

BLOOD SUGAR DYNAMICS IN RABBITS
WITH EXPERIMENTAL ATHEROSCLEROSIS
AND CORONARY INSUFFICIENCY PRODUCED
BY LIMITATION OF MOBILITY*

V. V. Tyavokin

UDC 616.13-004.6 + 616.132]-092.9-02 : 612.766.2-07 : 616.153.45-074

In rabbits with experimental atherosclerosis and coronary insufficiency produced by limitation of movement, the blood level of corticosterone and adrenalin falls. Despite this, the blood sugar level rises.

* * *

As reported previously, I first suggested this new method of producing atherosclerosis with coronary insufficiency by limiting movement of rabbits. In the course of subsequent analysis of this model of atherosclerosis with coronary insufficiency I have studied the blood sugar dynamics.

EXPERIMENTAL METHOD

Besides the blood sugar, catecholamines and corticosterone in the blood were investigated in these experiments.

The blood sugar was determined by the Hagedorn - Jensen method. Corticosterone in the blood was determined by a fluorometric method described by Yu. A. Pankov and I. Ya. Usvatova [3]. Catecholamines in the blood and myocardium of the animals were investigated by the fluorometric method described by L. G. Leibson and E. M. Stabrovskii [1]. In connection with adsorption, elution, and the calculations, the recommendations made by Euler and Floding [9] and by V. O. Osinskaya [2] were used. Fluorometry was carried out with an improved type ÉF-ZM fluorometer.

EXPERIMENTAL RESULTS

The blood sugar of 38 rabbits was investigated. Before limitation of movement of the rabbits their mean blood sugar was 93 ± 1.5 mg%, rising to 114 ± 9 mg% 1 day after the beginning of limitation of movement ($P < 0.02$), and to 135 ± 14.4 mg% ($P < 0.003$) and 133 ± 8.4 mg% ($P < 0.001$) after 3 and 5 days respectively. On the 7th day after the beginning of limitation of movement the blood sugar fell to 121 ± 5.6 mg% ($P < 0.001$), but on the 14th day it had risen again to 140 ± 8.6 mg% ($P < 0.001$). The changes in the blood sugar level varied in different rabbits on limitation of movements. In 7 animals, for example, this remained within normal limits (70-100 mg%), in 16 it varied from 111 to 150 mg%, in 12 between 151 and 200 mg%, and in 3 it exceeded 200 mg%: 202, 210, 228 mg%.

The blood corticosterone level was investigated in 22 rabbits. Before limitation of the animals' movements, their mean blood corticosterone level was 11.87 ± 0.25 μ g/100 ml plasma. A slight increase in its level, not statistically significant, took place one day after the beginning of limitation of movement. Later, 4, 7, and 14 days after the beginning of limitation of movement the mean blood corticosterone level fell to 10.57 ± 0.89 μ g ($P < 0.05$), 9.21 ± 0.92 μ g ($P < 0.005$), and 8.9 ± 0.86 μ g/100 ml plasma ($P < 0.001$) respectively.

* Given on April 17, 1967 at a meeting of Leningrad Endocrinologic Society.

Department of Internal Medicine, Leningrad Pediatric Medical Institute; K. M. Bykov Department of General Physiology, Institute of Experimental Medicine, Academy of Medical Sciences of the USSR, Leningrad (Presented by Active Member of the Academy of Medical Sciences of the USSR D. A. Biryukov). Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 66, No. 12, pp. 27-28, December, 1968. Original article submitted November 23, 1967.

The concentration of catecholamines in the blood and myocardium was investigated with the collaboration of N. B. Prokopovich. With limitation of movement of the rabbits their blood catecholamine level fell considerably. When the blood of 13 rabbits was investigated 5, 7, and 26-28 days after the beginning of limitation of movement, no catecholamine could be detected by the method used, whereas the mean blood adrenaline level before limitation of movement was $0.34 \mu\text{g/liter}$ and that of noradrenaline $0.02 \mu\text{g/liter}$. Catecholamines in the myocardium at the base of the heart was investigated in 16 control and 14 experimental rabbits. In the control group the mean adrenaline level was $0.788 \pm 0.0497 \mu\text{g}$, and the noradrenaline level $0.587 \pm 0.0083 \mu\text{g}$, while in the experimental group the corresponding values were $0.5812 \pm 0.0227 \mu\text{g}$ ($P < 0.001$) and $0.3417 \pm 0.0258 \mu\text{g}$ ($P < 0.001$).

The pancreas of 6 rabbits was investigated histologically. No abnormality was found in only one rabbit. In 3 animals the β cells in most islets were increased in size, and often their nuclei and nucleoli were giant in character. In 2 rabbits pyknosis of the nuclei of the β cells was observed. All rabbits except one showed macroscopic changes in the aorta: roughness of the endothelium, tubercles, erosion of the tubercles, and ulcers. Evidence of disturbance of the coronary circulation was found on the ECG.

Hence, despite a lowering of the corticosterone and adrenaline levels in the blood, the blood sugar level in rabbits with experimental atherosclerosis and coronary insufficiency caused by restriction of movement is raised.

LITERATURE CITED

1. L. G. Leibson and E. M. Stabrovskii, *Fiziol. Zh. SSSR*, No. 7, 857 (1962).
2. V. O. Osinskaya, *Biokhimiya*, No. 3, 537 (1957).
3. Yu. A. Pankov and I. Ya. Usvatova, in: *Methods of Investigation of Certain Hormones and Mediators* [in Russian], Moscow (1965), p. 137.
4. V. V. Tyavokin, in: *Atherosclerosis* [in Russian], Leningrad (1965), p. 184.
5. V. V. Tyavokin, *Pat. Fiziol.*, No. 1, 77 (1966).
6. V. V. Tyavokin, in: *Problems in Pharmacology and Experimental Pharmacotherapy* [in Russian], Vol. 9, No. 3, Moscow (1966), p. 80.
7. V. V. Tyavokin, *Cor et Vasa*, 9, 65 (1967).
8. V. V. Tyavokin, *Byull. Éksperim. Biol. i Med.*, No. 2, 9 (1967).
9. U. S. Euler and J. Floding, *Acta Physiol. Scand.*, 33, Suppl. 118, 57 (1955).