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DEVELOPMENT OF BORON NEUTRON CAPTURE THERAPY FOR ONCOLOGICAL DISEASES IN RUSSIA *)

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Boron Neutron Capture Therapy (BNCT) is a promising method for the selective destruction of malignant tumor cells by accumulating the stable isotope boron-10 in them and subsequent irradiation with epithermal neutrons. Because of the absorption of a neutron by boron, a nuclear reaction occurs with a large release of energy in the cell, which leads to its death. The method is based on the uniquely high ability of the non-radioactive boron-10 nucleus to absorb a thermal neutron. As well as on the ability of specially developed pharmacological preparations to deliver boron specifically to tumor cells, and on the fact that virtually all the energy of the nuclear decay reaction caused by the absorption of the boron neutron is released specifically in the cell that contained the boron nucleus. Unlike all methods of traditional external beam radiation therapy, including proton and heavy ion, the dose of ionizing radiation is delivered not to the volume, but to the cell.

Over the next two decades, BNCT has been actively developing in a number of advanced countries. The basis for this development is the development of specialized neutron sources capable of operating in oncology clinics. These circumstances once motivated the creation of the VITA (Vacuum Insolated Tandem Accelerator) facility at the INP SB RAS [1,2], capable of generating neutrons with an epithermal energy spectrum due to the interaction of a proton beam with a lithium target. A number of key BNCT technologies were tested on this facility, which allowed our country to become one of the world leaders in this field and, together with TAE Life Sciences (USA) [3], to create a facility for an oncology clinic in Xiamen (China) [4], where therapy is currently being successfully carried out on a regular basis.

The report will provide a brief overview of the state of development of the BNCT technique in the world, and then will describe the main achievements of the INP in research on the VITA installation. The main emphasis will be on the description of the next-generation installation, which was recently developed for the N.N. Blokhin National Medical Research Center of Oncology (Moscow), and is currently being installed and commissioned on the territory of the oncology center. The final part of the report will present our vision of the key tasks and plans for further development of the BNCT technique in Russia.

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*) abstracts of this report in Russian