RELATIONSHIP BETWEEN CONCENTRATION OF ACID MUCOPOLYSACCHARIDES IN THE AORTIC WALL AND DEGREE OF INCORPORATION OF β-LIPOPROTEINS

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A direct relationship is shown between the degree of incorporation of β-lipoproteins into the walls of the blood vessels and their concentration of acid mucopolysaccharides.

Many investigators [1, 2, 5, 12] ascribe a role to mucopolysaccharides in the pathogenesis of atherosclerosis. It has been shown that acid mucopolysaccharides can form specific complexes with serum β-lipoproteins [3, 4, 7, 8]. The sensitivity of some laboratory animals to experimental atherosclerosis is known to be intimately connected with the concentration of acid mucopolysaccharides in the aortic wall of these animals [10]. It is also known that the venous system is free from atherosclerotic changes and, at the same time, that the walls of veins contain less acid mucopolysaccharides than arterial walls [11].

The writers have investigated the incorporation of I^{125}-labeled β-lipoproteins in the aortic wall of animals differing in their sensitivity to experimental atherosclerosis, and also the degree of incorporation of I^{125}-labeled β-lipoproteins into the wall of the aorta and femoral vein in rabbits with experimental atherosclerosis.

EXPERIMENTAL METHOD

β-Lipoproteins (density from 1.019 to 1.063) were isolated from rabbit blood serum by ultracentrifugation [6] and labeled with I^{125} (Radiochemical Centre, Amersham, England) by the iodine monochloride method. It was shown chromatographically that the content of free I^{125} did not reach 3%.

The degree of incorporation of the labeled β-lipoproteins was studied in vitro on surviving segments of the investigated vessels after careful removal of all surrounding tissues, including the adventitia, from them. The segments of vessels, in the form of a disk, were placed in a flask and incubated in 4 ml Krebs-Ringer bicarbonate buffer with I^{125}-labeled β-lipoproteins (1.5×10^6 pulses/min per flask). Incubation continued for 2 h in a Warburg's apparatus at 37° under a constant supply of gas mixture consisting of 95% O_2 and 5% CO_2. Segments of vessels preliminarily treated with 20% TCA were used as the control. The residual radioactivity was carefully removed. Measurements were made with a crystal counter for soft γ-rays (Gamma, Budapest, type 5 III.11 506 801). The results were expressed in pulses/min/mg dry weight of vascular tissue.

RESULTS

The results of experiments on surviving segments of the aorta of rats, rabbits, and cocks are shown in Fig. 1. The degree of incorporation of labeled β-lipoprotein was considerably higher in the rabbits and cocks than in the rats.

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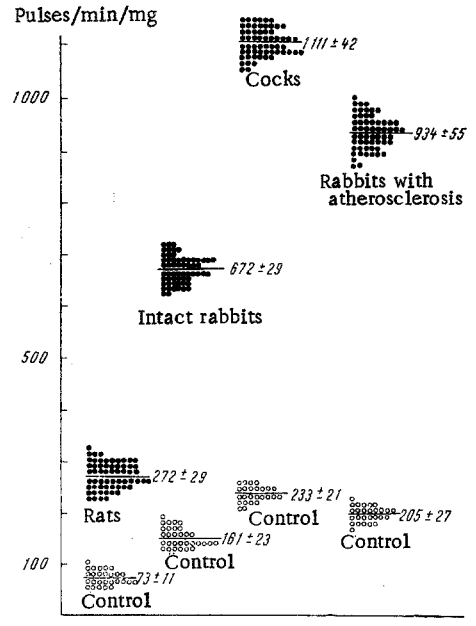

Fig. 1

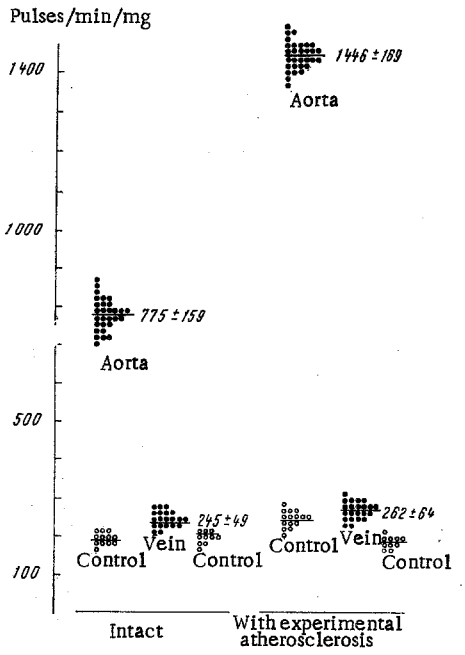

Fig. 2

Fig. 1. Incorporation of I^{125}-labeled β-lipoprotein into segments of aorta of rats, cocks, and rabbits.

Fig. 2. Incorporation of I^{125}-labeled β-lipoprotein into femoral vein and thoracic aorta of rabbits.

Comparison of incorporation of β-lipoproteins into the aortic wall of normal rabbits and of rabbits with experimental atherosclerosis shows that in the latter the degree of incorporation was considerably higher. Since the aortic wall of rats contains less acid mucopolysaccharides than that of rabbits and cocks, it may be considered that the degree of incorporation of β-lipoproteins is connected with the concentration of these substances.

It is clear from Fig. 2 that the aortic wall of rabbits incorporates much more β-lipoproteins than the wall of the vein.

Bearing in mind that in both cases the investigated segments of blood vessels differed in their content of acid mucopolysaccharides, it can be concluded that the difference between the level of incorporation of β-lipoproteins is due to the difference in concentration of mucopolysaccharides. The fact that cholesterol feeding stimulates incorporation of β-lipoproteins into the aortic wall of rabbits confirms this conclusion. It is known that one of the principal changes in the aorta in the early stage of experimental atherosclerosis is an increase in the concentration of acid mucopolysaccharides [9].

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