

DEBASIS BANIK, PhD

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EDUCATION

2013-2018 **PhD in Physical Chemistry**, Indian Institute of Technology (IIT), Kharagpur, India.

2011-2013 **MSc in Chemistry with Research**, IIT Kharagpur, India.

RESEARCH EXPERIENCE

Nov. 2025- **Postdoctoral Research Associate, Queen Mary University of London, United Kingdom.**

current • Isolating macrophages from mouse bone marrow and investigating efferocytosis using advanced imaging techniques.

July 2022- **Marie Skłodowska-Curie Actions Postdoctoral Fellow, University of Cambridge, United Kingdom.**

Oct. 2025 • Awarded prestigious MSCA postdoctoral grant from the UK Research and Innovation (UKRI) to investigate T cell/tumour interaction using cutting-edge imaging.

• My work provided novel insights into how ImmTAC®s (Bispecifics from Immunocore) redirect T cells to scan the cancer cell surface, and the role of adhesion proteins in contact formation. Currently, this work is under revision in *Nat. Commun.*

• Imaged *chimeric antigen receptor (CAR)* primary T cells finding carcinoembryonic antigen-related cell adhesion molecule 5 (CEACAM5) antigen on colorectal cancer (CRC) cell surface.

• Demonstrated that CRC cells evade CAR T-cell via a ~4× thicker glycocalyx and junctional sequestration of CEACAM5; enzymatic disruption (trypsin or clinically approved hyaluronidase) restored CAR T-cell engagement and cytotoxicity.

• Observed limited availability of CEACAM5 on human colorectal cancer tissues, whereas treatment with trypsin or hyaluronidase increased accessibility. This work is recently published in *Adv. Sci.*

Feb. - July 2022 **Postdoctoral Fellow, Weizmann Institute of Science, Israel.**

• Investigated protein conformational dynamics.

Feb. 2018- **Joint Postdoctoral Fellow, Vanderbilt University, USA & Singapore-MIT Alliance for Research and Technology (SMART), Singapore.**

Aug. 2021 • Quantified force-dependent CAR and TCR-pMHC interactions using optical tweezers, revealing peptide-specific catch bonds peaks at ~25 pN for CARs and ~14 pN for TCRs, and slip bonds in CD19-CAR T cells.

• Contributed to collaborative research demonstrating that wild-type $\gamma\delta$ TCR lacks mechanosensing capability, while a $\gamma\delta/\alpha\beta$ chimeric TCR with $\alpha\beta$ constant domains functions as a mechanosensor.

June 2013- **PhD Student, IIT Kharagpur, India.**

Jan. 2018 *Research activity:* Fluorescence spectroscopy and microscopy to study different self-assembly.

• Used fluorescence lifetime imaging microscopy (FLIM) and fluorescence correlation spectroscopy (FCS) to show that crown ether small molecules can inhibit formation of L-phenylalanine (L-phe) fibril responsible for phenylketonuria, and revealed distinct hydrogen-bonding mechanisms between L-Phe and L-tyrosine fibrillar assemblies.

• Investigated the microheterogeneity in binary mixtures (dimethyl sulfoxide-water, tert-Butyl alcohol-water and ethanol-water) by studying solvation dynamics using femtosecond fluorescence up-conversion and femtosecond transient absorption spectroscopy.

• Studied host-guest interactions using steady-state and time-resolved fluorescence techniques.

TECHNICAL AND OTHER SKILLS

Mouse work: Bone marrow-derived macrophages (BMDMs) isolation from mouse.

Human tissue and cells: Extensive experience in immunofluorescence (IF) staining of human colon cancer tissues, T cell (human and mouse) and cancer cell (human) culture and maintenance.

Cell based assays: Developed an assay to monitor early events of T cell/tumour interaction. Single cell and single molecule-based assays to study the mechanobiology of T cell receptor.

Imaging: Extensive experience in fluorescence microscopy, e.g., confocal, fluorescence lifetime imaging microscopy (FLIM), epifluorescence, total internal reflection fluorescence (TIRF), highly inclined and laminated optical sheet (HILO), epifluorescence selective plane illumination microscopy (eSPIM), super-resolution microscopy (STED, resPAINT), acoustic microscopy (LUMICKS), transmission electron microscopy (TEM), field emission scanning electron microscopy (FESEM).

Spectroscopy: UV-Vis spectroscopy, steady-state and time-resolved fluorescence spectroscopy, e.g., time correlated single photon counting (TCSPC) and fluorescence up-conversion; femtosecond transient absorption spectroscopy, fluorescence correlation spectroscopy (FCS), force spectroscopy, e.g., optical tweezers.

Others: 1H NMR (1D), circular dichroism (CD), isothermal titration calorimetry (ITC).

Leadership and Management: Conceptualized, led and executed my own research projects along with mentoring doctoral candidates and project students.

Independence: Led my research projects independently; wrote the manuscript where I am 1st author, addressed reviewers' response and published the works. Wrote research proposals and secured competitive funding to support my own projects.

Teamwork: During my PhD and postdoc, I established many successful internal and external collaborations led to several publications. As for example, my work on CAR T cell/colorectal cancer cell interaction is in collaboration with Dr. Bidesh Mahata, University of Cambridge.

Communication: Delivered talk and presented posters at many international conferences; shared published articles in social media; I spent 4 hours/week with undergraduate students in my 'Senior Demonstrator' role and sharing my interesting research findings to motivate them to become next generation scientists. Developed ability to communicate science to a non-specialist audience.

Networking: Work experience in India, Singapore, United States, Israel and United Kingdom. Frequent attendance to conferences; initiative in making connections with potential collaborators.

SELECTED INTERNATIONAL CONFERENCES

- 2024 • 17th ENII EFIS EJI Immunology Summer School, Alghero, Italy, **Poster**
- 2020 • 8th Annual Postdoctoral Association Research Symposium, Oak Ridge National Laboratories (ORNL), USA, **Oral**, *heard about Dr. Bidesh Mahata's work which led to successful collaboration later.*
- 2018 • The 7th Annual South eastern Immunology Symposium, University of Alabama, Birmingham, USA, **Poster**, *met with Professor Nicholas Gascoigne's group and established collaboration later.*

SELECTED PUBLICATIONS

- **D. Banik*** et al. T-cell signaling relies on partial CD45-exclusion at sub-micron sized cellular contacts. (*equally contributed with three others) *Nat. Commun.* 2026 (under revision).
- **D. Banik** et al. Enzymatic Remodelling of Tumour Microenvironment Enhances Anti-CEACAM5 CAR T-Cell Efficacy Against Colorectal Cancer. *Adv. Sci.* 2026; 0:e09762.
- **D. Banik** et al. Single Molecule Force Spectroscopy Reveals Distinctions in Key Biophysical Parameters of $\alpha\beta$ T-Cell Receptors Compared with Chimeric Antigen Receptors Directed at the Same Ligand. *J. Phys. Chem. Lett.* 2021, 12, 7566-7573.
- **D. Banik** et al. Inhibition of Fibrillar Assemblies of L-Phenylalanine by Crown Ethers: A Potential Approach toward Phenylketonuria. *J. Phys. Chem. B* 2016, 120, 7662-7670.
- E. Jenkins et al. (**D. Banik** as co-author). PD-1 signaling and anti-PD-1-mediated tumor control is established at microvillar-based cellular contacts. *Sci. Immunol.* 2026 (under revision).
- R. J. Mallis et al. (**D. Banik** as co-author). Molecular Design of the $\gamma\delta$ T Cell Receptor Ectodomain Encodes Biologically Fit Ligand Recognition in the Absence of Mechanosensing. *Proc. Natl. Acad. Sci. U.S.A.* 2021, 118 (26), e2023050118.

Summary: Peer reviewed journal articles: First authorships – **11** (1 in progress); Co authorships – **30** (2 in progress).

Book chapter: Co authorships – **1**. Google Scholar link: <https://scholar.google.com/citations?user=53fKByUAAAAJ&hl=en>

REFEREES

Available upon request.