Mathematical modeling of the calculation of the absorbed dose in uranium production workers with the genetic effects.

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Abstract : Conducted cytogenetic research in workers Stepnogorsk Mining-Chemical Combine (Akmola region) with the study of 26341 chromosomal metaphase. Using a regression analysis with program DataFit, version 5.0, dependence between exposure dose and the following cytogenetic exponents has been studied: frequency of aberrant cells, frequency of chromosomal aberrations, frequency of the amounts of dicentric chromosomes, and centric rings. Experimental data on calibration curves "dose-effect" enabled the development of a mathematical model, allowing on data of the frequency of aberrant cells, chromosome aberrations, the amounts of dicentric chromosomes and centric rings calculate the absorbed dose at the time of the study. In the dose range of 0.1 Gy to 5.0 Gy dependence cytogenetic parameters on the dose had the following equation: $Y = 0,0067e^{0,3307x}$ ($R2 = 0,8206$) – for frequency of chromosomal aberrations; $Y = 0,0057e^{0,3161x}$ ($R2 = 0,8832$) –for frequency of cells with chromosomal aberrations; $Y = 5 E-0,5e^{0,6383}$ ($R2 = 0,6321$) – or frequency of the amounts of dicentric chromosomes and centric rings on cells. On the basis of cytogenetic parameters and regression equations calculated absorbed dose in workers of uranium production at the time of the study did not exceed 0.3 Gy.

Keywords : Stepnogorsk, mathematical modeling, cytogenetic, dicentric chromosomes

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