ANNUAL REPORT

PUSHPAGIRI RESEARCH CENTRE

April 2022 to March 2023

PUSHPAGIRI
We care God cures

PUSHPAGIRI RESEARCH CENTER

ANNUAL REPORT

PUSHPAGIRI RESEARCH CENTRE (PRC)

Approved by KUHS for Ph.D. in Medicine, Dental, Nursing, Pharmacy and Allied Sciences & recognized by DSIR, Government of India

April 2022 to March 2023

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ABOUT PUSHPAGIRI RESEARCH CENTRE (PRC)

Pushpagiri Research Centre (PRC) is a unit of Pushpagiri Medical Society, which has been the pioneering force in providing super specialty health care in Central Travancore region of Kerala State. Established in 2010, PRC has grown to become of the best research centers in the state, in private sector. Pushpagiri Research Centre features open–plan, multifunctional research laboratories, which have all the facilities for conducting inter-disciplinary biomedical research.

Pushpagiri Research Centre is a Scientific and Industrial Research Organization (SIRO) recognized by Department of Scientific & Industrial research (DSIR); Govt. of India. Kerala University of Health Sciences (KUHS) has also approved PRC for its Ph.D. programmes. The centre has received funding from prestigious agencies like DST, DBT, ICMR, KSCSTE and Bill & Melinda Gates foundation and has been part of many international research collaborations. PRC is unique among all the research centres of Kerala as it has active Memorandum of Understandings (MoUs) with an array of institutions from government and private sectors.

OUR VISION

We aim is to create breakthroughs in medical field, by taking research outcome from bench to bedside, with high ethical standards, and to develop transformative technologies, to meet growing challenges in the area of human health and illness, with an innovative approach. It provides a platform, to develop strategies of therapeutic intervention to improve the quality of life, and to alleviate human sufferings. Our state-of-the-art infrastructure, and domain of expertise, catalyzes the translation of laboratory research of academia and industry to hospital bed.

OUR HISTORY

Pushpagiri Group of Institutions is located in the heart of Tiruvalla, a scenic town in Central Travancore in Kerala. This land is blessed with the visit of Saint Thomas, the disciple of Jesus. It harbours Sri Vallabha Temple, Saint John's Cathedral, Parumala Church to enrich the rich spiritual heritage of Tiruvalla. This place is richly ornamented with the lush green paddy fields and coconut grooves. The branches of Pushpagiri Medical Society comprise of Pushpagiri Institute of Medical Sciences, Pushpagiri College of Dental Sciences, Pushpagiri College of Pharmacy, Pushpagiri College of Nursing, & Pushpagiri College of Allied Health Sciences.

Pushpagiri Research Centre better known by the acronym PRC is a Scientific and Industrial Research Organization (SIRO) recognized by the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, Government of India. It was initiated in the year 2009 and functions in Pushpagiri Medical College Campus as a Central Research Facility. PRC features open-plan, multifunctional research laboratory and it conducts, promotes research in interdisciplinary areas of sciences such as Tissue Engineering and Regenerative Medicine, Medical Biochemistry, Bioinformatics and Drug Designing, Medicinal and Phytochemical Research, Molecular Biology, Cell Culture, Microbial Technology, Cancer Research and Epidemiology studies.

PRC offers a unique, pluralistic and open research culture that is supported by high-end infrastructure and instrument facilities. Various research schemes are funded by State & Central Government agencies like DST, DBT, ICMR, BRNS and International agencies like Bill and Melinda Gates Foundation, CEI, etc. PRC mainly focuses on translating the ideas from laboratory

to commercial market. The Research Centre is currently carrying out various researches in wound healing, tissue regeneration, antimicrobial resistance and usage of novel phytocompounds, *in-silico* research and computational drug designing, molecular biology, virology, infectious disease, clinical epidemiological studies and clinical trials, which is in collaboration with various institutions. PRC is having MoU with various government institutes like CIFT-Kochi, MG University-Kottayam HLL, Trivandrum and private institutes like MACFAST Tiruvalla, Bishop Moore College Mavelikara, CUSAT (Cochin University of Science Technology), SJRI (St. John Research Institute, Bangalore, Stockholm University, Vellore Institute of Technology (VIT), Vellore.

From Left to Right: ***Mr. Jacob P. Ouseph, Dr. Rosin George Varghese, Dr. Aniket Naha, Dr. Yogesh Bharat Dalvi, Dr. Nebu George Thomas, Rev. Dr. Mathew Mazhavancheril, Mr. George Varghese, Dr. Sherly Antony, Dr. Leya Elizabeth Babu, Dr. Soumya RS, Dr. Betsy A Jose***

Pushpagiri Research Team

DIRECTOR'S MESSAGE

India's emergence as one of the world's major economies is being reflected by its increasing contribution to the world's high-quality scientific research and research publications. The contributors of this development have been played by many research institutes around the country. One such research-intensive Centre is Pushpagiri Research Centre. The research team at PRC is keen in investigating, evaluating and unfolding the mystery lying around the field of biology by isolating bioactive compounds from nature to development of new diagnostic kits by breaking the conventional thinking to make translational research i.e., from lab to bedside, a reality. The youthful and energetic atmosphere of the centre is our success which develops an ideal and fertile research ecosystem for faculty, staff, students and trainees. We conduct various training programmes (cell culture, animal handling, bioinformatics), workshops (molecular biology, cell culture, animal handling, *in-silico* drug designing) and conferences (Bioradiance) which provides platform to various budding scientists and innovators to showcase their research, technical, analytical and presentation skills. These events encompass various disciplines like disease biology, tissue engineering, immunology and others, which also provide open possibilities for the interactive sessions, collaborative ventures with the field experts and the centre itself.

Our mission is to understand, evaluate, screen bioactive compounds and development of drugs, kits for the betterment of human race using *in-vitro* (cell culture) and *in-vivo* (animal models) methods to develop a unique training of individuals in basic & translational sciences and promote collaborations between medical, veterinary and agricultural professionals with basic biology scientists. Over the past few years, the ability of PRC in making a major contribution in the field of biology has been greatly supported by various funding agencies like DST, DBT, ICMR, BRNS and International agencies like Bill and Melinda Gates Foundation. I thank all the advisors, supporters and well-wishers of PRC for their constant encouragements throughout these years. God Bless Us!!

Rev. Dr. Mathew Mazhavancheril

Director & Head, Pushpagiri Research Centre

COORDINATOR'S MESSAGE

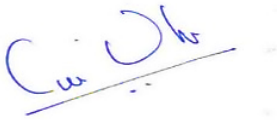
I am happy and privileged to forward this message for 2022 -23 annual report as the Coordinator of Pushpagiri Research Centre (PRC). It gives me immense satisfaction that over the years, PRC has made tremendous progress multidisciplinary research. Notably it has now become a leading research and diagnostic virology centre in the Central Travancore region of Kerala State.

We are steadily making progress in highly competitive scientific research and is coming into limelight in national and international levels. The Institute has chosen contemporary frontier areas of research in the fields of tissue engineering, biotechnology, biochemistry, microbiology, bioinformatics, cancer, virology, molecular biology and clinical epidemiology. We have several memorandums of understanding (MoU's) with reputed research institutions in India for taking up collaborative research work/projects.

PRC is a Department of Scientific and Industrial Research (DSIR) recognized institution. It is also a PhD centre recognized by Kerala University of Health Sciences (KUHAS). Apart from collaborative research initiative, we guide Masters Students (MD, MDS & M.Sc.) in their thesis studies. PRC has well equipped laboratories with invitro facilities and Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) approved Animal House.

PRC has crossed 300 publications in peer-reviewed high impact factor national and international journals. We are in a short time, is going to engage in industrial level projects. PRC, a part of Pushpagiri Medical Society, gives immense scope and opportunities in taking up research in medicine and basic sciences. I conclude this message by saluting all those who are pivotal in nurturing PRC over the years.

Sincerely,



George Varghese

Coordinator, Pushpagiri Research Centre

MANAGEMENT TEAM

H.G. Most Rev. Dr. Thomas Mar Koorilos
Metropolitan Archbishop of
Tiruvalla Patron

Rev. Msgr. Fr. Issac Parappallil
Vicar General Archdiocese of
Tiruvalla, President

Rev. Fr. Jose Kallumalickal
Chief Executive Officer, Secretary

Shri. Jacob Punnoose IPS
Principal Advisor

Rev. Fr. Dr. Mathew Mazhavancheril
Director & Head
Pushpagiri Research Centre

Rev. Fr. George Valiyaparampil
Director – College Of Medicine
& Allied Science

Rev. Fr. Thomas Pariyarath
Hospital Administrator &
Director IT & Marketing

Rev. Fr. John Padipurackal
Director Finance
& Facilities

Rev. Fr. Aby Vadakumthala
Director of Institutions
& Medicity

DSIR RECOGNITION

सूचना का अधिकार RIGHT TO INFORMATION

दूरभाष/TEL : 26962819, 26567373
(EPABX) : 26565694, 26562133
: 26565687, 26562144
: 26562134, 26562122
फैक्स/FAX : 26960629, 26529745
Website : http:/www.dsir.gov.in
(आईएसओ 9001:2008 प्रमाणित विभाग)
(AN ISO 9001:2008 CERTIFICED DEPARTMENT)

सत्यमेव जयते

भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
वैज्ञानिक और औद्योगिक अनुसंधान विभाग
टेक्नोलॉजी भवन, नया महरौली मार्ग,
नई दिल्ली - 110016
GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
Department of Scientific and Industrial Research
Technology Bhavan, New Mehrauli Road,
New Delhi - 110016

F.No. 14/590/2011-TU-V

Date: 27th March 2023

The Director
Pushpagiri Medical Society
Pushpagiri Medical Colege Hospital Campus,
Pathanamthitta,
Tiruvalla – 689101, Kerala ,

Subject: **Renewal of Recognition of Scientific and Industrial Research Organisations (SIROs).**

Dear Sir,

This has reference to your application for renewal of recognition of **Pushpagiri Medical Society, Tiruvalla, Kerala** as a Scientific and Industrial Research Organisation (SIRO) by the Department of Scientific and Industrial Research under the Scheme on Recognition of Scientific and Industrial Research Organisations (SIROs), 1988.

2. This is to inform you that it has been decided to accord renewal of recognition to **Pushpagiri Medical Society, Tiruvalla, Kerala from 01.04.2023 to 31.03.2026.** The recognition is subject to terms and conditions mentioned overleaf.

3. Receipt of this letter may kindly be acknowledged.

Yours faithfully,

(Dr. P.K. Dutta)
Scientist - 'G'

Pushpagiri received the DSIR recognition for the 4th consecutive time

RESEARCH ADVISORY BOARD

ADVISORY COMMITTEE MEMBERS

Dr. Anil Sukumaran

BDS, MDS, Ph.D., FDS RCS (Ed), FDS RCPS (Glas), FICD, FPFA

Professor, Periodontics, Implant Dentistry

Hamad Medical Corporation, Qatar

Dr. Aji P. Mathew

Ph.D.

Professor, Department of Materials & Environmental Chemistry

Stockholm University, Sweden

Dr. Lakshmi S. Nair

M. Phil, Ph.D., FSBOI, FAIMBE, FNAI

Professor, Department of Orthopedic Surgery, University of Connecticut Health, Associate Director, The Connecticut Convergence Institute for Translational in Regenerative Engineering, Connecticut, USA

Dr. Jayachandran VP

M.Sc., Ph.D.

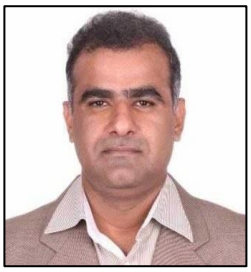
Lecturer, Applied Biology Section, Applied Sciences Department, University of Technology & Applied Sciences, PO Box 74,

AL-Khuwair, PC 133, Muscat. Sultanate of Oman

Dr Sabu Thomas

Ph.D., FRSC, FeurASc, D.Sc. (UL, France), D.Sc. (UBS, France)

Chairman, Trivandrum Engineering Science & Technology (TrEST) Research Park, Trivandrum, Government of Kerala, India Former Vice Chancellor, MG University, Professor of Polymer Science & Engineering, Kottayam 686560, Kerala, India



Dr Anand Anbarasu

M.Sc., M.Tech., Ph.D., FRSB (UK)

Professor, Department of Biotechnology
School of Bio Sciences and Technology
Vellore Institute of Technology, Vellore – 632014, Tamil Nadu, India

Dr. Nandakumar Kalarikkal

Ph.D., IIUCNN & SPAP

Associate Professor, Advanced Materials Laboratory, School of Pure and Applied Physics, International and Inter University Centre for Nanoscience and Nanotechnology, Mahatma Gandhi University, Kottayam-686 560, Kerala, India

Dr. Raghu KG

Ph.D. Rtd.

Chief Scientist, CSIR - National Institute for Interdisciplinary Science and Technology (NIIST), Trivandrum

Dr. Betsy Joseph

Ph.D.

MFDS RCPS (Glasg), Professor, Saveetha Dental College & Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India

Dr. K Rajankutty

B.Sc., BVSc. & AH, MVSc., Ph.D.

Scientist & Head, Small Animal Research Facility, Jubilee Mission Medical College & Research Institute, Trissur, 680005

ADJUNCT FACULTIES

Dr. Philip Mathew
MD
Official in World Health Organization (WHO)
Geneva, Switzerland

Dr. Mekha Grace Varghese
BDS, MDS
Tissue Engineering and Regenerative Medicine Laboratory
Pushpagiri Research Centre
Pathanamthitta, Tiruvalla, Kerala

Dr. Elna Paul
BDS, MSc (Oral Path.), Ph.D.
Project Scientist C,
ICMR Bioethics Unit,
2nd Floor Nirmal Bhavan,
Bangalore 562110

FACULTY MEMBERS AND SCIENTISTS OF PRC

Director and Head **:**

Rev. Dr. Mathew Mazhavancheril, M.Sc., Ph.D., Post Doc (France)

FACULTY MEMBERS AND SCIENTISTS OF PRC

Coordinator and Pushpagiri Centre for Virology	:		**Mr. George Varghese, M.Sc.** **Assistant Professor & Virology In-Charge**
Tissue Engineering and Regenerative Medicine Lab	:		**Dr. Nebu George Thomas, MDS, Ph.D.** **Scientist & Professor**
Molecular Biology and Phytoceutical Research Lab	:		**Dr. Yogesh Bharat Dalvi, M.Sc., Ph.D.** **Scientist**
Biochemistry Lab	:		**Dr. Soumya R.S., M.Sc., Ph.D.** **Scientist & Assistant Professor**
Medical Biotechnology and Computational Drug Designing Lab	:		**Dr. Aniket Naha, M.Sc., Ph.D.** **Scientist & Senior Resident**

FACULTY MEMBERS AND SCIENTISTS OF PRC

Microbial Technology and Infectious Diseases Lab :

Dr. Sherly Antony, MD, PDCR, NPDF

Assistant Professor

Clinical Epidemiology Unit :

Dr. Rosin George Varghese, MD

Assistant Professor

Physiology :

Dr. Leya Elizabeth Babu, MD

Assistant Professor

Public Health :

Dr. Betsy A Jose, MD

Assistant Professor & Project Coordinator (CANCare)

Secretary :

Mr. Jacob P. Ouseph

Executive, PRC

BIORADIANCE 2022

Organizing Chairman - Rev. Fr. Dr. Mathew Mazhavancheril

Co-Chairman - Dr. Thomas George

Organizing secretary - Dr. Nebu George Thomas

Joint Secretary – Dr. Saumya John

Treasurer – Dr. Yogesh Bharat Dalvi; Dr. Prameetha George Ittycheria

Registration - Dr. Annie Kitty George; Mr. George Varghese; Dr. Betsy A. Jose

Scientific Team - Dr. Sherly Antony; Dr. Leya Elizabeth Babu; Dr. Mekha Grace Varghese; Dr. Sherin George

Advisory Committee - Rev. Fr. Aby Vadakumthala; Dr. Aby Mathew T; Prof. Sabu Thomas; Prof. Nandakumar Kalarickal; Dr. A. Devadathan; Dr. Anil Sukumaran; Dr. Jacob George; Dr. Sunu Alice Cherian; Dr. Benley George; Dr Sunil S.

Bioradiance is a national research conference that is conducted annually by the Pushpagiri Research Centre focused on the research scholars, graduates, undergraduates and postgraduates of bioscience, medical, dental and allied sciences of Kerala with the aim of providing latest updates in the field of health research. This year Bioradiance'22 was conducted on 23rd and 24th September 2022 on the topic of "Translational Research in Tissue Engineering" using the online Google Meet platform. The workshop was organized by the Pushpagiri Research Centre and Department of Periodontics, Pushpagiri College of Dental Sciences along with Mahatma Gandhi University Kottayam. Rev. Dr. Mathew Mazhavancheril gave the presidential address and Prof. Dr. Sabu Thomas Vice Chancellor MGU was the guest of honor for the occasion.

Prof. Dr. Ramya R, Head of Oral Biology, Saveetha Dental College, Chennai discussed on what is Translational Research followed by Dr. Nandakumar Kalarikkal (Senior Professor, School of Pure and Applied Physics & Director-in-charge, School of Nanoscience) spoke on how various government and industrial agencies promote translational research and the various avenues available for young researchers. There was also an in-depth session on need for translational research in oral health and various disparities associated with the same by Prof Dr. Baiju RM (Govt Dental College Kottayam) and Prof. Dr. Harikumar (Govt. Dental College, Kozhikode). Subject experts from Community Medicine, Prof. Dr. Rajeev A. (Prof & Head, AIIIMS Manglagiri, Andhra Pradesh) and Dr. Anupa Lucas (Assoc. Professor, Govt Medical College, Kottayam) discussed on relevant issues in translating research to the general population.

Setting up translational research at various levels in educational institutions was discussed by Prof. Dr. Sabu Thomas (Vice- Chancellor MGU), Prof Dr. Melvin George (Head of Clinical Trials, SRM Medical College, Chengelpet Chennai), and Prof. Dr. Shantanu Patil (Head of Translational Medicine, SRM Medical College, Chengelpet, Chennai).

The workshop also highlighted the immense work done by PRC in collaboration with ICAR-CIFT and MGU on natural Hydroxyappatite. Experts from ICAR –CIFT, Dr. Muhammad Ashraf P and Dr. Binsi P. K., Clinical experts, Prof. Dr. Santhosh Pillai (Head of Pharmacology PIMS) and Dr. J. Venkatesan gave an update on the research till date in natural hydroxyapatite and the various biological and biomedical aspects of the same. The workshop concluded with hands on training on writing successful grant proposals by Prof. Dr. Ramya R.

E-poster competition was also held in which students from various colleges of south India had participated.

There were 311 registrations. Participants from 13 colleges of dental, medical and engineering colleges in Kerala and Karnataka, and Tamil Nadu took part in this. There were also participants from MACFAST, MG University, Kottayam, Amrita School of Nanoscience and Molecular Medicine, Catholicate College, Pathanamthitta, National College of Arts and Science TVM, PSMO College, Tirurangadi. The program was well organized and the duration of each session was adequate. The YouTube viewership for the first day is 234 and second day was 113 for the program.

According to the participants, all the sessions were good and Dr. R. Ramya's session on Hands-on training on "How to Write A Successful Grant Proposal" received good feedback. Internet connectivity issues and inability to log in was reported as technical issues. They reported that they would like to attend more sessions on Animal cell culture techniques, Application of phytocueticals in medicine, molecular docking, regenerative dentistry and medicine and role of genetics in dentistry.

RESEARCH FACILITIES OF PRC

a. Centre for Virology

virology@pushpagiri.in

Mr. George Varghese, M.Sc. Medical Microbiology (CMC Vellore),

surugv@pushpagiri.in

Pushpagiri centre for virology has groomed into a premier centre for viral diagnosis and research in Central Travancore. It is equipped with state of the art facilities. The mission of the centre is to initiate diagnostic services and research on viruses and viral diseases of humans. The centre is involved in providing diagnostic services and cutting-edge research on viruses and viral diseases in humans. It is equipped with state-of-the-art facilities. The mission of the centre is to initiate diagnostic services and research on viruses and viral diseases of humans. The volume of work is managed by fully automated systems like CLIA, ELFA and ELISA. The hall mark of Pushpagiri Centre for Virology is the Biosafety level-2 facility for molecular diagnosis and research. The lab

is equipped with conventional and real time PCR facilities. The centre also provides training programmes in PCR.

Diagnostic Viral Serology Facilities

The laboratory is handling various types of specimens, primarily from Pushpagiri Medical College Hospital. Serological diagnosis of HIV, Hepatitis viruses, including various HBV markers, HEV, HAV and Dengue Fever. Apart from ELISA's, the volume of work is managed by fully automated systems like CLIA (Chemiluminescence Immuno Assay – Abbot, USA) and ELFA (Enzyme Linked Fluorescent Assay - Vidas Biomerieux, France). The lab is giving valuable services during seasonal outbreaks of Influenza, Dengue etc.

Diagnostic Molecular Virology Facilites

The hall mark of Pushpagiri Centre for Virology is the diagnostic molecular virology. The lab is equiped with Conventional and real time PCR facilites. Apart from quantitative PCR's for HBV and HCV, diagnostic PCR for SARS CoV-2 and Lepspira is also available.

Quality Assuarance

The lab is NABL accredited as per ISO 15189:2012 for Real Time quantitative HCV PCR and SARS CoV-2 qualitative PCR. The quality of the lab is evaluated by NABL assessments and internal audits. Lab follows strict internal quality controls measures as per guidelines.

Research Facilites

Research at virology has been aimed at elucidating the epidemiology in the local community, initiating and maintaining surveillance, studies in the genetic variations of viruses and developing affordable technologies for the provision of diagnostics for diseases in the near future.

Consolidated Statistics of Diagnsotic Services Provided for April 2022 to March 2023

PUSHPAGIRI CENTRE FOR VIROLOGY	
Statistics - April 2022 to March 2023	
Test Name	**No. of Tests**
HIV	12591
HBsAg	13190
HCV	9950
HBeAg	78
HBeAb	20
HBcIgM	59
Anti Hbs Titer	2162
HAV IgM	91
HEV IgM	63
Dengue NS1	638
Dengue IgM	638
Dengue IgG	638
Influenza PCR	0
RSV PCR	0
JE PCR	0
Pan Entero PCR	0
HSV 1 & 2 PCR	0
VZV PCR	0
HBV Qualitative PCR	0
HBV Quantitative PCR	58
HCV Qualitative PCR	0
HCV Quantitative PCR	15
CMV PCR	0
Leptospira PCR	43
COVID-19 RT PCR	796
TOTAL INVESTIGATIONS	**41030**

Instrumentation Facilities

Refrigerator

Deep Freezer
(-80^{o}C)

Deep Freezer
(-20^{o}C)

CO_2 Incubator
for Virology

Dry Bath

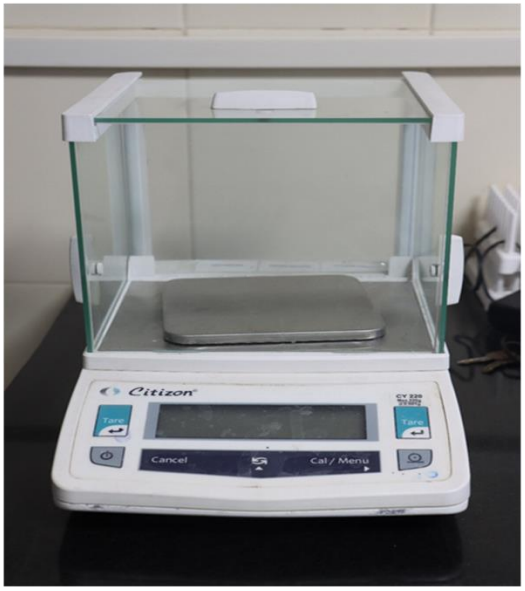
Cooling Centrifuge

Ultra Low Temperature Freezer

Laminar Air Flow

Vortex

Miniature Centrifuge



Weighing Balance

Biosafety Cabinet

Deep Freezer
(-20°C)

Refrigerator

Thermal Cycler

Real Time PCR

Real Time PCR
(QStudio5 Themo Fischer)

Abbot CLIA

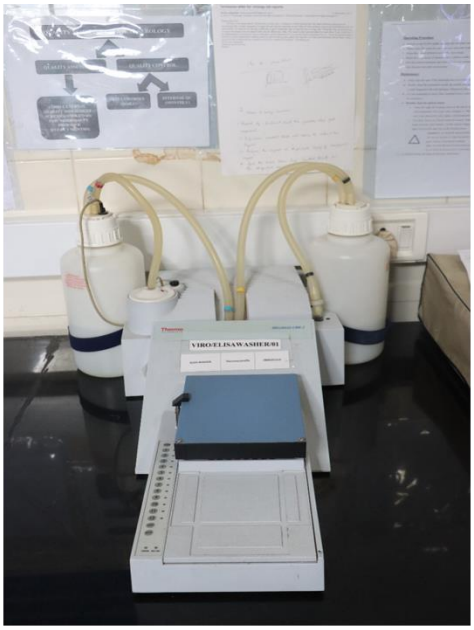
Incubator

BIORAD Connect R1

Water Bath

PC Attachment for Microplate Reader

Cooling Centrifuge

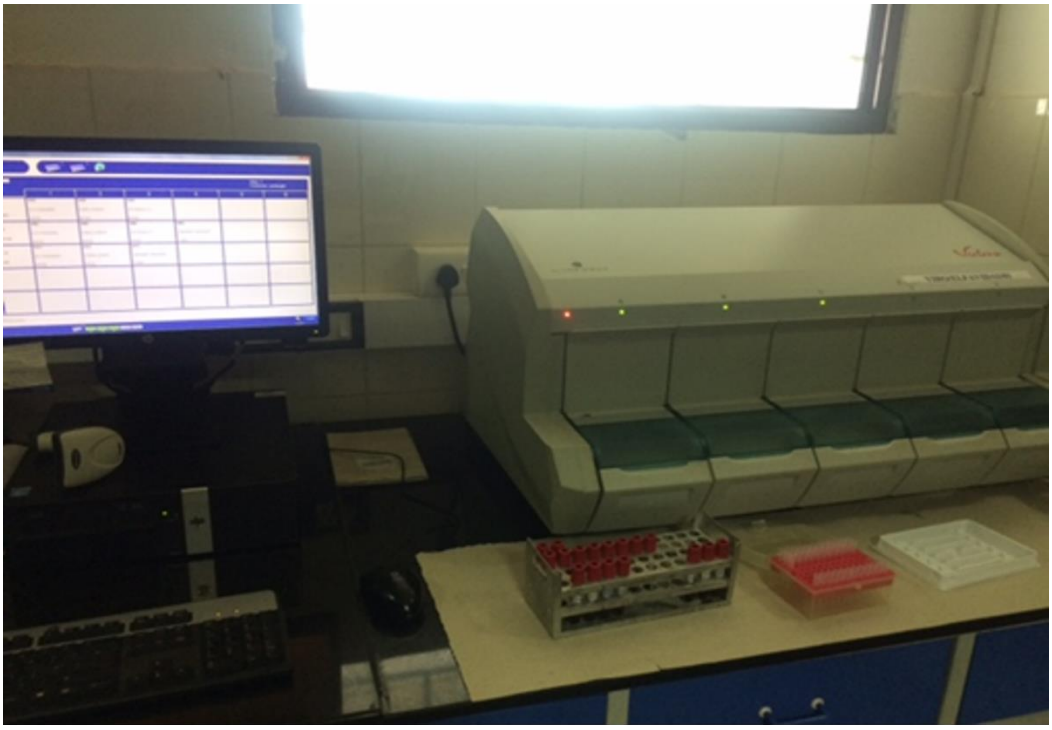


ELISA Washer

Centrifuge

Cyclo Mixer

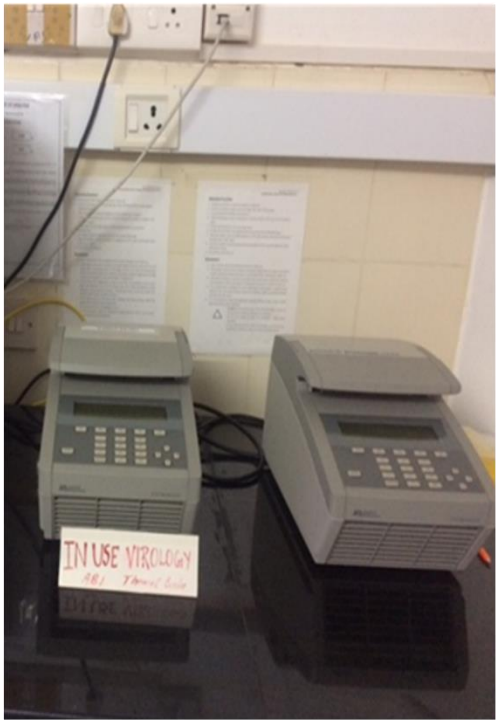
Refrigerator



Biomerieux VIDAS Machine

Abbot's Architect CLIA Machine

BSL-2 Facility



Applied Biosystems Thermocyclers

Refrigerated Centrifuge

Applied Biosystems Real Time PCR – Step One Plus

Applied Biosystems Real Time PCR – QuantStudio5

b. Regenerative Medicine and Tissue Engineering Laboratory

Scientist: Dr. Nebu George Thomas, MDS, Ph.D., nebugeorgethomas@pushpagiri.in

Involved in the development of scaffolds, using principles of engineering and life-sciences, which may help regenerate tissue lost due to various diseases or injuries. The goal of the lab is to develop scaffolds that have the ability to induce cellular response and stimulate regenerative cells. Focus on bone and skin regeneration in general, and periodontal tissue in particular. Also involved in studying interaction of various biomaterials with tissue structures in the body. Preclinical analysis of scaffolds were performed as per ISO guidelines. The lab performs pre-

clinical analysis of biomaterial as per ISO standard. The biomaterial are developed from marine sources and animal orgin for tissue engineering application the test preforrmed in the labs are:

- ***In-vitro*** **facilities**: Biomaterials Preparation and Extraction, Cytocompatibility, Cytotoxicity elution test, MTT cell proliferation assay, Surface culture test, Agar overlay assay

Clean room facility for fabrication of tissue engineering scaffolds for application in regenerative medicine with Lyophilizer facility

- ***In-vivo*** **facilities:** Genotoxicity, Mammalian test systems, Nonmammalian test systems, Intracutaneous Reactivity, Skin Sensitization Assay, Acute Systemic Toxicity, Hemocompatibility, Complement Activation, Thrombogenicity, Pyrogenicity, Carcinogenicity Implantation ,Performance and Efficacy Evaluation Osseointegration and Critical-Size Defects, Long-Bone Pressure Fitted Transcortical Placement, Trephined bone core repair, Mandibular Osteotomy Defect Repair, Osteomyelitis and Antimicrobial Treatments, Osteoinduction Models, Dental Implants and Guided Bone Regeneration, Teeth extraction procedure, Bone graft implantation procedure, Dental implant placement, Imaging, Live computed tomography (Cone beam CT-scan), Magnetic resonance imaging (MRI), Micro-computed tomography (micro-CT), Necropsy and Macroscopic Grading (Gross Pathology), Histology, Sample preparation , Nondecalcified (plastic) histology, Decalcified histology, Histopathology, Local effects on hard tissue, Local effects on soft (cartilage) tissues, Effects on major organs, Abnormal macroscopic findings and gross lesions, Histology Imaging, Histomorphometry

- **Histopathology lab-** Adaptor for disposable knife attachment, Albuminometer, Automated hematology analyzers-sysmex XN 1000, Mindray BC 6200, Automated urine analysers: FUS 1000, Uriplus 600, Balance for weighing organs, Binocular microscope, Bone saw, Hot air oven, Hot plate, Incubator

Instrumentation Facilities

Lyophilizer

Centrifuge

Heating Mantle

Water Bath Shaker

Heating Chamber

Biosafety Cabinet

Microtome

Hot Air Oven

UV-Vis Spectrophotometer

Heating Plate with Magnetic Stirrer

Laminar Air Flow

Miniature Centrifuge

Refrigerator

Ultra Cooling Freezer (-20^{o}C)

c. Phytoceuticals and Molecular Biology Research Laboratory

Scientist: Dr. Yogesh Bharat Dalvi, Ph.D., yogesh_dalvi@pushpagiri.in

The Phytoceuticals and Molecular Biology Research Lab is a leading laboratory dedicated to fundamental and translational research, with a strong focus on regenerative medicine. Through extensive exploration of plant and mushroom-based phytoceuticals, the lab aims to discover preclinical evidence for their potential in mitigating common diseases such as inflammation, diabetes, cancer, and tissue regeneration. The research involves both *in vitro* (biochemical and molecular biology) and *in vivo* (animal model) studies. Committed to adhering to international

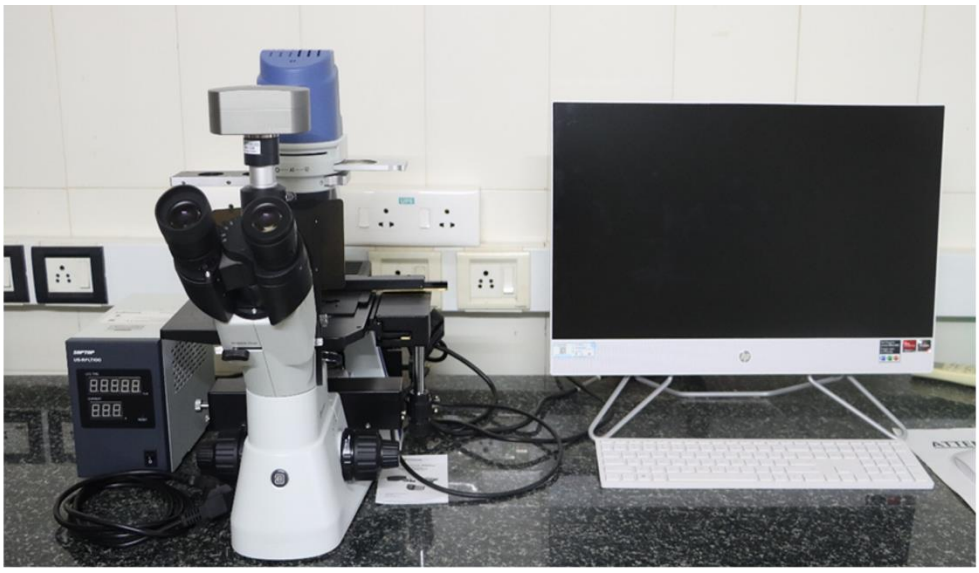
standards, the lab has established standardized *in vitro* (cell line-based models) and *in vivo* (animal-based) protocols in accordance with OECD and ISO guidelines. Key areas of specialization include toxicity, inflammation, diabetes, cancer, guided tissue regeneration (GTR), guided bone regeneration (GBR), diabetic wound healing, and cartilage regeneration. The lab's groundbreaking work has been published in esteemed high-impact journals, showcasing its valuable contributions to the scientific community. Currently, the lab holds an impressive h-index of 12 and boasts a patent for a tissue engineering scaffold with remarkable regenerative potential.

Our lab stands as a beacon of innovation in the realm of fundamental and translational research, with a primary focus on the dynamic field of regenerative medicine. Anchored in the heart of our pursuits is the extensive investigation of plant and mushroom-derived phytoceuticals. Through meticulous study and experimentation, we seek to unearth preclinical evidence showcasing the immense potential of these natural compounds in alleviating prevalent conditions, including inflammation, diabetes, cancer, and the regeneration of vital tissues. Our research canvas encompasses a dual approach, intertwining *in vitro* examinations rooted in biochemical and molecular biology with *in vivo* studies utilizing animal models. This holistic strategy ensures a comprehensive understanding of the complex interactions between phytoceuticals and biological systems. Committed to upholding global benchmarks, our lab has meticulously devised standardized protocols for both *in vitro* (cell line-based) and *in vivo* (animal-based) investigations, harmonizing our methodologies with the esteemed guidelines set forth by OECD and ISO.

Within our specialized domains lie multifaceted expertise, spanning toxicity assessment, inflammatory processes, diabetes management, cancer interventions, guided tissue regeneration (GTR), guided bone regeneration (GBR), diabetic wound healing, and the intricate realm of cartilage regeneration. This diverse spectrum reflects our dedication to unraveling the biological processes and leveraging them for transformative advancements. The hallmark of our journey is the invaluable knowledge we've contributed to the scientific community through the publication of pioneering works in prestigious high-impact journals. These publications underscore the significance of our findings and their potential to reshape paradigms in medical science. A testament to our impact is our lab's remarkable h-index of 12, emblematic of the profound influence our work wields in shaping the course of scientific inquiry.

Furthermore, our pursuit of innovation has yielded tangible results in the form of patents. We proudly showcase patents for a tissue engineering scaffold and hydrogel, both distinguished by their exceptional regenerative potential. These patents stand as hallmarks of our dedication to translating scientific insights into tangible solutions that hold the promise of transforming lives. In summation, the Phytoceuticals and Molecular Biology Research Lab at Pushpagiri Research Centre is a dynamic crucible of knowledge, innovation, and transformative research. Driven by a commitment to excellence and a profound understanding of the intersections between nature and science, we stand at the precipice of new discoveries that have the power to reshape the contours of medical understanding.

Instrumentation Facilities



Fluorescence and Inverted Microscope with PC Attachment

Simple Microscope with Camera Attachment

Compound Microscope with Camera Attachment

Laminar Air Flow

ELISA Plate Reader

CO_2 Incubator for Cell Culture

Cooling Centrifuge

d. Biochemistry Research Laboratory

Scientist: Dr. Soumya R.S, M.Sc., Ph.D., drsoumyars@pimsrc.edu.in

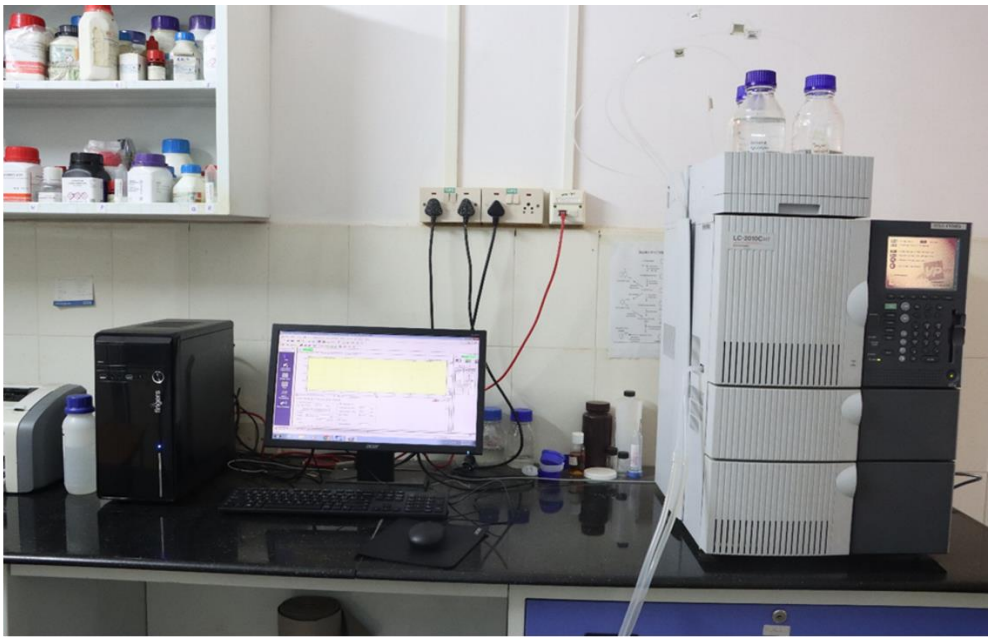
The area of research involved in the lab is the identification of novel mechanisms for the prevention of cardiovascular diseases and other metabolic disease through dietary molecules, phytocompounds and nanoparticles. In addition, the lab research also focused on guar gum based mitochondrial antioxidants in cardiac hypertrophy through cell culture, animal experiments, molecular biology techniques, biochemical analysis and phytochemistry techniques. Apart from that the lab offers training programs in HPLC, cell culture and animal handling.

The research lab involves in mitochondria dysfunction plays a key role in the etiopathogenesis of cardiovascular disease (CVD) and is regarded as an intriguing target for the

development of innovative therapies. Oxidative stress, mitochondrial permeability transition pore opening, and excessive fission are major noxious pathways amenable to drug therapy. Several mitochondria-targeted drug delivery systems (DDS) have been optimized with improved pharmacokinetic and biocompatibility, lower toxicity and antigenicity for application in the cardiovascular field. In this study triphenyl phosphonium conjugated rutin guar gum nanoparticles (Ru-TPP-GG) was prepared and was studied against angiotensin II (Ang II) induced hypertrophy in H9c2 cells. Ang II cells showed pathological hypertrophic responses and mitochondrial dysfunction which was evident from TGF β expression, cell surface area measurement and alteration of protein expression studies. Ru-TPP-GG nanoparticles safe guards the progress of hypertrophy in Ang II induced H9c2 cell lines by maintaining mitochondrial functions and the overall results imparts the possibilities of using nanoparticles conjugate as therapeutic agents for cardiovascular disease, a major health problem of the present day.

Myocardial infarction (MI) is the most prevalent cause of cardiovascular death. Isoproterenol [1–(3, 4–dihydroxyphenyl)–2–isopropylaminoethanol hydrochloride (ISO)] is a well-known model for studying MI. It is a synthetic catecholamine and β-adrenergic agonist that is an important regulator of myocardial contractility and metabolism. The pathophysiological and morphological aberrations produced in the heart of the myocardial necrotic rat model are comparable with those taking place in human MI. Allicin (diallylthiosulfinate) is the active compound of garlic with wide range of health benefits. Locust bean gum (LBG) is a galactomannan with a wide range of biological applications. The allicin functionalized LBG nanoparticles (LBGAN) were prepared by nanoprecipitation method and was characterized using particle size analysis, SEM and TEM was used for the *in vivo* studies. Five different groups of rats (200 ± 50g) were maintained; Group 1: control, Group 2: ISO, Group 3: allicin+ISO, Group 4: LBG+ISO, Group 5: LBGAN+ ISO, Group 6: metaprolol+ISO. The blood and heart tissues were collected to determine the biochemical parameters using established protocols. Histopathology of heart tissues was performed for the confirmation of results. The overall results of the study investigate the effectiveness of LBGAN against isoproterenol induced MI.

Instrumentation Facilities



Analytical HPLC with PC Attachment

Waterbath Sonicator

Weighing Balance

Vortex

e. Medical Biotechnology and Computational Drug Designing Laboratory

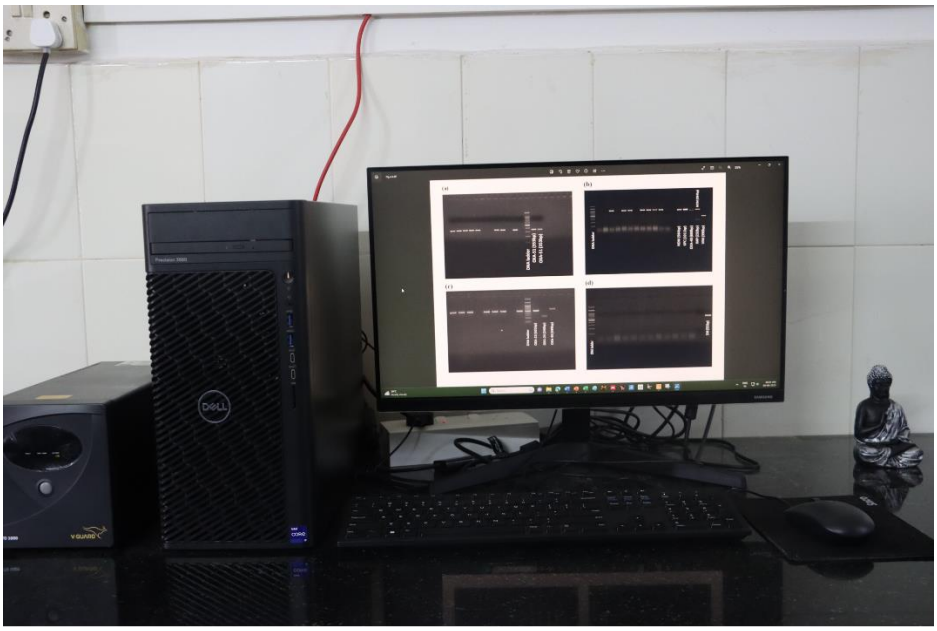
Scientist: Dr. Aniket Naha, M.Sc., Ph.D., draniketnaha@pimsrc.edu.in

The lab is involved in deciphering emerging causes of antimicrobial resistance through genomics, proteomics, systems biology and structural bioinformatics analyses. The lab aims to scrutinise clinically important nosocomial bacterial pathogens and envisages to devise sustainable therapeutic regimen through combination therapy upon augmenting active phytocompounds from medicinal plants with susceptible antibiotics. Besides the lab also explores in isolating and characterization of novel probiotics with high nutritive and enhanced immune modulatory potential. The lab is equipped with advanced workstation for carrying out extensive computational research and is dedicated in designing novel antimicrobial peptides and lead molecules through computer-aided drug designing for successful therapeutic interventions.

The research interest of the lab includes:

- The emergence of antimicrobial tolerance and resistance in ESKAPE pathogens
- Phenotypic-molecular characterisation, biofilm assay, quorum sensing and screening of potential biofilm disrupters
- Screening of effective antimicrobial agents derived from phytocompounds
- Elucidating the underlying mechanisms in inhibition of advanced glycation end-products (AGE) causing chronic diabetic complications using phytocompound derivatives
- Bioelectricity production through Microbial Fuel Cells (MFC) from hospital wastes/wastewater treatment plants
- Systems biology approaches using protein-protein interaction (PPI) and host-pathogen interaction (HPI) to reveal alternate therapeutic biomarkers in nosocomial pathogens
- Virtual screening, pharmacokinetics-pharmacodynamics (PK-PD) assessments, pharmacophore modelling and lead optimisation through quantum chemical density functional theory simulation.
- Structural bioinformatics approaches to validate the stability of novel theragnostic biomarkers with screened leads through molecular docking, molecular and essential dynamics simulation.

Instrumentation Facilities



Precision Tower
Dell Workstation

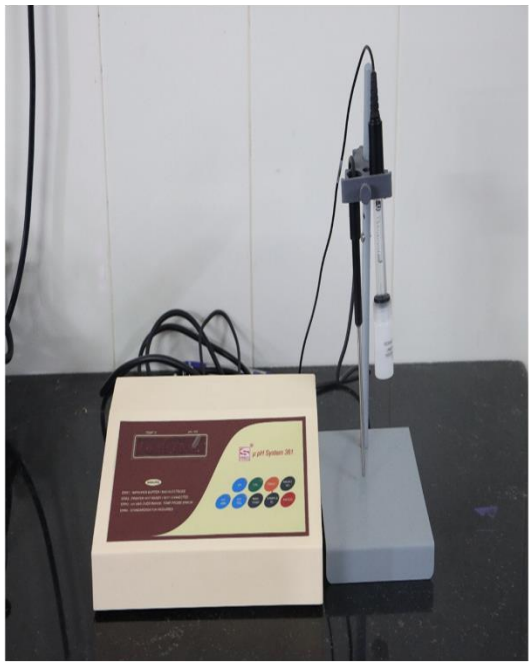
Ultra Cooling Centrifuge

Water Bath

Orbital Shaker

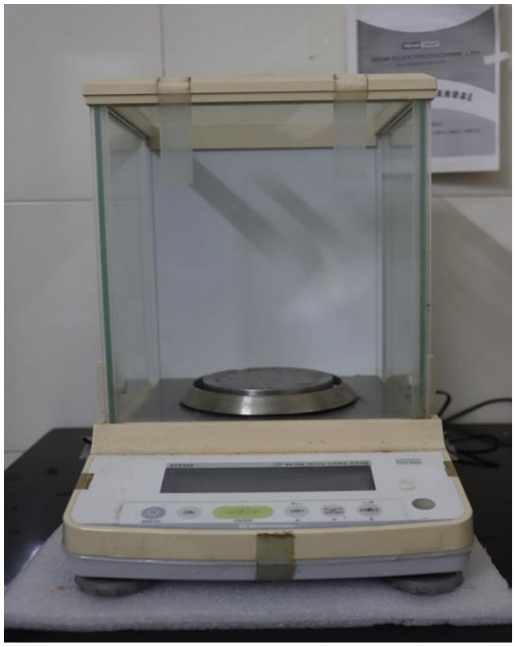
Colorimeter

Refrigerator



pH Meter

Heating Plate with Magnetic Stirrer



Precision Weighing Balance

Bright Field Microscope

Vortex

Heating Mantle

f. Microbial Technology Research & Infectious Disease Laboratory

Scientist: Dr. Sherly Antony, MD, drsherly@pushpagiri.in

Involved in the testing of antimicrobials from natural products as well as synthetic materials that can lead to drug innovations and remediation strategies. The emergence of antimicrobial resistance is a global health problem. Hence solutions encouraging and facilitating the evolution of new antimicrobials are the necessity of the hour. Also new emerging & re- emerging infectious diseases are scrutinised with in depth analysis of the agents of infectivity, their molecular characterisation and co-relation to severity of disease manifestations. Short term training programmes in basic clinical microbiology are offered.

Instrumentation Facilities

Magnetic Stirrer with Heating Mantle

Laminar Air Flow

Simple Microscope

Compound Microscope

Vortex

Microbial Colony Counter

Centrifuge

Bacteriological Incubator

Ultra Cooling Refrigerator (-20°C)

Hot Air Oven

High Precision Weighing Balance

Refrigerator

g. Clinical Epidemiology Unit

Assistant Professor: Dr. Rosin George Varghese, MD, pushpagiriceu@pushpagiri.in

Assistant Professor: Dr. Betsy A Jose, MD, dr.betsyajose@pushpagiri.in

Involved in providing statistical support to research projects, apart from services like proposal writing and study designs. The unit is affiliated to Indian Clinical Epidemiology Network and conducts various accredited short term training programmes in Biostatistics and Epidemiology. Funded project of Italian Bishops Conference. CANCare- a Free cancer screening program for females aged 18-60 years residing in Pathanamthitta, Alleppey and Kottayam District. Oral cancer, Thyroid, Breast and Cervical cancers are screened and the confirmatory tests are done free of cost. Project provides guidance and medical advice in choosing the appropriate forms of treatment. Conducts health education sessions for prevention of cancers. Conducts training program for Kudumbashree workers – We-CAN: a collaborative ToT endeavor by CANCare and Kudumbashree Mission where the CDS workers were given training for self-breast examination. Conducts Health Exhibitions related to cancers.

- **CANCare- Comprehensive Screening and Action for Women in Kerala**

Project funded by: CEI- Conferenza Episcopale Italiana, Committee for Charitable Action in the Third World

Principal Investigator: Rev. Dr. Mathew Mazhavancheril

Project Co-Principal Investigator: Dr Betsy A Jose

CANCare, is a comprehensive cancer screening programme and action for women in Kerala is a project for screening breast, thyroid oral and cervical cancers in women aged between 18-60 years residing in Pathanamthitta, Kottayam and Alappuzha districts of Kerala was launched at Pushpagiri Medical College in December 2020 after approval from. In order to deliver effective cancer screening, it requires the coordinated services of an enormous array of health care professionals including administrators, surgeons, oncologists, radiologists, pathologists, nurses, social workers and volunteers from multiple organizations in our community. The immense task of organizing and coordinating this diverse assemblage of individuals and services is accomplished through a group of selected leaders who have demonstrated curiosity, passion and the vision to create something better for our community. The CANCare programme was devoted to improve the survival and quality of life of cancer patients through early diagnosis, by emphasizing prevention programs, and by coordinating education for patients.

OBJECTIVES

1. To design and implement a programme for screening breast, thyroid, oral and cervical cancers, mainly in women residing in Pathanamthitta, Alappuzha and Kottayam districts of Kerala, India.
2. To provide financial and medical assistance to those women found to have suspected malignancies during screening programme.
3. To provide guidance and medical advice in choosing the appropriate forms of treatment, among those women who are confirmed to have malignancy during the screening and diagnosis phase

ACTIVITIES CONDUCTED

- 100 cancer screening programme were conducted for the benefit of women residing in Pathanamthitta, Alappuzha and Kottayam district of Kerala, India.
- The screening services were available for breast, thyroid, oral and cervical cancers.
- **9434** women participated in camps were screened for oral, thyroid, breast and cervical malignancy about which 896 suspects were identified
- **Given free diagnostic tests for 896** suspects identified from camps
- 100 health awareness classes and self-breast examination training for the camp participants were conducted along with camps
- Two cancer awareness exhibitions were conducted at Changanassery and Kaloor in collaboration with SB College Changanassery and Aryad block panchayath respectively
- Along with the 100 can-care camps oral healthcare awareness classes, general health awareness classes and menstrual hygiene classes were taken for the camp participants.
- As part of the projects, 2 days self-breast examination workshop (We-CAN) programme for selected volunteer women from Pathanamthitta districts were conducted at Pushpagiri Medical College Senate Hall
- 75 self-breast examination classes were conducted by the volunteer women across Pathanamthitta districts and free diagnostic tests were made available free for the suspects.

RESULTS

Table 1: Patient statistics from 8 March 2021 to 31 December 2022

Sl. No.	Category	Number (n)	Percentage (%)
1	The total number of populations (18 - 60-year-old women) screened as on 31st December 2022	**9434**	--
2	Total number of camps conducted as on 31 December 2022	**100**	--
3	Total number of suspects identified	**896**	**9.5%**
4	Total number of patients identified with any sort of clinical abnormality confirmed through CANCare	**709**	**7.5%**
5	Total number of patients confirmed with any sort of tumour lesions (Benign + Malignant)	**577**	**6.1%**
6	Total number of patients confirmed with malignant lesions	**412**	**4.3%**
7	Total number of patients confirmed with Benign lesions	**165**	**1.7%**

Table 2: Distribution of patients benefitted through CANCare (n = 9434)

Confirmatory Tests	Number of patients underwent	(%)	Patients detected with any abnormality	(%)	Patients with Benign lesions detected	(%)	Patients with malignant lesions detected	(%)
Neck USG	**473**	**5.0**	**438**	**4.3**	**72**	**0.8**	**269**	**2.85**
Mammogram	**333**	**3.5**	**227**	**2.3**	**76**	**0.8**	**126**	**1.3**
Breast USG	**49**	**0.5**	**29**	**0.3**	**17**	**0.18**	**2**	**0.02**
Pap Smear	**36**	**0.38**	**10**	**0.10**	**0**	**0**	**10**	**0.10**
Punch Biopsy	**5**	**0.06**	**5**	**0.06**	**0**	**0**	**5**	**0.06**
Total	**896**	**9.4**	**709**	**7.06**	**165**	**1.8**	**412**	**4.3**

Table 3: Percentage of benign and malignant lesions amongst suspected patients

Confirmatory Tests	Patients with abnormalities	Patients with benign lesions	(%)	Patients with malignant lesions	(%)	Total Patients diagnosed with cancer	%
Neck USG	**438**	**72**	**16.44**	**269**	**61.42**	**341**	**77.85**
Mammogram and Breast USG	**256**	**93**	**36.33**	**128**	**50**	**221**	**86.33**
Pap Smear	**10**	**0**	**0**	**10**	**100**	**10**	**100**
Punch Biopsy	**5**	**0**	**0**	**5**	**100**	**5**	**100**

Prevalence and pathophysiological findings of CANCare project

A total of 9434 patients were screened in a period of 2 years (2020-2022) since the inception of the CANCare project though 100 camps concerning the three districts (Pathanamthitta, Kottayam and Alappuzha) in Kerala. Among the screened patients, 896 (~ 10%) of them were shortlisted as suspects based on the lesions detected in cervix and oral cavity, inflammations and nodules in thyroid glands and lumps in the breast. These ailments can arise not only because of cancers but from several other pathophysiological and clinical conditions like cervicitis (in cervix), submucosal fibrosis, leukoderma, erythroderma, Aphthous stomatitis (in oral) and thyroiditis, goitre (in thyroid). However, the present programme concentrated on screening the cancer status of the women residing in the three districts of Kerala.

Further, confirmatory tests were done to screen out the cancer suspects from the non-cancer ailments. High prevalence of cancers was evident as a total of 709 (~80%) patients amongst diseased suspects being detected with tumour lesions. This plays an important role concerning the patient's further treatment regimen and also the follow-up procedures. Patients detected with benign tumors possess high chances of recovery than in malignant cases which causes severe morbidity and mortality. Therefore, investigations were performed to screen the intensity and stages of cancer progression to elucidate the benign and malignant conditions in patients. However, when the complete datasets were analysed concerning the studied population, it was found that the prevalence of cancers were ~6% (577 out of 9434 patients) implying an alarming outrage of cancer pervasiveness in the studied districts.

Confirmatory test (Neck USG) for Thyroid Cancer Screening

The confirmatory test for thyroid cancer is performed through neck ultrasonogram and the imaging is done through Thyroid Imaging Reporting and Data System (TI-RADS). The technique refers to any of several risk stratification systems for thyroid lesions, usually based on ultrasound features.

Based on the results obtained from this classification, it was found that ~3% and ~1% of the populations were diagnosed with malignant and benign lesions respectively. Concerning the patients detected with clinical abnormality in thyroid gland, ~93% (438 out of 473 people) of people were diagnosed with thyroid associated diseases. According to the TI-RADS classification it was clearly evident that 78% (16.44% benign and 61.42% malignant) of the suspected patients

had cancers. This data illustrates that the burden of malignant lesion in thyroid gland was higher when compared with the benign cases in these three districts.

Confirmatory test (Mammogram and Breast USG) for Breast Cancer Screening

The confirmatory test for breast cancer is performed through breast ultrasonogram and mammogram. Imaging done to confirm the cancer stages are derived from breast USG through Breast Imaging-Reporting and Data System (BI-RADS). The is the most commonly accepted technique for quality assurance and imaging of the breast thereby facilitating in the risk assessment.

From the population point of view, it can be inferred that 0.8% and 1.32% of the people were detected with benign and malignant breast lesions respectively. Further, from the BI-RADS classification of the suspected patients, it was observed that ~67% (256 out of 382 people) were diagnosed with clinical complications concerning breast mammogram and USG. Amongst these suspected population, ~86% (221 out of 256 patients) were diagnosed with benign (36.33%) and malignant (50%) breast cancer lesions making breast cancer as one of the most prevalent cancers screened through this CANCare programme following thyroid cancer. This data reveals the pervasiveness of malignant breast cancer to be much higher than that of benign lesions.

Confirmatory tests Pap Smear for Cervical and Punch Biopsy for Oral Cancer Screening

Outcome from cervical and oral cancer screening revealed that 0.1% and 0.06% of the population to have possessed cervical and oral cancers respectively. Though from bird's eye view the prevalence of cervical and oral cancers might seem low, on practical grounds it was observed that all the people with suspected abnormality were found to bore malignant cancerous lesions. This outcome drew clinical attention massively and further examinations concerning a larger study group. Our results are in correlation with the existing data revealing the low prevalence of oral and cervical cancers amongst women in Kerala, while higher prevalence is reported for breast and thyroid cancers respectively.

CONCLUSION

The CANCare programme explicitly fulfilled the vision of screening the women (18-60 years) of Pathanamthitta, Kottayam and Alappuzha districts of Kerala. The programme offered screening of four cancers (breast, thyroid, oral and cervical) at free of cost which facilitated the economically backward classes to come forward and receive the benefits of the screening programme. The

advertisements made through social media posts, flyers, posters, hoardings and newsletters had a greater impact facilitating in the outreach to almost 10,000 people who volunteered themselves for getting tested of these cancers. The programme created health awareness amongst the masses. CANCare facilitated to get benefitted not only from testing but also received training like self-breast examination protocols which is spreading to more public creating better awareness. The camps had huge response as evident from their verbal and written feedbacks and feedbacks received from the Kudumbasree workers who facilitated us immensely to make the programme a grand success. CANCare was successful in spreading the awareness and chances of complete recovery from cancers upon being diagnosed at an early or nascent stages through several exhibitions, training sessions in camps and colleges. The programme received accolades from eminent personalities (ministers, district collectors, gram panchayath heads and other local self-governments department members, volunteers, ASHA workers, government health institutions, NGOs, parishes, and youth movements) as they joined and became the part of the programme by sharing their views and promoting CANCare through online platforms and social media posts. Amidst loads of response from general public, we have been successful in reaching to only three districts out of fourteen districts of the state. Therefore, it becomes our moral obligation and ethical responsibility to extend this CANCare project throughout the state and country at large creating more awareness. Further, we aim to delve deeper into the determinacy of cancer and its causing mechanisms which could prove crucial for early detection and treatment besides framing strong health policies and equities.

CONFERENZA EPISCOPALE ITALIANA

PUSHPAGIRI We care God cures

CANCare WE HELP YOU TO LIVE A HE

We CAN
SELF BREAST EXAMINATION TRAINING PROGRAMME FOR WOMEN
"The best protection is early detection"

Official Inauguration of CANCare Project

(a)

(b)

Figure 9: Official Inauguration of CANCare Project on 08th March, 2020 on International Women's Day (a) Dr. Sheeja AL (District Medical Officer, Pathanamthitta) and Mrs. Bindhu Jayakumar (Municipal Chairperson) along with His Grace Most. Rev. Dr. Thomas Mar Koorilos (Metropolitan Archbishop of Tiruvalla, and Patron of Pushpagiri Group of Institutions), Rev. Fr. Jose Kallumalickal (CEO, Pushpagiri Group of Institutions), Principal, Medical Director and other distinguished personnel inaugurating the CANCare Project; **(b)** Rev. Dr. Mathew Mazhavancheril (Principal Investigator, CANCare Project) delivering the welcome speech

Inauguration of We-CAN Training Programme

CANCare PLANNING PHASE

Figure 2(a-d): Flyers and Brochures of CANCare Project for the general public regarding the tests to be conducted and creating awareness pertaining to cancers

Flyers, Brochures and Notices of Cancer Screening Camps by Pushpagiri Medical College and Hospital and its Collaborators

"We-CAN" - SELF-BREAST EXAMINATION TRAINING

Flyers, Brochures and Certificates of "We-CAN"

Training Programme

Instruments Procured for Cancer Screening

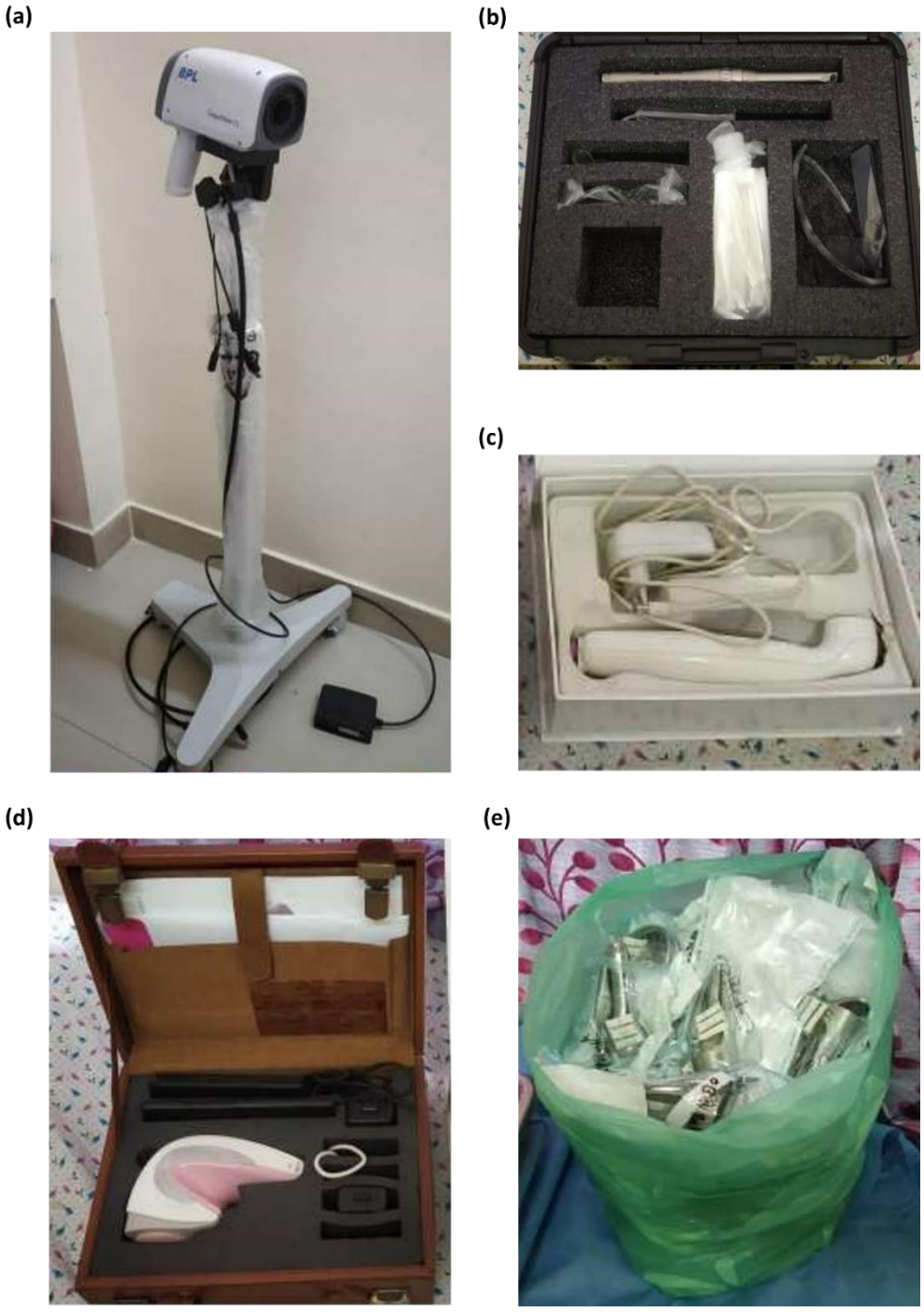


Figure 5: (a) Colposcope for examination of cervix using visual inspection by acetic acid (VIA); **(b)** Velscope for screening oral cavity; **(c)** Breast light for screening lumps in breast; **(d)** iBreastScan for screening lumps in breast; **(e)** Speculum for examining the cervix

Vehicles Procured from The CANCare Project

(a)

(b)

Figure 8: Vehicles procured for conduction of camps and trainings for CANCare Project: **(a)** Mahindra Marazzo 7 STR M2 (Diesel); **(b)** Traveller BSVI 13+D HR PS AC ABS 3350 (Diesel)

100 Camps and Awareness Sessions Conducted in Multiple Sites of the Alappuzha, Kottayam and Pathanamthitta Districts








100 Camps and Awareness Sessions Conducted in Multiple Sites of the Alappuzha, Kottayam and Pathanamthitta Districts









100 Camps and Awareness Sessions Conducted in Multiple Sites of the Alappuzha, Kottayam and Pathanamthitta Districts








100 Camps and Awareness Sessions Conducted in Multiple Sites of the Alappuzha, Kottayam and Pathanamthitta Districts

Training of Trainees (ToT) on Self-Breast Examination as A Part Of We-CAN Programme

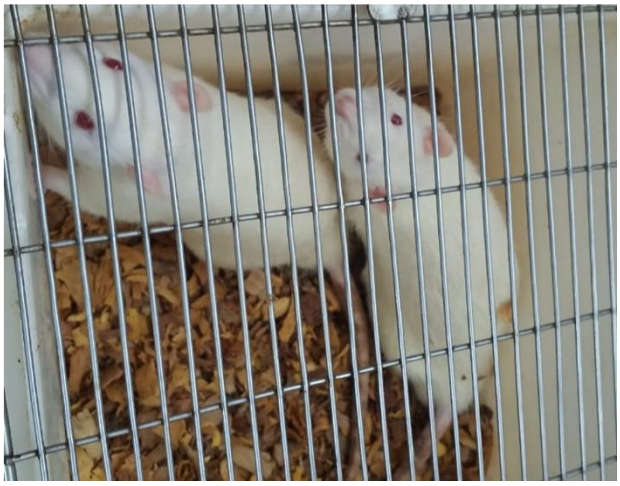
h. Animal House Experiment Facility

Chairman: Dr. Santosh Pillai, MD, drsantosh74@pushpagiri.in

Member secretary: Dr. Soumya R.S, M.Sc., Ph.D., soumyapadmakumar@gmail.com

Animal house in Pushpagiri Institute of Medical Sciences and Research Centre was established in the year 2008 (**Registration No:- 602/PO/Re/S/02/CPCSEA**). It is registered with Ministry of Environment and Forests (Animal Welfare Division), Govt. of Indio. The **Institutional Animal Ethics Committee (IAEC)** was established in the Institute, in accordance with the standards established by the **Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA)**. The IAEC scrutinizes each project to ensure that it.



Animals for experimental purposes in the Animal House Facility

Members of CPCSEA

Sl. No.	Name of the IAEC members	Designation in IAEC
1	Dr. Santosh Pillai	Biological Scientist cum Chairperson
2	Dr. Bhagyalekshmi N	Scientist In-charge of Animal House Facility cum Member Secretary
3	Dr. Prashanth Rathinam	Scientist from different biological discipline
4	Dr. Pooja Raghunath	Scientist from different biological discipline
5	Dr. P. N Sasidharan	Veterinarian

6	Dr. Sachin J. Shenoy	Main Nominee
7	Dr. Nishant Kumar Gupta	Link Nominee
8	Dr. Prakash K. G	Scientist from outside the Institute
9	Dr. Sibi P.I.	Socially Aware Nominee

LIST OF ONGOING OR NEWLY GRANTED PROJECTS

Sl. No.	Title of the project	PI and Co-PI(s)	Funding agency (if applicable) and duration	Collaborating institutions
1	Comprehensive cancer screening and action for women in Kerala	**Principal Investigators**: Rev. Dr. Mathew Mazhavancheril **Co-Principal Investigator:** Dr Betsy A Jose	Conferenza Episeopale Italiana Total amount: Rs. 1,05,55,228/-	Pushpagiri Medical Society
2	Human milk-based human milk fortifier for preterm infants	Dr. Tressia Alias Princy Paulose, **Dr. Yogesh Bharat Dalvi,** Ms. Siji K. Mary, Ms. Rekha Rose Koshy, Ms. Pinchu Elizabath Thomas, Dr. Jacob Abraham, **Dr. Nebu George Thomas,** Dr. Prashanth Thankachan	DBT Rs.50L	Bishop Moore College Pushpagiri Research Centre, PIMS & RC Mar Athanasios College for Advanced Studies Tiruvalla (MAC FAST) St. John's Research Institute, Bangalore

3	Development and validation of biomedical and cosmetic products from secondary fishery raw materials	Dr. Binsi PK, **Dr. Nebu George Thomas, Dr. Yogesh Bharat Dalvi**	CIFT Institutional Project 1000661052 [P-115/2020(3)]	Pushpagiri Research Centre, PIMS & RC CIFT, Cochin
4	Biobased scaffolds, membranes and hydrogels for improved wound healing and bone regeneration (Bioheal)	Dr. Aji P. Mathew, Dr. Sabu Thomas, Dr. Nandakumar Kalarikkal, **Dr. Nebu George Thomas**	Swedish Research Links	Stockholm University MG University Pushpagiri Research Centre, PIMS & RC
5	Fabrication of fish skin and collagen composite scaffolds loaded with drug molecules for simultaneous management of wounds and associated bacterial infections" under Block	Dr. Jaychandran VP, Dr. Umaima Ul Hoqani, Dr. Shinisha Sujesh, **Dr. Nebu George Thomas, Dr. Yogesh Bharat Dalvi**	Funding Program-funded by Ministry of Higher Education, Research and Innovation, The Sultanate of Oman, Dec 2021-Dec 2023- Total amount: Rs.30,24,000/-	Pushpagiri Research Centre Innovation, The Sultanate of Oman
6	Preclinical evaluation of 3D printed polylactic acid loaded with fish scale derived hydroxyapatite based composite scaffolds intended for alveolar bone regeneration	**Dr. Nebu George Thomas,** Mekha Grace Varghese, **Dr. Yogesh Bharat Dalvi,** Aji P Mathew, Natalia Fijol, Binsi PK, Anand A.	Swedish Research Links	Stockholm University CIFT, Cochin VIT (Vellore institute of technology) Pushpagiri Research Centre, PIMS & RC
7	Socket preservation with fish scale derived hydroxyapatite: An *in-vivo* murine study	Prathibha P.M., Binsi P.K., K. George Varghese, **Dr. Yogesh Bharat Dalvi,**	CIFT Institutional Project	Pushpagiri College of Dental Sciences, Medicity

		Nebu George Thomas, Zynudheen A.A., Ravishankar C.N.	1000661052 [P-115/2020(3)]	Pushpagiri Research Centre, PIMS & RC CIFT, Cochin
8	Fabrication and *in-vitro* biocompatibility evaluation of porcine cholecystic extracellular matrix based guided tissue regeneration membrane	**Dr. Nebu George Thomas, Dr. Yogesh Bharat Dalvi,** Dr. TV Anil Kumar, Dr. Betcy Thomas, Dr. Aswani Raj		Sree Chitra Tirunal Institute for Medical Sciences & Technology, TVM Pushpagiri Research Centre, PIMS & RC
9	Ebbabiolight assisted comparative evaluation of catechin doped bioactive glass nanoparticle (45S5) and chlorhexidine as an antimicrobial agent on oral biofilm from generalized chronic periodontitis patients - an *in-vitro* study	Dr. R Ramya, **Dr Nebu George Thomas,** Dr. Sabu Thomas, Dr. Nandakumar Kalarikkal		Saveetha Dental College (SDC) Saveetha Institute of Medical & Technical Sciences (SIMATS), Velapanchavadi, Chennai. Pushpagiri Research Centre, Pushpagiri Institute of Medical Science and Research Centre, Tiruvalla, Kerala International and Inter-University Centre for Nanoscience and Nanotechnology (IIUCNN), MG University, Kottayam

10	Proposed work includes: Dental implant surface coating with bioactive bioceramics Finite element analysis of dental implants	Dr. Anil Sukumaran, **Dr. Nebu George Thomas**		Hamad Medical Corporation, Qatar Pushpagiri Research Centre, Pushpagiri Institute of Medical Science and Research Centre, Tiruvalla, Kerala
11	Healing of chronic venous ulcers/ extensive ulcers by Nano-technology"" Collaboration with: Dr. Radhakrishnan E.K. (Assistant Professor, School of Biosciences) MGU	Dr. Radhakrishnan E.K, Dr. Sabu Thomas, Dr. Nandkumar, **Dr. Yogesh Bharat Dalvi, Dr. Nebu George Thomas**	Funded by "Dr N. Radhakrishnan Foundation for Research on Venous	M G university Pushpagiri Research Centre, PIMS & RC Pushpagiri College of Dental Sciences, Medicity
12	Evaluation of Antineoplastic and Associated Immune Modulatory Mechanisms of Violacein on Adenocarcinoma	**Dr. Yogesh Bharat Dalvi,** Dr. Shashanka Prasad, Dr. Sindhu R	Funded by SERB-CRG	Pushpagiri Research Centre, PIMS & RC JSS AHER, Mysuru JSS AHER, Mysuru
13	Virulence factor and phenotypic characterization of *Candida* sp. From clinical isolates	**Dr. Sherly Antony,** Dr. Teena Jacob, Dr. Mercy John Idikula, Dr. Shivprakash		PGI Chandigarh
14	Phenotypic identification and characterisation of carbapenem resistant isolates	**Dr. Sherly Antony,** Dr. Satish, Dr. Mercy John Idikula		IUCBR

	from clinical samples			
15	Prevalence of physical activity in underweight, overweight and obese young adults studying in different institutions in South Kerala, during the COVID -19 pandemic	**Dr. Leya Elizabeth Babu,** Mr. Nina Verghese (Student)	Funded by ICMR Short Term Studentship Project	

PAPERS PRESENTED OR GUEST LECTURES DELIVERED

Sl. No.	Name of the Conference/Workshop/ CME/webinar	Title of the Paper or Talk	Place	Name of Scientist
1	International Conference 2023 "Emerging trends in plant science research"	Exploring the therapeutic potential of Phytoceuticals in tissue engineering: Harnessing the power of plants, algae and fungi	Catholicate College, Pathanamthitta, Kerala	**Dr. Yogesh Bharat Dalvi**
2	International Conference 2023 "Emerging trends in plant science research"	Exploration of tissue engineering potency of Polycaprolactone scaffold incorporated Ganoderma extracts	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh & Namitha Vijay)	**Dr. Yogesh Bharat Dalvi**
3	International Conference 2023 "Emerging trends in plant science research"	Development of sodium alginate-based hydrogels integrated with polyherbal extract for diabetic wound healing	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh & Olivia Thokchom)	**Dr. Yogesh Bharat Dalvi**

4	International Conference 2023 "Emerging trends in plant science research"	Phytotherapeutic Approaches for accelerating diabetic wound healing: A comprehensive *in-vitro* and *in-vivo* investigation of herbal plant extracts.	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh Sunitha Sable)	**Dr. Yogesh Bharat Dalvi**
5	International Conference 2023 "Emerging trends in plant science research"	Isolation and molecular identification of phosphate solubilizing bacteria from soil	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh & Dain Babu)	**Dr. Yogesh Bharat Dalvi**
6	International Conference 2023 "Emerging trends in plant science research"	Analysing The Efficacy of Sodium Alginate Hydrogel Infused with Poly-herbal Extracts for Modern Wound Care Management	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh & Jaitha S Kumar)	**Dr. Yogesh Bharat Dalvi**
7	International Conference 2023 "Emerging trends in plant science research"	*In-vitro* And *In-vivo* Studies of Diabetic Wound Healing By PVDF-Collagen- Biomolecule Scaffold	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh, Dr. Nebu, Jeff P Johnson)	**Dr. Yogesh Bharat Dalvi**
8	International Conference 2023 "Emerging trends in plant science research"	CBCT Assisted *In-vivo* Regeneration Potential of Sol- Gel Synthesized Bioglass Loaded with Catechin Intended for Periodontal Regeneration	Catholicate College, Pathanamthitta, Kerala (Dr. Nebu, Dr. Yogesh, Mahima Soney)	**Dr. Yogesh Bharat Dalvi**
9	International Conference 2023 "Emerging trends in plant science research"	Diabetic Wound Care Management: A promising Approach with Zinc-Alginate Hydrogel Loaded with Moringa Bark Extract	Catholicate College, Pathanamthitta, Kerala (Dr. Nebu, Dr. Jayachandran, Dr. Yogesh & Nikhil Krishnan)	**Dr. Yogesh Bharat Dalvi**
10	International Conference 2023 "Emerging trends in plant science research"	Evaluation Of Anti-Inflammatory Property of Aqueous Ethanolic Poly-Herbal Extract In CFA-Induced Rat Model	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh & Saba Shaji Noushad)	**Dr. Yogesh Bharat Dalvi**

11	International Conference 2023 "Emerging trends in plant science research"	Evaluation Of Poly-Mushroom Extract in Treating Ethylene Glycol Induced Urolithiasis in Rat	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh& Saba Shaji Noushad)	**Dr. Yogesh Bharat Dalvi**
12	International Conference 2023 "Emerging trends in plant science research"	Exploring The *In-vivo* Biocompatibility Of PVDF- ZnO Composite Scaffold For Biomedical Applications	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh& Sneha Varghese)	**Dr. Yogesh Bharat Dalvi**
13	International Conference 2023 "Emerging trends in plant science research"	*In-vivo* Evaluation of Guar Gum Hydrogel Incorporated Poly Fungal Extract for Chronic Wounds in Rat	Catholicate College, Pathanamthitta, Kerala (Dr. Yogesh & Sreelekshmi. S)	**Dr. Yogesh Bharat Dalvi**
14	IRB Protocol Development	IRB protocol development	Pushpagiri Dental College	**Dr. Sharon Raj Eliza**
15	Orientation program for Interns	Research Methodology	Skill Lab - Pushpagiri Medical College	**Dr. Sharon Raj Eliza**
16	National Workshop on Research Grant Proposal writing, organized by JBI Pushpagiri centre for evidence-based practice	Basics of grant proposal writing 2022, October 3rd	Pushpagiri Nursing college, Tiruvalla	**Dr. Sherly Antony**
17	National workshop on grant proposal writing	Basics of grant proposal writing	Pushpagiri College of Nursing, 3rd Oct 2022	**Dr. Sherly Antony**
18	Sustainable development of biomaterials in the field of health and wellness	Nanotechnology: Sustainable biomaterials	Jain University, Bangaluru	**Dr. Yogesh Bharat Dalvi**
19	Translational research in Tissue engineering	Tissue engineering	Bioradiance, Pushpagiri research centre	**Dr. Yogesh Bharat Dalvi**
20	Being Professional in research	Professionalism	Bioradiance, Pushpagiri research centre	**Dr. Yogesh**

				Bharat Dalvi
21	National Seminar on Recent Trends in Disease Prevention and Health Management	Poster presentation title: Synthesis and *In-vitro* Evaluation of Triphenylphosphonium Conjugated Rutin Functionalized Guar Gum Nanoparticles with Enhanced Cardio protection and Ability to Restore Mitochondrial Function in Hypertrophy	CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, Kerala, 14 & 15 December 2022	**Dr. Soumya R. S**
22	National conference on advanced functional materials	Oral Presentation: Title: Effect of allicin incorporated locust bean gum nanoparticles on isoproterenol induced myocardial infarction in rats.	VTMNSS College, Thiruvananthapuram, and KSCTEC, Thiruvananthapuram Kerala, 23 &24, March 2023	**Dr Soumya R. S**
23	2nd International Conference cum Workshop on "Recent Trends in Structural Bioinformatics and Computer Aided Drug Design"	Poster Presentation Title: Two-component EvgS protein subdues both antimicrobial resistance and virulence in *Shigella flexneri* 2a str. 301: Evidence from Gene Interaction Network, Differential Gene Expression and Molecular Dynamics	Alagappa University, Karaikudi, Tamil Nadu, 21-25 November, 2022	**Dr. Aniket Naha**
24	Guest Lecture on 'Next Generation Sequencing (NGS)'	"Genome Annotation, Gene Analysis using DNA sequence Data and Sequence Analysis and Molecular Phylogeny"	Karunya Institute of Technology and Sciences, Coimbatore 10 November, 2022	**Dr. Aniket Naha**
25	Nanotechnology & Sustainability in health and wellness	Sustainable development of biomaterials in the field of health and wellness	JAIN University, Bangalore	**Dr. Yogesh**

				Bharat Dalvi
26	Tissue engineering	Translational research in Tissue engineering	JAIN University, Bangalore	**Dr. Nebu George Thomas**
27	Clinical Club	How to frame a Research Question?	PIMS & RC	**Dr. Rosin George Varghese**
28	Poster Presentation	Synthesis and *In-vitro* Evaluation of Triphenylphosphonium Conjugated Rutin Functionalized Guar Gum Nanoparticles with Enhanced Cardioprotection and Ability to Restore Mitochondrial Function in Hypertrophy	CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, Kerala, 14 & 15 December 2022	**Dr. Soumya R. S**
29	Oral Presentation	Effect of allicin incorporated locust bean gum nanoparticles on isoproterenol induced myocardial infarction in rats	Two-day, National conference on Advanced functional materials held at VTMNSS college Dhanuvachapuram, Trivandrum cosponsored by Kerala State Science Technology and Environment (KSCSTE) from 23-03-2023 to 24-03-2023.	**Dr Soumya R. S**
30	Clinical Club	Prevalence of carbapenem resistance in Gram negative ESKAPE pathogens and trend of susceptible antimicrobials for sustainable therapeutic regimen	PIMS & RC	**Dr. Aniket Naha**

TRAINEE STUDENTS

Sl. No.	Name of the student	Date of Joining	Title of the project	Name of the Scientist
1	Liji S.S.	07.03.2022	CIFT	**Dr. Nebu George Thomas**
2	Ms. Rose Christy	03.01.2022	Molecular Biology	**Dr. Yogesh Bharat Dalvi**
3	Ms. Ashifa Fathima	05.01.2022	Molecular Biology	**Dr. Yogesh Bharat Dalvi**
4	Mr. Chris Mathew	23.03.2022	Molecular Biology	**Dr. Yogesh Bharat Dalvi**
5	Ms. Mahima Rachel Soney	11.10.2022	CIFT	**Ongoing (Dr. Nebu George Thomas & Dr. Yogesh Bharat Dalvi)**
6	Mr. Nikhil Krishnan	14.07.2022	University of technology and applied science, Muscat	**Ongoing (Dr. Yogesh Bharat Dalvi, Dr. Nebu George Thomas, Dr. Jayachandran, Dr. Aniket Naha)**
7	Ms. Salome Mary Thomas	25.04.2022	Two Months	**Dr. Nebu George Thomas**
8	Anuhya Reddy	12.09.2022	DBT Trainee	**Dr. Yogesh Bharat Dalvi**
9	Ankita Panigrahi	01.08.2022	CIFT Trainee	**Dr. Nebu George Thomas**
10	Jeffy.P. Johnson	02.01.2023		**Dr. Yogesh Bharat Dalvi**
11	Dain Babu	02.01.2023		**Dr. Yogesh Bharat Dalvi**

STUDENT PROJECTS

M.Sc. Project Students

Sl. No	Name	Topic	College & type	Name of Scientist
1	Josna. K	Guided bone regeneration of PVDF Nickel Ferrite.	CMS College, Kottayam, M.Sc. Dissertation	**Dr. Yogesh Bharat Dalvi**
2	Jeffy P. Johnson	*In-vitro* and *in-vivo* studies with diabetic wound healing by PVDF, Collagen and Biomolecule	CMS College, Kottayam, M.Sc. Dissertation	**Dr. Yogesh Bharat Dalvi**
3	Able P.Shaji	*In-vitro* and *in-vivo* biocompatibility of PVA/PEG/HAp.	CMS College, Kottayam, M.Sc. Dissertation	**Dr. Yogesh Bharat Dalvi**
4	Mr. Muhammed Shahinkhan	*In-vitro* and *in-vivo* biocompatibility of PVA-PEG incorporated HAP membrane	St. Peter's College, Kolenchery, M.Sc. Dissertation	**Dr. Yogesh Bharat Dalvi**
5	Ms. Jomary George	Guided bone regeneration of PVDF and PVDF Nickel Ferrite in murine model	St. Peter's College, Kolenchery, M.Sc. Dissertation	**Dr. Yogesh Bharat Dalvi**
6	Ms. Anuranjini N A	*In-vitro* and *in-vivo* diabetic wound healing of PVDF-collagen membrane contain marine biomolecules.	St. Peter's College, Kolenchery, M.Sc. Dissertation	**Dr. Yogesh Bharat Dalvi**
7	Ms. Aswathy S H	Development and evaluation of cellulose-based hydrogels for articular cartilage defects in animal models.	VIT, Vellore, Ph.D.	**Dr. Nebu George Thomas**
8	Mr. Sooraj S. Nair	*In-vitro* and *in-vivo* diabetic wound healing of PF127 thermosensitive gel containing PLGA encapsulated plant extract	Mar Augusthinose College, Ramapuram,	**Dr. Yogesh Bharat Dalvi**

9	Ms. Anju Jose	*In-vitro* and *in-vivo* diabetic wound healing of PF127 thermosensitive gel containing Ag+ nanoparticle encapsulated plant extract	SB College, Changanacherry,	**Dr. Yogesh Bharat Dalvi**
10	Aswathy S	*In-vivo* biocompatibility assessment of cross-linked carboxymethyl cellulose hydrogel.	Indira Gandhi College of Arts and Sciences, Kothamangalam, M.Sc. Biotechnology	**Dr. Nebu George Thomas**
11	Aswani Raj	*In-vivo* biocompatibility evaluation of porcine cholecystic extracellular matrix-based guided tissue regeneration.	St. Mary's College for Women, Tiruvalla, M.Sc. Biotechnology	**Dr. Nebu George Thomas**
12	Mahima Rachel Sony	CBCT assisted *in-vivo* regeneration potential of sol-gel synthesis of 45S5 bioglass loaded with catechin intended for periodontal regeneration.	St. Mary's College for Women, Tiruvalla, M.Sc. Biotechnology	**Dr. Nebu George Thomas**
13	Vishnu Priya	Virulence factor and phenotypic characterization of *Candida* sp. From clinical isolates.	Sree Shankara College, Kalady	**Dr. Sherly Antony**
14	Ranjan	Phenotypic identification and characterisation of Carbapenem resistant Isolates from Clinical samples	Sree Shankara College, Kalady	**Dr. Sherly Antony**
15	Anu Saju	Circulating levels of Fe, Ca and Vitamin D in children with attention deficit hyperactivity disorder (ADHD) and autism spectrum disorders (ASD).	St. Peters College, Kolenchery, MG University.	**Dr. Sherin Jacob**
16	Joseph PH	Oxidative stress and its correlation with iron levels in patients with hypothyroidism, hyperthyroidism and hyperparathyroidism	SB College, Changanassery.	**Dr. Sherin Jacob**

17	Mary J. Anto	Seroprevalence of rubella IgG in pregnant women – a preliminary study among antenatal cases in a tertiary care hospital.	St. Xavier's College, Aluva / MG University	**George Varghese**
18	Soorya PR	Qualitative analysis of protective immunity against Measles virus among pregnant Women to understand the need of supplemental immunization	St. Xavier's College, Aluva / MG University	**George Varghese**
19	Ms. Theresa Joseph	Evaluation of protective immunity against Hepatitis B virus among pregnant women -a preliminary study among antenatal cases in a tertiary care hospital	St. Xavier's College, Aluva / MG University	**George Varghese**
20	Ms. Neethu A	Seroprevalence of Cytomegalovirus (CMV) IgG in pregnant women – a preliminary study among antenatal cases in a tertiary care hospital.	St. Xavier's College, Aluva / MG University	**George Varghese**
21	Ms. Archana Prasad	Prevalence of Cytomegalovirus (CMV) infection among pregnant women – a preliminary study among antenatal cases in a tertiary care hospital	St. Mary's College, Tiruvalla / Mg University	**George Varghese**
22	Ms. Jincy Babu	Seroprevalence of rubella IgG in pregnant women – a preliminary study among antenatal cases in a tertiary care hospital.	St. Mary's College, Tiruvalla / MG University	**George Varghese**
23	Ms. Sruthi R. Nair	Synergistic Effect of *Terminalia chebula* Seed Extract in Association with Susceptible Antibiotics Against Carbapenem Resistant ESKAPE Pathogens: An *In-silico* and *In-vitro* Approach	Vellore Institute of Technology, Vellore	**Dr. Aniket Naha**
24	Ms. Anagha Darshan	Efficacy of phytocompounds extracted from Azadiractica indica	CMS College, Kottayam	**Dr. Aniket Naha**

		in synergism with the susceptible antibiotics against nosocomial *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*		
25	Niveda Pramod Osheen Maria Jacob Philip John Netto Reshma T R Rijomon R S	Prevalence of eating disorders and its associated factors among medical Students	PIMS & RC	**Dr. Rosin George Varghese**
26	Vaishnavi A T Vasunthara S Vidhya Rose Vinitha Wilson	Consumption pattern of caffeinated products and caffeine use disorders among medical students	PIMS & RC	**Dr. Rosin George Varghese**
27	Cinta Jacob Colin cherian Diya Jacob Diya Santhosh Elza Rose	Prevalence of body image dissatisfaction and its associated factors among medical Students	PIMS & RC	**Dr Rosin George Varghese**
28	Ms. Jaitha S Kumar	Analysing The Efficacy of Sodium Alginate Hydrogel Infused with Poyl-herbal Extracts for Modern Wound Care Management	M.Sc. Dissertation	**VISTAS, Chennai**
29	Ms. Saba Shaji Noushad	Evaluation Of Anti- Inflammatory Property of Aqueous Ethanolic Poly- Herbal Extract In CFA-Induced Rat Model	M.Sc. Dissertation	**VISTAS, Chennai**
30	Ms. Sana Shaji Noushad	Evaluation Of Poly- Mushroom Extract in Treating Ethylene Glycol Induced Urolithiasis in Rat	M.Sc. Dissertation	**VISTAS, Chennai**
31	Ms. Sneha Varghese	Exploring The *In-vivo* Biocompatibility Of PVDF- ZnO	M.Sc. Dissertation	**VISTAS, Chennai**

		Composite Scaffold for Biomedical Applications		
32	Ms. Sreelekshmi.S	*In-vivo* Evaluation of Guar Gum Hydrogel Incorporated Poly Fungal Extract for Chronic Wounds in Rat	M.Sc. Dissertation	**VISTAS, Chennai**
33	Ms. Olivia Thokchom	Development of sodium alginate-based hydrogels integrated with polyherbal extract for diabetic wound healing	M.Sc. Dissertation	**Pune University**
34	Ms. Sunitha Sable	*In-vivo* biocompatibility evaluation of porcine cholecystic extracellular matrix-based guided tissue regeneration.	M.Sc. Dissertation	**Pune University**
35	Rijomon, Niveda Pramod, Osheen, Philip, Reshma	Prevalence of eating disorders & its associated factors among medical students	PIMS & RC, MBBS Project	**Dr. Rosin George**
36	Vaishnavi AT, Vasunthara S, Vidhya Rose, Vinitha Wilson	Prevalence of caffeine use disorders & its associated factors among medical students	PIMS & RC, MBBS Project	**Dr. Rosin George**
37	Cinta Jacob, Colin Cheriyan, Diya Jacob, Diya Santhosh, Elza Rose	Prevalence of body image dissatisfaction & its associated factors among medical students	PIMS & RC, MBBS Project	**Dr. Rosin George**

MDS THESIS

Sl. No.	Title	MDS Student	College	Scientist
1	Biocompatibility – Bioglass/collagen-chitosan	Dr. Amal MDS Student	Sree Sankara College, Kalady	**Dr. Nebu George Thomas**
2	Biocompatibility – Chitosan-FSHA	Dr. Alenya MDS Student	Pushpagiri Dental College, Medicity	**Dr. Nebu George Thomas & Dr. Yogesh Bharat Dalvi**
3	Biocompatibility – Chitosan-Bioglass	Dr. Maymol MDS Student	Pushpagiri Dental College, Medicity	**Dr. Nebu George Thomas**
4	Biocompatibility – Fishbone	Dr. Meenu MDS Student	Pushpagiri Dental College, Medicity	**Dr. Nebu George Thomas & Dr. Yogesh Bharat Dalvi**
5	Comparative evaluation of the antibiofilm property of chitosan hydrogel loaded with catechin and chitosan hydrogel loaded with chlorhexidine'	Dr. S.S Ancy – 1st year MDS,	Sri Sankara Dental College, Varkala,	**Ongoing Dr. Nebu George Thomas**
6	'*In-vitro* biocompatibility assessment of chitosan hydrogel loaded with a fish scale derived hydroxyapatite intended for periodontal regeneration	Dr. Bincy U – 1st year MDS,	Department of Periodontics, Sri Sankara Dental College, Varkala	**Ongoing Dr. Nebu George Thomas & Dr. Yogesh Bharat Dalvi**
7	*In-vitro* biocompatibility assessment of demineralized fish bone intended for periodontal regeneration (Dr Nebu George, Dr Yogesh Bharat Dalvi).	Dr. G Meenu – 1st year MDS, of Dental Sciences	Department of Periodontology and Implantology, Pushpagiri College	**Ongoing Dr. Nebu George Thomas & Dr. Yogesh Bharat Dalvi**

8	Preclinical analysis of fish scale derived hydroxy apatite intended for bone regeneration (Dr. Nebu George Thomas, Dr. Yogesh Bharat Dalvi).	Dr. Chinchu – 1st year MD,	Department of Pharmacology, Pushpagiri Institute of Medical Science and Research Centre	**Ongoing Dr. Nebu George Thomas & Dr. Yogesh Bharat Dalvi**
9	Application of Marine-based hydroxyapatite in periodontal regeneration. (Ph.D. synopsis)	Dr. Sruthy Prathap	Yenapoya university	**Ph.D. synopsis (Dr. Nebu George Thomas)**
10	Fabrication and *in-vitro* biocompatibility evaluation of porcine cholecystic extracellular matrix based guided tissue regeneration membrane.	Dr. Betcy Thomas	MDS, Pushpagiri Dental College	**Dr. Nebu George Thomas**
11	*In-vitro* biocompatibility assessment of chitosan hydrogel loaded with 45S5 BG intended for periodontal regeneration.	Dr. Vimal Thomas Oomen	MDS, Pushpagiri Dental College	**Dr. Nebu George Thomas**
12	Development and evaluation of cellulose-based hydrogels for articular cartilage defects in animal models.	Ms. Aswathy S.H.	VIT, Vellore, Ph.D.	**Dr. Nebu George Thomas**
13	*In-vitro* biocompatibility of chitosan hydrogel loaded with fish scale derived hydroxyapatite intended for periodontal regeneration.	Dr. Binsi U	MDS, Pushpagiri Dental College	**Dr. Nebu George Thomas**

DETAILS OF Ph.D. SCHOLARS

SI. No.	Ph.D. Candidates	Guide	Topic	Collaborative Institution
1	Dr. Sharlene Sara Baby	Dr. S. Sunil (Guide) **Dr. Yogesh Bharat Dalvi (Co Guide)**	DNA Methylation Biomarker as an Early Diagnostic Tool in the progression of Oral Squamous Cell Carcinoma	Kerala University of Health Sciences, Pushpagiri College of Dental Sciences
2	Saira Siraj E.	Dr. Benley George	Analysing the relationship between the social determinants and oral health disparities “A Mixed method approach	Kerala University of Health Sciences, Pushpagiri College of Dental Sciences
3	Abdul Saheer P.	Dr. Benley George	Assessment of Oral health, Behavior, Psychosocial and nutritional status among Institutionalized inmates in Idukki district-A multicenter cross-sectional study	Kerala University of Health Sciences, Pushpagiri College of Dental Sciences
4	Dr. Julie Toby Thomas	**Dr. Nebu George Thomas**	Cardiometabolic risk and periodontal disease	University of Helsinki, Finland.
5	Dr. Sruthy Prathap	**Dr. Nebu George Thomas**	Evaluation of the activity of composite graft material synthesised from eggshell derived bone substitute (hydroxyapatite) in a biocompatible matrix (fish collagen) on bone healing and regeneration in animal model (Wistar rats)	ICAR- Central Institute of Fisheries Technology
6	Dr. Aswathy	**Dr. Nebu George Thomas**	Unravelling the Potential of Carboxymethyl Cellulose Hydrogels for Articular Cartilage Repair using Rat Model Study	Vellore Institute of Technology, Vellore

PUBLICATIONS IN PEER-REVIEWED JOURNALS AND BOOK CHAPTERS

1. Jacob, Sherin, **Sherly Antony**, Aravind Madhavan, Raveendran Sindhu, Mukesh Kumar Awasthi, Mohammed Kuddus, Santhosh Pillai, Sunita Varjani, Ashok Pandey, and Parameswaran Binod. "Nanocellulose in tissue engineering and bioremediation: mechanism of action." Bioengineered 13, no. 5 (2022): 12823-12833.
2. Jose, Jiya, Avinash R. Pai, Deepu A. Gopakumar, **Yogesh Bharat Dalvi**, V. Ruby, Sarita G. Bhat, Daniel Pasquini, Nandakumar Kalarikkal, and Sabu Thomas. "Novel 3D porous aerogels engineered at nano scale from cellulose nano fibers and curcumin: An effective treatment for chronic wounds." Carbohydrate Polymers 287 (2022): 119338.
3. Malini, N. A., V. Ruby, **Yogesh Bharat Dalvi**, and G. K. Roy. "Endocrine, Metabolic and Ovarian Features of Human PCO Repeat in Sprague Dawley Rats-An Experimental Study." Journal of Endocrinology and Reproduction (2022): 55-65.
4. Joshy, K. S., Robin Augustine, Anwarul Hasan, Alap Ali Zahid, Susan M. Alex, **Yogesh Bharat Dalvi**, Fatima Mraiche, Sabu Thomas, Nandakumar Kalarikkal, and Hong Chi. "Cisplatin encapsulated nanoparticles from polymer blends for anti-cancer drug delivery." New Journal of Chemistry 46, no. 12 (2022): 5819-5829.
5. Unni, Rekha, Ruby Varghese, **Yogesh Bharat Dalvi**, Robin Augustine, Latha MS, Hari Kumar Bhaskaran Nair, Anwarul Hasan, and Tiju Joseph Mathew. "Characterization and In vitro biocompatibility analysis of nanocellulose scaffold for tissue engineering application." Journal of Polymer Research 29, no. 8 (2022): 358.
6. Sultan, Sahar, **Nebu George Thomas**, Mekha Varghese, **Yogesh Bharat Dalvi**, Shilpa Joy, Stephen Hall, and Aji P. Mathew. "The design of 3D-printed polylactic acid–bioglass composite scaffold: a potential implant material for bone tissue engineering." Molecules 27, no. 21 (2022): 7214.
7. Koshy, Rekha Rose, Siji K. Mary, Arunima Reghunadhan, **Yogesh Bharat Dalvi**, Lekshmi Kailas, Nereida Cordeiro, Sabu Thomas, and Laly A. Pothen. "Tissue Engineering Scaffold Material with Enhanced Cell Adhesion and Angiogenesis from Soy Protein Isolate Loaded with Bio Modulated Micro-TiO2 Prepared via Prolonged Sonication for Wound Healing Applications." ACS Biomaterials Science & Engineering 8, no. 11 (2022): 4896-4908.

8. Abu-Shawish, Ghadah, Joseph Betsy, and Sukumaran Anil. "Is obesity a risk factor for periodontal disease in adults? a systematic review." International Journal of Environmental Research and Public Health 19, no. 19 (2022): 12684.
9. **Aniket Naha**, **Sherly Antony**, Soumitra Nath, Dhrubjyoti Sharma, Anamika Mishra, Devika T. Biju, Aravind Madhavan, Parameswaran Binod, Sunita Varjani, and Raveendran Sindhu. "A hypothetical model of multi-layered cost-effective wastewater treatment plant integrating microbial fuel cell and nanofiltration technology: A comprehensive review on wastewater treatment and sustainable remediation." Environmental Pollution (2023): 121274.
10. Bhowmik, Deepshikha, Shiela Chetri, Kingsley Erhons Enerijiofi, **Aniket Naha**, Tushar Deb Kanungo, Maulin P. Shah, and Soumitra Nath. "Multitudinous approaches, challenges and opportunities of bioelectrochemical systems in conversion of waste to energy from wastewater treatment plants." Cleaner and Circular Bioeconomy (2023): 100040.
11. Varghese, Ruby, Namitha Vijay, and **Yogesh Bharat Dalvi**. "Antiviral Polymers For Food Safety." Nanotechnology Platforms for Antiviral Challenges: Fundamentals, Applications and Advances (2023): 45.
12. Augustine, Robin, Sumama Nuthana Kalva, **Yogesh Bharat Dalvi**, Ruby Varghese, Maneesh Chandran, and Anwarul Hasan. "Air-jet spun tissue engineering scaffolds incorporated with diamond nanosheets with improved mechanical strength and biocompatibility." Colloids and Surfaces B: Biointerfaces 221 (2023): 112958.
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SPECIAL ACHIEVEMENTS LIKE AWARDS, MoUs, ORATIONS, PATENTS

1. **Dr. Nibu Varghese, Dr. Nebu George Thomas, Dr. Yogesh Bharat Dalvi,** Dr TB Anilkumar filed a patent on 'Process for the Fabrication of Multi-Layered Porcine Cholecystic Extracellular Matrix (CECM) For Tissue Engineering Application' (Indian government IPEXP235.Y22)
2. **Dr. Sherly Antony** selected as **American Society for Microbiology (ASM) Young Ambassador to India (2023)**
3. DBT sanctions 50 Lakhs for the project entitled "Human Milk-based Human Milk Fortifier for Preterm Infants" **(Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi**)
4. CIFT MOU **(Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi**)
5. Mahatma Gandhi University (MGU) **(Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi)**
6. Adhiparasakthi Dental College and Hospital Dental school in Melmaruvathur, Tamil Nadu **(Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi)**
7. St. Gregorios Medical Mission Hospital, Parumala **(Dr. Nebu George Thomas)**
8. Young Innovation Program (YIP 2020) project got selected **(Dr. Nebu George Thomas)**
9. MOU with CFTRI, Mysuru **(Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi)**
10. Collaboration with Sree Chitra tirunal institute of medical science and technology **(Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi)**
11. CSIR-IGBI award for Genetic concept in Sci-Art Comic National level competition, celebrating 200 years of Mendelism. **(Dr Yogesh Bharat Dalvi).**
12. Collaboration with Department of Physics and Botany, Catholicate College, Pathanamthitta (**Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi**).

13. Collaboration with Department of Chemistry, Providence College, Alappuzha. (**Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi**).
14. Collaboration with Department of Chemistry, Christian College, Chengannur. (**Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi**).
15. Best Oral Presentation "Exploration of tissue engineering potency of Polycaprolactone scaffold incorporated Ganoderma extracts (Research scholar Category) (**Dr. Yogesh Bharat Dalvi** and Namitha Vijay).
16. Best Oral Presentation "Development of sodium alginate-based hydrogels integrated with polyherbal extract for diabetic wound healing (Student Category) (**Dr. Yogesh Bharat Dalvi** and Olivia Thokchom).
17. Collaborative study on: Oral screening of children with autism spectrum disorders and longitudinal changes in salivary constituents after minimally invasive caries treatment – A cross-sectional survey and cohort Dr. Sherin Sara George. BDS. MDS. Senior Lecturer, Department of Paediatric and Preventive Dentistry Pushpagiri College of Dental Sciences. (**Dr. Nebu George Thomas**).
18. Collaborative study on: Development of Tooth Ash as bone graft, Hamad Medical Corporation, Qatar (**Dr. Nebu George Thomas** and **Dr. Yogesh Bharat Dalvi**)
19. Technology on Development of Bioceremic Hydroxyapatite from Fish Source for Dental Regeneration got selected as a product by Indian Council of Agriculture Research (**Dr. Nebu George Thomas**)
20. **Dr. Soumya R.S** is appointed as the Member Secretary of Institutional Animal Ethics Committee, Pushpagiri Institute of Medical Sciences and Research Centre
21. **Dr. Soumya R.S** received Ph.D. Guideship from the Kerala University of Health Science Guideship Order No. KUHS (U.O. NO 262/2023/dean/KUHS DATED 12/04/2023)

POST GRADUATION THESIS – M.Sc., MD, MDS

Synergistic Effect of *Terminalia chebula* Fruit Extract in Association with Susceptible Antibiotics Against Carbapenem Resistant Gram Negative ESKAPE Pathogens: An *In-vitro* and *In-silico* Approach

Dr Aniket Naha, Sruthi R Nair

ABSTRACT

Carbapenem-resistant bacteria pose a serious threat to public health due to the few available treatments and the high fatality rates linked to infections brought on by these diseases. In recent years, there has been a great interest in exploring new methods to tackle these drug-resistant bacteria. *Terminalia chebula*, a medicinal plant with long history of traditional use and has shown a different pharmacological activity, including antibacterial action. The goal of this study was to find out how antibiotics and *Terminalia chebula* synergistic effect help to combat bacteria that were resistant to carbapenem. The mechanisms underlying the synergistic effects were found to be multifactorial and involve a variety of modes of action, including the blockage of efflux pumps, control over biofilm development, and disruption of cell membrane integrity. Additionally, it has been demonstrated that *Terminalia chebula* extracts increase the permeability of bacterial cell membranes, increasing the amount of antibiotics that accumulate intracellularly and contributing to the observed synergism. According to the study it was observed that the combination therapy may have the potential to overcome the carbapenem resistance in the bacteria. However, more investigation is required to clarify the precise mechanisms involved and to optimize the formulation for clinical applications. *In-silico* analysis were also done to determine the binding affinity of certain molecules found in the *Terminalia chebula* with the penicillin binding protein found in the Gram negative ESKAPE pathogen. In conclusion, the present study highlights the effects of *Terminalia chebula* against carbapenem-resistant Gram Negative ESKAPE bacteria.

Keywords: *Carbapenem, Antimicrobial Resistance, Phytocompound, Antibiotic Susceptibility Test, Synergistic Effect, Binding Affinity*

Efficiency of Phytocompounds Extracted from *Azadirachta indica* In Synergism with Susceptible Antibiotics Against Nosocomial *Pseudomonas aeruginosa*

Dr Aniket Naha, Anagha Darshan

ABSTRACT

Antibiotic resistance is a serious global health threat that occurs when bacteria change in response to the use of antibiotics and become harder to treat. *Pseudomonas aeruginosa* is one of the ESKAPE pathogens, which is a group of bacteria that are resistant to many antibiotics and can cause severe hospital-acquired infections. Carbapenem-resistant *P. aeruginosa* poses a serious threat to public health and requires urgent action to prevent and control its spread. *Azadirachta indica* has medicinal properties including antibacterial activity and is widely used in the Indian traditional medicinal system for treating various ailments. This study is aimed to understand the efficiency of phytocompounds in leaf extract of *A. indica* to enhance the effect of susceptible antibiotics against nosocomial *P. aeruginosa.* It has been demonstrated that the isolated clinical strains of *P. aeruginosa* have stronger biofilm-forming ability which is the major reason for antibiotic resistance. The methanolic extract of *A. indica* leaf enhanced the antibacterial activity when combined with susceptible antibiotic against Carbapenem-resistant nosocomial *P. aeruginosa.* From this study, it is observed that the combination therapy using *A. indica* with susceptible antibiotic have the potential to destroy biofilm formed by *P. aeruginosa.* However further investigation is required to identify the specific phytocompounds and their optimum concentration in which maximum inhibition occurs and the exact mechanism that phytocompounds use to destroy biofilm formed by *P. aeruginosa.*

Keywords: *Antimicrobial resistance, Nosocomial pathogens, Synergistic effect, Phytoextraction, Antibiofilm potency*

In-vitro And *In-vivo* Biocompatibility of PVA/PEG/Hap Scaffolds in Murine Model

Dr. Nebu George Thomas, Able P Shaji, Dr. Yogesh Bharat Dalvi

ABSTRACT

The present study investigating the biocompatibility of scaffolds implanted into rats. Biocompatibility is concerned with the interactions that occur between biomaterials and host tissues. As foreign objects in that host tissue these materials may initiate several types of responses. It has often been postulated that the immune response, by which the host normally defends itself against invasion by foreign organisms, can be involved in the response to biomaterials. It is essential to determine the biocompatibility of scaffolds in both *in-vitro* and *in-vivo* for various biomedical applications to ensure their safe clinical use. We have studied these aspects with our PVA/PEG/HAp Scaffolds. Changes in tissue levels were analyzed over 4 weeks after intravenous administration of scaffolds to murine model. Selected tissues were also analyzed and studied histological to determine biocompatibility of PVA/PEG/HAp Scaffolds. Tissue samples harvested after implantation of scaffolds at 7h, 14th, 21 and 28h day's for histological analysis. The inflammatory response and the degree of resorption for each tested material are reported. In conclusion, we can determine the biocompatibility of our scaffolds after the estimation of histopathological studies to ensure their safe use. This study discusses the mechanisms by which interactions that occur between biomaterials and host tissues and the evidence that suggests the immune response is indeed of significance in biocompatibility.

Keywords: *PVA/PEG/HAp Scaffold*

Biocompatibility of PVDF Synthetic Scaffold Containing Cellulose Nanofiber and Nickel Ferrite Nanoparticle Intended for Tissue Engineering

Dr. Nebu George Thomas, Anju Jose, Dr. Yogesh Bharat Dalvi

ABSTRACT

Poly (vinylidene fluoride) (PVDF) and its family of copolymers are arguably the best-known examples of a class of high-performance polymers noted for their remarkable piezoelectric and ferroelectric properties. After more than 30 years of study and development, the piezoelectricity and electromechanical properties of PVDF and its copolymers have been improved markedly. Today this class of polymer still possesses the highest electromechanical responses over a broad temperature range among known synthetic organic materials. Further, when considered along with their easy conformability, flexibility, robustness, and lightness, it is not surprising that electro active polymers continue to be the focus of interest of the designers of high-performance electromechanical devices.

The aim of this study was to screen the cytotoxicity and evaluate biocompatibility of PVDF synthetic scaffold containing cellulose and nickel ferrite nanoparticle intended for tissue engineering. The MTT assay was performed with the extracts of the scaffold shown that the nanoparticle PVDF scaffolds not exhibit any toxic effect on L929-mice fibroblast cell line and it shows more cell viability in the two incubation periods. It was a good indication of better wound healing activity of the scaffold. After 4 weeks of subcutaneous implantation, the entire scaffolds were completely degraded and maintained good integrity. In histopathological analysis PVDF synthetic scaffold containing cellulose and nickel ferrite nanoparticle intended for tissue engineering of scaffold, shown no significant inflammatory reaction or rejection this indicated that the scaffold has good histocompatibility.

Keywords: *PVDF, MTT assay, L929-mice fibroblast cell line*

In-vitro & *In-vivo* Diabetic Wound Healing Study Using Composite of PVDF, Collagen & Biomolecule

Dr. Nebu George Thomas, Anuranjini N A, Dr. Yogesh Bharat Dalvi

ABSTRACT

Diabetes is a heterogeneous group of metabolic disorders characterized by high blood glucose level. In diabetic patients, prolonged inflammation of the wound leads to serious complications that often lead to amputation with limited treatment. Currently, available wound dressing materials have many limitations. Current strategies of regenerative medicine are focused on the restoration of pathologically altered tissue architectures by transplantation of cells in combination with supportive scaffolds and biomolecules. To restore function or regenerate tissue, a scaffold is necessary that will act as a temporary matrix for cell proliferation and extracellular matrix deposition, with subsequent ingrowth until the tissues are restored or regenerated. PVDF, Collagen and polydopamine nanoparticles are a better option for regenerative medicine and have high antimicrobial, anti-inflammatory, and anti- oxidative properties. With the background information, the present study was designed to determine diabetic wound healing using a synthetic copolymer of PVDF/Collagen biomolecule. *In-vitro* study reveals that this synthetic scaffold is not cytotoxic i.e., biocompatible. *In-vitro* wound healing assay (Scratch assay) done in L929 cell line of mouse fibroblast cell. Induction of diabetes in 200-250g. body weight male Sprague Dawley Rat using a single dose of STZ (40Kg/Kg body weight). *In-vivo* wound healing study was done in animals with 3 different samples; a scaffold made up of PVDE/Collagen/Biomolecule (Treatment), PVDF(Blank), Paraffin gauze (Positive control), and one wound left untreated. In cell viability assay the treatment scaffold shows 102.273%cell viability after 48 hours. Which has a significant role in the stimulation of cell migration and proliferation (71.4%) of L929 Cell line to scratch compared to control. *In-vivo* study in Sprague Dawley Rat shows that a Composite of PVDE, Collagen and Biomolecule promote enhancement in wound closure (100% within 20 days) with less congestion, oedema and inflammation, as well as improved wound angiogenesis, proliferation and epithelialization compared to untreated. It is proved by histopathological parameters. Thus, in our present study, the healing effect of a scaffold made up of PVDF, Collagen and polydopamine

nanoparticles may have occurred due to anti-inflammatory and anti-oxidative properties which in turn reduce the time of wound contraction and lead to a faster wound recovery.

Keywords: *Diabetic mellitus, diabetogenic chemicals, wound healing, scaffolds, PVDF,Collagen, PDPs, electrospinning, tissue engineering*.

Analysing The Efficacy of Sodium Alginate Hydrogel Infused Using Poly Herbal Extract for Modern Wound Care Management

Dr. Nebu George Thomas, Jaitha S Kumar, Dr. Yogesh Bharat Dalvi

ABSTRACT

This study aims to evaluate the effectiveness of sodium alginate hydrogel infused with polyherbal extract for modern wound care management. The wound-healing properties of the polyherbal extract are well established, and the use of hydrogels for wound management is gaining popularity due to their ease of application and superior therapeutic outcomes. The sodium alginate hydrogel provides a moist environment that promotes wound healing, reduces pain, and prevents infections. The polyherbal extract is added to the hydrogel to enhance its healing properties. In this study, the efficacy of the sodium alginate hydrogel infused with the polyherbal extract is analyzed through *in-vivo* experiments. *In-vivo* wound, healing studies proved that sodium alginate incorporated polyherbal extract is an excellent wound healing agent, and wounds get healed completely. The wound treated with sodium alginate contracted to 50% by the 10^{th} day and was completely healed by the 20^{th} day. From the histopathological analysis, it could be seen that the sodium alginate-treated skin tissue exhibited superior features. The images revealed extensive fibrosis in the dermis, higher angiogenesis, and epithelization. This proved that the sodium alginate incorporated has very good wound-healing properties and can be used as potential wound-healing aid.

Keywords: *Diabetes, Wound, Wound healing, Polyherbal extracts*

In-vitro And *In-vivo* Studies of Diabetic Wound Healing By PVDE, Collagen, And Biomolecule

Dr. Nebu George Thomas, Jeffy P Johnson, Dr. Yogesh Bharat Dalvi

ABSTRACT

Wound healing remains a challenging clinical problem, and correct, efficient wound management is essential. Much effort has been focused on wound care with an emphasis on new therapeutic approaches and the development of technologies for acute and chronic wound management. With the available background information in this field, the present study was designed to determine the diabetic wound healing activity of PVDF in combination with collagen and a biomolecule. The *in-vitro* diabetic wound healing studies were carried out I929 mice fibroblast cells during MTT and scratch assays which mimicked the original wound healing processes. Samples showed a two-fold increase in wound closure. *In-vivo* biocompatibility study proved the tissues to be biocompatible, non-inflammatory and angiogenic with the incorporation of prepared biofilms. Excision wound healing was adopted on Sprague Dawley rats to understand the wound contraction effect of the prepared films over a period of 21 days time. The wound treated with PVDE, Collagen and a biomolecule contracted to 50% by 10" day and was completely healed by 20" day, which was much faster when compared to the wounds treated with other samples. H and E stained histological sections of tissues collected after implantation showed extensive fibrosis, angiogenesis and cell proliferation. Thus, in our present study, it could be shown that the above-mentioned materials can be utilized as a promising biomaterial for diabetic wound healing application where spontaneous tissue regeneration is critical.

Keywords: *PVDF, I929 mice fibroblast, H and E stain*

Guided Bone Regeneration of PVDF And PVDF/Nickel Ferrite in Murine Model

Dr. Nebu George Thomas, Jomary George, Dr. Yogesh Bharat Dalvi

ABSTRACT

Bone tissue engineering aims to induce new functional bone regeneration via the synergistic combination of biomaterials, cells and growth factors. The present study aims at the bone regeneration activity of synthetic scaffolds PVDF and PVDF Nickel Ferrite. Polyvinylidene fluoride (PVDF) is a piezoelectric biomaterial with good biocompatibility and moderate mechanical properties that has received a lot of attention in the field of bone repair. The B-PVDF induces undesired structural deformations or microstructural limitations which may hinder specific applications. Alternative composite nanofibers developed have been proven to act as adequate mechanical supports and promote osteoconduction in bone tissue regeneration. Nickel ferrite nanoparticles was a significant one which can be used in a variety of fields, including biomedical applications. The *in-vitro* cell cytotoxicity analysis was performed on mice fibroblast cell lines using MTT assay and the cell proliferation and migration capacity along with cell-cell interaction were analyzed through scratch assay. The *in-vivo* study of bone regeneration is evaluated using calvarial defect on Sprague Dawley rats. Scaffolds PVDF and PVDF Nickel Ferrite are shown to support the proliferation of L929 cells, as shown by the microculture tetrazolium (MTT) assay. It also shows promoted cell migration as shown by scratch assay. The amount of new bone formed in the defects was determined by Cone Beam Computed Tomography (CBCT). The results of the *in-vitro* analysis indicated that the PVDF and PVDF Nickel Ferrite have no evidence of acute inflammatory reactions or cellular necrosis. They are non-toxic at the molecular level suggesting that the PVDF and PVDF Nickel Ferrite are biocompatible and induce bone regeneration by triggering osteoblast cells also PVDF combined with Nickel Ferrite shows enhanced bone regeneration.

Keywords: *PVDF, PVDF Nickel Ferrite, Calvarial defect, CBCT*

Assessment of the Efficacy of Polyherbal Extract-Infused Hydrogels for Diabetic Wound Healing: A Preclinical Investigation

Dr. Nebu George Thomas, Olyvia Thokchom, Dr. Yogesh Bharat Dalvi, Sunita Sable, Bhagyashri Somani, Namitha Vijay, Nikhil Krishnan

ABSTRACT

Wound healing is a complex physiological process and, in this aspect, hydrogels have become increasingly popular for wound dressing due to biocompatibility, moisture control, high water content, and biodegradability. Guar gum, also known as Gauran, is a galactomannan polysaccharide extracted from guar beans. Alginate, on the other hand, is a natural edible polysaccharide found in Phaeophyceae and several bacteria. This study aimed to investigate the properties of Guar gum hydrogels and Sodium alginate hydrogels containing a polyherbal (GLY-01) extract derived from traditional medicine. The Guar gum hydrogels, prepared in different concentrations by cross-linking reaction using Borax solution, were tested for self-healing and injectability. Along with Guar gum hydrogels, the Sodium alginate hydrogels prepared by cross-linking reaction using $ZnCl_2$ solution were used to evaluate their efficacy in wound healing. The hydrogels were assessed for *in-vitro* cytocompatibility with the help of the MTT assay using the L-929 cell line. Results showed that 5% Guar gum with Plant extract (GGPH) and 5% Sodium Alginate with Plant extract (SAPE) have relatively better cell viability. The *in-vivo* study was conducted on Streptozotocin diabetes-induced Sprague Dawley rats under positive control, negative control, blank and test conditions for 20 days. The results of the study showed that the hydrogels were effective in achieving >80% wound closure by the 15th day and 100% wound closure between the 18th and 20th day of treatment, compared to the negative control. The histopathology test with H&E staining revealed that the hydrogels facilitated higher angiogenesis, epithelialization, and hair follicle growth while reducing inflammation. Therefore, it can be concluded that hydrogels loaded with the polyherbal extract have the potential as a biomaterial for acute and chronic diabetic wound healing.

Keywords: *Guar gum, Sodium alginate, polyherbal extract, cross-linking reaction, diabetic wound, MTT assay, histopathology*

In vivo Evaluation of Guar Gum Hydrogel Incorporated Poly-Mushroom Extract for Chronic Wounds in Rats

Sreelekshmi. S, Dr. Yogesh Bharat Dalvi

ABSTRACT

Chronic wounds are widespread. It is estimated that 1 to 2% of the population will experience a chronic wound during their lifetime in both developed and undeveloped countries. The conventional medicines used for the treatment of chronic wounds are laying the open wound, debridement of necrotic tissues, and change of dressings until healthy granulation tissues are formed (medicines are Bacitracin, Neosporin, polysporin) But these possess serious side effects such as severe pain, significant emotional and physical distress, lack of sleep. In this context, we propose polyfungal extracts known for its biological properties such as antitumor, anticancer, antioxidant, antifungal activities that are incorporated with guar gum biopolymer for tissue regeneration. Studies in India have reported higher rates of wound infections from 23% to 38%due to chronic wounds. The conventional medicines used for the treatment of chronic wounds are Bacitracin, Neosporin, and polysporin. Although widely used serious side effects observed are severe pain, nausea, lack of appetite, significant emotional and physical distress, and lack of sleep. In this context, we propose to explore the angiogenic property of poly fungal extracts that are already known for their biological properties such as antitumor, anticancer, antioxidant, and antifungal activities. Guar gum is a biopolymer derived from the seeds of the guar plant. It has been used in a variety of applications, including food, pharmaceuticals, and cosmetics, due to its unique properties such as thickening, stabilizing, and emulsifying. In recent years, guar gum has also been studied for its potential use in tissue regeneration.

Keywords: *Wound healing, Guar gum hydrogel, Poly mushroom extract, Biopolymers*.

Phytotherapeutic Hydrogels for Diabetic Foot Ulcer: *In-vitro* And *In-vivo* Investigation

Dr. Yogesh Bharat Dalvi, Sunita Sable, Bhagyashri Somani

ABSTRACT

Diabetic foot ulcers (DFUs) significantly impact the global diabetic population, with 85% of amputations in diabetics being preceded by DFUs. Additionally, diabetics with neuropathic DFUs have a 45% estimated mortality rate within five years after amputation. India has a high prevalence of diabetes, accounting for 17% of global diabetes patients, and is projected to increase from almost 80 million to 135 million by 2045, according to the Indian Diabetes Association. Although advanced treatment options for DFUs exist, their high cost may be a barrier for middle-class individuals. Hydrogels are being investigated for wound care due to their moisture control, biodegradability, biocompatibility, and biosafety. Therefore, this study aimed to investigate the potential of a Sodium alginate-based hydrogels with polyherbal (JAS-01) plant extract (SAPE) cross-linked with Zinc Chloride and Guar gum-based hydrogel enriched with poly-herbal (JAS-01) extracts cross-linked with Borax for DFU care. The study synthesized a Guar gum-based hydrogel loaded with poly-herbal extracts (GGPH) and tested it for self-healing and injectability at various concentrations. The study followed ISO19033 guidelines to evaluate *in-vitro* cytocompatibility of SAPE and GGPH An *in-vivo* study was conducted on diabetic Sprague Dawley (SD) rats using a chronic wound model to assess wound closure quantitatively through a standard scale and qualitatively through histological analysis, evaluating epithelialization, angiogenesis, inflammation, and hair follicle formation during the healing process. The findings indicate that GGPH at all concentrations exhibited self-adhesive and self-healing properties. The 3% concentration showed better injectability and was selected for further *in-vitro* and *in-vivo* analyses. SAPE and GGPH demonstrated cytocompatibility, with a cell survival rate of up to 95% after 72 hours under the ISO19033 guidelines of MTT assay. In diabetic animals, SAPE along with GGPH achieved complete wound closure within the 15th day of treatment, with histological analysis showing the promotion of epithelialization, angiogenesis, hair follicle formation, and reduced inflammation. In conclusion, the study suggests that GGPH and SAPE have the potential to promote wound healing using cell viability, proliferation, and migration, as well as reduce tissue

damage through their antioxidant and anti-inflammatory properties. Therefore, SAPE and GGPH may serve as promising alternative treatments for DFU.

Keywords: *Diabetic foot ulcers (DFUs), Epithelialization, Angiogenesis Inflammation, JAS-01, SAPE, GGPH, MTT, Guar gum, Sodium Alginate,*

Evaluation Of Anti-Inflammatory Property of Aqueous Ethanolic Poly-Herbal Extract In CFA-Induced Rat Model

Saba Shaji Noushad

ABSTRACT

Inflammation is a crucial immune response that helps the body survives infections and injuries. However, it also contributes to the development of many prevalent diseases, including rheumatoid arthritis, atherosclerosis, and asthma. While steroidal and non-steroidal anti-inflammatory drugs are available, they often come with side effects and high costs and can't be used for a longer duration. Therefore, researchers have turned to natural sources, such as herbs, to find new anti-inflammatory compounds. Poly-herbal formulations are popular worldwide due to their medicinal and therapeutic uses. In this study, Sprague Dawley rats were divided into four groups, and Complete Freund's adjuvant was used to induce inflammation on the tibia tarsal joint of the right hind limb. The negative control group was given saline, and the positive control group received Diclofenac (10mg/kg). Two treatment groups were given different doses (30mg/kg and 15mg/kg) of a poly-herbal extract provided by Yogesh Bharat Dalvi, PRC, Tiruvalla. The anti-inflammatory effect of the extract was compared to the positive control using rat paw oedema measurements, GAIT analysis from days 1-28, and radiological assessment using X-rays on days 1, 14, and 28. Poly herbal extracts administration significantly reduced rat paw swelling, associated symptoms, and joint erosion compared to control groups, as shown by X-ray analysis, while gait analysis score decreased significantly from day 1 to day 25.

Keywords: *anti-inflammatory, poly herbal extract, inflammation.*

Evaluation Of Anti-Urolithiatic Property of Aqueous Ethanolic Poly-Mushroom Extract: An *In-vitro* and *In-vivo* Study

Sana Shaji Noushad

ABSTRACT

Urolithiasis, also known as urinary stones, is a common urological disorder with high prevalence worldwide. Calcium oxalate stones are the most common type of urinary stones, accounting for 70-80% of all cases. Although several treatment options are available, the recurrence rate of urinary stones remains high. Therefore, there is a need to explore natural remedies for the prevention and management of urinary stones. Present study was aimed to rationalize the traditional use of poly-mushroom extract in urolithiasis and to explore its possible underlying mechanism. *In-vitro* crystallization assays were performed to determine the inhibitory effects of poly-mushroom extract against crystal nucleation, aggregation and growth. *In-vivo* urolithiasis model was developed in rats by the administration of 0.75% ethylene glycol in drinking water. The anti-urolithic effects of poly-mushroom were evaluated by analyzing urine analysis and histological parameters. The *in-vitro* results revealed that the poly-mushroom extract has potent antiurolithiatic ability in both nucleation assays (with a maximum inhibition of 55.80 ± 2.01% at 300µg/ml extract concentration), aggregation assay (with a maximum inhibition of 26.52 ± 1.58% at 300µg/ml extract concentration). The *in-vivo* findings reveal superior nucleation and anti-aggregation efficacy in the preventive intervention group, whereas the curative group exhibits crystal aggregation albeit with smooth margins, which do not inflict tissue harm opposite to that of the negative control group. These observations were corroborated by histological evaluation.

Keywords: *Urolithiasis; Calcium oxalate; Poly-mushroom; Ethylene glycol*

Biocompatibility of Synthetic PVDF And Natural Cellulose Nanofiber Scaffold with Nickel Ferrite Nanoparticle Intended for Tissue Engineering

Dr. Nebu George Thomas, Sooraj S Nair, Dr. Yogesh Bharat Dalvi

ABSTRACT

Tissue engineering is an emerging area as a feasible strategy for dealing with its application in biomedical science with biocompatible and biodegradable biomaterials. The purpose of determining a material's biocompatibility is to detect any biological reactions that may cause harm or unintended consequences to the recipient an innovative approach to Polyvinylidene fluoride or polyvinylidene difluoride (PVDF) is a highly non- reactive thermoplastic fluoropolymer produced by the polymerization of vinylidene difluoride. Polyvinylidene fluoride incorporated with different concentrations of PVDF /cellulose nanofiber/nickel ferrite synthetic scaffold is used in the present study. *In-vitro* as well as *in-vivo* biocompatibility evaluations such as cytotoxicity, hemolysis, inflammation, and angiogenesis were evaluated. *In-vitro*, MTT assay analysis on 1.929 cells shows cytotoxicity, cell viability increases above 95%, and cell growth and proliferation. No hemolysis was observed as the hemolysis percentage is less than 1% and RBCs were not aggregated hence the biomaterial is hemocompatible. The *in-vivo* biocompatibility evaluation was with experimental four Sprague Dawley rats followed by histopathological analysis of the harvested biomaterial after the implantation. The formalin-coated hematoxylin & cousin (H&E) stained serial sections of samples which were harvested on 1" week. 2nd week. 3 weeks, and 4 weeks indicate inflammation and angiogenesis. The scaffold has more amount of angiogenesis as an increase in concentrations of PVDF / Cellulose Nanofiber and Nickel Ferrite and the week 4 histopathological results reveal low inflammation and high angiogenesis PVDF / Cellulose Nanofiber and Nickel Ferrite scaffold doesn't alter the morphology of cells but promotes cell attachment, cell growth, and proliferation. This study. demonstrates that scaffold is biocompatible and nontoxic as it promotes tissue regeneration and can offer a potential approach in tissue engineering applications.

Keywords: *Biocompatibility, PVDF / Cellulose Hemocompatibility, Cytotoxicity, Angiogenesis, Nanofiber, Nickel Ferrite*

In-vitro & *In-vivo* Biocompatibility of PVA/PEG Synthetic Scaffold Containing HAp in Murine Model

Dr. Nebu George Thomas, Muhammed Shahinkhan, Dr. Yogesh Bharat Dalvi

ABSTRACT

Tissue engineering (TE) has the potential to replace or enhance biological processes, avoid the need for organ transplantation, and create structurally similar functional scaffolds to those found in native tissues. An innovative approach to Polyvinyl alcohol (PVA) - Polyethylene glycol (PEG) incorporated with different concentrations of Hydroxyapatite (HAp) synthetic scaffolds are used in the present study. *In-vitro* as well as *in-vivo* biocompatibility evaluations such as cytotoxicity, hemolysis, RBC aggregation, inflammation, and angiogenesis were evaluated. *In-vitro* MTT assay analysis on L929 cells shows no cytotoxicity, cell viability increases above 95% as well as improves cell growth and proliferation. No hemolysis was observed as the hemolysis percentage is less than 1% and RBCs were not aggregated hence the biomaterial is hemocompatible. The *in vivo* biocompatibility evaluation was with experimental sixteen Sprague Dawley rats followed by histopathological analysis of the harvested biomaterial after the implantation. The formalin-coated hematoxylin & eosin (H&E) stained serial sections of samples which were harvested on 1st week, 2nd week, 3rd week, and 4th week indicate inflammation and angiogenesis. The scaffold has more amount of angiogenesis as an increase in concentrations of HAp and the week 4 histopathological results reveal low inflammation and high angiogenesis. The PVA/PEG/HAp scaffold doesn't alter the morphology of cells but promotes cell attachment, cell growth, and proliferation. This study demonstrates that scaffold is biocompatible and nontoxic as it promotes tissue regeneration and can offer a potential approach in tissue engineering applications.

Keywords: *Biocompatibility, Polyvinyl alcohol (PVA), Polyethylene glycol (PEG), Hydroxyapatite (HAp), hemocompatibility, cytotoxicity*

CBCT Assisted *In-vivo* Regeneration Potential of Sol- Gel Synthesized 45S5 Bioglass Loaded with Catechin Intended for Periodontal Regeneration

Dr. Nebu George Thomas, Mahima Rachel Soney, Dr. Yogesh Bharat Dalvi

ABSTRACT

The goal of periodontal regenerative techniques is to restore the periodontal tissues and their function. Recent advances in tissue-engineering are based on delivery of cells, proteins, and genes in biodegradable scaffolds. Tissue engineering is an interdisciplinary field which applies the principles of engineering and the life sciences toward the development of biological substitutes that restore, maintain, or improve tissue function. Several types of bone substitutes are commercially available including allograft, xenograft and alloplasts. The objective of the study was to evaluate the *in-vivo* regenerative potential of 45S5 Bioglass loaded with catechin based bone graft implanted in critical-size defects (CSD) created at rat calvaria using cone-beam computed tomography (CBCT). Herein, the regenerative potential of 45S5 Bioglass loaded with catechin was analyzed via the surgical procedure of bone regeneration. Bio-compatibility assessment has been done by *in-vitro* studies. The *in-vivo* biocompatibility and regeneration of 45S5 Bioglass loaded with catechin were evaluated by the guided bone regeneration in Spargue Dawley rats. A critical defect of 6mm is generated and the reconstruction of the cranial defect also analyzed. Cone beam computed tomography (CBCT) had been used for the depiction of the cranial defect site and exhibited an excellent result of the potential of to regenerate. The grayscale value in VGi and the selected region of interest (ROI, in mm) of CSD diameter were calculated. 45S5 Bioglass loaded with catechin is a promising candidate for the future clinical implementation of periodontal regeneration

Keywords: *Periodontal regeneration, 45S5 Bioglass loaded with catechin, CBCT, Critical size defect*

Evaluation Of *In-vivo* Biocompatibility of Cholecystic Extracellular Matrix Based Guided Tissue Regeneration

Dr. Nebu George Thomas, Aswani Raj, Dr. Dr. Yogesh Bharat Dalvi

ABSTRACT

There is intense interest in developing novel biomaterials which support the invasion and proliferation of living cells for potential applications in tissue engineering and regenerative medicine. Tissue engineering or regenerative medicine is a field of development of biomaterials leading to the practice of combining biologically active molecules or growth factors, scaffolds, and cells into functional tissues. Decellularization of existing tissue have formed the basis of one major approach to producing three dimensional scaffolds for such purposes. In this study, we utilize the decellularized porcine C-ECM based GTR membrane as implantable scaffolds for periodontal regeneration. To examine biocompatibility, scaffolds were subcutaneously implanted in wild type, immunocompetent mice. Following the implantation, the scaffold were resected at 1,2,3 and 4 weeks and processed for histological analysis (H&E). Histological analysis revealed a characteristic foreign body response to the scaffold in 1st week post-implantation. However, the immune response was observed to gradually disappear by 4th week post-implantation. By 4th week, there was no immune response in the surrounding dermis tissue and active fibroblast migration within the porcine C-ECM scaffold was observed. This was concomitant with the deposition of a new collagen extracellular matrix.

Furthermore, active blood vessel formation within the scaffold was observed through the period of study indicating the pro-angiogenic properties of scaffolds. Finally, while scaffolds retain much of their original shape, they do undergo a slow deformation over the 4th week length of the body. Taken together, our results demonstrate that porcine C-ECM membrane as scaffold are biocompatible and exhibit promising potential as a surgical biomaterial.

Keywords: *Periodontal regeneration, C-ECM Scaffold, GTR Membrane, Biocompatibility*

In-vivo Biocompatibility Assessment of Cross Linked Carboxy Methyl Cellulose Hydrogel

Dr. Nebu George Thomas, Aswathy S, Dr. Yogesh Bharat Dalvi

ABSTRACT

There is intense interest in developing novel biomaterials which support the invasion and proliferation of living cells for potential application in tissue engineering. Tissue engineering or regenerative medicine is a field of development of biomaterials leading to the practice of combining biologically active molecules or growth factors, scaffolds, and cells into functional tissues. Decellularization of existing tissues have formed the basis of one major approach to producing 3D scaffolds for such purposes. In this study, we utilize the cross linked carboxymethyl cellulose hydrogel as implantable scaffolds. To examine biocompatibility, scaffolds were subcutaneously implanted in wild type immunocompetent rat. Following the implantation, the scaffolds were resected at 1,2,3 and 4 weeks and processed for histological analysis (H & E). Histological analysis revealed a characteristic foreign body response to the scaffold 1-week post implantation. However, the immune response was observed to gradually disappear by 4 weeks post- implantation. By 4 weeks, there was no immune response in the surrounding dermis tissue and active fibroblast migration within the hydrogel scaffold was observed. This was concomitant with the deposition of a new collagen extracellular matrix. Furthermore, active blood vessel formation within the scaffold was observed throughout the period of study indicating the pro-angiogenic properties of scaffolds. Finally, while scaffolds retain much of their original shape they do undergo a slow deformation over the 4-week length of the body. Taken together, our results demonstrate that cross linked carboxymethyl cellulose hydrogel scaffolds are biocompatible and exhibit promising potential as a surgical biomaterial.

***Keywords**: Biocompatibility, 3D scaffolds, cross linked carboxymethyl cellulose hydrogel,*

A Study on The Nutritional Status, Specific Adipocytokine Levels and Oxidative Stress in Children with Autism Spectrum Disorder

Dr. Nebu George Thomas, Anu Saju, Dr. Sherin Jacob

ABSTRACT

Autism spectrum disorder (ASD) is a neurodevelopmental disorder resulting in pervasive abnormalities in social interaction and communication, repetitive behaviors, and restricted interests. Although the precise mechanism underlying the pathophysiology of autism remains to be determined. Calcium and iron are important minerals of biological system. Hypocalcemia and iron deficiency has been found to be associated with abnormal metabolic functions resulting in autistic spectrum disorder. Oxidative stress-induced mechanisms are believed to be the major cause for ASD. Adipokines are cytokines secreted mainly by adipose tissue and may have systemic effects in ASD. A significant change was observed in the levels of serum iron, calcium, vitamin D, MDA, and adipokines in the plasma of autistic children as compared to control group. This observational type of analytical study with case-control design was conducted in the Department of biochemistry Pushpagiri Institute of Medical Science and Research Center, Pathanamthitta, Tiruvalla. For this study, children aged 3-10 years were randomly selected, among which 25 were apparently healthy and 25 were diagnosed as ASD. 3 ml venous blood was collected from both groups for analysis level of serum vitamin D, calcium and iron, MDA, adipokines. The mean serum vitamin D, adiponectin, and iron were significantly lower in cases as compared to controls. Whereas there is significant increase in level of Lepin and MDA for ASD children when compared to control groups. The autism group had many statistically significant differences in their nutritional and metabolic status, including biomarkers indicative of vitamin insufficiency, increased oxidative stress, reduced capacity for energy transport. Several of the biomarker groups were significantly associated with variations in the severity of autism. These nutritional and metabolic differences are generally in agreement with other published results and are likely amenable to nutritional supplementation. Research investigating treatment and its relationship to the co-morbidities and etiology of autism is warranted.

Keywords: *Autism spectrum disorder, MDA, Vitamin D, Iron, Calcium, Adipocytokines*

Oxidative Stress and Its Correlation with Serum Levels of Iron and Specific Adipocytokines (Adiponectin and Leptin) In Hypothyroid and Hyperthyroid Patients

Dr. Nebu George Thomas, Joseph Thomas, Dr. Sherin Jacob

ABSTRACT

Department of Biochemistry & Microbiology, St Berchmans College, Changanassery affiliated to Mahatma Gandhi University, Thyroid disorders like hypothyroidism and hyperthyroidism are associated with higher rates of lipid peroxidation that leads to oxidative stress. Adipocytes (fat tissue) produce adiponectin and leptin hormones in large amounts. Altered adiponectin levels have been linked to the development of thyroid dysfunction. A sufficient quantity of leptin signalling is also required for appropriate Thyroid Stimulating Hormone function. Iron deficiency are linked to thyroid dysfunction in previous studies. No studies have done on the correlation of an oxidative stress marker with iron levels and adipocytokine levels in thyroid patients. Hence, we, aimed to study the levels of MDA (Malondialdehyde) and its correlation with the levels of Iron, Adiponectin and Leptin in patients with hypothyroidism and hyperthyroidism. The study found that serum MDA level, is significantly increased in both hypothyroidism ($p<0.01$) and hyperthyroidism ($p<0.01$) when compared to control group. Iron level and leptin level was significantly decreased in both hypothyroidism ($p<0.05$) and hyperthyroidism ($p<0.05$). Adiponectin level was significantly decreased in hypothyroidism ($p<0.05$) and increased in hyperthyroidism ($p<0.05$). The study also found that there was a significant correlation between the MDA level and iron, adiponectin and leptin levels in hypothyroid and hyperthyroid patients. Hence, the study concludes that the oxidative stress generated during hypothyroidism and hyperthyroidism is associated with development of an anaemic condition which is manifested as a decreased iron level in the circulation and could also cause an altered specific adipocytokine levels which adversely affects various metabolic process regulated by these proteins in thyroid patients.

Seroprevalence of Rubella IgG in Pregnant Women – A Preliminary Study Among Antenatal Cases in A Tertiary Care Hospital

Dr. Nebu George Thomas, Mary J Anto

ABSTRACT

Rubella is a mild self-limiting vaccine preventable viral disease. It is an infection caused by the rubella virus. Rubella infection in early pregnancy can lead to miscarriages, fetal death, or birth of an infant with congenital rubella syndrome (CRS). The aim of this study was to determine the prevalence of rubella virus specific antibodies among pregnant women. Blood sample was from 88 pregnant women attending the tertiary care centre of OBG from April-June 2022 and serum was separated. They were tested for Rubella IgG antibody using Enzyme-Linked Immunosorbent Assay (ELISA) kits. Of the 88 pregnant women screened for IgG to rubella virus, 69 were seropositive giving seroprevalence of 78.41% and 21.59% were seronegative and thus susceptible to rubella infection. This shows that rubella virus is endemic among pregnant women; therefore, there is need for rubella vaccination to reduce the burden of the disease.

Keywords: *Rubella virus, pregnant women, Congenital Rubella Syndrome (CRS), antibodies, seroprevalence, ELISA, rubella containing vaccine*

Qualitative Analysis of Protective Immunity Against Measles Virus Among Pregnant Women to Understand the Need of Supplemental Immunization

Dr. Nebu George Thomas, Soorya P R

ABSTRACT

Measles or Rubeola is an acute, viral, infectious disease caused by Measles virus. This RNA virus infectious disease mainly seen in children. Although it is a self-limiting disease, it becomes severe in undernourished and immune-compromised individuals. It is transmitted through respiratory droplets or by transplacental infection of the fetus during pregnancy. Measles in pregnancy leads to an increased risk of spontaneous abortion, premature labour, intrauterine foetal death, stillbirth, maternal death. Subacute sclerosing panencephalitis (SSPE), otitis media are another

complication. The aim of this study to perform a qualitative analysis of protective immunity among pregnant women against Measles virus infection. A descriptive study was carried out in 88 pregnant women attending tertiary care centre from April-June 2022. Blood samples were taken from each pregnant women attending ANC of OBG. From the collected blood, serum is separated and were tested for IgG Measles antibody using Enzyme-Linked Immunosorbent Assay (ELISA) kit. This study gathered 88 participants. Out of this, 48.87% cases showed protective immunity against measles and 51.13% cases does not show protective immunity against measles. It indicates that 41.17% have protective immunity upto 24 years of age, 45.90% between 25-34 years of age and 80% above 35 years of age. It shows that measles is a vaccine preventable disease. Proper immunization will reduce complications in antenatal cases.

Keywords: *Measles virus, pregnant women, Subacute panencephalitis (SSPE), ELISA, vaccination for measles.*

Guided Bone Regeneration of PVDF And PVDF Nickel Ferrite

Dr. Nebu George Thomas, Josna K, Dr. Yogesh Bharat Dalvi

ABSTRACT

Poly (vinylidene fluoride) (PVDF) membranes have been extensively applied to scientific research and industrial process due to their outstanding properties such as high thermal stability, good chemical resistance, and membrane-forming properties. Guided bone regeneration is presumed to be achieved when the osteoprogenitor cells are exclusively allowed to repopulate the bone defect site by preventing the entry of non-osteogenic tissues. The application of a membrane to exclude non-osteogenic tissues from interfering with bone regeneration is a key principle of GBR. To provide adequate conditions for the regeneration of damaged bone, it is necessary to develop piezoelectric porous membranes with antioxidant and anti-inflammatory activities. In this study, poly(vinylidene fluoride) (PVDF) and PVDF Nickel Ferrite were used. The *in-vitro* bone regeneration studies were carried out on L929 mice fibroblast cells during MTT and Scratch assays which mimicked the original bone regeneration. *In-vivo* study proved the tissues to be biocompatible, and non-inflammatory with the incorporation of the given material. The bone

regeneration model was adopted on Sprague Dawley rats over a period of 8 weeks. Thus, in our present study, it could be shown that PVDF Nickel Ferrite can be utilized far better than PVDF as a promising material where spontaneous tissue and bone regeneration was possible.

Keywords: *Guided Bone Regeneration, PVDF, PVDF Nickel Ferrite*

Biocompatibility- Bioglass /Collagen-Chitosan

Dr. Nebu George Thomas, Dr. Amal Sugunan, Dr. Yogesh Bharat Dalvi

ABSTRACT

This invitro study aimed to fabricate and analyze a novel Chitosan-fish collagen- bioactive glass-catechin composite membrane and compared it with the commercially available membrane for analysis of its biocompatibility, cytotoxicity and degradation rate to be used in guided tissue regeneration procedures. The advantages of using this absorbable substance include encouraging wound healing through clot stabilisation, wound stability, and haemostasis; improving primary wound covering by attracting fibroblasts; and augmenting flap thickness by providing a membranous scaffold. Overall, the findings showed that Chitosan-fish collagen -catechin-bioactive glass composite membrane could be a viable alternative to commercially available membrane in the field of Guided tissue regeneration. However, more research is needed to confirm the findings and determine the clinical use potential of this composite biomaterial.

Biocompatibility- Chitosan/FSHA

Dr. Nebu George Thomas, Dr. Alenya, Dr. Yogesh Bharat Dalvi

ABSTRACT

The present work proposes a combination of chitosan-based membrane loaded with bioactive bioglass and zinc oxide nanoparticles in order to produce a novel guided tissue regeneration membrane, fabricated by freeze dried lyophilization technique. The introduction of 45S5 bioactive bioglass into chitosan membrane makes the membrane more bioactive and increases the stiffness of the membrane. They show evidence of regenerative potential by the formation of

hydroxylcarbonate apatite layer on the surface of the glass. They also promoted cell metabolic activity and mineralization. The incorporation of zinc oxide nanoparticles into chitosan membrane enhanced porosity, tensile modulus and cytocompatibility of chitosan membrane. They also exhibit excellent antibacterial properties.

Biocompatibility- Chitosan/ Bioglass

Dr. Nebu George Thomas, Dr. Maymol, Dr. Yogesh Bharat Dalvi

ABSTRACT

Guided bone regeneration [GBR] is considered one of the methods most commonly involved for reconstruction of alveolar bone and for treating peri implant bone deficiencies and involves membrane placement in a bony defect to exclude non - osteogenic tissues from interfering with bone regeneration. Chitosan loaded with fish derived hydroxyapatite and TiO_2 nanoparticles could potentially be used as a guided bone regeneration membrane with the possibility to induce bone regeneration. Titanium dioxide [TiO_2] nanoparticles addition to chitosan scaffold improved bone regeneration capability, biomineralization and sponge robustness of the scaffold16.Fish derived hydroxyapatite incorporation into chitosan membrane resulted in osteoconductive and bioactive properties, also it was nontoxic, non-inflammatory and non-immunogenic and biocompatible.

In-vitro Biocompatibility Assessment of Chitosan Hydrogel Loaded with Fish Scale Derived Hydroxyapatite Intended for Periodontal Regeneration

Dr. Nebu George Thomas, Dr. Bincy U, Dr. Yogesh Bharat Dalvi

ABSTRACT

This study is intended to fabricate, characterize and to assess the *in-vitro* biocompatibility of chitosan hydrogel loaded with fish scale derived hydroxyapatite intended for periodontal regeneration. For this, first chitosan hydrogel will be prepared and then divided into three groups. First group will have chitosan hydrogel alone. Into the second group synthetic hydroxyapatite will be added and to the third group hydroxyapatite derived from fish scales will be added. Scanning Electron Microscopy (SEM) will be employed to examine the morphological characterization of

all the three groups of hydrogels. The Cytotoxic [MTT] assay to assess their biocompatibility will be checked on L929 cell lines. To determine their effects on fibroblast migration, an *in-vitro* cell migration assay (scratch assay) will be performed using L929 cells. The *in-vitro* assays with MG63 osteoblast cell lines reveal that fish scale derived HAp materials is non-toxic and bioactive. HAp derived from fish scale are more bioactive compared to commercially available synthetic HAp. Fish derived hydroxyapatite has a superior ability to induce apatite formation. Hydroxyapatite crystals derived from fish scales is apparently safer as there has been no unpropitious reports on the safety issues of fish derived products.

In-vitro Biocompatibility Assessment of Demineralized Fish Bone Intended for Periodontal Regeneration

Dr. Nebu George Thomas, Dr. Meenu, Dr. Yogesh Bharat Dalvi

ABSTRACT

The present work proposes the introduction of demineralized fish bone derived bone scaffold for periodontal regeneration. Marine biomaterials like collagen, alginates and chitosan have been employed for a wide variety of applications in dentistry. Studies have shown that they can also enhance viability of human periodontal ligament stem cells and up regulated the expression of osteogenic markers thus aiding in alveolar bone regeneration. Another principal agents for dental application is marine derived collagen and chitosan due to its excellent biocompatibility, bioactivity and antimicrobial properties. So the aim is to fabricate and assess biocompatibility (in terms of cytotoxicity and cell proliferation) of demineralized fish bone which could potentially be used as a scaffold with the possibility to induce tissue regeneration.

Preclinical Analysis of Fish Scale Derived Hydroxyapatite Intended for Bone Regeneration

Dr. Nebu George Thomas, Dr. Chinchu, Dr. Yogesh Bharat Dalvi

ABSTRACT

This study is the preclinical analysis of fish scale derived hydroxyapatite intended for bone regeneration. Alveolar bone resorption jeopardizes the structural, functional and esthetic outcomes of treatment. For achieving good long-term prognosis from bone loss, a sufficient volume of bone must exist. Fish derived hydroxyapatite has a superior ability to induce apatite formation. Hydroxyapatite crystals derived from fish scales is apparently safer as there has been no unpropitious reports on the safety issues of fish derived products. The fish scale derived hydroxyl apatite are in the form of flat-plate nano crystal and have a porous morphology, large surface area and higher surface roughness which lead to increase in cell adhesion and proliferation when compared to synthetic HAp crystals.15 Fish scale derived hydroxyapatite has a superior ability to induce apatite formation.

Application of Marine Based Hydroxyapatite Inperiodontal Regeneration

Dr. Nebu George Thomas, Dr. Sruthy Prathap, Dr. Yogesh Bharat Dalvi

ABSTRACT

Hydroxyapatite is a type of calcium phosphate with a chemical formula of $Ca_{10}(PO_4)_6(OH)_2$ Many studies reported the advantages of hydroxyapatite especially in stimulating bone healing, and claimed that it has been used in orthopaedics as bone void fillers, dental surgery, orthopaedic and dental implant coating, traumatology, spine and maxillofacial. Fish scale is rich in collagen type 1 and hydroxyapatite resembling bone structure. It is readily available, cost effective and can compensate for the limitations of grafting methods such as unavailability, zoonotic disease transmission and high cost. Hydroxyapatite biomaterial was successfully synthesised from fish scale through chemical precipitation method. *In-vivo* studies of fish scale derived hydroxyapatite shows no significant toxic effects. Certainly, the process of transforming fish into HA is an environmentally friprocess and stands as a good chance for reducing costs of treatment in bone

repair or replacement with little impact into the environment. It was proved to be non-cytotoxic and non-haemolytic in the screening test. There was no acute systemic toxicity. There was no intracutaneous erythemic or oedematous reactivity and no hypersensitivity observed in the present study.

Fabrication And *In-vitro* Biocompatibility Evaluation of Porcine Cholecystic Extracellular Matrix Based Guided Tissue Regeneration Membrane

Dr. Nebu George Thomas, Dr. Betcy, Dr. Yogesh Bharat Dalvi

ABSTRACT

The periodontium is a functional unit that is composed of gingiva, periodontal ligament, cementum and alveolar bone. Periodontitis is an inflammatory condition that leads to progressive destruction of periodontal tissues, affecting the tooth leading to loss of periodontal attachment and supporting bone. The conventional treatment modalities result in repair of the attachment apparatus but the ultimate goal of periodontal therapy is regeneration and restoration of tooth's supporting apparatus. Although conventional periodontal treatment (scaling & amp; root planning, flap surgery) improve clinical outcomes. Hemostatic function leads to early wound stabilization solubility in physiological conditions which results in difficult clinical manipulation, post operative infections and early rupture at the defect site guided tissue regeneration applications for regenerative periodontal procedure. Collagen materials have been utilized in medicine and dentistry because of their proven biocompatibility and capability of promoting wound healing. Collagen based membranes have some beneficiary properties such as hemostasis, weak immunogenicity and ability to augment tissue thickness. Drawbacks are risks of disease transmission, lower mechanical strength and rapid resorption. Unfortunately, this membrane in India has been crippled of very high cost. Therefore, we decided to develop a low cost GTR membrane affordable to the patients. The present work proposes to develop decellularized porcine cholecystic extracellular matrix (CECM) based GTR membrane for periodontal regeneration. Shown to have excellent regenerative potential for graft assisted healing and tissue remodeling of skin wounds, subcutis, skeletal muscle and in animal models. It contains collagen (type I), sulphated glycosaminoglycans, elastin, and many growth factors such as basic FGF, VEGF and TGFß with superior regenerative

potential. So our aim is to fabricate porcine CECM based GTR membrane and to compare *in-vitro* biocompatibility (in terms of cytotoxicity and cell proliferation) ISO 10993-5:200911, commercially available GTR membrane to induce periodontal regeneration.

In-vitro Biocompatibility Assessment of Chitosan Hydrogel Loaded With 45S5 BG Intended for Periodontal Regeneration

Dr. Nebu George Thomas, Dr. Vimal Thomas Oomen, Dr. Yogesh Bharat Dalvi

ABSTRACT

Periodontitis is defined as “an inflammatory disease of the supporting tissues of the teeth caused by specific microorganism or group of specific microorganisms resulting in progressive destruction of the periodontal ligament and alveolar bone, with pocket formation, recession or both. Periodontal regeneration is defined as reproduction or reconstruction of a lost or injured part in such a way that the architecture and function of the lost or injured tissues are completely restored. Regenerative procedures include root biomodification, guided tissue regeneration and bone grafts. Bone replacement grafts are widely used to promote new bone formation and periodontal regeneration in periodontal therapy. A wide range of bone grafting materials and bone graft substitutes have been applied and clinically evaluated including autogenous bone grafts, allografts, xenogenic bone grafts, synthetic or alloplastic bone grafts and composite grafts. Autogenous bone grafts are considered as the gold standard bone replacement graft as they possess most of the properties of an ideal graft material. A major concern with bovine-derived xenografts are the potential transmission of zoonotic diseases and prion infections such as bovine spongiform encephalitis (BSE). 5 Marine biomaterials like collagen, alginates and chitosan have been employed for a wide variety of applications in dentistry. Chitosan is obtained by partial deacetylation of insoluble naturally available chitin, obtained from exoskeletons of crustaceans, fungi, and insects. chitosan based bone grafts have excellent biocompatibility, osteoconductive, osteoinductive, solubility, biodegradability and antimicrobial and antifungal properties. Hydrogels are three-dimensional network systems composed of two or more components of polymer chains. As they are highly hydrated 3D network of polymers, they can provide chemical and mechanical signals and also an environment for cell to adhere, proliferate, and differentiate thus, they are

suitable for cell delivery and tissue development goals. Chitosan based hydrogels are potentially engineering scaffolds to obtain tissue repair achievements. They are used as delivery systems for the controlled release of therapeutic ingredients. It is also used as a hemostatic agent to promote the process of wound healing. They possess more advantages on biodegradability behavior, cytocompatability and adhesive force which can be used as an effective biopharmaceutical material to promote bone regeneration. Bioglass 45S5 bonds with bone rapidly and also stimulates bone growth away from the bone–implant interface. The mechanism for bone bonding is attributed to a hydroxycarbonate apatite (HCA) layer on the surface of the glass, following initial glass dissolution HCA is similar to bone mineral and is thought to interact with collagen fibrils to integrate (bond) with the host bone. The osteogenic properties (often termed osteoinduction) of the glass are thought to be due to the dissolution products of the glass, i.e., soluble silica and calcium ions, that stimulate osteogenic cells to produce bone matrix. So, our aim is to fabricate and assess biocompatibility of chitosan hydrogel loaded with sol-gel synthesized bioglass (45S5BG) intended for periodontal regeneration.

Comparative Assessment of Salivary Cystatin C Levels in Healthy and Stage III/IV Periodontitis Patients

Dr. Nebu George Thomas, Dr. Kavya S, Dr. Yogesh Bharat Dalvi

ABSTRACT

Periodontitis is an infectious disease of the supporting tissues of teeth caused by specific microorganisms or groups, characterized by progressive clinical attachment loss and alveolar bone loss, eventually leading to tooth loss. The complex interplay between pathogenic bacteria colonizing oral biofilms and the host's immune inflammatory mechanisms is responsible for the tissue destruction in periodontal diseases. The local microbial attack is warded off by the activation of host immune system and release of inflammatory mediators. This response is detrimental to the host because of its ability to destroy the surrounding cells and connective tissue structures. Several conventional methods have been followed over the years to assess severity of the disease and identification of probable individuals, who could be at a risk of periodontal breakdown in future.

More recently, genetic analysis has been in spotlight of the present-day research, but the high levels of specificity, sensitivity, complexity and high cost depicts its limitations. Thus, the identification of patients at a risk of active disease represents challenge to both clinical investigator as well as the clinician. Presently, saliva is one such area of research which holds tremendous value in diagnostic medicine. Saliva is the defender of oral cavity and is of supreme importance in the maintenance of health and integrity of oral tissues. It can be easily and non-invasively collected. It contains an array of locally and systemically derived, physically active and functionally versatile markers of periodontal disease and hence it offers the basis for patient specific diagnostic tests for periodontitis. Various endogenous proteinase inhibitors such as histatin, mucins, lactoferrin, lysozyme and the inhibitors of cysteine proteinases like cystatins are widely distributed in human saliva as well as several body fluids . The human cystatin gene family contains 14 genes (including two pseudogenes) from which seven cystatins are present in saliva [namely cystatin-A, cystatin-B, cystatin-C, cystatin D, cystatin-S, cystatin-SA and cystatin-SN. The highest concentration of cystatins was found in the submandibular saliva, but (at a much lower concentration) they are also present in the parotid saliva. Cystatins are also present in the gingival crevicular fluid. Cystatins are cysteine protease inhibitors that block the action of endogenous, bacterial and parasitic protozoan proteases. Cystatin-C and cystatin-S were shown to inhibit bacterial growth *P. gingivalis*. Cystatins also exert direct immunomodulatory properties. They are also likely to exert certain antiviral effect. In light of above data, this study is designed to gain insight into the contribution of actual levels of salivary cystatin C in periodontal health and in periodontitis patients. There are numerous studies that supports the diagnostic potential of GCF in assessing cystatin C but this study highlights the diagnostic potential of saliva in cystatin C identification as well as in periodontal disease. Considering the ease and simplicity as well as the patient acceptance of salivary diagnostics, measuring cystatin C in the saliva may provide an earlier diagnosis and advanced interventions in stage III/IV periodontitis patients.

Comparative Assessment of Bone Regenerative Potential of Fish Scale Derived Hydroxyapatite Loaded with Simvastatin and Fish Scale Derived Hydroxyapatite - An *In-vitro* Study

Dr. Nebu George Thomas, Dr. Lekshmi. M, Dr. Yogesh Bharat Dalvi

ABSTRACT

Periodontal regeneration is defined as production or reconstruction of a lost or injured part in such a way that the architecture and function of lost or injured tissues are completely restored.1 Successful regenerative periodontal procedures will result in regeneration of cementum, periodontal ligament and alveolar bone. Some regenerative approaches, such as guided tissue regeneration (GTR) and bone grafts, were developed to achieve periodontal tissue formation. However, clinical outcomes of those approaches are variable and unpredictable. Natural hydroxyapatite is preferred to synthetic hydroxyapatite because the former has better metabolic activity and preserves the chemical composition and structure of the precursor material. Among all the pharmacological compounds, simvastatin has been well investigated since the 90s for its osteo-promotive properties. Simvastatin belongs to the family of statins which are structural analogs of HMG-CoA (3-hydroxy-3-methylglutaryl-coenzyme A). Simvastatin could stimulate bone regeneration and promote bone formation. The mechanism simvastatin-mediated bone regeneration could be attributed to its osteoblast promoting, anti-inflammatory, osteoclast inhibiting, and neovascularization properties. The present study is to fabricate and assess cytocompatibility; mineralization and bio functionality of fish scale derived natural hydroxyapatite loaded with simvastatin to induce bone regeneration.

The Comparative Evaluation of Biocompatibility in Synthetic and Fish Scale Derived Hydroxyapatite Coated Titanium Implant -An *In-vitro* Study

Dr. Nebu George Thomas, Dr. Merin Basil, Dr. Yogesh Bharat Dalvi

ABSTRACT

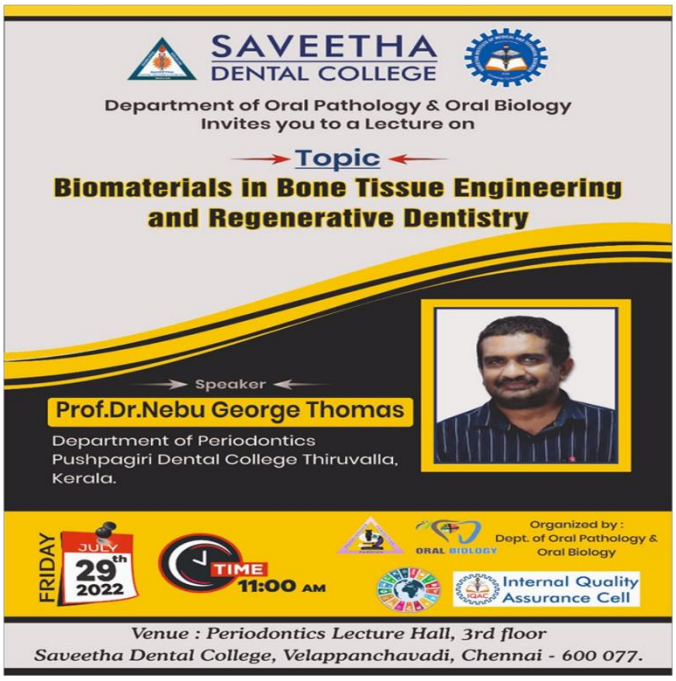
Natural or synthetic hydroxyapatite (HA) [$Ca_{10}((PO)_4)_6(OH)_2$], has been frequently used as implant materials for orthopaedic and dental applications, showing excellent bioactivity, adequate mechanical rigidity and structure, osteoconductivity and angiogenic properties, no toxicity, and absence of inflammatory or antigenic reactions. Natural or synthetic HAs have been frequently used as a material for bone tissue engineering mainly due to their close composition similarity with natural bone.1 Synthetic HA is stoichiometric and basically composed of calcium and phosphorus, with a Ca/P molar ratio of 1.67, and it has been reported to be most effective in promoting bone regeneration. On the other hand, natural HA is non-stoichiometric due to the presence of trace elements such as Ba, Si, F, Zn, Mg, K, Na, and CO_3, which makes it similar in chemical composition to human bone. HA extracted from fish scales using the calcination method has a Ca/P ratio in the range of 1.62–1.71, which is close to the stoichiometric synthetic HA Ca/P ratio of 1.67, and contains trace elements such as Na, Sr, Mg, and K. The presence of these trace elements in natural HA mimics the apatite produced by human bone and plays a vital role in the regeneration of bone, as well as accelerating the process of bone formation. 3 It is well known that, bone tissue binds directly to HA through a carbonated calcium deficient apatite layer at the bone-implant interface, inducing the deposition of newly formed bone after implantation. It has been demonstrated that HA surface supports osteoblastic cell adhesion, growth, and differentiation, and newly formed HA is deposited by the creeping substitution from the adjacent living bone. One of the advantages of HA is that its microstructure can be controlled to promote the formation of pores that allow the migration of blood vessels and bone tissue into the material. 1 Several mechanical and chemical treatments have been used to modify the surface morphology and properties of titanium dental implants. One possible method of improving dental implant biocompatibility is to increase surface roughness and decrease the contact angle.

GALLERY

Trivandrum NIIST visit

PRC Faculties with Dr. Ashok Pandey

Conference of Dr. Yogesh B Dalvi



Presentation of Dr. Nebu George Thomas

Dr. Nandhakumar & Dr Elna Paul visit in PRC

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PCDS-Research Presentation

PRC Website Meeting

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