SOME FEATURES DISTINGUISHING THE GASTRO-LINGUAL REFLEX DURING ANESTHESIA OF THE RECEPTORS OF THE HUMAN ORAL CAVITY

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To examine the degree to which the interoceptors of the stomach and the taste receptors of the oral cavity contribute toward the gastro-lingual reflex, a method of blocking them separately with anesthesin was developed. The dose and time of action of anesthesin for which the sensitivity of the taste receptors was blocked for long enough to apply a food stimulus were determined. A very slight change in the level of taste sensation was found after administration of a small dose (25 g) of the food stimulus and a sharp decrease in sensitivity after administration of the large dose (250 g). It is concluded that influences from the gastric interoceptors play the principal role in lowering the level of taste sensitivity after the intake of food.

The writer showed earlier that the tuning of the taste receptor system of the tongue is largely determined by influences from the gastric interoceptors [1, 2]. This phenomenon is described as the gastro-lingual reflex [3]. Observations on man and experiments on animals have demonstrated complex and diverse efferent influences on the taste receptor system which constitutes a unique afferent input for the digestive system [4–8].

The character of the gastro-lingual reflex was investigated after the taste sensitivity of the tongue had been blocked.

EXPERIMENTAL METHOD

The method described earlier, of repeated stimulation of single taste papillae of the tongue with tasty solutions of above-threshold concentration was used. In each investigation the sensitivity of four fungiform papillae of the human tongue located on different parts of its anterior half was studied. Touching each papilla with a glass capillary tube containing the tasty solution constituted one test. In the course of each investigation, 12 of these tests were carried out at intervals of 2 min, using one of a number of taste stimuli (solutions of sugar, salt, or citric acid). All three types of taste stimuli were used to test the character of the gastro-lingual reflex to each of them. To block the sensitivity of the taste receptors, anesthesin was used in doses of 0.35 and 0.25 g in 5 ml distilled water. The substance was kept in the subject's mouth for 2, 3, or 4 min. The sensitivity of the taste receptors was studied before and after anesthesia, in the fasting state, or 4 h after eating, when taste sensitivity was maximal. Herring, stewed meat, or white bread in an amount of 25 or 250 g were used as the food stimuli. Altogether 390 observations were made on four subjects.

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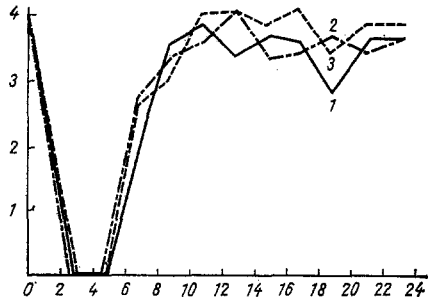

Fig. 1

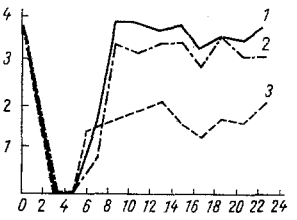

Fig. 2

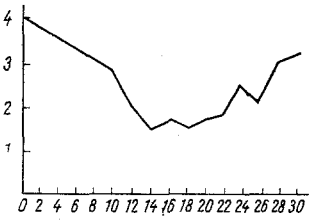

Fig. 3

Fig. 1. Changes in sensitivity of taste receptors after anesthesia of the mouth: 1) sugar solution; 2) citric acid solution; 3) salt solution. Here and in Figs. 2 and 3: abscissa, time (in min); ordinate, number of functioning papillae.

Fig. 2. Change in sensitivity of taste receptors after admininstration of meat following anesthesia of the mouth (taste stimulus – sugar solution): 1) taste sensitivity after anesthesia; 2, 3) taste sensitivity after anesthesia followed by taking 25 and 250 g meat, respectively.

Fig. 3. Changes in sensitivity of taste receptors after administration of starch mucilage with anesthesin (0.25 g).

EXPERIMENTAL RESULTS

The investigations showed that a dose of 0.25 g anesthesin was more effective in blocking the sensitivity of the taste receptors. With this dose the optimal duration of action of anesthesin was 3 min. After removal of the anesthesin from the mouth, taste sensation was blocked for 2-3 min, after which it was restored to its initial level. The results of these investigations were identical when test stimuli of different quality were used (Fig. 1).

Since the sensitivity of the taste receptors was blocked for 2-3 min and the time required to take the food was 30-50 sec, it can be concluded that the food entered the stomach without stimulating the taste receptors. The level of taste sensation after administration of 25 g of the food stimulus with the mouth anesthetized showed a very slight decrease, whereas after the taking of 250 g of the food stimulus against the same background the sensitivity of the taste receptors fell sharply (Fig. 2).

The results are evidence that influences from the gastric interoceptors play the dominant role in the lowering of taste sensitivity after the taking of food. This is particularly clearly manifested when the dose of the food stimulus acting on the interoceptors was large enough ($P < 0.001$).

After introduction of starch mucilage with anesthesin (0.25 g) into the stomach, i.e., with the taste receptor zone intact, the level of taste sensation fell appreciably (Fig. 3).

The method of blocking the sensitivity of the receptors of the taste and gastric zones separately, followed by administration of food, can provide extensive opportunities for the study of the role of these zones in the gastro-lingual reflex.

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