

Modeling the effect of α -radiation on determination in *Drosophila* imaginal discs

Currently, *Drosophila* is used as a model object in studying the influence of various environmental factors, such as high and low temperatures, the inclusion of active oxygen in metabolism, nutritional habits, and diabetes mellitus on longevity and fertility, as well as the effect of radiation on health and life expectancy. The annual dose load from natural radiation sources is mainly due to radon gas and its decay products (DP) and amounts to more than 50%. Radon is released from the earth's crust, and its concentration varies significantly and can range from several Bq/m³ to several thousand Bq/m³ (the norm for residential buildings is 200 Bq/m³). The energy range of alpha particles in the region of 5.5 MeV is of particular interest because it is in this region that the energies of all alpha particles emitted during the radioactive decay of three natural isotopes of radon are located – ²¹⁹Rn, ²²⁰Rn, ²²²Rn, and their DP. The study of radiation damage from radon is an urgent task due to the fact that, according to the International Commission on Radiological Protection, the main share of oncological diseases of the lungs and bronchi is caused by radon isotopes and, in particular, their DP.

In this work, the epigenetic effects of alpha particles, which in the environment are mainly generated by radon isotopes, were investigated. The object of the study was the X-linked genetic lines of *Drosophila melanogaster* (Winsley), Möller-5 (Basc), and the white (w) system. In the irradiation experiment, calibration alpha sources with alpha particle energies from 4.8 to 7.7 MeV were used. Radiation exposure ranged from 20 to 72 hours under controlled conditions, and the equivalent dose was up to 3 mSv per *Drosophila* larva.

In the experiment, in the first generation (F₁), deformities or morphoses were discovered, which can be called “radiation syndromes” or mutations, the manifestation of which is similar to the pleiotropic action of genes. The teratogenic properties of α -radiation in *Drosophila* flies of the first and second generations are expressed in the manifestation of the following morphoses, which looked like black spots or melanomas on various parts of the adult body: “generalized” melanomas; curled, curved wings: shortened wing; bubble on one wing; absence of one wing, deformation of the thorax, interruption and disruption of tergite patterns, disturbance of the distribution of ocular facets and hairs; lack of pigmentation of the second and third legs. The proportion of morphoses in the experiment was 1.8%, and in the control - 0.4%. Statistical analysis using the Chi-square method showed a significant difference between the experiment and control at $P \leq 0.01$. Based on this, we can assume that alpha particles (with the help of which the situation in radon-hazardous territories was modeled) have a mutagenic effect, manifested mainly in the formation of morphoses or deformities.

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Section

Applications of nuclear methods in science, technology, medicine and radioecology

Primary authors: Mrs BIYASHEVA, Zarema (al-Farabi Kazakh National University); Mr KADYRKHAN, Shyn-ggyskhan (al-Farabi Kazakh National University); DYACHKOV, Vyacheslav (Faculty of Physics. Voronezh State University); ZARIPOVA, Yuliya (al-Farabi Kazakh National University)

Presenter: DYACHKOV, Vyacheslav (Faculty of Physics. Voronezh State University)

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