



DR. BAIRAGI C. MALLICK

Associate Professor
Department of Chemistry
Room No: 107, Science Building (First Floor)
Contact No: +91-9178890581
Email ID: bairagi.mallick@cuja.ac.in
Lab webpage: <https://cuja.ac.in>

QUALIFICATIONS:

Ph.D. (2007), Indian Institute of Technology Bombay, Maharashtra, India
M.Sc. (1999), Ravenshaw University, Cuttack-753003, India
B.Sc. (1997), Ravenshaw University, Cuttack-753003, India

EXPERIENCE:

- o **Associate Professor**, School of Natural Sciences, Department of Chemistry, Central University of Jharkhand (CUJ), Jharkhand, Ranchi, India [December 2022 – till date]
- o **Associate Professor**, Department of Chemistry, Ravenshaw University, Cuttack, Odisha [February 2022 – December 2022]
- o **Assistant Professor**, Department of Chemistry, Ravenshaw University, Cuttack, Odisha [January 2010 – February 2022]

AWARDS/HONOURS:

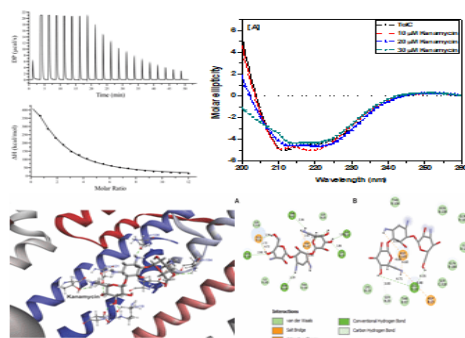
- o **Raman Postdoctoral Fellow**, University of Iowa, USA [September 2016 – August 2017]
- o **Brain Korea- 21 (BK-21) Postdoctoral Fellow**, Seoul National University, Seoul, Republic of South Korea [November 2007 – January 2010]
- o **Senior Research Fellow**, CSIR-NET-JRF, IIT Bombay, Maharashtra, India [July 2005- April 2007]
- o **Junior Research Fellow**, CSIR-NET-JRF, IIT Bombay, Maharashtra, India [July 2002- April June 2005]

RESEARCH INTEREST:

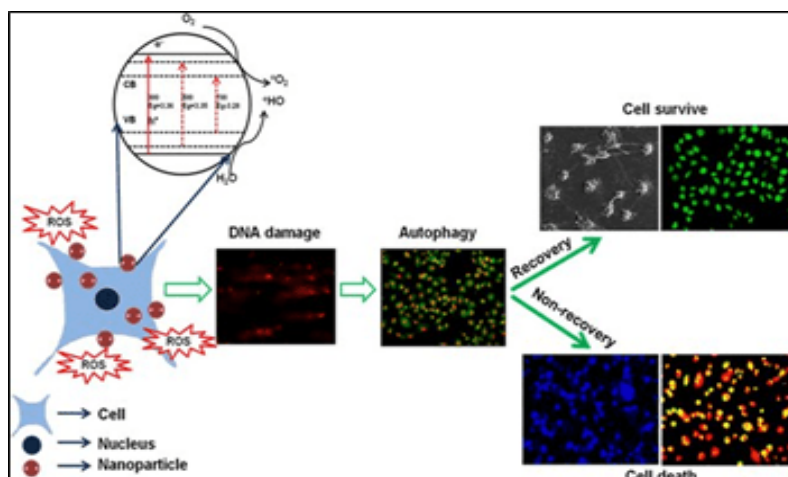
The treatment of microbial infections has greatly suffered in the present era of pathogenic dominance. And the present prevailing antimicrobial resistance (AMR) situation has become a challenge to the active medical partitioners and to the scientific community. Thus, our long-term goal is to understand the mechanism of AMR, and the efficacy of drugs used to treat bacterial infections by targeting the membrane/membrane associated proteins/enzymes involved in drug resistance.

Further, our extended focus is to Identify naturally available phytochemicals combined with biogenic or engineered nanoparticles which can be used as alternative drugs/antibiotics over the conventional used antibiotics to address the cause of AMR.

- o **Membrane/membrane-associated proteins:** The emergence/existence of antibiotic resistance bacteria has evidenced to be associated with the overexpression of efflux pumps. These efflux pumps are either membrane or membrane associated proteins that have mediated antibiotic resistance through efflux mechanism. Thus, understanding the mechanism of antibiotics binding of these proteins and their efflux mechanism through the membrane is a real challenge, but in long run, it will help to improve the present condition of antibiotic resistance. Our approach is to purify membrane proteins in active state, and explore the antibiotics binding dynamics through biophysical techniques and substructural it through bioinformatic analysis.



- o **Natural bioactive molecules:** The protective effects of naturally present phytosterols have been studied in various models and approaches. However, the exact mechanism of phytosterol action is still unknown. In our approach, we have identified different sources for extraction and purification of phytosterol of interest and test their efficacy as an anticancer agent against breast cancer cells.
- o **Nano-bio interface chemistry:** The rapid growth in nanotechnology has become the likelihood of engineered nanomaterials that coming into environmental and human contact. Nanoparticles interacting with cells membranes, DNA, proteins and organelles establish a series of nano-bio interfaces. The study in our group aimed to evaluate the antimicrobial propensity of biogenic/synthesized NPs with significant anti-microbial activity. This will established potential use of NPs in biomedical and pharmaceutical sciences over the conventional antibiotics



RSC Advances 2019, 9, 24888-

Group Members:

- o Nibedita Behera
- o Manaswini Patra
- o Chitranjali Jena

Master Students

- o Aritra Das Ghosh
- o Souvanjit Khuntia
- o Sanjay Pan
- o Soumya Singh
- o Pravin Pradhan
- o Monalisa Patra
- o Arene Xalxo

Lab Alumni:

- o Dr. Prakasini Sathapaty
- o Dr. Biraja Sankar Pattanayak
- o Sanjukta Badhai
- o Dr. Prangya P. Panda
- o Dr. Mamali Priyadarshinee

Projects Completed:

1. Interaction Role of PKM2 and HIF-1 α in Breast Cancer Progression [SERB-DST, Govt. of India]
2. Biochemical and Biophysical Characterization of Efflux Protein-Mediated Drug Resistance in *M. tuberculosis* [DBT Govt. of India]
3. Efflux Protein Mediated Multidrug Resistance in *coli* [UGC Major Research Projects]

Selected Publications:

1. Pattanayak, B. S.; Priyadarshinee, M.; Dehury, B.; Jha, S.; Beuria, T. K.; Soren, D.; Mallick, B. C.* Kanamycin mediated conformational dynamics of *Escherichia coli* outer membrane protein TolC. *Frontiers in Molecular Biosciences* 2021, 8, 636286. doi.org/10.3389/fmolb.2021.636286
2. Badhai, S.; Barik, D.; Mallick, B.C.* Anticancer efficacy of β -sitosterol loaded hydroxyapatite-alginate on colon cancer cell *in-vivo*. *Research J. Pharm. and Tech.* 2020, 13(3), 1147-1151. doi:5958/0974-360x.2020.00211.5
3. Mishra, S.; Priyadarshinee, M.; Debnath, A. K.; Muthe, K. P.; Mallick, B. C.; Das, N.; Parhi, P. Rapid microwave assisted hydrothermal synthesis cerium vanadate nanoparticle and its photocatalytic and antibacterial studies. *Journal of Physics and Chemistry of Solids* 2020, 137, 10211-10219. doi.org/10.1016/j.jpcs.2019.109211

4. Behera, N.; Arakha, M.; Soren, S.; Pattanayak, B. S.; Priyadashsinee, M.; Jha, M.; Mallick, B. C. Oxidative stress generated at nickel oxide nanoparticle interface results in bacterial membrane damage leading to cell death. *RSC Advances* 2019, 9, 24888-24894. doi.org/10.1039/C9RA02082A
5. Nayak, P. S.; Arakha, M.; Kumar, A.; Asthana, S.; Mallick, B. C.; Jha, S. Optimization of online silver nanoparticle biofabrication using *Bacillus thuringiensis*. *RSC Advances* 2016, 6, 8232-8242. doi.org/10.1039/C5RA21281B
6. Arakha, M.; Pala, S.; Samantarraia, D.; Panigrahi, T. K.; Mallick, B. C.; Pramanik, K.; Mallick, B.; Jha, S. Antimicrobial activity of iron oxide nanoparticle upon modulation of nanoparticle-bacteria interfaces. *Scientific Reports* 2015, 5:14813. doi:10.1038/srep14813.
7. Mallick, B. C.* Effects of Sarcosine on the Stability of Cytochrome C. *IJSR* 2014, 4;9, 2277-8179.
8. Arakha, M.; Saleem, Md.; Mallick, B. C.; Jha, S. The effects of interfacial potential on antimicrobial propensity of ZnO nanoparticle, *Scientific Reports* 2015, 5: 9578. doi:10.1038/srep09578.
9. Mallick, B. C.* Kang, Sa-Ouk; Jha, S. Ca²⁺-binding induces conformational stability of CAF-1 from *Dictyostelium discoideum*. *Chem. Sci.* 2014, 126:3, 751–761.
10. Mallick, B. C.; Kishore, N. Partial molar volumes of some alpha-amino acids in aqueous magnesium sulphate solutions at 298.15 K, *J. Solution Chem.* 2006, 35, 1441-1451

Book Chapters:

1. Sulata Sahu, Bairagi C. Mallick, Curcumin-Alginate Mixed Nanocomposite: An Evolving Therapy for Wound Healing. *Edited by:* Erim Deniz, 19th January 2022, Intech Open, Properties and Applications of Alginates, ISBN: 978-1-83969-500-1.
2. Arakha, M., Rath, S. K., Pradhan, A. K., **Mallick, B. C.**, Jha, S., Protein-nanoparticle interaction and its potential biological implications. *Bioprospecting of Enzymes in Industry, Healthcare and Sustainable Environment.* Springer Singapore, January 2021, PP-155-173. (ISBN: 978-981-33-4195-1)
3. Manoranjan Arakha, **Bairagi C. Mallick** and Suman Jha, Magnetic Nanoparticle Interface with an Antimicrobial Propensity, May 2019, Springer Nature Switzerland AG 2019, K.A. Abd-Elsalam et al. (eds.), *Magnetic Nanostructure, Nanotechnology in the Life Sciences*, ISBN No. 978-3-030-16439-3.

Patents:

Patent No.: 2021103494

Innovation Title: Effective delivery of phytosterol based drugs against colon cancer.

Inventors: Badhai, Sanjuta; Mallick, Bairagi C.; Barik, Durga Prasad

Teaching:

- Molecular Spectroscopy
- Bioinorganic Chemistry
- Analytical Chemistry
- Surface Chemistry
- Group Theory and Spectroscopy
- Physical Chemistry-I (Integrated B.Sc. course)