

Biodistribution and dosimetry of free ^{211}At and meta- ^{211}At]astatobenzylguanidine (MABG) in normal mice

Alpha particle emitting radionuclides are suitable for targeted radionuclide therapy (TRT), because of their short range in the tissue and high linear energy transfer. ^{211}At is considered to be one of the ideal nuclides for TRT. A new generation of alpha particle compounds for TRT including meta- ^{211}At -astato-benzylguanidine (^{211}At -MABG) are expected to have strong therapeutic efficacy with acceptable side effects [1]. ^{211}At -MABG has been proposed for therapy of pheochromocytoma. ^{211}At is a halogen and probably has similar characteristics to radioiodine [1-3]. However, the activity concentration of radioiodine was higher in the thyroid and lower in other organs as compared with free ^{211}At [3]. Therefore, it is important to know the biodistribution and absorbed dose to normal tissues for free ^{211}At and ^{211}At -labelled compounds to predict potential risk organs when these compounds will be used for TRT. The aim of this study is to perform dosimetry of free ^{211}At and ^{211}At -MABG to various organs in normal mice.

Male C57BL/6N mice were injected via tail vein with free ^{211}At (0.13MBq) or ^{211}At -MABG(0.2MBq), and the absolute uptake of these compounds in the organs (%ID/g) were determined at 5 min, and 1, 3, 6, and 24 h after the injection. Number of disintegrations per unit activity administered ($\mu\text{Ci-hr}/\mu\text{Ci}$ or $\text{Bq-hr}/\text{Bq}$) is known as 'Residence time'. It is the integral of a time activity curve for a source region. The absorbed radiation dose for each compound was calculated by OLINDA ver.2.0 by inputting residence time.

Biodistribution study showed that high uptake of free ^{211}At was observed in the lungs, spleen, salivary glands, stomach, and thyroid, while ^{211}At -MABG was observed in the heart and adrenals. The absorbed dose of free ^{211}At was higher in the thyroid and that of ^{211}At -MABG was higher in the adrenals, heart, and liver. The higher mean absorbed dose from ^{211}At -MABG in the specific organs was characteristic to the biochemical property of this compound.

Absorbed dose evaluation of free ^{211}At and ^{211}At -MABG would help to predict potential risk organs and therapeutic strategy when ^{211}At -labelled compounds are used for TRT.

[1] Ohshima Y, et al. Antitumor effects of radionuclide treatment using α -emitting meta- ^{211}At -astato-benzylguanidine in a PC12 pheochromocytoma model. *Eur J Nucl Med Mol Imaging* 2018;45:999–1010

[2] Stocklin G, et al. The impact of radioactivity on medicine. *Radiochim Acta*. 1995;70/71:249–72.

[3] Spetz J, et al. Biodistribution and Dosimetry of Free ^{211}At , ^{125}I - and ^{131}I - in Rats. *Cancer Biother Radiopharm*. 2013;28:657–64.

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