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TRITIUM RADIOBIOLOGICAL EFFECTS IN MAMMALS: REVIEW OF EXPERIMENTS OF THE LAST DECADE IN RUSSIA

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Abstract -- This review briefly describes techniques and basic results of experimental investigations in mice and rats on metabolism, dosimetry, and radiobiological effects of tritium oxide and some tritiated biogenic compounds (glucose, amino acids, and nucleosides) during the last 10 to 15 years in Russia. The content of water in tissue cells of mammals is shown to be 15 to 40% less than in whole tissue. The kinetics of tritium incorporation from oxide (HTO) and its retention in DNA of hemopoietic tissues were studied. The contribution of bound tritium to dose strongly depends on the chemical form of tritium and reaches 90% when labeled L-lysine is injected. Specific features of the action of HTO on hemopoietic tissue were investigated in tests of damage and repair of DNA, induction of chromosome aberrations in cells, content of nucleic acids, kinetics of cell populations, immunity parameters, carcinogenesis, decrease of life span, induction of dominant lethal mutations in germ cells in male mice, and reciprocal translocations in mouse spermatogonia. According to these tests, the radiobiological effects of tritium beta radiation in the form of oxide is 2 to 6 times higher than for gamma radiation of ^{137}Cs. The frequency of dominant lethal mutations induced by labeled lysine, thymidine, and deoxycytidine is 3 to 12 times higher than those induced by equal HTO activity. The results of these investigations are used to standardize HTO and the various biogenic compounds of tritium, improve techniques of indirect dosimetry, provide medical aid to personnel, and estimate population risk.