

Arghya Bandyopadhyay, Ph.D MRSB

Microbiology & Nanobiotechnology

OBJECTIVES:

Knowledge is ubiquitous, it does not have a shape. It is our efficiency how we give it a shape. I am wandering to collect some of the scintillating tiny fractions from it with my zeal to learn and utilize the best part of the experience gained from my intimacy with microbiology and nano-biotechnology. It is my aim in life to make out the best possible, sustainable development in the field of biology with the help of modern cutting-edge weapons like nanotechnology.

TECHNICAL SKILLS:

Nanotechnology:

Preparation, characterization and application of nanomaterials; TEM, SEM, AFM, XRD, SQUID etc.

Molecular Biology:

RAPD, RFLP, ARDRA, PCR, ELISA
Blotting (Northern, Southern and Western), cloning etc.

Computational biology:

In-silico analysis of protein structure, Molecular dynamics simulation, Docking.

Metagenomic and General:

Isolation of DNA from various sources for metagenomic studies, Bacterial and animal cell culture etc.

Specific technological skill:

DNA sequencer operation (Ion torrent, Life technologies)

RESEARCH INTEREST:

1. Nanobiotechnology for the development of biochip/biosensors, and theranostic device
2. Effect of engineered nanomaterials on the human system
3. Metagenomic study of bacterial community
4. Protein structure and function

EXPERIENCE:

Research:

6. Institute: University of Alberta

Department: Faculty of Medicine and Dentistry, Department of Medicine

Designation: Visiting Professor

Duration: January 2022 – August 2022

5. Institute: Indian Institute of Science Education and Research (IISER), Kolkata

Department: Centre for Advanced Functional Material and Department of Biological Sciences

Designation: National Post Doctoral Fellow

Duration: June 2019 – December 2021

4. Institute: ICMR-RMRC, Dibrugarh

Section: Enteric Diseases

Designation: Field Investigator

Duration: December 2017 - February 2018

3. Institute: Indian Institute of Science Education and Research (IISER), Kolkata

Department: Department of Chemical Sciences

Designation: Research Associate

Duration: December 2013 - June 2017

2. Institute: University of Kalyani, India

Department: Microbiology

Designation: University Research Scholar

Duration: August 2008 - November 2013

1. Institute: University of Kalyani

Department: Biochemistry and Biophysics

Designation: Master student

Duration: June 2005 - August 2005

(M.Sc. Thesis: Isolation, Identification and Characterization of Multiple Drug Resistance Bacteria from Hospital Waste.)

Teaching:

2. Institute: Sarada Ma Girls' College (West Bengal State University)

Department: Microbiology

Designation: Assistant Professor (on contract)

Duration: August 2018 - March 2019.

1. Institute: Jagannath Kisore College (Burdwan University)

Department: Microbiology

Designation: Lecturer

Duration: August 2006 - August 2008.

CURRENT RESEARCH ACTIVITIES:

From the very start of my research carrier, I was grasped by the idea of nanotechnology and it's *probable* immense possibility. After joining IISER Kolkata, I got exposure to a whole new dimension of cutting-edge technologies and multidimensional research activities. Now, at the University of Alberta, I am working on how to distinguish insulator workers by mi-RNA profiling for the onset and progression of COPD. Apart from that, I am also engaged to develop a distinguishing pattern of *sf*-TSLP and *lf*-TSLP (TSLP is an alarming cytokine, and able to initiate different immunological pathways) expression by a nanotechnology-based method. Without losing the connection with my Ph.D laboratory, I am also engaged in some different aspects of nanobiotechnological applications, like, combinatorial therapy of cancer with nanoparticles and ionizing radiation.

EDUCATION:

2008-2013

Ph.D in Microbiology,
Specialization in
Nanobiotechnology.
University of Kalyani, India

2004-2006

M. Sc in Microbiology.
Vidyasagar University, India.
First class with 62.7%

2001-2004

B. Sc (Honors) in Microbiology
Vidyasagar University, India
First class with 62.625%

National level examination qualification:

2. 2016 ICAR-ASRB NET qualified in Agricultural Microbiology. Score: 66%.
1. 2007 GATE qualified in Life Science, organized by IIT-Kanpur. Score: 330, All India Rank: 1599.

SUMMARY OF RESEARCH:

Predoc:

The study of my Doctoral thesis is based on the unique properties of nanomaterials. As the title of my thesis is "**Application of superparamagnetic nanoparticles and its nanocomposite for biomolecular recognition**" the whole work mainly focused on the SPIONs (superparamagnetic iron oxide nanoparticles) and the noble metal, *e.g.* gold, modified SPIONs. The work was aimed at synthesis of SPIONs and surface modification of the same with gold with minimum size increment along with negligible loss of magnetic property, hence vigorous characterization of the particle was done by different techniques TEM. SEM. AFM, DLS, SQUID, XRD, FTIR, etc. Further exploitation in the biological field was done by biomolecular recognition study. The biomolecular recognition property of the synthesized nanomaterial was checked by the interaction of nanomaterial with biomolecules. A crucial outcome of the work is; a 12 nm gold-coated SPION was synthesized, which has the predetermined chemically activated surface patches (like an acupuncture ball) for biomolecule attachment. Hence, the whole nanomaterial is able to detect complementary oligos at the level of pM concentration using the SPR property of the nanomaterial. Another interesting finding is the capability of unmodified SPIONs to extract DNA from a ruptured bacterial cell suspension.

Postdoc:

- Synthesis of polymeric nanomaterial and application as a drug delivery system.
- Molecular dynamics simulation of the nano-bio interface.
- Synthesis of different anti-fungal nanomaterial for different cropping plant systems.
- Synthesis and delivery of drug conjugated (for obstructive airway diseases), different nanomaterials, and their effect on the human pulmonary system.
- Synergistic effect of a metal nanoparticle and ionizing radiation on cancer cells as a possible anticancer treatment.
- Use of biocompatible metal nanoparticle to curb 4th generation XDR bacterial pathogen.

- Synthesis and use of different nanomaterial to induce stress response genes in cropping plant system.
- Treatment of cancer and bacterial pathogens using the natural compound of endophytic origin.
- Synthesis of regenerating enzyme-conjugated nanoparticles for biofuel production.

PUBLICATIONS:

Intellectual property:

Granted:

2. Synthesis of surface active gold nano layer fabricated iron oxide nano composite. **A. Bandyopadhyay**, S. Chatterjee, K. Sarkar. Indian Patent no: 290222.
1. A method for gold nanoparticle mediated delivery process of plasmid DNA into non competent *E. coli* for higher transformation efficiency. S. Chatterjee, **A. Bandyopadhyay**, K. Sarkar. Indian Patent no: 318003.

Original research articles:

10. Individual circadian preference (chronotype) is associated with asthma and allergic symptoms among adolescents. *ERJ Open Research*, 2020. P. Haldar, A-E. Carsin, S. Debnath, S. G. Maity, I. Annesi-Maesano, J. Garcia-Aymerich, **A. Bandyopadhyay**, S. Moitra, M. Kogevinas, S. Moitra.
9. Enhancing the radiotherapeutic index of gamma radiation on cervical cancer cells by gold nanoparticles. *Gold Bulletin*, 2019. P. Yadav, **A. Bandyopadhyay**, A. Chakraborty, Sk. M. Islam, K. Sarkar.
8. The destructive spontaneous ingression of tunable silica nanosheets through cancer cell membranes. *Chemical Science*, 2019. **A. Bandyopadhyay**, P. Yadav, K. Sarkar, S. Bhattacharyya.
7. Exposure to heavy metals alters the surface topology of alveolar macrophages and induces respiratory dysfunction among Indian metal arc-welders. *Toxicology and Industrial Health*, 2018. S. Moitra, J. Ghosh, J. Firdous, **A. Bandyopadhyay**, M. Mondal, J. K. Biswas, S. Sahu, S. Bhattacharyya, S. Moitra.
6. Enhancement of anticancer activity and drug delivery of chitosan-curcumin nanoparticle via molecular docking and simulation analysis. *Carbohydrate Polymers*, 2018. P. Yadav, **A. Bandyopadhyay**, A. Chakraborty, K. Sarkar.
5. Fungal contamination of the respiratory tract and associated respiratory impairment among saw-mill workers in India. *ERJ Open Research*, 2015. A. Adhikari, S. Sahu, **A. Bandyopadhyay**, Paul D. Blanc, S. Moitra.
4. A simple one pot purification of bacterial amylase from fermented broth based on affinity towards starch functionalized magnetic nanoparticle. *Preparative Biochemistry and Biotechnology*, 2014. T. Paul, S. Chatterjee, **A. Bandyopadhyay**, D. Chattopadhyay, S. Basu, K. Sarkar.
3. Potential application of superparamagnetic nanoparticles for extraction of bacterial genomic DNA from contaminated food and environmental samples. *Journal of the Science of Food and Agriculture*, 2013. S. Basu, S. Chatterjee, **A. Bandyopadhyay**, K. Sarkar.
2. Effect of iron oxide and gold nanoparticles on bacterial growth leading towards biological application. *Journal of Nanobiotechnology*, 2011. S. Chatterjee, **A. Bandyopadhyay**, K. Sarkar.
1. Rapid Isolation of genomic DNA from *E. coli* XL1Blue strain approaching bare magnetic nanoparticles. *Current Science*, 2011. **A. Bandyopadhyay**, S. Chatterjee, K. Sarkar.

Publications in conference proceedings:

2. Bacterial growth response on interaction with iron oxide and gold nanoparticles: Measuring risk to the Environment. *IEEE Xplore*. DOI: 10.1109/NSTSI.2011.611986. S. Chatterjee, **A. Bandyopadhyay**, K. Sarkar.
1. A rapid isolation of ultrapure bacterial genomic DNA for genomic studies using bare magnetic nanoparticles. Proceedings of National Conference on Biodiversity & Natural Resource Utilization. 2010. **A. Bandyopadhyay**, K. Sarkar.

Editorial article/Correspondence/Letter to the editor and other types of article:

4. Metabolomics of Respiratory Diseases. In: *Handbook of Experimental Pharmacology*, Springer, 2022. S. Moitra, **A. Bandyopadhyay**, P. Lacy.
3. Mica pneumoconiosis: a neglected occupational lung disease. *The Lancet Respiratory Medicine*, 2018. S. Moitra, **A. Bandyopadhyay**, S. Moitra.
2. Bio-organic Nanoparticles: Breaking the Barrier in Nanoparticle-mediated Pulmonary Drug delivery. *International Journal of Pulmonary & Respiratory Sciences*, 2017. **A. Bandyopadhyay**, S. Moitra.
1. Therapeutic potential of nanoparticulate system for treatment of protozoan infection. *Aperito Journal of Bacteriology, Virology and Parasitology*, 2014. P. Yadav, **A. Bandyopadhyay**.

Articles under communication/preparation status in peer-reviewed journals:

- Use of gold nanoparticles and curcumin conjugated gold nanoparticles as radiation sensitizer and protectant.
- Bident use of bacteria in arsenic bioremediation and biosynthesis of gold nanoparticles– a plausible cost-effective biomining method.
- Carbon nanotube upregulated SLT1 gene via miR-820b/miR-2-3p targeting DICER-DUF-Dead Box helicase TF which induced salinity stress tolerance in jute (*Corchorusolitorius* L).

Abstract published:

11. Pulmonary *Candidiasis* and respiratory impairments among saw-mill workers. 16th Joint National Conference of National College of Chest Physicians (NCCP) & The Indian Chest Society (ICS). November, 2014. Agra. India.
10. In vitro evaluation of iron oxide, gold, and their composite nanomaterials against cancer cell line. International Conference on Polymeric Biomaterials, Bioengineering & Biodiagnostics, October, 2014, New Delhi, India.
9. Rapid detection of Coliform bacteria from water samples using magnetic nanoparticles. 53rd annual conference of Association of Microbiologist of India, November, 2012, KIIT, Orissa, India.
8. A superparamagnetic nanoparticle based approach towards the purification of biomolecules: Nucleic acid and Protein. 4th international conference on Advance Nano materials, ANM 2012, IIT Chennai.
7. One pot synthesis of zero valent iron nanoparticles for it's potential application in waste water treatment. 4th international conference on Advance Nano materials, ANM-2012, IIT Chennai.
6. Surface functionalized gold nanoparticle mediated transformation of non competent *E. coli*: A nanobiotechnological breakthrough. ICNANO (International Conference on Nanomaterials and Nanotechnology) 2011, University of Delhi, New Delhi, India.
5. Synthesis of gold nano layer protected magnetic nanocomposite: A novel approach for developing a biosensor. ICNANO (International Conference on Nanomaterials and Nanotechnology) 2011, University of Delhi, New Delhi, India.
4. Bacterial growth response on interaction with iron oxide and gold nanoparticles: Measuring risk to the environment. NSTSI (International Conference on Nano Science, Technology and Societal Implications) 2011, C. V. Raman College of Engineering, Bhubaneswar, India.
3. A rapid isolation of ultrapure bacterial genomic DNA for genomic studies using bare magnetic nanoparticles. National Conference on Biodiversity & Natural Resource Utilization, Department of Botany, Visva-Bharati, Santiniketan. 2010, West Bengal, India.
2. Synthesis of stable bare magnetic nanoparticles for rapid isolation of ultrapure bacterial DNA for molecular studies. ICNEA (International Conference on Nanobiomaterials on Environmental Applications) 2009, NEERI, Nagpur, India.
1. A comparative study on cultivable and uncultivable bacteria from gut community of *Labeo bata*. IMS (Indian Mycological Society) 2009, University of Calcutta, Kolkata, India.

Gene Bank submission:

1. KF483576.1 (<http://www.ncbi.nlm.nih.gov/nuccore/KF483576.1>).

OTHER ACHIEVEMENT(S):

4. **Research Excellence Award 2020** by Department of Chemical Sciences, IISER Kolkata.
3. **Reviewer** of Toxicology and Industrial Health.
2. **Editorial Board Member** of Aperito Journal of Bacteriology, Virology and Parasitology (AJBVP).
1. Featured in “**Who-is-Who**” section of DRDO funded compendium on Indian Capability On Nano Science And Technology, released on the eve of the Inauguration of “National Workshop on Nanotechnology for Defense Applications” (NWNDA-2011) at Solid State Physics Laboratory, DRDO, New Delhi, India. (Published by: MacMillan publishers India Ltd., bearing ISBN 978-935-059-030-0.)

MEMBERSHIP:

2. Member of Royal Society of Biology.
1. Lifetime member of the Indian Society of Nanomedicine.

CONTACT AND PERSONAL INFORMATION:

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I hereby declare that the above information is correct to the best of my knowledge and belief.

PROFESSIONAL PROFILES:



<https://www.linkedin.com/in/arghya-bandyopadhyay-1a7488142/>



https://scholar.google.com/citations?user=iZDV_swAAAAJ&hl=en