

shown. It is well to bear this in mind when one attempts to relate results of animal experimentation to human physiology. It will be of interest to compare the cellular catalysts of serotonin- and nonserotonin-containing mast cells (15).

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### Changes of Body Weight in Normal Men Who Stop Smoking Cigarettes

The role of overweight and obesity in the development of so-called degenerative diseases (1) and, consequently, the factors that affect body weight continue to be of interest.

We are all familiar with the occasional large gains in weight among men who stop smoking. Surprisingly enough, the phenomenon of weight change following a break in a lifelong pattern of smoking, which is not associated with intercurrent illness or a medically supervised dietary regimen designed to reduce or to increase body weight (2), has not been studied systematically. One reason for the absence of such information is the fact that longitudinal investigations on the

"normal" adult man are difficult to carry out.

This study (3) was undertaken within the wider framework of researches on aging, focused on factors that are associated with the development of "degenerative" (noninfectious, noncongenital) heart disease and carried on in the Laboratory of Physiological Hygiene, University of Minnesota, since 1947. A group of approximately 300 business and professional men, examined at yearly intervals, serve as subjects. The laboratory staff refrains from giving advice to them, but findings indicative of the presence of disease are reported to their personal physicians. We wish to study the effects of the differences in the mode of life.

The "experimental" subjects are men who voluntarily stopped smoking cigarettes and on whom weight data are available for 2 years before and 2 years after the year in which they stopped smoking. A control group was obtained by selecting men who did not stop smoking and were matched in age, relative body weight (actual weight expressed as a percentage of "standard" weight for sex, age, and height), and actual body weight at the beginning of the first year of the 5-year period, without reference to weight trends during the rest of the period. The means and standard deviations and the *t*-tests of significance of the differences between means of the experimental and the control groups, respectively, were  $49.8 \pm 4.2$  and  $51.2 \pm 3.5$  years ( $t = 1.20$ , nonsignificant) for age;  $97.5 \pm 11.9$  and  $97.7 \pm 11.2$  ( $t = 0.05$ , nonsignificant) for relative body weight; and  $75.8 \pm 9.2$  and  $75.8 \pm 9.2$  kg for absolute body weight. Thus, at the outset, the two groups did not differ significantly in respect to any of the three criteria that were considered for matching. Both groups represent "normal," middle-aged men, with body weight close to their age standard. The intensity and total duration of smoking were similar.

Longitudinal observations on smoking and body weight are summarized in Table 1. Using the average weights for years 1 and 2, and for years 4 and 5, we obtained, in the control group, a small (1.1 lb), statistically nonsignificant decrement while, in the experimental group, there was a substantial (8.2 lb), statistically highly significant rise. The respective *t*-values refer to *t*-tests for paired varieties; with (*N*-1), that is, 20 degrees of freedom, the reference value  $t_{0.001} = 3.850$ . On comparing the mean difference between the change in the experimental and matched group, we obtain a net difference of 4.23 kg (9.3 lb), which is also statistically highly significant; in this case the *t*-tests were calculated for unpaired variates, with

Table 1. Mean weights, weight changes, and differences in weight change between the two groups.

Item	Experimental group	Control group
Weight (kg) for years 1 plus 2	76.05	76.36
Weight (kg) for years 4 plus 5	79.78	75.86
Weight change		
Mean	+ 3.73	- 0.50
Standard deviation	$\pm 1.94$	$\pm 3.03$
<i>t</i> within group	5.65*	1.18
Weight change difference (kg)		4.23
Weight change difference, <i>t</i> between groups		5.39*

\* Statistically highly significant.

2(*N*-1), that is, 40 degrees of freedom. The corresponding  $t_{0.001} = 3.551$ .

It should be emphasized that both our groups consisted of essentially "normal" men. We have not included several individuals who stopped smoking because of intercurrent coronary heart disease or in whom a rigorous dietary (reducing) regimen, together with termination of smoking on medical orders, was a part of therapy.

The present data provide information on interindividual variability in the weight gain, its average amount, and its statistical significance. The question of permanence of the gain beyond 2 years remains open. While the evidence concerning the effect on body weight of stopping cigarette smoking is convincing, no simple and definite interpretation of the phenomenon can be offered. Experimental observations on the inhibition of gastric hunger contractions by smoking (4) and the increase in tobacco consumption among individuals who are maintained on reduced calorie intake (5) suggest that smoking tends to depress the felt need for food.

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