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Complex chromosome aberrations persist in individuals many years after occupational exposure to densely ionizing radiation: an mFISH study.

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Source: Genes Chromosomes Cancer. 2005 Sep;44(1):1-9

Date: Sep-2005

Language: English

Publication Type: Article

Keywords: Chromosome Aberrations - radiation effects
Chromosomes, Human - radiation effects
Humans
In Situ Hybridization, Fluorescence
Nuclear Reactors
Occupational Exposure
Plutonium
Radiation, Ionizing
Radon
Russia
Translocation, Genetic

Abstract: Long-lived, sensitive, and specific biomarkers of particular mutagenic agents are much sought after and potentially have broad applications in the fields of cancer biology, epidemiology, and prevention. Many clastogens induce a spectrum of chromosome aberrations, and some of them can be exploited as biomarkers of exposure. Densely ionizing radiation, for example, alpha particle radiation (from radon or plutonium) and neutron radiation, preferentially induces complex chromosome aberrations, which can be detected by the 24-color multifluor fluorescence in situ hybridization (mFISH) technique. We report the detection and quantification of stable complex chromosome aberrations in lymphocytes of healthy former nuclear-weapons workers, who were exposed many years ago to plutonium, gamma rays, or both, at the Mayak weapons complex in Russia. We analyzed peripheral-blood lymphocytes from these individuals for the presence of persistent complex chromosome aberrations. A significantly elevated frequency of complex chromosome translocations was detected in the highly exposed plutonium workers but not in the group exposed only to high doses of gamma radiation. No such differences were found for simple chromosomal aberrations. The results suggest that stable complex chromosomal translocations represent a long-lived, quantitative, low-background biomarker of densely ionizing radiation for human populations exposed many years ago.

PubMed ID: 15912529 View in PubMed