Individual Monitoring of Internal Exposures for Nuclear Medicine Workers in Argentina


Glasgow, Escocia, 13 al 18 de mayo de 2012
1. INTRODUCTION
According with the IAEA’s ITERIM and BSS 115 individual monitoring should be undertaken where appropriate, adequate and feasible for any worker who normally works in a controlled area and may incur in a significant exposure. The IAEA suggests, in its publication RS-G-1.2, quantitative criteria for the evaluation of the need for the implementation of a program for internal monitoring; i.e. that internal monitoring should be carried out whenever the potential internal exposure of incorporation leads to a value of annual committed effective dose equal or higher than 1 mSv.

The external individual monitoring for nuclear medicine workers is a requirement in Argentina, meanwhile the internal individual monitoring is not a requirement neither in this country nor in most of other countries in the world. So that, it is of interest to propose a monitoring procedure to control 131I internal exposures of these workers. Since the surface contamination monitors, are available in Nuclear Medicine Centres (NMC), the possibility of using them in a first screening is analysed. The detectors are calibrated and the detection limits are obtained to analyse their response in correlation with the E(50). Based on these results, a worker monitoring procedure is proposed to control 131I intakes.

2. OBJECTIVE
To propose an individual monitoring procedure feasible to implement routinely with the instrumentation available in the nuclear medicine centers (NMC) for the control of 131I internal exposures in normal and accidental scenarios.

3. DETECTORS RESPONSE FOR WORKERS MONITORING
A calibration procedure, feasible to implement in NMC, is performed to calculate detection limit (DL) to define the detector response in terms of E(50).

<table>
<thead>
<tr>
<th>Detector</th>
<th>Characteristics</th>
<th>DL (kBq)</th>
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<tbody>
<tr>
<td>A. Geiger-Muller quenched by halogen</td>
<td>Ø = 45mm, 1.5-2.0 mg/cm² Mica window</td>
<td>9.1</td>
</tr>
<tr>
<td>B. Geiger-Muller</td>
<td>Ø = 45mm, 2 mg/cm² Mica window</td>
<td>9.2</td>
</tr>
<tr>
<td>C. Plastic scintillator</td>
<td>3”x3” plastic scintillator</td>
<td>2.1</td>
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Conservative hypothesis:
- 131I vapour
- e(50) = 2 \times 10^{-8} Sv/Bq (ICRP 68)
- Time after exposure: 1 day
- m(t) = 0.23 (ICRP 78)

4. MONITORING PROCEDURE
The screening monitoring is performed each day, before the beginning of the daily work, using the available calibrated surface contamination detector in the NMC. The detector is located in front of the thyroid to detect 131I. Depending on the results it could be stopped at this step when the measurement M is below the DL. Results above DL could indicate a potential intake, so that, the following steps should be carried out:

1. Screening monitoring
2. Confirmatory monitoring
3. Internal dose assessment

M ≥ DL Surf Monitor

4. CONCLUSIONS
The surface detectors available in NMC for radiation protection purpose have an adequate response for a first screening to detect potential workers intakes. In case of a positive result is obtained, the use of gamma camera and the application of IDEAS Guidelines criteria allows to complete the process of internal dose assessment. It is concluded that this proposed procedure is easy to implement and it could contribute to obtain a first mapping of the workers 131I internal exposures in nuclear medicine.