Spatial distribution of elements in a murine solid tumor caused by blood flow interruption

A. Terakawa, K. Ishii, H. Yamazaki[1], S. Matsuyama, Y. Kikuchi, K. Kusano, H. Sugai, M. Karahashi, Y. Nozawa, S. Yamauchi, S. Furumoto[1], Y. Funaki[1], S. Wada[2], N. Ito[2] and K. Sera[3]

Department of Quantum Science and Energy Engineering, Tohoku University
6-6-01-2 Aoba, Aramaki, Aoba-ku, Sendai 980-8579, Japan

[1]Cyclotron and Radioisotope Center, Tohoku University
6-3 Aoba, Aramaki, Aoba-ku, Sendai, Miyagi 980-8578, Japan

[2] School of Veterinary Medicine, Kitasato University
35-1 Towada, Aomori 034-8628, Japan

[3]Cyclotron Research Center, Iwate Medical University
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

Abstract

Spatial distribution of principal elements in a NFSa fibrosarcoma tumor treated with a vascular disruption agent, AVE8062 (a derivative of combretastatin A-4) at a single dose of 40 mg/kg was evaluated using submilli-PIXE analysis. We found that potassium and sulfur concentrated at the periphery of the treated tumor and a ring-shaped calcium distribution in the area between the inner necrotic region and the periphery. In addition to the PIXE analysis, we performed high spatial resolution [^{18}F]FDG-PET scan for the treated tumor in mice to compare the elemental distribution and FDG uptake in the tumor. The results of the PET scan suggest that the potassium and sulfur concentrations are related to residual viable cells at the tumor periphery whereas the ring of calcium concentration just inside the tumor periphery is possibly derived from hypoxia-induced response.