

Roles of orexin neurons in motivated behaviors in rats

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Orexin neurons regulate physiological functions, including not only energy homeostasis and wakefulness, but also motivated behaviors. These neurons seem to play important roles in linking metabolic need to motivated behaviors via the dopaminergic system. Recently, we developed a rat model that expresses the Cre recombinase specifically in orexin neurons. Moreover, we established the gambling test for assessing reward motivation and decision-making under conditions of uncertainty, as well as a touch-screen system for assessing reward sensitivity and craving. Here, we examined the roles of orexin neurons in reward motivation and decision-making when orexin neurons are manipulated using pharmacogenetics approaches. In the gambling test for rodents, cell-specific excitatory manipulation of orexin neurons of rats using the DREADD technology resulted in risky arm-choice. Positive, but not negative, reward prediction error may contribute to reward-based risky choice when orexin neurons are activated. The motivational values of a large reward was increased when orexin neurons were activated by the DREADD technology. In the probability reversal learning test, cell-specific excitatory manipulation of orexin neurons resulted in low performance in rats. These results suggest that activated orexin neurons affect motivational processes, and may alter strategy in reward-based choice behavior, potentially leading to an action that fails to yield rewards and detect changes in reinforcement contingencies.