

Sylvester Joins Forces with College of Engineering to Cure Cancer

Researchers at Sylvester Comprehensive Cancer Center at the University of Miami Miller School of Medicine have joined forces with the University of Miami College of Engineering for Engineering Cancer Cures™, a collaborative initiative to develop and deploy innovative technologies for early detection, diagnosis, and treatment of cancer.



Members of Engineering Cancer Cures™.

Sylvester Director Stephen D. Nimer, M.D., and Dean of Engineering Pratim Biswas, Ph.D., co-created Engineering Cancer Cures, which is led by Shanta Dhar, Ph.D., assistant director for technology and innovation at Sylvester, and Ashutosh Agarwal, Ph.D., associate professor of biomedical engineering.

Engineering Cancer Cures aims to find innovative ways to tackle this multidimensional disease, which is heterogenous in terms of biology and disease evolution, according to Dr. Dhar.



Shanta Dhar,
Ph.D.

“Through this collaborative partnership, we will be able to integrate cancer biology, clinical outcomes, and new pathways discovered with engineered therapeutics and diagnostics to advance cancer cures,” Dr. Dhar said.

While cancer clinicians know what cancer patients need, engineers help to fulfill those needs by designing innovative therapies, procedures, algorithms and more, according to Dr. Agarwal, who is associate director of UM’s Biomedical Nanotechnology Institute and a Sylvester member.

Collaborative Working Groups

Engineering Cancer Cures includes three working groups – Intelligent Materials and Targeting, Cancer Tissue Engineering, and Artificial Intelligence/Machine Learning/Deep Learning-Based Imaging and Analytics – that are led by members of both partners. Initial research projects include looking at how to better reach tumor targets, therapeutic cell

engineering, artificial intelligence (AI) in cancer imaging, and many others.



Ashutosh
Agarwal, Ph.D.

Dr. Agarwal, who is co-leading the initiative's Cancer Tissue Engineering working group with Jashodeep Datta, M.D., assistant professor of gastrointestinal surgical oncology, said they will focus on such things as the possible transition from classic therapies that can be taken or infused, such as chemotherapies, to treatment that involves placement of living tissue or cells in cancer patients.

"Therapies of the future are cell injections and tissue engineering that can go inside a body," Dr. Agarwal said. "We are working with Sylvester's cancer clinicians to develop engineered cells, engineered tissues, and engineered gene edits that can solve the incurable cancers of today."



Jashodeep
Datta, M.D.

Engineering Cancer Cures will accelerate collaborative discoveries otherwise siloed in the cancer biology and engineering disciplines, according to Dr. Datta.

“As a cancer researcher focused on how innate immune cells in pancreatic cancer interact with tumor and stromal cells, I will leverage Dr. Agarwal’s expertise in biomimetic tissue engineering platforms to reconstruct the precise physiologic microarchitecture that allows tumor-stromal-immune interactions in the tumor microenvironment to instigate chemoresistance in pancreatic cancer,” Dr. Datta said.

Killing Cancer, Sparing Healthy Tissue

The Intelligent Materials working group, co-led by Dr. Dhar and Sakhrat Khizroev, Ph.D., will look at targeting therapy to tumor cells with nanoparticles, while leaving healthy surrounding tissue unharmed. Other focuses of the group include identifying novel targets for imaging and therapy, cancer pain management, and more.

In the Artificial Intelligence/Machine Learning/Deep Learning-Based Imaging and Analytics working group, a team of



clinicians and mathematicians are integrating and analyzing large datasets from genomic sequencing, tissue pathology, and radiologic tissue imaging.



Stephan
Schürer, Ph.D.

“Here at Sylvester and at the University of Miami medical system, we are generating a lot of data in research and patient care,” said Stephan Schürer, Ph.D., a professor of pharmacology at the Miller School, who is co-leading the group with Mohamed Abdel-Mottaleb, Ph.D., professor and chair of the Department of Electrical and Computer Engineering. “It is critically important to be able to use the data to develop predictive models.”

The collaboration with engineering will result in infrastructures that allow optimal use of the data and development of novel solutions for patients and the health system, according to Dr. Schürer, who leads the Cancer Science Initiative and is director of digital drug discovery at UM’s Institute for Data Science and Computing.

While other respected U.S. cancer centers encourage collaboration between cancer center and engineering

scientists, Sylvester stands out for its access to a diverse local population of cancer patients, according to Dr. Agarwal.

A Strategic Advantage



Wael El-Rifai,
M.D., Ph.D.

“This gives us a strategic advantage because we know that drugs and therapies approved in studies with predominately White patients might not work in Black or Hispanic patients, for example. It is very important to capture those racial differences,” Dr. Agarwal said.

The fight against cancer requires innovative transdisciplinary research models that work seamlessly without borders, said Wael El-Rifai, M.D., Ph.D., professor and associate director of Program Development, co-leader of the Tumor Biology Program at Sylvester and Engineering Cancer Cures Steering Committee member.

“That is the essence of Engineering Cancer Cures,” Dr. El-Rifai said.

Content Type article