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Survival of Mice Protected from Lethal Radiation by Liv.52

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A large number of chemicals have been tested for their ability to protect animals against radiation death (Patt *et al*., 1953, DeSaive and Varetto-DeNoel 1955, Mole and Temple 1957). All these chemicals are reported to have a high toxicity, which limits their value in the clinical field. But Liv.52 (an indigenous preparation) is an effective radioprotector and non-toxic even at higher dose levels (10g/kg. b. wt.). The drug is being used clinically as a detoxicating agent in various countries with a wide range of application in various hepatic disorders (Mathur 1957, Joglekar *et al*., 1963, Karandikar *et al*., 1963, Sule *et al.,* 1968, Arora 1969, Deshpande *et al*., 1971).

The present experiment attempts to study the protective effect of Liv.52 against radiation sickness and mortality in Swiss albino mice.

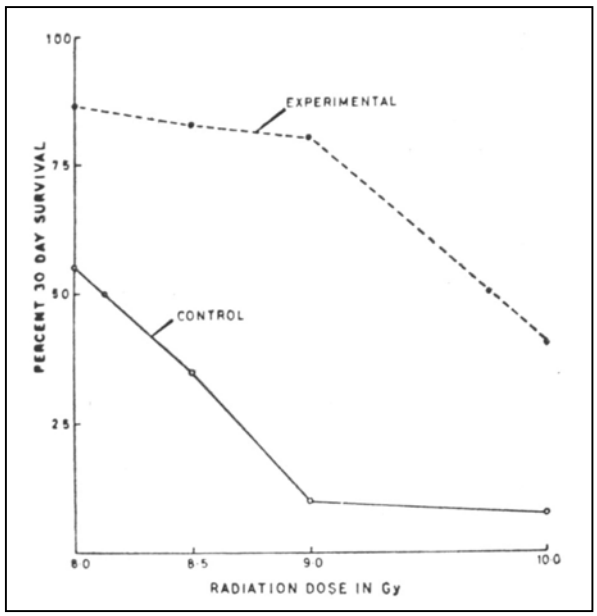
MATERIALS AND METHODS

Male Swiss albino mice, 6-8 weeks of age, with an average body weight of 26 g were selected from an inbred colony and divided into two groups taking at least 90 animals for each. One group was orally administered Liv.52 drops daily (received from The Himalaya Drug Co., Bombay). 0.05 ml/animal, 15 days prior to and after irradiation and served as the experimental group. The other group received only tap water in a similar way and served as the control group.

After 15 days of this treatment the animals in both the groups were irradiated (whole body) in a well-ventilated, plastic box at the dose rate of 0.8 Gy/min. to different doses, viz. 8.0, 8.5, 9.0 and 10.0 Gy of 60 Co gamma radiation. The mice were kept in an air-conditioned room, maintained on standard mice feed (procured from Hindustan Lever Ltd., New Delhi) and water *ad libitum*. The radiation sickness and mortality were observed for 30 days after irradiation.

RESULTS

In the control animals symptoms of radiation sickness like diarrhoea, anorexia, ruffling of hair and epilation were severe as compared to the experimental animals. In some cases the animals had arched backs. Occasionally excessive watering of the eyes was observed and continuous blinking was seen terminally in some animals. Mostly they sat or lay immobile in a corner of the cage. However, in the drug-treated group these symptoms were totally absent and the animals were very active. It was also observed that in the experimentally group mortality



occurred within 10 days, while in the control animals it was recorded upto 16 days.
The percentage of 30-day survivals was higher in the Liv.52-treated animals than in the untreated group as shown in the Fig. The LD 50/30 is estimated to be 9.75 Gy in treated animals as compared to 8.12 Gy in the untreated controls.

Thus in these conditions the dose reduction factor is calculated to be 1.2.
The dose reduction factor (DRF) is expressed as

$$\text{DRF} = \frac{\text{LD 50/30 for protected animals}}{\text{LD 50/30 for unprotected animals}}$$

where LD 50/30 is that radiation dose which causes 50 per cent deaths within 30 days.

DISCUSSION

When animals are exposed to large, acute, whole-body doses of X or gamma radiation, death may follow due to damage to one or more of the following systems: the haematopoietic, gastrointestinal and central nervous systems. These animals may be saved by appropriate radio protective drugs, which restore or replace tissues of the injured system. The short-term or 30 day mortality is the most widely used criterion for evaluating protective compounds. The present paper is the first one describing the protective role of Liv.52 against radiation-induced 30-day mortality and sickness. The following pertinent information has been obtained from this study.

1. Liv.52 delays the onset of radiation sickness; even some symptoms were completely absent in the drug-treated animals.
2. In the drug-treated animals, mortality occurred within 10 days while it was recorded upto 16 days in the control group. This clearly indicates that Liv.52 protects the animals against haematopoietic death.
3. The dose reduction factor (DRF) is estimated to be 1.2.

The exact mechanism of the drug is not known but it appears that Liv.52 may (a) increase the spontaneous food consumption and food conversion in the animals by protecting the liver which plays an important role in the general metabolism and (b) neutralize the peroxides formed from water molecules after irradiation, which are toxic and cause damage to various systems. Studies along these lines are now under way in the authors laboratory.

SUMMARY

An indigenous drug, Liv.52, which is commercially available in India as a detoxicating agent, has been shown to be protective in mice against lethal doses of ionizing radiation. It is also found that the time of onset and severity of radiation sickness are reduced considerably by the drug. Therefore this drug has a promising future in the clinical field.

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