

Rice student wins award for revolutionary MRI research

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Fullerene-based contrast agents could allow first single-cell imaging

The Nanotechnology Foundation of Texas has selected Rice University doctoral student Balaji Sitharaman as one of two winners of the 2004 George Kozmetsky Award for Outstanding Graduate Research in Nanotechnology for his efforts to create a revolutionary new class of contrast agents that could, for the first time, allow magnetic resonance imaging of individual cells.

"Balu is one of the best graduate students I have worked with in my 30 years at Rice," said Lon Wilson, professor of chemistry and Sitharaman's Ph.D. advisor. "He's already produced six peer-reviewed manuscripts that have been published or accepted by first-rank journals, and it's likely that he'll double that by the time he graduates."

More than 25 million patients in the U.S. undergo MRIs annually, and doctors use contrast agents in almost of quarter of those procedures. Contrast agents increase the sensitivity of the scans, making it easier for doctors to deliver a diagnosis. The most effective and commonly used contrast agent is the toxic metal gadolinium.

Sitharaman has created new forms of contrast agents by encasing gadolinium inside fullerenes. Fullerenes are single molecules of carbon atoms arranged in spherical or tube-shaped structures. By enclosing the gadolinium inside the carbon molecules, Sitharaman has simultaneously reduced the toxicity of the metal to near zero while boosting its

effectiveness as a contrast agent.

One of Sitharaman's creations is a buckyball encasing a single atom of gadolinium. More recently, he has discovered a method of encasing as many as 100 atoms of the metal inside a short length of carbon nanotube. The resulting "gadonanotubes" are 100 times more effective as contrast agents than the best forms in clinical use.

In future work, Sitharaman plans to use existing methods of attaching antibodies and peptides to fullerenes to try to create a contrast agent that will bind only with diseased cells such as cancer cells. He is hopeful that these tissue-specific imaging agents might allow for the first intracellular, individual cell MRIs.

"I m grateful and honored by this recognition by the Nanotech Foundation of Texas and look forward to the benefit of our research to diagnostic medicine," said Sitharaman. Sitharaman and University of Texas at Austin student Aaron Saunders were named as this year's Kozmetsky Award recipients on Jan. 12. The prestigious award includes a \$5,000 prize.

The awards are the first of their kind offered to U.S. graduate students working on nanotechnology. A Rice student has won one of the two awards in each of the first two years they have been offered.

Competition for the awards is fierce. For example, the scientific review board that judged this year's applicants used a 400-point scale, and the top four finishers were separated by only 42 points.

Source: Rice University

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