

Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 366.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Biological Effects of the Rays produced by a Cyclotron

BIOLOGICAL effects of neutron-rays from a cyclotron have been reported, on the change of blood pictures in living rats by Lawrence and Lawrence¹, on the retardation of the germination of wheat seedlings by Zirkle and Aebersold², and on the fatal dose of the sarcoma 180 by Lawrence, Aebersold and Lawrence³. They compared the effects of fast neutrons with those of hard X-rays, and found that neutrons are, in fact, biologically, much more effective than in the case of X-rays.

Apart from these questions of the action of neutrons, we have been engaged in making experiments on histological changes in the organs of a mouse, irradiated with rays produced by bombarding a beryllium target with 2.8 MeV. deuterons from the cyclotron in this Institute.

Healthy male mice weighing 13-17 gm. were chosen for use because of their small size, which made irradiation possible in the limited space available in the cyclotron. A glass cylinder, 2 mm. in wall thickness, 46 mm. in diameter, and 106 mm. in length, was divided into two parts by a glass plate inserted along the axis, one animal being put in each of the partitions. The cylinder was placed in the observation chamber of the cyclotron, and the two mice were irradiated simultaneously under the same conditions. The animals were kept at an equal mean distance of about 8 cm. from the beryllium target. The irradiation was continued for four hours with mean deuteron current of 0.4 microampere.

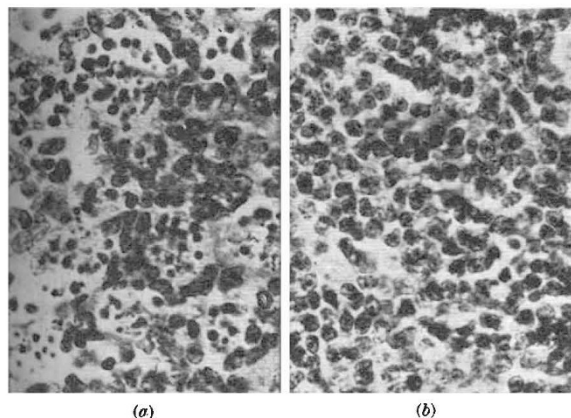


FIG. 1.

(a) IRRADIATED SPLEEN; (b) NON-IRRADIATED SPLEEN.

As was shown in the laboratory of one of us, histological change of the spleen in the rat, irradiated with X-rays, can be observed best about ten hours after the beginning of irradiation⁴.

Therefore ten hours after the beginning of irradiation the animal was dissected; the spleen and testes

were taken out, the former being fixed in Helly solution and stained with hæmatoxylin and eosin, while the latter was fixed in Champy solution and stained with Heidenhain's iron-hæmatoxylin as usual.

Fig. 1a shows a follicle of the spleen in the irradiated animal, and Fig. 1b the same part of the non-

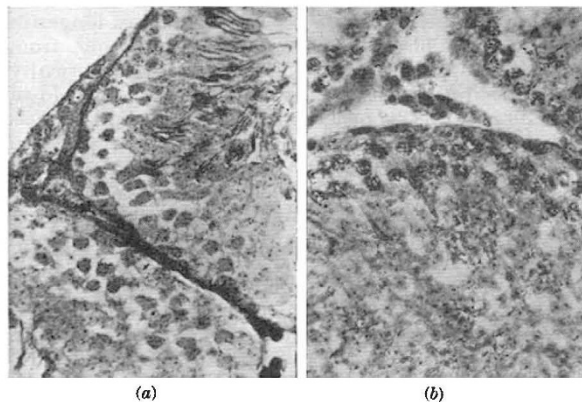


FIG. 2.

(a) IRRADIATED TESTICLE; (b) NON-IRRADIATED TESTICLE.

irradiated one; in the former, one can observe the remarkable decrease in the number of lymphocytes. Moreover, a large number of strongly stained dots in the same picture shows the destroyed particles.

In testicles, cells in the various stages of the spermatogenesis are more or less affected and destroyed, but interstitial cells, Sertoli's cells and spermatozoa are relatively intact. Further, one can observe in Fig. 2a that there is a diminution in radiosensitivity in passing through the various stages from spermatogonia to spermatozoa.

In conclusion, our thanks are due to Prof. S. Nishikawa and Dr. Y. Nishina for their interest in this work, to Mr. T. Yasaki and Mr. S. Watanabe for their assistance in the physical work, and to Dr. W. Nakahara for his hospitality in keeping our mice. We wish to thank the Japan Wireless Telegraph Company for the electromagnet and other equipments used for the cyclotron, and Mitsui Ho-onkwai Foundation and Tokyo Electric Light Company for financial support.

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¹ Lawrence, J. H., and Lawrence, E. O., *Proc. Nat. Acad. Sci.*, **22**, 124 (1936).

² Zirkle, R. E., and Aebersold, P. C., *Proc. Nat. Acad. Sci.*, **22**, 134 (1936).

³ Lawrence, J. H., Aebersold, P. C., and Lawrence, E. O., *Proc. Nat. Acad. Sci.*, **22**, 534 (1936).

⁴ Motida, N., Sasao, T., and Koenuma, N., *Nippon Röntgen Gakkwai Zasshi (Japanische Z. Röntgenologie)*, **14**, 201 (1936); Motida, N., Koenuma, N., and Sasao, T., *Nippon Röntgen Gakkwai Zasshi*, **14**, 471 (1937).