S10-7 Minimally invasive cytoselective radiation therapy using boron neutron capture reaction

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Boron neutron capture therapy (BNCT) is a binary cancer treatment based on the nuclear reaction of two essentially nontoxic species, ^{10}B and thermal neutrons. This reaction yields an unstable intermediate, ^{11}B, which immediately undergoes fission to generate ^{7}Li and ^{4}He bearing approximately 2.4 MeV. The particles dissipate their kinetic energies before traveling a distance equivalent to one cell diameter, enabling them to precisely kill tumor cells. BNCT has been carried out on limited number of patients because of thermal neutrons obtained from reactors, but accelerator-based BNCT is now under development as one of the standard radiation therapies. In the meanwhile, the marked accumulation and selective delivery of boron into tumor tissues are the most important requirement to achieve an effective BNCT of cancers. We focused on a liposomal boron delivery system. The accumulation of boron in the liposomal bilayer is highly potent, because drugs can be encapsulated into the vacant inner cell of a liposome. Furthermore, functionalization of liposomes is possible by combination of lipid contents. We developed boron lipids, which has a double-tailed moiety conjugated with ionic boron clusters. We succeeded in preparation of the boron nano capsules using the boron lipids and examined their BNCT effects on tumor bearing mice. Suppression of tumor growth was observed in the mice injected with the boron nano capsules a week after neutron irradiation.