Identification and Analysis of Biological Markers for Tritium Exposure

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In nuclear fusion reactors, tritium is used for fuel and is at risk of leak. In order to assess risk of tritium, we need to elucidate cellular effects of tritium. We recently found that the DNA-PK/AKT/GSK3beta/CyclinD1 pathway is activated by long-term exposure to moderate dose of fractionated X-rays. Tritium exists as tritiated water (HTO) by the isotope exchange reaction. In this study we analyzed cellular reaction against HTO. Human liver cancer cell line HepG2 and cervical cancer cell line HeLa were immersed in RPMI medium containing HTO at the dose rate of 8 cGy/hr for 25, 100 and 125 hrs. Total dose was 2, 8 and 10 Gy, respectively. We determined whether the DNA-PK/AKT/GSK3beta/CyclinD1pathway is also activated by HTO exposure or not. As a result, exposure to 8 and 10 Gy of HTO induced phosphorylation of both the AKT and the DNA-PKcs proteins in both HepG2 and HeLa. We are underway whether threshold level of tritium exposure to induce the DNA-PK/AKT/GSK3beta/CyclinD1 pathway or not. Our study may provide the marker to estimate the biological effects against tritium exposure in human cells.