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Effects of olfaction on taste differentiation in the mouse

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Taste and smell have been studied as independent sensory system, however, to understand the complex process of eating, it is important to study the relationship between them. For example, the sweetness of sugar or chocolate is not sensed if the nose is pinched closed while eating. However, the sweetness will be sensed once breathing through the nose is resumed. This suggests that olfactory function is extremely important for distinguishing taste quality. The physiological mechanism responsible for these phenomenon is not known.

We studied the influence of olfactory senses on taste sensation by behavioral science approaches and use of electrophysiological methods in animals (mice) under both normal and abnormal circumstances. Abnormal conditions were destroying olfactory cells in the olfactory cavity in mice by $ZnSO_4$ or using the tracheal tube with the nasal cavity and the pharynx obstructed by Vaseline and cotton balls.

The results were as follows :

1. Behavioral observations of mice, using the two-bottle preference and lick test methods, showed that mice with abnormal olfactory sensations could not differentiate tastes.
2. Electrophysiological studies of responses from

taste nerves, showed that peripheral taste receptor cells transmitted signals normally to the taste center of the cerebral cortex, even when the olfactory senses were abnormal. Electrophysiological recordings from extracellular electrodes in cells in the taste area of the cerebral cortex, showed that taste responses were abnormal in animals with destroyed olfactory cells, which indicated that these animals could not differentiate taste.

From the results described above, we conclude that the olfactory sense is strongly related to the ability to differentiate tastes and that the taste information is suggested to be strongly modified in the brain.

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