An Estimation of External Radiation Exposure to a Veterinarian, an Animal Owner, and General Public in Veterinary Nuclear Medicine

Asumi Hanawa, Kanan Suzuki, Noriko Nabeshima , Yuji Nagai, Masahiro Natsuhori, Tatsuya Ishikawa[*1], Kazunori Terasaki[*2], Satoru Hatakeyama[*3], Shoji Futatsugawa[*3], and Nobuhiko Ito

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

[*1] Asahi Techno Glass Corporation, , Ikuta 1-50-1, Funabashi, Chiba 273-0044 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

Abstract

This study was performed in order to establish a safely guideline for using radioisotopes in the field of veterinary nuclear medicine in Japan. Well often used radionuclides (F-18 and Tc-99m) were employed for evaluating the external radiation exposures to veterinarians, animal owners, and general public. The human external radiation exposures from radiation sources (phantom) in various situations were considered by comparing the results of computer simulation with the actually measured exposure. The computer simulation was performed by using macro program with Microsoft VBA.

In this simulation process, absorption and buildup were taken into consideration with the gamma ray emitted from radioactive materials inside of the body of an animal. Both actual measurement values and the simulation results were well corresponded. It is considered that this system can be also applied for the evaluation of human external exposures. As a result of evaluating the atmospheric dose rate around an animal by using this exposure calculation system, the unequal distribution was found in the circumference of the phantom. An estimation of external radiation exposure to veterinarian, an animal owner, and general public was performed under consideration of the actual working condition, the distance from the source, and the time of possible exposure.

After 24 hours of radiopharmaceuticals administration, the dose of an animal owner and the general public was calculated to be below the dosage limit (5 mSv/yr for an animal owner, and 1 mSv/yr for the general public: ICRP 1990). The authors consider these exposures are minimum and would cause no significant issue by starting the veterinary nuclear medicine in Japan. Moreover, since injected radiopharmaceutical is generally excreted out of the body, the exposure of animal owner and general public will actually be much lower than the estimation. The safety guideline to perform veterinary nuclear medicine in Japan will be established by further application of this type of research.