

Sex-differential expression of mu-opioid receptor 1 in noradrenergic neurons of the A7 and paraventricular nucleus of the thalamus

Abstract

Norepinephrine (NE) neurons are important for many different functions, such as arousal, attention, mood, memory, appetite, and homeostasis. Opioid-mediated modulation of the NE system plays an important role in sleep-wake regulation, pain management, and sensory integration. Previous research has shown that NE subpopulations perform a variety of functions according to genetic lineage. MOR1 has been implicated in the NE regulation of the hypoglossal (XII) nerve during sleep states, and sex differences in MOR1 expression have shown that females have higher rates of certain sleep disorders, especially among chronic opioid users. The present study aimed to characterize sex differences in MOR1 expression in NE neurons of the A7 and PVT. Using immunohistochemistry, MOR1 expression was mapped in NE neurons of the A7 and PVT in 4-6 week-old male and female C57BL/6J mice. It was found that male mice had higher MOR1 expression in A7 NE neurons compared to female mice ($P=0.03$). However, males and females did not differ in MOR1 expression in PVT NE neurons. MOR1 expression also did not differ between NE neurons of the A7 and PVT. Our findings suggest that sex differences in opioid use-related sleep disorders may be in part due to sex-differential expression of MOR1 in A7 NE neurons, which has clinical implications for the treatment of patients with these disorders. However, more research is needed to fully characterize the relationship between sex and MOR1 expression in the NE system.