INFLUENCE OF CHANGES IN NONSPECIFIC RESISTANCE CAUSED BY THE ACTION OF NATURAL AND PREFORMED PHYSICAL FACTORS ON THE DEVELOPMENT AND COURSE OF EXPERIMENTAL HYPERTONIA

(UDC 616.136.7-008.331.1-092.9-056-02:615.831.7)

V. A. Baronenko

Institute of Normal and Pathological Physiology (Dir.—Prof. V. V. Parin, Active Member, Academy of Medical Sciences, USSR), Academy of Medical Sciences, USSR, Moscow, and I. M. Sechenov Institute of Medical Climatology and Climatotherapy (Dir.—B. V. Bogutskii), Yalta

Presented by V. V. Parin, Active Member, Academy of Medical Sciences, USSR
Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 58, No. 8, pp. 27-29, August, 1964
Original article submitted May 7, 1963

We found no data in the literature regarding the influence exerted on the development of hypertonia by preliminary ultraviolet and solar irradiations, which, as is well known, alter the nonspecific resistance of the organism [1, 3-5]. The present work is devoted to a study of this problem.

EXPERIMENTAL METHOD

The experiments were conducted on 29 6 month old rabbits of the chinchilla breed. The animals were divided into 3 groups. The animals of the 1st group (9 rabbits) were subjected to ultraviolet irradiation and those of the 2nd group (10 rabbits) underwent solar irradiation; the animals of the 3rd group (10 rabbits) were the control. The irradiations were carried out daily in 2 courses: the 1st, two week course was given before unilateral nephrectomy, while the 2nd, one month course was begun 2 weeks after the kidney was removed. Before the 2nd course of irradiations ended experimental renal hypertonia was induced in the rabbits of all 3 groups by Kogan's method [2].

The ultraviolet irradiations were conducted with a PRK-2 quartz lamp, from 0.5 to 5 biodoses being given in both courses. The dose was increased by 50% daily. A carefully shaved 23 × 12 cm area of skin on the back was irradiated.

The solar irradiations were conducted daily between 11 am and 1 pm during the warm part of the year (September-October). The irradiation time was increased by 5 min after every 3rd irradiation: from 5 to 20 min in the first

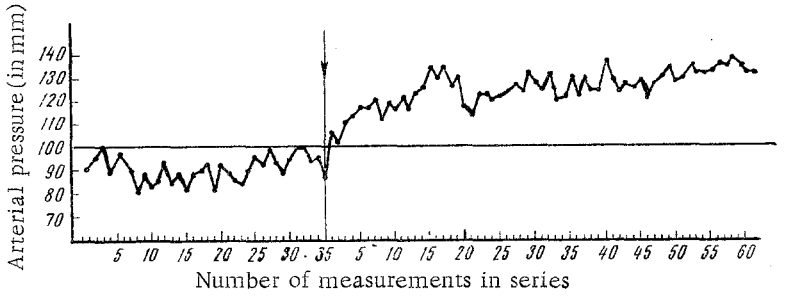

Fig. 1. Dynamics of arterial pressure in the animals of the control group. The arrow indicates the moment at which the helix was applied to the renal artery.

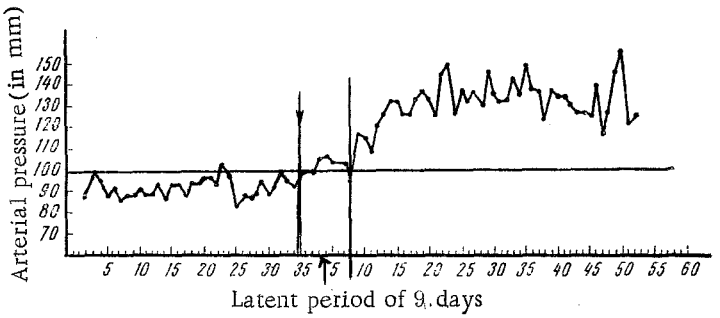

Fig. 2. Dynamics of arterial pressure in animals subjected to ultraviolet irradiation. Specifications the same as in Fig. 1. pressure (in mm).

course and from 5 to 40 min in the 2nd. The area of the irradiated surface was the same as for the animals of the 1st group.

EXPERIMENTAL RESULTS

After application of a helix to the artery of the intact kidney the control rabbits exhibited a rapidly progressive, statistically reliable increase in arterial pressure, which reached its maximum toward the end of one month ($P < 0.01$). During the following 2 months of observation the arterial pressure remained elevated, exceeding its initial level by 40% (Fig. 1).

The arterial pressure of the animals of the 1st group increased only after a latent period which lasted 9 days (Fig. 2). During this period the pressure either remained normal or increased slightly. After the latent period the arterial pressure began to rise rapidly, reaching its maximum toward the end of the 1st month. During the following 2 months the pressure was somewhat higher than in the control animals (by 10 mm) and was distinguished by considerable lability.

In the 2nd group of animals arterial pressure increased by an average of 3-5 mm after application of the helix and remained at this level for 6 days. There was a sharp rise in arterial pressure during the 10 days following this latent period and it reached its maximum toward the end of the 2nd month, exceeding its initial level by 40%. The arterial pressure gradually decreased from the 2nd half of the 3rd month after application of the helix onward, but remained 20% above normal.

An acceleration of heart rate and a deviation of the electrical axis of the heart to the left was noted in the animals of all three groups after application of the helix to the renal artery. However, in the control group levograms were observed for a larger number of animals and were recorded 2-5 weeks earlier than in the 1st and 2nd groups. The EKG's of the rabbits of the control group exhibited increases in the amplitude and slope of the T wave, especially for the 2nd and 3rd leads, during the 4th-5th week of hypertonia; this wave was considerably attenuated thereafter. These changes in the EKG were not recorded for the irradiated animals. It must also be noted that the animals subjected to solar irradiation exhibited a higher survival rate.

The data obtained show that preliminary two-course ultraviolet or solar irradiation increases the resistance of the animals to hypertonia. The occurrence of a latent period in the development of hypertonia in the irradiated animals, which was lacking in the control group, must be considered to be a manifestation of this.

Investigation of the mechanism underlying this increase in the resistance of the organism to hypertonia is the goal of our subsequent work.

LITERATURE CITED

1. V. A. Baraboi, Uspekhi sovr. biol. (1962), Vol. 53, No. 3, p. 265.
2. A. Kh. Kogan, Pat. fiziol. (1962), No. 3, p. 79.

3. A. P. Parfenov, Human Habituation [in Russian], Leningrad (1960).
4. E. I. Pasynkov, Abstracts of Papers Presented at the Conference on the Biological Action of Ultraviolet Radiation [in Russian], Leningrad (1958), p. 21.
5. S. M. Chubinskii, Sunlight and its Action on the Human Body [in Russian], Moscow (1959).