Nanofibers Carry Toxic Peptides Into Cancer Cells

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(PhysOrg.com) -- Researchers have long known that certain peptides are capable of killing cells by inserting themselves into the cell membranes and disrupting normal membrane structure and function. Now, researchers at Northwestern University have learned how to deliver these cytotoxic peptides to tumor cells using self-assembling nanofibers that can slip into cancer cells and allow the toxic peptides to do their job from inside the cell.

The research team, led by Samuel Stupp and Vincent Cryns, published its work in the journal Cancer Research. Dr. Stupp is a member of the Nanomaterials Cancer Diagnostic and Therapeutic Center, a National Cancer Institute Center for Cancer Nanotechnology Excellence.

To create their nanofibers, the researchers first synthesized molecules called peptide amphiphiles. These molecules fold into sheet-like structures that have one water-seeking, or hydrophilic, side and one water-avoiding, or hydrophobic side. When mixed in solution, this peptide self-assembles into long, nanometer-thin fibers. When the cytotoxic peptide was attached to one end of the peptide amphiphiles, it ended up decorating the surface of the fiber.

When added to breast cancer cells, this construct easily entered the cells, while the cytotoxic peptide alone did not. The nanostrucutres also induced breast cancer cell death, while the cytotoxic peptide alone did not. One surprising finding was that the nanostructures triggered cell death more effectively in breast tumor cells than they did when added to

normal breast cells, suggesting that the fibers themselves may have some selectivity for tumor cells.

This work, which is detailed in a paper titled, "Induction of Cancer Cell Death by Self-assembling Nanostructures Incorporating a Cytotoxic Peptide," was supported in part by the NCI Alliance for Nanotechnology in Cancer, a comprehensive initiative designed to accelerate the application of nanotechnology to the prevention, diagnosis, and treatment of cancer.

An abstract of this paper is available at the journal's Web site.

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