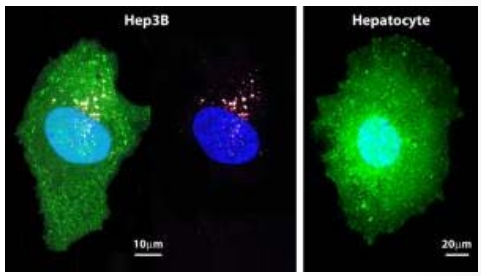
Science

New Technique Uses Nanoparticles with Honeycomb-like Compartments to Attack Cancer Cells

Tiffany Kaiser - April 20, 2011 7:40 PM

6 comment(s) - last by AnimalCO.. on Apr 23 at 6:52 PM

Could be available in as little as five years



Hep3B shows green cancer cell penetrated by protocell, which is releasing drug-filled nanoparticles into the cancerous tissue. The Hepatocyte is a normal cell with no penetration (Source: Department of Energy/Sandia National Laboratories)

Jeff Brinker, study leader and a researcher at Sandia National Laboratories as well as a professor at the University of New Mexico, and Carlee Ashley, a Harry S. Truman post-doctoral fellow at Sandia National Laboratories California, have developed silica nanoparticles that contain honeycomb cavities to store different kinds of cancer-killing drugs.

Drug delivery systems have become an important part of cancer research, as researchers are looking for a replacement for chemotherapy. Traditional cancer drugs produce negative side effects because they are released into the system to attack cancer cells, but end up attacking healthy cells as well since they have no direction. With drug delivery systems, such as the remote-controlled microcarrier drug delivery system developed by Canadian researchers and the synthetic nanopolymer coated with cancer drugs created by Purdue researchers, scientists are coming closer to finding methods of drug delivery with no side effects.

Now, Brinker and Ashley have found a new technique that utilizes silica nanoparticles that are 150 nanometers in diameter. The nanoparticles are honeycombed with little compartments that are meant to carry various kinds of cancer drugs directly to cancerous tissue without harming surrounding healthy tissue.

The new system is different from others because it utilizes protocells instead of liposomes alone. Protocells are the combination of the nanoparticles and membranes formed from liposomes, where the aggressive cancer drugs are sealed tight. SiRNA, which silences the expressions of proteins to cause cell death, is also within the honeycomb to be released. The membrane is modified with peptides that are designed to bind to receptors overexpressed on a cancer cell's surface. The drugs are then released from the honeycomb compartments into the cancerous cells.

Researchers tested the new system by exposing various phages, or viruses that attack bacteria, to two groups of cells - one that is cancerous, and one that is not.

"Proteins modified with a targeting peptide that binds to a particular carcinoma exhibit a 10,000-fold greater affinity for that cancer than for other unrelated cells," said Ashley.

Brinker and Ashley noted that their honeycombed protocell technique had greater stability, targeting efficacy and cargo capacity than targeted liposomes alone. It also had greater cytotoxicity for cell destruction of human liver cancer cells.

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In addition, this new technique is easier to use than targeted liposomes because liposome carriers require specialized loading strategies while the new system simply soaks nanoparticles in different drug combinations to make personalized medications. The lipids then protect the harmful drugs from leaking as they travel through the human system. These nanoparticles can circulate in the system for days or weeks depending on their size, which is engineered from 50 to 150 nanometers in diameter using an aerosolized precursor solution. Evaporation-induced self-assembly then produces the particles, which are later made into protocells.

"Their overall dimensions determine how widely they'll be distributed in the bloodstream," said Brinker. "We're altering our synthesis to favor the smaller sizes."

The smaller sizes are capable of navigating "under the radar" of organs like the liver, meaning they can circulate longer.

Researchers believe this method will be available for use in five years.

"The enormous capacity of the nanoporous core, with its high surface area, combined with the improved targeting of an encapsulating lipid bilayer (called a liposome) permit a single protocell loaded with a drug cocktail to kill a drug-resistant cancer cell," said Brinker. "That's a millionfold increase in efficiency over comparable methods employing liposomes alone - without nanoparticles - as drug carriers."

This study was published in *Nature Materials*.

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Cure Naturally

By **aurareturn** on 4/21/2011 3:35:56 PM , **Rating:** 1

It's possible to cure cancer with Hydrogen Peroxide that costs $1 at Walmart.

Look it up. There are cheap/natural cures to cancer. The medical industry just doesn't want you to know.

RE: Cure Naturally

By **JPForums** on 4/22/2011 8:28:57 AM , **Rating:** 2

> **quote:**
> *It's possible to cure cancer with Hydrogen Peroxide that costs $1 at Walmart.*

Effectiveness aside, the articles I found specifically say not to use your $1 Walmart hydrogen peroxide. Impurities and stabilizers make it a topical only hydrogen peroxide. You have to use food grade hydrogen peroxide (read fit for consumption) in the proposed treatments. This is the stuff they use to disinfect food and food packaging. This is a fair bit more expensive, though still far less expensive than current cancer treatments.

As to the effectiveness of said treatments, it may be true that there is a huge conspiracy by pharmaceutical companies to force use of their overly expensive drugs. However, if it was effective, I would think that H2O2 use would be prevalent in places that had no vested interest in said companies. I haven't found many places that advertise the use of H2O2 treatments. Though, I'll grant you that I haven't looked very hard. I'd like to see more definitive studies on the effectiveness of the treatments before I put much effort into finding them.

Parent

RE: Cure Naturally

By **AnimalCO** on 4/23/2011 6:52:19 PM , **Rating:** 2

Don't bother. It's absolute crap.

Parent

RE: Cure Naturally

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