1. No.
   2021G006

2. Title
   Effect of nicotine on plasticity of dopaminergic neuron in Pavlovian conditioning

3. Period
   2021-2023

4. Summary
   Pavlovian conditioning is a fundamental process in which organisms learn about their environment by associating stimuli with rewards, acquiring behaviors that are beneficial for survival, and promoting adaptation to their surroundings. During the early stages of Pavlovian conditioning, dopamine neurons in the ventral tegmental area (VTA) do not initially respond to reward stimuli. However, once conditioning is established, they respond to reward stimuli and secrete dopamine. To investigate the mechanism of plasticity in VTA dopamine neurons during this process and the involvement of nicotine, we established a Pavlovian conditioning experiment. We examined the impact of nicotine administration on conditioned learning behavior. Mice administered with nicotine showed a significant increase in conditioned responses during the presentation of conditioned stimuli compared to control mice. This study found that the enhancing effect of nicotine on Pavlovian conditioning behavior was not observed when VTA dopamine neurons were inactivated using 6-OHDA. This suggests that VTA dopamine neurons play a crucial role in this process. Furthermore, a positive correlation was found between conditioned responses and the number of c-Fos-positive cells in the bed nucleus of the stria terminalis (BNST), known as an upstream brain region of VTA dopamine neurons. Furthermore, conditioned responses were inhibited when the neural activity of BNST was suppressed by KORD. These findings suggest that the neural circuitry between BNST and VTA regulates Pavlovian conditioning learning. In the future, we will further develop the system to detect phosphorylated substrates *in vivo* and analyze phosphorylation signals in conditioned learning.