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Modeling of the distribution of radionuclide concentrations in organs and tissues of the human body

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Monitoring the accumulated dose in the population from natural terrestrial radionuclides and timely assessment of the maximum dose to prevent potential risks of radiogenic oncological diseases is an important and one of the priority tasks. The main source of the accumulated dose by the population is the natural terrestrial radionuclides that enter the body through human life, and this problem is international in nature [1].
The concentration of chemical elements in the organs and tissues of the human body pretty much depends not only on the use of certain products, but also on geographical residence with a different geological landscape [2]. Different concentrations of chemical elements accumulated in various organs or tissues entail the accumulation and corresponding distribution of natural radionuclides. In this work, the authors developed a software-mathematical complex [3], which allows you to simulate the distribution of natural nuclides and radionuclides in the organs and tissues of the human body. Unlike existing software systems that simulate the interaction of radiation with biological objects, such as Geant4-DNA, etc. [4], the developed program simulates the spread of radionuclides throughout the body, taking into account the conversion factors from one organ to another. Thus, a mathematical calculation based on experimental accumulation coefficients and methods for calculating the doses of ICRP makes it possible to calculate the internal radiation doses of the corresponding organs and tissues. Such modeling allows us to calculate the risks of cancer due to internal exposure to incoming natural terrestrial radionuclides. The distribution of the studied radionuclides is visualized, which allows you to visually study the potential areas of internal sources of radioactive radiation.
The result of the development of this software was the collective work of a team of authors, which was carried out in an open-type nano-technological laboratory at KazNU al-Farabi from 2018 to 2020. with the support of state grant funding for basic research (project: "Fundamental research on the mechanisms of formation of nanoscale oncradiogenic structures in the body and the development of anti-cancer rapid devices for their detection", No. IRN AP05131884).

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