

# The 65th Frontier Brain Science Seminar

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## Understanding Why We Sleep: Insights from Animal Models

演者: 林 悠 先生

東京大学大学院理学系研究科生物科学専攻 教授  
筑波大学国際統合睡眠医科学研究機構 客員教授

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場所: 日医エオードトリウム (医薬イノベーションセンター1F)

### Abstract

Fundamental questions related to sleep such as “Why is sleep essential?” and “How are dreams generated?” remain unsolved. We recently identified a brainstem circuit that operates as the central switch that induces REM sleep in mice (ref. 1). This allowed us to generate mice in which REM sleep can be increased or decreased at a desired time point, and to identify circuits that control forebrain activity during REM sleep. In addition, based on imaging approaches focusing on cerebral blood flow, we found that REM sleep is characterized by extremely high cerebral capillary blood flow, suggesting a crucial role for REM sleep in brain maintenance (ref. 2).

Considering that all animals investigated so far exhibit sleep, sleep might serve a highly conserved basic role. Based on an unbiased screening using the worm *C. elegans*, we found that endoplasmic reticulum (ER) factors that are involved in protein quality control strongly affect sleep amount, both in worms and mice (ref. 3). I will discuss the possibility that sleep evolved to cope with ER stress.

### References

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2. Cerebral capillary blood flow upsurge during REM sleep is mediated by A2A receptors. Chia-Jung Tsai, Takeshi Nagata, Chih-Yao Liu, Takaya Suganuma, Takeshi Kanda, Takehiro Miyazaki, Kai Liu, Tsuyoshi Saitoh, Hiroshi Nagase, Michael Lazarus, Kaspar Vogt, Masashi Yanagisawa, Yu Hayashi. *Cell Reports* 17:109558 (2021).
3. ER proteostasis regulators cell-non-autonomously control sleep.  
Taizo Kawano, Mitsuaki Kashiwagi, Mika Kanuka, Chung-Kuan Chen, Shinnosuke Yasugaki, Sena Hatori, Shinichi Miyazaki, Kaeko Tanaka, Hidetoshi Fujita, Toshiro Nakajima, Masashi Yanagisawa, Yoshimi Nakagawa, Yu Hayashi. *Cell Reports* 42(3):112267 (2023)

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Organizer: Seung-Min Um (RCIBS/Dept. of Biochemistry) (Ext. 7228)