Purpose: To characterize and determine the dosimetric properties of a newly designed 125I source (Model AgX100 I-Seed) for interstitial brachytherapy.

Methods: High-resolution photon spectrometry and thermoluminescent dosimetry (TLD) techniques were utilized for a comprehensive experimental characterization of the AgX100 source introduced recently by Theragenics Corporation® (Buford, GA). The photon characteristics emitted by the AgX100 source were determined by a high-purity germanium spectrometer. The dose distributions around the source were measured using 1 mm  1 mm  1 mm TLD cubes placed in SolidWaterTM phantoms. The dosimetric parameters needed for dose calculation using the American Association of Physicists in Medicine (AAPM) Task Group (TG) No. 43 formalism were derived from the measured dose rate distributions with Monte Carlo calculated SolidWaterTM-to-water conversion factors.

Results: It was found that 1) the photon energy spectrum emitted by the AgX100 source was nearly identical to that emitted by the well-established model 6711 OncoSeedTM manufactured by GE Healthcare; 2) the dose-rate constant determined by the photon spectrometry technique $(0.957 \pm 0.037 \text{ cGyh-1U-1})$ and by the TLD technique $(0.995 \pm 0.007 \text{ cGyh-1U-1})$ was within 1.5% of the corresponding values determined for the model 6711 source; 3) the radial dose function and the anisotropy function of the AgX100 source were also found to be similar to the TG-43 consensus data for the model 6711 source. The anisotropy constant determined for the model AgX100 source (0.941) was virtually identical to the TG-43 consensus value (0.942) for the model 6711 source.

Conclusions: A comprehensive dosimetric characterization has been carried out for the new AgX100 source. The AAPM TG-43 dosimetry parameters for the new source have been determined from the experiment data.