Correlation between Hematopoietic Stem Cell Changes and Life Span

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Abstract

To clarify whether the decrease in the number of hematopoietic stem cells (HSCs) after continuous radiation exposure is a direct effect on HSCs or indirect effect through changes in the bone marrow microenvironment, we transplanted irradiated HSCs and investigated their self-renewal capacity, differentiation ability and possible effect on mouse life span.

HSCs from wild type (+/+) mice irradiated at a low dose-rate (20 mGy/day; total dose: 8000 mGy) or a high dose-rate (770 mGy/min; total dose: 2000 or 4000 mGy) of gamma rays were transplanted to non-irradiated mast cell-deficient WBB6F1-*W/W^{v}* mice to determine the effect of life span. As of March 31, 2019, we observed that the life spans of *W/W^{v}* mice transplanted with 1×10^5 HSCs derived from mice exposed to high dose-rate gamma rays were shortened.

In vitro cultures of HSCs from the bone marrow of mice that were continuously irradiated with low dose-rate gamma rays (20 mGy/day; total dose: 8000 mGy) showed no viable cells at the 25th week whereas HSCs bone marrow cells from the non-irradiated mice continued to proliferate up to 30 weeks in culture.

Table 1 Number of CFU-S per flask (using cells collected at 23 weeks of culture).

	Non-irrad	20 mGy/day x 400 days (8,000 mGy)
No. of cells/flask ($\times 10^6$)	0.8±0.5	0.2±0.1
No. of CFU-S/flask	186.7±23.1	Not detected

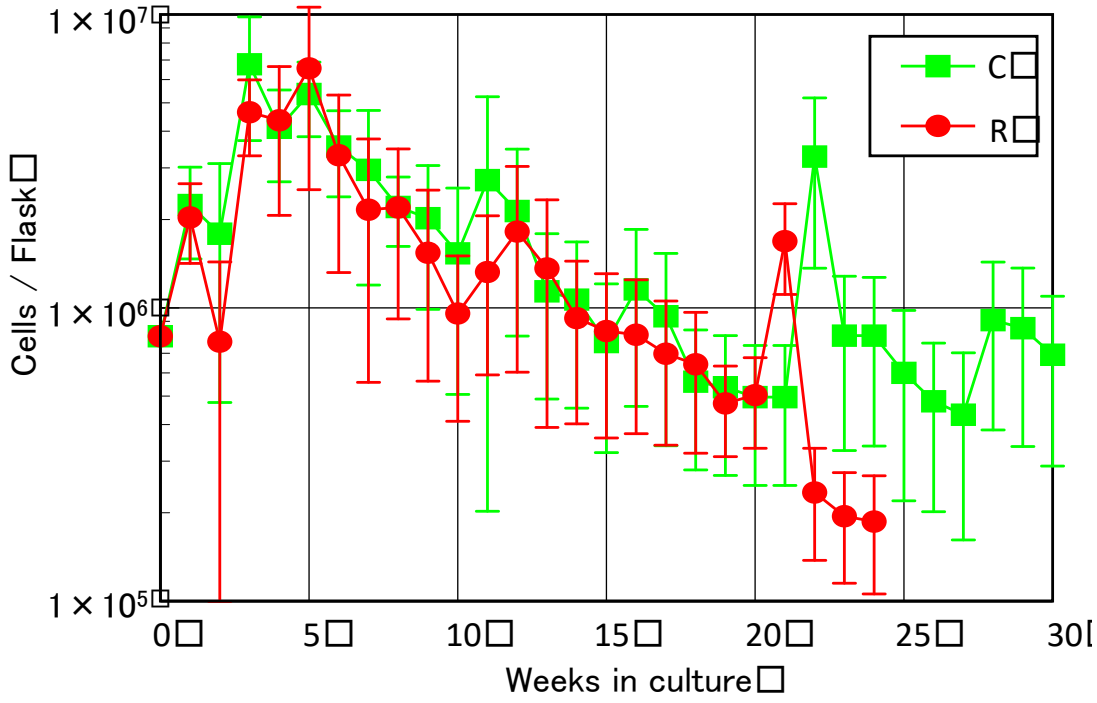

Fig. 1 Number of HSCs in culture (per flask). Cells were subcultured every week at a split ratio of 1:8.
C: cells derived from non-irradiated mice.
R: cells derived from irradiated (20 mGy/day; total dose: 8000 mGy) mice.