President Joe Biden will announce up to $23 million in funding for Tulane University to invent advanced cancer imaging system

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Project leads J. Quincy Brown (left), associate professor of biomedical engineering, and Brian Summa, associate professor of computer science, test a prototype of a new imaging system that will one day allow surgeons to scan a tumor site and determine within minutes whether any cancer tissue has been left behind, making repeated invasive surgeries unnecessary.

President Joe Biden and First Lady Jill Biden will visit Tulane University today to announce that the university will be awarded up to almost $23 million to create an

imaging system that will give doctors the ability to scan a tumor during surgery and determine within minutes whether any cancer tissue has been left behind.

This advancement would revolutionize cancer treatment. While patients are still under anesthesia in the operating room doctors will be able to determine, with certainty, that all the cancer has been removed from the area, making repeated invasive surgeries unnecessary.

“This announcement in support of Tulane’s cancer research by President Biden and Dr. Biden is a historic moment for Tulane,” Tulane President Michael A. Fitts said. “Tulane is a proud partner in supporting the goal of the Biden Cancer Moonshot. This advancement will save lives. The President and First Lady have been relentless champions in the battle to end cancer. Today, we are celebrating the results of their commitment.”

The funding for the Tulane award the Bidens announced comes from the Advanced Research Projects Agency for Health (ARPA-H), a federal funding agency established by the Biden Administration to rapidly advance high-potential, high-impact biomedical research that cannot be readily accomplished through traditional research or commercial activity.

Tulane researchers will lead a team focused on overcoming the technical computing and engineering challenges to make the advanced imaging device a reality within the next five years. Receiving the full funding amount will require the team to reach certain milestones in their efforts.

“Currently, it can take days to weeks before a surgeon knows whether all the tumor has been removed, and our goal is to get that down to 10 minutes, while the patient is still on the table,” said J. Quincy Brown, PhD, associate professor of biomedical engineering in the Tulane School of Science and Engineering and lead researcher on the project. “If successful, our work would transform cancer surgery as we know it.”

The project, called MAGIC-SCAN (Machine-learning Assisted Gigantic Image Cancer margin SCANner), would be one of the world's fastest high-resolution tissue scanners, capable of detecting residual cancer cells on the surface of removed organs within minutes. The system would be trained on thousands of clinical scans so that it can accurately highlight cancer at a cellular level as it renders a highly detailed 3D map of the surface of the tumor.

“The idea is to remove the tumor completely,” said Brown, comparing the process to scanning an orange. “If the orange pulp is the tumor, you don’t want any orange pulp poking through the orange peel, which would represent the possibility of tumor left behind in the patient.”

Every year, nearly two million Americans are newly diagnosed with cancer. For solid tumors, surgical removal is often the first option. Yet during surgery, it can be difficult to tell where a tumor ends and healthy tissue begins due to a lack of contrast. Currently, pathologists examine thin sections of tumors under a microscope to examine the borders between cancer and healthy tissue, but these sections take time to process and only cover a fraction of the tumor.

The new technology combines innovations in microscopy, automation, computing infrastructure and machine learning. It uses optical-sectioning super-resolution structured illumination microscopy to image at twice the resolution of conventional microscopes.

“Right now, the image is not as high resolution as we want, the microscope has to go faster, and we have to develop new algorithms for rapidly detecting and displaying problem areas to the surgeon,” Brown said. “In short, it has to be faster and better.”

Tulane researchers have already been working on developing this technology using prostate and colorectal cancer patients – two of the most difficult kinds of tumors to remove – and they’ve managed to get the detection time down to about 45 minutes.

“Our device will need to process an unprecedented amount of data, billions in pixels in minutes, and will detect cancer at the cellular level,” said Brian Summa, PhD, an associate professor of computer science at Tulane and co-lead on the project. “We plan to develop our approach such that it should extend to other types of cancer, for instance, breast cancer.”

Collaborating with Tulane will be researchers from the University of Georgia, who will work on improving the quality of the imaging resolution, and the University of Utah, who will work on the cyber infrastructure required to handle the massive sets of data from patients needed to train the machine-learning models.

“This thrilling project is the result of a team of Tulane-led researchers being able to imagine a healthier, safer world, and then exhibiting the extraordinary technical

skills required to turn that fantasy into a reality," Tulane Senior Vice President for Academic Affairs and Provost Robin Forman said. "Quincy, Brian and the others on the team are providing a wonderful example of what can happen when a great university brings together innovative, ambitious researchers from different fields and gives them the opportunity to explore and discover together."

Clinical validation of the device will be accomplished with partners at Cedars-Sinai Medical Center in Los Angeles, Southeast Louisiana Veterans Hospital and East Jefferson General Hospital. The Tulane-spinout company Instapath Inc. will help the team develop FDA-compliant versions of the new scanner. The project is part of a broader initiative by ARPA-H to develop Precision Surgical Interventions (PSI) that improve surgical accuracy and reduce errors.

News of the ARPA-H award arrives as Tulane is experiencing unprecedented momentum in every dimension of university life – including record-breaking research funding, historic levels of interest from the nation's top students and a once-in-a-generation physical expansion, especially on its downtown campus. A recent report found that through its current momentum Tulane has become an economic and community powerhouse for New Orleans and Louisiana, making an annual $5.2 billion impact on the state's economy.

EDITOR'S NOTE: *Photos and b-roll video of lead researchers J. Quincy Brown and Brian Summa are available here.*

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