Research on the Biological Effect of Heavy Charged Particles with Different Energies

Theme Abstract

This Theme continues the studies completed within Theme 04-9-1077-2009/2017 "Research on the Biological Effect of Heavy Charged Particles with Different Energies."

Accelerated heavy charged particles are a powerful tool for addressing fundamental issues of modern radiobiology and genetics. Evaluation of their biological effectiveness is essential for solving radiation medicine problems. As is known, radiation therapy with proton and carbon ion beams is one of the most efficient ways of treating hard-to-reach malignant neoplasms — in particular, brain tumors. Besides, high-energy protons and heavy ions are the largest component of space radiation and would present the highest radiation risk to the crews of the manned missions beyond Earth's magnetosphere. In this connection, particle beam therapy of tumors and ensuring the radiation safety of the future manned interplanetary flights are the top priorities of modern radiobiology.

The availability of a wide range of radiation sources at JINR's basic facilities, including heavy ion beams of different energies, offers a unique opportunity for carrying out research in these fields. The experiments planned at JINR's accelerators will be aimed at studying the mechanisms of the action of heavy ions at the molecular, cellular, tissue, and organismal levels of biological organization. Special focus will be placed on new ways of increasing the biological effectiveness of radiation therapy with charged particle beams and the analysis of damage to experimental animals' central nervous system in order to estimate the radiation exposure risk to crews on interplanetary flights and to take into account the possible side effects of the radiation therapy of malignant neoplasms.

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