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Liv.52 Protection Against Late Effect of Radiation on Mammalian Spleen

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INTRODUCTION

Many chemicals have been reported to protect animals against radiation injuries. But their clinical applications have been found to be very limited because of their high toxicity[1-3]. In the authors laboratory a series of experiments have been conducted to evaluate the radioprotective efficacy of various chemicals since 1975. Very recently, we have observed the radioprotective effect of an indigenous preparation commercially known as Liv.52, which has been used clinically as a detoxicating agent with a wide range of applications in various hepatic disorders[4-9]. Therefore, the present study is an attempt to determine the role of Liv.52 against radiation-induced changes in a haematopoietic organ.

MATERIALS AND METHODS

Six to nine weeks old male Swiss albino mice, weighing 23-30 g were selected from an inbred colony and divided into three groups of 50 each. Each group contained an experimental and a control set of animals. The experimental sets were given an oral dose of 0.05 ml/animal of Liv.52 daily. The drug was administered 15 days before and 15 days after irradiation. The control animals were given an equal volume of tap water in the same manner.

Fifteen days after this treatment, the animals of the first, second and third groups were exposed to 8.0, 9.0 and 10.0 Gy Gamma radiation respectively in a well-ventilated plastic box at the dose rate of 0.8 Gy/min. On the 70th post-irradiation day the surviving animals were sacrificed and their spleens were removed. The wet weight of the spleen from each animal was determined separately and then fixed in Bouin's fluid. The results were expressed in the form of individual as well as mean tissue weight ± S. E. Photomicrographs of fixed spleens of the experimental and control sets were made to demonstrate the relative size of the organ.

RESULTS

It was observed that the mean spleen weight became double after 8.0 and 9.0 Gy irradiation, and it was two and half times greater in 10 Gy exposed animals, as compared to non-irradiated normal animals. However, in the drug-treated animals, the mean weight of the organ remained almost within the normal range after exposure at all the dose levels. The spleen weight and size in the control groups were also significantly higher as compared to that of the drug treated animals at all exposures (Table 1 and Fig. 1)

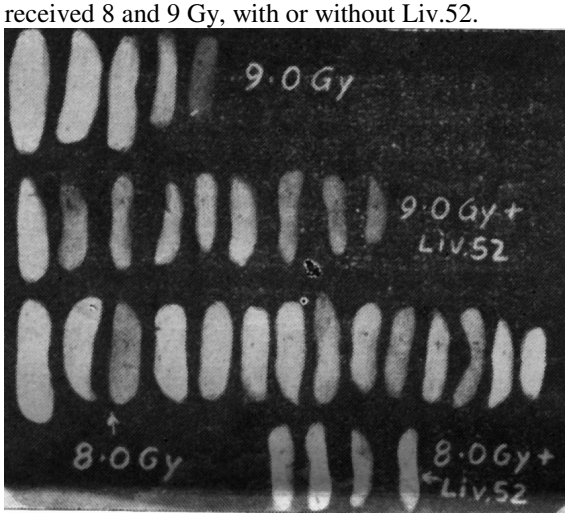
Table 1: Spleen weight (mg) changes after exposure to different doses of gamma radiation with or without Liv.52

Dose (Gy)	Group	Weight range	Mean weight ± SE	*p* value
8.0	C*	168-448 (15)	285.20 ± 18.50	$p<0.01$
	E*	100-155 (7)	126.00 ± 6.78	
9.0	C	175-408 (8)	247.60 ± 42.95	$p<0.05$
	E	88-163 (14)	135.22 ± 8.69	
10.0	C	250-305 (8)	181.00 ± 16.25	$p<0.001$
	E	115-150 (12)	127.33 ± 11.34	

Numbers in parentheses indicate the number of animals used
C* – Control group, without Liv.52
E* – Experimental group, with Liv.52.

DISCUSSION

Fig. 1: Morphological appearance of spleens that received 8 and 9 Gy, with or without Liv.52.



One of the earliest effects of radiation is a reduction in organ weight, which reflects the histopathological changes in the tissue. The weights of the other organs varied with the dose in a relatively simple manner; those of the most radiosensitive organs could be described by a linear change in the logarithm of the weight against the dose[10]. The spleen, however, showed a more complicated response after total body irradiation. Its weight declined after a series of low doses but it became progressively heavier at higher dose levels[11-13]. A similar behaviour of the spleen is also observed in the present experiment where the weight of this organ became two to two and half times greater than that of the normal animals at 70 days after exposure to 8.0, 9.0 and 10.0 Gy, while the drug treated animals the spleen weight and size remained almost within the normal range.

Saini[13] has stated that when bone marrow becomes totally aplastic and proliferative its capacity and that of other blood forming organs is reduced or nullified. Then undifferentiated or "stem" cells started dividing and differentiating into erythroblasts and myeloblasts in the red pulp to compensate the peripheral blood cell loss. He also reported that this increased extra medullary haemopoiesis in the active red pulp resulted in an increase in spleen weight. Similarly in the present study a pronounced recovery of the control spleens is demonstrated by a weight increase above normal values, while in the Liv.52-treated animals the spleen weight remained within normal levels which indicates the protection afforded by Liv.52 to the haematopoietic organs from ionizing radiation.

SUMMARY

The effects of 8.0, 9.0 and 10.0 Gy gamma rays were observed at 70 days post-irradiation on the spleen weight changes in the presence and absence of Liv.52. It was found that the drug protects the haematopoietic organs against ionizing radiation. The protection is shown by the absence of compensatory reaction in the Liv.52-treated spleens as is evident by their lesser weight and size.

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