

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

Ignacia TANAKA, Satoshi TANAKA, Keiji OGURA, Kazuaki ICHINOHE, Jun-ichiro KOMURA  
*Department of Radiobiology*

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. Results showed significant decreases in the lifespan of male parent mice (F<sub>0</sub>,  $p=0.003$ ) exposed to 20 mGy/22 h/day and their male progenies (F<sub>1</sub>,  $p=0.044$ ) (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

Parent male mice (F <sub>0</sub> )	n	Mean (days)	SD	<i>P</i> (Student's t-test)
Non-irradiated	180	866.8	184.1	
0.05 mGy/22h/day	180	851.7	188.1	0.449
1 mGy/22h/day	180	865.4	191.1	0.944
20 mGy/22h/day	180	806.3	191.6	<b>0.003</b>

F <sub>1</sub> Male mice	n	Mean (days)	SD	<i>P</i> (Student's t-test)
Non-irradiated	278	893.3	208.6	
0.05 mGy/22h/day	249	876.7	213.6	0.359
1 mGy/22h/day	259	866.4	198.7	0.134
20 mGy/22h/day	218	855.5	210.5	<b>0.044</b>

F <sub>1</sub> Female mice	n	Mean (days)	SD	<i>P</i> (Student's t-test)
Non-irradiated	274	812.6	185.8	
0.05 mGy/22h/day	239	794.8	165.0	0.261
1 mGy/22h/day	237	810.9	172.2	0.915
20 mGy/22h/day	215	802.9	189.9	0.554

F <sub>2</sub> Male mice	n	Mean (days)	SD	<i>P</i> (Student's t-test)
Non-irradiated	339	878.4	203.4	
0.05 mGy/22h/day	272	870.8	217.2	0.648
1 mGy/22h/day	354	877.4	197.1	0.952
20 mGy/22h/day	248	872.4	197.0	0.725

F <sub>2</sub> Female mice	n	Mean (days)	SD	<i>P</i> (Student's t-test)
Non-irradiated	286	814.7	175.1	
0.05 mGy/22h/day	285	799.4	191.5	0.320
1 mGy/22h/day	301	809.1	179.1	0.711
20 mGy/22h/day	214	817.6	191.0	0.863