High dietary iron and radiation exposure increase biomarkers of oxidative stress in blood and liver of rats

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Radiation exposure and increased iron (Fe) status independently cause oxidative damage that can result in protein, lipid, and DNA oxidation. During space flight astronauts are exposed to both increased radiation and increased Fe stores. Increased body Fe results from a decrease in red blood cell mass and the typically high Fe content of the food system. In this study we investigated the combined effects of radiation exposure (0.375 Gy of Cs-137 every other day for 16 days for a total of 3 Gy) and high dietary Fe (650 mg Fe/kg diet compared to 45 mg Fe/kg for controls) in Sprague-Dawley rats (n=8/group). Liver and serum Fe were significantly increased in the high dietary Fe groups. Likewise, radiation treatment increased serum ferritin and Fe concentrations. These data indicate that total body Fe stores increase with both radiation exposure and excess dietary Fe. Hematocrit decreased in the group exposed to radiation, providing a possible mechanism for the shift in Fe indices after radiation exposure. Markers of oxidative stress were also affected by both radiation and high dietary Fe, evidenced by increased liver glutathione peroxidase (GPX) and serum catalase as well as decreased serum GPX. We thus found preliminary indications of synergistic effects of radiation exposure and increased dietary Fe, warranting further study. This study was funded by the NASA Human Research Project.