

Cancer Nanotechnology Center



Engineers, scientists and physicians are working together to develop practical platforms to diagnose, treat and monitor cancers such as leukemia and breast cancer. Pictured: ECE professor Sadik Esener (center) with UCSD Moores Cancer Center director Dennis Carson (left) and co-director Thomas Kipps (right).

In a new national effort to fight cancer with nanoscale devices that find and destroy tumor cells while leaving healthy tissue unharmed, the National Cancer Institute (NCI) has just awarded UCSD \$3.9 million in the first year of a five-year \$20 million initiative to establish a Center for Cancer Nanotechnology Excellence (CCNE). The UCSD center will use nanotechnology to develop anti-cancer therapies that directly target tumor cells; more accurate and faster diagnostics; and ways to track down cancer cells that survive therapy.

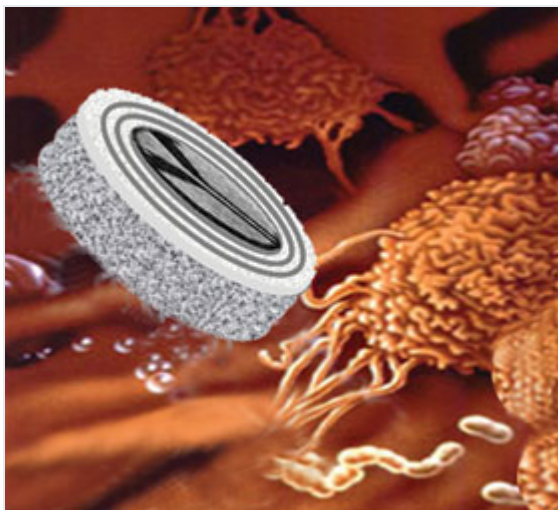
The NCI named a total of seven university centers to develop clinically useful nanotechnologies to treat, understand, and monitor cancer. The UCSD team includes engineers, chemists, and biologists who will collaborate with physicians at the Rebecca and John Moores UCSD Cancer Center, and colleagues at the Burnham Institute for Medical Research and University of California campuses at Irvine, Riverside, and Santa Barbara.

One focus of the UCSD effort will be to develop smart nanoplastforms. About the size of a red blood cell, these nanoporous "mother ships" would move through the body and target specific tumor cells or the blood vessels that feed them. After arriving at their destinations, the mother ships would release their payload nanoparticles, which could be designed to help image tumors, enter cells and perform measurements, and deliver therapies. Chemists at UCSD together with materials scientists at the University of California, Santa Barbara nanofabrication facility will synthesize nanoparticles that will be coated with "biolinkers," molecules developed at the Burnham Institute to make the particles attach to specific types of tumor cells.

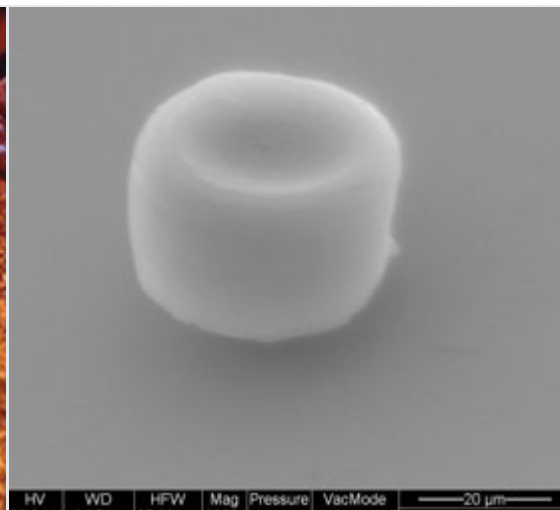
"Cancer nanotechnology is one of the most exciting and promising areas of cancer research today," says Dr. Dennis Carson, director of the Moores UCSD Cancer Center. "We are developing powerful drugs and other chemotherapeutic agents that are more and more effective when they reach their target. But we need engineers and materials scientists to build the nanodevices that can deliver these agents to the target."

"Nanotechnology will enable doctors to get more rapid noninvasive feedback on the effectiveness of treatment, and when biopsies are needed, these approaches will require much smaller tissue samples for analysis in the laboratory," adds Sadik Esener, Jacobs School professor of electrical and computer engineering and the principal investigator of the UCSD center.

The team of 35 co-investigators will focus on six projects, each to develop new technologies that when integrated together will create platforms for more powerful and selective cancer therapy. The technologies will be evaluated in animal models. In order to help identify inventions with commercial potential, representatives from General Electric, Honeywell, Irvine Sensors, Nanogen, and Enterprise Partners Venture Capital will serve on a committee to regularly evaluate the progress of the research at UCSD. Esener says he also plans to expand the number of industry partners.



The UCSD researchers will develop a smart, multifunctional "mother ship" platform that would travel through the blood stream, home in on tumors and release their nanoparticle payloads. These nano devices may be used to identify and



Proof of concept device: UCSD chemists have created porous Silpolystyrene composite "mother ship" microparticles that are 40 microns in diameter. The UCSD team aims to prepare similar platforms that are less than 5 microns in diameter.

image tumors, take measurements, and then kill the tumors by releasing anti-cancer drugs on cue.