Magnetic field directs nanoparticles to tumors

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(PhysOrg.com) -- To improve the tumor-specific delivery of drug to tumors, a team of investigators from the University of California, San Diego (UCSD) has created a system of nanoparticles-within-a-nanoparticle that can be directed to and concentrated at the site of tumor using a magnetic field.

Once at the tumor site, radiofrequency irradiation triggers drug release from the nanoparticles, bathing the tumors in drug and markedly reducing the growth of the tumors.

Reporting its work in the journal Nano Letters, a research team led by Sungho Jin described the multiple steps it uses to create these multi-component nanoparticles that contain both magnetic nanoparticles and the drug Camptothecin trapped within a silica shell.

Trapped within the silica nanoparticle, the close proximity of the hundreds of magnetic iron oxide nanoparticles boosts their responsiveness to a magnetic field applied from outside the body. More importantly, at moderate magnetic field strengths the nanoparticles not only accumulate in the vicinity of a tumor but also penetrate into the tumor mass.

Based on these initial results, the investigators injected the nanoparticles into mice implanted with human breast tumors. After using a magnetic field to direct the nanoparticles to tumors during a two-hour period, the researchers subjected the animals to three 8-minute exposures to

radiofrequency irradiation. The treated animals experienced a marked reduction in the size of their tumors and experienced no noticeable side effects.

This work is detailed in a paper titled, "Magnetically Vectored Nanocapsules for Tumor-Penetration and Remotely Switchable On-Demand Drug Release." An abstract of this paper is available at the journal's website.

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