Purpose: To evaluate the effect of low-dose (< 50 cGy) whole body gamma irradiation on antioxidant defense system enzymes in the liver, lung and kidney of Balb/c mice at various post-irradiation intervals. We examined the critical level of radiation dose and the degree to which these changes remain affected in these organs after irradiation.

Methods: Young male Balb/c mice (5-6 wks), were divided into irradiated and non-irradiated groups. Whole body irradiation was done with gamma rays from a 60 Cobalt source at doses of 10, 25 and 50 cGy (48.78 cGy/min). Lipid peroxidation and antioxidant defense enzymes (reduced glutathione, superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase) were measured in liver, lung and kidney at 4, 12 and 24 hr after irradiation.

Results: Lipid peroxidation increased by 1.38, 2.0 and 1.33 folds in lung, liver and kidney respectively at 12 hrs after exposure to 25 cGy. Reduced glutathione increased significantly in all these organs at 12 hrs after exposure of the animals at these doses as compared to control. Superoxide dismutase activity increased in liver and kidney up to 1.37 folds at 12 hrs of exposure at these doses. The antioxidant enzyme activities of catalase, glutathione peroxidase and glutathione reductase also increased between 1.1 and 1.3 folds in kidney and liver of mice at these doses. Interestingly, the activities of these enzymes remained unaltered in the lung after exposure of the animals at different doses.

Conclusions: Low-dose whole body irradiation differentially modulates the antioxidant defense system in liver, lungs and kidneys of mice which may be due to variable sensitivities in activation of the related genes in these organs. The induction of endogenous glutathione immediately after exposure to low-dose gamma irradiation, may be beneficial in protecting the cells from the reactive oxygen species (ROS) induced oxidative stress in various ROS-related diseases.

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