Measurements of Minute Radioactive Contamination by a Human Counter in Reference to an Imaging Wards

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The facilities and staffs in the field of nuclear medicine are inevitable to have a possibility of unexpected radioactive contamination. The purpose of the study is to measure an amount of activity contaminating the staffs and linens in the imaging wards by using a human counter.

The human counter was consist of a detecting system and a shielded cabin surrounded with steel walls of eight inches thick. The detecting system had eight detectors, placed above and below a person of object. Each detector was made of an NaI(Tl) crystal of 5-in diameter and 4-in thickness. The minimum detectability ranged around nanocuries for gamma-ray emitters of medium energies. Three technicians showed respective Ga-67 contaminations of 0.056, 0.038 and 0.163 micro-curies in a total body and 0.020, 0.017 and 0.157 micro-curies at the distal of bi-lateral upper extremities at three days after radionuclide imagings of seven patients. Each was intravenously administered with 1.4 mili-curies of Ga-67 citrate.

The results suggested that the hand was a main sources of the contamination. The measurements using the detecting system of the human counter showed minute amounts of contamination on linens and underwears of patients.

The smear tests also revealed minute amounts of contamination on the floor, doorknobs and an imaging bench. The same measurements were repeated after using Tc-99m, showing munute amounts of Tc-99m contamination, like those of Ga-67.

The Quantitative Measurement of the Sureface Contamination with ^{3}H and ^{14}C

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The sureface contamination of both ^{3}H and ^{14}C are very common phenomenon in the radioisotope labroatory, but it is difficult to know ^{3}H DPM and ^{14}C DPM separately on the sureface. So we stadied two methods of measurement about it.

First method: The smearing sample in a vial with liquid scintillater is counted by the liquid scintillation counter (double labelled setting of ^{3}H and ^{14}C), now next separated ^{3}H CPM and ^{14}C CPM from the liquid scintillation counter are translated into DPM by the data computer.

The ^{3}H contamination is underestimated less than true in the case of high ratio of the ^{14}C contamination, while both ^{3}H and ^{14}C contamination are almost truly estimated in the case of low ratio of the ^{14}C contamination. For the wiping materials, the cotton balls are better than the smearing filter paper.

Second method: ^{3}H and ^{14}C in a smearing sample are collected separately in to vials with liquid scintillater by the sample oxidizer, and the vials are counted by the liquid scintiilation counter (single labeled setting), and then CPM is translated into DPM according to above described manner.

In spite of the high ratio of ^{14}C contamination, ^{3}H and ^{14}C contamination are truly estimated.

The CPM is not influenced by any wiping materials. In this case, the inflammable decontaminater like metanol can not be used.

It is concluded as follows: The first method is more simple and the second method is more precision.