THE PROTECTIVE ACTION OF THE ORGANIC PHOSPHORUS PREPARATION NIBUFIN IN ALBINO MICE IRRADIATED WITH A LETHAL DOSE OF X-RAYS

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The organic phosphorus compound nibufin (the p-nitrophenyl ester of dibutylphosphinic acid) is an active cholinesterase inhibitor [1]. There are reports in the literature [2-5] that both acetylcholine and cholinomimetic preparations have a protective action against acute radiation sickness. In preliminary observations on 150 albino rats, the prophylactic intramuscular injection of a solution of nibufin (1:3000) in a dose of 0.2 ml/100 g body weight after irradiation with a lethal dose (800 R) of hard x-rays appreciably lowered the increase in the cholinesterase activity * of the brain and heart muscle. At the same time, after prophylactic administration of nibufin the time of death of albino rats irradiated with a lethal dose of x-rays was clearly postponed. In the present investigation the protective action of nibufin was studied in albino mice.

EXPERIMENTAL

Two series of experiments were conducted on 243 albino mice weighing 20-22 g. Acute radiation sickness was produced by irradiation on a type RUM-3 x-ray apparatus under the following conditions: skin-focus distance 60 cm, current 10 mA, voltage 180 kV, filters 1 mm Cu + 1 mm Al, dose 800 R.

In all the experiments, both in the control series and in those in which nibufin was given, the mortality rate among the mice reached 100% not later than the 14th day. At autopsy hemorrhages were observed in the intestine, lungs, heart, and spleen and degenerative changes were found in the liver.

The protective action of nibufin was estimated from the decrease in the percentage of albino mice dying 3 and 6 days after irradiation. These times were chosen because the "minimum" of the compensatory mechanisms of the animal organism when irradiated with a lethal dose of x-rays occurs on the 3rd day.

RESULTS

In the control group of mice receiving a dose of 800 R, 6 of the 49 animals (12.2%) died during 3 days, and 26 (53%) died during 6 days. Nibufin solution (1:3000), injected subcutaneously in a dose of 0.2 ml/100 g body weight 10-15 min before irradiation with the above dose of x-rays, caused little decrease in the mortality among the mice during the first 3 days. Of the 143 mice receiving nibufin before irradiation, 16 (11.2%) died during the first 3 days. However, during the first 6 days, of the 100 mice receiving nibufin before irradiation with a lethal dose of x-rays only 36 died (36%, compared with 53% in the control series). Hence the prophylactic protective action of nibufin in acute radiation sickness caused by a lethal dose of x-rays appears after the protecive compensatory mechanisms of the organism have reached their minimum.

*The cholinesterase activity was determined by Hestrin's method [6].

The additional (therapeutic) administration of nibufin on the 3rd day after irradiation did not lower the mortality among the animals up to the 6th day by comparison with the mortality among the irradiated mice receiving the preparation only prophylactically.

On the 94 animals receiving nibufin before and after irradiation, up to the 6th day 36.1% had died, compared with 36% of the mice receiving nibufin only prophylactically.

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