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Circadian Regulation of Metabolism for the Prevention and Treatment of Metabolic Diseases

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Circadian timing system is a dynamic integrator of genome-environment interaction. Chronic circadian rhythm disruption increases risk for numerous chronic diseases. Therefore, approaches to sustain robust circadian rhythm hold untapped potential to prevent or reverse chronic diseases. Time-restricted feeding/eating (TRF/TRE; 8-12 h food access in the active phase) without changing nutrient quantity or quantity improves circadian rhythms and aligns them appropriately to the period of fasting or feeding. Subjecting rodents to TRF prevents excessive weight gain, adiposity, glucose intolerance, systemic inflammation, hepatosteatosis and hypercholesterolemia independent of diet type. Rodents on TRF also show increased endurance, motor coordination, and brown fat function. When high fat diet induced obese mice or mice with genetic predisposition to obesity are subjected to TRF, they also experience similar therapeutic benefits. TRF does not alter the major gut microbiome composition, yet it modulates gut metabolism of carbohydrates and bile acids. Unbiased assessment of the temporal changes in transcriptome, metabolome and gut microbiome revealed TRF exerts pleiotropic effect on metabolism in multiple tissue types in both rodents and insects. To test the translational potential of TRF in humans, we have begun to monitor

daily eating pattern using a novel unbiased, evidence-based, and scalable method. Preliminary data shows erratic eating pattern with extended period of frequent caloric intake events that potentially maintains a post-prandial metabolic state in humans in widespread. Time-restricted feeding without overt attempt to alter nutrition quality or quantity might be a potential new lifestyle intervention to improve human health.

Conflict of interest: Dr. Panda has published a book titled "The Circadian Code"

Biography

Satchidananda (Satchin) Panda is a professor at the Salk Institute, La Jolla, California, where his research focuses on the circadian regulation of behavior, physiology and metabolism in model organisms and in humans. Recently he discovered that maintaining a daily feeding-fasting cycle – popularly known as Time-restricted eating (TRE) – can prevent and reverse metabolic diseases. Based on a feasibility study in humans, his lab is currently carrying out a smartphone based study (www.mycircadianclock.org) to assess the extent of circadian disruption among adults.