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ANALYSIS OF INTERNAL DOSES TO MOLE VOLES INHABITING THE EAST-URAL RADIOACTIVE TRACE

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Abstract text

Substantial task of development of approaches to radiation protection of non-human biota is investigation of relationships of exposure to dose, and dose to effects. Small mammals inhabiting territory of the East-Ural Radioactive Trace (EURT) are affected to ionizing radiation for many generations after accident at Mayak plutonium production in 1957. According to results of numerous studies a number of effects of exposure are observed. It is remarkable that the revealed effects are both negative and adaptive. In particular, the analysis of the variability of morphological structures of the axial skull and lower jaw in the population of northern mole vole (*Ellobius talpinus Pall.*), the burrowing rodent inhabiting the EURT, is of great interest. At the same time there is no reliable assessment of the radiation doses to these animals.

Earlier we developed the approach to assess internal doses to mouse-like rodents (mice and voles) caused by incorporated ^{90}Sr, which is the main dose contributing radionuclide at the EURT. Dose assessments are based on the results of beta-radiometry of intact bone. Routine methods for measuring the activity concentration of ^{90}Sr in skeleton require ashing of samples, however in morphometric studies the destruction of material should be avoided: the skulls of mole voles are stored in the environmental samples depository of IPAE. Coefficients linking results of beta-radiometry of intact bone and activity concentration of ^{90}Sr in skull of mouse was obtained basing on comparison of results of beta-radiometry of intact bone and bone ash. Obtained coefficients can not be directly applied for calculating activity concentration of ^{90}Sr in mole vole skulls because they are significantly larger. Therefore the additional study is required to assess proper coefficient of conversion from beta-radiometry to activity concentration of ^{90}Sr.

Developed dose assessment procedure includes application of the published values of absorbed fractions of beta-radiation energy for different combinations of source and target organs calculated using voxel-based mouse model (e.g. Stabin e*t. al.*, 2006). Distribution of radionuclide by organs and tissues was estimated applying developed strontium biokinetic model for mouse-like rodent. Similar approach can be used to calculate radiation doses to organs and tissues of mole voles, taking into account differences in size and body weight of mice and mole voles.

Strontium biokinetic model for mole vole can be designed basing on that of mouse-like rodent, considering physiological differences and available published data on strontium retention in the organism of burrowing rodents. There are no specific voxel-based models of mole vole. Nevertheless, the models of small mammals of similar size can be applied. Assessment of individual doses to mole voles allows investigating the relationship between radiation dose to these animals and observed morphometric and other biological effects.

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