1.0 Statement

Dosimetry shall be used to determine the internal radiation exposure of all designated workers and permit holders using in excess of the activity levels described herein, in order to measure the effectiveness of control measures and to comply with all applicable regulations.

Memorial University places great emphasis on the need to keep all exposures AS LOW AS REASONABLY ACHIEVABLE, economic and social factors being taken into account. This is known as the ALARA principle and it shall be adhered to at all times.

2.0 Procedures

2.1 Thyroid Bioassay

Thyroid Bioassay is the method used to determine internal uptake of I-125 or I-131.

2.1.1 Lab personnel are to perform screening using the following protocol. Based on these results further action may be required. All individuals shall undergo thyroid bioassay **after 24 hours but within 5 days** following work if they:

- Use in a 24 hour period the amounts of volatile I^{125} or I^{131} outlined in Table 1 of this RSOP;
- Are involved in an I^{125} or I^{131} spill greater than 2 MBq;
- Are externally contaminated by I^{125} or I^{131}; or
- Have worked within two meters (2 m) of a person whose screening measurement results are equal to or greater than 1 kBq, if they were working within one hour after the time of the suspected exposure.

Table 1: ACTIVITY LEVELS ABOVE WHICH BIOASSAY FOR IODINE-125 OR IODINE-131 IS NECESSARY

Conditions	Activity in MBq
Open Room	2
Fume Hood	200
Glove Box	20,000

2.1.2 A baseline (background) bioassay is required before actually starting work.

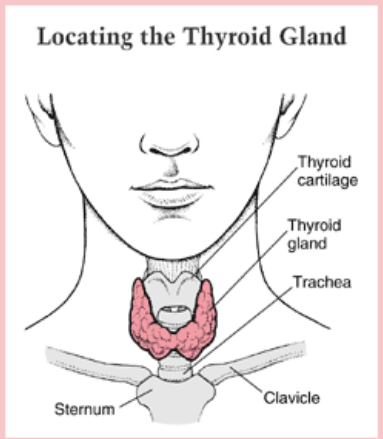

Figure1: Location of the Thyroid

2.1.3 Equipment required:

- Survey Meter - general purpose (e.g. Ludlum Model 3/18).
- Detector - Sodium Iodine Crystal, gamma scintillator (e.g. Ludlum Model 44-3 or 44-21).
- The meter together with the detector must be checked annually against a standard calibration source to verify accuracy and counting efficiency.

2.1.4 Procedure

- The procedure is to be performed in an area of low background activity, after removing contaminated gloves or apron.
- Check the response of the meter with a calibration source.
- BACKGROUND COUNT - Hold detector as close as possible without contact to the arm or leg, take a reading (for approximately 120 sec), and record the average value as a background count in the thyroid screening log (Appendix A). If you have difficulty determining a steady background reading, make sure the integration switch (next to the audio switch on most meters) is set at "s" for slow (longer integration times).
- THYROID COUNT (reading) - Hold detector close to your thyroid at a distance of 2 cm (see Figure 1: Location of the Thyroid). Take a reading after 60 seconds and record the result in the thyroid screening log (Appendix A). Calculate the net thyroid count by subtracting the background and record the result in the thyroid screening log (Appendix A).
- A WRITTEN RECORD OF ALL BIOASSAYS MUST BE MAINTAINED.
- Forward a copy of the bioassay records to the Department of Health & Safety within one month.
- Calculate level of Thyroid Uptake in Bq as follows:

$$\textbf{Thyroid Uptake (Bq)} = \frac{\textbf{Net Thyroid Count (reading – background) (cps)}}{\textbf{Counting Efficiency of the meter (cps/Bq)}}$$

If Thyroid Uptake < 1 kBq: Notify the RSO and your Permit Holder at the earliest convenience.

If Thyroid Uptake > 1 kBq ("General level"): NOTIFY THE RSO AND YOUR PERMIT HOLDER IMMEDIATELY AND SEND A DETAILED REPORT TO THE DEPARTMENT OF HEALTH AND SAFETY.

a. Monitor clothing/skin at neck-line for contamination and record results. If contamination is found - wash neckline/remove clothing, re-monitor and record.
b. If measured contamination is reduced, repeat a. until all removable contamination is eliminated.
c. If washing does not reduce measured activity then a thyroid uptake has most likely occurred.
d. Check other staff and the laboratory for contamination.
e. Record details of the procedures followed to detect or quantify contamination and possible explanations in the Bioassay Record.

If Thyroid Uptake > 10 kBq ("CNSC Reporting level"): NOTIFY THE RSO AND YOUR PERMIT HOLDER IMMEDIATELY AND SEND A DETAILED REPORT TO THE DEPARTMENT OF HEALTH AND SAFETY.

- The RSO shall immediately inform the CNSC and arrange to have a Bioassay performed within 24 hours by an agency licensed by the CNSC to perform internal dosimetry.

All personnel working with tritium in excess of the levels in Table 2 (below) in any two week period shall participate in the Tritium Bioassay Program. Contact the Radiation Safety Officer for more information prior to commencement of work.

Table 2: Activity Levels Above Which Bioassay for Tritium is Necessary

Type of Containment	**Tritium or Tritiated H_2O**	**Gas or Nucleic Acid Precursors**	**Tritium Labeled Compounds**
None	400 MBq	400 MBq	4 GBq
Fumehood	700 MBq	2 GBq	20 GBq

Appendix A: Thyroid Screening Log

Investigation Level: _____ net cps (= 1 kBq of I^{125})

Reporting Level: >_____ net cps (= 10 kBq of I^{125})

Employee name: _____

Instrument used: _____

Instrument efficiency: _____

Date of Measurement	Last Use of Iodine (date)	Background Count Rate (cps)	Thyroid reading (cps)	Net Count Rate (cps)	Thyroid uptake (Bq)	Technician Name	Action Taken