AbstractID: 3992 Title: Spatial dose distributions in solid tumors from 186Re transported by liposomes using HS radiochromic media

Purpose: To establish a protocol for directly measuring spatial dose deposition and activity distribution of beta particles emitted by Re-186 transported by liposomes in a HNSCC Xenografts in Nude Rats using HS GafChromic dosimetry media.

Methods and Materials: Nude rats (n=3) at 4–5 weeks age (75–100 g) bearing a tumor with an average volume of 1.73±0.37 cm^3 were injected intratumorally with 0.29±0.05 ml of 18.5±2.7 MBq (0.50±0.09 mCi) ^{186}Re-liposomes, which contained 4.0±0.7 mg of DSPC and cholesterol. The ^{186}Re-liposome dose was equally divided and delivered to several separate locations of the tumor. SPECT and CT images in vivo were acquired using a micro-SPECT/CT scanner. The rats were sacrificed six hours after liposome injection, and tumor lobes were excised and sectioned in slices (3 mm thickness). HS films were placed between each slice and the tumor lobe was reassembled to its original shape. Film calibration was performed between 0-40 Gy using ^{60}Co γ rays. Film response was measured using a flatbed scanner in 36 bits RGB transmission mode. Dose distributions were extracted from the red and green components.

Results: The 2D spatial dose distributions are highly heterogeneous with dose regions above 40 Gy. Dose gradients up to 40 Gy in distances smaller than 2 mm in the center of the slice tumor were found. While comparing dose distributions between the 3 different tumors, significant differences in the volumes (larger than 30%) covered by the isodose curves of 1 Gy were observed.

Conclusions: The method to measure direct dose distributions produced by Re-186 transported by liposomes using GafChromic HS film has proved to be adequate for the large dose gradients produced. The use of the different components of the scanned image (red and green) allows us to extend the sensitivity range of the HS film without loss of precision.