Bioengineering and Biotechnology

A True Interdisciplinary Team

Presented by

Dr. Rakesh Kumar Sinha
Professor & Head
Department of Bioengineering and Biotechnology
Birla Institute of Technology, Mesra

Department of Bioengineering and Biotechnology

Background:

The Department of Biotechnology was established in 2002 with financial support from the Department of Agriculture, Government of Jharkhand, with objectives like providing education and training facilities, carrying out application oriented research, developing in-house technologies and promoting consultancy services in various areas of Biotechnology.

Along with the various organizational restructuring, the Biomedical Instrumentation center was merged with the Department and it's name was changed to Bio-Engineering in May, 2013.

Recently in view of larger acceptability and considering its major academic as well as research base, the department name is now changed to ***Department of Bioengineering and Biotechnology***.

Vision & Mission

- **Vision**
  - The Department of Bioengineering and Biotechnology has a vision to impart international standard quality education in the field of Bioscience, Biotechnology and Bioengineering.
- **Mission**
  - To create state-of-the-art infrastructure for Research and Training in Biotechnology and Bioengineering.
  - To provide globally acceptable technical education in Bioscience, Biotechnology and Bioengineering.
  - To nurture graduates for innovation and creativity in the field of Bioscience, Biotechnology and Bioengineering having ethical and social concern.
  - To promote collaboration with Academia, Industries and Research Organizations at National and International level.
  - To contribute to socio-economic development through education and bioentrepreneurship.

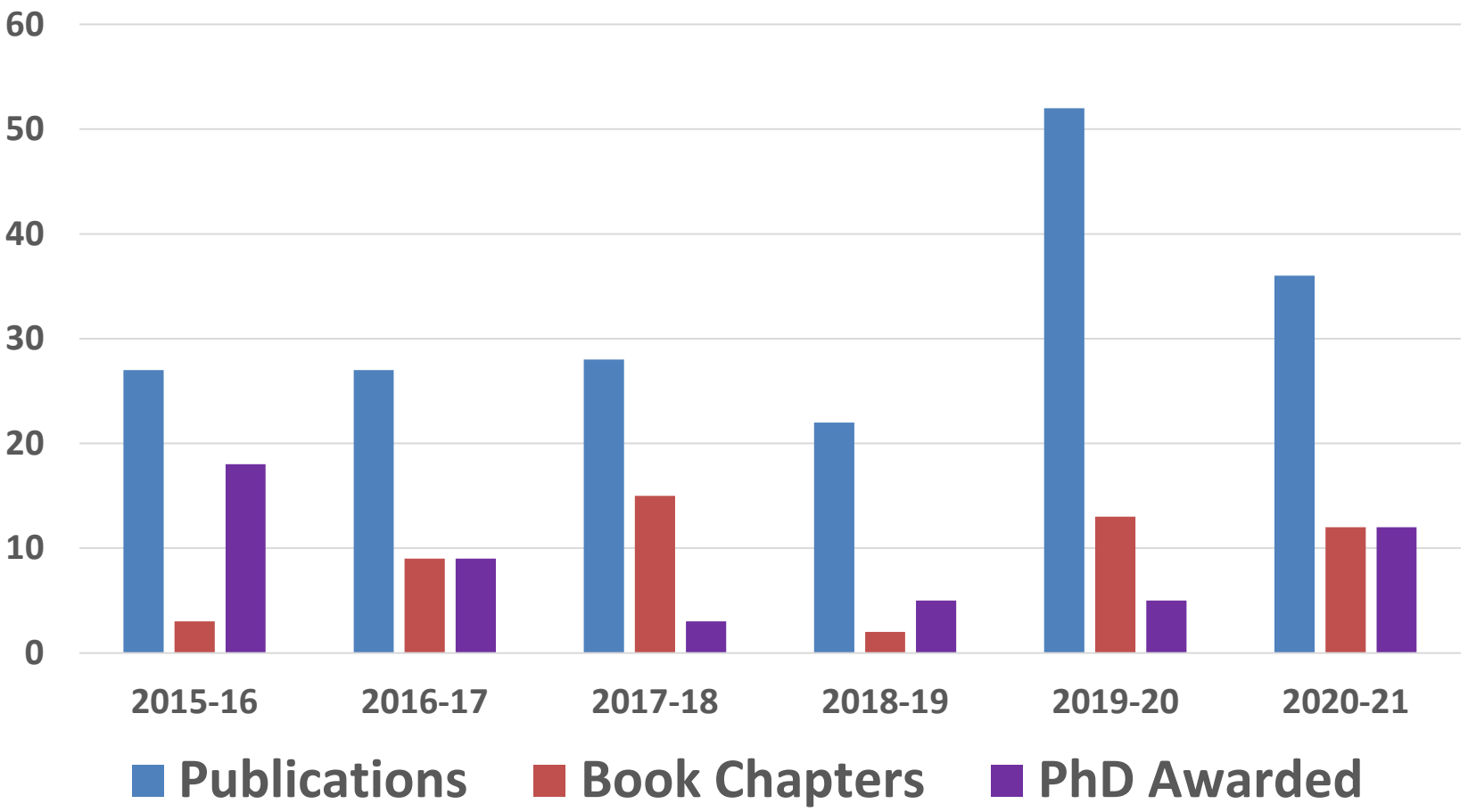
Courses Offered

B.Tech. Biotechnology (60 seats)
M.Tech. Biotechnology (18 seats)
M.Sc. Biotechnology (30 seats)
Ph.D. Biotechnology and Bioengineering

Alumni of the Department are working worldwide in the premier Biotechnology organizations and Universities.

Weblink:https://www.bitmesra.ac.in/Visit_Department_Page?cid=1&deptid=51&pid=450

Research Progress in Last Five Years



7 PhD theses are under evaluation

Research Projects

Ongoing

S.N.	Funding agencies	Research grant (Lakhs)	Duration
1	DBT	235	2019-2026
2	AICTE	18	2020-2023
3	ICMR	82	2020-2023
4	DST	51	2019-2022

- Total 33 research projects are completed: **Total grant more than 1200 Lakhs**

Technical Programs

- Conferences 6
- Workshops 4
- FDP 2
- Webinar 2

- Department is organizing International Symposium on Plant Biotechnology (ISPB-2021) from October 27th-30th, 2021.

Research Students

- Currently 57 PhD students are working.

- Total 84 students awarded the PhD degree since the inception of the department.

BEBT Family

New faculty Induction

Dr. Alok Jain

Joined as a Ramalingaswami Fellow on 02/07/2020
Joined as Assistant Professor on 23/08/2021

Dr. Rajnish Prakash Singh

Joined as a Ramalingaswami Fellow on 01/07/2021

Alok Jain, Ph.D.

Assistant Professor and Ramalingaswami Fellow (Bioengineering and Biotechnology), BIT-Mesra

26 publications ; H index 8 ; i_{10} index 8 ; Citations 435

Research Interest

- ❑ In-silico Drug Design: Hit to lead discovery
- ❑ Computer aided biomaterial design
- ❑ Protein structure-function relationship

Fellowships & Awards

- ❑ GATE-2003; AIR-49
- ❑ CSIR-SRF in 2008
- ❑ Biophysical Society-USA in 2010
- ❑ Travel awards from CSIR, INSA, DST

Research Grants and Personal Support

- ❑ Computing grant: IIT Delhi-2020 (equivalent to ₹ **7,60,320/-**)
- ❑ DBT Ramalingaswami fellowship 2019 **(₹ 1,13,50,000/-)**
- ❑ Computing grants: Germany-2015 **(3.5 million core hours)**

Education and Experiences

- ❑ B.E. (Chemical Eng.) : Pt. R. S. S. University, Raipur, India
- ❑ Ph.D. : Indian Institute of Technology Kanpur, India
- ❑ Postdoc : Max Planck Institute of Polymer Research, Germany
- ❑ Postdoc : University of Konstanz, Germany
- ❑ Assistant Professor: NIPER-Ahmedabad

Rajnish Prakash Singh, Ph.D.

Ramalingaswami Fellow (Bioengineering and Biotechnology), BIT-Mesra

Name:	**Dr. Rajnish Prakash Singh**
Designation:	Ramalingaswami Fellow
Joining Date:	01.07.2021
Highest Degree:	Ph.D. in Microbial Molecular Biology
Ph.D. Awarding Institute:	BITS Pilani, Pilani Campus, Rajasthan

Area of Research :

- Microbiology
- Probiotics

Area of Teaching Interest :

- Molecular Biology
- Genetic Engineering

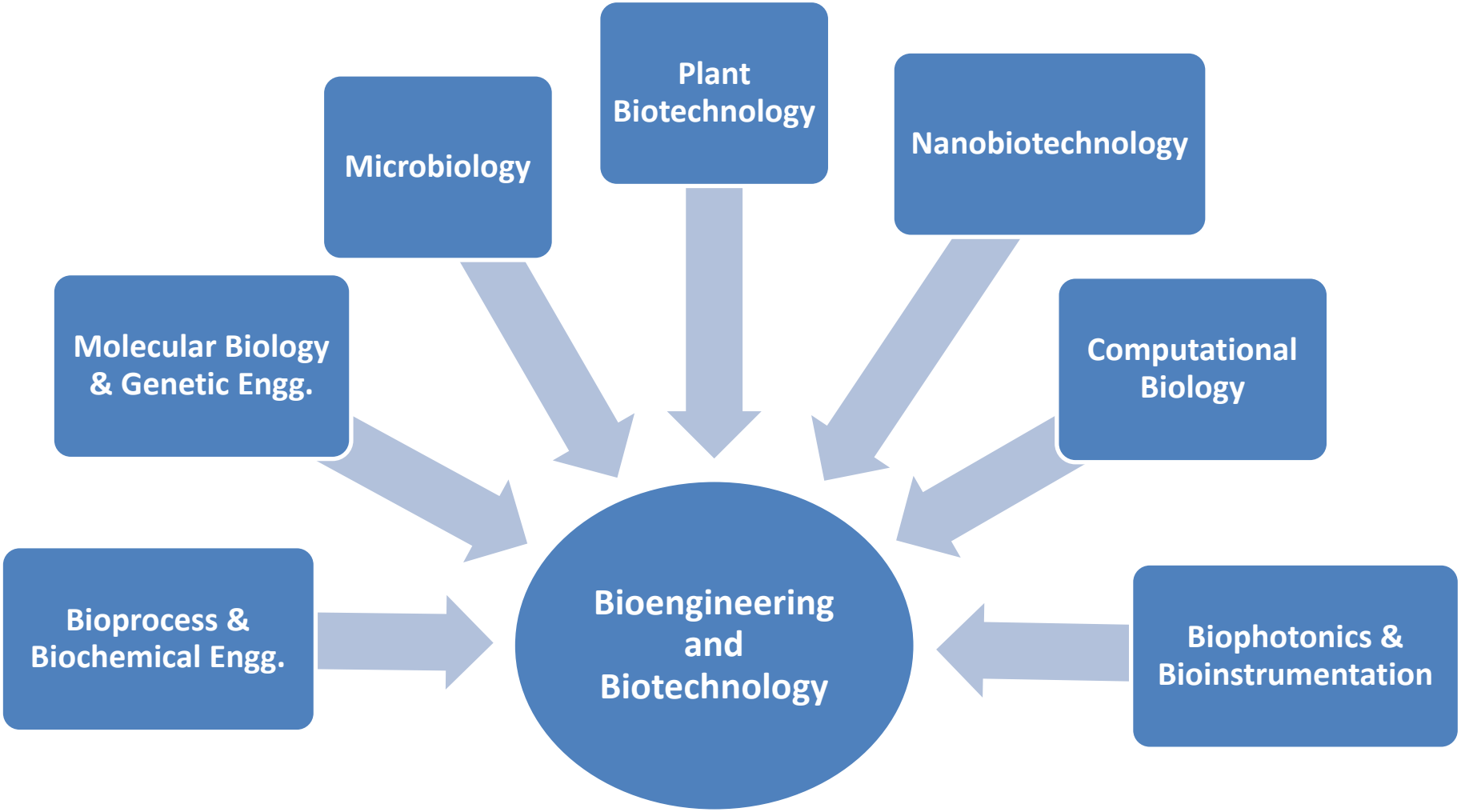
Publications:

- Journals: 35
- Conferences: 17
- Book Chapters: 01
- Books: Nil
- Patents: 1
- Ph.D. Guidance: Nil

- Funded Projects: 01 (DBT-Ongoing)

Total Impact factor >100 (as per Thomas Rheuters)

Major Domains



Bioprocess and Biochemical Engineering

Dr. Padmini Padmanabhan

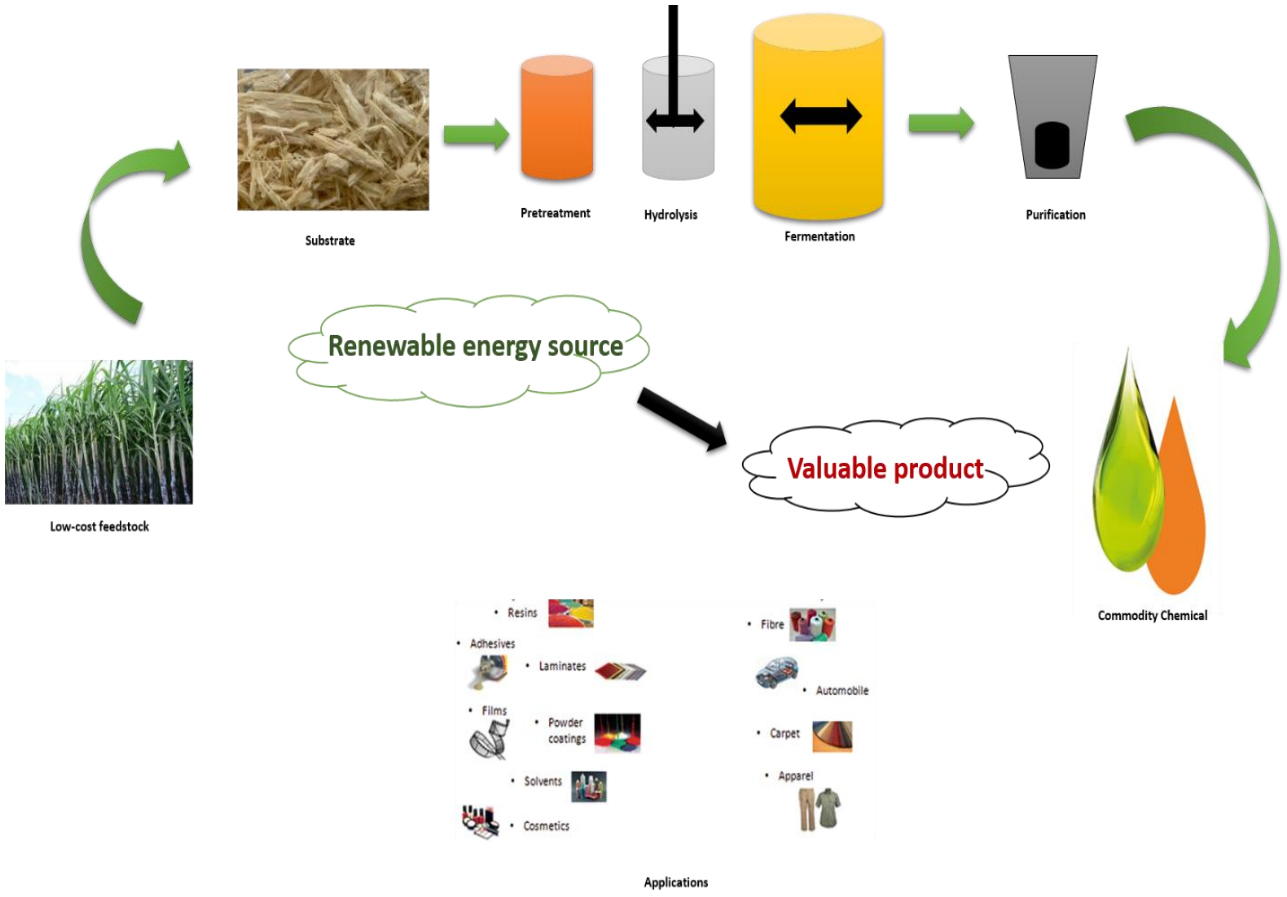
Dr. Ramesh Chandra

Dr. Vinod Kumar Nigam

Dr. S. Muthu Kumar

Dr. Soham Chattopadhyay

Dr. Padmini Padmanabhan



Value addition of waste product: Renewable energy and other products

Dr. Ramesh Chandra

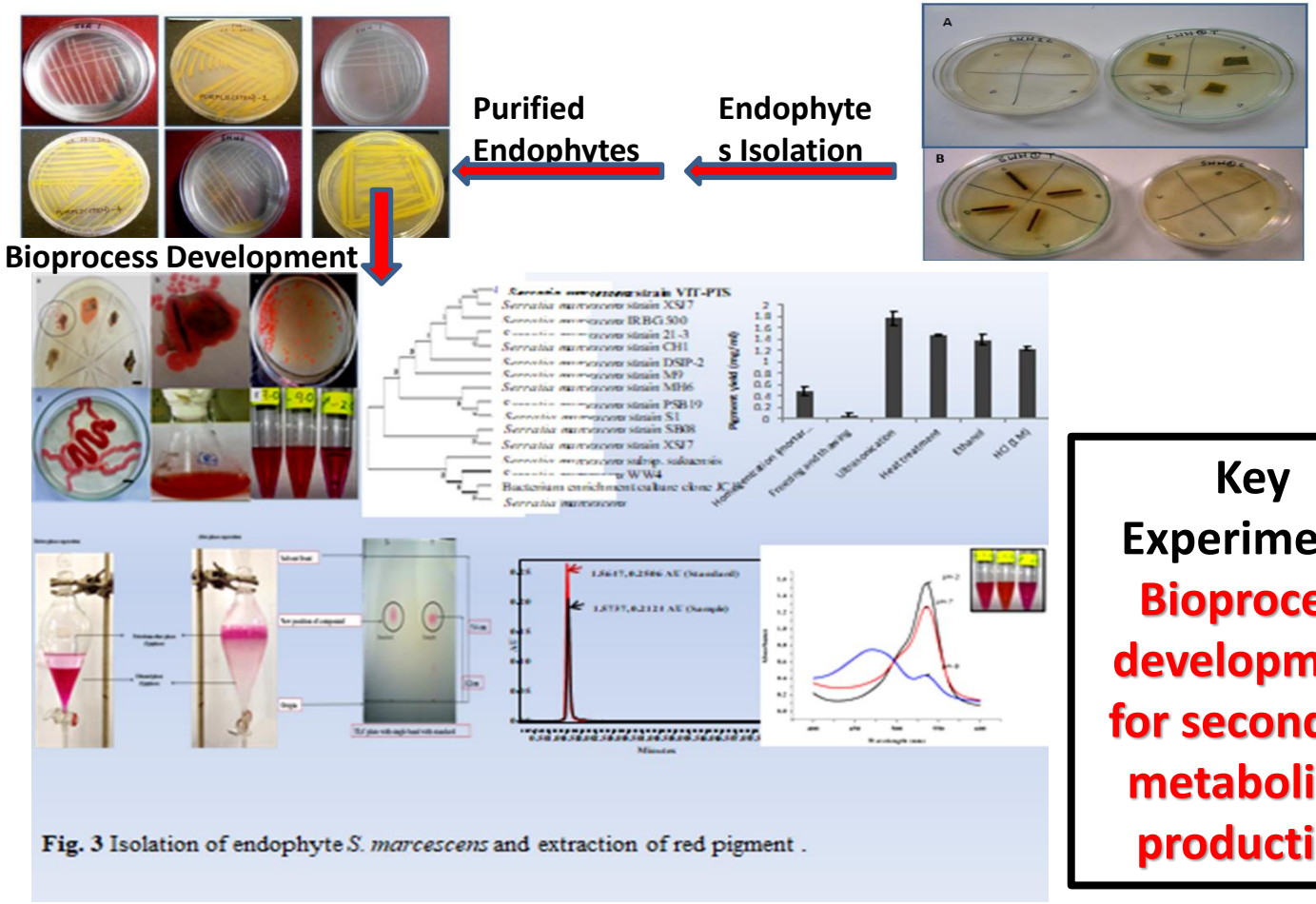
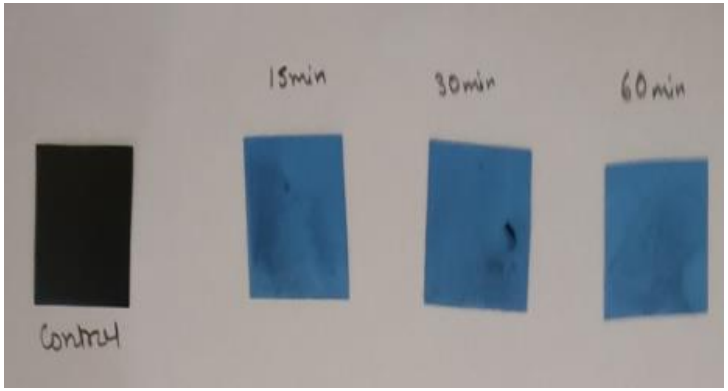


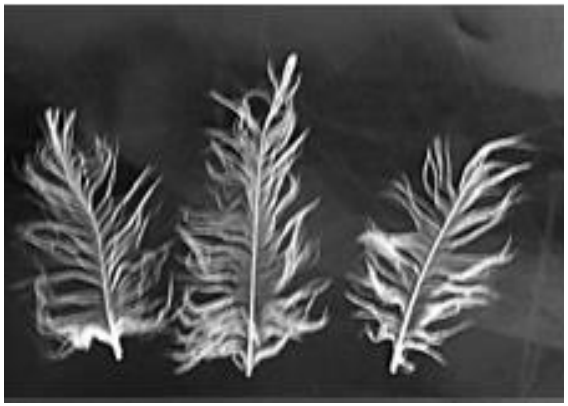
Fig. 3 Isolation of endophyte *S. marcescens* and extraction of red pigment .

Key Experiments

Bioprocess development for secondary metabolites production

Dr. Vinod Kumar Nigam





Applications of Halophilic bacteria in removal of silver and degradation of keratin

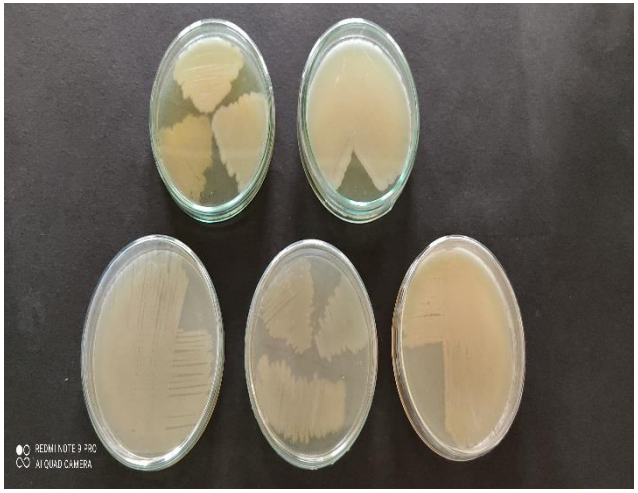
XYLANASE

CELLULASE

AMYLASE

Bioprospecting for thermozymes

Dr. S. Muthu Kumar

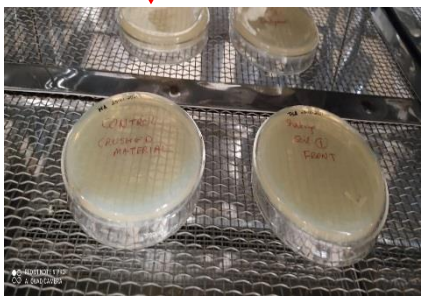


Microbial production of small molecules and its purification

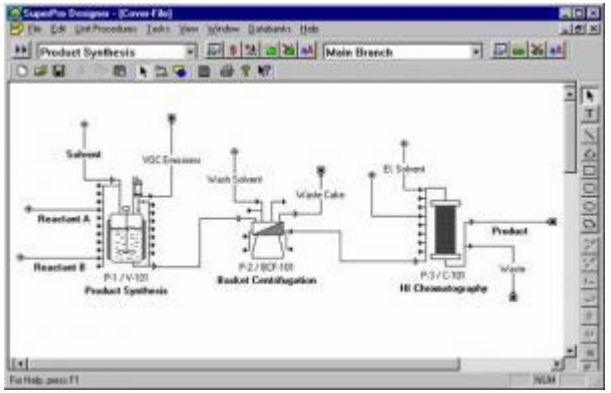
Scale up

Key Experiments

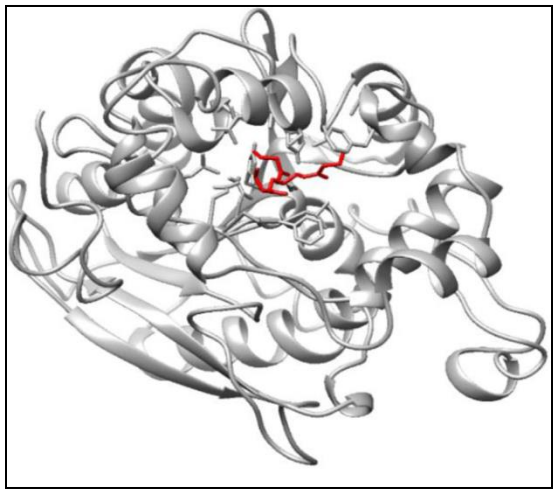
Process optimization and Development



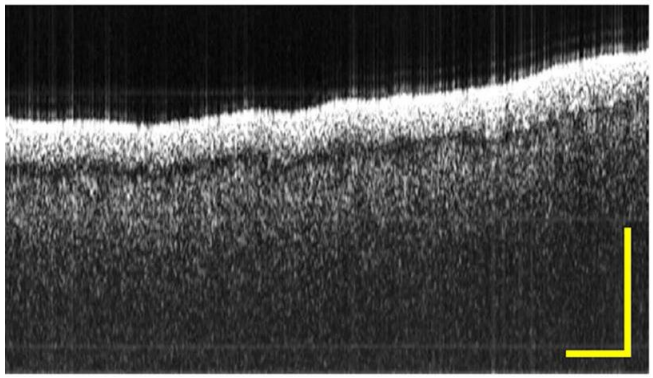
Computer aided simulation



Dr. Soham Chattopadhyay



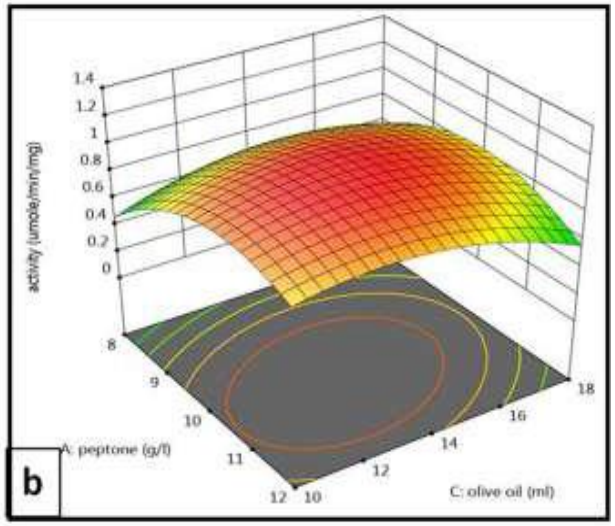
Molecular interaction analysis



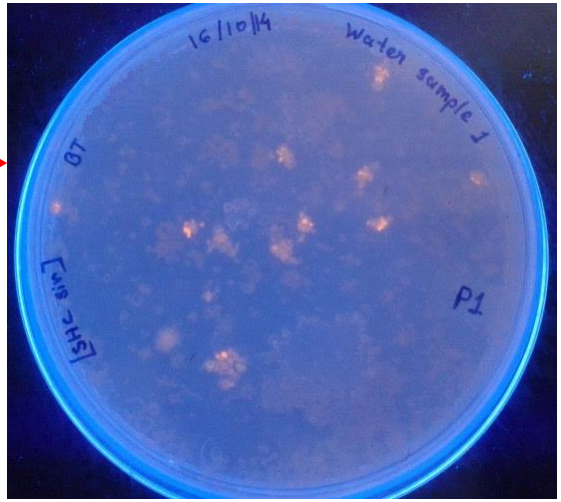
OCT images (B-scan) of lipase immobilization kinetics study

Key Experiments

Parameter optimization using RSM for Enzyme production



Isolation and Characterization of Enzyme producing microbes



Molecular Biology and Genetic Engineering

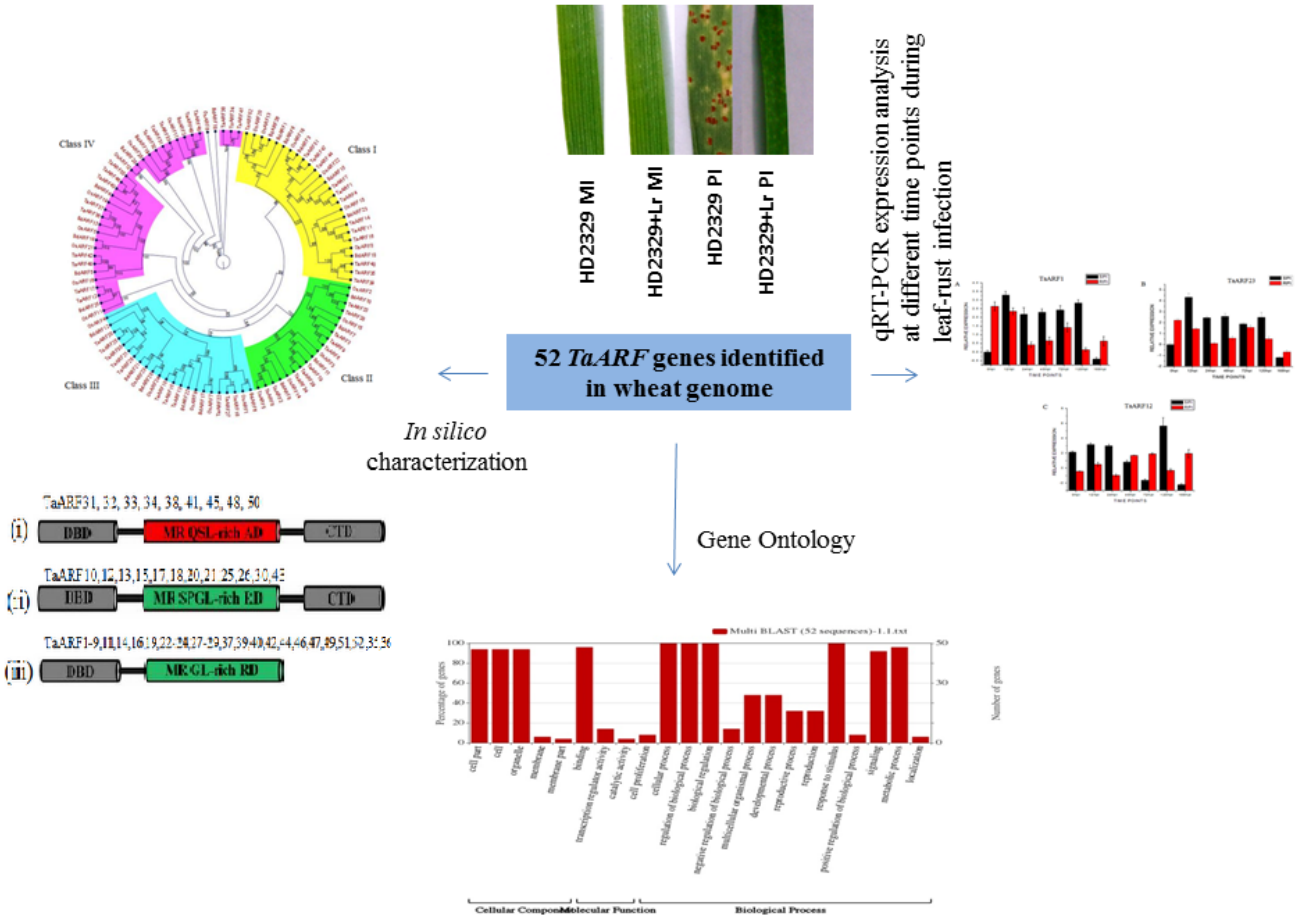
Dr. Kunal Mukhopadhyay

Dr. Dev Mani Pandey

Dr. Manish Kumar

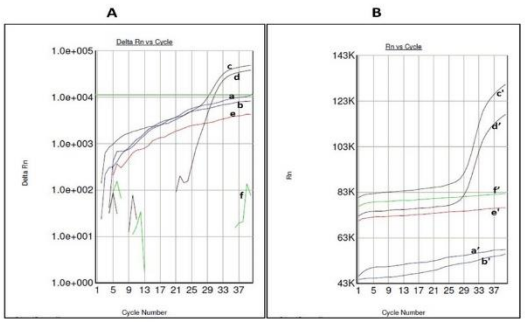
Dr. Dinesh Prasad

Dr. Kunal Mukhopadhyay

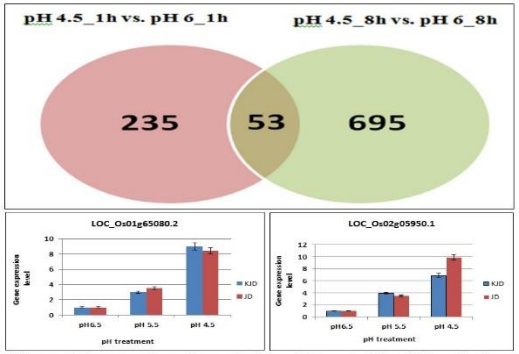


Differential expression of genes during leaf rust pathogenesis

Dr. Dev Mani Pandey

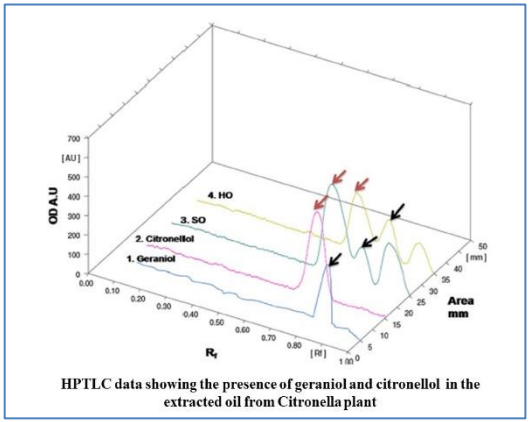


Molecular Beacon Probe based Real Time PCR result for the detection of promoter motif in Down-Regulated DEGs

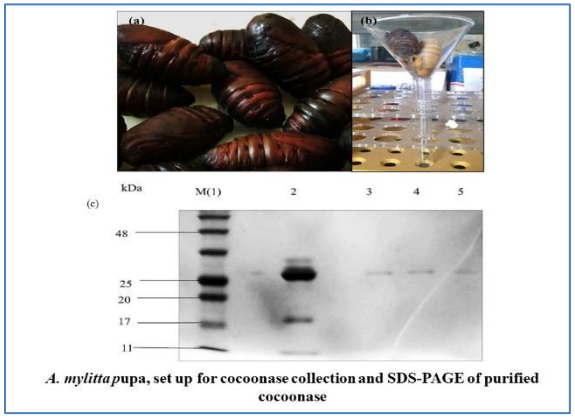


Differential expression of gene in low pH treated Arabidopsis plant, and Expression of hub genes from above DEGs in low pH treated rice plant

Key Experiments



HPTLC data showing the presence of geraniol and citronellol in the extracted oil from Citronella plant

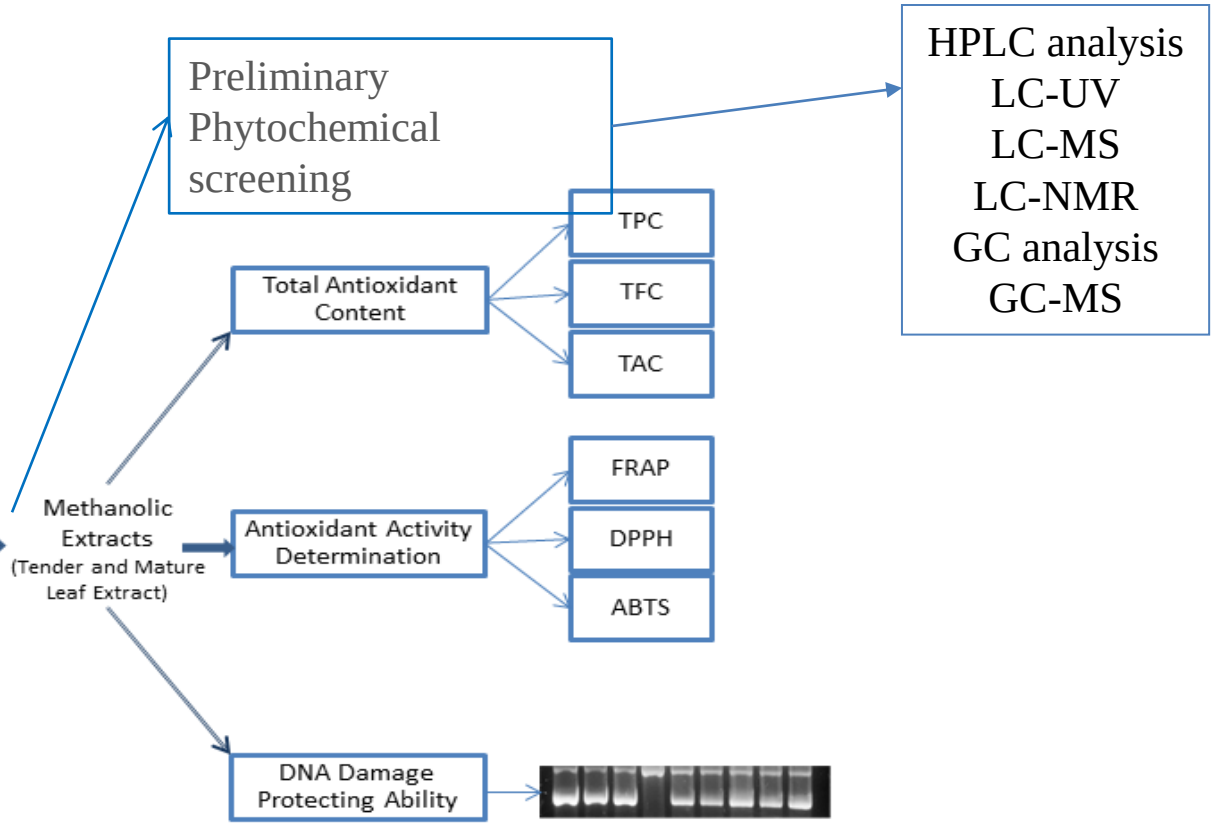


A. mylitta pupa, set up for cocoonase collection and SDS-PAGE of purified cocoonase

Stress response analyze & production of industrially important enzymes

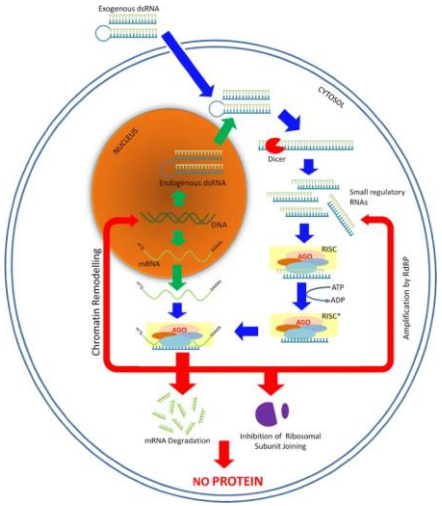
Dr. Manish Kumar

Phlogacanthus thyrsiflorus Nees



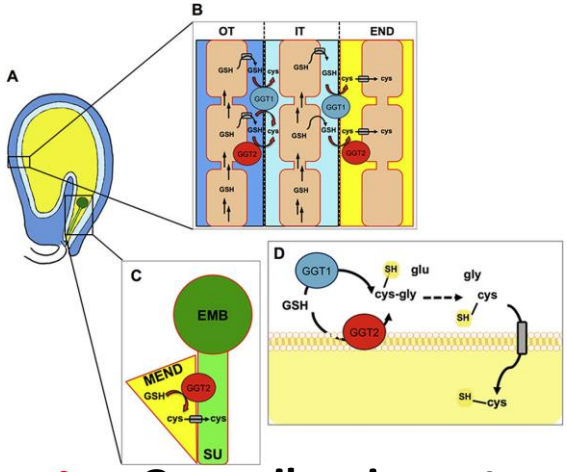
Secondary metabolites production and their identifications

Dr. Dinesh Prasad



RNA interference

https://link.springer.com/article/10.1007/s00425-013-2019-5



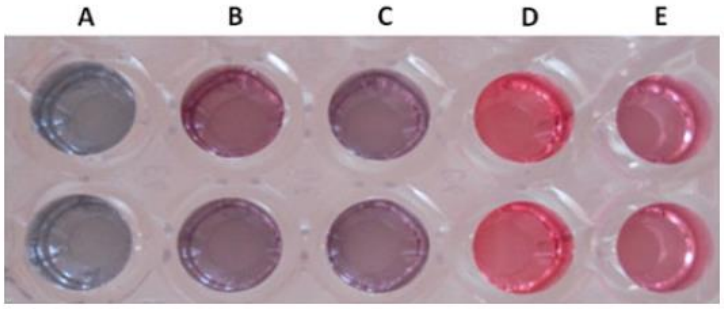
Gene silencing ggt gene

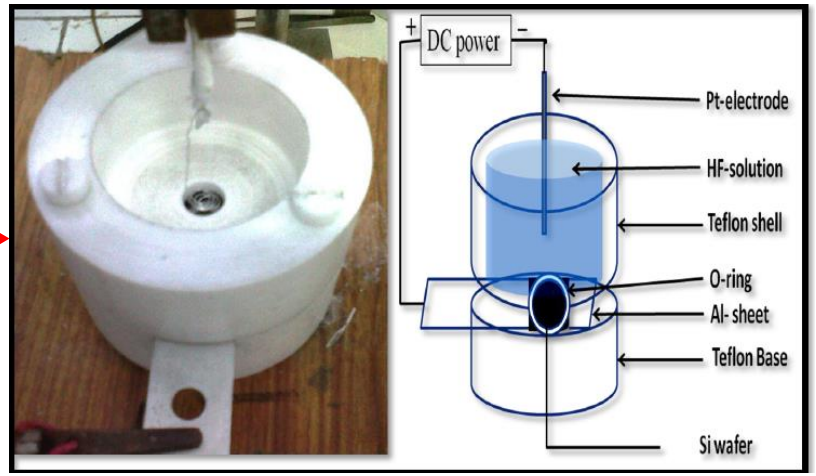
https://www.sciencedirect.com/science/article/abs/pii/S0981942817300918?via%3Dihub#undfig1

Key Experiments

Gold nanoparticle based colorimetric biosensor to detect specific DNA

https://link.springer.com/article/10.1007/s11274-011-0679-5





Functionalized Porous silicon used for Pb detection

https://www.ingentaconnect.com/contentone/asp/senlet/2016/00000014/00000011/art00007

Microbiology

Dr. Vinod Kumar Nigam

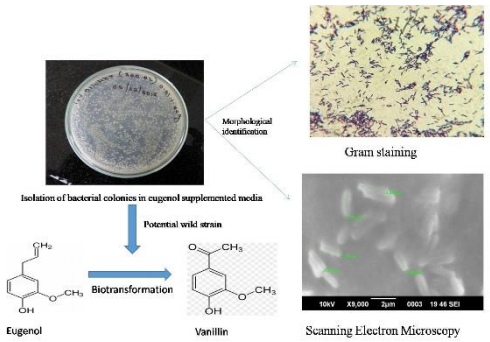
Dr. Shashwati Ghosh Sachan

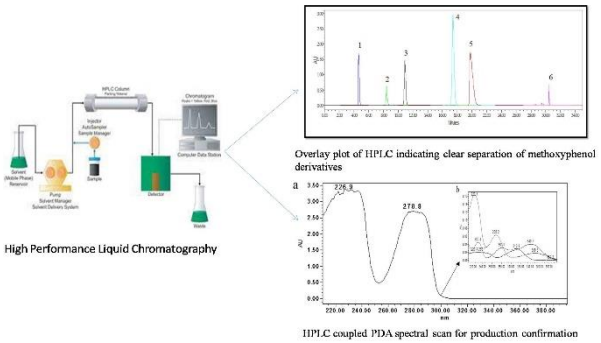
Dr. Shubha Rani Sharma

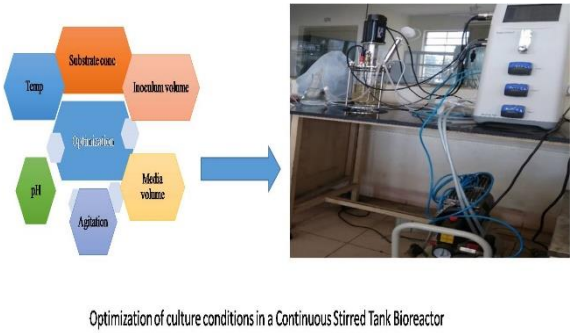
Dr. Hare Ram Singh

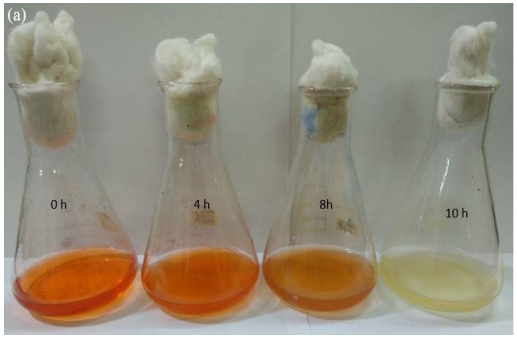
Dr. Rajnish Prakash Singh

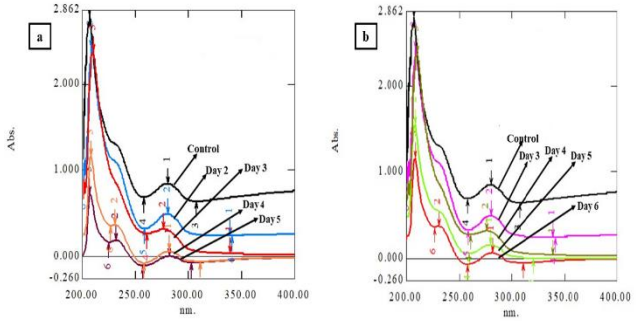
Dr. Shashwati Ghosh Sachan

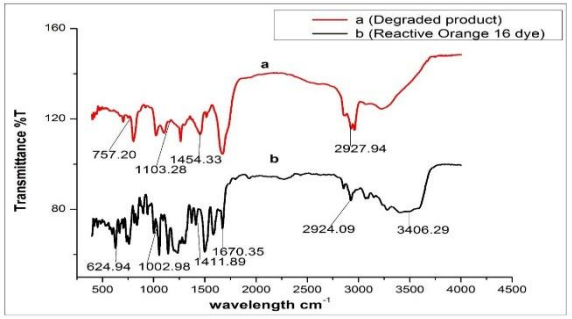


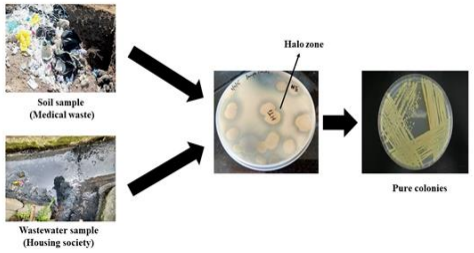


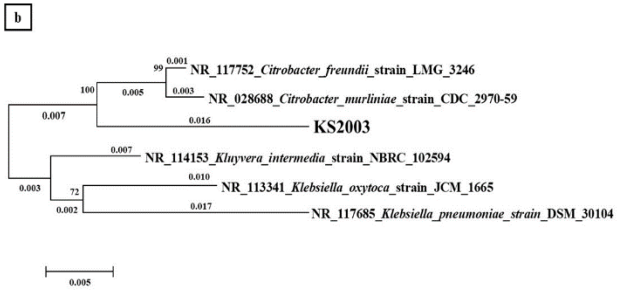


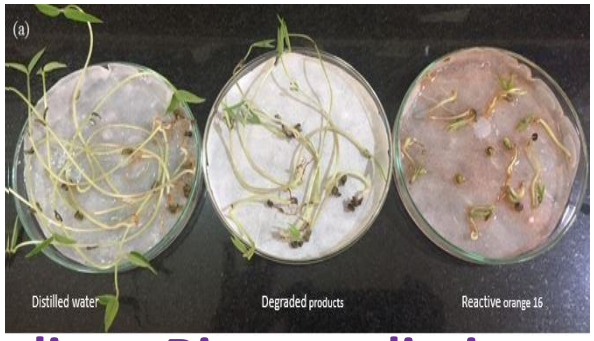






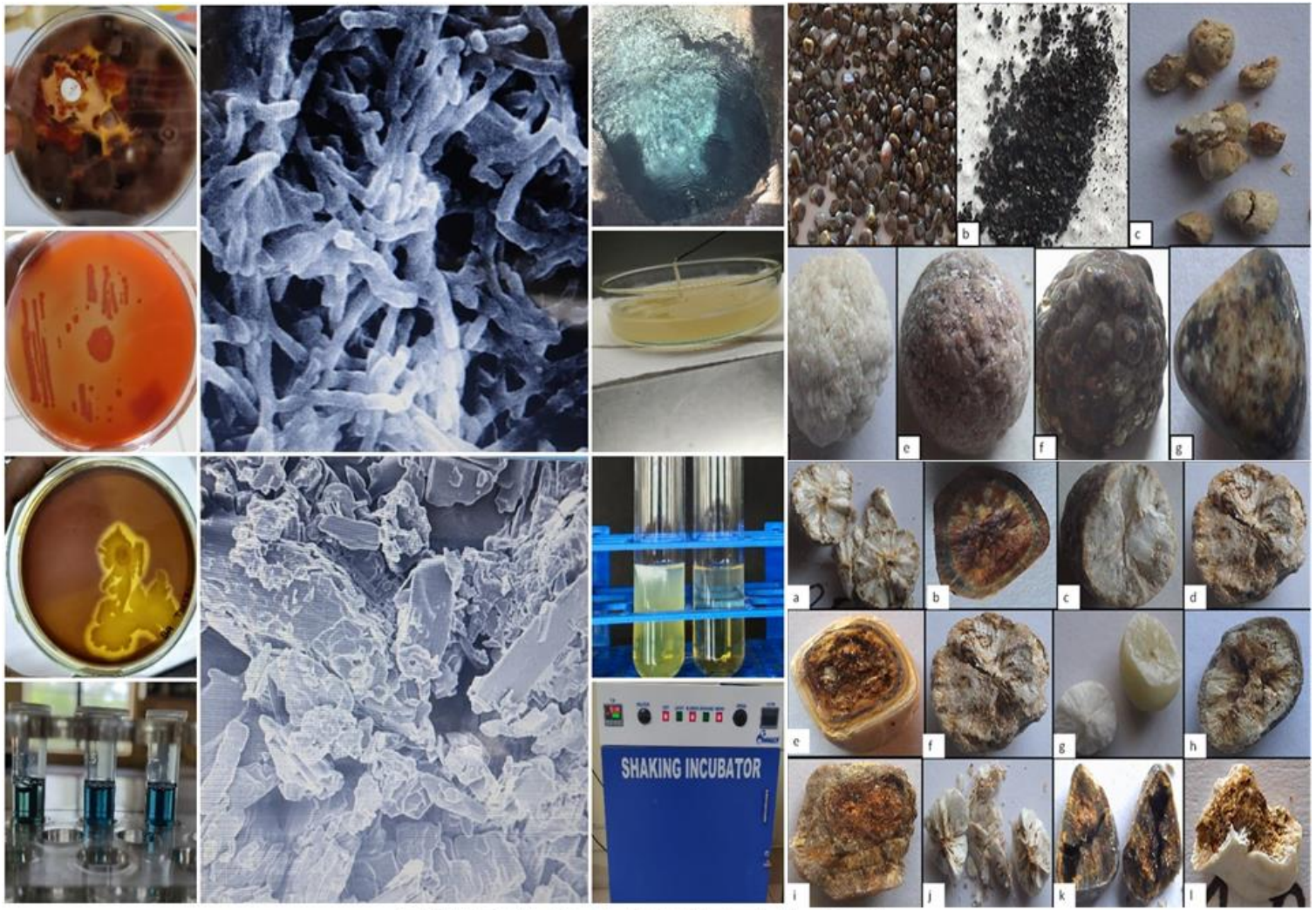






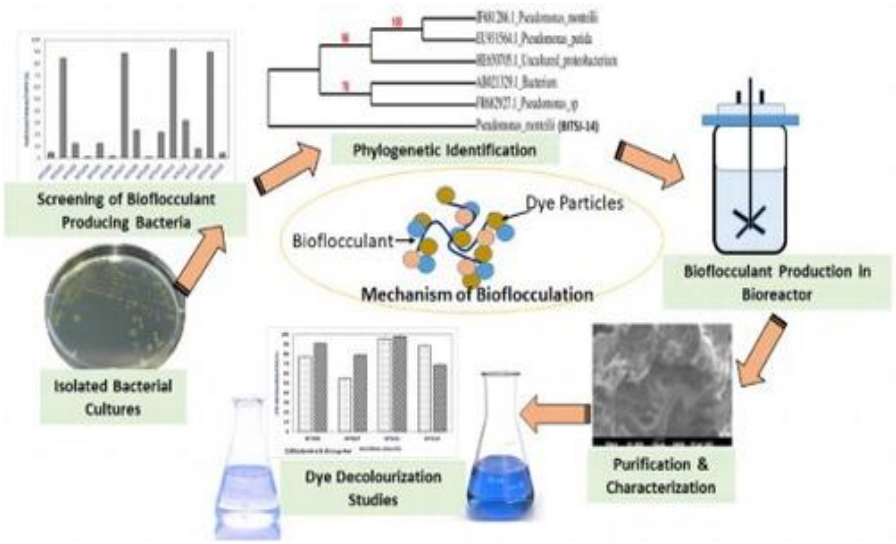
Microbial biotransformation of secondary metabolites; Bioremediation

Dr. Shubha Rani Sharma

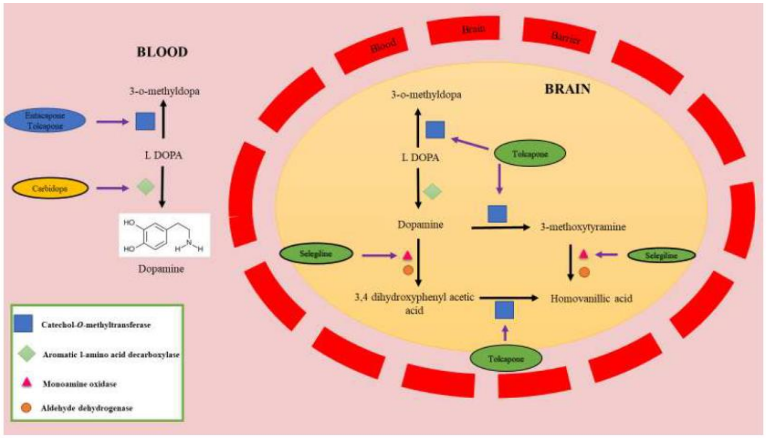


Gallbladder stone formation and their characterization

Dr. Hare Ram Singh



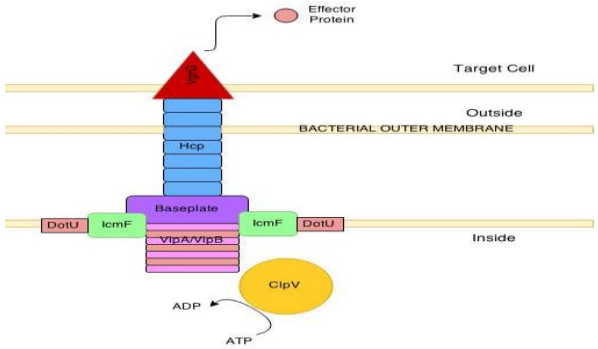
Characterization of various microbial species for their industrial applications



Mode of action of L-DOPA along with Enzyme inhibitors against Parkinson's disease

Dr. Rajnish Prakash Singh

A



T6SS 'Nano-weapon'

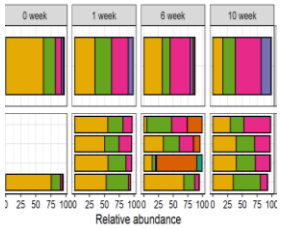
Killing of the microbial pathogens

Bacteriocidal action

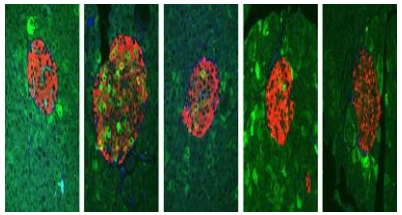
B

Engineered Probiotic Microorganism

Multifarious health effects

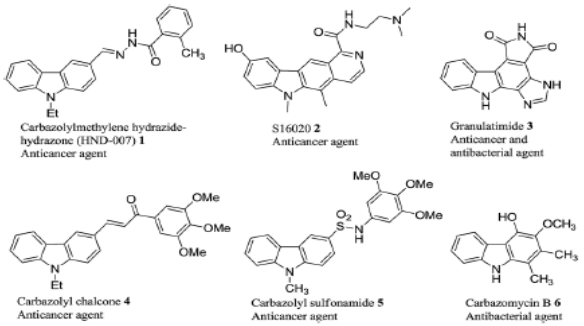


Microbiome analysis



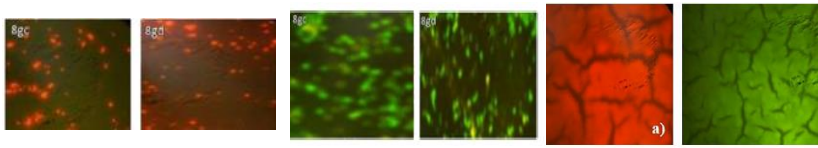
Histopathological analysis

C- Interdisciplinary work

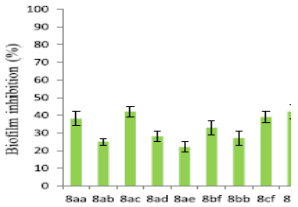


Chemically synthesized compounds

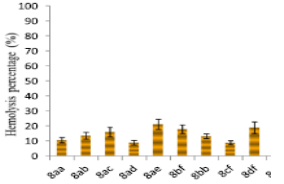
Screening for various properties



Antibacterial/Antifungal, Anticancer, Bio-imaging



Biofilm inhibition



Hemolytic action

Nanobiotechnology

Dr. Raju Poddar

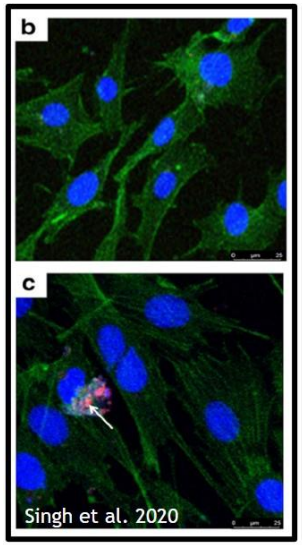
Dr. Sneha Singh

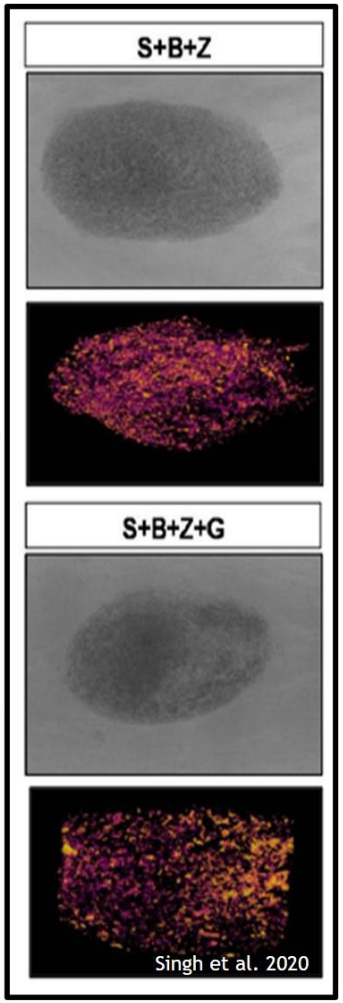
Dr. Dinesh Prasad

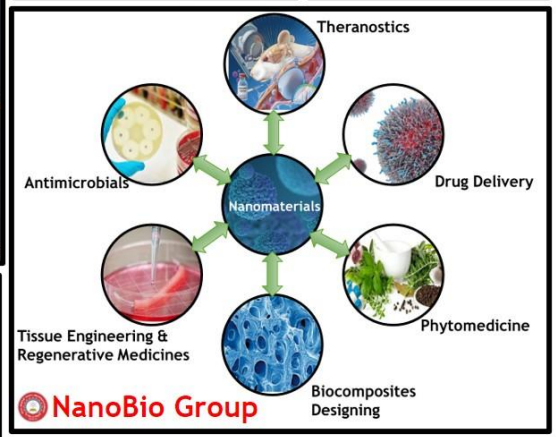
Dr. Koel Mukherjee

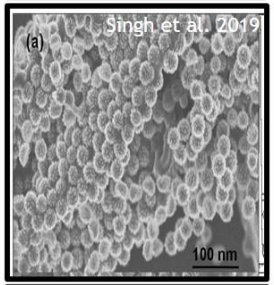
Dr. Alok Jain

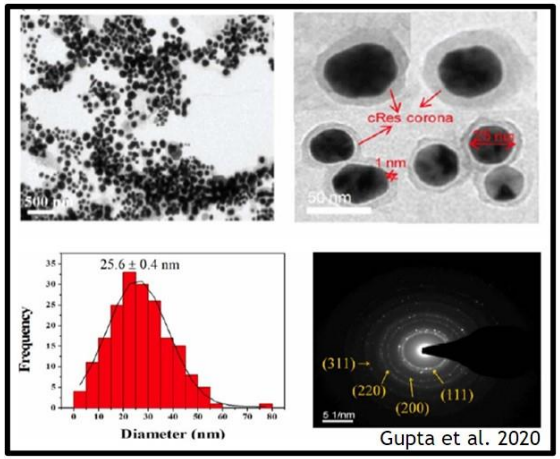
Dr. Sneha Singh

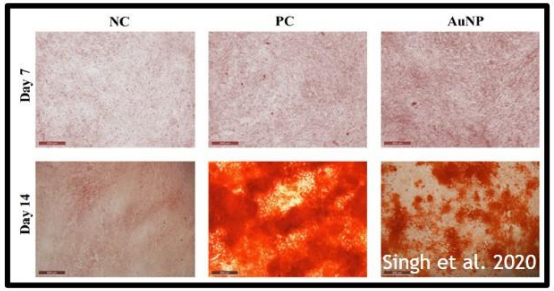


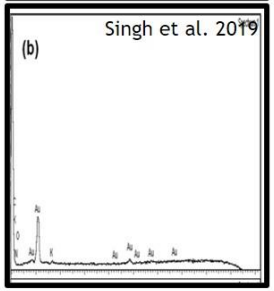






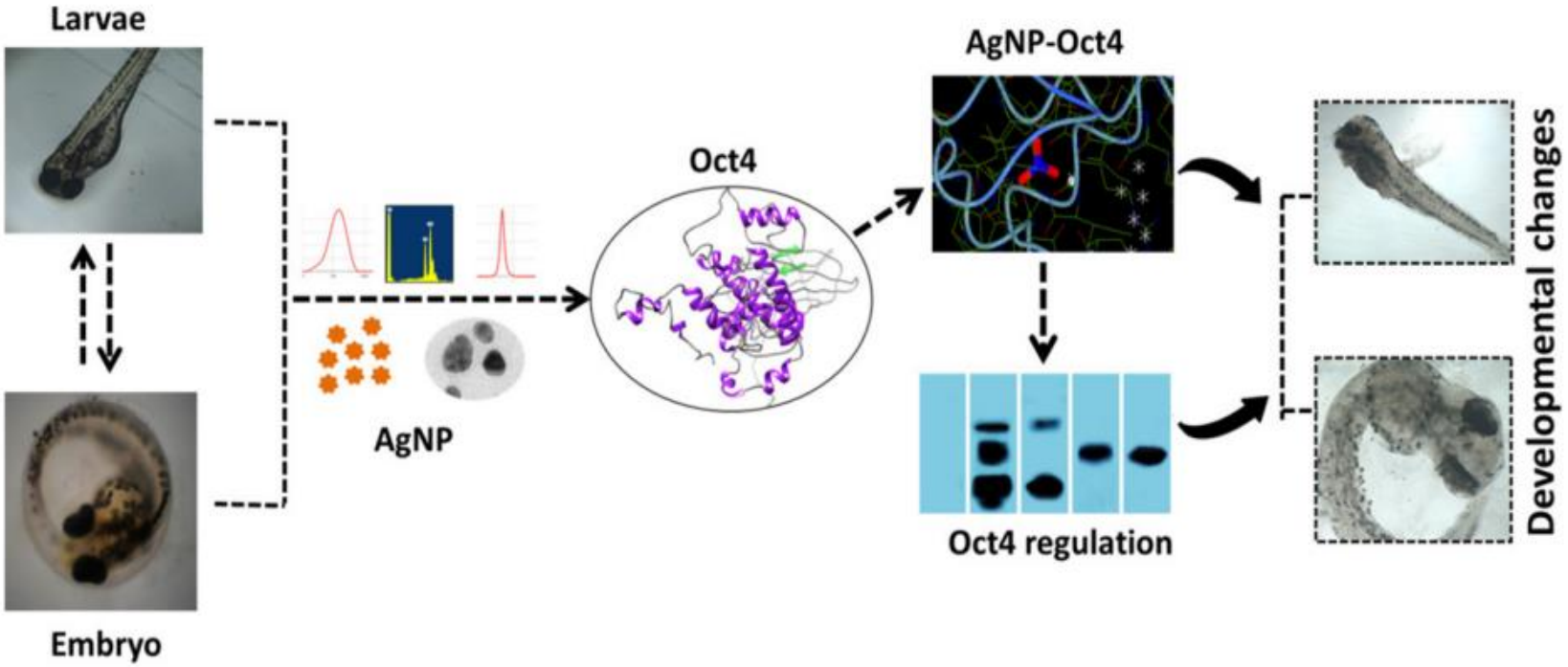






Nanobio composites for tissue engineering applications

Dr. Koel Mukherjee



Nanobiotechnology: application to aquatic body, Toxicity study

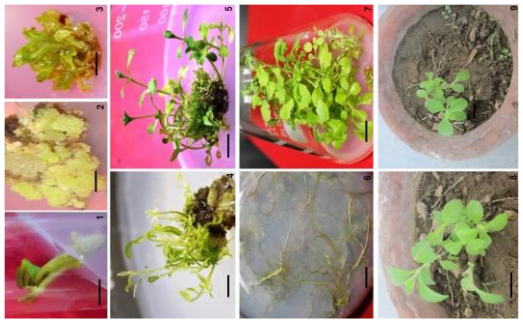
Plant Biotechnology

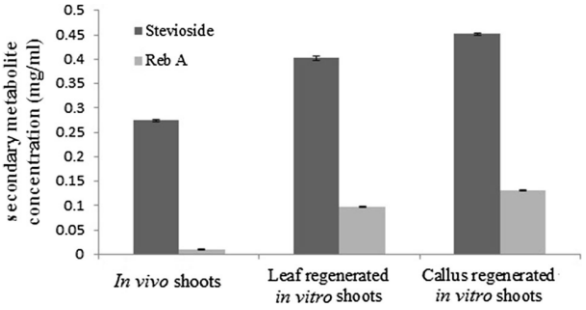
Dr. Dev Mani Pandey

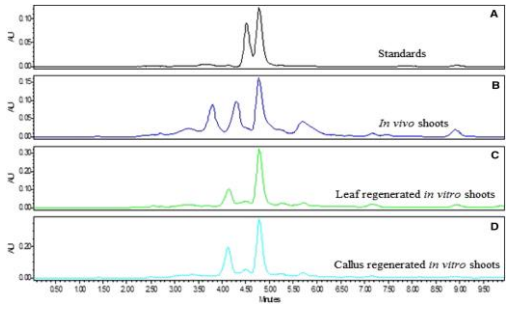
Dr. Sheela Chandra

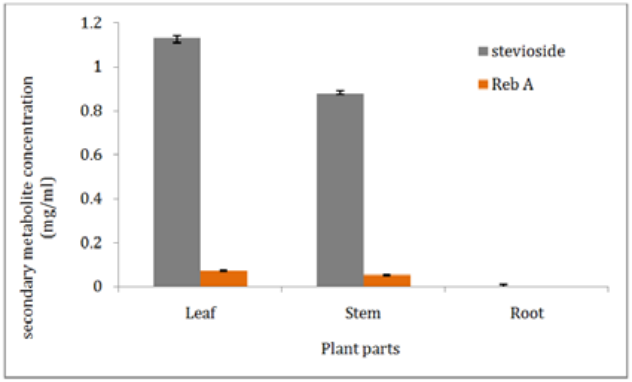
Dr. Dinesh Prasad

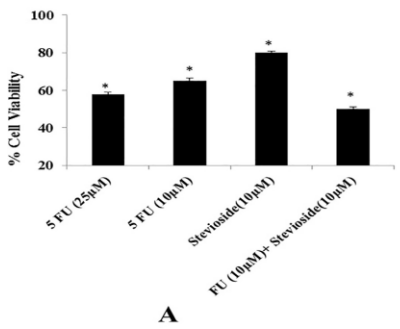
Dr. Sheela Chandra



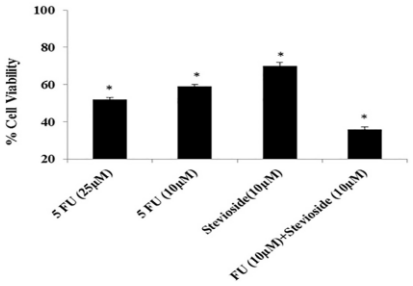








A



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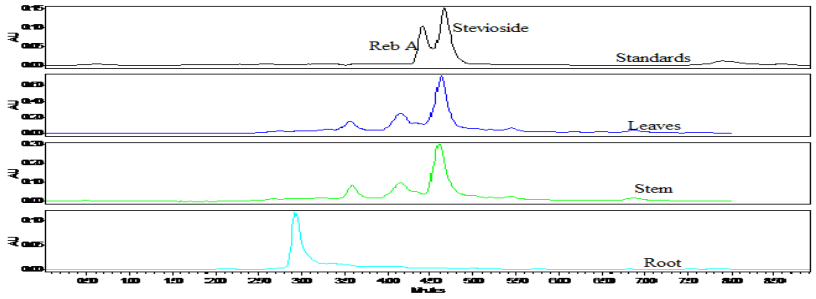


Plant tissue culture

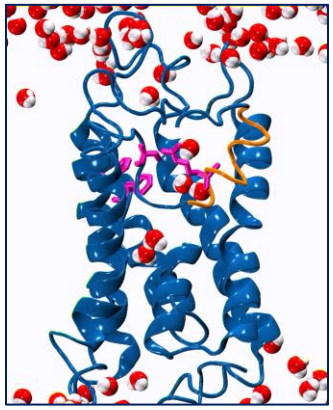
Computational Biology

Dr. Raju Poddar

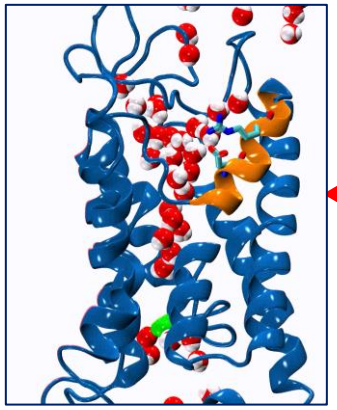
Dr. Koel Mukherjee

Dr. Alok Jain

Dr. Alok Jain

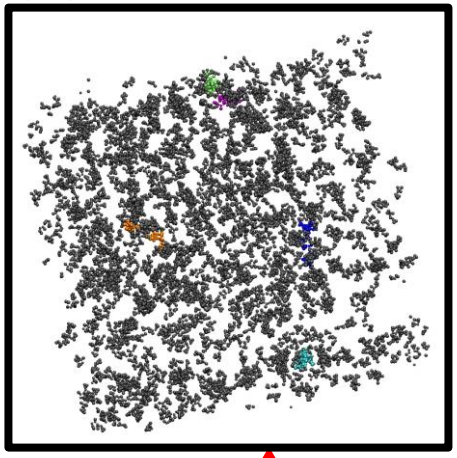


Wild type



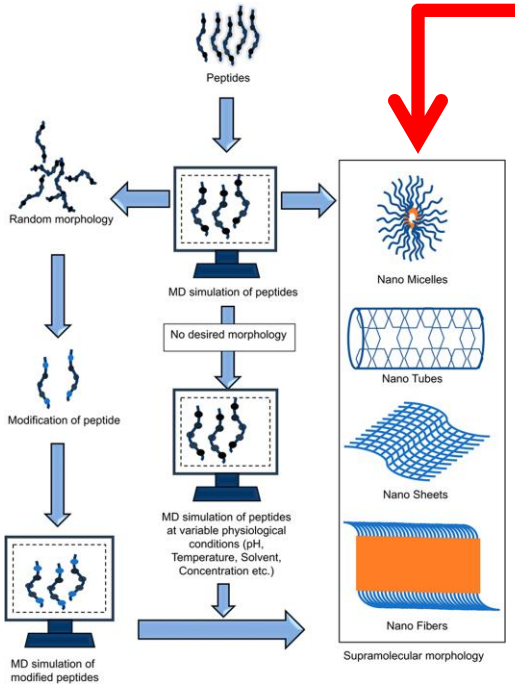
Mutant

Protein function



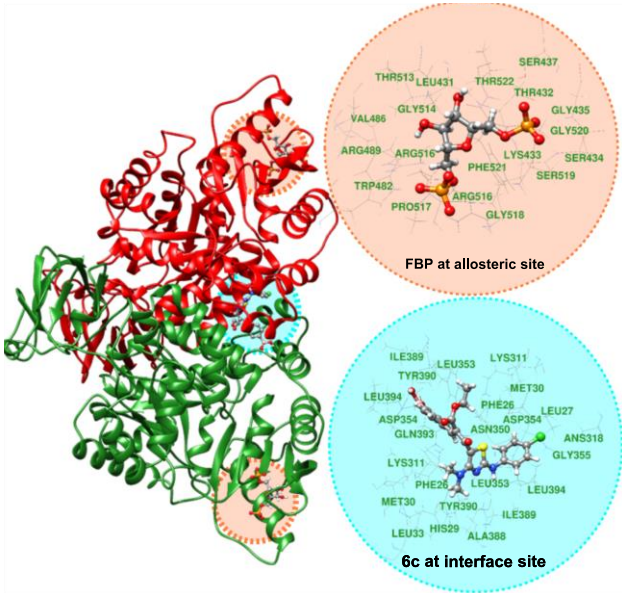
Nanostructure assembly

Key Areas



Biomaterial design and optimization

Drug Design



Biophotonics and Bioinstrumentation

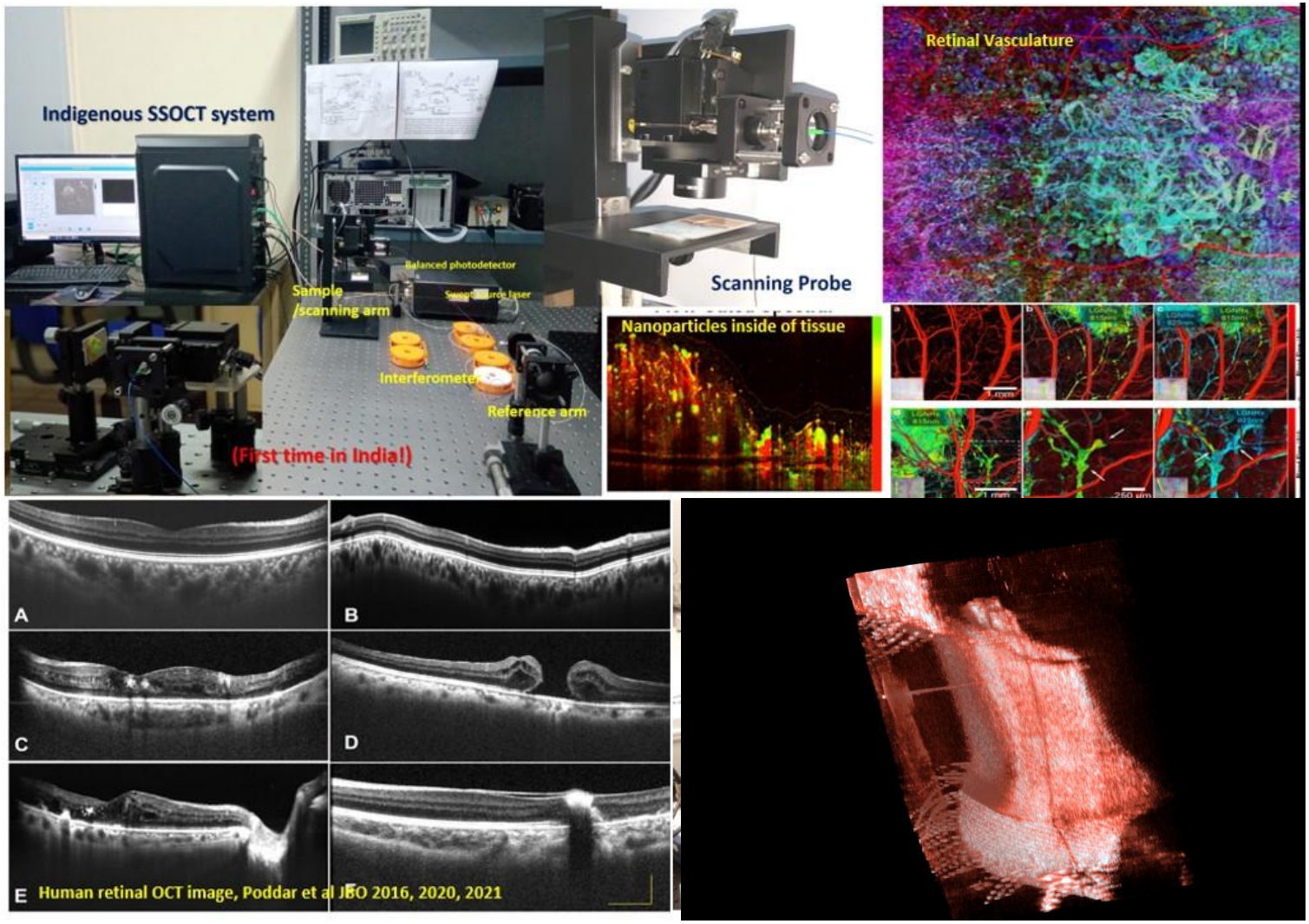
Dr. Rakesh Kumar Sinha

Dr. Raju Poddar

Dr. Yogender Aggarwal

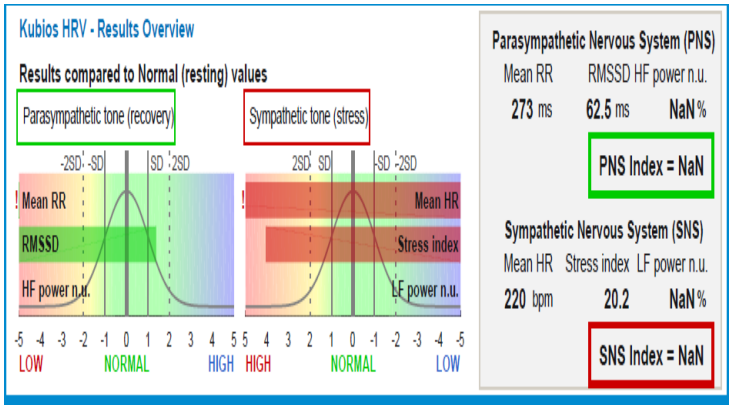
Dr. Anjana Dwivedi

Dr. Raju Poddar



Dr. Yogender Aggarwal

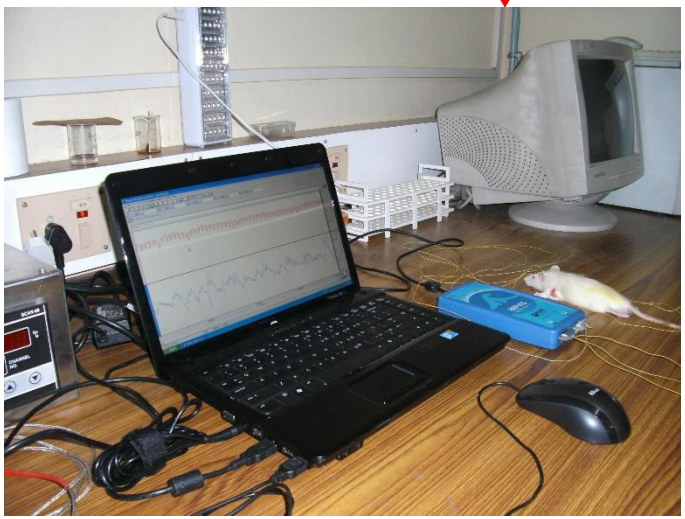
ECG under Mental Arithmetic Task



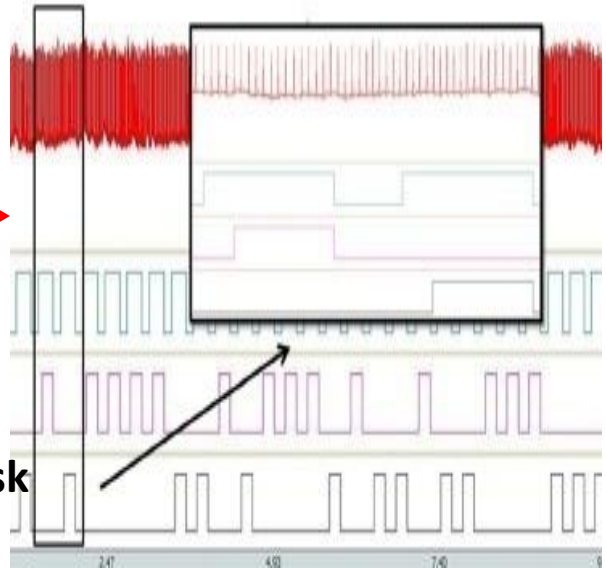
HRV Analysis

Key Experiments

ECG Acquisition from Diabetic Rat Model



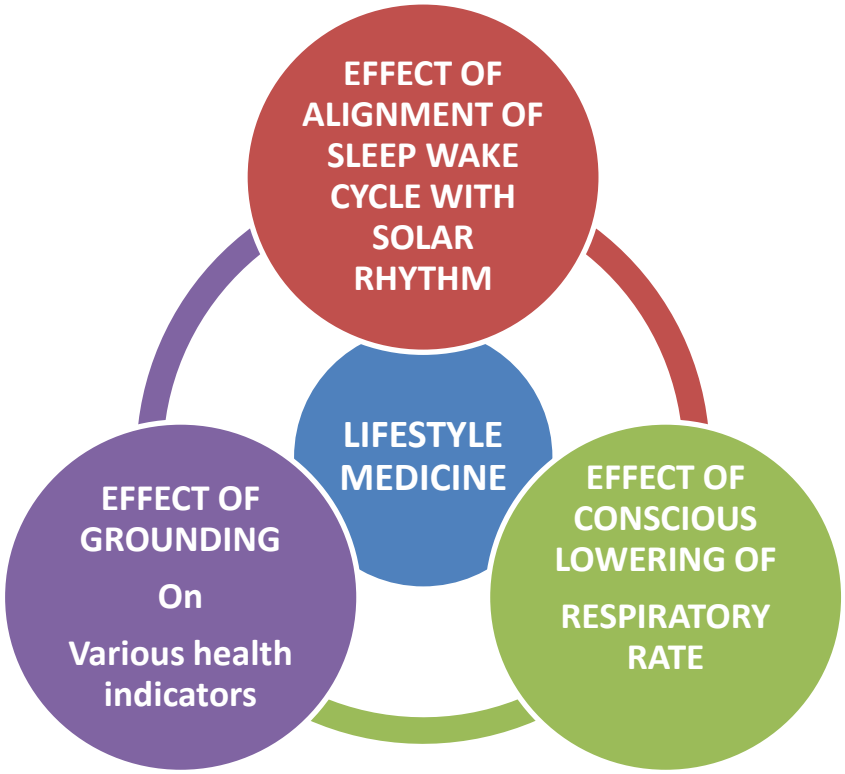
ECG Analysis under Mental Task



Dr. Anjana Dwivedi

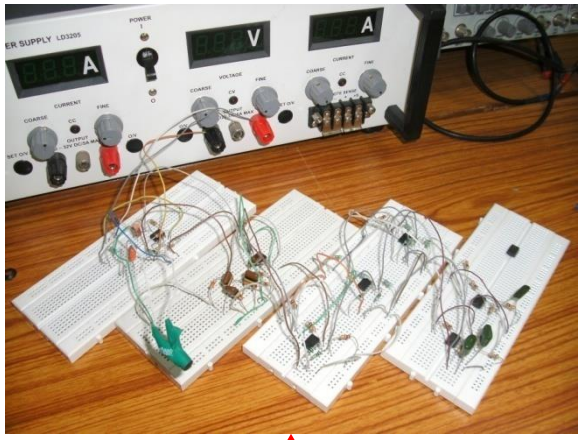
SYSTEMS BIOLOGY

- **Identification of Differentially Expressed Genes (DEGs) in Cancer Progression**
- **Meta-analysis for liquid biopsy based diagnostic marker**



Dr. Rakesh Kumar Sinha

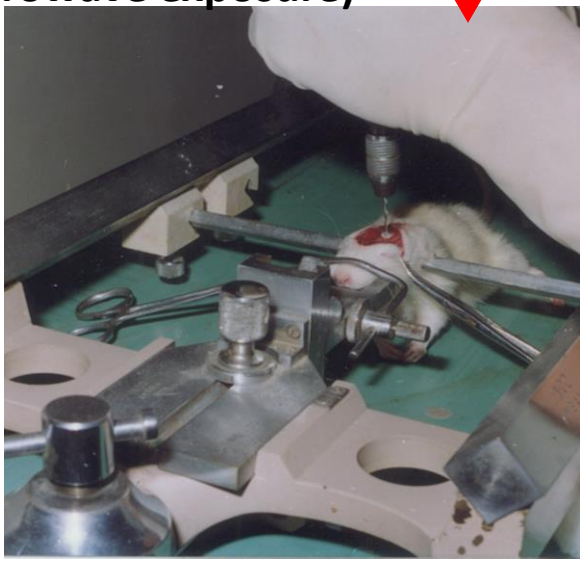
Human-Machine interaction

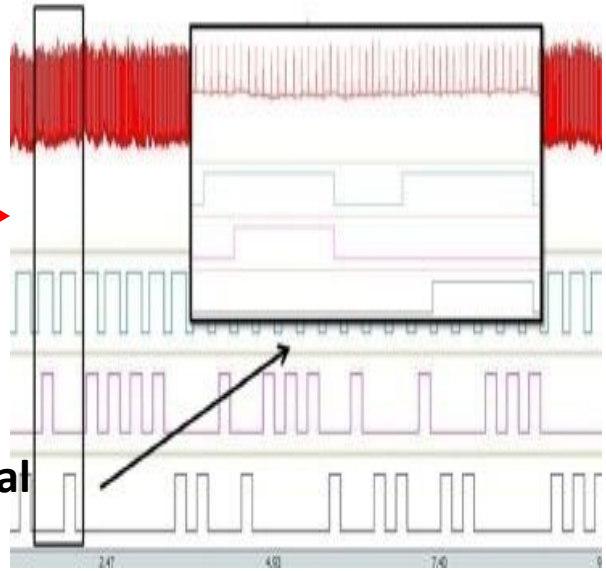


Bioelectronics

Key Experiments

Brain electrophysiology and sleep study (Heat and Microwave exposure)





Heart rate variability analysis with mental task

Mission 2020-25 Proposed Plan

- **Driving new areas for research**
  - Animal Biotechnology
  - Biomaterials and Tissue Engineering
  - Drug Design

- **Implementation of new /or strengthening existing laboratories**
  - Biocomputing and Drug Design Lab.
  - Animal Cell Culture Lab.
  - Project Lab.
  - Post graduate lab need complete renovation
  - Strengthening and modernization of Bioprocess lab.

Mission 2020-25

- **Three** industrial MOUs already signed and two are in under consideration.
- **Several** national and international collaboration established.
- Exchange program under **Erasmus+** has been established
- **More than twenty** research projects submitted
- Motivating the faculty members to increase the research output.
- Consultancy
- New course development

Thank You !!