Nanoparticles May Help Optimize Chemotherapy

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(PhysOrg.com) -- A research group reported recently in the *Proceedings of the National Academy of Sciences* that they have engineered nanoparticles to help block a protein process that takes place in tumors, making the tumors more susceptible to chemotherapy treatment.

The protein process, a series of chemical reactions officially known as the mitogen activated protein kinase (MAPK) signal transduction cascade, plays a role in many cellular functions, including cell growth and development, cell division, and death. Inhibiting the cascade in tumor cells slows their growth and makes them easier to kill via chemotherapy.

The MAPK cascade is the focus of much study because of its role in turning healthy cells into tumor cells and regulating tumor-cell functions. Because one drawback of chemotherapy is that it tends to kill normal cells along with malignant ones, interrupting the MAPK cascade in tumor cells could lead to cancer therapies that are more targeted and don't induce as many side effects, which tend to leave cancer patients so sick.

In this case, the researchers, from Harvard Medical School and National Chemical Laboratories, in India, designed nanoparticles from a biodegradable polymer material that chemically bond to a MAPK inhibitor, a molecule that disrupts the MAPK cascade.

When tumor cells "ingest" the nanoparticles through the cell membrane,

the particles release the inhibitor. In mice with melanoma, a cancer typically found in skin, this method slowed the growth of the tumors and increased the effectiveness of the chemotherapy drug they were given, cisplatin, which is used to treat most cancers. With further research, this work could lead to more successful chemotherapy treatments in humans.

Notably, this work is the first published report of a MAPK inhibition method that has been combined with nanoparticle-based tumor targeting, another area that shows promise for cancer treatments. The research opens a door to the use of nanoparticles and other nanostructures as vehicles for blocking or interrupting the processes that cause tumors to grow.

For more information: Sudipta Basu, Rania Harfouche, Shivani Soni, Geetanjali Chimote, Raghunath A. Mashelkar, and Shiladitya Sengupta (April 21, 2009) *Proc. Natl. Acad. Sci. USA*, 10.1073/pnas.0902857106