AbstractID: 13360 Title: Induction of Plasmonic Heating Inside Breast Tumor Phantom using Gold Nanorods and Near-infrared Laser

Purpose: To demonstrate and quantify gold nanorods (GNRs)-induced plasmonic heating inside breast tumor phantom during near-infrared (NIR) laser illumination. **Method and Materials:** GNRs were fabricated using published procedures. Two types of breast gel phantoms were fabricated. The first phantom was nearly water-equivalent as it was fabricated using 1.5% agar gel (98.5% water). The second phantom, on the other hand, was fabricated using a more turbid intralipid-based gel (2% agar, 2% intralipid, and 96% water). Both phantoms contained an identical GNR-filled cavity with 4 mm inner diameter. The cavity was filled with approximately 0.1 weight percent GNRs and located at the center of a quadrant of hemi-spherical phantom at 2.5 cm depth measured from the base of the phantom. Both phantoms were illuminated with an 808 nm NIR laser at 1 W power under the identical geometry. Thermocouples were used to measure the temperature changes within the cavity and surrounding medium. **Results:** There was significant difference between the two gel phantoms in terms of achievable temperature rise within a GNR-filled cavity. For a 60 second illumination, the cavity inside an agar-based gel phantom was heated up to 15°C above the background temperature, while there was a temperature change of only about 1.5°C within the cavity inside an intralipid-based gel phantom. **Conclusion:** The current results suggest tumors inside breast tissue with high water content may be easily heated up to a few degrees above the surrounding body temperature within a short time interval (e.g., on the order of 10 seconds) without much difficulty. According to the current results, however, it might be difficult to achieve such a temperature change for tumors inside breast tissue similar to intralipid-based gel in terms of its optical property.

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