Evaluation of radiation exposure from water phantom containing ^{18}F-FDG or Na^{99m}TcO$_4$

Arane Kasuya[1)], Atsunori Matsuda[1)], Masahiro Natsuhori[1)], Kazunori Terasaki[2)], Satoru Hatakeyama[3)], Tatsuya Ishikawa[4)], Tadashi Sano[1)], Shoji Futatsukawa[5)], and Nobuhiko Ito[1)]

[1)] Kitasato University, School of Veterinary Medicine and Animal Sciences
Higashi 23-35-1, Towada, Aomori 034-8628, Japan

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

[3)] Nishina Memorial Cyclotron Center, Japan Radioisotope Association
Tomegamori 348-58, Takizawa, Iwate 020-0173, Japan

[4)] Asahi Techno Glass Corporation
Ikuta 1-50-1, Funabashi, Chiba 273-0044, Japan

[5)] Radioisotope section, Japan Radioisotope Association
2-28-45 Honkomagome, Bunkyo, Tokyo 113-8941, Japan

Abstract

In order to evaluate radiation safety of veterinary nuclear medicine it has been wanted to collect data of radiation exposure of human from animal as a radiation source. Therefore this study was performed to estimate radiation exposure of human from animal that was administered radiopharmaceutics namely, ^{18}F-FDG and Na^{99m}TcO$_4$. A water phantom including 10L of water placed in stainless animal cage was used to add 185MBq (5mCi) of ^{18}F-FDG and Na^{99m}TcO$_4$. The dose (rate) of exposure from the phantom was measured by ionization chamber (IC) type survey meter, scintillation survey meter (SS), and glass luminescent radiation dosimeter (RPLD) at various distance and time after the administration. Although both ^{18}F and ^{99m}Tc followed the inverse square low as to the distance to the detectors, the dose rate at the surface of the phantom showed 3.1 (IC) to 3.5 (SS) times higher than its simulation curve of dose-distance of the ^{18}F in the phantom and 1.8 (IC) to 3.8 (SS) times higher in ^{99m}Tc. This higher dose rate would be contributed to the effects of build-up and volume effects of the radiation source. The higher measured value in SS than IC was due to the overestimation of the lower energy by SS. According to the results obtained, it is necessary to know the characteristics of relatively high and low energy radiation and their responses by the survey meters of use for the clinical use in veterinary nuclear medicine, especially for the consideration of the criteria of the animal release to the owner.