Surajit Ganguly, PhD.

Chronic Disease Biology – Neuroscience & Drug Discovery

Profile: Dr Surajit Ganguly is a Team Lead Scientist at JH-IMM in Hamdard University (Jamia Hamdard) with over 19 years (post-PhD) of experience in the field of molecular neuropsychiatry and neuropharmacology, including research on circadian regulation of serotonin (5HT) acetylation and melatonin synthesis in higher mammals. While working with Dr. David Klein at NIH, Bethesda USA, he discovered the post-translational cellular mechanism of serotonin (5HT) acetylation in higher mammals, including humans, which is considered to be the primary mechanism driving daily rhythm in melatonin production. He has a PhD degree in Science (Biochemistry) from Jadavpur University (CSIR fellow at Indian Institute of Chemical Biology). He was trained in molecular and cellular Neurosciences during his post doctoral period at National Institute of Health (NIH), Bethesda, Maryland. He previously held various US Federal Government Scientific positions at NIH and subsequently, was a research faculty at Johns Hopkins Medical Center, Baltimore, before relocating to India. He is a recipient of Award of Merit from the US public health service at NIH and Prof. B Uvnas Prize (Gold Medal) from the Indian Pharmacological Society including several other awards and fellowships. He has authored about 27 research articles in high impact journals with an average impact factor of >6 per publication. He was an invited speaker and chaired sessions in several International and national symposiums including Gordon Research Conferences. He also served as guest faculty for DST (SERB) sponsored International schools on chronobiology research and regularly participates in peer-review process for several International journals and grant proposals from national agencies.

Research Interest: The overall goal of his laboratory at JH-IMM is to understand the role of metabolic acetate as epigenetic modifier in psychiatric disorder and CNS-specific tumors. The central question being asked is how various metabolic acetate donors can regulate epigenetic mechanisms to protect neuropsychiatric behavioral abnormalities. He is using combination of in-vitro (cell-based) and in-vivo (rodent models) techniques to screen and identify exogenous metabolic acetate donors as acetate supplements and /or related intrinsic factors that interfere and protect phenotypic changes in animal models that correlate with selective, well-documented behavioral parameters in psychiatric patients. Currently, the lab is using two animal model systems: (a) drug-induced mouse model for experimental psychosis; and (b) chronic infection model in rodents. These models provide an opportunity to investigate a therapeutic paradigm for neuropsychiatric disorders with possibilities to extend to other CNS related disorders.

The following funded research projects (as PI) are being implemented to address the above central question.

A. Role of acetate metabolism in neuronal function and CNS Tumor: One of the research goals of Dr. Surajit Ganguly's laboratory is to identify small-molecule translational markers that might ensure progress in understanding the relationship between the NMDA-modulated animal models and the symptoms associated with psychiatric spectrum disorders. Dr. Ganguly is now studying to decipher the regulation of epigenetic acetylation induced by metabolic supplements in drug-induced animal models. This area of research is funded by DBT (BT/PR11062/Med/10/124/208) and DHR (HRD/SUG-15/2015-16).

PhD Scholar: Mr. Arnab Chowdhury, MSc (ICMR SRF).

Research Associate/ Consultant: Dr Subhendu Seth

B. Relationship between Parasite/Bacterial infection and Neurodevelopmental disorder: There is a developing idea that environmental factors, like maternal infection and transmission to fetus could play a major role in fetal neurogenesis. Though strong, these studies are correlative in nature and lack molecular or mechanistic support. Dr. Ganguly's goal is to bridge these gaps by testing a mechanistic link between Recombinant Bacteria infection model (developed by Dr Sudeshna Kar) or Parasites like Toxoplasma Gondii (RH Strain is a gift from Dr. Nancy Malla, PGIMER Chandigarh) and neonatal neurodevelopmental abnormalities. Dr. Ganguly, in collaboration with Dr. Sudeshna Kar, is developing animal models to study the mechanistic relationship. This research has been initiated with support from DST (D.O. No. SR/SO/HS-01/2009).

PhD Scholar: Ms. Priya Gusain, MSc (CSIR fellow).

Collaborator(s): Dr. Sudeshna Kar, JH-IMM; Dr. Subha Shukla, and Dr. Gautam Palit, CDRI, Lucknow,.

Selected Publications and Book chapter:

Ganguly S *, Klein D C. (2017) The Timezyme and Melatonin: Essential Elements of Vertebrate Timekeeping, pp 503-520; *In* Biological Timekeeping: Clocks, Rhythms and Behaviour (V. Kumar ed; Publisher Springer India),

* Corresponding Author

Singh S, Choudhury A, Gusain P, Parvez S, Palit G, Shukla S, Ganguly S. (2016) Oral acetate supplementation attenuates N-methyl D-aspartate receptor hypofunction-induced behavioral phenotypes accompanied by restoration of acetyl-histone homeostasis. Psychopharmacology (Berl) 233(7):1257-68.

Choudhury A, Singh S, Palit G, Shukla S, Ganguly S (2016) Administration of N-acetylserotonin and melatonin alleviate chronic ketamine-induced behavioural phenotype accompanying BDNF-independent and dependent converging cytoprotective mechanisms in the hippocampus. Behav Brain Res. 297:204-12.

Chatterjee M, Verma R, Ganguly S,* and Palit G * (2012) Neurochemical and molecular characterization of ketamine induced experimental psychosis model in mice. Neuropharmacology. 63 (6):1161-1171;*Corresponding authors

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Bailey MJ, Coon SL, Carter DA, Humphries A, Kim JS, Shi Q, Gaildrat P, Morin F, Ganguly S, Hogenesch JB, Weller JL, Rath MF, Møller M, Baler R, Sugden D, Rangel ZG, Munson PJ, Klein DC. Night/day changes in pineal expression of >600 genes: Central role of adrenergic/cAMP signaling. J Biol Chem. 2009 Mar 20;284(12):7606-22.

Szewczuk LM, Saldanha SA, Ganguly S, Bowers EM, Javoroncov M, Karanam B, Culhane JC, Holbert MA, Klein DC, Abagyan R, Cole PA. De novo discovery of serotonin N-acetyltransferase inhibitors.J Med Chem. 2007 Nov 1;50(22):5330-8. Epub 2007 Oct 9

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Ganguly S, Weller JL , Ho A , Chemineau P, Malpaux B, Klein DC .
Melatonin synthesis: 14-3-3-dependent activation and inhibition of arylalkylamine N-acetyltransferase mediated by phosphoserine-205. Proc Natl Acad Sci U S A. 2005 Jan 25;102(4):1222-7.

Zheng W, Zhang Z, Ganguly S, Weller JL, Klein DC, Cole PA.
Cellular stabilization of the melatonin rhythm enzyme induced by nonhydrolyzable phosphonate incorporation. Nature Struct Biol. 2003 Dec;10(12):1054-7.

Ganguly S, Coon SL, Klein DC. Control of melatonin synthesis in the mammalian pineal gland: the critical role of serotonin acetylation. Cell Tissue Res. 2002 Jul;309(1):127-37.

Ganguly S, Gastel JA, Weller JL, Schwartz C, Jaffe H, Namboodiri MA, Coon SL, Hickman AB, Rollag M, Obsil T, Beauverger P, Ferry G, Boutin JA, Klein DC. Role of a pineal cAMP-operated arylalkylamine N-acetyltransferase/14-3-3-binding switch in melatonin synthesis. Proc Natl Acad Sci U S A 2001 Jul 3;98(14):8083-8088

Obsil T, Ghirlando R, Klein DC, Ganguly S, Dyda F. Crystal structure of the 14-3-3zeta:serotonin N-acetyltransferase complex. a role for scaffolding in enzyme regulation. Cell 2001 Apr 20;105(2):257-267