Estimation and Measurement of Radiation contamination in the Thyroid

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Abstract

After a radiological radiation despite the fact that whole-body counter is a special apparatus especially to measure total body radiation, there is not enough time to transfer injured people to the centers equipped with this device. This project discusses about the possibility of measuring radioactivity caused by the breathing of individuals at the time of incident by hand-held spectrograph. Experiments and measurements have been carried out by a gamma-ray spectrograph and a thyroid phantom and a 131I hotbed. It should be noted that background radiation plays an important role in the outcome of the final result in all stages of testing and measurements which its effects will be examined separately. In the end, an instruction will be prepared for calibration of handheld gamma spectrometers with regard to extracting parameters affecting the efficiency and minimum detectable activity and its measures will be developed for provision and deployment in nuclear disaster management centers in the country. The absolute return of detector was measured for Phantom thyroid containing 131I in the range between 0.1 and 0.03 in terms of distances up to 15 cm. in this research the amount of LLD was obtained to be equal to Bq128 which was in line with the results of Sumber group (equal to 142 Bq). We also practically showed that this device is capable of identification and estimation of 131I- activity inside thyroid phantom in values near Bq250. This device has the required practical capability to classify internal contamination of patients and it is very useful in this respect for programs of internal contamination estimation in radiological accidents which may occur in nuclear medicine centers and the nuclear industry.

Key words: calibration, handheld gamma spectrometer, thyroid, spectrometry

1. Introduction

A nuclear and radiological accident is actually an accident during which radionuclides will be distributed in the environment. These accidents can usually be the result of natural disasters such as earthquakes or floods or acute problems and technical defects or terrorist activities and sabotages.

According to reports, about 1495 radioactive sources have been stolen or lost in the US from October 1996 to September 2001 and each of them can cause a nuclear accident [1]. This project discusses about the possibility of measuring radioactivity caused by the breathing of individuals at the time of incident by hand-held spectrograph. The detector used in this study is a gamma-ray detector, thus only sources of gamma-ray emission have been examined in this project while these infections can occur in form of alpha and beta and gamma radiation. A joint report from energy department and nuclear commission introduces radioisotopes which have the greatest attention in this regard in pairwise form which are: 137-Cs ,192- ,Ir241Am- ,60-Co [2.3].