

Late Effect of Whole-Body Irradiation on the Peripheral Blood of Mice and its Modification by Liv.52

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INTRODUCTION

Chemical protection of peripheral blood cells in animals has been reported by various workers¹⁻⁴. But intensive research has failed to produce a clinically viable radio-protector. In an attempt to find a suitable compound with low toxicity and high radiation protection, we have, in this study, selected an indigenous drug, Liv.52, which is being used clinically as a detoxicating agent and in the treatment of various hepatic disorders⁵⁻⁸. In an earlier study, the protective effect of Liv.52 was observed in mice against radiation sickness and dermatitis⁹. The present study attempts to evaluate the role of Liv.52 in protecting against radiation-induced peripheral blood changes in mice.

MATERIALS AND METHODS

Male Swiss albino mice, weighing 22 ± 5 g, were selected from an inbred colony. The animals, maintained on standard mice feed and water *ad libitum*, were divided into two groups of 60 each. One group received a daily oral dose of 0.05 ml/animal of liv.52 drops. (The Himalaya Drug Co.) from 15 days before till 15 days after a whole-body exposure to 8.0, 9.0 or 10.0 Gy at the dose rate 0.8 Gy/min and served as the experimental.

The other group of animals was given tap water in a similar manner and irradiated as above, and served as the control. On the 70th post-irradiation day the surviving animals were sacrificed and their blood was drawn from the heart. The total leucocyte, erythrocyte, differential lymphocyte and granulocyte counts were recorded.

Table 1: Peripheral blood cell changes in mice after exposure to different doses of gamma rays in the presence and absence of Liv.52

Dose (Gy)	Groups	Total leucocytes (/c mm)	Percentage		Total erythrocytes ($\times 10^6$ /c mm)
			Granulocytes	Lymphocytes	
8.0	C	2550.00 \pm 133.33	16.82 \pm 1.12	52.50 \pm 2.02	10.12 \pm 0.42
	E	2982.20 \pm 110.20 <i>p</i> <0.05	16.00 \pm 1.34 <i>p</i> = NS	57.83 \pm 1.23 <i>p</i> <0.05	10.66 \pm 0.51 <i>p</i> =NS
9.0	C	2520.00 \pm 132.00	16.63 \pm 2.10	50.66 \pm 1.88	9.26 \pm 0.36
	E	2896.32 \pm 102.12 <i>p</i> <0.05	17.12 \pm 0.96 <i>p</i> = NS	57.00 \pm 2.12 <i>p</i> <0.05	10.42 \pm 0.38 <i>p</i> <0.05
10.0	C	2225.25 \pm 150.55	24.98 \pm 1.33	48.25 \pm 2.22	8.69 \pm 0.52
	E	2666.26 \pm 140.32 <i>p</i> <0.05	18.88 \pm 1.04 <i>p</i> <0.05	55.12 \pm 1.42 <i>p</i> <0.02	9.96 \pm 0.31 <i>p</i> <0.05
C = Control; E = Experimental Normal values: Total leucocytes 3136.66 \pm 182.21/c mm Granulocytes 16.30 \pm 0.96% Lymphocytes 62.33 \pm 1.48% Total erythrocytes 11.12 \pm 0.38 $\times 10^6$ /c mm.					

RESULTS

The total leucocyte and erythrocyte counts and lymphocyte percentages did not reach the normal levels in both control and experimental animals, 70 days after all exposures. However, these values were significantly higher in the Liv.52 treated group as compared to those of the control animals. The granulocyte percentage did not show any noticeable change after exposure to 8.0 and 9.0 Gy in control and experimental animals as compared to the normal value. But the granulocyte percentage was significantly higher in 10.0 Gy irradiated animals as compared to that of the normal and experimental animals.

DISCUSSION

In the present experiment, irradiation with lethal doses of gamma rays brings about a reduction in the level of leucocytes. This supports the earlier findings of Norris *et al.*¹⁰, who reported that after 50 days of higher exposures (260-280 Rads), the mean WBC counts fell to fairly stable level i.e., 5500 cells / mm³ of whole blood as compared to pre-irradiation mean count of 10800 cells/mm³. After exposure to 231-240 and 241-260 Rads, the total leucocyte counts were 84% of the pre-irradiation value on day 60. Similarly, Anisworth and Leony¹¹ reported that the total leucocyte counts returned to only 70-80% of the pre-irradiation values during the observation period of 168 days.

In the present study, the lymphocyte count did not reach the normal level on day 70 after the exposures but the granulocyte percentages showed no noticeable changes in the 8.0 and 9.0 Gy irradiated groups, even though the values were well above normal after 10.0 Gy. Thus, it appears that the low level of total leucocyte count in the present study is mainly due to the loss of lymphocytes and this deficit largely accounted for the failure of the total white blood cells count to return to the pre-irradiation level. Similarly Norris *et al.*¹⁰, also suggested that various white blood cells except lymphocytes approached pre-irradiation level in about 50 days.

The lower number of erythrocyte counts in the present study may be due to defective haemopoiesis as well as intravascular red cells damage¹². In addition, the shortening of life span of erythrocytes by radiation, as suggested by Kohn and Furth¹³, may have a significant role in bringing about the erythrocyte depletion at 70 days. It is an established fact that the depletion in the various blood components is largely due to the adverse effect of radiation on the blood-forming organs. Brues and Stroud¹⁴ and Saini¹⁵ reported that when bone marrow became totally aplastic and its proliferative capacity and that of other blood-forming organs is reduced or nullified by heavy irradiation, then "stem" cells in the red pulp of the spleen start dividing and differentiating into erythroblasts and myeloblasts to compensate the peripheral blood cell loss.

SUMMARY

The radio-protective effect of Liv.52 on the peripheral blood of Swiss albino mice was studied on 70 days after exposure to 8.0, 9.0 and 10.0 Gy gamma rays. A significant increase in leucocyte and lymphocyte counts was observed in all the Liv.52 treated animals as compared to the control group. Similarly, the erythrocyte count was also significantly higher in the experimental animals of 9.0 and 10.0 Gy exposed groups in comparison to their corresponding controls.

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