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MUTAGENIC EFFECTS OF ALPHA RADIATION IN DROSOPHILA TEST-SYSTEM

Abstract. There is a long period of time between an agent intervention on a living organism and biological consequences. For this reason, methods for determining a potential mutagenic activity of individual environmental components and natural complexes are required. We used a traditional Muller-5 (Basc) test based on Drosophila melanogaster for testing the influence of ecological factors. Due to this test system, we analyzed genetic effects of α-radiation, which is formed during the radioactive decay of radon daughter products. The test system was used to detect mutations with an autonomous manifestation. Now days, it is also used for detecting conditional mutations with non-autonomous manifestation, which form special features related to an invariant part of species appearance of a living organism. The most striking property of conditional mutations is morphoses formation. In our research, the morphoses appeared in the second generation and were due to the presence of conditioned mutations in parents taken from the F_1. The primary inducer of the conditional mutations emergence was ionizing α-radiation, and in the next generation they were supplemented by the genetic characteristics of the parents being the inversions. The revealed morphoses formed a characteristic group of deformities: blackspots (melanomas) or white spots on a body; curled, curved, or undirected wings; blister on the wings, without one wing, with deformation of the head, thorax and abdomen, mutation of sterility. Sterility was tested in several generations of flies. A characteristic feature of all morphoses is asymmetry and it is defined as a genetically unstable variation of individual morphogenesis associated with changes in the environment. A statistical analysis of experimental data in the Muller-5 test system (Basc) showed that α-radiation has a mutagenic effect with a probability of not less than 95%.

Key words: radon, emanation, α-radiation, inversion, Basc, Drosophila, morphoses.

Introduction. Almaty is a city with the highest natural radiation in Kazakhstan, which rich in such natural resources as minerals, metal ores and natural gas and oil reserves. Kazakhstan has 12 % of the world's uranium resources and may be exposed to a variety of hazardous materials including radon, a radioactive gas occurring naturally as an indirect decay product of uranium. Radon gets out of the earth surface through 5 tectonic faults crossing the city territory. Radon and its decay products are sources of α-radiation - a stream of heavy positively charged particles [1]. In nature, alpha particles occur as a result decay of heavy elements atoms, such as uranium, radium and thorium. Emanation (a release of radon into the air pores) happens when the radium decay took place near the soil surface and it was mainly carried out by recoil energy produced by a radon nucleus in the process of radium nucleus disintegration.

Most of radiation is produced not so much from radon but its decay daughter products. Radon emissions are supposed to be dangerous for living organisms and can cause oncological diseases in humans. In human body, radon facilitates some processes also leading to lung cancer. The decay of radon nuclei and its daughter isotopes in the lung tissue causes a micro-burn, as the whole alpha particles energy is absorbed at its decay point. Combination of radon and smoking is especially hazardous and increases the disease risk. According to the US Department of Health, radon had regarded to be the second factor (after smoking) that causes lung cancer, mostly, of bronchogenic (central) type. Lung cancer caused by radon irradiation is the sixth most frequent reason causing death from cancer [2]. Radon