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Development of Automated Air Monitoring System for Airborne Radioiodine: The Way to Reduce Occupational Exposure for Nuclear Medicine Workers

Iodine-131 (131I) is the most common therapeutic radiopharmaceutical used in nuclear medicine. However, 131I can be converted to a volatile form (also called "airborne radioiodine") which can cause a potential internal exposure to the radiation workers via inhalation process. Consequently, monitoring of airborne radioiodine is recommended by IAEA (International Atomic Energy Agency) and ICRP (International Commission on Radiation Protection). In practical, the monitoring processes are included the sampling of air with adsorption media using charcoal cartridge. Then, the cartridge is transferred to measure in the calibrated radiation detector. Consequently, these processes take time, and the result is not in real-time. Therefore, the aim of this work was to design and develop the automated air monitoring system for airborne radioiodine in nuclear medicine. In this work, the 3-inch sodium iodide activated with thallium (NaI(Tl)) scintillation detector with single channel analyzer (SCA) was used to detect the airborne radioiodine collected from the charcoal cartridge. To calibrate the counting system, the in-house standard was fabricated using standardized 131I from the Secondary Standard Dosimetry Laboratory (SSDL) of the Office of Atoms for Peace (OAP). The automate system was assembled as well as the in-house software was developed for system operation. After mechanical evaluation, the equipment was tested at the Division of Nuclear Medicine, Faculty of Medicine Ramathibodi Hospital. During the testing period, the equipment was measured several testing scenarios. The results were satisfactory. However, minor problems were reported for example the high background counts due to improper shielding and software errors. In conclusion, this product can be used to monitor and measure the airborne radioiodine with the automated and real-time result.

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