RADIOPROTECTIVE EFFECT OF 2-MERCAPTOPROPIONYLGLYCINE ON THE PROTEIN CONTENTS OF MOUSE ILEUM

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THE -SH groups are important structural parts of protein molecules and play substantial role in their function. With the recognition that the SH containing enzymes are very sensitive to radiation and that the presence of cysteine can prevent radiation damage, the substances having the group SH have become the most promising source of radioprotective agents. A number of SH compounds are reported to protect against radiation injury but MPG is preferred because of its detoxicating nature and optimum protection shown by the drug at a very low dose level (20 mg/kg body wt.); this is far below its LD_{50} dose of 2100 mg/kg body wt.[1]. The present paper deals with the radioprotective action of MPG on the protein contents of the ileum of Swiss albino mice.

Six to eight week old male Swiss albino mice, were selected from an inbred colony (weighing 22 ± 2 g) and divided into two groups, the control and the experimental, maintained on standard mice feed and water *ad libitum*. Animals of the experimental group received 20 mg/kg body weight of MPG (2-mercaptopropionylglycine, was dissolved in distilled water to give a concentration of 2 mg/ml and pH adjusted at 6.4 with 0.1 N NaOH), intraperitoneally. The control group of animals was given an equal volume of distilled water in the same manner. After an interval of 15–30 min after injection, the animals of both the groups were exposed to 250, 500 or 1000 R of gamma rays from a ^{60}Co theraphy source at the dose rate of 50 R/min. Six animals from each group were autopsied at different post-irradiation intervals (3, 6, 12 and 24 hr and 3, 5, 7 and 14 days) and ileum was taken out. Ileum was split longitudinally, thoroughly rinsed with physiological saline, blotted on moist filter paper minced in chilled petridish and the protein content of ileum was estimated biochemically by the method of Lowry *et al*[2].

Animals of both the groups showed a reduction in the protein content at 3 hr after all the doses of radiation (250, 500 and 1000 R); the reduction continued further to reach a minimum at 24 hr in both the groups at the exposure doses of 250 and 500 R. However, at the irradiation dose of 1000 R, the minimum value is found on day 3 in the control and at 24 hr in the experimental group. The reduction in the protein value becomes more exaggerated with the increase of radiation dose. Recovery starts at 3 days in both the control and the experimental groups after an exposure to 250 and 500 R. Normal value is attained at 5 days in control group and 3 days in experimental group in the former, while in the latter the normal value is obtained at 7 days in control animals and on day 5 in experimental animals. After 1000 R, recovery starts at 5 days in control, but the value remains significantly lower than the normal even on the 7th day. But in the experimental group, recovery starts at 3 days, when the value is significantly higher than normal, then it falls to normal by the 7th day (figure 1).

From the results it is clear that the protein content decreased in both the groups at the initial intervals at all dose levels and the damage is dose-dependent. The observations agree with earlier findings[3,4] who also reported that ionizing radiation depresses the synthetic activity of protein. The present study with lower doses (250 and 500 R) showed the maximum depression at 24 hr, while with 1000 R, a minimum value is

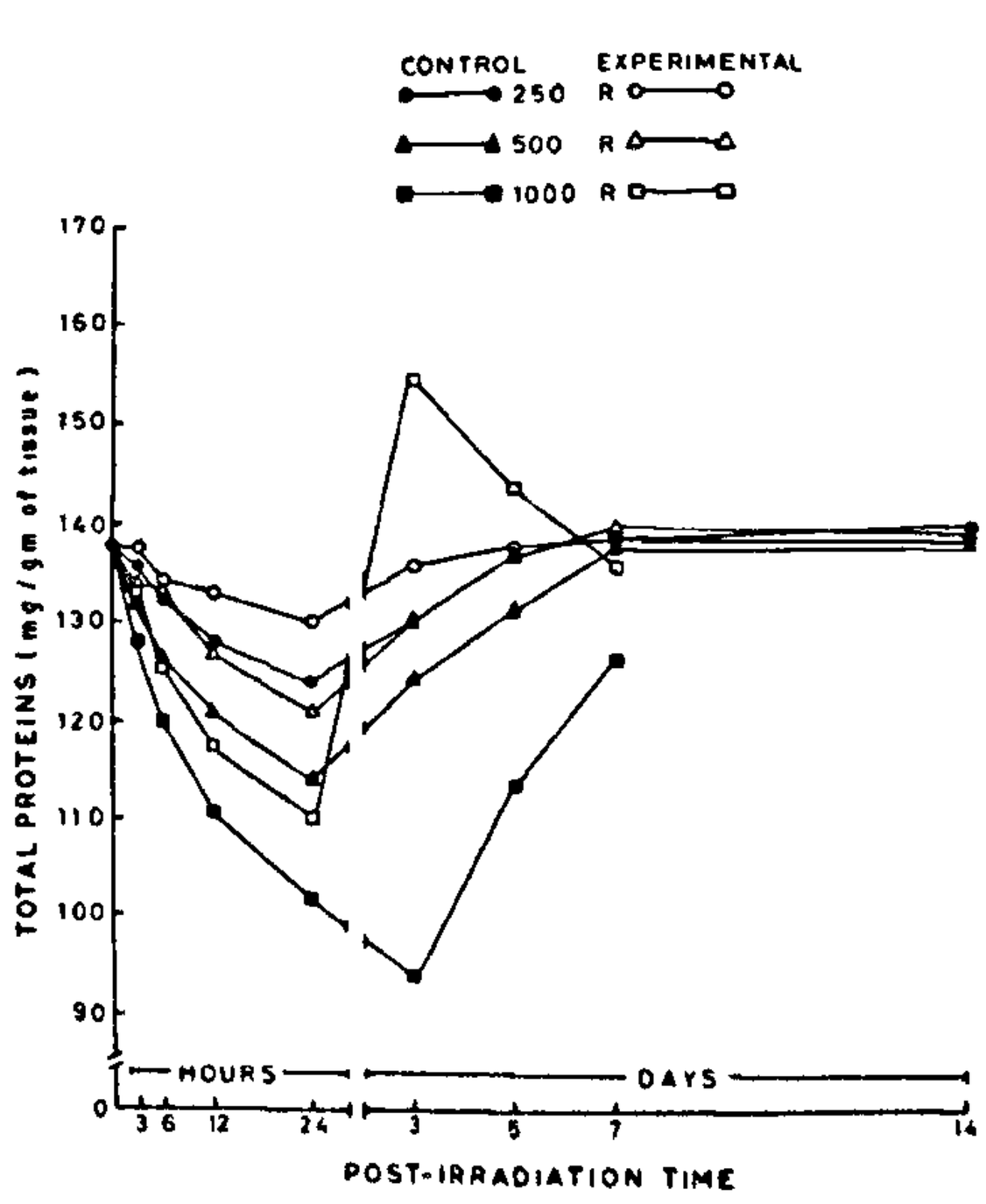

Figure 1. Variations in the amount of protein (mg g of tissue) in the ileum of Swiss albino mice after exposure to various doses of gamma rays.

recorded on day 3. Wrigglesworth and Pover[5] also reported maximum damage in protein contents on the third day with 1000 R which agrees with the present study. Kwok and Chapman[6] reported that the protein synthesis decreased after irradiation which may be due to an impairment of carrier transport system of precursors in protein. Maisin[4] and Paul and Zimmerman[7] reported that radiation depressed the m-RNA synthesis thereby decreasing the protein anabolism. The observation of Mathur[8,9] indicated that depression in intestinal protein content is directly related to the DNA and RNA metabolism. After the maximum damage, recovery starts and normal value is reached earlier in lower dose groups and in the 1000 R group, normal value is not attained.

MPG-treated animals showed a similar pattern of changes, the maximum damage being observed at 24 hr but damage is less severe than in the control. It is clear from the fact that the protein contents in the experimental animals remained significantly higher than in the control. The recovery observed is faster as compared to control. The present findings agree with those of Romantsev and Blokhina[10] who reported that shortly after injection of aminothiols into animals, inhibition of radiosensitive biochemical precursors (DNA, RNA and Protein) was observed, which in turn, protected DNA, RNA and protein from radiation-induced lesions. Eldjarn *et al*[11] proposed that the cysteine-cysteamine group of radio-protectors acted by forming temporary mixed disulfides with -SH and -S-S- groups of proteins. Kollmann and Shapiro[12,13] and Kollmann *et al*[14] showed that GED protected the protein against radiation damage by the formation of mixed disulphide bond between GED and protein. It appears from the present findings that the drug MPG exerts its protective influence on the cells by the formation of mixed disulphide bond between the -SH compounds (protector) and protein. The formation of mixed disulphide bond, could result in restoration of the target irrespective of the radiation attack which may be *via* direct or indirect action and brings about an early recovery.

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FURTHER GENETIC ANALYSIS OF THE TRILOBATE LEAF MUTANTS IN MUNGBEAN (*VIGNA RADIATA* VAR *AUREUS* (L) WILCZEK)

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THE inheritance of trilobate leaf condition in mungbean cv K851 was reported earlier[1]. The mutant analysed in that study was induced through γ-irradiation (source ^{60}Co). This mutant plant (mutant-1) had all trilobate leaves in contrast to the standard plants which had only monolobate leaves. A spontaneous leaf mutant (mutant-2) with similar phenotype (figure 1) later appeared in the experimental population of the same cultivar. A true breeding stock of mutant-2 was prepared for further studies. In both the mutant stocks, penetrance was complete but expressivity was variable. Also, both the mutants showed anthocyanin pigmentation of stem, leaf petioles and leaf veins. The gene for anthocyanin pigmentation appeared to be tightly linked to the gene for trilobate leaf shape as the