Intelligent Nanoscale Bioreactors for Drug Delivery

October 2 2006

In a powerful demonstration of how to build a multifunctional, smart nanoscale drug delivery system, researchers at the University of Basel have created a drug-loaded nanocontainer that targets specific cells and releases its payload when receiving a specific physiological signal.

These smart nanocontainers can serve as a model for creating anticancer drug delivery vehicles that will target tumors and release their contents only when they receive a tumor-specific biochemical signal.

Writing in the journal *Nano Letters*, a group of investigators led by Patrick Hunziker, M.D., describe its development of a polymer nanoparticle that incorporates a biological receptor in its outer shell and a biological effector inside the cell. This receptor and effector duo provides the means of detecting a specific biochemical signal that then has an effect on the nanocontainer and its contents. That effect can include drug release or the generation of a diagnostic signal.

In the proof-of-concept experiments described in their paper, the investigators used a bacterial pore protein that can transport a specific non-fluorescent molecule into the nanocontainer.

Once inside the nanocontainer, this molecule then serves as a substrate for an enzyme loaded into the nanocontainer, producing a fluorescent molecule that can be seen using fluorescence microscopy. The researchers used the appearance of a fluorescent signal as proof that their smart nanocontainer was functioning as designed. The investigators

note that the enzyme chosen could be one that converts an inactive drug into its active form for release only inside a diseased cell.

This work is detailed in a paper titled, “Toward intelligent nanosize bioreactors: a pH-switchable, channel-equipped, functional polymer nanocontainer.” This paper was published online in advance of print publication. An abstract of this paper is available at the journal’s website.

Source: National Cancer Institute