NSF Awards $1,150,000 to Nanoscale Interdisciplinary Research Team Studying the use of Magnetic Nanoparticles in Cancer Treatment

The National Science Foundation (NSF) recently awarded $1,150,000 over four years to the Department of Chemical Engineering (ChE) at the University of Puerto Rico, Mayagüez (UPRM) to support research applying nanotechnology to cancer treatment. The University of Puerto Rico is also providing over $200,000 in additional support for the project.

Dr. Carlos Rinaldi, professor in ChE, is the lead investigator in the proposal, whose objective is to study the use of magnetic nanoparticles to erradicate cancer cells and tumors.

The award is one of the NSF's Nanoscale Interdisciplinary Research Teams (NIRTs) whose other members include Profs. Madeline Torres-Lugo and Gustavo Gutierrez, from Chemical and Mechanical Engineering at UPRM, Prof. Silvina Tomassone from Chemical Engineering at Rutgers University (RU), and Prof. Zach Hilt from the University of Kentucky (UKY), in addition to Prof. Rinaldi.

The award supports the research and education of Chemical Engineering doctoral candidates Adriana Herrera (UPRM ChE), Hector Luis Rodríguez (UPRM ChE), Mike Tomasini (RU ChE), and Reynolds A. Frimpong (UKY, ChE). Undergraduate students Melissa Haber and María del Carmen Rodríguez (UPRM ChE) are also part of the research team.

"The long term objective of the project is to develop a new treatment for localized cancer tumors, that is, a cancer that has not spread throughout the body. The sought treatment would not have the deleterious secondary effects of current treatments such as chemo- and radio-therapy," said Rinaldi.

The PI explained that the treatment under study would be particularly suited to cases where the tumor is difficult to reach by conventional surgical means.

"Imagine a cancer in a difficult-to-reach part of the body. A clinician injects a solution with nanoparticles into the tumor and waits a few days for the nanoparticles to spread throughout the tumor through the action of diffusive transport. Magnetic Resonance Imaging can be used to visualize the spread of the nanoparticles, as they provide good imaging contrast in this technique. Then a high frequency oscillating magnetic field is applied and the nanoparticles burn the tumor, because of rotational friction."

If needed, the treatment could be repeated after a few weeks. "Once the tumor has been destroyed, the body will eventually process the nanoparticles, in such a way that no subsequent surgery is needed to remove them. The iron oxide nanoparticles we are using have been approved by the FDA for use as MRI contrast agents in humans."

Rinaldi explained that the project in fact began two years ago, with seed funding from the Puerto Rico NSF EPSCoR and NIH MBRS programs. “This illustrates the value of providing seed funds to develop new research projects that can then compete for external grants.”

“After much work in the lab and serving in panels evaluating similar proposals, we have been able to obtain these very competitive research funds. We have demonstrated that cutting edge research can be carried out at the University of Puerto Rico, Mayagüez.”

Related Information:

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