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THRESHOLD LIMITS IN CYTOGENETIC INDICATION AND BIODOSIMETRY IN TERMS OF CHRONIC EXPOSURE

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In spite of the great variety of bioindication and biodosimetry methods, World Health Organisation (WHO) and International Atomic Energy Agency (IAEA) accept dose reconstructions by cytogenetic methods based on the analysis of specific chromosomal aberrations (DIC, FISH techniques) on metaphases from peripheral blood cells. Capabilities and characteristics of cytogenetic indication and biodosimetry are well-studied after acute exposure (IAEA, 2011), while the number of studies on bioindication and biodosimetry after chronic exposures is quite limited. The objective of the current study was to assess threshold limits for cytogenetic indication after chronic external gamma-ray exposure. mFISH was applied to assess the yield of chromosomal aberrations in peripheral blood lymphocytes among Mayak workers chronically exposed to external gamma-rays. To ensure reliable bioindication based on the analysis of the chromosomal aberrations yield in peripheral blood lymphocytes after occupational chronic exposure, the yield must be greater than "background"level. The yield of stable chromosomal aberrations per 100 cells measured in the control group (comprising similar aged individuals with no occupational exposure) and equal to 1.76⊠0.33 was considered as "background"level. Based on our method of dose threshold assessment using dose distribution functions (Osovets S.V., Azizova T.V., Day R.D. et.al. 2011, 2012), a dose threshold for bioindication after chronic external gamma-ray exposure was estimated equal to about 1.0 Gy based on the yield of stable chromosomal aberrations. Bioindication threshold assessed based on the yield of stable chromosomal aberrations >1.76⊠0.33 (61 individuals) indicates that individuals were chronically exposed to external gamma-rays in total absorbed dose to red bone marrow > 1.0 Gy. Due to the small study groups the estimates obtained are to be considered as preliminary. However, limits obtained should allow for correct planning future research on development the biodosimetry system for assessment of total doses of chronic exposure, based on the yield of stable chromosomal aberrations in peripheral blood lymphocytes. The current study was funded by the Federal Ministry of Defense of the Federal Republic of Germany withtin the framework of the contract M / SAB X / 9A001 «Biological indication and Dosimetry of chronic exposure».

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