Intrinsic disorder plays a role in conserving the circadian circuit

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Video Byte

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Abstract

Over billions of years of evolution, the rhythm of Earth's day and night – the diurnal cycle – has remained one of very few constants. As a result, all kingdoms of life have evolved internal time-keeping mechanisms. Organisms with the ability to maintain a circadian clock have an evolutionary advantage in both survival and reproductive rates, and disruption of circadian rhythms has been linked to disease states, including obesity, heart disease, diabetes, depression, and cancer. As shift work, stress, digital devices, and health conditions can disrupt our internal clocks, better understanding of how they function is needed. A new review of the circadian circuit examines the role of protein disorder in maintaining clock function. In animals and fungi, the circadian clock functions as a protein-directed feedback loop, with the positive arm stimulating the negative arm. This oscillation relies on intrinsic disorder in the structure of the proteins involved, which controls everything from timing and regulation of output to the capacity of the clock to respond to cellular conditions. This observation provides insight into the timing mechanisms underlying the circadian clock, inspiring new studies of why protein disorder is important in circadian clock function.