

EFFECT OF X-RAY IRRADIATION ON ADENOSINE TRIPHOSPHATASE ACTIVITY IN DENERVATED AND INTACT MUSCLES

P. M. Zubenko, K. V. Ostashkov,
and I. I. Sokolov

UDC 612.744.15.015.1.014.481.1

Denervation of a muscle prevents the decrease in adenosine triphosphatase activity developing in the muscle after x-ray irradiation of animals.

* * *

Our earlier investigations showed that integrity of the nervous system is essential for the development of pathological processes in muscles after x-ray irradiation of animals [1, 2].

In this investigation we studied the effect of x-ray irradiation on adenosine triphosphatase (ATPase) activity of intact and denervated muscles.

EXPERIMENTAL METHOD

Enzyme activity was determined from the quantity of phosphorus split from ATP by extracts of rabbit gastrocnemius muscles during incubation for 10 min at 37°. The quantity of phosphorus split off during incubation was determined by a slightly modified method of Berenblum and Chain [3]. The dose of single whole-body x-ray irradiation of the rabbits was 1200 R. The muscle was denervated by unilateral excision of a segment (0.8–1 cm) of the sciatic nerve 5 days before irradiation.

EXPERIMENTAL RESULTS

The ATPase activity 24 h after irradiation, expressed in $\mu\text{g P/mg tissue}$ in the intact muscles was reduced on the average by 30% (from 11.9 ± 0.53 to 8.3 ± 0.49 ; $P < 0.001$), and 10–12 days after irradiation it was reduced by 21% (from 11.54 ± 0.61 to 9 ± 0.7 ; $P < 0.02$).

Denervation prevented the irradiation effect. For instance, 24 h after irradiation the ATPase activity in the muscle denervated 6 days previously was $9.86 \pm 0.43 \mu\text{g}$, compared with $11.2 \pm 0.44 \mu\text{g}$ in denervated muscles of unirradiated rabbits ($P > 0.05$). The decrease in ATPase activity in the late stages after denervation of the muscles was not significant. Whereas the ATPase activity 16–18 days after denervation was 12.91 ± 0.69 , in animals with a denervated muscle this index on the 10th–12th day of irradiation was 11.2 ± 0.68 ($P > 0.05$).

The fact that denervated and intact muscles differ in their sensitivity to x-ray irradiation undoubtedly indicates the essential role of the nervous system in responses of the organism to irradiation.

LITERATURE CITED

1. P. M. Zubenko and I. I. Sokolov, Abstracts of Proceedings of the First Ukrainian Biochemical Congress [in Ukrainian], Chernovtsy (1965), p. 149.
2. I. I. Sokolov, in: Problems in Experimental and Clinical Radiology [in Russian], Kiev (1965), p. 108.
3. J. Berenblum, Biochem. J., 32, 295 (1938).

Department of Biophysics and Biochemistry, Dnepropetrovsk University; Central Research Laboratory, Dnepropetrovsk Medical Institute (Presented by Active Member of the Academy of Medical Sciences of the USSR S. E. Severin). Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 66, No. 11, pp. 31–32, November, 1968. Original article submitted September 17, 1966.