The Association of Radiation Exposure with Stable Chromosome Aberrations[1] in Atomic Bomb Survivors based on DS02R1[2] Dosimetry and FISH Methods[3]

The frequency of stable chromosome aberrations in blood lymphocytes[4] is known as a biological means of estimating radiation exposure dose. Using that frequency as a tool in analysis can help to determine which individuals are more or less sensitive to radiation and to assess the accuracy of estimates of an individual's A-bomb radiation dose.

In this study, the relationship between radiation exposure and the frequency of stable chromosome aberrations in the lymphocytes of A-bomb survivors was analyzed using the latest dose estimation system (DS02R1) as well as FISH methods.

Similar to results from analysis using the previous dose estimation system known as DS86 and the Giemsa staining method (conventional procedure used for detecting stable chromosome aberrations), this study observed a statistically convincing relationship between radiation dose and stable chromosome aberrations. As in previous analyses, the study found that the effect of radiation is related to age at the time of bombing. Differences in effects between the A-bombed cities of Hiroshima and Nagasaki were not as marked as in previous studies, and no effects were observed due to differences in gender or smoking. Also, the observed radiation effect differed by type of shielding whereby radiation was blocked, such as by houses or factories, indicating that further study is needed on the accuracy of the radiation dose estimates used for some individuals.

Notes

[1] Stable chromosome aberrations: A chromosomal abnormality that remains stable for a long duration and does not disappear during cell division.

[2] DS02R1: DS stands for dosimetry system, based on which radiation exposed dose can be estimated. Information concerning A-bomb survivors such as their distance from the A-bomb's hypocenter and angle from the blast, shielding situation, orientation to the bomb blast, posture, and so on, can be used to calculate individual A-bomb survivor doses. The DS system was created in 1986 (DS86) and revised in 2002 (DS02), reflecting progress made in computer technology. The latest version is known as DS02R1, which is a revised version of DS02.

[3] FISH (Fluorescence in situ hybridization) method: A detection method used to detect presence of erroneously translocated DNA sequences from other chromosomes using a fluorescence microscope.

[4] Lymphocytes: A type of white blood cell, one component of blood, involved in immune function.

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