



Title	Radiation-Induced Mortality of Previously Splenectomized Mice
Author(s)	栗冠, 正利; 坂本, 澄彦
Citation	日本医学放射線学会雑誌. 1963, 23(7), p. 835-837
Version Type	VoR
URL	https://hdl.handle.net/11094/19838
rights	
Note	

The University of Osaka Institutional Knowledge Archive : OUKA

<https://ir.library.osaka-u.ac.jp/>

The University of Osaka

RADIATION-INDUCED MORTALITY OF PREVIOUSLY
SPLENECTOMIZED MICE

By

Masatoshi SAKKA* and Kiyohiko SAKAMOTO

Department of Radiology, School of Medicine, Tokyo Medical and Dental
University, Yushima, Bunkyo-ku, Tokyo, Japan.

予め脾臓摘出を受けたマウスの放射線死亡について

東京医科歯科大学医学部放射線医学教室

栗 冠 正 利* 坂 本 澄 彦

(昭和38年7月6日受付)

マウスの全身照射後の造血障害に依る死亡は残存する造血組織の量に依って決ると云われている。照射前に脾臓摘出を行って造血組織の一部を除き全体の造血組織の量を減じておくことと完全な個体よりも造血系障害に依る死亡が高率に起るかも知

れない。この考えが成立つか否かを知るためにこの実験を行つた。

その結果脾臓摘出マウスと正常マウスとの間に有意差は認められなかつた。

Severity of hematological injury of mice having received a total-body irradiation depends upon the amount of hematopoietic tissues surviving from irradiation. In animals previously extirpated a part of the hematopoietic tissue, radiation-induced hematologic death may occur more frequently than in normal animals irradiated with the same dose. The purpose of the present experiments is to testify the validity of this hypothesis.

MATERIAL AND METHOD

Litter-mated dd colony albino mice, male and female, eight weeks of age, weighing 25 to 29 grammes were used for the first experiments from spring to summer, 1961. The second experiments, from autumn to early winter, 1962, were carried out with the same colony of animals purchased from market.

Half of a litter were anaesthetized by intraperitoneal injection of 0.1 to 0.15 cc of 5% Mintal and the spleen was extirpated. Suture of side abdominal wall was followed by small amount of intraperitoneal Penicillin administration. Each animal was housed one per cage of 25°C and maintained on solid diet (Oriental Yeast Co.) and water ad lib. Three days after splenectomy, animals were irradiated in a plastic cylinder of three mm of wall thick-

* 現在は東北大学医学部放射線基礎医学教室

Present address, Medical Radiation Research Laboratory, School of Medicine, Tohoku University, Kitayobancho, Sendai, Japan.

ness. Splenectomized and non-splenectomized litters were placed side by side on a wax phantom of 10 cm thick and were irradiated within a broad beam of X-rays at the same time.

Conditions of irradiation: 200 KV X-rays, HVL=1.8mm Cu, TSD=50 cm, Field size=15 cm \times 15 cm. Exposure dose rate was read from a 100 r Victoreen condensor chamber placed at the centre of a plastic cylinder on a wax phantom. A single total-body exposure of 690 r was delivered to animals with a dose rate of 53 r/min.

RESULTS

1. In experiments of spring-summer, 1961, four out of 17 splenectomized mice died within a month after total-body X-irradiation. Date of death was on 7th, 11th, 12th, and 16th of experiment (irradiation was given on 0th day). In a control group, one out of 14 mice died on the 14th day. The difference in two groups was not significant statistically, being within one standard deviation from a mean of 5/31 on a binominal probability co-ordinate paper (Table 1).

Table 1

	Total number	Number of death (within a month after total-body X-irradiation)
Splenectomized group	17	4
Control group	14	1

2. In the second experiment carried out from autumn 1960 to early winter 1962, dd colony male albino mice purchased from market were used after 10 days of quarantine period, because sufficient number of litter-mated animals was not available in our laboratory.

All of 14 splenectomized animals died within 30 days after total-body irradiation of 690r. Date and number of death were as follows: Two animals on 6th day, two on 9th, five on 10th, two on 12th, two on 14th and one on 16th day.

All of eight non-splenectomized control mice died within 30 days after total-body irradiation with the same dose. Date and number of deaths: two animals on 9th day, one on 10th, three on 13th, one on 18th and one on 30th. Median survival time for splenectomized and control groups was 11 and 13 days respectively. No significance was demonstrated between them (Table 2).

Table 2

	Total number	Number of death (within a month after total-body X-irradiation)
Splenectomized group	14	14
Control group	8	8

CONCLUSION AND DISCUSSION

It seems that previously splenectomized litter-mated animals were more sensitive to total-body X-irradiation than non-splenectomized controls in spring-summer experiments, but

a significant difference was not demonstrated.

In the second experiments, all animals died irrespective of splenectomy. The great difference in summer and winter experiments in response to the same dose of X-rays may be explained by genetic constructions of the animals. Genetic nature of "dd colony" of mice in our experiments has not yet been confirmed and not registered as a strain. In the first experiment brother-sister mated F_4 litters were used which derived from a dd mother (P) purchased from a market.

Therefore, radiosensitivity of F_4 might have changed from its original P's sensitivity during a experimental period. Haematopoietic system is very sensitive to radiation in young adults and such a sensitive tissue may well be treated in a genetically confirmed strain.

REFERENCES

- 1) Duggar, B.M., Biological effects of radiation, Vol. 1 & 2. McGraw-Hill Book Co., Inc., New York, 1936.
- 2) Ellinger, F. et al.: Reproducibility of the lethal effects of total-body irradiation in mice, *Radiology*, 64, 210, 1953.
- 3) Jacobson, L.O., Modification of radiation injury in experimental animals, *Amer. J. Roentgenol.*, 72, 543, 1954.
- 4) Kereiakes, J.G. et al., Effect of partial shielding by grids on survival of X-irradiated rats, *Proc. Soc. Exper. Biol. Med.*, 86, 153, 1954.
- 5) Mole, R.H., Quantitative observation on recovery from whole-body irradiation in mice. I. Recovery after single large doses of Radiation. *Brit. J. Radiol.* 29, 563, 1956.
- 6) Mole, R.H., Quantitative observation on recovery from whole body irradiation in mice. II. Recovery during and after daily irradiation, *Brit. J. Radiol.*, 30, 40, 1957.
- 7) Quastler, H., Studies on roentgen death in mice. I. Survival time and dosage, *Amer. J. Roentgenol.*, 54, 449, 1945.
- 8) Quastler, H., Studies on roentgen death. II. Body weight and sensitivity, *Amer. J. Roentgenol.*, 64, 963, 1956.