Possible explanations of these results on the volume changes may involve activation of ion pumping mechanisms, which prevent net accumulation of salts under the correct environmental conditions, or some physical restraint to volume change as could for example be imposed by protein cross linkage[7] which might depend on intracellular pH (conceivably altered by external HCO_3^-) and the presence of divalent cations.

Zusammenfassung. Analyse des unterschiedlichen Verhaltens eines glatten Muskels in Locke- und Krebs-Lösung.

A. F. Brading and T. Tomita

Department of Pharmacology, University of Oxford, South Parks Road, and Department of Physiology, Kyushu University (Japan), 8 November 1971.

Neural Correlates of Taste Sensation Quality

It is now urgently required to clarify how human sensory experiences can be interpreted in terms of neurophysiology, or how chains of nervous events, that is, integration of spatial and temporal neural activities, in man, the whole of which is nothing but sensory experience, can be correlated with our sensation.

Concerning neural correlates of sensation quality, there are, as is well known, two major theories, the pattern theory[1] and the specificity theory[2]. Now, in agreement with the view of Hensel[3], the author believes that a certain definite pattern of nerve impulses in peripheral level, composed temporally and spatially, may convey, as a whole, a certain definite sensation quality; in other words, he believes that sensation quality might be deciphered, at least to some extent, by means of some tempo-spatial analysis of the primary afferent code.

In the case of taste sensation it is well known that there is a broad sensitivity of every receptor cell[4], multiple sensitivity of individual afferent fibres[5] (due to multiple branching of each fibre) and probably multiple innervation of each receptor cell. Taking these interrelationships between receptor cells and afferent nerve fibres into consideration, the author, using a nerve impulse count summator[6], recorded with Nitta[7] from the glossopharyngeal nerve trunk of the toad, the temporal sequence of the total sum of nerve impulses elicited during each 100 msec after the stimulation as evoked in response to various chemical stimulations of the whole tongue (Figure 1).

According to our previous investigation[8], each reaction time of 4 tastes in man at the threshold sensation was approximately 2 sec or so. Therefore, assuming that the taste quality is encoded within this short time[9], summated response curves of 4 primary taste qualities within 3 sec after the stimulation were analyzed in respect to the rate of rise, the peak time and the rate of fall in order to know which of them characterizes each curve, i.e., each quality.

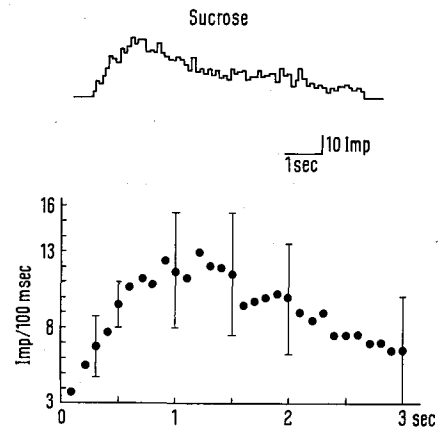

Fig. 1. Temporal sequence of summated response (above) and that of averaged values of 30 measurements (below), both to sucrose stimulation. Vertical bars mean fiducial limit ($p < 0.05$).

		RI (in 0.5 sec)	PT (sec)	RD (in 1 sec)
so	HCl, acet. ac.	14	1	3
b	QHCl, picr. ac., nicot., m-tolylurea, $MgSO_4$, sym-dimethylurea	5	1.5	3
sw	sucrose, glycine, α-dimethylurea	5	1	2
sa	NaCl, KCl, LiCl	6	0.5	2

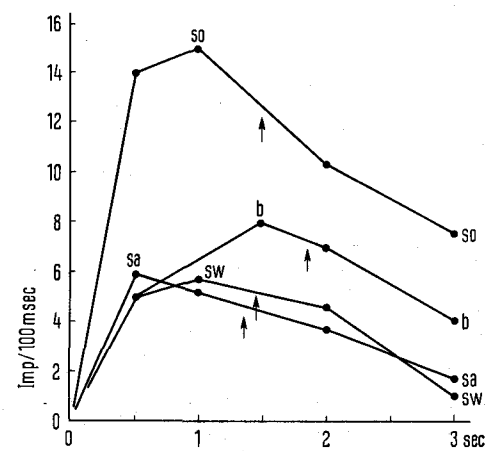

Fig. 2. Summated responses of four primary taste qualities shown as a function time. so, b, sw and sa: sour, bitter, sweet and salty quality, respectively. RI, rate of increase, means increase of impulse numbers in 0.5 sec; while RD, rate of decrease, means decrease of them in 1 sec. Arrows indicate reaction time values obtained by us previously in man[8]. Each point denotes averaged values of 30 experiments on each chemical substance.

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		RI (in 0.5 sec)	PT (sec)	RD (in 1 sec)	RT (sec)
so	acetic acid (1/160 M)	14.5	0.9 ± 0.2	3.6	1.5
sa	NaCl (1/2 M)	1.8	0.6 ± 0.3	1.9	1.35
sw	sucrose (1/2 M)	5.7	1.3 ± 0.2	3.4	1.45
b	QHCl (1/160 M)	7.7	1.6 ± 0.2	5.0	1.85

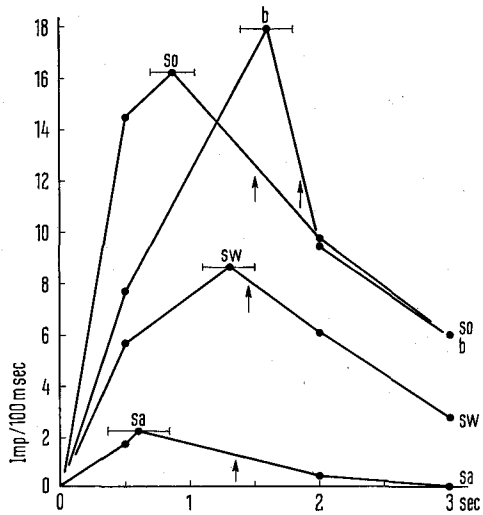

Fig. 3. Temporal sequence of summated responses of the most popular representatives of 4 primary taste qualities. Horizontal lines represent fiducial limit ($p < 0.05$). The difference between the peak time of bitter and that of sweet is statistically significant ($p < 0.05$). RT means the reaction time in sec obtained by us in man[8]. Other explanations in Figure 2.

Figure 2 shows summated response of four primary taste qualities as a function of time after the stimulation. Two or six kinds of chemicals were used for each quality. HCl, NaCl, KCl and LiCl were prepared as $1/2\,M$ solutions, while the others as $1/160\,M$ ones. The Table in the Figure shows mean values of the rate of increase (RI), the peak time (PT) and the rate of decrease (RD) of each quality calculated from the figure. As is clearly seen from the Figure and the Table, the numerals underlined characterize each quality, while the rate of decrease has nothing to do with the taste quality. The same thing can be more definitely said on the summated response curves obtained from the most popular representatives of four primary taste qualities (Figure 3).

From these results it could be concluded that the impulse train of the greatest rate of increase mediates as ensemble the sourness, and that of the smaller one with the shortest peak time mediates as a whole the salty sensation. The bitter sensation is evoked by impulse pattern with the longest peak time, while the sweet sensation by that with an intermediate one, both almost equal to each other in respect to the rate of increase.

Zusammenfassung. Neurophysiologische Untersuchung über die Basis der Geschmacksdifferenzierung in die vier Hauptqualitäten bei Kröten und Nachweis eines offenbar spezifischen Impulsmusters im N. glossopharyngicus.

M. ICHIOKA

Department of Physiology, School of Dentistry, Tokyo Medical and Dental University, Bunkyo-ku, Tokyo (Japan), 25 October 1971.

Effect of Aluminium Phosphate Gel on Whole-Body Retention of Simultaneously Administered ^{226}Ra, ^{85}Sr and ^{47}Ca in Mice

Aluminium phosphate inhibits intestinal absorption of Sr in man[1] and rat[2] and lowers the whole-body retention to about 10% of control values for ^{85}Sr and to 50% for ^{47}Ca[3], thus being somewhat less specific for Sr than sodium alginate[4]. Increasing the phosphate level of the diet also reduces Sr uptake[5]. We compared the capacity of aluminium phosphate to inhibit intestinal uptake of the heaviest alkaline earth metal ^{226}Ra with that obtained for ^{47}Ca and ^{85}Sr when a mixture of the 3 isotopes is administered by gastric tube to 3-month-old male black C 57 mice, previously fasted for 24 h with free access to water. The total body-burden was measured in vivo by a Ge(Li) detector coupled to a translating and rotating sample holder, as described previously[3]. Each animal received 15 μCi ^{226}Ra, 7 μCi ^{85}Sr and 3 μCi ^{47}Ca at pH 5 in 0.25 ml volume, intubated in the stomach. The tested aluminium phosphate gel was the commercially available 'Phosphalugel' (Laboratories Biotherax, 93 Saint-Denis, France) containing a mean quantity of 3% Al and 10.5% phosphate, together with some other substances such as agar, pectin, sorbic acid and calcium sulfate. Some of these substances might also be able to reduce Sr uptake[6]. The gel was administered by gastric tube (0.4 ml/mouse corresponding to 480 mg Al/kg body weight, and 1680 mg PO_4/kg). The control animals received the same volume of a boiled 0.2% agar gel in water having about the same consistency as the phosphate gel.

Six treatments were tested on 5 to 6 mice each:

group 1 received $AlPO_4$ gel just before isotope intubation;
group 2 received agar gel just before isotope intubation;
group 3 received $AlPO_4$ gel just after isotope intubation;
group 4 received agar gel just after isotope intubation;
group 5 received $AlPO_4$ gel 1 h after isotope intubation;
group 6 received agar gel 1 h after isotope intubation.

In group 1 to 4, there was maximum 1 min time lapse between the 2 intubations. The total body retention 4 days after the intubation is given in the Table. Most of the mice which received phosphate treatment close to the moment of intubation of the isotopes had a ^{226}Ra content lower than the detection limit of the Ge(Li) detector, corresponding to less than 0.3% of the administered dose.

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