

THPO0011

EFFECT OF 90 MeV PROTON IRRADIATION ON SPLEEN INJURY IN C57BL/6J MICE

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INTRODUCTION

Proton therapy has become one of the most important physiotherapy for tumors in the world, which can greatly improve the cure rate of tumors that are ineffective by conventional treatments. In addition, proton is also the main source of radiation in space environment. Therefore, it is of great scientific significance to use accelerators to carry out basic research on proton radiotherapy and space radiobiology, which can provide technical support and basic data for the optimal design of proton therapy and risk assessment of personnel in space environment.

Proton radiation biological effect is an important research content of space radiobiology and proton beam cancer therapy. The 100 MeV high intensity proton cyclotron(CYCIAE-100) owned by the China Institute of Atomic Energy can provide stable medium and low energy proton beams, which is very suitable for carrying out basic research on the biological effects of radiation.

MATERIALS AND METHODS

(1) Animals and Experimental Design

Male C57BL/6J mice aged 6-8 weeks were obtained from SIPEIFU company, Beijing, China. The mice were acclimatized for a week under standard vivarium conditions. Next, we randomly divided the 72 animals into the experimental and control groups, including the control group of C57BL/6J(n=6), 0.2、0.5 and 2 Gy experimental group of C57BL/6J(n=6). At the end of the experiment, samples were collected on the first, third and seventh day.

(2) Radiation Exposure

Proton irradiation was performed at the single-particle effect experimental terminal of CYCIAE-100 (Fig.1,2). Mice were exposed to 0.2、0.5 and 2 Gy of 90 MeV proton with 0.8Gy/min. Control groups were subjected to a sham radiation procedure.

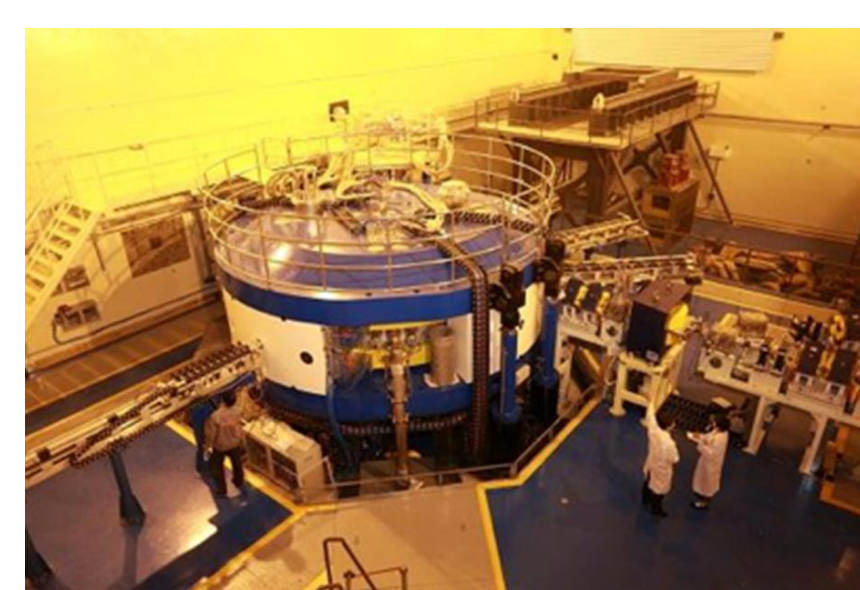


Fig. The 100 MeV proton cyclotron

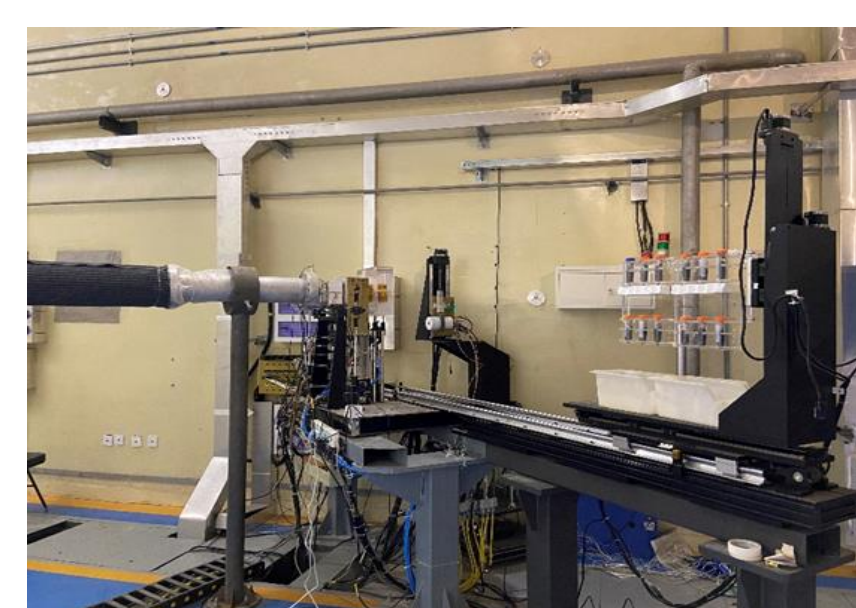


Fig.2 The mice irradiation terminal diagram of cyclotron

(3) Experiment Content

The body weight and organs (spleen, liver and thymus) of mice were weighed to study the effects of radiation on body weight and organ index of mice. The expression level of DNA damage-related protein γ H2AX in spleen was detected by western blot.

RESULTS

(1)The results of weight and organ index

The results showed that compared with the control group, the body weight of mice in each irradiation group had no significant change(Fig.3). Compared with the control group, the spleen organ index of the irradiated group decreased, indicating that the spleen atrophy after proton radiation, and the most obvious one was 2Gy (Fig.4).

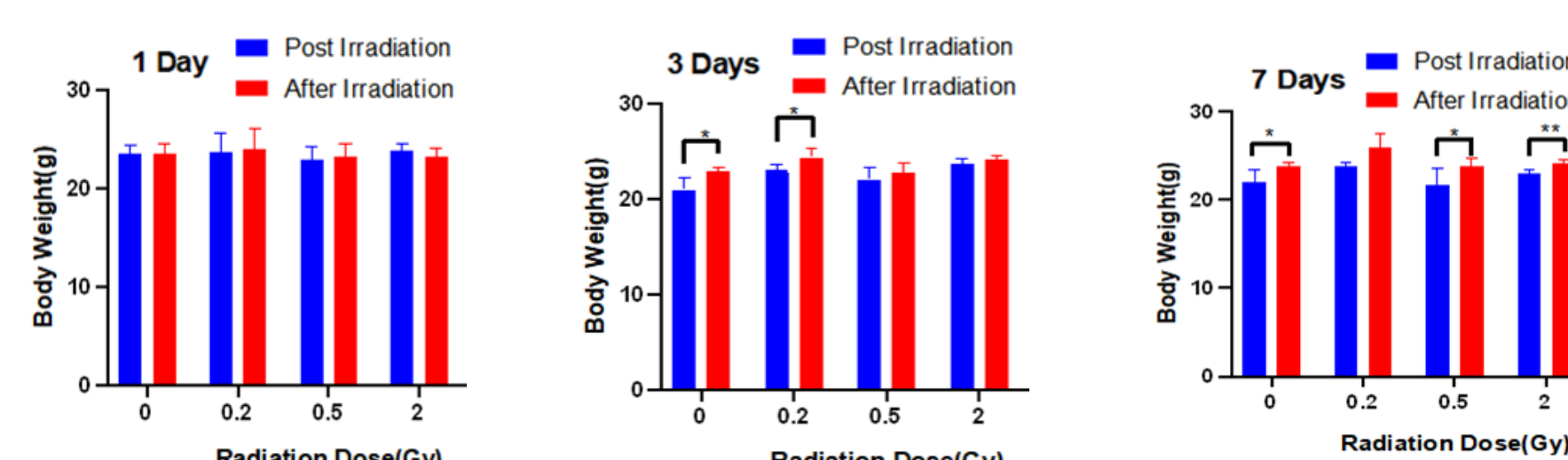


Fig.3 The effect of different doses of proton radiation on the weight change of mice

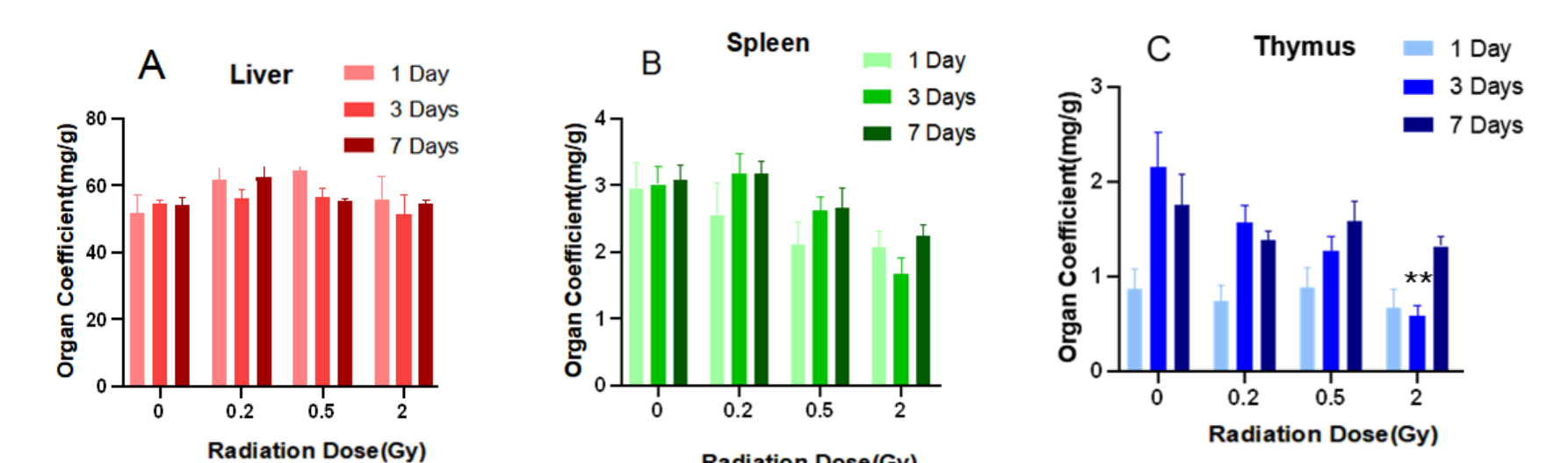
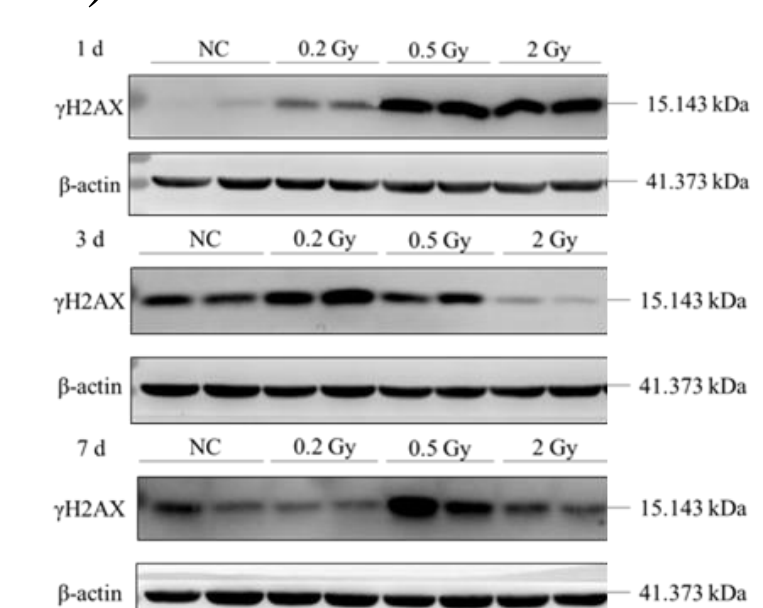
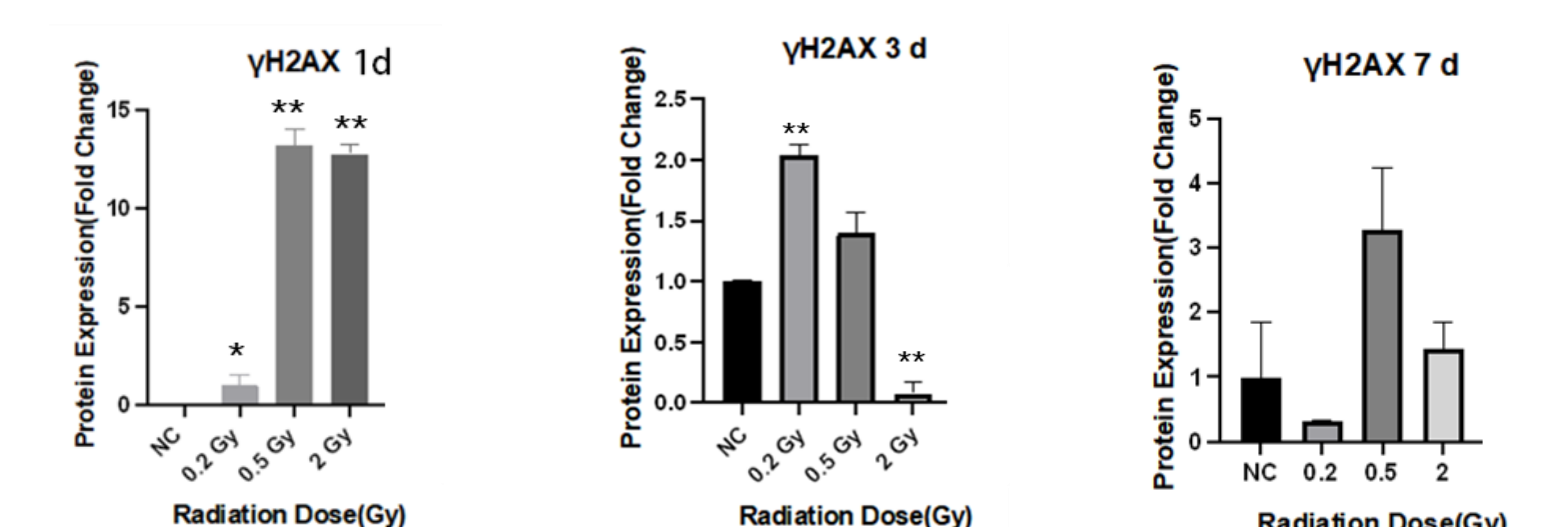


Fig.4 The effect of different doses of proton radiation on the changes in organ coefficients of liver, spleen and thymus in C57BL/6J mice

(2) The result of western blot

The γ H2AX is a marker of DNA double strand break. The results of western blot shown that the expression of γ H2AX in spleen increased significantly on the 1 day after irradiation, especially in 0.5 and 2 Gy, indicating that the spleen DNA damage was the most serious on the 1 day after proton radiation, but decreased on the third day and seventh days, indicating that the DNA damage of spleen recovered (Fig.5-6).

Fig.5 γ -H2AX Western Blotting results of mice spleen tissueFig.6 Semi-quantitative analysis results of γ -H2AX expression level in mice spleen tissue

CONCLUSION

The results shown that proton radiation had obvious effect on spleen injury in mice, which triggered the regulation of immune system, thus affecting the injury repair of the body itself.

Honorary Chairman: Professor Mingwu Fan (HUST) & Professor Xiaogang Xue (CIAE)

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