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Radiation Fields, Effects and Risks in Human Space Missions (5)

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IGFBP-3 PROTEIN AS AN INDICATOR OF RADIATION-INDUCED LIVER INJURY: POTENTIAL USE IN SPACE RADIATION ASSESSMENT

Abstract

Robust and minimally invasive biomarkers are valuable for risk assessment of space radiation. Recent years, more and more biomolecules have been reported responsive to ionizing radiation in body fluids. However, the origin and organ-specific response of them remain unclear, which severely limit their application as new biomarkers. Our previous study found that the level of Insulin Like Growth Factor Binding Protein-3 (IGFBP-3) in mouse serum significantly increased after whole-body exposed to different doses of protons, carbon ions and X-rays. The liver is thought to be the primary source of IGFBP-3. In this study, the expression of IGFBP-3 in liver was detected after whole body irradiation. Moreover, mice were partial irradiated (head, chest and abdomen) by X-rays, and the level of IGFBP-3 in serum were detected. We found that the expression of IGFBP-3 in liver tissue showed significant increase after exposed to protons, carbon ions and X-rays, while the level of IGFBP-3 in serum increased only in abdominal irradiation group. In order to compare with the live injury induced by other causes, trichloromethane (CHCl3) was used to induce hepatic fibrosis and the expression of IGFBP-3 in liver and serum was detected. Unlike the effect of irradiation, CHCl3 could not induce the expression changes of IGFBP-3 in both liver and serum. These results indicate that ionizing radiation could stimulate expression of IGFBP-3 in liver and further up-regulate its level in circulating blood. IGFBP-3 protein has great potential as a specific biomarker for prediction and prognosis of radiation-induced liver injury in future space mission.