

Chromosome aberrations¹ among atomic-bomb survivors exposed in utero: Updated analysis accounting for revised radiation doses and smoking

RERF scientists reanalyzed the association between chromosomal abnormalities (specifically, peripheral-blood lymphocyte² translocations³) and radiation dose in atomic-bomb survivors exposed in their mother's womb (in utero). With respect to translocation numbers, a previous analysis revealed no overall increase across the entire range of doses, whereas a small increase was seen in the number of translocations at low doses. To aid in confirming that result, this reanalysis included the use of updated DSo₂R₁⁴ radiation dose estimates and, for the first time, consideration of the act of smoking, a known cause of chromosomal aberrations.

Use of updated radiation dose estimates led to no discernible change from the previous results. Consideration of smoking led to a decline in the estimated naturally occurring translocations, because the number in the previous analysis included abnormalities potentially caused by smoking. However, smoking was not found to affect the association of translocations with radiation dose. As a result of these two key findings, we have greater confidence in the findings of a slight increase in number of chromosome aberrations at low doses but no overall increase across the entire range of doses among the in utero exposed survivors (please note that because the number of study participants was concentrated in the lower dose range, chromosomal abnormalities were widely dispersed, which points to limitations in the study including the possibility that extreme results were observed).

Notes

¹Chromosome aberrations:

Refers to structural abnormalities in chromosomes, which are made up of DNA and involved in the expression and transmission of genetic information.

²Peripheral-blood lymphocytes:

A type of white blood cell that is involved in immune function.

³Translocation:

An exchange of parts of chromosomes that can occur after breaks caused by damage from radiation. As long as translocations result in no loss of genetic material, cells seldom harbor biological abnormalities.

⁴DSo₂R₁:

With improved radiation dose estimates, the first revised version (published in 2017) of the A-bomb dose estimation system known as DSo₂. For further information, click here: <https://www.rerf.or.jp/uploads/2017/09/rr16012.pdf>.

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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.