta Medica- Neurosciences and Cardio-sciences in CD, Current Contents database On Diskette on three subjects - Life Sciences, Engineering, Computing and Technology; Physical, Chemical and Earth Sciences- BIOSIS, and ADONIS Full text database.

Training Programmes

The National Medical Library conducted a training programme on MEDLARS SEARCH APPRECIATION at the Sree Chitra Institute from 8-12 January, 1996 for the medical librarians of Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Pondichery and Goa. Fourteen health information professionals participated in the programme.

Fifteen participants of the 'Training Course for Working Librarians on Library Automation and Application Software Packages' organised by the Department of Library and Information Science, University of Kerala, under the auspices of Prof. K.A. Issac Endowment, were given training on LIBSYS and Internet for one day at the Institute library.

Staff and students of Department of Library and Information Science, University of Kerala, visited the Library as part of their curriculum.

Staff and students of the Department of Library and Information Science, Farookh College, visited the library as part of their study tour.

Nursing Education

MRS. P. P. SARAMMA MSc (NURSING)

Instructor in Nursing

The eighth batch of Post Basic Certificate students in Cardio-vascular and Thoracic nursing and the fourth batch of Neuro-nursing students successfully completed their programmes in December, 1995. Altogether there were 14 postbasic certificate holders. Currently, seventeen students are undergoing training in these two programmes. During this year, nursing students from various institutes were provided clinical experience, the details of which are shown below.

- i. Two M.Sc students from Rajkumari Amrit Kaur College of Nursing, New Delhi-one month summer field experience with project work.
- ii. Four M.Sc nursing students from College of Nursing, Thiruvananthapuram - one month clinical experience.
- iii. Two M.Sc nursing students from Fr.Muller's College of Nursing, Mangalore-one month clinical experience
- iv. Thirty seven BSc nursing students from College of Nursing, Kottayam - two weeks Clinical experience and
- v. Twentyseven B.Sc nursing students from College of Nursing, Kottayam-two weeks clinical experience.

A team of nursing experts visited this division on 2.1.1996 as part of Government of India's mission for collecting data for a project proposal on strengthening nursing services in the country. Nursing Manual was released on 9.6.95 by the Director of the Institute and copies were made available in each ward for reference. ■

Public Relations

SMT. T. V. HEMALATHA MA, LLB,
PGDJ

Public Relations Officer

Public Relation Section was responsible for the publication of the Institute News-letter, local hospitality for guests, co-ordination of meetings and workshops and interacting with the press and electronic media. The section also organised a workshop on the usage of Hindi. The Official Language Implementation Committee was reconstituted with the Director as the Chairman. The Committee recommended a number of measures to further the use of the Official Language and also organised a workshop on the use of Hindi for the employees of the Institute. ■

Medical Illustration

SRI. P. J. GEORGE

Chief Technician.

This section prepared superior quality photographs for more than eighty scientific papers published during the year and computer-generated projection slides for presentation at national and international conferences. ■

Achutha Menon Centre For Health Science Studies

DR. T. N. KRISHNAN PhD
Honorary Professor

DR. V. RAMAN KUTTY MD, MPhil, MPH (HARVARD)
Associate Professor

DR. P. SANKARA SARMA PhD
Assistant Professor

Major themes for research for the faculty of the Centre were:

- (a) Diffusion of health technology in Kerala, public and private sectors,
- (b) Health Financing in Kerala, and
- (c) Epidemiology of heart disease in Kerala.

Besides, the Centre also provided help (consultation) in design, conduct and analysis of research studies for other faculty of the Institute. Support to the residents/ research staff on data analysis was also provided.

The study on Health Financing in Kerala, funded by UNICEF, Madras, was completed and report submitted.

Computer facilities were upgraded to a 486 machine with software such as Microsoft office and SPSS-windows and one more node was added.

Joint collaborative research activity included

- (i) House hold health expenditure survey in 3 districts of Kerala - in collaboration with

Prof. P. G. K. Panikar,
Centre for Development
Studies;

- (ii) Epidemiology of Epilepsy, in collaboration with the Department of Neurology of the Institute; and
- (iii) Vitamin D status & its role as a risk factor for CHD - in collaboration with the Division of Cellular & Molecular Cardiology.

Departmental Reports

Department of Anaesthesiology

DR. K. MOHANDAS MD
Professor & Director of the Institute

DR. R. C. RATHOD MD
Professor & Head

DR. (MRS) A. ROUT
Additional Professor (on leave)

DR. H. D. WAIKER MD
Additional Professor (on leave)

DR. RUPA SREEDHAR MD Dip NB
Associate Professor

DR. G. SURESH MD
Assistant Professor

DR. PIUS K. MANAVALAN MD
Assistant Professor

DR. THOMAS A. KOSHY MD
Assistant Professor

DR. SHRINIVAS V. GANDHINHLAJKAR MD
Assistant Professor (from 27.7.95)

DR. P. GAYATRI MD Dip NB
Consultant (Ad - hoc)

DR. V. K. SATHYAJITH MD Dip NB
Consultant (Ad - hoc)

DR. RATAN GUPTA MD Dip NB
Consultant (Ad - hoc)

SRI. GANAPATHY POTTI
Scientific Assistant

Candidates for Post Doctoral Certificate Course

Dr. Gopalakrishnan Raman MD

Dr. C. Suresh MD

Dr. Nirmala Soundara Rajan MD

Dr. M. G. Pramod MD

Dr. Sumedh R. Kelkar MD

Dr. Sunil T. Pandya MD

Table: 11.
Anaesthesia support given during the year (1995-'96)

Procedures	Number
Open Heart Surgery	722
Thoracic, vascular & closed heart surgery	623
Neurosurgery	660

Anaesthetic services were also provided for investigational and interventional radiological and cardiac procedures.

Seven intensive care ventilators and ten pulse oxymeters were added to the equipment during the year.

Post graduate students in Anaesthesiology from the Medical Colleges at Goa and Nagpur underwent short-term training programme in the department during the year.

The Association of Kerala Medical Graduates, U S A, held its Anaesthesiology update at the Institute on the 16th of December 1995. The update was on "Cardio Pulmonary Resuscitation and Advanced Cardiac Life Support". ■

Division of Biochemistry

DR. K. SUBRAMONIA IYER Ph D
Additional Professor

DR. N. JAYAKUMARI Ph D
Associate Professor

SMT. SANTHA GEORGE M Sc
Scientist

SRI. B. SASIKUMAR M Sc
Scientific Assistant

The Central Clinical Laboratory functioned round the clock providing investigative support in clinical chemistry and pathology. Total number of procedures crossed 2.86 lakhs, registering an increase of 11% over the previous year. With the installation of the multichannel, random access autoanalyser, the promptness of service in clinical chemistry increased considerably.

In order to provide effective support in critical care medicine, the laboratory installed system ABL 610 from Radiometer which measures pH, blood gases, total hemoglobin, oxygen saturation and the electrolytes Na, K, Ca and Cl. The system uses the advanced technology of intracuvette ultrasound hemolysation of blood and spectrophotometry for precise measurement of hemoglobin.

Research Activities

The levels of antioxidant vitamins, vitamin E, vitamin C, and B-Carotene in blood collected from healthy

volunteers and their susceptibility to in vitro oxidative stress were evaluated. The extent of oxidative injury was measured by quantitating the levels of thiobarbituric acid-reactive substances, a marker of lipid peroxidation. The basal levels of vitamin E in healthy controls were within the reported normal range. However, in 80% of the volunteers, the levels of B-Carotene were below the normal range. Similarly, in most of the volunteers, levels of vitamin C were on the lower side of the normal range. Oxidative stress raised the levels of lipid peroxides several-fold above basal value, and none of these values showed any relation to the initial levels of vitamin E. However, subjects having levels of vitamin C and B-Carotene below the normal range had higher rates of lipid peroxidation compared to those having normal levels of these antioxidant vitamins.

Although vitamin E is the major antioxidant in serum, most of it remained intact after exposure to oxidants. Vitamin C was

found to be the most susceptible to oxidative attack and vitamin E the least susceptible. Further, smokers were found to have very low basal levels of vitamin C and their serum after exposure to oxidants showed high levels of peroxidation products. This indicated the proneness of these individuals to high peroxidation potential which may cause premature development of free radical-related diseases like cancer or ischaemic heart disease. This preliminary study indicated the need for evaluating antioxidant levels in a larger population and the data generated may ultimately help in recommending antioxidant therapy as a preventive measure against coronary artery disease and atherothrombotic brain infarction.

Studies on stroke patients, in collaboration with the Department of Neurology, indicated significantly higher levels of lipid peroxides in these patients. The activity of the major free radical scavenging enzyme, super-oxide

dismutase, was found to decrease in these patients as a result of the increased peroxidation potential. High density lipoprotein(HDL), was also significantly decreased in stroke patients. Efforts were on to isolate and characterise HDL from the patients in order to

understand the possible role of HDL in different types of atherosclerotic vascular diseases.

An ultracentrifuge, optima TLX from Beckman, was an important addition to the research laboratory. ■

Division of Blood Transfusion Services

DR. JAISY MATHAI MBBS, DCP
Chief Blood Transfusion Officer

DR. P. V. SULOCHANA MBBS
Blood Transfusion Officer

DR. SATHYABHAMA MBBS
Blood Transfusion Officer

Blood donation remained more or less at the same level as in previous years. Nearly 50% of collected units were used for component preparation. The increased use of blood components helped to optimise blood inventory, thus providing transfusion services to more patients.

Research Activities

The division addressed

- (i) the possible causes of Transfusion Reactions in SCTIMST
- (ii) the incidence of post-transfusion hepatitis among post operative patients of the institute, and
- (iii) the attitude of blood donors towards pre-donation questionnaire and intimation of test results.

Joint collaborative research activity with the Thrombosis Research Unit included

- (i) Preparation and standardization of topical fibrin glue as a surgical adjunct
- (ii) Preparation of platelet concentrate for betathrom boglobulin antigen preparation, and
- (iii) evaluation of platelet stored in PVC bags for 72 hours.

Following important persons visited our division.

- (i) Dr. Z. S. Bharucha, Tata Memorial Hospital, Bombay, visited the division and discussed a wide range of topics in Blood Banking
- (ii) Mr. Thomas M. Chacko of Retrovirus Diagnostic Division of Virology

Reference Lab at West Haven, USA, spoke on Lab diagnosis of HIV infection.

Nineteen Medical officers from government services attended a one month training programme in modern blood banking technology at our Blood Bank sponsored by the State AIDS Cell Unit of NACO. One doctor from the private sector also attended the one-month training programme.

An Hospital Transfusion Committee was constituted for evaluation of blood transfusion practice at the hospital and form guidelines for its optimal usage.

An animation film for creating general awareness on blood donation was made by C-DIT with our blood bank.

The division was awarded the prestigious Indian Red Cross Society citation and Trophy for its meritorious services in Blood Transfusion and Blood Donation.

Ms. Usha Kandaswamy participated as counsellor in the Mahila Adalat 1996, Thiruvananthapuram, and attended the V chapter meet of ISBT&I at Kottayam. ■

Department of Cardiology

DR. K. G. BALAKRISHNAN MD, DM, FAMS, FACC
Professor & Head (on leave)

DR. JAGAN MOHAN A. THARAKAN MD, DM
Professor

DR. THOMAS TITUS MD, MNAMS (MEDICINE) DM
Additional Professor

DR. RAMAKRISHNA PILLAI MD, DM
Associate Professor

DR. V. AJITHKUMAR MD, DM
Associate Professor

DR. ANIL BHAT MD, DM
Associate Professor

DR. S. SIVASANKARAN MD, DM, Dip NB (CARDIOLOGY)
Assistant Professor

DR. BIMAL FRANCIS, MD, DM
Assistant Professor

SRI. K. N. VIJAYASENAN B Sc
Scientific Assistant.

Candidates for DM:

Dr. K. Latchumanadas MD

Dr. T. Sudhalakshmi MD

Dr. P. Kader Muneer MD

Dr. P. K. Joseph MD

Dr. Buvanesh Babu MD

Dr. K. U. Natarajan MD

Dr. S. Manoj MD

Dr. K. J. James MD

Dr. G. Justin Paul MD

Dr. Harikrishnan MD

Dr. Nageswara Rao MD

Dr. C. Rajiv MD

The out-patient statistics for the Cardiology Department shows that 5619 new patients were registered in the year 1995-1996. There were 2190 admissions to the hospital during the same period and the majority of admissions were for cardiac catheterisation and interventional procedures.

Table: 12. Different Procedures Performed During the Year

Procedures	Number
1. Coronary angiography	483
2. Cardiac catheterisation	536
3. Balloon mitral valvotomy	279
4. Balloon pulmonary valvotomy	31
5. PTCA	53
6. Coarctation dilatation	7
7. Pacemaker Implantation	85
TOTAL	1474

As the department could perform a large number of balloon mitral valvotomy procedures, the waiting period for patients with mitral stenosis could be considerably reduced. Balloon mitral valvotomy was also performed on very sick patients and pregnant patients.

The Department organised a workshop on "Coronary

Angioplasty and Coronary stenting" on 2nd February 1996 and four of our patients had successful coronary stent implantation performed with excellent results. Dr. Sudheer Vaishnav, Cardiologist at Nanavati Hospital participated as the Principal investigator during the workshop. The workshop was instrumental in establishing the coronary stent programme in the department.

The department acquired an electrophysiology recorder to undertake radiofrequency ablation for the management of various forms of cardiac arrhythmias.

Dr. Sivasankaran, Dr. Latchumanadas, Dr. Sudhalakshmi and Dr. P. K. Joseph presented papers at the annual CSI conference at Lucknow in December 1995.

Department of Cardiovascular and Thoracic Surgery

DR. M. P. MOHANSINGH FRCS (ENG)FRCS (EDIN)

Professor & Head

DR. K. S. NEELAKANDHAN MS, M CH

Professor

DR. R. SANKAR KUMAR MS, M CH

Additional Professor

DR. K. G. SHYAMKRISHNAN MS, M CH

Additional Professor

DR. M. UNNIKISHNAN MS, M CH

Additional Professor

DR. Y. A. NAZER MS, M CH

Additional Professor (On leave)

DR. KRISHNA MANOHAR MS, M CH

Associate Professor

DR. S. K. NAIR MS, M CH

Associate Professor.

DR. AVINASH DAL MS, M CH

Assistant Professor (Adhoc)

MR. THOMAS MALIAEKAL

Scientific Assistant

Candidates for M Ch course in CVTS

Dr. Apurva vaidya MS

Dr. Akbar Bhat MS

Dr. Sandeep Attawar MS

Dr. Shipra Gupta MS

Dr. Ravindra Singh Rathor MS

Dr. Sandeep Shrivastava MS

Dr. Joseph Xavier MS

Dr. Avijit Basu MS

Dr. Vijit Koshy Cherian MS

Dr. Jayant Kumar Das MS

Dr. Jigeesh Doshi MS

Candidate for post doctoral certificate course in vascular surgery

Dr. Vijay Singh Thakur MS

Table:13. Open Heart Surgery done during the year

Type of cases	Number
ASD	295
VSD	43
ICR	146
MVR	87
AVR	28
DVR	25
CABG	116
CMV	82
PDA	150
LUNG	76
Aneurysm	60
BT shunts	25
Vascular	61
Miscellaneous	199
Total :	1393

Of the 1393 surgical procedures performed, 740 were open heart surgical procedures. Waiting lists for valve replacement and coronary artery bypass grafts remained unacceptably long. Pulmonary resections and vascular and aneurysm surgery increased in number, as expected, with a corresponding reduction in simpler cases done. The project on SITRA vascular grafts progressed well. ■

Division of Cellular and Molecular Cardiology

DR. C. C. KARTHA MD, FASc
Professor & Head

DR. R. RENUKA NAIR PhD
Scientist

DR. K. SHIVAKUMAR PhD
Scientist

DR. JOHN T. EAPEN PhD, FAZ.
Scientist

Research Activity

Three studies were successfully completed and three projects were initiated during the year. Projects which got under way were

- (i) experimental studies for assessment of cardiac function in a rabbit model for endomyocardial fibrosis.
- (ii) investigations into the role of free radicals in the mediation of cardiac fibroblast proliferation by lanthanides, and
- (iii) estimation of trace element levels in serum of malnourished children during episodes of diarrhoea and acute infections.

Studies which were completed included

- (i) collagen phenotyping of myocardial tissues from patients with endomyocardial fibrosis
- (ii) standardisation of procedures for isolation and culture of ventricular myocytes from adult rats and methods for measuring the extent of cellular contraction and relaxation using an edge detection device, and
- (iii) a case control study of vitamin D status and some

of the known risk factors in patients with coronary artery disease.

The ongoing studies on cardiovascular pathology associated with magnesium deficiency yielded important insights. Magnesium deficiency was found to enhance vascular smooth muscle cell proliferation and collagen synthesis in vivo in rats, implying an increased growth response in the vasculature. This observation is in line with the postulated relationship between magnesium deficiency and arteriosclerosis. Further, in magnesium deficiency, enhanced lipid peroxidation was found in aortic cells which strengthens the view that magnesium deficiency may influence the atherosclerotic process at many steps. Significant alterations in cardiac tissues of rats in response to dietary deficiency of magnesium included enhanced lipid peroxidation and increased rates of collagen synthesis and deposition. Although stimulation of collagen synthesis was found to be at the transcriptional level in the early stages of magnesium deficiency, increased fibroblast

proliferation was observed with increased severity of deficiency. It was concluded that cardiac fibrogenesis in magnesium deficiency is reparative in nature, following oxidative damage to the cardiac muscle. The role of growth promoting cytokines and the neuropeptide Substance P in mediating cardiac injury and response in magnesium deficiency was taken up for exploration.

A Wallac 1409 liquid scintillation spectrometer and a Ninon Kohden 2-channel mini polygraph system (model RM-6100) were purchased during the current year.

The atomic absorption spectrophotometer, which was out of order for a long period, was put into use, thanks to engineers from IGCAR, Kalpakkam. Since then, the facility was widely used by scientists within and outside the Institute.

Dr. Muthu Periasamy, Director of Molecular Cardiology, Department of Internal Medicine, University of Cincinnati, Ohio, visited the division and delivered a lecture on calcium regulation and cardiac failure.

Prof. D. P. Agarwal from the Institute for Human Genetics, University of Hamburg, visited the division and gave a talk on the molecular basis of alcohol use and abuse.

Division of Microbiology

DR. J. SHANMUGAM M Sc, Ph D, MD (HON), FIMSA, FABMS, FIVS
Professor and Head

MRS. MOLLY ANTONY M Sc, DMV
Assistant Professor

DR. MURALIDHAR K. KATTI MSc, PhD
Assistant Professor

MR. M. RAVINDRANATH BSc
Scientific Assistant

MRS. K. NASEEMA MSc
Scientific Assistant

The Division continued to offer routine diagnostic services in Microbiology. The data were fed in to the computer and analysed every month. This helped to understand the patterns of antibiotic resistance in pathogen bacteria as well as the outbreak of nosocomial infections.

Research Activities

The Division studied the incidence of viral encephalitis due to Herpes simplex, Measles and Coxsackie B viruses.

The study of *Campylobacter jejuni* in relation to its role in the genesis of GB syndrome has yielded useful findings.

Attempts are also on to identify the pathogenic bacteria responsible for nosocomial infections in this hospital.

The antiviral effects of selected indigenous plants from Kerala

State was chosen the subject of investigations of doctoral students in the department.

In collaboration with the Department of Cardiovascular and Thoracic Surgery, a three year project has been sanctioned by the Department of Science, Technology and Environment, Government of Kerala.

Dr. J. Shanmugam was the subject expert at the CSIR interview for award of research fellowships in Medical Sciences.

MD students and B.Sc MLT students from the Thiruvananthapuram Medical College underwent training in immunological and virological techniques.

Sr. Elsa Tom from St. Thomas College, Pala spent two months learning antimicrobial study techniques and carried out a part of her Ph.D work in the

department. The Louis Pasteur Centenary Memorial Symposium was jointly organised with the Regional Research Laboratory (CSIR) and the AMI Unit, Trivandrum, at the Regional Research Laboratory (CSIR), on 20th November 1995.

The Division of Microbiology, in collaboration with the Department of Cardiovascular and Thoracic Surgery, organised an INDO-UK Symposium on Hospital Infections in ICUs & Control at the Institute on the 17th and 18th of January 1996. The symposium was co-sponsored by the Hospital Infection Society of United Kingdom.

The Division was selected as one of the six nodal centres in India by the National Institute of Biologicals, Ministry of Health and Family Welfare to run the quality control programme in clinical microbiology.

Department of Neurology

DR. K. RADHAKRISHNAN MD, DM, MNAMS

Professor and Head

DR. C. SARADA MD, DM

Additional Professor

DR. M. D. NAIR MD, DM

Additional Professor

DR. SANJEEV THOMAS MD, DIP NB, DM

Associate Professor (on leave)

DR. ASHA VIJAYARAGHAVAN MD, DM

Assistant Professor (on leave)

DR. P. A. SURESH MD, DM

Assistant Professor

DR. ABRAHAM KURUVILLA MD, DIP NB, DABN (NEUROLOGY), DABN

(CL-NPH)

Assistant Professor

DR. B. SANTHOSH KUMAR MD, DM

Assistant Professor (ad hoc)

DR. S. DINESH NAYAK MD, DM

Assistant Professor (ad hoc)

Candidates for DM

Dr. Gigy V Kuruttukulam MD

Dr. Thomas John MD

Dr. Atri Chakraborty MD

Dr. B. Reghunath MD

Dr. Mathuranath MD

Dr. Joseph Cherian MD Dip NB

Dr. Lally Alexander MD

Dr. Sylaja MD

Dr. Sudeep Balakrishnan MD

Routine Activities

There was an increase in outpatient attendance, hospitalization and neurophysiologic procedures during the year under reference. The video - EEG

monitoring registered over 100 patients in its first year of service.

Table: 14. Routine Activities for the year

Activity	Number
O.P.Registration	2920
In-patients	1216
E E G	1408
E N M G	561
Video EEG	111

Comprehensive Epilepsy Care Programme

A comprehensive programme for evaluation of medically unsatisfactorily controlled patients with epilepsy was

initiated during last year. This included video-EEG monitoring, computerized EEG classification system, neuropsychologic evaluation and Wada's test. Out of 111 patients who underwent video-EEG monitoring, 25 had anterior temporal lobectomy for intractable complex partial seizures. An outstation epilepsy care centre was established in a rural area in Thrissur district.

Therapeutic plasma exchange programme

A large volume plasma exchanger, Hemonetics (USA), was procured in August 1995.

A standardized protocol was developed for therapeutic plasma exchange. Twenty-five patients underwent exchange through this equipment after its inception.

Research activities

An overview of the projects initiated during this year and continuing from previous years is given below.

1. A "Registry for Subacute Sclerosing Pan-encephalitis (SSPE)" was initiated involving the whole of Kerala. The aim was ascertainment of all cases of SSPE in Kerala, analysis of causative factors including measles, its immunisation, various geographical, environmental and cultural factors associated with this disease. This project is funded by the STEC, Kerala.
2. An open label study on the "Efficacy of Ginkgo Biloba in patients with medically intractable seizures."
3. The project on "Psychosocial problems in long standing epilepsy", funded by ICMR was in progress.
4. "Role of Free Radicals in Completed strokes, TIA, migraine with aura and dementia of Alzheimers type", in collaboration with the Department of Biochemistry and funded by STEC, Kerala.
5. A multi-centre study on the "Neurologic Intensive Care in India was started in January 96 in collaboration with the Neurology departments in Christian Medical College, Vellore, and Nizam's Institute of Medical Sciences, Hyderabad.
6. "Sensitivity of trans-oesophageal ECHO in the detection of occult cardiac lesions in young strokes", in collaboration with the Department of Cardiology was in progress.
7. "Campylobacter jejuni serology in patients suffering from Guillain-Barre syndrome", in collaboration with the Department of Microbiology, SCTIMST.
8. The project on "A linguistic analysis of communicative disorders - An inter disciplinary study" in collaboration with ISDL was completed by the end of 1995.
2. Robert Griggs M D, Professor and Chairman of Neurology, University of Rochester School of Medicine, Rochester, New York, in December 1995, who highlighted the "Recent understanding of myotonic dystrophy.
3. Professor K. Govindan Gopinathan, Clinical Professor of Neurology, New York University Medical Centre, New York, USA, in December 95, who spoke on "Management of Parkinsonism."
4. Professor Walter G Bradley, Miami University of Medicine, Florida, USA, in February 1996, who spoke on "Guillain - Barre Syndrome - an appraisal."

The department hosted the Annual Meeting of the State Chapter of the Neurological Society of India in October 1995.

Important visits to the Department

The department had many important visitors.

1. Professor S H Subramony, Vice Chairman of the Department of Neurology, University of Mississippi, USA, in August 95, who spoke on the "Neurogenetics of Spinocerebellar degeneration.

Department of Neurosurgery

DR. DAMODAR ROUT MS, MCh, FAMS
Professor (on leave)

DR. BASANT K. MISRA MS, MCh, DIP NB
Additional Professor (on leave)

DR. SURESH NAIR MCh
Additional Professor

DR. N. BHASKARA RAO DIP NB
Assistant Professor

DR. UMA NAMBIAR MS, MCh
Assistant Professor

DR. N. I. KURIAN MS, MCh
Assistant Professor (Ad-hoc)

DR. RAJNEESH KACHHARA MS, MCh
Assistant Professor (Ad-hoc)

Candidates for MCh

Dr. Girish Menon MBBS
Dr. Yashesh Dalal MS
Dr. Puduru Sai Sudarsan MS
Dr. Dibanath Chakraborty MS
Dr. Sonal A. Thakker, MBBS
Dr. Narendra K. Das MS
Dr. Prithvi Varghese MS
Dr. Ravi Gopal Varma MS
Dr. S. Parameswaran MBBS

The department got increasing referrals of complex intracranial surgical problems. The volume of operative work remained almost the same as in previous years (Table 13). Surgery for intracranial aneurysms and tumors of the base of skull formed 30% of the total surgical procedures.

Surgery for temporal lobe epilepsy was initiated in collaboration with the Department of Neurology.

Research Activities

Ongoing research project on the effect of urokinase and papaverine on chronic vasospasm in a canine model of subarachnoid haemorrhage made satisfactory progress.

Dr. Setti S Rengachary, Professor of Neurosurgery, University of Minnesota, Minneapolis, visited the department and delivered lectures on Lumbar Microdiscectomy and two interesting cases of raised ICP.

Dr. Emil Pasztor, former Director of National Institute of Neurosurgery, Budapest, Hungary, visited the department and delivered lectures on transoral approaches to clivus and transphenoidal surgery during December 1995.

Dr. R. M. Varma, Emeritus Professor of Neurosurgery, NIMHANS, Bangalore, Dr. Ashish Chand, Head of the Dept. of Neuro-surgery, St. Johns Medical College, Bangalore and Brig. Gill of Command hospital, Delhi, visited the department.

M.Ch. (Neurosurgery) trainees from NIMHANS, Bangalore and CMC Vellore spent short periods in the Department as observers.

Table: 15. Operative procedures Performed during the year

Diagnosis	Number of cases
Aneurysm (Patients 105)	113
Arteriovenous malformations	16
Acoustic neurinomas	24
Petro-clival and other C P angle tumor	20
Brainstem glioma	4
Meningiomas	61
Pituitary adenomas	45
Craniopharyngiomas	21
Gliomas (Supratentorial)	46
Cerebellar tumors	22
CV junction anomalies	46
Spinal tumors	31
Other spinal lesions	57
Temporal resection for TLE	23
Miscellaneous	149

Division of Neurochemistry

DR. P. S. APPUKUTTAN PH.D
Additional Professor

SMT. K. I. ANNAMMA BSc
Scientific Assistant

Routine Activity

Assays for the enzymes, aryl sulfatases A and B and Hexosaminidases A and B, were done with serum and urine samples of patients.

Research Activity

A highly sensitive ELISA was developed for the human serum anti-galactoside antibody (anti Gal) that is known to be crucial in anti-bacterial and anti-tumor defence and probably in certain autoimmune neurological disorders. This assay employed microplate-coated bovine thyroglobulin as substrate and horse radish peroxidase as marker enzyme. To evaluate the biological activities of (Fab) 2 and Fab fragments of anti-Gal, these fragments were prepared by pepsin and papain digestion respectively and purified by affinity chromatography.

In the search for endogenous glycoprotein ligands of heart lectin, glycoproteins co-purified along with this lectin were separated by (i) electrophoretic elution and (ii) HPLC, and

homogeneous lectin was obtained. Using peroxidase labeled anti-Gal, this antibody was shown to recognise surface glycoconjugates of Group A Streptococci sugar-specifically.

A Mettler electronic balance (through C.S.I.R. project) and a Sigma magnetic stirrer (through C.S.I.R. project) were procured. ■

Division of Pathology

DR. V. V. RADHAKRISHNAN MD
Professor & Head

DR. S. SANDHYAMANI MD
Additional Professor

DR. ANNAMMA MATHAI M Sc, PH D
Scientific Assistant

During the year 1995-96, 850 surgical pathology specimens from neuro and cardiac diseases were subjected to histopathological studies. Frozen section diagnosis was performed in 210 patients and routine immunological investigations in 2000 patients. Besides these, muscle

biopsies were undertaken in 55 cases. Enzyme histochemistry for NADH-TR and ATPases were standardised and applied to all the muscle biopsies. Histochemical stains were extremely useful in classifying mitochondrial myopathies as well as congenital myopathies.

The Division also introduced immuno-histochemical staining for proliferating cell nuclear antigen (PCNA) Ki-67 and in-vitro bromo-deoxyuridine uptake. These parameters were useful in predicting aggressive biological behavior of intracranial tumors.

The Division, in collaboration with the Department of Paediatric Neurology, Medical College, Trivandrum undertook muscle enzyme histochemical profiles in neuromuscular and muscular disease in children.

Prof. Paul Kleihus of the Institute of Neuropathology, University Hospital, Zurich and Editor of Brain Pathology Journal visited the department in March 1996.

Dr. Sandhyamani, as visiting scientist, worked on advanced techniques in glycobiology in the laboratories of Dr. V.P. Bhavanandan, Hershey Medical Centre, Hershey, and Dr. E. A. Davidson, Georgetown University Medical Centre, Washington D.C.

Characterization of acid mucopolysaccharides (glycosaminoglycans) on autopsy specimens from the Institute revealed abnormal accumulation of heparian sulfate and chondroitin-4-sulphate in arteries affected by mucoid vasculopathy, possibly predisposing the blood vessels to thrombosis and structural weakness and consequent aneurysms and dissections.

■

Department of Radiology

DR. K. RAVIMANDALAM MD
Additional Professor & Head (till September 1995)

DR. A. K. GUPTA MD
Additional Professor

DR. SANTHOSH JOSEPH DMRD, MD
Additional Professor

DR. MADHAVAN UNNI DMRD, MD
Associate Professor (on leave)

DR. A. SRINIVAS RAO MD
Associate Professor (till 13.3.1996)

Candidates for postdoctoral certificate course

Dr. Ashok Raghavan, MD
Dr. K. P. Sreekumar, MD

Table: 16. Routine procedures done

Procedures	Number
Plain X-rays	16757
CT scan	3130
MRI Scan	2236
Invasive Diagnostic procedures	
Cerebral angiogram	161
Spinal angiogram	10
Aortogram and peripheral arteriogram	174
Myelogram	7
Miscellaneous	58
Interventional procedures	
Cerebral and craniofacial embolization	51
Balloon angioplasty	44
Cerebral Thrombolysis	2
Amyl Nitrate test	4
I.V.C.Filter implantation	1

Research Activity

Research activities in the department included

- i. intervertebral disc ablation using Nd:YAG Laser,
- ii. laser welding of blood vessel-using Nd:YAG Laser,
- iii. development of barium sulphate impregnated hydrogel beads for embolization,
- iv. MRI study of vascular lesions of brain,
- v. MRI study of aortoarteritis,
- vi. evaluation of different drugs in the prevention of restenosis after anangioplasty,
- vii. a prospective study of cranio-vertebral region with special reference to cerebellar tonsil in vivo using MRI development of animal model of post subarachnoid haemorrhage vasospasm

to establish the role of papavarine and urokinase in vasospasm.

Joint collaborative research activity: Prospective study of craniovertebral region in collaboration with the Department of Anatomy, Medical college, Trivandrum. A Digital Subtraction Angiography (DSA) system (Advantx-DLX from GE medical system) was made operational since November 1995.

Important visitors to the department were:

- i. Prof. Krishna V. G. Rao, Professor of Neuroradiology, USVHSA, USA and
- ii. Dr. Krishna Kandappa, Associate Professor of Radiology, Harvard Medical School, Boston, USA.

Biomedical Technology Wing

Biomaterials Group

DR. R. SIVAKUMAR PH D
Leader

DR. K. SREENIVASAN PH D
*Scientist - Analytical
characterization infection
resistant coating*

DR. PRABHA D. NAIR PH D
Scientist - Ophthalmic Sponge

DR. T. RAMACHANDRAN PH D
Scientist - Laser

SRI. NIRANJAN D. KHAMBETE
M.TECH
Scientist - EMG Electrode

DR. P. R. HARIKRISHNA VARMA
PH D
Scientist - Bioceramics, SEM

DR. ANNIE JOHN PH D
Scientist - TEM

DR. A. C. FERNANDEZ PH D
*Scientist -
(on leave)*

SRI B. AJIT KUMAR M.TECH
*Scientist -
(on leave)*

SRI R. SREEKUMAR B SC
*Scientific Assistant - SEM
(Operation and Maintenance)*

The Materials Testing
Laboratory was renamed
BIOMATERIALS GROUP.

The Analytical Facilities
continued to be utilised by the
different research groups of the
Institute.

Facilities were also extended to
external organisations on a
chargeable basis. A number of

analyses were carried out
routinely using analytical
equipments like liquid
chromatograph, IR
Spectrophotometer, Thermal
analyser system and Instron. A
gas Chromatograph with head
space sampler was added for
characterisation of polymers
and measurement of residual
Eto gas etc.

The SEM/TEM were used regularly to study material-tissue interaction using standardised techniques for processing, embedding and sectioning of ultra thick sections of materials like polymers and ceramics and tissues.

A study of tissue response to Calcium Phosphate-based ceramics in bone in rabbit was started. Demonstration class in TEM were held as part of the In-service course for Zoology and Botany teachers of Kerala University.

Development of Porous Hydroxyapatite Ceramic Granules for restorative/bone filling applications made further progress. Granules in the appropriate size/range were prepared and animal implantations were carried out. The results of the toxicological evaluation were satisfactory. Freeze drying procedure was developed for the same. Studies on processing of dense bioceramics by gel casting and colloidal processing routes were also carried out. Microwave sintering of hydroxyapatite ceramic systems was carried out using a laboratory microwave oven.

A research programme was initiated on the development of synthetic recognition system also called Molecular Imprinting, capable of interacting selectively with molecules of interest. These systems could be used as

selective absorbent, as sensor component etc. Studies on Cyclodextrin based polymers made further progress. A chemical process to incorporate silver onto polyethylene surface was developed as a part of the effort to obtain anti-microbial polymer surfaces.

The Laser activity involved collaboration with the Department of Cardiovascular surgery and Department of Radiology for the development of laser techniques in thoracic surgery and intervertebral disc ablation. The existing fiber delivery system was modified for the purpose and was tried out in animal model. Studies on laser-tissue interaction and the form of laser delivery for applications in the treatment of oesophageal and bronchial tumors and intervertebral prolapse were carried out. Experiments in dental application of lasers also continued. A new programme on Optic fiber sensors for biomedical applications was started. An internal project was initiated for the development of optical fiber sensor for blood pressure waveform monitoring and demonstration of its technical feasibility.

The first phase of development of the Concentric Needle Electrode (CNE) was completed this year. The CNE were assembled on a regular basis and were evaluated for their clinical performance in the Neurology department of our

hospital. The performance was found to be quite satisfactory.

The clinical evaluation of Ophthalmic sponges at Sankara Netralaya continued. Methods were formulated to enhance the rate of swelling of the sponges towards water and blood. A combination of procedures involving variations in the synthetic procedures, surface modifications, as well as processing was carried out to enhance the rate of swelling of the sponges. A new sponge using PVA-chitosan blends showed promise with substantially high rate of absorption.

Polyurethane membranes of specific pore size were fabricated for use as guided tissue regeneration membranes in periodontal defect surgeries. This was a collaborative programme with Dr.Varma, Dental College, Manipal.

The membranes are also being evaluated for potential application as diffusion barrier in solid state batteries.

Thrombosis Group

DR. LISSY K. KRISHNAN PH D
Scientist and Leader

DR. R. AJAYKUMAR PH D
Post Doctoral Fellow

In vitro Thrombogenicity Evaluation of biomaterials through tests such as platelet adhesion, aggregation, protein adsorption and activation of blood coagulation is being established. This activity is being developed as an important component of first level evaluation of materials and devices for blood compatibility.

Antibodies against human fibrinogen was raised in rabbits and purified using protein-A sepharose column. HRP conjugated antibodies were used to identify fibrinogen adsorbed to the surface. Antibodies were raised against platelet antigen GP IIb/IIIa in hens and purified from the egg yolk. These can be used to quantitate the platelet/membrane adhered to biomaterials.

Experiments were initiated to isolate bone morphogenic protein (BMP) from bovine bone. 8-10 proteins were extracted, out of which a few were selectively adsorbed onto hydroxyapatite being developed for implant applications. In vitro assay of the adsorbed protein for its ability to proliferate osteosarcoma cell lines is being standardized.

Another area of focus was the development of Fibrin Sealant Components for surgical applications.

Fibrinogen concentrate was prepared from the fresh plasma obtained from the blood bank using cryogenic and chemical methods. The mechanical strength and haemostatic effects were studied in animal models.

develop a hollow fibre based membrane oxygenator for use during open heart surgery in a period of 2 1/2 years.

The division continued to extend active support to the Department of Cardiac Surgery in the data analysis and reporting of the results of the multi-centric trial of the chitra heart valve prosthesis. Facilities for the production of heart valves were extended to M/s.TTK Pharma Ltd, the licencees of the heart valve technology. The technology transfer documentation on Quality Assurance was completed.

Interaction with TPF on further R&D in the area of hydrocephalus shunt continued. Work on the development of a novel flow controlled shunt has been initiated.

Further evaluation of the vascular graft as recommended by the Ethics Committee was completed and clearance for clinical trials is awaited.

Division of Artificial Internal Organs

DR. G .S. BHUVANESHWAR MS, PH D
Engineer and Leader

SRI. C.V. MURALEEDHARAN M TECH
Engineer

SRI. S. VIJAYAN M Sc
Scientific Assistant

A new activity, viz., "The development of a Membrane Oxygenator" was initiated as a joint

collaborative R&D project with M/s. SPIC, Madras as the industrial partner in October 1995. The project aims to

Biosurface Technology

DR. CHANDRA P. SHARMA M TECH, MS, SC D, MEBE
Scientist and Leader

DR. THOMAS CHANDY M SC, PH D
Scientist

SRI. P. R. HARI B SC, AIE
Scientific Assistant

A new approach to develop a hybrid tissue of bovine pericardium grafted with polyethylene glycols of varying molecular weight for non thrombotic and anticalcifying properties was attempted. Evaluation of the stability of the hybrid material in-vivo was initiated.

Aspirin and heparin embedded chitosan/polyethylene vinyl acetate comatrix controlled release system was studied. The initial burst release was modified with styrene-butadiene coatings. Another example was the development of hydroxy-apatite spheres, loaded with povidone-iodine for sustained antimicrobial property.

A chitosan based wound dressing along with collagen, PEG and alginates was evaluated clinically by Professor Dr. Ramakrishnan Nair, Department of Plastic Surgery, Medical College, Trivandrum.

The immuno adsorbent beads being developed for specific binding of immunoproteins were evaluated under in-vitro

conditions. Animal trials were planned in collaboration with the Department of Neurology of our institute. ■

Toxicology Group

DR. K. RATHINAM M SC, PH D
Scientist and Leader

SRI. P. V. MOHANAN M SC
Scientist

SRI. ASHOKAN K. KUTTIYIL M SC
Scientist (Temporary)

The Toxicological Evaluation of Materials used for various Devices and Implants, as per International Standard and protocol, was the main focus of the group. Mandatory biological tests for devices such as sterility and pyrogen testing were also carried out. The small animal facility was transferred to this group. This activity involved care, breeding and management of small animals like guinea pigs, rabbit, rat and mice for inhouse toxicological experiments. Toxicological

studies such as oral toxicity, sensitization, mucous irritation and mast cell studies were carried out with the Dental Composites. Hydroxyapatite and Titanium samples were tested for oral toxicity, sensitization and haemolysis.

Steps for identification and monitoring of different species of microorganisms were initiated to develop a microbiology support for device development. The test

procedure for bioburden evaluation of bioburden of devices and material samples was standardised this year. Bioburden evaluation was carried out on needle electrodes, ophthalmic sponge, etc. in order to standardise the protocol and monitor the bioburden during different processing steps.

Monitoring of the quality of water used in Technology

Proving Facility (TPF) was done periodically.

A collaborative project with Regional Research Laboratory in the area of "Analysis of tribal medicines and therapeutic uses - Diabetes" was initiated. This involves development of suitable animal model and evaluation of the efficacy of different formulations.

Division of Pathophysiology

DR. MIRA MOHANTY MD
Scientist and Leader

DR. T. V. KUMARY PhD
Scientist

The evaluation and assessment of Material-Tissue interaction was the main focus of the activities. Specifically, histological evaluation of tissue response to chitosan beads, hydroxy-apatite granules and powders, titanium, UHMW polyethylene, delrin etc. was carried out. Detailed hard tissue response to hydroxyapatite (HA) granules and powders is being developed and evaluated in comparison with the imported HA, in current clinical use. Improvements and refinements were made over the existing practice of preparation and processing of hard and soft tissues.

Expertise is also being built in the area of in vitro cytotoxicity assessment of

materials using cell culture methods. The materials evaluated included uncoated and silver oxide coated latex, different forms of hydroxyapatite and tricalcium phosphate ceramics, latex processed under different conditions and carbon. Methods were standardised to use different types of cells (L-929, MG-63, Vero and osteoblast like cells) in contact with materials to assess the morphological and functional response of the cells.

The ICMR funded project on the elucidation of mechanisms of toxicity of haemo-globin was completed. The procedures adopted to reduce the toxicity of haemoglobin solution yielded a non-toxic solution. In

vitro safety studies using cytotoxic tests and in vivo infusion into rats were carried out. Concentration of upto 7mg% of Hb was not cytotoxic and infusion into rats did not cause any adverse clinical effects or any morphological change in the different organs studied.

Polymer Division

DR. M. JAYABALAN PH D
Scientist and Leader

MISS. P. P. LIZYMOL M Sc
Scientific Assistant

The development of a high performance potting compound for fabrication of hollow fibre haemodialyzer was pursued with adhesive systems based on both the epoxy and the polyurethane. The epoxy potting compound was synthesised using resorcinol and triethyl amine. The influence of parameters like molar ratio of phenolic compound epichloro-hydrin, catalyst concentration, temperature and time was studied. Two types of polyurethane potting compound, one based on hydroxyl terminated polyurethane prepolymer and the other based on isocyanate terminated polyurethane

prepolymer, were synthesised with suitable hardner/extender. The required specification for potting compound are being developed. Work was also carried out to develop a prototype dialyser in the laboratory for evaluation.

In the area of soft tissue adhesives, shelf life studies were carried out on oligomer of capped isocyanato ethyl methacrylate/acrylic acid. The compound is non-freezable and stable at 4° C for the past 18 months. The synthesis of potential bone bonding tissue was initiated using diglycidyl acrylate of resorcinol and phloroglucinal. ■

without introducing any foreign groups was developed and their possible application was explored.

Barium sulphate - loaded poly (2-hydroxyethyl methacrylate) microspheres which are highly radioopaque were evaluated in a dog model for their embolic effect and radio opacity.

Poly (vinyl pyrrolidone) graft-modified polyester sewing ring of heart valve prosthesis was taken up for in vivo animal evaluation.

The DST sponsored project on the preparation and evaluation of casein microspheres as drug carriers was completed. The efficacy of mitoxantrone-loaded (an anti-cancer drug) micro-spheres was investigated against Ehrlich ascites carcinoma (EAC) in mice. The therapeutic effect observed with drug loaded casein microspheres was significant in comparison with the therapy using free drug. ■

Division of Polymer Chemistry

DR. A. JAYAKRISHNAN PH D
Scientist and Leader

DR. P. RAMESH PH D
Scientist

Surface modification of Polyvinyl chloride (PVC) with phase-transfer catalysis mediated substitution of chlorine with sulphide and thiosulphate was carried out. Further work on the

SRI. M. C. SUNNY AIC
Scientific Assistant

characterisation of this migration resistant PVC for blood contacting application is in progress.

A method to graft poly (ethylene) glycol of various molecular weights onto PVC

Polymer Processing Group

DR. R. SIVAKUMAR PH D
In-Charge

DR. V. KALLIYANA KRISHNAN M SC, PH D
Scientist- Dental Composites

MR. ROY JOSEPH M SC, M TECH
Scientist - Latex Catheter

The Division of Polymer Technology was reconstituted as Polymer Processing Group with effect from 06-1-96.

Clinical Trials of Light cured Dental composites was taken up in association with Prof. Bhat, Dean, College of Dental Surgery and Prof. (Mrs) A. Valiathan, Dept. of Orthodontics and Maxillofacial Surgery, Manipal Academy of Higher Education.

One of the drawbacks of the light cured composite developed was that it was not radio-opaque. So attempts were made to develop a radio-opaque composite by incorporating Zirconium dioxide as the filler material. Another approach was to substitute conventional quartz filler with radio-opaque glass filler material. Various formulations were tested using a commercially available filler and a few formulations were of adequate strength.

Further work in the area of dental composites included:

- a. efforts to develop a dentine bonding agent based on methacrylate/dicarboxylic acid system consisting of a

resin part and a primer part. The shear strength and tensile strength of dental composites fixed on human teeth using the newly developed bonding agent were measured. The primer part is presently undergoing toxicity trials.

- b. Studies on the phenomenon of microleakage in the presence and absence of the bonding agent.

The collaborative programme for the development of urinary catheters, initiated between Rubber Board, Kottayam and the Institute is in progress. A number of commercially available catheters were analysed and found to contain a rubber accelerator zinc dialkyl dithiocarbonate. A curing system was formulated which passed cytotoxicity tests. The influence of wall thickness and mould diameter on the shrinkage of rubber tubes was determined and based on this information the mould design data is being derived.

Work was initiated to graft a hydrogel material based on polyvinyl pyrrolidone, poly

hydroxyethyl methacrylate etc. on the rubber surface. This will reduce the friction and thereby minimise tissue damage, patient discomfort etc. ■

Technology Proving Facility

DR. G. S. BHUVANESHWAR MS,
PH D
Engineer and In-charge

SRI. D. S. NAGESH M TECH
Engineer (on leave)

In addition to the regular maintenance of the clean rooms, continued R&D with M/s. Hindustan Latex Ltd (HLL), the licensee of Hydrocephalus Shunt made progress. The moulds and dies for a paediatric sized (10mm burr hole) flushing valves were handed over to HLL for the fabrication of clinical quality prototypes. Samples were given to Neuro Surgeons for user feedback. Other products like T&Y connector and a flow controlled shunt are under development. A new 2 channel computerised test system was fabricated for the testing of shunts. ■

Technical Co-ordination Cell

SRI. D. RANJIT BE (ELEC)
Engineer and In-charge

The main activity was the co-ordination of the Patenting (Intellectual Property Rights) of the Institute's active developments. Three of the pending patent applications from the Institute were sealed this year. They were related to:

1. Dental Cement - Bis GMA
2. PVA Polyacrylonitrile blended membrane for Haemodialysis
3. Humidifier

The new patent applications filed this year related to :

- 1) Hydroxyapatite powders
- 2) Silver Oxide coating for anti-bacterial activity
- 3) PVC surface modification

The present status of the intellectual property rights generated so far by the Institute is as follows :

Patents sealed	18
Designs held	12
Patents filed and pending	33

The cell co-ordinated the organisation of technical lectures by visiting scientists from India and abroad. Appropriate exhibition material on the BMT Wing activities was generated. A computer with colour monitor and software package was added for enhancing the technical documentation capability. ■

and a fixture for cutting the ophthalmic sponge. Compression moulds for sponge block compression were fabricated. Grinding the samples of EMG electrodes to be supplied for clinical trials were carried out. A die for ceramic powder compaction was designed and fabricated. A few components of silicone band were moulded for evaluation and in vivo animal study. One set of shunt final valve assembly fixture was made. The division also designed and fabricated two fixtures for conducting bending test and friction test on dental arch wire and clips. A compression mould was fabricated for PVC sheet specimen preparation to study its mechanical properties. Acrylic funnels were fabricated for carrying out pull out test on catheters.

A Conventional cum Numerical Controlled 125 CCN Schaublin (Swiss) Lathe machine which can be operated manually as well as on CNC Programmes was added to the Tool Room.

The operation and maintenance of utilities such as electric power supply, air-conditioning system, sanitary system as well as the the panbit, incinerator, telephone exchange, etc were carried out by the division. Modification work of laying the under ground cable for street light and installation of sodium vapour lamps in the campus was completed. ■

Division of Engineering Services

SRI. O. S. NEELAKANTAN NAIR B Sc (ENGG)
Engineer and Leader

SRI. V. RAMESH BABU BE (MECH)
Engineer

SRI. K.P. R. BHAS DIP (ELEC. ENGG)
Junior Engineer

The division took up the development of Silicone Rubber Band used in ophthalmic retinal detachment surgery. This involved design and fabrication of mould and

standardisation of processing of moulding silicone bonds. Animal trials were initiated. The division designed and fabricated a set up for washing the ophthalmic sponge blocks

Vivarium

DR. G. ARTHUR VIJAYAN LAL B V Sc
Scientist and Leader

DR. P. R. UMASHANKAR B V Sc & AH
Scientist

One of the main activities involved procurement, quarantine and conditioning as well as care and breeding of large animals like dogs, sheep, goat, pig, calves etc. for various experimental and surgical procedures. A well equipped animal operation theatre consisting of X-ray radiography, fluoroscopy and angiographic monitoring and recording system is maintained to carry out cardiac and neuro surgical procedures for the in vivo and ex vivo evaluation of various devices.

The following is a list of the studies carried out using appropriate animal models.

1. Evaluation of hydroxyapatite, tricalcium phosphate and their combination in rabbit model by bone implantation studies.
2. Explantation of large diameter vascular graft with Yorkshire Pig as animal model.
3. Biocompatibility testing of silicone retinal retractor ring using rabbit model.

4. In vivo progesterone availability from microsphere formulations in rabbit model.
5. Fibrin glue evaluation - Anaesthesia and surgical technique was standardised in liver incision model of rats.
6. Antibodies against human fibrinogen - Poultry chicken as an animal model. A suitable cage system for laboratory set up was designed and used satisfactorily.

The vivarium also extended support for the following projects :

1. Laser Ablation of Intervetebral disc in canine model (in collaboration with Department of Radiology)
2. Renal embolization of radio-opaque microspheres (in collaboration with Department of Radiology)
3. Developing an animal model for endomyocardial fibrosis (in collaboration with Division of Cellular and Molecular Cardiology)

4. Basilar artery angiography on canine model (in collaboration with Departments of Neurosurgery and Radiology)
5. Invasive and non invasive methods of functional evaluation of cardio vascular system in primate model. Technique of animal restraint and anaesthesia were standardized.

Technology Transfer Cell

SRI. S. BALRAM, B.TECH
Scientist and Leader

The Technology Transfer Cell continued to provide the necessary Techno-commercial support for active interaction with industries and other institutions.

The routine activities centered around the technologies already transferred, such as Blood Bag, Oxygenator & Cardiotomy Reservoir, Hydrocephalus Shunt, Heart Valve etc. to various industries. Regular follow up on the collection of premia and royalties in respect of licenses issued both by NRDC and directly by the Institute, fulfilment of the Institute's commitments in case of new licenses such as transfer of know-how documents etc. and other formalities were carried out.

The Technology Transfer Cell co-ordinated the following new agreements entered into by the Institute for

technology development and transfer:

1. Memorandum of Understanding with M/s. T T K Pharma, Madras, for heart valve production at the Technology Proving Facility (TPF).
2. Exchange of letter with M/s. Hindustan Latex Ltd, Trivandrum, for continued R&D in Hydrocephalus Shunt
3. Agreement with M/s. S P I C Pharmaceuticals, Madras, for joint development of membrane oxygenators and transfer of technology.

Preliminary steps were initiated to identify suitable entrepreneurs and industries for transferring the know-how of the Ophthalmic Sponge and the Concentric Needle Electrodes. ■

Visitors and Guest Seminars

1. Dr. Nick Jedynekiewicz, University of Liverpool, U. K. "Compomer-A new generation of Dental Restorative Material," 3rd July '95.
 2. Dr. Paul Stone, a practising Dentist from Scotland. "Bone and soft tissue augmentation for Implantology," 4th July'95.
 3. Dr. Sudhir Bowry, Akzo Nobel Fraser AG, Wuppertal, Germany. "Evaluation and application of Hollow Fibers for Dialyser and Oxygenator", 27th Jan'96.
 4. Dr. S. K. Gautam, School of Biomedical Engineering, IIT, Bombay. "Membrane based extra corporeal devices for Apharesis", 15th Feb'96.
 5. Dr. G. S. Murthy, Indian Institute Science, Bangalore. "Adsorption of Proteins on Plastics and its utility in diagnosis and academic research", 22nd Feb, and "Development of an Industrial process for the isolation of Human Chorionic Gonadotropin (HCG) from early pregnancy urine", 23rd Feb '96.
 6. Prof. P. Balaram, Indian Institute of Science, Bangalore. "Application of Synthetic Peptides in pharmaceutical and Biomedical fields", 27th Feb '96.
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Current Status of the Technologies Commercialised by the Institute

SL. NO.	TECHNOLOGY	COMPANY	STATUS
1.	Blood Bag System (Licenced to four companies through NRDC, New Delhi)	Peninsula Polymers, Trivandrum Hindustan Latex Ltd, Trivandrum Electromedical and Allied Industries Ltd, Calcutta JMitra and Co., New Delhi.	Production Since 1985. Production since 1985 Project Initiation stage Project Implementation Stage.
2.	Rigid Shell Bubble Oxygenator and Cardiomy Reservoir	South India Drugs and Devices Ltd, Madras	Production since 1992.
3.	Hydrocephalus Shunts	Hindustan Latex Ltd, Trivandrum	Production since 1994.
4.	Heart Valves (Through NRDC, New Delhi)	TTK Pharma Ltd. Madras	Limited production since 1995
5.	Bone Wax	TTK Pharma Ltd, Madras	Production since 1995

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Patents filed

The following Indian Patent applications were filed :

1. **Molecularly imprinted polymers by Gamma irradiation.**
668 / MAS / 95, 6-6-95
2. **Migration resistant PVC Phase transfer Catalysis.**
709 / MAS / 95 , 13-6-95
3. **Preparation of alginate for oral delivery of preparations such as Insulin.**
1106 / MAS / 95, 30-8-95
4. **Grafting polyethylene Glycol onto the surface of plasticized poly (vinyl chloride).**

Externally Funded Research Projects

1. Title

- ☞ Developing an animal model for endomyocardial fibrosis

Principal Investigator:
Dr. C. C. Kartha.

Funded by
Indian Council of Medical Research,
New Delhi

Duration: Two years

Status: Ongoing.

2. Title

- ☞ Structural and functional changes in the myocardium due to suboptimal concentrations of magnesium.

Principal Investigator:
Dr. R. Renuka Nair.

Funded by:
Roussel Scientific Institute, Bombay.

Duration: 4 years

Status: Ongoing.

3. Title

- ☞ Stimulation of cardiac fibroblast proliferation by lanthanides: a free radical-mediated response.

Principal Investigator
Dr. R. Renuka Nair.

Funded By:
Indian Council of Medical Research,
New Delhi

Duration: 3 years

Status: Ongoing.

4. Title

- ☞ Cellular basis of myocardial injury by cerium in magnesium deficiency.

Principal Investigator
Dr. K. Shivakumar.

Funded by:

Department of Science and
Technology, New Delhi

Duration: 4 years

Status: Ongoing.

5. Title

- ☞ ELISA for human serum anti-Galactoside antibody and its epitopes in tissues.

Principal Investigator:
Dr. P. S. Appukuttan

Funded by:
Science and Technology,
Environment Committee,
Government of Kerala.

Duration: 3 years.

Status: Ongoing.

6. Title

- ☞ Identification and characterization of gluco conjugates containing the generally tumor-related epitopes terminal α -gal and T-antigen in normal and neoplastic human brain tissue using jacalin.

Principal Investigator:
Dr. P. S. Appukuttan.

Funded by:
Council for Scientific and Industrial
Research, New Delhi.

Status: Ongoing.

7. Title

- ☞ Interaction of human serum anti-galactoside antibody(antiGal) with autologous brain glucoconjugates bearing corresponding epitopes.

Principal Investigator:
Dr. P. S. Appukuttan.

Funded by:

Science and Technology,
Environment Committee,
Government of Kerala.

Status: Ongoing.

8. Title

☞ Studies on mucoid vasculopathy in Kerala.

Principal Investigator:
Dr. Sandhyamani.

Funded by:
Department of Science and
Technology, New Delhi.

Duration: 3 years.

Status: Ongoing.

9. Title

☞ Development of an immunodiagnostic system for Tuberculous meningitis suited to laboratories in developing countries.

Principal Investigator:
Dr. V. V. Radhakrishnan.

Funded by:
Department of Science and
Technology, New Delhi.

Duration: 3 years.

Status: Ongoing.

10. Title

☞ Monoclonal antibodies against β -TG and GMP-140 to detect clinical platelet activation.

Principal Investigator:
Dr. Lissy K. Krishnan

Funded by:
Dept. of Science & Technology,
New Delhi

Duration: 3 years.

Status: Ongoing

11. Title

☞ Development of polyurethane interpenetrating polymer network membranes for encapsulating islets of Langerhans"

Principal Investigator:
Dr. Prabha D. Nair

Funded by:
Dept. of Science & Technology,
New Delhi

Duration: 2 years.

Status: Ongoing.

12. Title

☞ Synthesis of Hydroxyapatite and Sintered body for biomedical applications.

Principal Investigator :
Dr. P. R. Harikrishna Varma,

Funded by:
Department of Science &
Technology, New Delhi, under SERCYS
Scheme.

Duration : 2 years.

Status : Ongoing.

13. Title

☞ Development of blood compatible functional polymers as selective adsorbents for protein bound antigens during hemoperfusion.

Principal Investigator:
Dr. Chandra P. Sharma

Funded by:
Department of Biotechnology, New
Delhi

Duration : June 1993 to June 1996.

Status : Completed.

14. Title

☞ Bioprosthesis associated calcification: Prevention via surface modification

and target drug delivery.

Principal Investigator:
Dr. Thomas Chandy

Funded by:
Department of Biotechnology,
New Delhi

Duration: 3 years.

Status: Ongoing.

15. Title

- ☞ Preparation and evaluation of casien microspheres as drug carriers.

Principal Investigator:
Dr. A. Jayakrishnan

Funded by:
Dept. of Science & Technology,
New Delhi

Duration: May 1991 to May 1995.

Status: Completed.

16. Title

- ☞ Development of electrode for neurophysiological applications.

Principal Investigator:
Dr. R. Sivakumar

Funded by:
Department of Science and
Technology, New Delhi

Duration: November 1992 to
May 1995.

Status: Completed.

17. Title

- ☞ Elucidation of Mechanisms of toxicity of haemoglobin

Principal Investigator:
Dr. T. V. Kumary

Funded by:
Indian Council for
Medical Research, New Delhi

Duration:
October 1993 to October 1995.

Status: Completed.

18. Title

- ☞ Studies on the controlled release of anti-fertility vaccines using biodegradable polymeric matrices.

Principal Investigator:
Dr. A. Jayakrishnan

Funded by:
Dept. of Biotechnology, New Delhi

Duration:
March 1992 to March 1996.

Status: Completed.

Visits Abroad for International Conferences

1. Dr. K. Mohandas participated in the conference of Executive Heads of Commonwealth Universities, held at Malta on March 25 - 29 , 1996.
2. Dr. Anil Bhat presented a paper on cost effectiveness of closed mitral valvotomy versus balloon mitral valvotomy, at the Eleventh Asian Pacific Congress of Cardiology, held at Bali, Indonesia, in September 95.
3. Dr. Sivasankaran was presented the best poster award at the API conference held in Kathmandu in January 1996, for the paper "Utility of lateral view chest X-ray in clinical Cardiology."
4. Dr. Neelakandhan presented two papers at the 17th World Congress of International Union of Angiology in London in April 1995.
5. Dr. K Radhakrishnan and Dr.Sanjeev Thomas participated in the 21st International Epilepsy Congress at Sydney, Australia in September 1995.
6. Dr. Abraham Kuruvilla and Dr. M D Nair participated in the 10th International Congress of EMG and Clinical Neurophysiology, at Kyoto, Japan in October 1995.
7. Dr. Abraham Kuruvilla and Dr.M D Nair participated in the 51st Joint Annual Conference of API at Kathmandu, Nepal in January 1996.
8. Dr. Abraham Kuruvilla attended the 42nd Annual Scientific Meeting of the American Association of Electrodiagnostic Medicine, Montreal Canada in September 1995.
9. Dr. Suresh Nair, Dr. B. K. Misra and Dr. D. Rout presented papers at the 9th Asian-Australasian Congress of Neurological Surgery at Taipei, Taiwan, in Nov. 1995.
10. Dr. Suresh Nair and Dr. Misra attended the Workshop on Image Guided Surgery at Taipei, Taiwan.
11. Dr. D. Rout attended the European Congress of Neurological Surgery held at Berlin in May 1995. He also participated as a member in the ad hoc committee meeting on standardisation of terminology and surgical

- results for the World Federation of Neurological Societies.
12. Dr. Suresh Nair was a visiting faculty to (a) Hyogo Brain and Heart Centre at Himeji, Japan (b) Fujita Health University, Toyoake, Japan, and (c) Osaka City University, School of Medicine, Osaka in November - December 1995.
 13. Dr. Suresh Nair participated in the symposium 'Neurosurgery update for young neurosurgeons in Asia' The Nuyuna Sapporo, held at Sapporo, Japan.
 14. Dr. Bhaskara Rao was deputed by the Institute for training in epilepsy surgery to Mayo Clinic, Rochester and Montreal Neurological Institute from August to November 1995.
 15. Dr. Bhaskara Rao attended the annual conference of the Congress of Neurological Surgeons held at Sanfrancisco and visited the New York University Medical Centre, New York and Kings College Hospital, London.
 16. Dr. Sandhyamani delivered invited talks on mucoid vasculopathy and the metabolic disorder at the Hershey Medical Centre, Georgetown University Medical Centre, and the Armed Forces Institute of Pathology (AFIP).
 17. Dr. A. Srinivas Rao visited the Royal Melbourne Hospital, Australia, for application training in DSA.
 18. Dr. Sarathosh Joseph and Dr. A. Srinivas Rao attended the 7th Asian Oceanic Congress of Radiology at Kuala Lumpur, Malaysia.
 19. Dr. R. Sivakumar attended the Gordon Research Conference on "Biocompatibility and Biomaterials" during July 23-28, 1995 at U.S.A. He took part in the discussions on the future developements in biomaterials and evaluation of biocompatibility.
 20. Dr. M. Jayabalan was selected as an Indian delegate to visit and interact with French laboratories and to deliver invited talks at the Indo-French symposium on "Frontiers in Polymerisation reactions : Mechanisms, Macro-molecular synthesis and process" held at the University of Bordeaux, Centre for National de la Recherche Scientifique, Lyon and Universite Pierre et Marie Curie, Paris during September 18-26, 1995.
 21. Dr. A. C. Fernandez proceeded on sabatical leave to the University of Minnesota, U.S.A for a period of one year.
 22. Sri. D. S. Nagesh obtained the Boyscast Fellowship to work at the Cleveland Clinic Fondation, Cleveland, U.S.A, for one year.
 23. Sri. B. Ajit Kumar went on leave to the University of Utah, U.S.A, for his Ph.D programme.
 24. Dr. Harikrishna Varma spent three months from April-June'95 at the Interdisciplinary Centre in Biomedical Materials, Queen Mary & Westfield College, London under Indo-UK Link Programme. During the period, studies on processing and mechanical properties of zirconia reinforced hydroxyapatite ceramics were carried out under the supervision of Prof. W. Bonfield.

Participation in Conferences and Workshops

1. Mr. D. Jayachandran attended the 3rd National Course on 'Medical Service Management for Non-medical Personnel' organised by the Indian Society of Health Administrators at Bangalore in December 1995.
2. Mrs. R. Prasannakumari, Librarian, attended the Workshop on Internet for Information Professionals organised by the Indian Institute of Science at Bangalore on 20-22 July, 1995.
3. Mrs. P. P. Saramma, Nursing Tutor, presented a scientific paper titled "Role of nurse in the control of hospital infection" - at the Indo- UK Symposium on Hospital Infection Control conducted in the Institute.
4. Dr. Raman Kutty participated in the National Seminar on Control of High Blood Pressure at AIIMS, New Delhi as an invitee.
5. Mrs. Usha Kandaswamy presented a poster on "Attitude of Blood Donors on Transfusion Transmitted diseases" at the XX National Conference of ISBTI, Madras.
6. Dr. S. Sathyabhama attended a one day seminar on Advanced Centrifugation techniques in November, 95.
7. Dr. P. V. Sulochana presented a paper on Transfusion Transmitted Infection, at the Indo U K symposium.
8. Dr. Jaisy Mathai presented a poster on 'Evaluation of a positive DAT' at the XX National Conference of ISBTI, Madras.
9. Dr. Jaisy Mathai participated as a faculty in the course on 'Quality control and Quality assurance for Laboratory trainers' sponsored by CMAI & National Academy of Sciences, New Delhi.
10. Dr. Jaisy Mathai participated as a resource person in the workshop on 'Rational use of Blood' organised by the state AIDS Cell.
11. Dr. P. V. Sulochana attended a 2 - month course at the Institute of Immunohaematology, Bombay, in Transfusion Medicine, conducted by ICMR.
12. Mrs. Philomina Augustine, Sr. Grade BTA, attended a

- one month Technicians Training course in Blood Group Serology and Blood Bank Methodology at Institute of Immunohematology (ICMR) Bombay.
13. Dr. Jaisy Mathai was an invited subject expert to compere 'Jyothirgamaya', an educative serial on HIV, telecast by AIR.
 14. Dr. Unnikrishnan won the best poster presentation prize at the conference of IACVTS in February, 1996.
 15. Dr. K. Shivakumar participated in a workshop on Immunology, Molecular Biology and Cell Biology at the Institute for Research in Reproduction, Bombay.
 16. Dr. C. C. Kartha was invited for lectures at the mid year meeting of the Indian Academy of Sciences, and the annual meeting of Cardiological Society of India and annual meeting of International Academy of Pathology (Indian Division).
 17. Dr. J. Shanmugham attended the Project Review Committee meeting at the ICMR Head quarter as expert in Virology.
 18. Dr. V. V. Radhakrishnan was invited to give a lecture on "Tuberculosis - myths and facts" at the Symposium on Mycobacterial and Tropical disease organised by the Department of Neurology, Cristian Medical College, Vellore, in Decmber 1995.
 19. Dr. V. V. Radhakrishnan was awarded the Sri. Ram Memorial Oration for 1996-1997 by the National Academy of Medical Science, New Delhi.
 20. Dr. V. V. Radhakrishnan was the associate editor of the Indian Journal of Neurology.
 21. Dr. Sandhyamani presented a paper at an international symposium of Diabetes Mellitus in the Tropics at Cuttack in October 1995, on pancreatic changes in human autopsies performed at SCTIMST and in the monkey model developed by dietary means for mucoid vasculopathy.
 22. Dr. Sandhyamani delivered a talk at a symposium on 'Current Concepts in Cardiovascular Diseases' at AIIMS, NewDelhi.
 23. Dr. A. K. Gupta spoke on 'Laser angioplasty Past, Present and Future' at the Conference on medical application of laser in New Delhi in April, 1995.
 24. Dr. A. K. Gupta delivered a lecture on 'Development of course curriculum in Neuro radiology at the 'Training Programme in Neuro radiology' Workshop, held in NIMHANS, Bangalore, in November 1995.
 25. Dr. Gupta spoke on 'Interventional Neuroradiology - The techniques' at the symposium on Interventional Neuroradiology, organised by the Neurological Society of India in New Delhi in December, 1995 and 'Laser in Medicine' At Anna University, Madras in December 1995.
 26. Dr. S. Joseph was invited to speak on (a) 'Neuro radiology' (b). 'Aorto iliac and peripheral angioplasty' (c). 'Hydrogel Microspheres - Applications in embolization' (d). 'PACS - Preliminary Experience at SCTIMST' at the Annual Conference of Indian Radiological and Imaging Association in Bangalore, in November 1995.
 27. Dr. S. Joseph spoke on 'MRI Imaging in Syringomyelia with special emphasis on flow studies' at the Annual conference of IARI in Bangalore, in November, 1995.
 28. "Development of Biomedical Implants", College of Dental Surgery, Manipal Academy of Higher Education, Manipal, May, 1995. (Dr.R.Sivakumar)
 29. "Long-term polymeric prosthetic implants - Challenges" in the Conference and

- Exhibition on Prosthetics : Biomaterials and Implants held at HAL, Bangalore on May, 1995.
(Dr.M. Jayabalan)
30. "Biomedical Devices and Implants" at Dayton Research Institute, Ohio, USA, August 1995.
(Dr.R.Sivakumar)
31. "Modelling of Plasma Spraying", State University of New York, Stonybrook, USA, August 1995. (Dr. R. Sivakumar)
32. "Therapeutic opportunities using Polymeric microspheres in medicine and surgery", at the 61st Annual meeting of Indian Academy of Sciences, Madras, Nov 1995. (Dr. A. Jayakrishnan)
33. 'Development of Dental Restoratives at Chitra Institute' at Indian Dental Association meeting, Trivandrum, December, 1995
(Dr. Kalliyana Krishnan. V).
34. "Implant associated infections in particular reference to Staphylococcus epidermidis" at the INDO-UK symposium on Hospital infections in ICUs and control, held at Trivandrum, during January, 1996.
(Dr. K. Rathinam)
35. "Biomedical Devices and Implants", Bapuji Dental College and Hospital, Davengere, Karnataka, Feb.1996.
(Dr.R.Sivakumar)
36. "Biomaterials Present and Future", at the Symposium on 'Functional Materials', Materials Research Society of India, 7th Annual General Meeting, Bangalore, Feb.1996.
(Dr. R. Sivakumar)
37. 'Polymers for Potentially New Medical Applications', at Central Institute of Plastics, Engineering & Technology, Ahmedabad, Feb. 1996.
(Dr. Kalliyana Krishnan. V)
38. Shri. D. Ranjit organised an exhibition stall at the Medical College, Trivandrum, in connection with the MEDEX '95 during May 95.
39. Dr. K. Rathinam participated and presented a paper entitled "Increased MIC values of Penicillin G against Staphylococcus epidermidis after contact with intravenous catheters: at the XIX National Congress of Indian Association of Medical Microbiologist, held at JIPMER, Pondichery during 6-8, October 1995.
40. Dr.K.Rathinam participated and presented a paper entitled "Correlative study between in vivo systemic toxicity and in vitro mast cell system for evaluation of biomaterial extracts" at the XIV Annual Conference of Society of Toxicology, India held at Bombay during December 20-21, 1995.
41. Sri. D. Ranjit and Sri R. Sreekumar represented the Institute at the 71st All India Medical Conference for Physicians held at Bhuvaneshwar, Dec. 27-30, 1995.
42. Sri. D. Ranjit and Sri. R. Sreekumar participated at the 83rd Indian Science Congress held in Jan '96 at the Punjab University, Patiala
43. Dr. Jayakrishnan was awarded the Special Topic Award (Biotechnology for Development) of the 8th Kerala Science Congress held at Cochin in January 1996 for his paper on "polycaprolactone microspheres as a vaccine carrier".
44. Ms. S. Lakshmi, Dr. Jayakrishnan's Ph.D student won the Young Scientist Award in the 8th Kerala Science Congress held at Cochin in January 1996 for her paper on the "Phase Transfer Catalysis mediated surface modification of PVC".
45. Dr. Harikrishna Varma presented a paper on "A new polmeric route for the preparation of Calcium Phosphate Bioceramic powders" by

- H.K.Varma, N. Kalkura and R. Sivakumar at the National Seminar on Advanced Materials and Processes organised by IIM, Trivandrum chapter, on 24-25 Jan 96.
46. Dr. Thomas Chandy presented a paper entitled "Chitosan / polyethylene Vinyl acetate co-matrix for cardiovascular drug delivery", in the 8th National Conference of Society for Biomaterial Artificial Organs (India), at Manipal, 30-31st January, 1996.
47. A poster on "Development of protein delivery system based on Hydroxyapatite Ceramic" by Mr.Willi Paul and Dr.C.P.Sharma bagged the best poster presentation award at the VII th AGM of Materials Research Society of India (MRSI) held in Indian Institute of Science, Bangalore from 1st - 3rd Feb. 1996.
48. A poster on " The realisation of hydrophilic sponges for ophthalmic applications"by Dr. Prabha.D. Nair, Ms.V. Geetha, Dr. R. Sivakumar, Dr. S. S. Badarinath and Dr. H. N. Madhavan was presented at the VII th AGM of Materials Research Society of India (MRSI) held in Indian Institute of Science, Bangalore from 1st - 3rd Feb. 1996.
49. Mr. Roy Joseph attended a national seminar on 'Advances in Polymer Technology' and presented a paper entitled "Effect of silane concentration on the properties of light cured dental composite" held at Cochin University of Science and Technology, Cochin on Feb 8-9, 1996.

Income and Expenditure Account

For the year ended 31st March, 1996.

Income	(Rs. in lakhs)
1. Grant from Government of India	625.00
2. Income Generated from the Hospital Services	761.03
3. Income generated by the R & D wing	49.92
4. Other Income (Interest, Rent, etc)	77.52
5. Excess of expenditure over income from fixed to general fund	208.10
	1,721.57
Expenditure	
1. Salaries & Allowances	542.95
2. Administrative Expenses	105.19
3. Hospital Expenses	669.89
4. General Expenses	160.93
5. Expenses of R & D wing	179.22
6. Expenses for Academic Programme	63.39
	1,721.57

Balance Sheet as on 31.3.1996

Liabilities	(Rs. in Lakhs)
General Fund	4,837.43
Specific Benefit Funds	647.64
Current Liabilities	206.90
	5,691.97
Assets	
Fixed Assets	4,065.82
Current Assets	125.12
Investment of Staff Benefit Funds	626.89
Loan and Advances	589.21
Cash and Bank Balance	284.93
	5,691.97

Administrative Bodies

Institute Body

President : Dr. N. H. Wadia

- | | | |
|---|---|---|
| <p>1. Prof. P.S. Bidwai,
Chief Cardiologist and
Senior Research Consultant
Central India Institute of
Medical Sciences,
88/2, Bajaj Nagar,
Nagpur - 440 010
(Maharashtra)</p> <p>2. Prof. R.N. Chakravarti,
Professor-emeritus (Rtd)
Viswakshand-II,3/261,
Gomati Nagar,
Lucknow - 226016</p> <p>3. Sri. S. V. Giri (Ex-officio)
Secretary to the
Government of India.
Department of Education
Ministry of Human
Resources development,
Shasti Bhavan,
New Delhi.</p> <p>4. Sri Gopal Krishna Pillai
(Ex-officio) Secretary to
Government of Kerala,
Department of Health and
Family Welfare,
Thiruvananthapuram.</p> <p>5. Dr. Gunawant Rambhau
Sarode Member of Parlia-
ment (Lok Sabha) 175,
North Avenue, New Delhi.</p> <p>6. Prof. Indira Nath,
Professor of Biotechnology
All India Institute of
Medical Sciences,
New Delhi - 110 016</p> | <p>7. Dr. P. K. Iyengar
(Ex-officio) Chairman,
State Committee on
Environment,
Science and Technology,
Thiruvananthapuram.</p> <p>8. Sri. S. B. Krishnan
(Ex-officio) Joint Secretary
to the Government of India
and Financial Advisor,
Department of Science and
Technology, Ministry of
Science and Technology,
Technology Bhavan,
New Delhi - 110 029.</p> <p>9. Sri Kodikunnil Suresh,
Member of Parliament
(Lok Sabha) 85,
South Avenue, New Delhi.</p> <p>10. Dr. K. Mohandas
(Ex-officio) Director, Sree
Chitra Tirunal Institute,
Thiruvananthapuram.</p> <p>11. Dr. A.K. Mukherjee
(Ex-officio) Director
General of Health Service,
government of India,
New Delhi.</p> <p>12. Prof. Rajinder Kumar,
Professor of Chemical
Engineering,
India Institute of Science,
Bangalore.</p> <p>13. Dr. P. Rama Rao
(Ex-officio) Secretary to
the Government of India.</p> | <p>Ministry of Science and
Technology, Department of
Science & Technology
Technology Bhavan,
New Delhi - 110 029.</p> <p>14. Dr. K. Rama Rao, Director
II, Defence Research &
Development Lab,
Hyderabad - 500 258</p> <p>15. Prof. D. V. Singh,
Director, Central Road
Research Institute,
New Delhi 110 020</p> <p>16. Dr. R. Sivakumar
(Ex-officio) Head,
Biomedical Technology
Wing. Sree Chitra Tirunal
Institute,
Thiruvananthapuram.</p> <p>17. Secretary to the Govern-
ment of India (Ex-officio)
Ministry of Health and
Family Welfare Nirman
Bhavan,
New Delhi - 110 011.</p> <p>18. Sri. Thennala G.
Balakrishna Pillai Member
of Parliament (Rajya
Sabha) T.C - 16/6,
Krishnavilasom Road,
Jagathy,
Thiruvananthapuram - 14.</p> <p>19. Dr. J.V. Vilanilam (Ex-
officio) Vice Chancellor,
Kerala University
Thiruvananthapuram - 34.</p> |
|---|---|---|

20. Dr B. N. S. Walia,
Director, Postgraduate
Institute of Medical
Education & Research,
Chandigarh - 160 012

Governing Body

Chairman : Dr. N. H. Wadia

1. Dr. P. K. Iyengar.
(Ex-officio) Chairman,
State Committee on
Environment, Science and
Technology Government of
Kerala,
Thiruvananthapuram.
 2. Dr. K. Mohandas
(Ex-officio) Director, Sree
Chitra Tirunal Institute,
Thiruvananthapuram.
 3. Dr. A.K. Mukherjee
(Ex-officio) Director
General of Health Services,
Government of India,
New Delhi.
 4. Dr. P. Rama Rao
(Ex-officio) Secretary to
the Government of India,
Ministry of Science &
Technology. Department of
Science & Technology,
Technology Bhavan,
New Delhi - 110 029
- Dr. V. V. Radhakrishnan,
Professor of Pathology
(till December 1995)
- Dr. C.C. Kartha, Professor
of Cellular and Molecular
Cardiology, Sree Chitra
Tirunal Institute,
Thiruvananthapuram.
- Prof. D. V. Singh,
Director, Central Road
Research Institute,
New Delhi 110 020

7. Dr. R. Sivakumar
(Ex-officio) Head
Biomedical Technology
Wing, Sree Chitra Tirunal
Institute,
Thiruvananthapuram.

Standing Committees

Academic Committee

- Dr. K. Mohandas,
Director of the Institute
(Chairman)
- Dr. K. G. Balakrishnan,
Professor of Cardiology & Dean,
Sree Chitra Tirunal Institute,
Thiruvananthapuram
- Dr. B.S. Das,
Professor of Neurosurgery
National Institute of Mental
Health & Neurosciences,
Bangalore
- Prof. Indira Nath,
Professor of Biotechnology,
All India Institute of Medical
Sciences, New Delhi.
- Dr. Placid Rodriguez,
Director, Indira Gandhi Centre
for Atomic Research
Kalpakkam, Tamil Nadu.
- Dr. G.B. Parulkar,
Professor of Cardiovascular &
Thoracic Surgery & Dean (Rtd),
K.E.M. Hospital, Bombay.
- Dr. C. P. Sharma,
Scientist, Biosurface Technol-
ogy, Sree Chitra Tirunal Insti-
tute, Thiruvananthapuram.
- Dr. R. Sivakumar,
Head, BMT Wing,
Sree Chitra Tirunal Institute
Thiruvananthapuram.

Prof. J. V. Vilanilam,
Vice Chancellor,
Kerala University,
Thiruvananthapuram.

Building Committee

Dr. K. Mohandas,
Director,
Sree Chitra Tirunal Institute
(Chairman).

Dr. P. K. Iyengar, Chairman,
State Committee on
Environment, Science and
Technology Government of
Kerala, Thiruvananthapuram.

Mr. P. A. Prabhakaran,
Construction Engineer,
Vikram Sarabhai Space Centre,
Thumba, Thiruvananthapuram.

Dr. R. Sivakumar Head Bio-
medical Technology Wing,
Sree Chitra Tirunal Institute
Thiruvananthapuram.

Mr. P. Vijayakrishnan, Financial
Adviser & Chief Accounts
Officer, Sree Chitra Tirunal
Institute Thiruvananthapuram
(Convener)

Finance Committee

Dr. K. Mohandas, Director of
the Institute (Chairman)

Prof. R. N. Chakravarti,
Professor-emeritus (Rtd)
Viswakshand-II,3/261, Gomati
Nagar, Lucknow-226016

Sri. S. B. Krishnan,
Joint Secretary & Financial
Adviser to the Ministry of
Science & Technology.
Government of India,
New Delhi.

Mr. P. Vijayakrishnan,
Financial Adviser & Chief
Accounts Officer,
Sree Chitra Tirunal Institute
Thiruvananthapuram
(Convener)

Junior Staff Selection Committee

Maj. (Dr) K. A. Hameed
(till Sept. 95)

Dr. P. R. N. Menon
(Ex-officio) Medical
Superintendent
Sree Chitra Tirunal Institute
Thiruvananthapuram.

Dr. R. Sivakumar,
(Ex-officio) Head, BMT wing,
Sree Chithira Tirunal Institute,
Thiruvananthapuram.

Three nominees of the
President

A Representative of the
Academic Staff of the Institute
nominated by the Director.

Senior Staff Selection Committee

Dr. K. Mohandas,
Director of the Institute
(Chairman)

Prof. P. S. Bidwai
(Institute nominee)
Chief Cardiologist & Senior
Research Consultant Central
India Institute of Medical
Sciences
Nagpur.

A nominee of the Secretary
Department of Science &
Technology Government of
India, New Delhi.

An expert from outside the
Institute nominated by the
President.

Head, Biomedical Technology
Wing (Ex-officio) Sree Chitra
Tirunal Institute
Thiruvananthapuram.

A Professor from the Institute.

Technology Develop- ment Committee

Dr. K. Mohandas, Director of
the Institute (Chairman)

Dr. A. Gopalakrishnan,
Chairman, Atomic Energy
Regulatory Board, Bombay.

Dr. A. Jayakrishnan, Scientist,
Sree Chitra Tirunal Institute,
Thiruvananthapuram.

Prof. R. Kumar, Professor of
Chemical Engineering, Indian
Institute of Science Bangalore.

Dr. S. R. Rajagopal, Emeritus
Scientist Materials Science
Division, National Aeronautical
Laboratory, Bangalore.

Dr. K. Rama Rao.
Director II, Defence Research
and Development Laboratory
Hyderabad.

Dr. R. Sivakumar, Head Bio-
medical Technology Wing, Sree
Chitra Tirunal Institute,
Thiruvananthapuram.

Technology Transfer Committee

Dr. S. Varadarajan
(Chairman) Rtd. Secretary to
the Government of India, DST,
New Delhi.

A Senior Officer of the DST
(nominated by the Secretary,
DST)

Mr. C. Venugopal,
Technology Transfer Division,
VSSC, Thiruvananthapuram.

Mr. A. K. Nair, Kerala State
Industrial Development Corpo-
ration, Thiruvananthapuram.

Head, Biomedical Technology
Wing (Ex-officio) Sree Chitra
Tirunal Institute.

Expert Nominee (in case of
devices) nominated each time.

Principal Investigator (for
specific devices)

FA & CAO of the Institute
(Ex-officio)

Ethics Committee

Mr. K. S. Rajamony (Chairman)
Member, Kerala Public Mens
Corruption Commission,
Trivandrum.

Dr. B. N. Dhawan,
Scientist Emeritus
(Pharmacology),
Central Drug Research Institute,
Lucknow.

Head Biomedical Technology
Wing Sree Chitra Tirunal
Institute.

Dr. K. A. Kumar,
Professor of Psychiatry,
Medical College,
Trivandrum.

An external expert on the
device technology (to be
identified and nominated by
the Director each time).

Director of the Institute.

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