

## Effects of *In Utero* Low Dose-rate Gamma-ray Exposure in B6C3F1 Mice

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### Abstract

Detailed histopathological analyses of germ cells and gonads were carried out in FY2017. Images of sectioned gonads (stained with HE and immunostained with anti-MVH antibody), collected from fetuses on gestation day 18 and from 10-week-old mice exposed to gamma-rays at dose-rates of 20, 200 and 400 mGy/day, were used to count the number of germ cells (MVH positive staining cells). The number of germ cells, in both males and females, at gestation day 18 and at 10 weeks of age, were drastically decreased in the 200 mGy/day irradiation group and were scarcely observed in the 400 mGy/day irradiation group. The average sizes of both testes and ovaries of fetuses in the 200 mGy/day and the 400 mGy/day groups were considerably smaller than the non-irradiated controls. In the 20 mGy/day irradiation group, however, there was no significant change in the number of germ cells as well as in the size (cross-sectional area) of the gonads as compared to the non-irradiated group. Histopathological examination showed that testes from the 200 and 400 mGy/day groups had many seminiferous tubules with no germ cells. Many ovaries from these same groups did not show any normal structures.

We have started experiments to examine reproductive function in these mice exposed to radiation *in utero*. Breeding experiments were conducted on mice exposed to 200 mGy/day gamma-rays with matching non-irradiated controls. While 100% of the non-irradiated controls (both sexes) were fertile, only 6.25% of the females and none of the males exposed to 200 mGy/day were fertile.

Investigations on the long-term effects of *in utero* exposure are currently in progress. As of March 31, 2018, no significant difference in survival rates was observed between experimental groups.

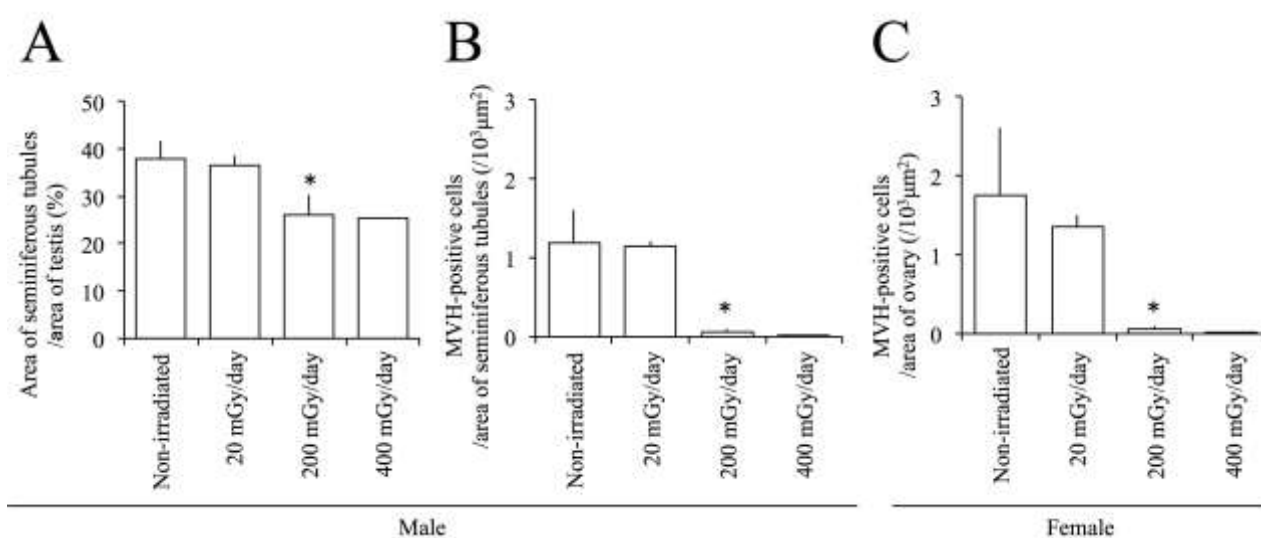


Fig.1 Results of histological analysis of fetal gonads. Ratio of seminiferous tubule area in testis (A), number of MVH-positive cells in testis (B) and number of MVH-positive cells in ovary (C). The numbers of the litters used in this analysis were as follows: 4 (Non-irradiated), 4 (20 mGy/day), 7 (200 mGy/day) and 3 (400 mGy/day). Mean  $\pm$  SD, \*:  $P < 0.05$  vs. Non-irradiated.

Table 1 Results of examination of reproductive functions in B6C3F1 mice exposed to medium dose-rate gamma-rays *in utero*.

	Non-irradiated		200 mGy/day	
	Male	Female	Male	Female
Number of litters	3		3	
Total no. of F <sub>1</sub> mice	13	13	9	16
No. of pregnant mice	13	13	0	1
Pregnancy rate (%)	100	100	0	6.25
Average no. of implantation sites/dam	9.15 $\pm$ 1.68	9.23 $\pm$ 0.927	0	0.0625 $\pm$ 0.250
Average no. of F <sub>2</sub> mice born/litter	8.31 $\pm$ 2.21	8.85 $\pm$ 0.987	0	0
Average no. of weaned F <sub>2</sub> mice/litter	7.46 $\pm$ 2.67	8.85 $\pm$ 0.987	-	-
	Male	3.54 $\pm$ 1.71	3.15 $\pm$ 1.28	-
	Female	3.92 $\pm$ 1.93	4.69 $\pm$ 0.855	-
No. of F <sub>2</sub> mice born/No. of implantation sites (%)	89.6 $\pm$ 12.6	96.9 $\pm$ 8.53	-	0
Weaning rate (%)	91.2 $\pm$ 22.1	100	-	-