Absence of dose rate effects on optical response of BANG® polymer gels at low and intermediate dose rates.

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Recently, microscopic optical laser CT scanning of irradiated BANG® gels was proposed as a high-resolution 3D dosimetry for endovascular brachytherapy sources. Absence of dose rate effects is a prerequisite for any 3D dosimeter of brachytherapy sources. In BANG gels, radiation-induced free radical chain polymerization of acrylic monomers dissolved in aqueous gelatin, produces sub-micron sized polymer particles which remain entrapped in the gel, and whose spatial distribution corresponds to the dose distribution. Since each particle scatters light, the optical attenuation increases in proportion to dose. To investigate, two sets of measurements using these gels were done. We irradiated a series of BANG gels (5% gelatin, 3% acrylamide, 3% bisacrylamide, 89% water) in glass vials to graded doses up to a dose of 2 Gy using a Cesium-137 irradiator (J. L. Shepard Inc, Mark I), at dose rates ranging from 0.0092 up to 1.53 Gy/min, and at a dose rate of 3 Gy/min using 6MV and 18MV x-rays from a linac. Optical density per cm of irradiated gels was measured in a spectrophotometer, at the wavelength of 633nm,and we found no dose rate dependence. This result supports the feasibility of using optical CT scanning of gels for measuring dose distributions generated by conventional brachytherapy sources up to a dose rate of 3 Gy/min.