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2. **Title**

   Effects of Smoking on Taste Perception in the Insular Cortex

3. **Period**

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4. **Summary**

It is believed that smoking is one of risk factors for taste disorder. Nicotine easily reaches brain through the blood brain barrier. Thus, it is possible that neuronal activities in taste-related brain areas such as the parabrachia nucleus, solitary tract and insular cortex, are modulated by nicotine, and consequently taste perception is modulated. However, little information is available for this idea. In this study, we examined how nicotine modulates synaptic plasticity in pyramidal neurons of the mouse insular cortex. We found that activation of nAChRs oppositely modulated synaptic potentiation in layer 3, 5 and 6 pyramidal neurons of the insular cortex. In layer 3 and 5 pyramidal neurons, activation of nAChRs depressed synaptic potentiation induced by combination of presynaptic stimulation with postsynaptic depolarization (paired training) through enhancing GABAergic synaptic transmission via activation of β2-containing nAChRs in non fast-spiking interneurons. By contrast, in layer 6 pyramidal neurons, activation of nAChRs enhanced synaptic potentiation through activating postsynaptic β2-containing nAChRs. We also found that in layer 5 pyramidal neurons of the mouse insular cortex, activation of nAChRs facilitates synaptic depression. Furthermore, the interaction between nAChRs and dopamine receptors plays an important role in modulation of synaptic activities in layer 5 pyramidal neurons of the mouse insular cortex. Thus, it is strongly suggested that smoking induces these synaptic changes in the insular cortex and affects taste perception.