No. 2336

Study of Neural Mechanisms Underlying Salt Preference Learning

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Summary

It is known empirically that salty taste enhances the taste of food, but the mechanism of this enhancement is not fully understood. It is known that when rats are repeatedly exposed to sodium deficiency, they develop a preference for hypertonic saline solution, which they normally dislike. This is thought to be due to the fact that hypertonic saline relieves the discomfort caused by sodium deprivation, and thus, the rats learn to prefer a strong salty taste. Since neurons in the basolateral amygdala (BLA) respond to salty stimuli, we aimed to identify the input pathway to the BLA that is involved in salt taste preference learning.

The retrograde neural tracer Fluoro-Gold (FG) was injected into the BLA of transgenic rats expressing eGFP as well as Fos protein, a marker of neural activity (Fos-eGFP rats). The experimental group received furosemide (FRO), a diuretic and antihypertensive drug, and 24 hours later, 3% NaCl solution was presented for 30 minutes. The control group received saline (SAL) instead of FRO. This trial was performed twice (Test 1 and 2), and followed by perfusion 90 minutes after the end of the second presentation of 3% NaCl solution.

The experimental group consumed more NaCl solution than the control group. The consumption of the second test was also higher than that of the first, although not significantly so. Histological experiments revealed that many FG-labeled neurons were in the paraventricular thalamus (PVT). The number of GFP-expressing neurons in the PVT was significantly higher in the experimental group than in the control group.

Our study provides evidence that repeated sodium deprivation leads to increased consumption of 3% NaCl solution, indicating the establishment of a salt taste preference. A large number of FG-labeled neurons in the PVT and higher expression of GFP-expressing PVT neurons in the experimental group suggest that neurons projecting from the PVT to the BLA play a role in salt taste preference learning.