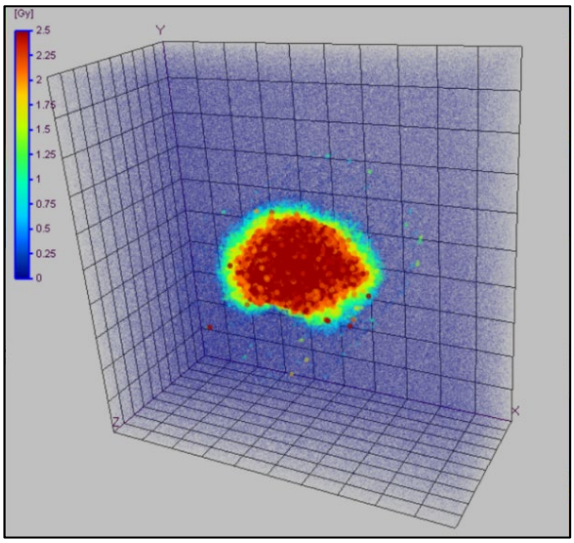
Reference exhibition

3D Gel Dosimeter for Radiotherapy

A polymer gel dosimeter is one of the chemical dosimeters and can be read out with high accuracy using MRI.

X-ray irradiation



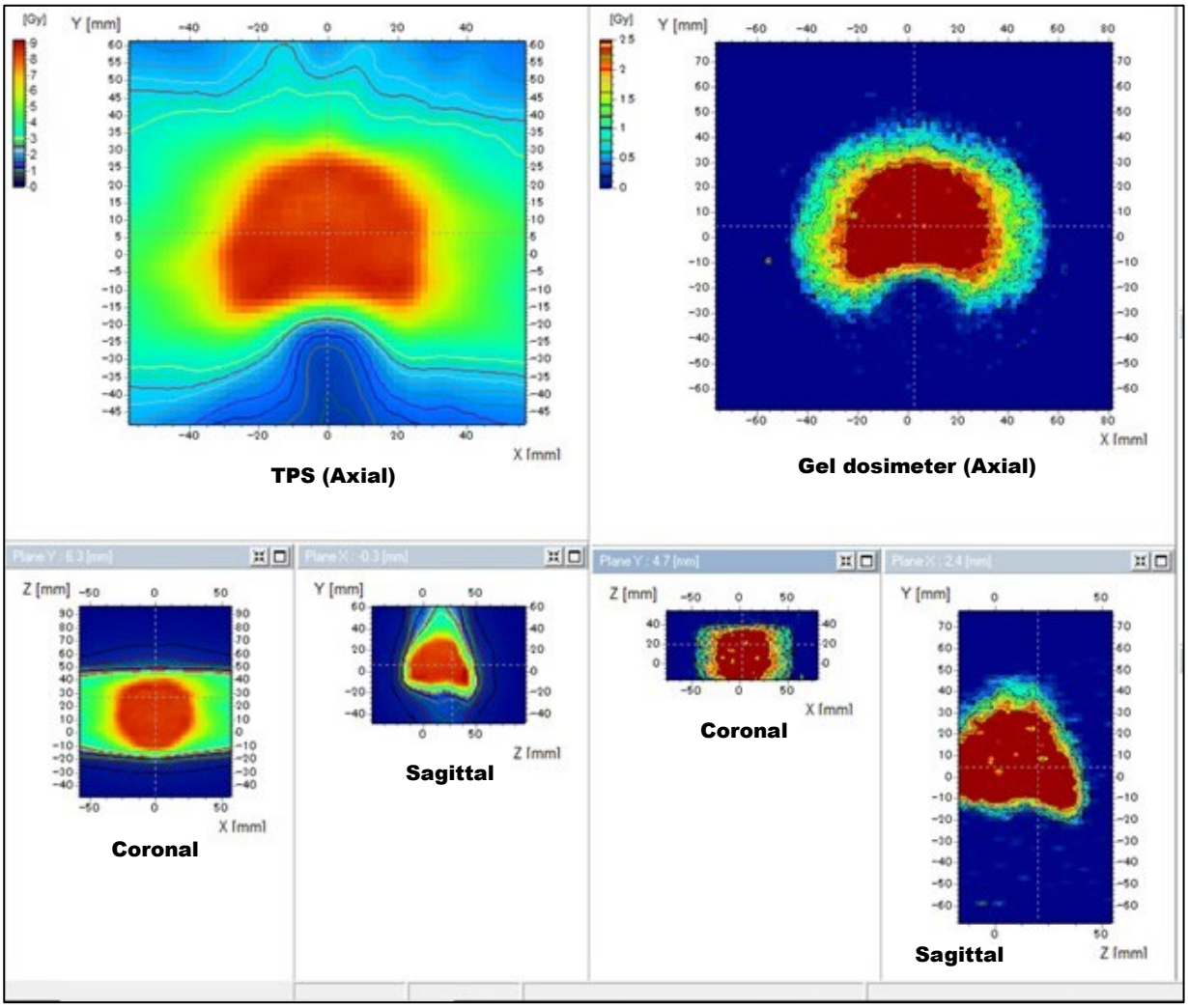
3D Dose distribution

- **True 3D dosimetry**
  - ➢ No directional dependence
  - ➢ Homogeneous gel matrix containing reactive monomers

- **Room temperature storage**
  - ➢ This is the first polymer gel dosimeter that can be stored at room temperature.
  - ➢ A thermally tolerant gel matrix and a chemically stable oxygen scavenger are used.

- **Tissue equivalence**
  - ➢ Main component is water.

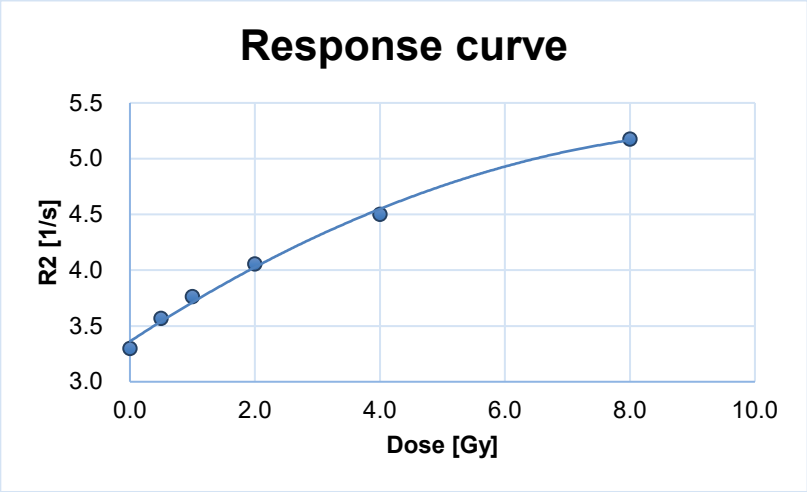
- **Comparison of dose distribution**



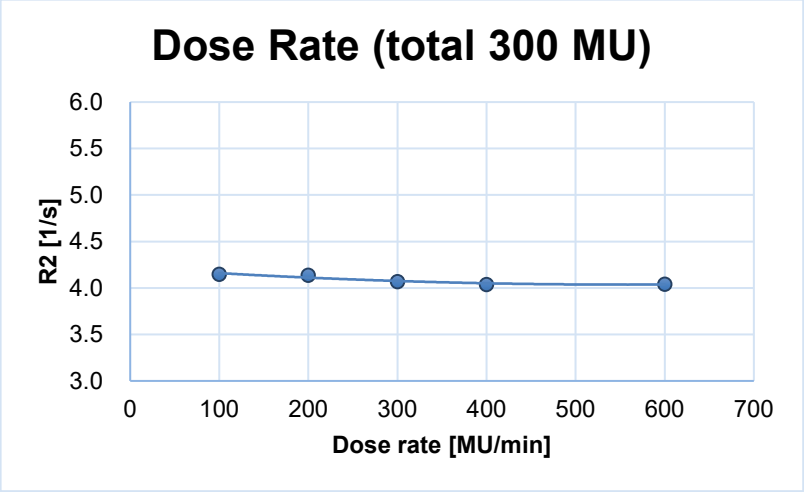
- **Dosimetry system**
  - A pair of gel dosimeter bottles: one for preparing the dose-response curve, and another for dose verification
  - MRI image processing software
  - Solid phantom (optional)

- **Chemical compositions of the gel dosimeter**
  - Reactive monomers
  - Hydrogel: no gel-to-sol transition upon heating
  - Oxygen scavenger: stable at room temperature

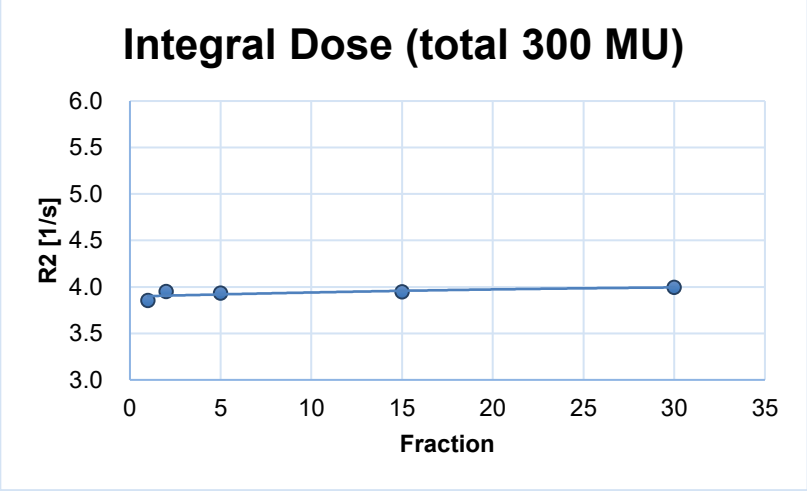
- **Dose-response curve**



- **No dose-rate dependence**



- **No integral dose dependence**



Measurement steps

1. X-ray irradiation: Generation of hydroxyl radical resulting from water radiolysis
2. Chemical reaction: Polymerizing a reactive monomer and a cross-linker in the hydrogel induced by the hydroxyl radical
3. MRI measurement: Measuring the T2 relaxation time with MRI
4. Image processing: MRI image processing with the software converting the T2 to the corresponding relaxation rate R2

References of polymer gel dosimetry

Polymer gel dosimetry
L J Schreiner, T Olding and K B McAuley
2010 **J. Phys.: Conf. Ser. 250** 012014

Topical Review: Polymer gel dosimetry
C Baldock, Y De Deene, S Doran, G Ibbott, A Jirasek, M Lepage, K B McAuley, M Oldham, and L J Schreiner
2010 **Phys Med Biol. Feb 11**; 55(5): R1–R63

Polymer gel – TPS radiotherapy dosimetry GeVero® software for ionizing radiation absorbed dose 3D distribution calculations
Marek Kozicki, Piotr Maras, Jacek Jankowski and Andrzej C Karwowski
2009 **J. Phys.: Conf. Ser. 164** 012062

Data from RIKEN

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