AbstractID: 13471 Title: MR Relaxation Properties for Fe-Containing MWCNTs and Potential for Combined MR Imaging and Tumor Ablation Therapy

Purpose: Investigate MR relaxation and laser heating properties of Fe-containing Multi-Walled Carbon Nanotubes (MWCNTs), to determine their potential uses as Magnetic Resonance Imaging (MRI) Contrast Agents (CAs) and Laser Absorbing Agents (LAAs) for laser-induced thermal therapy (LITT) for cancer.

Methods and Materials: MRI relaxation properties of 3 different Fe-containing MWCNT solution (600mg, 200mg 60mg Fe) were determined in a 1.5T MR scanner using a multi-echo pulse sequence. To study *in vivo* MR properties for LITT of cancer, two breast tumor bearing mice were intratumorly injected with 600mg Fe MWCNTs and N-Doped MWCNTs which contains very few iron articles as a comparison, followed by Near Infared (NIR) LITT ($3W/cm^2$, 30seconds). 7T MR T2 maps of the mouse tumors with instilled MWCNTs were acquired at 5 time points during and after LITT. Additionally, LITT using 600mg Fe-containing MWCNTs was evaluated using a larger group of mice (n=4).

Results: MWCNT R2 (or 1/T2) measurements, shows that the 600mg Fe MWCNTs' R2 is about 5 times higher than R2 for a commercial MR CAs (Feridex I.V.® (ferumoxides)). Thus, Fe-containing MWCNTs may perform very well as T2-weighted MR CAs. Futhermore, the *in vivo* MR study shows that 600mg Fe MWCNTs CAs effectively change the tumor T2 relaxation from 61ms to 22ms and creates a void signal in the implanted target area, enabling tumor localization for MR-guided LITT. After one week post-LITT, Fe-containing MWCNTs were still located in the implanted target region, indicating minimum migration/ diffusion, and T2 relaxation properties were stable. The *in vivo* study also showed that 600mg Fe-containing MWCNTs + LITT show potential as a new cancer therapy.

Conclusion: Fe-containing MWCNTs have favorable MR relaxation values and biological stability, and show great potential as a dual-modality agent for T2 MR Contrast imaging and NIR laser absorption for MR-guided LITT.