resistivity and the cation stimulating effectiveness, even though some kind of interaction between cations and the mucopolysaccharide anionic groups is likely to take place, this is irrespective of the kind of cation. This may be true for the cations used in our experiments; otherwise our method would not be adequate to detect very small differences in ion diffusion. Anyway, our results indicate that the viscous mucopolysaccharidic substance at the tip of the labellar taste hairs of *Phormia* may act as a barrier that modulates the sensory response to the external environment, and therefore the reflex behaviour of the insect.

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Importance of the viscous substance at the tip of the labellar taste hairs of *Phormia regina* M. on the salt-sugar interaction[1]

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Summary. The role of the mucopolysaccharide layer at the tip of labellar taste hairs of *Phormia regina* M. on the inhibitory mechanism of sugar on the stimulating effect of salt and vice versa has been investigated.

The addition of salt to sugar stimulating solutions reduces the responses of the sugar sensory units in the taste hairs of Phormia. On the other hand, salt sensory unit responses are lowered by adding sugar to the salt stimulating solutions[2-4]. In the present study, we have tried to investigate the importance of the viscous mucopolysaccharide layer at the tip of taste hairs of Phormia[5,6] in salt-sugar interaction, bearing in mind that the physical-chemical properties of the layer could determine changes in the concentration of the stimulating agents at the dendrites as compared to the external environment. The functional importance of the mucopolysaccharide layer has been evaluated by measuring hair electrical resistivity and considering this parameter as an index of ion diffusion and therefore of the probability of reaching the dendrites. We accordingly tested resistivity of the taste hairs by bathing them in NaCl or NaCl+sucrose equiconductive solutions. Control experiments were performed by repeating these measurements on hairs, the tips of which had been cut off (amputated hairs).

Material and methods. 1-2-day-old blowflies, *Phormia regina* M., were used. Resistivity measurements were performed, according to the technique described by Stürckow[7], on the first 2-3 long rostral labellar aboral hairs. Each hair was bathed in 2 solutions, containing either 0.5 M NaCl or 0.5 M sucrose in a random sequence. An adequate amount of NaCl was added to the latter to reach the same conductivity as the 0.5 M NaCl solution. The conductivity was evaluated by means of a Kohlrausch bridge. The tips of the hairs were cut off, in control experiments on amputated hairs, with microscissors.

Results and discussion. NaCl was added at a concentration of about 0.7 M to the 0.5 M sucrose solution to reach the same conductivity as the 0.5 M NaCl solution. As shown in the table, the resistivity of the intact hairs was lower when tested with the NaCl solution than with the equiconductive NaCl+sucrose solution. The difference was statistically significant. On the contrary, no statistically significant difference in resistivity was detectable when the same experiments were performed on amputated hairs. If one considers that it is necessary to enhance the NaCl concentration in the NaCl+sucrose solution in order to reach the same conductivity of the pure NaCl solution, it may be concluded that the presence of sugar can diminish NaCl stimulating effectiveness by lowering its activity and diffusion coefficients. This possibility has already been suggested by Wolbarsht[8] and reported by Dethier[4]. It is also conceivable that a similar influence may be exerted by NaCl on sucrose. Otherwise our results suggest that the salt-sugar mutual inhibitory effect cannot be related solely to the physical-chemical properties of the mixed sugar-salt solutions. In fact, the resistivity of the intact hairs was significantly lower with the NaCl solution than with NaCl+sucrose solution, even though both solutions were equally conductive. This difference did not occur when the same experiment was performed on amputated hairs, thus indicating its dependance on the structure of the hair tip. Although not providing direct evidence, these results may be explained if one considers the specific features of the mucopolysaccharide molecular structure, since the higher concentration of the solutes in the NaCl+sucrose solution than in the equiconductive NaCl one may cause the mucopolysaccharide molecular net to contract osmotically, resulting in a reduction of the diffusion coefficient of the solutes. Sucrose can also partly obstruct the 'channels' along which the solutes diffuse[9,10]. Both factors hinder diffusion of the solutes across the viscous mucopolysaccharide layer at the tips of the hairs, as shown by the higher resistivity of the hairs when bathed in the NaCl+sucrose solution, and thus lessen the probability of contact between the stimulating substances and the dendrites. In conclusion, in terms of molecular structure of the mucopolysaccharide,

Intact and amputated labellar taste hair resistivity (MΩ) tested with equiconductive 0.5 M NaCl or 0.5 M sucrose solutions. NaCl at an adequate concentration was added to the latter to reach the same conductivity of the 0.5 M NaCl solution.

	Test solution NaCl	NaCl+sucrose	Number of experiments
Intact hairs	27.47 ± 0.81	41.57 ± 0.97	42
Amputated hairs	10.80 ± 0.67	11.55 ± 0.77	44

Mean values ± SE. Intact hairs tested with NaCl differ significantly from the corresponding NaCl+sucrose treated (Student's t-test, $p < 0.001$); there is no significant difference between the amputated hairs ($0.5 > p > 0.4$).

the results of our experiments emphasize the importance of the layer of viscous substance[5,6] at the tip of the labellar taste hairs of Phormia in the inhibitory mechanism of sugar on the stimulating effectiveness of salt and vice versa.

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Resting heartrate variability in man declines with age

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Summary. The heartrate variability under resting conditions of 14 normal male subjects, age range 22-63 years, declined with increasing age. Mean heartrate did not show age-dependant changes.

Recently, several authors have suggested that reduced beat-to-beat variation in heartrate (HR) may be indicative of autonomic neuropathy in man[4,5]. This stems from the findings that both multiple sclerotic[6] and diabetic[7] patients with autonomic neuropathy show reduced HR variability (HRV).

These studies[4-7] were performed on patients with specific neurological syndromes or accessory neurological complications subsequent to general medical conditions. In normal subjects, HRV has been studied in relation to mechanisms of sinus arrhythmia[8] and may be reduced in subjects over 40 years when compared with those under 25 years of age[9]. Using a forced deep-breathing exercise, it has been further suggested that normal subjects may show reduced HRV with increasing age[7]. We report now that under resting, non-laboratory conditions HRV in normal male subjects clearly declines with age in a substantially linear manner.

Method. 14 normal male subjects, age range 22-63 years, agreed to take part in this study. HR was recorded by biotelemetry as previously described[10]. Subjects were fitted with a subminiture biotelemetry transmitter (Sandef SNR 102F) which picked up an electrocardiograph signal via 2 chest electrodes attached to the skin over the sternum. The transmitted signal was received by a matching biotelemetry FM receiver (Sandef SNR 102R), fed into an instantaneous rate meter (Devices 2751) and an instantaneous HR record was plotted on an ultraviolet recording oscillograph (Bell and Howell 5-127). Testing was carried out in a large, quiet, comfortable room, with the subject seated in an armchair. This procedure, together with the use of biotelemetry, was employed to cause the minimum of disturbance to the subject.

After an adaptation period, continuous instantaneous beat-by-beat HR recordings were made for a period of 5 min. Subjects were asked to sit quietly throughout the test session. From each 5 min recording, 50 HR values at 6 sec intervals were determined. From these data, mean HR ($\overline{HR}$) was calculated for each subject and the SD in this mean taken as the measure of HRV.

Results. As shown in figure 1, HRV declined with increasing age in normal male subjects, over the age range 22-63 years. While the data suggested a slight curvilinear component in the inverse relationship between age and HRV, there was a significant inverse linear correlation between these 2 variables ($r = -0.889$, $p < 0.001$). $\overline{HR}$ showed no change with age of subject, and there was also no simple relationship between $\overline{HR}$ and HRV (figure 2; $r = -0.293$ and $r = 0.526$ respectively, NS).

Discussion. From the results it is clear that HRV declines with increasing age in normal male subjects under the relaxed, non-laboratory conditions employed in this study. This confirms previous suggestions made on the basis of laboratory studies employing either discrete rather than continuous age-ranges of subjects[9] or forced deep-breathing exercises[7]. Both cardiac output and heart power

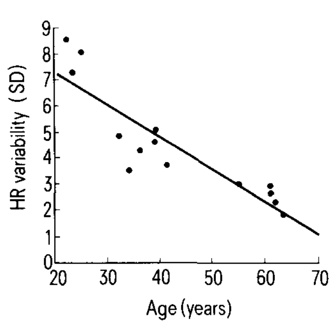

Fig. 1. Heartrate (HR) variability against age for 14 normal male subjects. Variability was assessed as the SD of mean HR determined over 50 sample HR's (see Method).

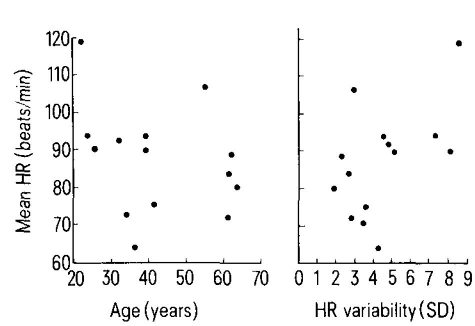

Fig. 2. Mean heartrate (HR) against age (left) and HR variability (right) for the 14 normal male subjects of figure 1.