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Synthesis of carborane containing compounds as potential agents for boron neutron cancer therapy of cancer

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For many years, studies of biochemically active derivatives of carborane have been mainly continue due to the search for more efficient methods of boron delivery to tumor cells for boron neutron capture therapy (BNCT). This is an important work that continues to this day in many laboratories in the world. More recently, it became known that boron clusters have remarkable properties that can be used in the development of drugs, along with the detection of antitumor effects and other types of biological activity that are inherent in some derivatives of carboranes and metal carboranes.
One of the most important methods of synthesis in the carborane compounds is organometallic synthesis. By the beginning of this work, a huge amount of carborane compounds was obtained on its basis and the effect of bulk electron-deficient carborane systems on the course and direction of a significant number of reactions was studied. A significant part of these compounds has a number of practically useful properties, and, in particular, high antitumor activity as classical chemotherapeutic drugs, as well as the possibility of their use as drugs for boron neutron capture therapy of cancer.
In this research, novel nitro-containing carborane compounds have been synthesized with potential anticancer activity. Structure of the compounds were elucidated by FTIR and NMR spectroscopy.
Moreover, carborane compounds were immobilized on supermagnetic Fe3O4 nanoparticles with average size of 18.9 nm. Attachment of carborane with 21 boron atoms per molecule was carried out through the ionic interaction of carborane borate with amino groups of modified Fe3O4 NPs. The process of functionalization was controlled by FTIR, TEM, SEM, XRD, DLS and Mössbauer spectroscopy.Biocompatibility was evaluated in-vitro using cultured mouse embryonic fibroblasts (MEFs). The results shows us increasing of IC50 from 0.110 mg/ml for Fe3O4 NPs to 0.405 mg/ml for Fe3O4-Carborane NPs. Obtained data confirm biocompatibility and stability of synthesized NPs and potential to use them in BNCT.

Primary author: Ms LISSOVSKAYA, Lana (Igorevna)

Co-authors: Dr KOROLKOV, Ilya (Institute of nuclear physics of Kazakhstan); Mr GORIN, Yevgeniy (Institute of Nuclear Physic Republic of Kazakhstan)

Presenter: Ms LISSOVSKAYA, Lana (Igorevna)

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