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THE STUDY ON SPACE-FLIGHT INDUCED DNA DAMAGE IN ARABIDOPSIS THALIANA AND THE PROTECTIVE EFFECT OF HYDROGEN

Abstract

Ionizing radiation (IR) is a known mutagen responsible for causing DNA strand breaks in all living organisms. Strand breaks thus created can be repaired by different mechanisms, including homologous recombination (HR), one of the key mechanisms maintaining genome stability. Here, we used previously generated Arabidopsis thaliana, transgenic for homologous recombination reporter system, in which homologous recombination frequency(HRF) was used as mutagenic end points. Based on the system, effect of DNA damage by space-flight during the Shenzhou-9 mission was investigated and the results showed that 13 days space-flight exposure of seedlings induced a significant increase in HRF compared with its ground-base three-dimensional clinostat controls and ground 1g controls. We also observed three-dimensional clinostat induced a significant increase in HRF compared with ground 1g controls. Molecular hydrogen (H2) has antioxidant activities by selectively reducing hydroxylradical (•OH) and peroxynitrite(ONOO-), so we investigated the effect of hydrogen on IR-induced HRF. Treatment with hydrogen-rich water dramatically reduced the HR frequency induced by exposure of seedlings to 0 to 80 Gy 60Co radiation , suggesting that hydrogen represents a potentially novel preventative strategy for radiation-induced DNA damage in plants.