Scripps Research

Hacking our body clocks to optimize health

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ABOUT THE LECTURE

With broad insights into biological rhythms, Katja Lamia discussed how our bodily processes change over 24 hours to synchronize with the daily shifts in our environment. She revealed the molecular machinery underpinning internal timekeeping and showed how their rhythmic activity influences our metabolic health and response to exercise. Lamia also alerted us to the risks of disrupting our daily cycles and what this could mean for shift work and jet lag.

TOP TAKEAWAY POINTS

1. The body's internal timekeeping system is called the circadian clock (*circa* meaning "about" and *dian* referring to "a day"). It is the biological clock that oscillates over a 24-hour period, controlling many of our physiological processes, from body temperature and blood pressure to hormone levels and sleep. **Daily rhythms are seen across nearly all organisms, enabling them to respond to changes in their external environment.**

2. At the molecular level, **these rhythms are generated by a series of genes and proteins** which act together in feedback loops, much like an electrical circuit. Levels of these genes and proteins fluctuate throughout the day, switching on and off certain activities in different tissues.

3. While our master clock resides in the brain, each organ also has its own circadian clock. Lamia observed in mice that **disruptions to the clock in the liver had profound effects on metabolic health**. Without a functioning liver clock, normal rhythms in blood sugar are lost, causing abnormal responses to fasting and feeding.

4. Increasing data show that **major long-term disruptions to our circadian rhythms, such as shift work, can elevate our risk for many different diseases, including cancer.** Using a mouse model with a predisposition toward lung cancer, Lamia and her team witnessed a near 70% increase in tumor growth in mice exposed to light conditions mimicking rotational shift work.

5. In this experimental model of shift work, researchers have determined certain genes normally activated by heat appear to be involved in the cancer's growth. Since shifts in body temperature have been observed in people who experience circadian disruption, **the research may point to temperature monitoring as a potential way of protecting shift workers at risk of cancer.**