Run, eat, sleep, repeat: Hypothalamic integration of homeostatic and circadian signals.

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Project description:

Maintaining regular patterns of physical exercise, meals, and sleep are accepted as key to enjoying a long and healthy life. Such schedules act to strengthen our 24h body clock, ensuring that it is optimally aligned with our social and physical environment. In turn, the body clock regulates parts of the brain that control how much we eat and sleep. These brain areas also communicate with the body clock so that we initiate and terminate our meals and sleep cycles at the right times of the day and night. Disruptions to daily patterns in behavior, such as occurs with shiftwork, are detrimental to our health, weakening our body clock and altering both the time of day at which we exercise, eat, and sleep as well how much we eat, drink, and rest. This results in excessive body weight gain and poor heart and mental health.

The brain's hypothalamus contains both the body clock as well as the centres that regulate how much we eat and sleep. Unfortunately, the brain chemical that it is used to communicate between the body clock and these other key areas of the hypothalamus is unknown. A good candidate is the brain's melanocortin system and in this project, the student will use mice and study how activating or inhibiting melanocortin signaling within the hypothalamus affects its control of if, when and how much we eat, sleep, and exercise. Further, the effects of altering this brain chemical on the response to simulated shiftwork will be explored. It is anticipated that some changes with this chemical signal will facilitate re-adjustment to changes in shift-work schedules. This mouse work will be complemented by using the UK biobank and evaluating if alterations in melanocortins signaling in the human brain have similar effects on sleep, physical activity, and well-being. This could result with the development of agents useful to combat the long-term health consequences of shiftwork.