

# Transgenerational Effects in Mice Exposed to Continuous Low-dose-rate Gamma-rays – Pathological Study –

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## Abstract

To study the effects of continuous low-dose-rate gamma-ray irradiation on the progeny of mice, males (sires) were irradiated for 400 days with  $^{137}\text{Cs}$  gamma-rays at low dose rates of 20 mGy/22 h/day, 1 mGy/22 h/day, and 0.05 mGy/22 h/day with accumulated doses equivalent to 8000 mGy, 400 mGy, and 20 mGy, respectively. Immediately after completion of irradiation, the male mice were bred with non-irradiated females to produce F<sub>1</sub> mice. Randomly selected F<sub>1</sub> males and females were bred to produce F<sub>2</sub> mice. All mice, except the dams of F<sub>1</sub> mice, were subjected to pathological examination upon natural death. Lifespan, cancer incidence and number of offspring were used as parameters to evaluate the biological effects of low-dose-rate irradiation. There were no significant differences in the pregnancy rate and weaning rate in the parent generation. There were, however, significant decreases in the mean litter size ( $p=0.029$ ), as well as the mean number of weaned pups ( $p=0.023$ ) per female bred to males exposed to 20 mGy/22 h/day compared to the non-irradiated controls. Partial results showed significant decreases in the lifespan of male parent mice (F<sub>0</sub>,  $p=0.001$ ) exposed to 20 mGy/22 h/day and their male progenies (F<sub>1</sub>,  $p=0.006$ ) (Table 1). No significant differences were found in the cause of death and cancer incidence in F<sub>1</sub> and F<sub>2</sub> progeny mice.

Table 1 Mean life spans (Batch Number).

Parent male mice (F <sub>0</sub> ) (1-6)	n	Mean (days)	SD	<i>p</i> (Wilcoxon test)
Non-irradiated	180	866.8	184.1	
0.05 mGy/22h/day	180	851.7	188.1	0.344
1 mGy/22h/day	180	865.4	191.1	0.795
20 mGy/22h/day	180	806.3	191.6	<b>0.001</b>
F <sub>1</sub> Male mice (1-4)	n	Mean (days)	SD	<i>p</i> (Wilcoxon test)
Non-irradiated	132	895.0	213.8	
0.05 mGy/22h/day	129	882.6	216.5	0.544
1 mGy/22h/day	152	859.2	222.5	0.094
20 mGy/22h/day	120	835.6	221.0	<b>0.006</b>
F <sub>1</sub> Female mice (1-4)	n	Mean (days)	SD	<i>p</i> (Wilcoxon test)
Non-irradiated	135	795.4	180.4	
0.05 mGy/22h/day	129	796.6	169.8	0.806
1 mGy/22h/day	134	811.8	178.8	0.496
20 mGy/22h/day	110	794.2	191.3	0.896
F <sub>2</sub> Male mice (1-4)	n	Mean (days)	SD	<i>p</i> (Wilcoxon test)
Non-irradiated	223	881.8	203.8	
0.05 mGy/22h/day	162	885.3	217.9	0.628
1 mGy/22h/day	252	883.4	193.1	0.307
20 mGy/22h/day	171	863.3	201.3	0.293
F <sub>2</sub> Female mice (1-4)	n	Mean (days)	SD	<i>p</i> (Wilcoxon test)
Non-irradiated	194	814.0	161.7	
0.05 mGy/22h/day	146	787.3	196.6	0.529
1 mGy/22h/day	213	811.1	171.9	0.617
20 mGy/22h/day	147	808.9	206.1	0.502