Study Details How Platinum Nanocages 'Cook' Cancer Cells

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Platinum-based anticancer agents have a long history as proven therapeutic agents, but their toxicity and short lifetime in the body and the ability of tumors to develop resistance to these drugs limit the ultimate utility of these agents.

In an attempt to overcome these limitations, a multi-institutional research team comprising members from Stanford University, the Massachusetts Institute of Technology (MIT), and the University of Duisburg-Essen in Germany is using targeted carbon nanotubes as delivery agents for an inactive form of platinum that cancer cells themselves convert into a toxic anticancer agent.

Reporting its work in the *Journal of the American Chemical Society*, the research team headed by Stanford's Hongjie Dai, Ph.D., a member of the Center for Cancer Nanotechnology Excellence Focused on Therapy Response, and Stephen Lippard, Ph.D., MIT, describes its development of methods to attach platinum-containing compounds firmly to the surface of carbon nanotubes to create what they call a "longboat delivery system" for the platinum warhead.

The particular form of platinum that the researchers use, known as platinum-IV, is capable of binding to other molecules in addition to the nanotube. The investigators use that capability to attach the tumor-targeting agent folic acid to the platinum warhead.

When administered to tumor cells that overexpress a folic acid receptor,

the modified nanotubes rapidly enter the target cell. There, enzymes within the cell convert platinum-IV to a far more toxic form known as platinum-II. This chemical conversion has the effect of releasing platinum from the nanotube and enabling it to travel to the cell nucleus, where it reacts with deoxyribonucleic acid (DNA) and eventually kills the cell.

Tests with cancer cells growing in culture showed that this nanotube formulation of platinum is more than 8 times more potent than the approved anticancer agent cisplatin.

This work, which is detailed in the paper “Targeted Single-Wall Carbon Nanotube-Mediated Pt(IV) Prodrug Delivery Using Folate as a Homing Device,” was supported by the NCI Alliance for Nanotechnology in Cancer. An abstract of this paper is available through PubMed.

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