



No 9

Centre for Biomedical and Biomaterials Research

University of Mauritius

Newsletter

December 2021

A decade of contribution to the community

December 2011 - 2021



Funders, Collaborators & Networks over the decade

Foreword

On the 15th December 2011, we were relocated from UoM campus to the nearby MSIRI premises in a building rented by UoM. This marked the beginning of our new adventure, deploying CBBR.

Ten years ago, the vision was to establish a structure where PhDs and PostDocs could be trained, Research & Innovation could thrive and Industry linkages established. All imbued with a culture of service to the community. Our first five years were dedicated to establishing state-of-the-art labs, networks and recruiting PhDs, this was followed by a second five-year period which saw consolidation of networks across the scientific community, industry and the civil society.

CBBR has now reached its third five-year developmental period where collaborative projects

with Industry and the Society will be at the forefront. We have had many challenges during these 10 years, but challenging situations led to transformational experiences. CBBR showed resilience, with a flexible ability to bounce back and turn challenges into opportunities.

In 2022, we will be relocated on campus in re-designed labs to allow us to project CBBR ten years forward. We are all looking forward to this new challenge with the support and trust of our Industry collaborators and the UoM community.

Archana Bhaw-Luximon

Contents

- Core Technology update
- Industry Perspectives
- Awards and recognition
- Publication and community outreach
- Team

Core Technology – UPDATE



Nanotechnology applications: Biomaterials Engineering & Nanomedicine



Biomaterials

Land Resources (Sugarcane, Aloe vera): **Cellulose, Lignin, Polysucrose, Acemannan, PHAs**

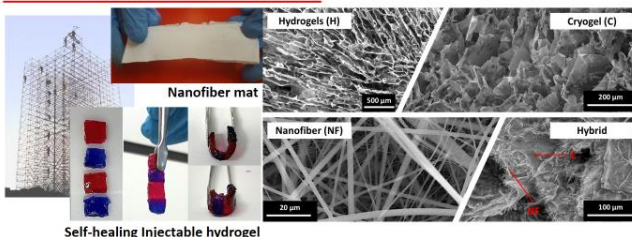
Marine Resources (Seaweeds, crab shell): **Carrageenan, Fucoidan, Chitosan**

Bombyx Mori (Silk cocoon): **Silk fibroin**

Small natural molecules (land and marine-based): **Thymol, Curcumin, Jaspamide, Ginkgo**

Nanoparticles: **Nanosilica from bagasse ash, Silver nanoparticles**

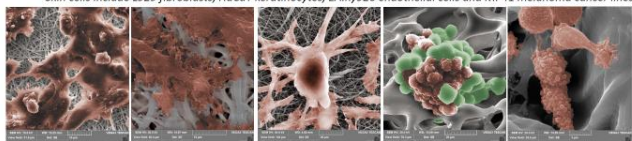
Tissue Engineering Scaffolds



Self-healing injectable hydrogel

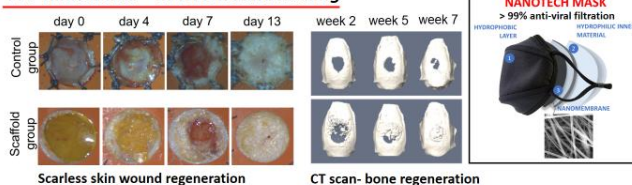
Cell culture in Lab – *In vitro* cell studies

Skin cells include L929 fibroblasts, HaCaT keratinocytes, EA.hy926 endothelial cells and MP41 melanoma cancer lines.

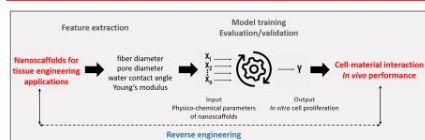


L929, co-culture L929 and EA.hy926 and L929/HaCaT on mat Co-culture L929/MP41 on hydrogels

Pre-clinical trial – *In vivo* wound healing



Predictive modelling Scaffold Performance using AI



1st UoM Clinical Trial In collaboration with MoHW

Vacuum Assisted Closure (VAC) - negative pressure wound therapy



Dr AG Jeetoo & Souillac Hospitals

Contact: a.luximon@uom.ac.mu



In 2017-2018, nanofiber and hydrogel scaffolds for wound healing had completed *in vivo* biocompatibility studies in collaboration with CYROI, La Réunion. This allowed us to fine tune our scaffolds.

In 2019-2020, a selection of scaffolds were assessed for wound healing in Wistar rat models under EU pre-clinical license. Accelerated and scarless skin wound healing were observed. In parallel, we started multiple cell culture on the scaffolds to study processes such as angiogenesis, cell migration, inflammation, extra cellular matrix formation, cell-cell interactions.

2021, marked a new step for scaffolds with bone regeneration experiments with a few selected scaffolds. Mechanical properties play a key role in this process. One particular scaffold, injectable hydrogel X revealed very promising results in CT scans of the skull wound model with wound closure after 7 weeks.

More experiments are planned for 2022 which will include cell encapsulation technology and tendon-ligament regeneration.

We acquired in April 2021 a semi-industrial pilotline Nanospinner for upscaling of nanofiber production.

**Biomaterials, Drug Delivery and
Nanotechnology Unit, CBBR**

Industry Perspectives

RT Knits Ltd and CBBR – Landmark Research Collaborative Agreement, preparing the future

In a patriotic spirit, RT Knits started its collaboration with CBBR back in May 2020 in a mutual quest to develop a scientifically researched face mask to help the country at a period during which it was battling against the pandemic, the more so that there was a shortage of face masks. Since then, research in other areas of interest to both parties have been carried out with promising results.

Following this fruitful partnership, RT Knits and CBBR under the aegis of the University of Mauritius signed a Research Collaboration Agreement (RCA) in October 2021 to conduct research over a period of 5 years in the areas of technical, functional and medical textile. This agreement is a first of its kind in Mauritius in terms of an industrial-academic research partnership over the long haul.

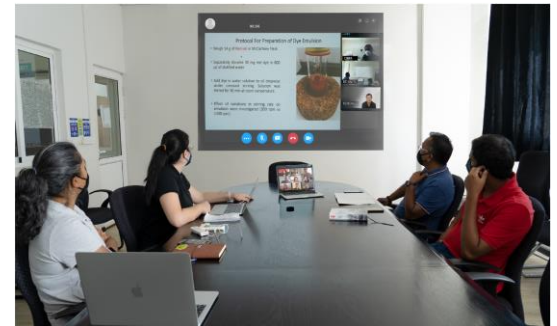
The textile industry in Mauritius does not invest enough in long-term Research and Development (R&D) to develop innovative products that will differentiate the industry from international competition especially from large producing countries characterized by low cost labour. This RCA is a key investment which is a prerequisite for the long-term competitiveness and growth of the company. Even though R&D does not guarantee the development of significant successful innovations, it helps in solving other technical bottlenecks in other projects of the company.

At RT Knits, we are proud of this collaboration with CBBR, and we believe that this RCA will accelerate the rate at which we innovate to create unique competitive advantages in the future.

Kendall Tang, *CEO RT Knits Ltd*



CBBR & RT Knits Ltd at UoM Innovation Week 2021



RT Knits - CBBR weekly R & D meeting involving engineers, researchers & marketing unit



Value added products from pomegranate wastes with anti-diabetic potential

Type II diabetes is increasingly prevalent but also fundamentally preventable. The hyperglycemic condition induces the formation of advanced glycation end products (AGEs) that bind to their receptors on cells to promote oxidative stress as well as inflammation, two major drivers of the disease manifestation. Pomegranate mesocarp, a major waste from pomegranate fruit juice production is normally discarded due to its astringent taste. Nevertheless its richness in biomolecules makes it interesting to target disrupted metabolic pathways in diabetes. Our latest publication in the Journal of American College of Nutrition published in October 2021 highlights the protective potential of the mesocarp against AGEs-induced oxidative stress and inflammation in a diabetes-like cell model. The mesocarp, a polyphenolic antioxidant rich functional food, suppressed AGEs formation. At cellular level, the mesocarp inhibited the deleterious effects of AGEs by decreasing the expression of the AGEs receptor, by counteracting the increase in biomarkers of oxidative stress and inflammation as well as by increasing the antioxidant defence system. These scientific evidences raise some hope that need to be clinically validated. This further encourages new market opportunities by promoting the development of the waste by-product into new products. This can subsequently entail social, economic and environmental benefits.



Pomegranate fruit Pomegranate mesocarp Mesocarp extract

- *Piteesha Ramlagan participated at the 1st International Symposium of the International Union of Food Science and Technology (IUFoST) Early Career Scientist Section, Food Innovations for Sustainable Development Goals (SDGs), which was held virtually on 15-16 September 2021. She presented a 5-minute research pitch entitled “Pomegranate Mesocarp: A Novel Potent Therapeutic Against Diabetes” at the Young Scientists Research Pitch Competition, highlighting the practical relevance of her research in addressing relevant SDGs.*

Award of PhD 2021, Main Supervisors: Theeshan Bahorun and Vidushi Neergheen

Tatsha Bholah - An investigation of the role of cytoglobin in carcinogenesis

Piteesha Ramlagan - Antioxidant effects of functional foods on cellular and physiological disorders associated with diabetes

Nawraj Rummun - An investigation of the anti-proliferative mechanisms of selected Mauritian endemic plants and their bioactive fractions in cancer cell line models

Vidushi Neergheen, Biopharmaceuticals Unit

Regional Nanotech Network

African Materials Research Society (AMRS) and United Nations Economic Commission for Africa (UNECA) – Nanotechnology Bootcamp

AMRS in collaboration with UNECA organized a Nanotechnology Research and Innovation Bootcamp in August 2021. It was aimed at undergraduate students, graduate students and postdocs with an interest in using nanotechnology for the development of Africa. A total of 100 participants from the five regions of Africa were selected from whom five participants were selected for mentoring at an institution of a world expert in nanotechnology. CBBR participated with a keynote lecture and in the jury panel.

Talks and discussions were held by world renowned experts in Nanotechnology in Agriculture, Health, Energy and Water. Some highlights were Dr Jason White, Nanotechnology for Agriculture at the Connecticut Agricultural Experiment Station, Prof Xiumei Mo, Electrospun nanofibers for biomedical applications, Prof Sushanta Mitra & Dr Oleg Stukalov, Waterloo Institute for Nanotechnology (WIN): Sustainable Innovation Ecosystem and Prof Paul Weiss, Nanotechnology approaches to Biology and Medicine, UCLA.

Analytical Services

Services through High-end Analytical Facilities – Tools Filling the Gap in Industry portfolio

- **Labscale and Pilot Line Invenso electrospinning machines**
Nanofibers, electrospinning, coating
- **Tescan Scanning Transmission Electron Microscope/EDX**
Imaging and sizing of structures, Composition of materials
- **Universal Instron Mechanical tester – compression and stretching** Mechanical properties of devices, materials, PPE etc
- **Netzsch Thermal analyzers**
Thermal properties & purity of materials
- **Brookhaven Particle Size analyzer**
Determination of size of particles
- **Kruss Drop Shape Analyzer**
Hydrophilicity/hydrophobicity of surfaces
- **Diener Plasma System**
Surface modification, sterilization
- **Fully equipped Bio Lab for in vitro testing**
Fluorescence microscope, Ultra low freezer, Low temperature Centrifuge, CO₂ and CO₂/N₂ incubators, Microplate reader, Autoclave, Nitrogen tanks, Cell lines, Biosafety Level 2 hoods, Tissue lyser
- **Equipped Chemistry Lab**
- **Access to Local & International partner Labs**
- **Access to expert network**



Awards and Recognition



Dr Nowsheen Goonoo was awarded the Inaugural Rising Star Africa Prize 2021, established in memory of Paul O'Brien FRS, by the Royal Society for her work on the development of nanoengineered seaweed-based scaffolds for the treatment of diabetic foot ulcers. She will receive a medal, a grant of £14,000 to support her research and a personal gift of £1,000.



Dr Itisha Chummun is the winner of the Study UK Alumni Award 2021 Mauritius under the Social Impact Category. The Study UK Alumni Award celebrates the outstanding achievement of alumni who have used their experience of studying at a UK university to make a positive contribution to their communities, professions and countries. Dr Chummun is an Alumni of Queen Mary University, London for her Master's degree and did her PhD at CBBR. She benefitted from professional development training sessions (Gemstone- Amplifying your impact; Meta-NLP Practitioner course) by the British Council Mauritius.



Ms Lakshmi Sujeeun, MPhil/PhD in the area of machine learning algorithms was awarded the CBBR best oral presentation at UoM Virtual Research Week 2021.

Prof Archana Bhaw-Luximon has been nominated by the President of the German Chemical Society, the Chair of the Editorial Board, and the Executive Committee of the journal as International Advisory Board member of *Angewandte Chemie* (IF 15) for a three-year term, 2022-2024.

Highlight Recent Publications

- ***Biomaterials, Drug Delivery & Nanotechnology (BDDN) Unit***

Piezoelectric core-shell PHBV-PDX blend scaffolds for reduced superficial wound contraction and scarless tissue regeneration, *Biomaterials Science*, 2021, DOI: 10.1039/D1BM00379H

Assessing mechanism of actions of natural molecules/extracts for phase-directed wound healing in hydrogel scaffolds, *RSC Medicinal Chemistry*, 2021, DOI: 10.1039/D1MD00100K

- ***Biopharmaceuticals Unit***

P. Ramlagan, M. Y. Issa, P. Rondeau, E. Bourdon, T. Bahorun, M. A. Farag V. S. Neergheen. Metabolite profiling of antioxidant rich fractions of *Punica granatum* L. mesocarp and CD36 expression regulation. *Journal of the American College of Nutrition*, 2021, <https://doi.org/10.1080/07315724.2021.1978349>

Highlights Community Outreach and Talks



Workshop Organization



Joint CBBR-WADDP Half-Day Webinar
Hosted by UNECA/AMRS



Nanotechnology in Health in the Southern African Region Partnerships and Possibilities

Wednesday 21st April 2021 08:00-11:00 WAT; 09:00 -12:00 CAT; 10:00 -13:00 EAT



Assoc. Prof. A. Bhaw-Luximon
Head, CBBR,
University of
Mauritius



Prof. Y. Choonara
Chair and Director
of WADDP,
University of
Witwatersrand,
South Africa



Dr. I. Chummun
Postdoc, CBBR,
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Dr. N. Goonoo
L'Oreal-UNESCO
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Mauritius



Assoc. Prof. P. Kumar
WADDP, University
of Witwatersrand,
South Africa



Assoc. Prof. L. DuToit
WADDP, University
of Witwatersrand,
South Africa



Dr. F. Gimié
Veterinarian, GIP
CYROI, La Réunion,
France

LEISHMACURE Workshop

30 October 2021, BDDN Unit

Leishmacure is a joint project funded by the German Federal Ministry of Education & Research, between Mauritius, Germany, Ghana and Kenya aiming at using scaffolds for cutaneous leishmaniasis wound healing. Phase 1: 60 000 Euros



Community Outreach

- **Consultative Workshop on 'Plastic-Free Mauritius: Defining the Roadmap', Ministry of Environment, Solid Waste Management & Climate Change, 18-19 October 2021**
Prof Archana Bhaw-Luximon
Materials Engineering: rPET and Biomaterials
Dr Nowsheen Goonoo
Eco labels for single use plastics
- **Inspiring the next generation of scientists by sharing research insights, hurdles and challenges of a Mauritian scientist with the African Woman Leaders Club at Le Bocage International School on 31 May 2021**
Dr Vidushi Neergheen
- **UoM Doctoral School 29 March 2021**
Prof Archana Bhaw-Luximon
What are the challenges and opportunities of the next generation UoM PhDs and PostDocs?
Dr Nowsheen Goonoo
Surviving the turbulent waters of earning a doctoral degree
- **Contributed in mounting the UNECA generic BSc and MSc curriculum in Materials Science and Nanotechnology for African Universities – Prof Archana Bhaw-Luximon**

Conference Highlights

- **International congress of "Apollonia" University of Iasi, 1-3 March 2021**
Dr Nowsheen Goonoo
Bioelectric-responsive biomaterials for scarless wound repair
- **Science, Technology and Innovation in the Global South: Focus on Small Island Developing States at the International Science Council Second Global Forum of Funders-Virtual Meeting. 26-28 April 2021, Keynote**
Dr Vidushi Neergheen
- **UNECA Nanotechnology Research and Innovation Bootcamp, 10-13 August 2021, Keynote and jury member**
Prof Archana Bhaw-Luximon
Nanotechnology in Health at UoM
- **Asian Polymer Association BioForum, IIT Delhi, India, 27-28 August 2021, Invited Talk**
Prof Archana Bhaw-Luximon
Advanced functional nanobiomaterials derived from natural resources for biomedical and peripherals applications

Researchers

Biomaterials, Drug Delivery and Nanotechnology (BDDN) Unit

Prof Archana Bhaw-Luximon (Head CBBR)

Dr Nowsheen Goonoo (Federal Ministry of Education and Research, Germany, Research Fellow)

Dr Itisha Chummun (PostDoctoral Fellow, French Embassy & RT Knits Ltd funded)

Mr Devesh Bekah (BSc, MSc Univ of Toronto & Ryerson Univ, RA, UNECA funded)

Ms Koushanee Madub (HEC funded PhD and Fellowship)

Dr Abha Jodheea-Jutton (Medical Doctor, HEC funded MPhil/PhD)

Mr Avin Ramanjooloo (MSc UoM, MPhil/PhD HEC Fellowship)

Mr Akash Nundloll (MChem Manchester Univ, MPhil/PhD HEC Fellowship)

Ms Lakshmi Sujeeun (MSc Univ of La Reunion, MPhil/PhD HEC Fellowship)

Ms Laetitia Huet (MSc Monash Univ, MPhil/PhD, RT Knits Ltd Funded)

CYROI, La Réunion, Pre-Clinical Trials Team

Dr Fanny Gimié (Veterinary and President Ethics Committee, La Réunion)

Dr Colette Cordonin (Biochemist)

Mr Imade Ait Arsa (Biochemist engineer)

Industry Collaborators

Mr Kendall Tang, CEO RT Knits Ltd – Innovation in Textiles

Mr Yannis Fayd'Herbe, MD, MCFI Ltd – Chemicals Industry

Biopharmaceuticals Unit

Dr Vidushi Neergheen

Dr Tatsha Bholah (RA)

Mrs Chahidat Soudjay Mohammed (MPhil/PhD)

Ms Annaelle Hip Kam, Ms Bhoomika Dowaraka-Persad, Ms Warda Jaumbocus (MPhil/PhD)

Acknowledgements

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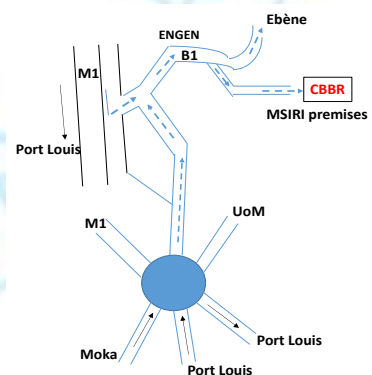


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