(B01)低体温誘導の記憶へのリスクと可塑性

研究代表者：Michael Lazarus

Visit duration：From June 1, 2017 to August 31, 2017

Affiliation　　：Department of Physiology, Anhui Medical University

Place of visit　：WPI-International Institute for Integrative Sleep Medicine, University of Tsukuba

Name/Title　　：　Dr. Qi Xu

From June 1, 2017 to August 31, 2017. Dr. Qi XU from the Department of Physiology, Anhui Medical University, was working with Associate Professor Michael Lazarus at the WPI-International Institute for Integrative Sleep Medicine, University of Tsukuba.

Dr. Xu focuses on the neuronal circuits by which the brain regulates the body temperature, cognitive functions, and even the sleep and wakeful consciousness. Employing the innovative genetically or chemically engineered systems (optogenetics and chemogenetics), he wants to find out the neuronal circuits of defined sets of neurons with neurobehavioral and electroencephalographic outcomes in behaving animals.

Astronauts suffer serious health risks, such as insomnia and core body temperature increase while in space, and which could be putting their lives in danger. Previous studies found that the astronauts' core body temperature increases by roughly 1° C on long-duration missions. An elevated body temperature impairs physical and cognitive performance, and on average astronauts get less than six hours sleep a night on orbiting space shuttles, which may even induce a mild state of systemic inflammation.

The nucleus accumbens (NAc) comprises a contingent of neurons specifically expressing the postsynaptic A_{2A}-receptor ($A_{2A}R$) subtype making them excitable by adenosine, the endogenous $A_{2A}R$ agonist endowed with powerful sleep-promoting properties. Dr. Xu and colleagues manipulated NAc $A_{2A}R$-expressing neurons by using both optogenetics (for an acute activation) and chemogenetics (for a long-lasting activation), activation of $A_{2A}R$-expressing neurons in NAc promotes slow-wave sleep by increasing the number and duration of episodes (Fig. 1). And they found that the role in sleep played by $A_{2A}R$-expressing neurons within NAc core is mediated by their inhibitory projections to GABAergic ventral pallidum neurons. Finally, their results showed that in presence of positive stimuli (tasty food, female littermates), animals spent more time awake in depend of time in slow-wave sleep. likely

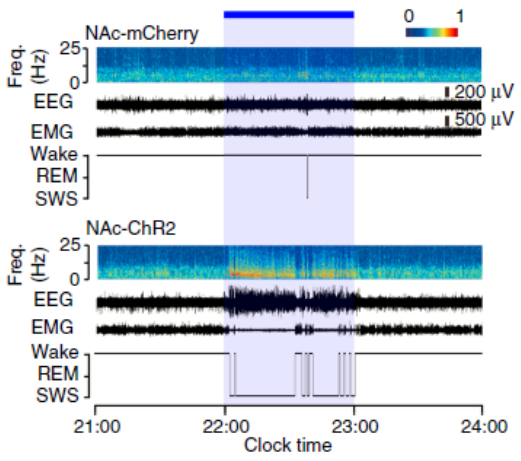

Fig.1 Optogenetic stimulation of $A_{2A}R$ neurons in the NAc evoked a rapid and robust sleep response.

Reference: Yo Oishi, Qi Xu, Lu Wang, Bin-Jia Zhang, Koji Takahashi, Yohko Takata, Yan-Jia Luo, Yoan Cherasse, Serge N. Schiffmann, Alban de Kerchove d'Exaerde, Yoshihiro Urade, Wei-Min Qu, Zhi-Li Huang, Michael Lazarus. Slow-wave sleep is controlled by a subset of nucleus accumbens core neurons in mice. Nature Communications, doi: 10.1038/s41467-017-00781-4.