1. **No.**

   FP01806078

2. **Title**

   Effect of nicotine on central system regulating glucose metabolism via olfactory system

3. **Period**

   2017-2019

4. **Summary**

Olfactory dysfunctions are associated with increased risk of many diseases, including diabetes. One of the major adverse factors is smoking. In the present study, we therefore investigated the functional relationship between olfactory and metabolic system, and the influence of smoking-related factors on this inter-organ network system in mice. To this end, we established a new method that can accurately provide olfactory sensory information to mice, and successfully detected their smell preference. When fasted mice were exposed to food odor by using this apparatus, hepatic gluconeogenesis was reduced, whereas serum NEFA levels were elevated via lipolysis in the white adipose tissue. Repetition of such olfactory stimulation improved insulin sensitivity in diet-induced obese mice. Lipid utilization triggered by olfactory stimulation was 1) augmented by direct effect of nicotine, 2) enhanced by indirect effect of nicotine via promotion of olfactory memory, but 3) inhibited by cigarette smoke extract (CSE). Thus, nicotine, a main constituent of cigarette, has the ability to enhance the functional link between olfactory and metabolic system to maintain energy homeostasis; however the benefit appears to be lost by other constituents, like CSE. Therefore, smoking needs to be avoided for protecting olfactory functions and for preventing metabolic disorders, including diabetes.