

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 sclerotic⁶ and diabetic⁷ 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 arrhythmia⁸ and may be reduced in subjects over 40 years when compared with those under 25 years of age⁹. Using a forced deep-breathing exercise, it has been further suggested that normal subjects may show reduced HRV with increasing age⁷. 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 described¹⁰. Subjects were fitted with a subminiature 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 oscillo-

graph (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 ($\bar{H}R$) 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 ($r = -0.889$, $p < 0.001$). $\bar{H}R$ showed no change with age of subject, and there was also no simple relationship between $\bar{H}R$ 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 subjects⁹ or forced deep-breathing exercises⁷. Both cardiac output and heart power

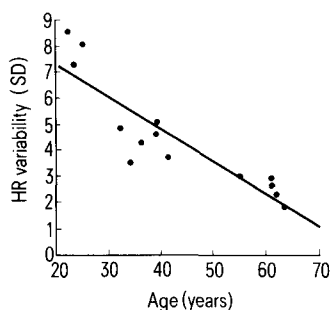


Fig. 1. Heartrate (HR) variability against age for 14 normal male subjects. Variability was assessed as the SD of mean HR determined over 50 sample HR's (see Method).

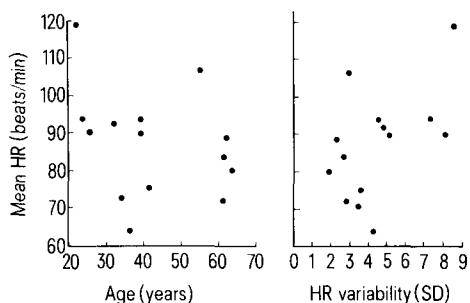


Fig. 2. Mean heartrate (HR) against age (left) and HR variability (right) for the 14 normal male subjects of figure 1.

have been shown to decline with age in normal male subjects¹¹, but there is contradictory evidence on age-dependant changes in HR. Both an increase¹² and a decrease¹¹ in HR with age have been reported. In the present study no effect of age on HR was seen, and we conclude that HRV is especially sensitive to age-dependant factors.

Physiological mechanisms possibly controlling HRV have been discussed in detail elsewhere^{7,8}, and have yet to be precisely defined. The demonstrated reduction of HRV in

multiple sclerotic and diabetic patients⁴⁻⁷ has been equated with autonomic neuropathy and the present results may therefore indicate progressive change in autonomic function to be a component of the ageing process in man. Other authors, however, have suggested that HRV may be an index of the integrity of cerebral cardioregulatory centres¹³ or may in fact reflect the general functional state of the central nervous system (CNS)^{14,15}. Were this to be so, our results could be interpreted as indicative of subtle impairment of CNS function in man with increasing age.

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Steroidal effect in the resistance offered by wheat varieties to *Tribolium castaneum* (Herbst)

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Summary. The steroids present in the resistant, susceptible and intermediate wheat varieties to *Tribolium castaneum* (Herbst) were estimated quantitatively; β -sitosterol shows significant differences in these varieties. The contents of β -sitosterol in 4 varieties of wheat is hence correlated to the resistance of the varieties to the flour beetle.

The metabolism of phytosterol to cholesterol in tobacco hornworm is already shown², and in this conversion desmosterol is an intermediate product³ which was isolated and indentified in a number of phytophagous and ominivorous species⁴ through the use of several inhibitors of sterol metabolism.

The resistance to pests offered by the stored grains, specially wheat varieties, has been recorded by many authors⁵⁻⁷ without indicating the cause of this resistance. In our previous study of cholesterol level at different developmental stages of *Tribolium castaneum*, fed on such resistant and susceptible varieties, significant differences in cholesterol level were obtained⁸. Considering that the resistant variety has an effect on the cholesterol, a metabolite of dealkylation of sterols, we tried to analyze total sterols present in the different wheat varieties by TLC. In addition to this separation of sterols, we also estimated each sterol quantitatively. The present work, therefore, reports the presence of sterols both qualitatively and quantitatively in the wheat varieties, partially throwing light on the cause of resistance offered by stored grains to their pests.

Materials and methods. The sterols were separated from 4 different wheat varieties; one was highly resistant (Kalyan Sona), one highly susceptible (Sonalika) and the remaining 2 were intermediate ones to the growth and development of *Tribolium castaneum*. These varieties, obtained from the Government Agricultural Experiment Station, Durgapura, Jaipur, India, were selected after conducting biological tests in our laboratory^{9,10}. The varieties were conditioned at the temperature $30 \pm 2^\circ\text{C}$ and relative humidity of $65 \pm 5\%$ for 7 days. They were ground by hand grinder and sieved through 100 mesh. The dried wheat flour (2 g) of each

variety was refluxed for 4 h with 5% (v/v) hydrochloric acid in 70% ethanol and extracted with ethyl acetate by the method of Tomita et al.¹¹. The ethyl acetate extracts were filtered and then concentrated to dryness in vacuo. The dried residues were weighed and dissolved in chloroform. Four such replicates of each were examined and the mean values were determined. Thin-layer glass plates (20×20 cm) were coated with 0.4 mm to 0.5 mm Silica gel 'G' h) dried at room temperature and activated at 100°C . The total extracts of various wheat varieties along with the known compounds were chromatographed on these plates with hexane-ethylacetate solvent system (3:1). Examination of dried chromatograms under UV-light showed 3 clear fluorescent spots which were identified from their R_f -values (compared with the standards) then the fractions were scraped off the plates separately and collected in beakers. These sterols from the different wheat varieties were eluted with chloroform, dried and weighed.

Results and discussion. The analysis of free sterols in the

Quantitative analysis of free sterol in some wheat varieties of Rajasthan

Sample No.	Wheat varieties	β -Sitosterol (mg%)	Stigmasterol (mg%)	Lenosterol (mg%)
1	Kalyan Sona (R)	3.25	1.4	0.75
2	Lal Bahadur (MR)	4.3	1.6	0.77
3	D 134 (MS)	5.82	2.17	1.17
4	Sonalika (S)	6.3	2.35	1.42
	SE \pm	0.066	0.154	0.004
	CD at 5% level	0.243	0.568	0.014