Supporting Information

Iron Oxide Nanoparticle Encapsulated Diatoms for Magnetic Delivery of Small Molecule to Tumors

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METHODS:

Preparation of HSA-IONPs

5 mL of 15 nm IONPs at 1 mg/mL in chloroform were added to 20 mg of dopamine in 2 mL of DMSO. This mixture was mixed at 70°C for 1 hour. Hexane as a poor solvent was added and the particles were collected by centrifugation. The resulting particles were redispersed in 0.5 mL DMSO. 50 mg of HSA was dissolved in 1 mL of H_2O. The nanoparticle solution was added to the HSA solution dropwise while under sonication. The nanoparticles were purified by a NP-5 desalting column and redispersed in PBS.

Viability assay

Approximately 1×10^4 4T1 cells were seeded in each well of a 96-well plate. After 24 h incubation, IONP-DTMs at different concentrations (0, 37.5, 78, 156, 312, and 625 μg/mL) were added to the plate. After incubation for another 24 h, an MTT assay was performed to determine the cell viability.

Animal models

4T1 breast cancer model cells were cultured in MEM supplemented with 2 mmol/L L-glutamine, 1.5 g/L sodium bicarbonate, 0.1 mmol/L nonessential amino acids, 1.0 mmol/L sodium pyruvate, and 10% fetal bovine serum at 37 °C in a humidified atmosphere with 5% CO_2. Athymic nude mice were purchased from Harlan laboratories. The animal model was established by subcutaneously injecting approximately 1×10^6 4T1 cells into the right hind limb of each mouse. All the animal experimental procedures were conducted following a protocol approved by the University of Georgia Institutional Animal Care and Use Committee (IACUC).

In Vivo NIRF Imaging Studies

The imaging studies started when tumors reached a size between 200 and 500 mm^3. The 4T1 tumor-bearing mice were anesthetized with isoflurane and intravenously injected with IONP-DTMs at a dose of 1.65 mg/kg. Before injection, a magnet bar was attached to the skin of the tumors, and remained there for 1 h. For control animals, no magnetic bar was applied. T_2-weighted fast spin echo images were acquired on a 7 T Varian small animal MRI system before and 1 h post the particle injection, with the following scan parameters: TR = 2.5 s; TE = 48 ms; ETL = 8; FOV 40^2 mm^2; matrix size = 256^2; 15 axial slices with 1 mm slice thickness. Fluorescence studies were performed on a Maestro II imaging system (PerkinElmer). After the imaging, the animals were sacrificed. Tumors were harvested and subjected for ex vivo imaging. The images were unmixed by the vendor provided software. ROIs were circled around the tumors, and the optical intensities (in total scaled counts/s) were read by the Maestro software.

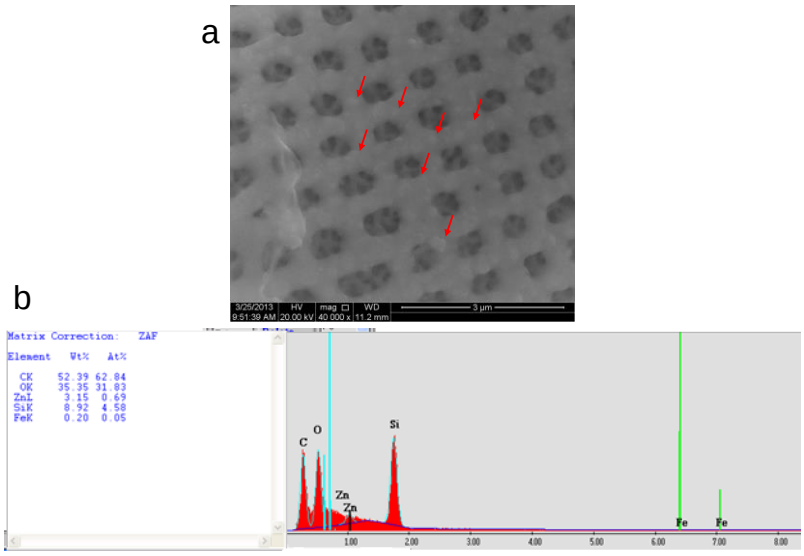

Figure S1. a) SEM image of IONP-DTM. b) EDX analysis of IONP-DTMs.

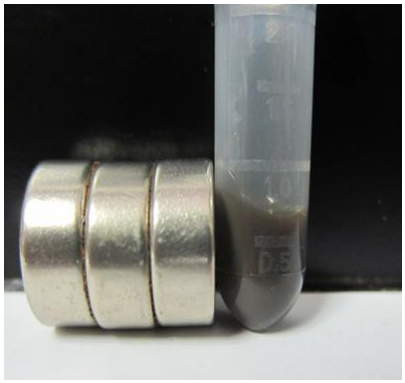

Figure S2. Applying a magnetic bar to a HSA-IONP solution. Due to weak magnetic response, most of the particles were not attracted to the wall.

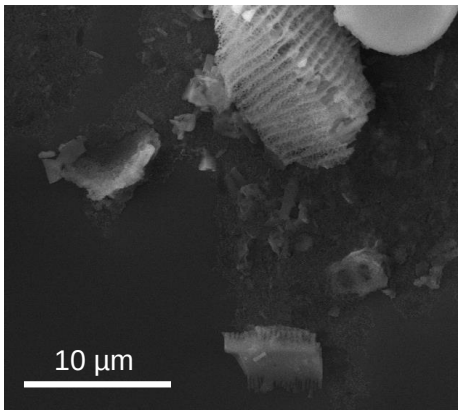

Figure S3. IONP-DTMs after one week incubation in a body fluid mimic. Many particles were found partially degraded after the incubation.