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Background Level of Unstable Chromosome Aberrations in the Kazakhstan Population: a Human Biomonitoring Study

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Kazakhstan is known as a country with a complex radioecological situation resulting from different sources of exposure to radiation such as a natural radiation background, extensive activities of the industrial system of the former Soviet Union and a well-known testing of nuclear power weapons occurred in the Semipalatinsk Test Site (STS) area during the period 1949–1989. Moreover, approximately 41% of the world's reserves of uranium are concentrated in Kazakhstan, especially in the North and West regions with their uranium ore and thorium-containing provinces where the most significant deposits of uranium and thorium and their daughter decay products are located

For all these reasons, Kazakhstan's current situation in terms of radiological safety provides a unique opportunity for a wide range of studies including biomonitoring studies and retrospective dosimetry investigations. Several studies concerning radiation exposure rely heavily on the quantification of the radiation-induced chromosome aberrations, such as dicentric chromosomes (Dic) and acentric fragments (Ace) in the peripheral blood lymphocytes (PBLs) of exposed and potentially exposed subjects.

The present study focuses on the assessment of the background of dicentric chromosomes in Kazakhstan's population, which is the starting point in the retrospective dose assessment of irradiated people, since the baseline level of spontaneous dicentrics can vary significantly in different populations.

Dicentric chromosomes, are specific radiation-induced aberrations occurring at a very low level in unirradiated persons and increasing in a linear or linear quadratic manner after exposure to high- or low-LET radiation, respectively. This means that, in the context of the biological dosimetry, estimates of an absorbed whole-body dose can be determined by the dicentric frequency observed in PBLs.

In this context, aiming to determine the background frequency of chromosome aberrations in the population of Kazakhstan, considering the heterogeneity of natural radiation background levels of its large territory, a selection of 40 control subjects living in four cities of North, South, West and East Kazakhstan has been investigated.

Keywords:

Human biomonitoring study, Kazakhstan population, radiation exposure, biological dosimetry.