Therapeutic nanoparticles targeted to radiation treated tumors

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Reporting its work in the *Journal of Controlled Release*, the team of investigators led by Zhoaozhong Han of Vanderbilt University describes how it used a technology known as "phase display" to identify a short peptide that binds specifically to irradiated tumor cells and used that peptide as an agent to target doxorubicin-containing nanoparticles to radiation-treated cells. Tests using cells grown in culture demonstrated that lipid-based nanoparticles decorated with this peptide do not bind to healthy cells, whether irradiated or not, nor to tumor cells that are not

irradiated.

To test if this targeting peptide exhibits the same selectivity in a living animal, the investigators dosed mice bearing human tumors with one of two lipid nanoparticles loaded with the anticancer drug doxorubicin: one nanoparticle was decorated with the targeting peptide, while the "control" nanoparticle was coated with a random peptide that showed no binding preference for a particular type of cell. The researchers also attached a fluorescent probe to the nanoparticles in order to track their accumulation in the animals. Each animal had tumors growing on both sides of the body, with the tumors on only one side receiving radiation therapy.

When injected into the tumor-bearing mice, the targeted liposomes accumulated rapidly around the irradiated tumors but not around the tumors that were not irradiated. Similarly, the untargeted nanoparticles were largely excreted. More importantly, irradiated tumors treated with the targeted nanoparticle showed a marked increase in cell death and a substantial decrease in the number of blood vessels infusing those tumors. The researchers note that the use of anticancer nanoparticles targeted to irradiated tumors may make it possible to lower the dose of radiation used to treat tumors without negatively impacting therapeutic outcomes.

This work, which was supported in part by the National Cancer Institute, is detailed in a paper titled, "Tumor-targeted delivery of liposome-encapsulated doxorubicin by use of a peptide that selectively binds to irradiated tumors." An abstract of this paper is available at the journal's website.

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