

Stealth particles to target tumors

August 31 2005

Stealth nano particles may some day target tumor cells and deliver medication to specific body locations, according to Penn State chemical engineers.

"Mainly we have focused on chemotherapy drugs," says Dr. Michael Pishko, professor of chemical engineering and materials science and engineering. "But others are considering using this delivery system to deliver genes in gene therapy."

The researchers first produce nano-sized powders of the drug they wish to deliver and encapsulate them in a polymer nanoshell. The drug used for this project was paclitaxel – an anti breast cancer drug – and dexamethasone – a steroid frequently used to treat eye inflammation. This shell allows the drug to travel in stealth mode through the bloodstream.

"A layer-by-layer self-assembly technique was used to encapsulate core charged drug nanoparticles in a polymeric nanoshell," the researchers told attendees today (Aug. 31) at the 230th American Chemical Society Meeting, Washington, D.C.

Normally, drugs, especially the toxic drugs used for chemotherapy, trigger the human immune system into action, but, with the polymer shell for protection, these drugs can circulate longer without being removed.

"If the drugs do not trigger an immune response, then lower levels of

drug can be used than currently are necessary in chemotherapy," says Pishko.

The researchers, who include Pishko, Alisar Zahr and Cheryl A. Rumbarger, graduate students in chemical engineering, tested their nanoshell in cell culture and found that it had less phagocytosis – removal of the drug – during a 24-hour period than the unencapsulated drug.

Combined with longer retention in the body, the researchers engineered the nanoparticle shells to target specific cells by attaching a functionalized polymer to the shell. They designed this tentacle-like projection to target a receptor on a tumor cell, or a specific location in the eye, for example. Once the drug arrives via the blood to the tumor or eye, it attaches and slowly releases its contents.

This type of drug delivery system works especially well in such highly vascularized areas such as tumors and the eye, because the drug can travel right up to the target area. Delivery to areas in the brain would not be feasible because of the blood brain barrier that prevents foreign substances from moving from the blood into the cells of the brain.

"For targeting, we could exploit the fact that cancer tumors have a lot more folic acid receptors and target those," says Pishko. "We could also use specific monoclonal antibodies to target specific tumors."

The researchers also considered delivery of drugs to specific type cells, like those in the eye. This type of stealth targeting drug delivery system could also deliver genes or gene fragments in gene therapy.

Source: Penn State

Citation: Stealth particles to target tumors (2005, August 31) retrieved 25 April 2024 from <https://phys.org/news/2005-08-stealth-particles-tumors.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.