boron compounds

Study of boron accumulation in mice with U87 human glioblastoma xenografts after administration of elemental boron nanoparticles using inductively coupled plasma atomic emission spectrometry

Ksenya S Kuzmina[1,2], Anna I Kasatova[1,2], Evgeny L Zavyalov[1,3], Irina N Zavestovskaya[4,5], Anton A Popov[5], Ivan V Zelepukin[6] and Sergey Yu Taskaev[1,2]

[1] Novosibirsk State University, Novosibirsk, Russia
[2] Budker Institute of Nuclear Physics, Novosibirsk, Russia
[3] Institute of Cytology and Genetics, Novosibirsk, Russia
[4] Lebedev Physical Institute, Moscow, Russia
[5] National Research Nuclear University, Moscow, Russia
[6] Institute of Bioorganic Chemistry, Moscow, Russia
E-mail: kuzminaksenya@mail.ru

For the successful implementation of boron-neutron capture therapy, targeted boron delivery agents are needed. There are several criteria for an “ideal” boron-containing drug: firstly, its use must be safe; secondly, the accumulation of boron should be tumor-specific and its concentration in tumor tissue should be 20-50 μg/g or more; thirdly, boron delivery drug should excrete relatively rapid from blood and normal tissues, and persiste in tumor for at least several hours during neutron irradiation. Therefore, conducting studies to assess the accumulation of boron in tumors and organs after administration of a boron-containing drug is an important step in planning therapy. The purpose of the study was to evaluate the accumulation of boron in organs and tissues after intratumoral administration of elemental boron nanoparticles obtained by laser ablation and coated with polyethylene glycol [1] in mice with U87 human glioblastoma xenografts.

Nanoparticles were injected intratumorally once in a volume required to achieve a concentration of 40 μg/g in the tumor site. The study used boron with natural isotope content: 20% ^{10}B, 80% ^{11}B. Tumor, blood, skin, kidneys, liver, spleen, brain and muscle were collected for subsequent ICP AES analysis [2].

The accumulation of boron in the tumor 30 minutes after administration was 56 μg/g, and after 90 minutes – 82 μg/g. The content of boron in the blood was significantly lower and amounted to 4 μg/ml after 30 minutes and 3.5 μg/ml after 90 minutes, respectively. Thus, the accumulation of boron in the skin was at the level of the values obtained in the control group. The resulting accumulation of boron in the tumor is sufficient for successful BNCT in the case of boron enrichment with the ^{10}B isotope.

Acknowledgments:
This research was funded by Priority 2030 program.

References:

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