

The 51st Frontier Brain Science Seminar

Sponsored by Research Center for Idling Brain Science (RCIBS)

A Novel Neuronal Circuit that induces Hibernation-like State in Mice

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Date: 4th December, 2020 (FRI.) 17:00~18:30

Venue: Seminar Room 8 School of Pharmacy and Pharmaceutical Sciences Bldg. (U3), 7F



Live streaming by Zoom is also available.

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Abstract

Some mammals actively lower their body temperature to reduce energy expenditure when facing food scarcity, a state known as hibernation. Hibernating animals fully recover to a normal condition with no organ or tissue damage. Because a hypometabolic state could be beneficial for many medical applications, this ability has evoked great interest. We found that chemogenetic excitatory manipulation of a neuronal population in the anteroventricular periventricular hypothalamus, that express neuropeptide Qrfp, (Quiescence-inducing neurons, Q neurons) induces a long-lasting hypothermic/hypometabolic state similar to hibernation (Q neurons-induced hypometabolic state, QIH). Q neurons act mainly on the dorsomedial hypothalamus to induce the QIH. We also found that glutamatergic neurotransmission in Q neurons is important for inducing QIH, but GABAergic neurotransmission also plays a role. In the QIH, although body temperature and O₂ consumption were maintained very low, ability to regulate metabolism and behavior was conserved, showing a stark contrast to hypothermic states induced by anesthesia. No obvious tissue/organ damage or abnormalities in behavior were observed after recovery. This finding opens the door to the development of induction of a hibernation-like state, which would have potential applications in non-hibernating mammalian species including humans.

※ This seminar is eligible for credit accreditation for Graduate School of Medicine and Pharmaceutical Sciences for Education.

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