

PREPARATION OF THERMOLUMINESCENCE DOSIMETERS FOR EXTERNAL RADIOTHERAPY BEAM AUDIT IN MALAYSIA

Norhayati Abdullah¹, Siti Sara Deraman¹, Taiman Kadni², Mohd Taufik Dollah², Norhayati Salleh²

¹Medical Physics Group, Radiation Safety and Health Division, Malaysian Nuclear Agency (Nuclear Malaysia), 43000 KAJANG, SELANGOR

²Secondary Standard Dosimetry Laboratory (SSDL), Malaysian Nuclear Agency (Nuclear Malaysia), 43000 KAJANG, SELANGOR

INTRODUCTION

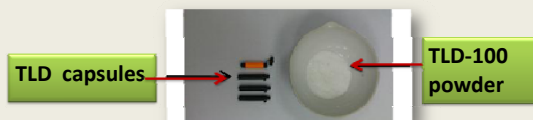
As a member state of the IAEA, Malaysia has participated in the "IAEA/WHO Thermoluminescence Dosimeter (TLD) Postal Audit Programme" since 1985 (Samat *et al.*, 2009). However, only less than eight radiotherapy centres in Malaysia were involved in the programme annually. Currently, the number of participating centre was reduced to half by the IAEA due to limited laboratory resources. For this reason, the Secondary Standard Dosimetry Laboratory (SSDL) Malaysia initiates to establish the National TLD Postal Dose Quality Audit in Malaysia in order to cater all radiotherapy centres in Malaysia. This audit is very important in order to ensure the consistency, reliability and accuracy of radiation beams used to treat cancer patients in Malaysia.

OBJECTIVES

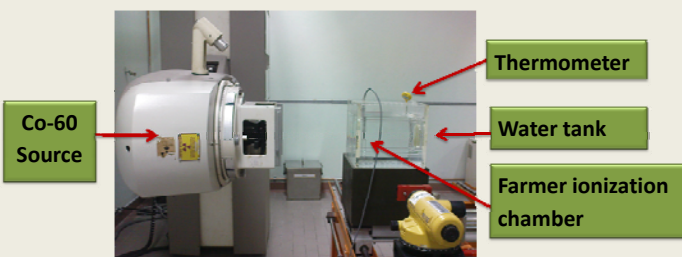
- to check the response, reproducibility and linearity of the virgin TLD-100 powder
- to establish the standard calibration curves for 6MV and 10MV photon beams
- to verify the accuracy and reliability of standard calibration curves

METHODOLOGY

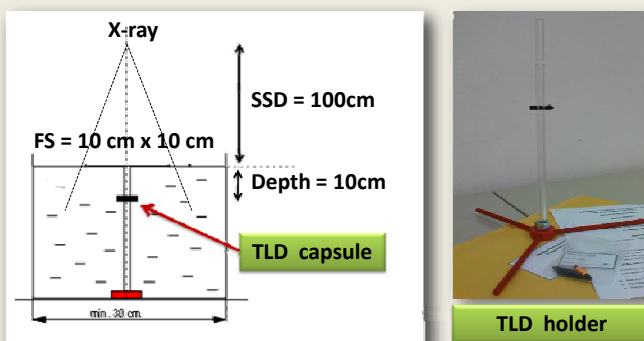
1- Preparation of TLD



2- Consistency check and linearity test

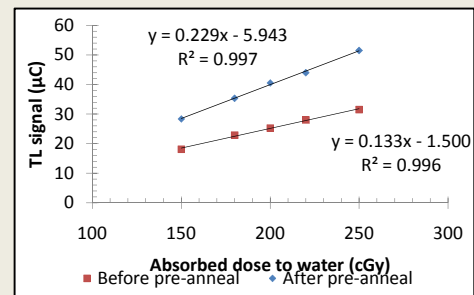


3- Establishment and verification of TLD calibration curves

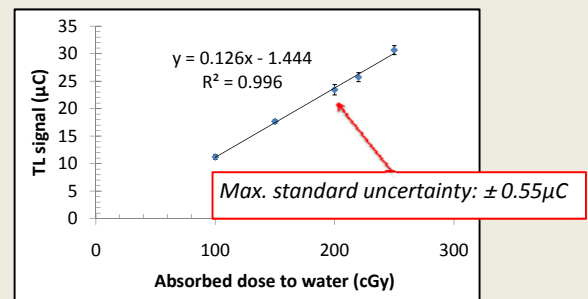


RESULTS AND DISCUSSION

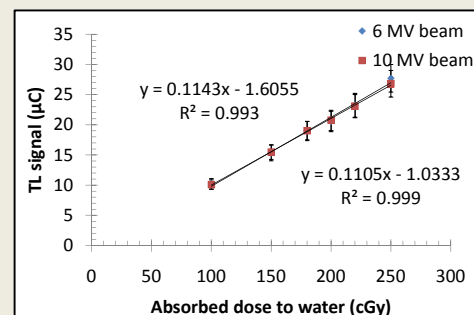
1- The **sensitivity** of virgin TLD-100 powder **increases** about **55% to 65%** after the pre-anneal process.



2- TLD-100 powders provide reliable, consistent and linear readings for absorbed dose within 100 to 250cGy.



3- The TLD calibration curves for 6 MV and 10 MV photon beams.



4- The **expanded uncertainty** ($k=2$) of absorbed dose to water from TLD measurement = **4.1%**. The IAEA's expanded uncertainty = 3.6% (Izewska *et al.*, 2000).

Table 1: Verification of TLD calibration curves.

Beam	TL signal	D_{user} (Gy)	D_{SSDL} (Gy)	% dev. relative to D_{SSDL}
6 MV	22.87 ± 0.96	2.00	2.14	-6.54
10 MV	21.30 ± 1.05	2.00	2.02	-1.04

CONCLUSIONS

The TLD-100 powders provide reliable, consistent and precise readings thus could be used in the National TLD Postal Dose Quality Audit for radiotherapy centres in Malaysia.

References:

- [1] International Atomic Energy Agency (IAEA). (2000). Absorbed Dose Determination in External Beam Radiotherapy: An International Code of Practice for Dosimetry Based on Standards of Absorbed Dose to Water, TRS No. 398. Washington D.C.
- [2] Izewska, J., & Andreo, P. (2000). The IAEA/WHO TLD postal programme for radiotherapy hospitals. *Radiotherapy and oncology*, 54(1), 65-72.
- [3] Samat, S. B., Evans, C. J., Kadni, T., & Dollah, M. T. (2009). Malaysian participation in the IAEA/WHO postal TLD and postal ionisation chamber intercomparison programmes: analysis of results obtained during 1985-2008. *Radiat Prot Dosimetry*, 133(3), 186-191. doi: 10.1093/rpd/ncp035