

Curriculum Vitae



Name : **DR. OLY BANERJEE**
Date of Birth : 8th December, 1992
Marital Status : Unmarried
Gender : Female
Nationality : Indian
Phone : (+91)8981119623
Email : olyb@svu.ac.in / olybanerjee812@gmail.com
Residential Address : 96, New Station Road, Bhadrakali, Hooghly – 712201, India

Present Position: Assistant Professor, Department of Medical Laboratory Technology, School of Allied Health Sciences, Swami Vivekananda University, Barrackpore. West Bengal, India.

ORCID ID: 0000-0002-0810-0183

Web of Science Researcher ID: HZL-9989-2023

Academic Qualifications

#	Qualification	University/Institute Name	Institute/College Name
HIGHER / ESSENTIAL QUALIFICATION DETAILS			
1	Doctor of Philosophy	University of Calcutta	Serampore College
2	Master of Science	University of Calcutta	Serampore College
3	Bachelor of Science	University of Calcutta	Raja Peary Mohan College

Awards and Scholarship

Fellowship:

- Indira Gandhi Single Girl Child Fellowship 2013-2015
- SVSCM Fellowship, Department of Higher Education, Government of West Bengal
- SJSGC Fellowship, University Grants Commission, Government of India.

Awards / Recognition:

- Prof. Chandan Mitra Memorial Young Scientist Research Award 2023

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- 1st position in Oral presentation in International Seminar on “Dual Missions of Research and Teaching: a Holistic View of Higher Education” at Serampore College during 5-7 December 2022.
- 1st position in poster presentation competition at PHYSICON 2018 [Theme- Frontiers in Translational Physiology: Molecule to Public Health] held at Serampore College during 22 to 24 November, 2018.

Field of Major Interest

1. Endocrinology and Reproductive Physiology
2. Nutritional Biochemistry
3. Environmental Toxicology
4. Metabolic syndrome

Techniques known

Techniques learned during PG Programme:

- Techniques of animal (mouse and rat) handling and maintenance as per guidelines of the CCSEA (Committee for Control and Supervision of Experiments on Animals).
- Collection of blood (by cardiac puncture and from tail vein) and different tissues from rat and mice
- Experimental Physiology involving kymographic experiments [effect of ions and drugs on toad heart and isolated rat intestine, vagus stimulation on isolated toad heart, bioassay of oxytocin using rat uterus].
- Basic biochemical measurements and clinical biochemistry [Estimation of serum calcium; serum bilirubin; serum alkaline phosphatase; blood glucose; blood creatinine; blood urea; SGPT and SGOT using kit based method].
- Basic haematological techniques
- Surgical techniques including Thyroidectomy, Adrenalectomy, Ovariectomy, Castration, Pancreatectomy and Cryptorchidism
- Study of estrous cycle after unilateral and bilateral ovariectomy
- Histological mammalian tissue preparation

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- Haematoxylin and eosin staining, Periodic acid- Schiff (PAS) staining
- Immunocytochemistry of different mammalian tissues
- Sperm counting and motility
- Isolation of granulosa cells from rat and mouse ovary.
- Statistical analysis of data using parametric and non-parametric tests.

Techniques learned during Ph.D. Programme:

- Isolation of islet cells from rat and mouse pancreas.
- In vitro cell culture of isolated islet cells and viability assay
- Flow cytometry
- SDS- PAGE, Western Blot
- qPCR; Agarose Gel electrophoresis
- Immunohistochemistry and immunofluorescence
- Fluorescence and Phase contrast microscopy
- ELISA: Hormone and Cytokine assays from serum and tissue homogenates of rat and mouse using ELISA-kits
- Isolation and assessment of murine macrophage functions like- Cell Viability assay, phagocytosis, bacterial killing, respiratory burst response etc.
- Assay of antioxidant enzymes like superoxide dismutase, Catalase, Reduced Glutathione, Glutathione peroxidase, Glutathione reductase, lipid peroxidase and myeloperoxidase activities in isolated cells and tissues.
- Statistical analysis using GraphPad Prism and presentation of data using bar, chart, scatter plot, dot plot, box and whisker plot, heat maps, box plot, kernel density plot and violin plot.

Other techniques:

- Spectroscopy
- Electrophoresis
- Chromatography

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Training Details

Did a workshop on the basis of Flow cytometry with hands on training.

Work Experience

- Worked as honorary Research Fellow in Serampore College (Affiliated to University of Calcutta) under Dr Sandip Mukherjee since 2018 February to October 2019.
- Worked as a SVMCM (Govt. of West Bengal) Research Fellow in Serampore College (Affiliated to University of Calcutta) under Dr Sandip Mukherjee since 19 November 2019 to 31 March 2022.
- Worked as a Sabitribai Jyotirao Phule Single Girl Child (UGC, Govt. of India) Research Fellow in Serampore College (Affiliated to University of Calcutta) under Dr Sandip Mukherjee since 01 April 2022 to 30 June 2023.
- **Working as Assistant Professor in the Department of Medical Laboratory Technology, School of Allied Health Sciences, Swami Vivekananda University, Barrackpore since 01 July 2023 to continuing.**

Membership of Scientific Associations/ Societies:

- Associate member of Physiological Society of India (PSI)

Description of the Ph.D. thesis

Title of the thesis: Studies On The Effect Of Ethanol Extract Of *Centella asiatica* On Bisphenol-A (BPA) Mediated Changes In Glucose Homeostasis: Role Of Aryl Hydrocarbon Receptor.

Summary:

Type 2 diabetes mellitus (T2DM) is a leading global cause of mortality. Emerging evidence suggests that chemical contaminants may contribute to T2DM alongside the established risk factors like physical inactivity and obesity. Environmental chemicals have a significant impact on living organisms, including humans, by influencing specific signal transduction pathways. Among them, there are certain pollutants and commercial products referred to as "Endocrine disrupting chemicals" (EDCs) that have the ability to mimic or disrupt the functions of the body's own hormones. Bisphenol-A (BPA) is a pervasive endocrine-disrupting chemical and is known to convey its harmful impact on pancreatic islets through

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estrogen receptors (ERs). While BPA's binding affinity for ERs is significantly lower than that of its natural counterpart, estrogen, recent observations suggested that BPA can activate aryl hydrocarbon receptor (AhR) in certain contexts and interaction between BPA and AhR has raised concerns about potential toxicological effects in endocrine pancreas. Furthermore, tryptophan metabolic pathway was reported as a potential link to BPA-induced gestational T2DM. Yet, a comprehensive understanding of how this pathway impacts glucose regulation and islet cell function remains incomplete. To explore this question, at first, we investigated BPA's (10 and 100 μ g/kg body weight/day for 21 days) potential to activate AhR within pancreatic islets and assessed the protective role of ethanol extract of *Centella asiatica* (CA) (200 and 400mg/kg body weight/day for 21 days) against BPA-mediated toxicity in mouse model. This study also delves into the effects of BPA on the tryptophan (TRP)-kynurenine (KYN) metabolic pathway within the context of the endocrine pancreas and the potential benefits of ethanol extract of *Centella asiatica* (CA).

Our results indicate that BPA effectively triggers the activation of AhR and modulates its target genes within pancreatic islets. In contrast, CA activates AhR but directs downstream pathways differentially and activates Nrf2. Additionally, CA was observed to counteract the disruption caused by BPA in glucose homeostasis and insulin sensitivity. Furthermore, BPA-induced oxidative stress and exaggerated production of proinflammatory cytokines were effectively counteracted by CA supplementation. Additionally, loss of mitochondrial membrane potential (MMP), abnormal cell cycle, and increased apoptosis were implicated in the detrimental impact of BPA on the endocrine pancreas which were effectively counteracted by CA supplementation. Our study also revealed that BPA increased the KYN/TRP ratio and up-regulated the expression of indoleamine 2,3-dioxygenase (IDO1) and tryptophan 2,3-dioxygenase-2 (TDO2), which were potentially mitigated by CA supplementation. Furthermore, BPA disrupted the expression of genes of selected TRP-KYN metabolic pathway enzymes, limiting KYN's use for metabolic processes and making it available for binding to the aryl hydrocarbon receptor (AhR) activated by BPA. CA showed a significant capacity to restore the TRP-KYN metabolic pathway by modulating key enzymes within it.

Additionally, to explore the specific role of AhR and its interaction with ERs to mediate BPA toxicity in pancreatic islets, mice were treated with BPA (10 and 100 μ g/Kg body weight/day for 21 days) with or without intraperitoneal co-treatment of CH22319 (AhR antagonist, 10mg/kg), and ICI182780 (ER antagonist, 500 μ g/kg) in vivo. In vitro study was also carried out with isolated islet cells treated with BPA (1nM), with or without CH22319 (10mM) and ICI182780 (1mM). Both in vivo and in vitro study demonstrated the involvement of AhR in the BPA mediated alteration in insulin secretion, GSIS and expression of insulin, pERK1/2 and pAkt which were counteracted by CH22319 alone or with ICI182780.

In summary, our study suggests that CA influenced AhR signaling to mitigate the disrupted pancreatic endocrine function in BPA exposed mice. By shedding light on how BPA

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interacts with AhR, our research provides valuable insights into the mechanisms involved in the diabetogenic actions of BPA. Our study also establishes that therapeutic targeting of AhR and ER combined might be a promising target against diabetogenic action of BPA. This research identifies BPA-induced disruptions in TRP metabolism as potential target for CA's protective effects, which may help mitigate BPA's diabetogenic impact on pancreatic islets. As a result, CA emerged as a potent agent in neutralizing the diabetogenic effects of BPA to a considerable extent.

Proficiency

Concepts and skills	Endocrinology, Reproductive Physiology, Nutritional Biochemistry, Cellular and Molecular Biology, Mathematical Calculations & Deduction, Analytical Calculations.
Other Concepts/Interests	Computer Basics and Diploma, Ms Office, Origin- graph, Data Handling, Mathematics.
Communication skill	Fluent Communication skills in English, with proper diction. Also capable of writing scientific manuscripts in own research area as well as other field of research.

Publications

- **Banerjee O**, Paul T, Singh S, Maji BK, Mukherjee S. Individual and combined antagonism of aryl hydrocarbon receptor (AhR) and estrogen receptors (ERs) offers distinct level of protection against Bisphenol A (BPA)-induced pancreatic islet cell toxicity in mice. *Naunyn-Schmiedeberg's Archives of Pharmacology* 2024, DOI: 10.1007/s00210-024-03506-9. [IF:3.1]
- **Banerjee O**, Singh S, Paul T, Maji BK, Mukherjee S. *Centella asiatica* mitigates the detrimental effects of Bisphenol-A (BPA) on pancreatic islets. *Scientific Reports* 2024; 14(1):8043. [IF:3.8]
- **Banerjee O**, Singh S, Prasad SK, Bhattacharjee A, Seal T, Mondal J, Sinha S, Maji BK, Mukherjee. Exploring aryl hydrocarbon receptor (AhR) as a target for Bisphenol-A (BPA)-induced pancreatic islet toxicity and impaired glucose homeostasis: Protective efficacy of ethanol extract of *Centella asiatica*. *Toxicology* 2023, 500:153693. [IF: 4.5]
- Singh S, **Banerjee O**, Saha I, Kundu S, Syamal AK, Maji BK, Mukherjee S. Cadmium-Induced Perturbation of Spleen Redox Status: Therapeutic Role of Pumpkin Seed Protein Isolate. *Tox Int.* 2023; 30(3), 279–288.
- **Banerjee O**, Singh S, Saha I, Pal S, Banerjee M, Kundu S, Syamal AK, Maji BK, Mukherjee S. Molecular dissection of cellular response of pancreatic islet cells to

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Bisphenol-A (BPA): A comprehensive review. *Biochem Pharmacol.* 2022 Jul;201:115068. [IF: 5.8]

- Mukherjee S, **Banerjee O**, Singh S. The role of B vitamins in protecting mitochondrial function. In: Ostojic S, editor. *Molecular Nutrition and Mitochondria*. 1st Ed, Academic Press, Elsevier; 2022. p. 167-193.
- **Banerjee O**, Singh S, Prasad SK, Ray D, Banerjee M, Pal S, Kundu S, Maji BK, Mukherjee S. Dichlorophene activates aryl hydrocarbon receptor (AhR) and indoleamine 2, 3-dioxygenase 1 (IDO1) to mediate splenotoxicity in rat. *Drug Chem Toxicol.* 2022 Sep;45(5):2311-2318. [IF: 2.6]
- **Banerjee O**, Singh S, Bose A, Kundu S, Banerjee M, Ray D, Maji BK, Mukherjee S. Therapeutic potential of L-arginine in a rat model of ovarian ischemia-reperfusion injury. *Environ Expt Biol.* 2021; 19:81-88.
- Banerjee M, **Banerjee O**, Singh S, Mukherjee S. Protective Effects of Black Tea (*Camellia sinensis*) Extract on Endosulfan Induced Oxidative Stress, Inflammation and Hepatic Damage in Rats. *Tox Int.* 2022; 29:555-561.
- Prasad SK, Singh S, Bose A, Prasad B, **Banerjee O**, Bhattacharjee A, Maji BK, Samanta A, Mukherjee S. Association between duration of coal dust exposure and respiratory impairment in coal miners of West Bengal, India. *Int J Occup Saf Ergon.* 2021 Sep;27(3):794-804. [IF: 2.4]
- Mukherjee S, **Banerjee O**, Singh S, Maji BK. COVID 19 could trigger global diabetes burden - A hypothesis. *Diabetes Metab Syndr.* 2020 Sep-Oct;14(5):963-964. [IF:10.0]
- Singh S, **Banerjee O**, Bhattacharjee A, Prasad SK, Bose A, Maji BK, Mukherjee S. Effect of individual and combined supplementation of phytoene, phytofluene, and lycopene against nicotine-induced pancreatic islet cell dysfunction. *Tox Environ Health Sci.* 2020; 12(5):11-22. [IF: 1.7]
- Banerjee A, Singh S, Prasad SK, Kumar S, **Banerjee O**, Seal T, Mukherjee S, Maji BK. Protective efficacy of *Tinospora sinensis* against streptozotocin induced pancreatic islet cell injuries of diabetic rats and its correlation to its phytochemical profiles. *J Ethnopharmacol.* 2020 Feb 10; 248:112356. [IF: 5.4]
- Singh S, Nandi A, **Banerjee O**, Bhattacharjee A, Prasad SK, Maji BK, Saha A, Mukherjee S. Cold stress modulates redox signalling in murine fresh bone marrow cells and promotes osteoclast transformation. *Arch Physiol Biochem.* 2020 Oct;126(4):348-355. [IF: 3.0]
- Banerjee A, Das D, Paul R, Roy S, Bhattacharjee A, Prasad SK, **Banerjee O**, Mukherjee S, Maji BK. Altered composition of high-lipid diet may generate reactive oxygen species by disturbing the balance of antioxidant and free radicals. *J Basic Clin Physiol Pharmacol.* 2020 Mar 30;31(3). [Cite Score: 3.6]
- Prasad SK, Bose A, Bhattacharjee A, **Banerjee O**, Singh S, Mukherjee S, Pal S. Radioprotective effect of ethanolic extract of *Alocasia indica* on γ -irradiation-induced

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reproductive alterations in ovary and uterus. *Int J Radiat Biol.* 2019 Nov;95(11):1529-1542. [IF: 2.6]

- Prasad SK, Singh S, Bose A, Prasad B, **Banerjee O**, Bhattacharjee A, Kumar Maji B, Samanta A, Mukherjee S. Combined effect of coal dust exposure and smoking on the prevalence of respiratory impairment among coal miners of West Bengal, India. *Arch Environ Occup Health.* 2019;74(6):350-357. [IF: 1.8]
- Ray D, Bhattacharjee A, **Banerjee O**, Prasad SK, Singh SK, Maji BK, Samanta A, Mondal AC, Mukherjee S. Folic acid and vitamin B12 ameliorate nicotine-induced testicular toxicity in rats. *Biomed.* 2019; 39(2):353-368.
- **Banerjee O**, Singh S, Prasad SK, Bhattacharjee A, Banerjee A, Banerjee A, Saha A, Maji BK, Mukherjee S. Inhibition of catalase activity with 3-amino-1,2,4-triazole intensifies bisphenol A (BPA)-induced toxicity in granulosa cells of female albino rats. *Toxicol Ind Health.* 2018 Nov;34(11):787-797. [IF: 1.9]
- Bhattacharjee A, Prasad SK, **Banerjee O**, Singh S, Banerjee A, Bose A, Pal S, Maji BK, Mukherjee S. Targeting mitochondria with folic acid and vitamin B₁₂ ameliorates nicotine mediated islet cell dysfunction. *Environ Toxicol.* 2018 Sep;33(9):988-1000. [IF: 4.5]

Papers presented in conference/symposia

- Participated in poster presentation competition in PHYSICON (2018). Theme-Frontiers in Translational Physiology: Molecule to Public Health held at Serampore College during 22-24 November 2018.
- Participated oral presentation competition in 26th West Bengal State Science & Technology Congress, 2018, hosted by Sidho Kanho Birsha University.
- Participated in poster presentation competition in 106th Indian Science Congress, 2019, hosted by Lovely Professional University during 3-7 January 2019.
- Oral Presentation in IABMS 2022 held at Sri Sri University, Cuttack, Odisha during 19-21 December 2022.
- Oral presentation in International Seminar on “Dual Missions of Research and Teaching: a Holistic View of Higher Education” at Serampore College during 5-7 December 2022.

Conference/Symposia attended

- Have attended the 2nd state conference of APPI (2014) in Calcutta Medical College, on electrophysiology and experimental physiology.
- Have attended UGC sponsored National Level Seminar organized by Department of

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Microbiology, Ramakrishna Mission Vidyamandir, in collaboration with CSIR-IICB, Kolkata.

Future research plan

I am strongly driven to contribute to research that aims to establish a robust connection between environmental toxicology and the increasing prevalence of metabolic syndrome. In my future research, I intend to concentrate on the following specific area:

- Identifying biomarkers that can effectively monitor therapeutic responses during the onset and progression of diabetes mellitus.
- Validating natural bioactive compounds as a therapeutic agent against onset and progression of diabetes mellitus.

I plan to employ a multi-omics approach, incorporating genomics, transcriptomics, proteomics, and metabolomics, to conduct a thorough analysis of molecular changes linked to the onset and progression of diabetes. Additionally, I will utilize longitudinal studies involving preclinical models, intervention trials, and retrospective analyses of clinical cohorts. Advanced statistical and bioinformatics tools will be employed for data integration, aiming to identify robust biomarker candidates.

Name and address of the referees:

1. Dr. Sandip Mukherjee (Ph.D. Supervisor)

Associate Professor

Department of Physiology, Serampore College (Affiliated to University of Calcutta)

9 William Carey Road, Serampore, Hooghly-712201

West Bengal, India

Mobile number: +91-9088014072 / 9830632675

E-mail: sandip@seramporecollege.ac.in / sm_kdc@yahoo.co.in

2. Dr. Bithin Kumar Maji (Ph.D. Joint Supervisor)

Associate Professor

Department of Physiology, Serampore College (Affiliated to University of Calcutta)

9 William Carey Road, Serampore, Hooghly-712201

West Bengal, India

Mobile number: +91-9433509890

E-mail: bm_scp@yahoo.in

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3. Dr. Kaushik Bharati

Team Lead, COVID-19 Research Trackers - UNESCO

New Delhi, India.

Mobile number: +91-9910331170

E-mail: dr.kaushik.bharati@gmail.com

I hereby declare that all the particulars stated above are true to the best of my knowledge and belief.

Date: 31/01/2025



Ms. Oly Banerjee