



Dr. SAYAN MUKHERJEE

Ph.D.

BIOMATERIALS AND TISSUE ENGINEERING LAB
SCHOOL OF MEDICAL SCIENCE AND
TECHNOLOGY INDIAN INSTITUTE OF
TECHNOLOGY KHARAGPUR

PERSONAL INFORMATION

Date of Birth: 20.02.1996

Place of Birth: Rishra, India

CONTACT

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Google scholar:

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RESEARCH INTEREST

Biomaterials
Tissue Engineering
Carbon Nanoparticles
Nanomedicine
Medical Microbiology
Sepsis
Wound management

EDUCATION

PhD

Sept. 2020- Jan 2026

School of Medical Science and Technology, Indian Institute of
Technology (IIT) Kharagpur
Supervisor: Prof. Santanu Dhara, PhD (IIT KGP)

M.Sc.

2018 – 2020

Molecular Medical Microbiology
Joint M.Sc. PhD course conducted by IIT Kharagpur in
collaboration with Tata Medical Centre, Kolkata.
CGPA: **8.31**

B.Sc. (Hons)

2015-2018

Human Physiology
Serampore College, University of Calcutta
Percentage: **68%**

Higher Secondary [XII th]

2014

Mahesh Sri Ramkrishna Ashram Vidyalaya [H.S], Rishra
West Bengal Council of Higher Secondary Education
Percentage: **85.2%**

Madhyamik [X th]

2012

Mahesh Sri Ramkrishna Ashram Vidyalaya, Rishra
West Bengal Board of Secondary Education
Percentage: **87.9%**

GATE 2020

Qualified in Life Sciences

AIR: 568

GATE score: 556

TECHNICAL SKILLS

- **Biomaterial fabrication:** Nanoparticle synthesis and functionalization, polymer monolith, injectable hydrogel, polymer foam, 3D printing, electrospinning, wet-spinning, Physico-chemical characterization & imaging techniques
- **Cell culture techniques:** Primary cell isolation from human skin, stem cell isolation from adipose and placenta, Endothelial cell isolation, stem cell differentiation study (osteogenic, chondrogenic, myogenic) MTT assay, fluorescent imaging, Scratch assay, cell migration assay, tube formation assay.
- **In vivo experience:** small animal handling and surgery, histopathological tissue sample preparation and staining, Immuno Histochemistry.
- **CAM assay and Ex vivo biocompatibility testing**
- **Hemocompatibility and antihemorrhagic capability testing**
- **Molecular Biology Skills:** DNA/ RNA extraction from human tissue and isolation, Cloning and expression of recombinant protein, restriction digestion, ligation, transformation, PCR, qRT PCR, Western Blot, SDS PAGE, Gel Electrophoresis, ELISA, Flow cytometry, Sanger Sequencing.
- **Medical Microbiology Skills:** Bacterial Culture, Bacterial identification, Microscopy, Antimicrobial susceptibility testing (Manual & automated by Vitek2), Blood culture Analyzer (BacT/Alert), Gene Expert.
- **Molecular Diagnostic Skills:** Antimicrobial resistance gene identification, Viral/ bacterial/ fungal nucleic acid detection, Antiviral resistance detection. Hybrid Capture, Fungal Protein detection by ELISA.
- **Laboratory Management Skills:** Laboratory Design, Hospital infection control, Quality Control, Internal Quality Control, External Quality Assurance, Inter Lab Comparisons, Laboratory and test accreditation, Audits: internal and external, NABL, NABH and ISO guidelines.
- **Clinical Skill:** Good clinical laboratory practices Certification, Clinical sample handling, ICU audit, Patient interactions, Sepsis management knowledge.
- **Languages:** English, Bengali, Hindi.
- **Computer:** Microsoft Office, Adobe Photoshop, Adobe Illustrator, Bio render, EndNote, Origin, GraphPad Prism.

RESEARCH EXPERIENCE

1. Ph.D. Thesis Project (2020-2026)

Indian Institute of Technology Kharagpur, India (2020-2026)

Biomaterial and Tissue Engineering Lab, School of Medical Science and Technology, IIT KGP.

Thesis title: SYNTHESIS AND CHARACTERIZATION OF FUNCTIONALIZED CARBON NANODOTS - A SUSTAINABLE TECHNOLOGY FOR HEALTHCARE

Objectives of the thesis:

- i) Synthesis and characterization of Iodine functionalized 2, 5-dimethoxy-2, 5-dihydrofuran (DHF) crosslinked whey protein-derived carbon nanodots for antibacterial application
- ii) Iodine functionalized 2, 5-dimethoxy-2, 5-dihydrofuran (DHF) crosslinked whey protein-derived carbon nanodots for infected wound management
- iii) Sodium-entrapped carbon nanodots from silk wastewater for combating multidrug-resistant bacteria in healthcare settings
- iv) Silk wastewater derived sodium-entrapped carbon nanodots embedded chitosan foam for hemorrhage management

Working in the area of Carbon dots and its antibacterial and tissue engineering application. I am working in this field to synthesis and modification of carbon dots from industry waste-water. My area of concern is exploring antibacterial, antioxidant, wound healing and hemostatic activity of novel synthesized nanomaterial.

2. CSIR Summer Research Training Program (Online: 2020)

North East Institute of Science and Technology, Jorhat, Assam

Project title: Integrative roles of traditional essential oils and conventional antibiotics against multi drug resistant pathogens Under the mentorship of Dr. Kuldeep Uttam Bansod.

3. M.Sc. 4th Semester Thesis Project: (2020)

Tata Medical Center, Kolkata

Project title: Immunological Response and Clinical Profile among Patients with Sepsis in a Cancer center Under the supervision of Dr. Sanjay Bhattacharya.

4. M.Sc. 3rd Semester Thesis Project: (2019)

School of Medical Science and Technology Indian Institute of Technology (IIT), Kharagpur

Project title: Expression analysis of Cytokeratin transcript levels in Oral Potentially Malignant Disorders and Oral Squamous Cell Carcinoma Under the supervision of Prof. Jyotirmoy Chatterjee.

5. Summer Internship: (2019)

Department of Microbiology and Department of Critical Care, Tata Medical Center, Kolkata

Project title: Arterial Blood Gas as a Prognostic Indicator in Patients with Sepsis

Under the supervision of Dr. Sudipta Mukherjee, Dr. Pralay Shankar Ghosh, and Dr. Sanjay Bhattacharya

PUBLICATIONS

Peer review journals

- 1) Iodine functionalized 2,5-dimethoxy-2,5-dihydrofuran (DHFI) crosslinked whey protein-derived carbon nanodots (WCND) for antibacterial application.
S Mukherjee, AK Pandey, N Dogra, B Das, UK Singh, S Dhara, Colloids and Surfaces B: Biointerfaces 231, 113543, 2023.
- 2) Sodium-Entrapped Carbon Nanodots from Silk Wastewater for Combating Multidrug-Resistant Bacteria in Healthcare Settings
S Mukherjee, A. K Pandey, S Mishra, P Das, U K Singh, K Chakraborty, S Bhattacharya, S Pal, S Dhara, ACS Appl. Bio Mater. 2025
- 3) Sulphur rich iodinated multifunctional carbon nanodots for surgical site infection management.
S Mukherjee, K Chakraborty, B Biswas, N Dogra, P Das, S Bhattacharya, P Mahapatra, R Goswami, S Das, S Dhara; Under communication
- 4) In Silico, In Vitro and Ex Vivo Evaluation of the Antihyperglycaemic, Antioxidant and Cytotoxic Properties of Coccinea grandis L. Leaf Extract.
P Prabhakar, **S Mukherjee**, A Kumar, S Kumar, DK Verma, S Dhara, MK Maiti, M Banerjee. Food Technology and Biotechnology 62 (2), 188-204, 2024
- 5) Optimization of microwave-assisted extraction (MAE) of key phenolic compounds from pigeon pea (Cajanus cajan L.), their characterization, and measurement of their anti-diabetic and cytotoxic potential. P Prabhakar, **S Mukherjee**, A Kumar, S Kumar, DK Verma, S Dhara, MK Maiti, M Banerjee. Journal of Food Measurement and Characterization, 1-24, 2023.
- 6) Optimization of MAE for Carica papaya phytochemicals, and its in silico, in vitro, and ex vivo evaluation: For functional food and drug applications.
P Prabhakar, **S Mukherjee**, A Kumar, S Kumar, DK Verma, S Dhara, MK Maiti, M Banerjee. Food Bioscience, 102861, 2023.
- 7) Mechanically compliant Catla catla scales gelatin hydrogels promote myogenic differentiation and skeletal muscle loss regeneration
A Biswas, N Dogra, R Rajasekaran, B Biswas, P V Vaidya, S Biswas, A K Ojha, **S Mukherjee**, T Roy, S Mishra, K Chakraborty, D Bhattacharya, R Goswami, P Manchikanti, S Dhara. International Journal of Biological Macromolecules, 334 (2), 2025.
- 8) Electrophoretic deposition of ethylcellulose- nano zinc oxide loaded bioactive glass- polymeric composite coatings on stainless steel for antibacterial and bone regeneration applications
H Hadem, A K Ojha, **S Mukherjee**, P S Prasad, A Biswas, S Dhara, S Das, K Das, Colloids and Surfaces A: Physicochemical and Engineering Aspects. 2025 Jun 20:137544.
- 9) Highly Interconnected Ti6V4Al Foam with Tailorable Pore Architecture and Mechanical Property by Powder Processing for Skeletal Tissue Ingrowth
P V Vaidya, V S Seesala, R G Talukdar, A Biswas, S Jana, M K Yadav, R Rajasekaran, N Dogra, T

- Roy, **S Mukherjee**, A Bagde, P Dabhade, Z Q Syed, P Fulzele, S Gupta, T K Bandyopadhyay, S Dhara, *Advanced Engineering Materials*. 2025 May 7:2401630.
- 10) Assessment of chitosan-coated zinc cobalt ferrite nanoparticle as a multifunctional theranostic platform facilitating pH-sensitive drug delivery and OCT image contrast enhancement, D Dhar, S Ghosh, **S Mukherjee**, S Dhara, J Chatterjee, S Das, *International Journal of Pharmaceutics* 654, 123999, 2024
 - 11) Electrophoretic Deposition of 58S Bioactive Glass-Polymer Composite Coatings on 316L Stainless Steel: An Optimization for Corrosion, Bioactivity, and Cytocompatibility. H Hadem, A Mitra, A K Ojha, R Rajasekaran, B Satpathy, D Das, **S Mukherjee**, S Dhara, S Das, K Das, *ACS Applied Bio Materials* 7 (5), 2966-2981, 2024
 - 12) Feasibility Insights of the Green-Assisted Calcium-Phosphate Coating on Biodegradable Zinc Alloys for Biomedical Application: In Vitro and In Vivo Studies. D Palai, A De, PS Prasad, T Roy, **S Mukherjee**, S Dhara, S Das, K Das, *ACS Applied Materials & Interfaces* 16 (19), 24274-24294, 2024
 - 13) Study on the Bioactivity Response of the Newly Developed Zn-Cu-Mn/Mg Alloys for Biodegradable Implant Application. D Palai, A De, PS Prasad, T Roy, **S Mukherjee**, S Dhara, S Das, K Das. *ACS Biomaterials Science & Engineering*, 2024
 - 14) 3D-Printed Fish Gelatin–Xanthan Gum Hydrogel with Myogenic Differentiation toward Skeletal Muscle Loss Repair. A Biswas, P V Vaidya, R Rajasekaran, S Biswas, **S Mukherjee**, A K Ojha, S Mishra, UN Nagalakshmi, N Dogra, P Manchikanti, S Dhara, *ACS Applied Bio Materials*. 2025 Dec 20.
 - 15) Myogenic Differentiation on 3D-Printed Interpenetrating Bioactive Hydrogel of Decellularised Human Placenta with Fish Scale Gelatin. A Biswas, P V Vaidya, R Rajasekaran, S Biswas, **S Mukherjee**, A K Ojha, S Mishra, N Dogra, P Manchikanti, S Dhara *MedComm - Biomaterials and Applications (Accepted/In Production)* 2026
 - 16) Arterial blood gas as a prognostic indicator in patients with sepsis. **S Mukherjee**, S Das, S Mukherjee, P S Ghosh, S Bhattacharya. *Indian journal of medical microbiology*, 2020

Review articles:

- a) Organic-Inorganic Hybrid Nanocomposites for Nanotheranostics: Special Focus on Preventing Emerging Variants of SARS-COV-2. **S Mukherjee**, S Manna, N Som, S Dhara. *Biomedical Materials & Devices*, 1-15, 2023

Book chapters:

- a) Potentialities of nanomedicine and nanocarriers for infectious disease treatment. JL Parimi, S Sadhu, **S Mukherjee**, S Bhati, P Manchikanti, S Dhara. Elsevier 2023.
- b) Immunological Perspectives Involved in Tissue Engineering. A Hansda, **S Mukherjee**, K Dixit, S Dhara, G Mukherjee. *Regenerative Medicine: Emerging Techniques to Translation Approaches*, 37-55, 2023
- c) Transmission electron microscopy for biomedical nanotechnology. **S Mukherjee**, S Kaushik, P Singh, S Shweta, I P Sahu. *Analytical Techniques for Biomedical Nanotechnology*, 2023

Conference abstract:

- a) **S Mukherjee**, A K Pandey, and S Dhara, **Poster Presentation** on Synthesis and characterization of Degummed wastewater-derived Carbon Nanodots (DwCND) for antibacterial applications: December 2022, International Conference on Biomaterials, Regenerative Medicine and Devices, IIT Guwahati,
- b) **S Mukherjee**, A K Pandey, N Dogra and S Dhara, **Poster Presentation** on Iodine functionalized 2,5-dimethoxy-2,5- dihydrofuran (DHFI) crosslinked carbon nanodots for antibacterial and wound healing application, September 2023, 33rd Annual Conference of the European Society for Biomaterials, Davos, Switzerland.
- c) **S Mukherjee**, N Dogra, B Biswas, R Goswami, S Dhara, **Poster Presentation** on Sulphur rich iodinated carbon nanodots: dual-action topical agent for infected wound management, May 2025, TERMIS 2025, Freiburg, Germany.

PATENTS

- a) **Sayan Mukherjee**, Anurag Kumar Pandey, Santanu Dhara, Textile industry wastewater-derived carbon-nanodot composition for surface disinfection and sanitization (Application No: 202431049834)
- b) **Sayan Mukherjee**, Anurag Kumar Pandey, Santanu Dhara, Surface Functionalized protein-derived carbon nano-dot (CND) for antimicrobial application and infected chronic wound management (Application No: 202431037165)
- c) Krishna Chaitanya Sunka, **Sayan Mukherjee**, Bhaskar Ray Chaudhuri, Santanu Dhara, Method of producing machinable radiopaque polypeptide monoliths. (**Granted Patent** No. 540078)
- d) **S Mukherjee**; N Dogra; S Dhara, Acid-soluble Polymer Foam by Carbon nanodot-mediated hydrogen bubbling with tailorable porosity and application thereof

ADMINISTRATIVE EXPERIENCE

- Member of **Tissue Engineering and Regenerative Medicine International Society**
- Member of **Microbiologist Society of India**, West Bengal division.
- **Joint Secretary** of Student council, School of Medical Science and Technology, Indian Institute of Technology, Kharagpur.
- **General Secretary** of Student council, School of Medical Science and Technology, Indian Institute of Technology, Kharagpur.
- **General secretary Socio-cultural** of B. R. Ambedkar Hall of Residence, Indian Institute of Technology, Kharagpur.
- **Research Scholar Representative** of School of Medical Science and Technology, Indian Institute of Technology, Kharagpur.