

# Evaluation of thyroid Exposure of Nuclear Medicine Staff Working with Radioiodine



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## 2. Background and Goal of the present work

Iodine-131 (<sup>131</sup>I) is the most commonly used iodine radioisotope, and activities used are sometimes very high.

In solution iodine is volatile at room temperature; nuclear medicine personnel are thus exposed both to external irradiation risk of which is monitored by wearing a dosimeter and to internal contamination risk of induced by inhalation.

Our objective was to evaluate the internal contamination by iodine 131 of nuclear medicine personnel.

## 4. Material and method

The I-131 content in the thyroid of staff members working with this radionuclide in the form of solution and capsule has been measured in one Department of Nuclear Medicine performing therapy and diagnosis of thyroid disease in Tunisia.

Measurements were performed with an NaI (Tl) portable detection unit for in situ measurements of radioiodine.

We carried out 45 measurements; 15 from a control group and 30 carried out in two stages one month apart by the personnel.



Figure 1: NaI (Tl) portable detection unit

## 3. Results

<sup>131</sup>I was detected in thyroid for all the medical staff. Counting rates varied from 88,14 cps to 1105,77 cps which corresponds to 0,59 (0,1 – 1,09) mSv per year.

The maximum values corresponded to persons most exposed to radiation exposure.

Namely they were technicians who prepared and administered iodine to patients.

However, these values remain within the regulatory limits.

Values for control group were of the order of background noise around 90 cps.

## 1. Discussion

Employees of nuclear medicine units are regularly exposed to various isotopes during their preparation and application to patients in the form of radiopharmaceuticals. Unsealed radiopharmaceuticals such as I-131 are frequently used in the nuclear medicine department for therapeutic purposes: as an adjunct to surgery in thyroid cancer or in hyperthyroidism, potentially giving rise to significant occupational doses [1].

The average occupational dose from our study were found to be 0,59 (Minimum: 0,1– Maximum: 1,09) mSv per year, being in the range of most values reported in the literature (Fig 2).

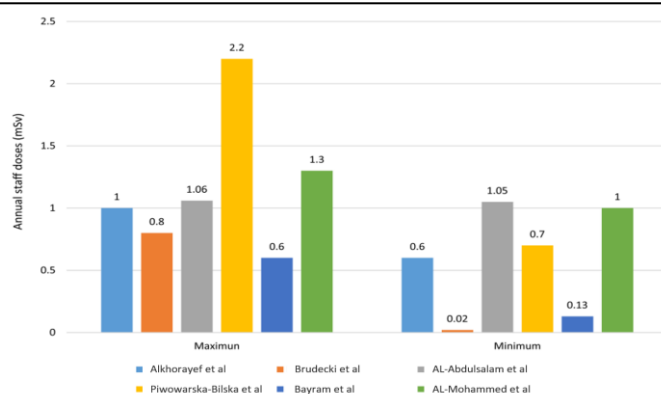


Figure 2 : Occupational exposures in several studies [2]

Thus, it is essential to ensure that staff receive minimal occupational dose from external and internal incorporated radioiodine, the latter due to inhalation of radioactive iodine due to its volatile nature and the measurement of occupational radiation exposure and assessment of the associated biological risk is crucial in seeking to ensure staff are working in a safe environment. Manufacturers in nuclear medicine have reformulated the <sup>131</sup>I solution to reduce the volatility of the iodine. There has also been an increase in use of the iodide in encapsulated form.

## 5. Conclusions and Acknowledgements

With staff potentially receiving significant doses during source preparation and administration, radiation protection and safety assessment are required in ensuring practice complies with international guidelines.

Several methods and devices have been developed for in vivo measurements of <sup>131</sup>I in the thyroid by using portable gamma detectors.

This method remains easy to apply thanks to simple, inexpensive equipment and generally available in the MN services.

### References

- [1] Bitar, A., Maghrabi, M. & Doubal, A. W. Assessment of intake and internal dose from <sup>131</sup>I for exposed workers handling radiopharmaceutical products. Appl. Rad. Isot. 82, 370–375 (2013).
- [2] AL-MOHAMMED, H. I., SULJEMAN, A., MAYHOLB, Faraed H., et al. Occupational exposure and radiobiological risk from thyroid radioiodine therapy in Saudi Arabia. Scientific Reports, 2021, vol. 11, no 1, p. 1-8.