

## Further analysis of incidence of multiple myeloma among atomic bomb survivors, 1950-1994

Concerning any relationship between radiation and multiple myeloma<sup>1</sup>, epidemiological studies carried out until this point, including RERF's Life Span Study (LSS)<sup>2</sup>, have not yielded consistent and clear results. In this analysis, cases of multiple myeloma observed in the LSS between 1950 and 1994 were examined with a particular focus placed on diagnostic accuracy.

Among 122 multiple myeloma cases identified during the defined period, 67 (55%) were considered confirmed, 23 (19%) probable, and 32 (26%) uncertain, in terms of diagnostic accuracy. The occurrence (incidence) of confirmed cases increased with increasing age and was highest in the 70-and-older age-group. Statistical analysis indicated that, per 1 gray (Gy)<sup>4</sup> of radiation, excess relative risk (ERR)<sup>3</sup> (i.e., likelihood that multiple myeloma resulted from radiation exposure) was 0.44. Although not a statistically clear association between radiation and multiple myeloma incidence, that number was higher than the ERR of 0.02 previously reported by RERF.

In the aforementioned analysis time-period, most A-bomb survivors younger than 20 at the time of bombing had not yet reached the age (in their 70s) at which multiple myeloma is more likely to occur. Therefore, continued long-term observation with careful consideration of diagnostic accuracy is necessary to fully understand the risk of multiple myeloma due to radiation exposure.

### Notes

<sup>1</sup> Multiple myeloma: This form of myeloma occurs when abnormal plasma cells (a type of white blood cell) concentrate in the bone marrow and become cancerous (when normal cells turn into cancer cells), forming tumors in bones throughout the body.

<sup>2</sup> Life Span Study (LSS): The main purpose of this study is to investigate the long-term effects of atomic bomb radiation on cause of death and cancer incidence. At the time of the 1950 national population census in Japan, about 94,000 atomic bomb survivors were selected from among those who were confirmed to be in Hiroshima and/or Nagasaki at the time of the atomic bombings and about 27,000 who were not in city at the time. This study has tracked over a span of many years about 120,000 members.

<sup>3</sup> Excess relative risk (ERR): Excess relative risk is the increase or decrease of a certain health risk in an exposed group compared with a control group. An excess relative risk of 0 means that radiation exposure did not affect risk. An excess relative risk of 1 in the exposed group indicates a rate of disease that is double the rate in the unexposed, or control, group.

<sup>4</sup> Gray (Gy): Gray (1 gray = 1,000 milligray) is a unit of radiation that represents the amount of radiation dose absorbed by a substance when it is exposed to radiation. The average dose for RERF's LSS participants is around 140–200 milligray (0.14–0.2 Gy). As reference, the average annual amount of radiation we are all exposed to in our daily lives, including medically, is estimated to be around 2–6 milligray (0.002–0.006 Gy).

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RERF's objective with this brief outline is to succinctly explain our research for the lay public. Much of the technical content of the original paper has been omitted. For further details about the study, please refer to the full paper published by the journal.