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Could not win thee sleep: Metabolic cost of sleep debt

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This presentation will discuss recent translational discoveries from our group that demonstrate metabolic profiling using cutting edge NMR spectroscopy and mass spectrometry are instrumental in understanding the biology of sleep and chronobiology. Sleep or sleep like behavior is conserved in almost all animal species across the evolutionary timescale. The physiological role of sleep to increased quality of life is known but not well understood. It is believed that sleep serves as a compensating mechanism for the systemic tax related to the activities during wakefulness. In spite of clear health benefits, sleep curtailment is an overwhelming and prevalent burden across the globe. Decreased sleep and sleep disorders are associated to life threatening diseases including cardiometabolic ailments and cancer. Using metabolomics technologies, we have shown in a rat model that sleep restriction imparts significant changes in hepatic metabolic profiles. Similar changes are also heavily manifested in circulatory peripheral metabolites and lipids. Together, these observations demonstrate a shift in oxidative metabolism. In humans, sleep restriction leads to global metabolic shift associated to alteration in energy metabolism. We have further demonstrated that metabolic changes are manifested in chronic diseases such as insomnia associated with decreased quality and quantity of sleep. These studies reveal that insomnia rewires the metabolic network to induce night-time catabolic activities and significantly affects the metabolic oscillation during the diurnal day. Some of the changes are associated to altered metabolic networks preceding type 2 diabetes hence reaffirming the notion that altered sleep leads to metabolic diseases. Finally, we posit that these types of studies will be critical in clinics for unraveling sleep deprivation related disorders and their treatment.

Biography

Arjun Sengupta is a Chemist who has received his PhD training in the fields of Metabolomics of Infectious Diseases and NMR Spectroscopy. Currently, he is working in the Laboratory of Aalim M Weljie in University of Pennsylvania. His research interest involves deciphering the link between metabolism, sleep and circadian rhythm and how such links can be exploited for translational and clinical purpose. He uses high resolution NMR spectroscopy and mass spectrometry to profile tissues and biofluids from sleep restricted animals and human recruits to explore the connection between sleep, metabolism and other phenotypes related to disease and aging. His research in the field of Metabolomics of insomnia and sleep restriction unraveled crucial changes in metabolic pathways that may explain some of the clinical manifestation of sleep curtailment.

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