

Memory-enhanced mice provide clues to the treatment of memory impairments

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Memory has been a subject for philosophy and psychology for a long time because of its essential nature of human behaviors and thought. Localization of memory in the brain was proved only six decades ago, and the existence of flexibility of neuronal network (neuronal plasticity) was scientifically established a few decades ago. Recently, we are able to approach the molecular mechanisms underlying memory using genetically-modified animals thanks to the great advances in molecular biology. In this talk, I discuss the genetically-modified mice with enhanced memory including our ICER (inducible cAMP early repressor) KO and overexpressing mice lines. ICER knockout mice showed the enhanced long-term memories in the tasks such as fear conditioning and Morris water maze. On the other hand, ICER overexpressing mice showed the impaired long-term memories. However, the short-term memory was intact in both KO and overexpressing mice. The opposite phenotypes of ICER KO and overexpressing mice suggest the important role of cAMP and CREB/ICER systems in long-term memory. In addition, I discuss that the mice with enhanced memory will provide potential clues to overcome memory deficits associated with aging, disease and traumas.