

Ionizing radiation and frequency of chromosomal aberrations in exposed personnel

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Abstract

Frequencies of chromosomal aberrations in lymphocytes of peripheral blood were investigated among the observed groups of subjects who were exposed to low radiation doses (external exposure) in comparison with the control group.

The first group of subjects is involved in the production of radioisotope technetium, whose accumulated work exposure time ranges between 3 and 30 years.

The second group works on inspection of the medical X-ray equipment, whose accumulated work exposure time is between 2 and 34 years.

The third group worked on decontamination of the terrain from depleted uranium radioactive ammunition. These workers were involved in mechanical removal of the surface soil layer to a depth of 50cm. They were selected out of a group of professionals otherwise exposed to radiation from confined sources in their daily work. The accumulated work exposure of this group ranged from 2 to 34 years.

The control group consisted of individuals not working in the ionizing radiation zone.

The average yearly absorbed dose measured by TL dosimeters for all three observed groups did not exceed 2mSv. The chromosomal aberrations were analyzed by a modified Moorhead method. The objective of the study was to establish the existence of differences in the frequencies of chromosomal aberrations change with respect to the source type, i.e. type of radioactive emission. Comparisons of the chromosomal changes in the observed groups revealed that the group working on technetium production had an increase in the frequency of chromosomal aberrations with respect to control. The aberrations found were of the acentric fragment and chromosomal break types. A comparison of the exposed groups between each other, no statistically significant differences in the numbers of chromosomal aberrations were found. Soil decontamination from depleted uranium did not contribute to the relative radiation risk, since it lasted only a few months, and was done by the professionals fully clothed in protective garments. The greatest radiation risk was found with the workers employed at the technetium radioisotope production. The production workers also had the longest accumulated work exposure with 2 years minimum, average above 10 years of laboratory work. It can thus be concluded that there is a direct relationship between the chromosomal aberrations found and the time of exposure to ionizing radiation sources. The probability of aberration occurrence is greater, but the frequency is not in a linear relationship with

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the accumulated work exposure time. The aberrations found indicate a necessity of medical surveillance of the personnel working in the ionizing radiation zone with the same dynamics. The results were statistically processed using the Student t-test (Statistica 5 software, StatSoft, Inc.) and the x-square test.

KEYWORDS: ionizing radiation, chromosomal aberrations, peripheral blood lymphocytes.

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