# New nanoparticles could improve cancer treatment

## Particles can deliver a combination of chemotherapy drugs d prostate-cancer cells.

Anne Trafton, MIT News Office

October 5, 2010

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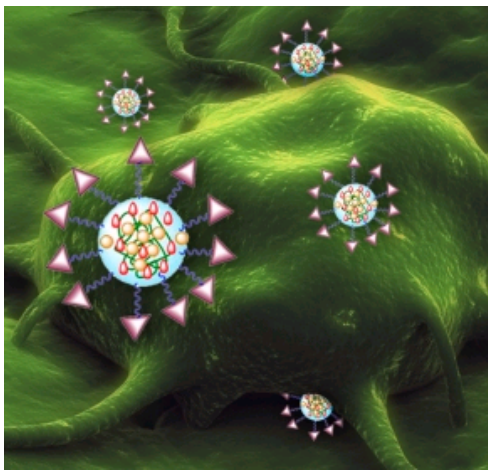

Drug-carrying nanoparticles designed by MIT Brigham and Women's Hospital researchers decorated with tags that bind to molecules f surface of tumor cells.
Nanoparticle images: MIT/Brigham and Wome

In recent years, studies have shown that for many types of cancer, combination drug therapy is more effective than single drugs. However, it is usually difficult to get the right amount of each drug to the tumor. Now researchers at MIT and Brigham and Women's Hospital have developed a nanoparticle that can deliver precise doses of two or more drugs to prostate cancer cells.

In a study appearing online this week in the *Proceedings of the National Aca Sciences*, the researchers tailored their particles to deliver cisplatin and doce drugs commonly used to treat many different types of cancer.

Such particles could improve the effectiveness of chemotherapy while minimi effects normally seen with these drugs, according to the researchers. They c adapted to target cancers other than prostate cancer, or even to deliver dru diseases that require combination therapy.

To build their nanoparticles, the researchers developed a new strategy that a to incorporate drugs with very different physical properties, which had been i with previous drug-delivering nanoparticles. In earlier generations of nanopa molecules were encapsulated in a polymer coating. Using those particles, hy (water-repelling) drugs, such as docetaxel, and hydrophilic (water-attracting) as cisplatin, can't be carried together, nor can drugs with different charges.

"With the old way, you can only do it if the two drugs are physically and chem similar," said Omid Farokhzad, director of the Laboratory of Nanomedicine ar Biomaterials at Brigham and Women's Hospital and a senior author of the pa this way, you can put in drugs that are relatively different from each other."

MIT Institute Professor Robert Langer and Stephen Lippard, the Arthur Amos Professor of Chemistry at MIT, are also senior authors of the paper. Former Women's postdoctoral associate Nagesh Kolishetti is the lead author. The re funded by the National Cancer Institute, National Institute of Biomedical Imag Bioengineering, and the David Koch Prostate Cancer Foundation.

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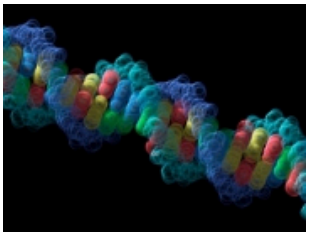

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With the researchers' new technique, called "drug-polymer blending," drug m
hung like pendants from individual units of the polymer, before the units asse
polymer nanoparticle. That allows the researchers to precisely control the ra
loaded into the particle. They can also control the rate at which each drug wi
released once it enters a tumor cell.

The new particles offer a much-needed ability to fine-tune drug combinations
personalize treatment for individual patients, said Michael Pishko, professor o
engineering at Texas A&M University, who was not involved in this study. "Th
on the money in terms of what these systems should look like," he said.

Once the drugs are loaded into the nanoparticle, the researchers add a tag t
a molecule called PSMA, which is located on the surfaces of most prostate tu
This tag allows the nanoparticles to go directly to their target, bypassing hea
and potentially reducing the side effects caused by most chemotherapy drug
could permit doctors to give much higher doses to a larger number of patient

The researchers have filed for a patent on the polymer-blending fabrication t
and are now testing the drug-delivering particles in animals. Once they gathe