



News Release

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UNM Cancer Center Research in the News

UNM Cancer Center and Sandia Labs Design New Nanoparticle for Safer, More Effective Drug Delivery

Potent new “protocell” could significantly improve effectiveness of chemotherapy

Albuquerque, NM—April 20, 2011—Researchers at the UNM Cancer Center and Sandia National Laboratories have designed a new type of drug-delivery particle that has the potential to significantly increase the effectiveness of conventional chemotherapy and decrease its side effects. Carlee Ashley, Dr. C. Jeffrey Brinker and colleagues report on the engineering of this new nanoparticle drug carrier, which they dub a “protocell,” in a paper highlighted on the cover of the May issue of the scientific journal *Nature Materials* and chosen as a featured paper in the journal’s “News & Views” section.

A hybrid particle made up of a lipid membrane and a silica core, the protocell combines key properties of each material to deliver high levels of a mix of common chemotherapy drugs to cancer cells while limiting the collateral damage to normal cells. In the “News & Views” commentary that accompanies the paper, MIT researcher and Howard Hughes Medical Institute investigator Darrell Irvine notes that protocells are “so potent that a single particle on average per cell is sufficient to kill a model hepatic carcinoma cell” *in vitro* under conditions that minimally impact healthy liver cells. This combination of potency and specificity constitutes a significant advance over existing nanoparticle-based therapeutics, which tend to be optimized around their targeting abilities or their drug-carrying capacity. The protocell, by contrast, achieves both.

“This research has exciting implications for our development of more personalized and effective chemotherapy treatments with fewer side effects,” said Dr. Cheryl Willman, Director and CEO of the UNM Cancer Center. “Carlee Ashley, Dr. Jeffrey Brinker and the whole team are to be commended for their extraordinarily innovative work. It is an outstanding example of the cutting-edge collaborations we at the UNM Cancer Center are pursuing with our partners at

Sandia National Laboratories, National Institutes of Health-funded discovery centers across UNM and other leading research institutions around the nation.”

“One of the ‘holy grails’ of materials science applied to medicine is the creation of nanoparticles that bind exclusively to target cells and deliver high doses of therapeutic compounds,” said Dr. C. Jeffrey Brinker, UNM Distinguished and Regents’ Professor of Chemical and Nuclear Engineering, UNM Cancer Center member and Sandia National Laboratories Fellow. “In creating the protocell, we believe we have taken a significant step toward approaching this ideal.”

“The protocell is the first example of a nanocarrier that simultaneously achieves high targeting specificity, high toxicity to target cells and low levels of collateral damage,” explained Carlee Ashley, a Harry S. Truman Postdoctoral Fellow in Biotechnology and Bioengineering at Sandia National Laboratories. “We believe it holds great promise in mitigating the side effects of chemotherapy and delivering the unique drug combinations needed for personalized medicine.”

The engineering requirements of targeted drug-delivery nanoparticles are dauntingly complex. Though several nanoparticle-based therapeutics are currently in clinical use, no targeted nanoparticle system has yet been approved by the US Food and Drug Administration, reflecting the difficulty of the engineering challenge. Key design criteria for such a system include targeting specificity (and, related to this, high toxicity to target cells and minimal damage to other cells), stability and what researchers call cargo capacity, the ability of a nanoparticle to carry and deliver a mix of chemically disparate therapeutic agents such as those that make up chemotherapy’s “drug cocktail.”

Compounding the challenge of creating a single particle that combines and optimizes all three capabilities is the fact that the physical properties required for each may be in conflict with one another. This is the conundrum that the protocell has solved. “To date, no other nanoparticle-based delivery vehicle has been reported to possess all of these attributes, making protocells the first example of a nanocarrier that simultaneously addresses the complex requirements of targeted, multicomponent delivery,” write the paper’s authors. “Perhaps the most striking feature of protocells is their ability to deliver high concentrations of diverse cargos and ‘cocktails’ of chemically disparate components.”

About the UNM Cancer Center

The UNM Cancer Center is the Official Cancer Center of New Mexico and the only National Cancer Institute (NCI)-designated cancer center in the state. One of just 66 NCI-designated cancer centers nationwide, the UNM Cancer Center is recognized for its scientific excellence, contributions to cancer research and delivery of medical advances to patients and their families. It is home to 85 board-certified oncology physicians representing every cancer specialty and more than 125 research scientists hailing from prestigious institutions such as M.D. Anderson,

Protecell research in Nature Materials, cont.

Johns Hopkins and the Mayo Clinic. The UNM Cancer Center treats more than 65 percent of the adults and virtually all of the children in New Mexico affected by cancer, from every county in the state. In 2010, it provided care to more than 15,800 cancer patients. The Center's research programs are supported by over \$59 million annually in federal and private funding.

UNM Cancer Center contact information

Dorothy Hornbeck, JKPR, (505) 797-6673, dhornbeck@jameskorenchen.com

Audrey Manning, UNM Cancer Center, (505) 925-0486, amanring@salud.unm.edu

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