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Generation of radiation effects from high-energy gamma quanta during irradiation of biological objects at the medical linear accelerator ELEKTA AXESSE

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The study of X-ray-induced mutations The white gene is becoming one of the main test objects in the study of the problem of direct and reverse mutation of its alleles under the action of X-ray radiation [1], and later under the action of neutrons and γ-radiation [2] on such biological objects as Drosophila melanogaster. Moreover, at present, Drosophila is used as a model object in the study of the influence of various environmental factors, such as high and low temperatures, the inclusion of active oxygen in the metabolism, nutritional characteristics and diabetes mellitus on longevity and fertility [3-4]. The work [5] studied the number and frequency of mutations in the white gene induced by different doses of reactor neutrons (E = 0.85 MeV) with doses from 2.5 Gy to 20 Gy, as well as by 60-Co γ-radiation with doses up to 60 Gy. In various works, gamma-ray irradiation of the studied biological objects is mainly carried out with energies up to 3 MeV. In this work, experiments have been carried out to study mutations of the radiation effect on the capabilities of new generations of Drosophila melanogaster by beams of gamma quanta with energies of 10 and 15 MeV. The radiation doses were 2 Gy, 10 Gy and 20 Gy. The electron accelerator Elekta Axesse of the Sunkar Cancer Center (Almaty, Republic of Kazakhstan) was used as a source of gamma quanta. The technique of irradiation of biological objects was tested by measuring the experimental linear absorption coefficients of 6 MeV gamma quanta obtained at this linear accelerator for elements B, C, O, S, Fe, Ba [6].
As a result of the experiments, the types of induced mutations, the dependence of the mutagenic effect on the dose were determined, and the significance of genetic effects for various energies of gamma quanta was estimated. This made it possible to develop a methodology and perform experiments on irradiation of Drosophila melanogaster to study the influence of hard gamma radiation and the occurrence of radiation effects and mutations in this energy range.
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