

## Tulane Researchers Design Nanotechnology Blood Test to Find Hidden COVID-19 Infections

by Keith Brannon

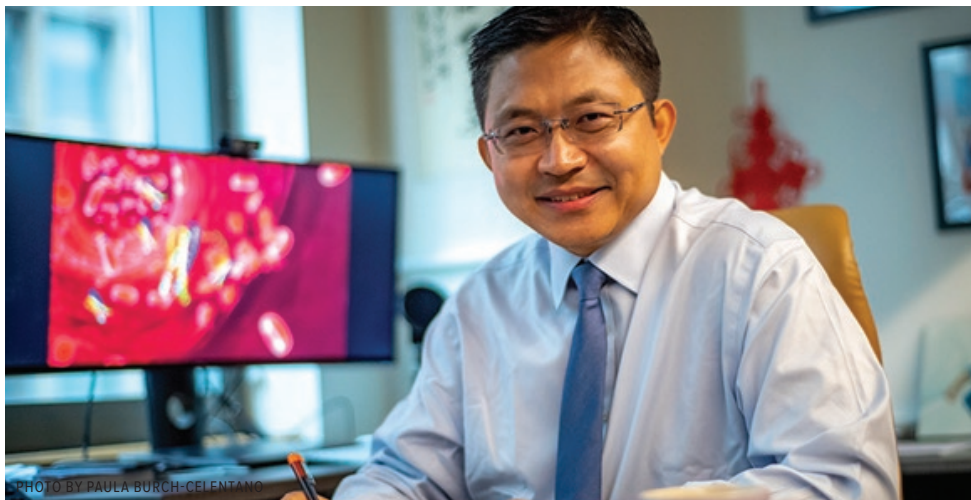
Nasal swab PCR tests are the gold standard for diagnosing COVID-19, but sometimes these tests miss cases when patients are swabbed later in the course of their infection as viral levels decline in the upper respiratory tract yet remain in the lungs, gut, or other parts of the body.

Tulane University researchers have developed a new type of blood test to find these hidden infections using nanoparticles to detect fragments of the virus released by infected cells anywhere in the body. Because the test uses a screening target that remains stable in the blood, it can detect COVID-19 weeks after initial infection, according to a new study published in the journal *Nature Nanotechnology*.

The test analyzes small lipid-enclosed bubbles of cell material called extracellular vesicles (EVs). These vesicles accumulate in the blood and protect their contents from being destroyed by enzymes. Cells infected by SARS-CoV-2 secrete EVs that contain RNA from the virus. Researchers captured these EVs using an antibody and then fused them with synthetic lipid vesicles loaded with a testing reagent. The blood test uses reverse transcription PCR to amplify the RNA target region and CRISPR to amplify the signal produced by this target to detect an infection.

“We believe the major utility of our approach is its ability to detect plasma EV-derived SARS-CoV-2 RNA as an early and durable sign of systemic infection,” said lead study author Tony Hu, PhD, Weatherhead Presidential Chair in Biotechnology Innovation at Tulane University School of Medicine.

Hu’s lab team compared the new test with standard nasal swab PCR tests in controlled infection models using non-human primates.



Tony Hu, PhD, Weatherhead Presidential Chair in Biotechnology Innovation.

Viral levels in the upper respiratory tract caught by nasal PCR tests tended to peak between days one and thirteen post-infection and decreased rapidly after peak expression. The blood test found lower extracellular vesicle viral RNA levels early in infection, but these consistently increased after day six and remained stable a month after infection.

The EV test was able to detect SARS-COV-2 RNA in blood samples from hospitalized adults who had one or more negative nasal swab tests but who were ultimately diagnosed with COVID-19. It also detected positive results in children who had multiple negative nasal swab PCR test results or a single positive test followed by multiple negative results.

The technology could give doctors a secondary screening tool for suspected COVID-19 cases that are negative via traditional PCR testing, Hu said.

“It may be particularly valuable for individuals with long-term evidence of infection where transient upper respiratory tract PCR results may not reflect virus levels circulating elsewhere in the body,” Hu said. “This includes individuals with compromised immune systems, such as transplant recipients and others receiving immunosuppressive therapies. It may also be relevant during organ donation to reduce the risk of virus transfer.”

The study was co-authored by Bo Ning, Zhen Huang, Brady M. Youngquist, John W. Scott, Alex Niu, Christine M. Bojanowski, Kevin J. Zvezdaryk, Nakhle S. Saba, Jia Fan, Xiao-Ming Yin, Christopher J. Lyon, and Chen-zhong Li of Tulane University School of Medicine; Chad Roy of the Tulane National Primate Research Center and Jing Cao of the University of Texas Southwestern Medical Center.

## Howard University Students and Raising A Village Foundation Work to Close DC’s Learning Gap

by Aaliyah Butler

Howard University Center of Career and Professional Success has partnered with Raising A Village Foundation for the upcoming school year in a collective effort to increase participation in student mentoring and tutoring.

The Center of Career and Professional Success provides career services through experiential learning and campus employment. As part of this federal work-study partnership, Howard University students will be afforded the opportunity to work with the Raising A Village Foundation’s Driven 2 Succeed program as Driven Student Guides and mentors. This experience gives them direct access to empower

young scholars in D.C.’s underserved communities. Raising A Village’s goal for the school year is to ensure more than 1,000 District of Columbia Public Schools students receive quality, high-impact tutoring.

“Distance learning has significantly affected learning outcomes for so many students from underrepresented communities in the education system,” said Melissa Knight, interm director of the Howard University Center of Career and Professional Success. “We are excited that our federal work-study program will help bring these students back on track with their educational goals.”

This Fall, Raising A Village will facilitate an in-person tutoring model that has expanded to

twelve sites across Washington, D.C. Howard University federal work-study students have the opportunity to make an impact by serving as guides and increasing access to academic interventions for D.C. Public School students.

“As an HBCU alumna, the opportunity to partner with other HBCUs like Howard University brings me joy because we can give students the ability to use their experiences and education to become difference-makers in children and families’ lives every day,” said Raising A Village Founder & CEO Jaleesa Hall.

Vielka Vasquez, a sophomore psychology major, said she’s learned that adults can really impact the lives of a child and the importance for uplifting children.

## Knight Foundation, Columbia University Launch First Amendment Institute, \$60 Million Project to Promote Free Expression in the Digital Age

The John S. and James L. Knight Foundation and Columbia University have announced the creation of the Knight First Amendment Institute at Columbia University. The \$60 million effort will seek to preserve and expand First Amendment rights in the digital age through research and education and by supporting litigation in favor of protecting freedom of expression and the press.

News organizations have a long history of championing First Amendment rights, helping to shape and clarify laws on privacy, information access, libel, and press freedom. In the past decade, however, economic pressures on traditional news companies have put a strain on their capacity to fight for these rights. Filling this critical void, the institute will be a primary, durable, and influential advocate of free expression in the digital age.

“The First Amendment is not self-executing; only people can make it what it has become, through our attitudes, actions and, more pointedly, through the courts,” said Lee C. Bollinger, president of Columbia University. “In the past, news organizations pursued and won key court cases defining free expression. But such cases can be enormously expensive and many media—both established and new—are increasingly hard-pressed in the current economic environment to support First Amendment legal action. While the digital age has opened up new opportunities for accountability journalism, we need to fill the void and continue to champion free expression through litigation, research, and education.”

A recent Knight Foundation poll of leading newsroom editors revealed that they believe the news industry is less able to pursue legal cases around free speech and freedom of the press issues than it was ten years ago, with most also agreeing that First Amendment law has not kept pace with new digital-age demands.

“The basic freedoms we take for granted under the First Amendment are hardly settled,” said Alberto Ibarguen, president of Knight Foundation. “As the internet becomes even more integral to our lives, we face significant questions about the evolution of our rights. Threats to free speech are on the rise, and our hope is that the Institute will not just protect but help reinvigorate First Amendment principles for future generations.”

Knight Foundation and Columbia University will contribute \$5 million each in operating

funds and \$25 million each in endowment funds to the institute, an independent 501(c)(3) nonprofit organization. It will be affiliated with Columbia, benefitting from the University’s top-tier law school, journalism school, and other relevant academic fields. President Bollinger is a noted First Amendment scholar who has made freedom of expression and the future of journalism core priorities in Columbia’s academic and civic mission.

In recent years the University has, for example, launched Columbia Global Freedom of Expression to support and promote international legal norms protecting an independent free press, Columbia Global Reports to publish long-form journalism on under-reported global issues and, at the Columbia Journalism School, the Tow Center for Digital Journalism and the Brown Institute for Media Innovation in partnership with Stanford Engineering to develop and teach new methods of online and data-driven story-telling.

Jameel Jaffer, former ACLU deputy legal director, will direct the Institute.

Over the past two decades, Knight Foundation has invested \$18 million to help build the Columbia Graduate School of Journalism. The total Knight Foundation investment in the Knight Institute at Columbia, \$30 million, is the largest journalism grant in Knight’s history, and brings to more than \$100 million the amount the foundation has invested in the principles outlined in the First Amendment, including support for the Newseum, Yale Law School, and organizations supporting free press rights both inside and outside of the United States.

The Institute launches amid emerging First Amendment concerns on such topics as: National Security Agency electronic surveillance of journalists and news sources; privacy rights on digital platforms; the overall freedom of internet platforms; use of digital technology in courtrooms and access to court records; free speech on college campuses; the lack of a strong constitutional shield for journalists reporting sensitive topics; a crackdown on government employees who talk with the media; and government delays and refusals in handling FOIA requests. The main activities of the Knight First Amendment

Institute at Columbia University will be in the areas of litigation, research, and education. The institute will watch for court cases that offer an opportunity to define First Amendment law in the digital age, with a goal of achieving significant victories, and priority given to cases with digital components. Through its research, fellowships, publications, lectures, and other events, the institute will seek to help the legal community, including the nation’s network of legal clinics, understand the principles underlying the First Amendment and how they apply to new technology.

“Digital journalism has created exciting, unprecedented opportunities for how we report and receive the news. Today’s reporters and news outlets have access to innovative platforms, fresh perspectives, and a level of immediacy like never before. But it is also creating First Amendment



challenges,” said Jennifer Preston, Knight Foundation’s vice president for Journalism. “Without sustained advocacy dedicated to defending uninhibited expression and a free press, we are at risk of experiencing a steady erosion of these bedrock freedoms. This is a precarious moment for the First Amendment, and with this Institute we hope to establish a primary, permanent, influential advocate of free expression.”

About the John S. and James L. Knight Foundation: Knight Foundation supports transformational ideas that promote quality journalism, advance media innovation, engage communities, and foster the arts. The foundation believes that democracy thrives when people and communities are informed and engaged. For more, visit [knightfoundation.org](http://knightfoundation.org).



## Stanford to go 100 Percent Solar by 2021

A second solar-generating plant, to be built in the next three years, will complete the university's transition to clean power and further shrink campus greenhouse gas emissions.

By Chris Peacock

Stanford's solar future is growing even brighter. A new solar generating plant—Stanford's second—announced today, will enable the university to use 100% renewable electricity in three years, more than two decades ahead of California's goal of a carbon-free grid by 2045.

Completing the university's transition to clean power, Stanford finalized an agreement to collaborate with Recurrent Energy on an 88-megawatt solar photovoltaic plant to be constructed in central California, near Lemoore. The plant is scheduled to go online in late 2021.

Because of advances from the cutting-edge Stanford Energy System Innovations (SESI), Stanford's current greenhouse gas emissions already are down by 66% from peak levels. The new solar plant, to be known as Stanford Solar Generating Station #2, is projected to reduce GHG emissions even further, to 80% below peak levels—four years ahead of the renewable energy goal established in the university's long-range planning process.

The new station will augment the 67-megawatt Stanford Solar Generating Station #1 in Rosamond, California, which came online in 2016, and five megawatts of on-campus rooftop solar power, which came online in 2017. Together, the three installations will produce enough clean renewable electricity each year to equal the university's annual electricity consumption.

"As a university, we are pursuing an ambitious plan to further reduce our carbon footprint, and our second solar plant is a critical new component of that plan," said Stanford President Marc Tessier-Lavigne. "Sustainability is a major focus for Stanford and a priority for our local community. Completing our transition to clean power builds on the groundbreaking research of Stanford faculty and students, and it marks a major advance in our efforts to provide a sustainable learning environment for our campus."

### Conversion to renewable energy

To increase energy efficiency and use innovative, clean and renewable energy on campus, Stanford initiated a plan in 2008-09 that includes high-efficiency standards for new buildings, continued efficiency improvements for existing buildings and SESI, an advanced energy-management system with thermal energy storage invented by the university to heat and cool campus buildings. It has updated more than 155 buildings on campus and transformed the energy supply from one based on fossil fuels to an electrically powered heat recovery system.

A smaller SESI installation will provide energy for Stanford's new Redwood City campus, scheduled to open in 2019, giving it a small carbon footprint and path to becoming carbon-free.

Stanford achieved a 50% reduction in its greenhouse gas emissions in 2015, when the SESI electricity-powered heating and cooling plant replaced an aging, gas-fired cogeneration plant that had served the university since 1987.

"After we built the new plant, we were able, through California's regulatory process, to secure control over all electricity purchases and source the kind of electricity we wanted," said Joseph Stagner, Stanford's executive director of sustainability and energy management. "The university leadership promptly said: Let's go out and make that clean power and help reduce our dependence on fossil fuels for campus operations."

When Stanford's first solar plant went online in 2016, the university increased its clean electricity portfolio to 65%, up from the state minimum of 27%, and has since further reduced university greenhouse gas emissions to 66% below peak levels.

The university's long-range plan set a goal of an 80% reduction in total campus GHG emissions by 2025. But the transformation of its electricity supply to entirely clean renewable power by 2021 means Stanford will reach its goal four years ahead of schedule and decades ahead of statewide requirements. California enacted legislation earlier this year that requires electricity to be 100% carbon-free by 2045.

The campus will not be wired directly to the remote installations. Essentially, they will inject clean electricity into the state's power grid, and Stanford will be able to withdraw an amount equivalent to their production from that grid.

By pursuing direct, long-lasting changes to its infrastructure, Stanford avoided the need for temporary measures, such as purchasing renewable energy and carbon offsets, which give credit for renewable resources even if the power comes from other sources.

### A path to future emissions reductions

As it continues to reduce GHG emissions, the university is studying additional innovations, including a new lake water heat-exchange system that will provide additional clean heat supply through SESI, converting the remaining outlying campus buildings that currently use natural gas for heating to the SESI clean hot



water supply system, and completing conversion of the Marguerite, Stanford's free community shuttle bus fleet, to electricity.

These additional changes would move Stanford GHG reduction to 90% when implemented. The remaining 10% of GHG emissions comes from a number of small laboratories and building processes. Stanford will inventory them in 2019 in order to develop plans for replacing them with carbon-free alternatives.

"Stanford's deliberate and comprehensive approach to reducing greenhouse gas emissions dovetails with the interdisciplinary research and teaching on campus and our commitment to being a good neighbor and citizen," said Robert Reidy, vice president for land, buildings and real estate.

As part of the university's new long-range plan, a Sustainability Design Team will explore these and other innovations for a carbon-free Stanford.

Over the years, the academic programs and initiatives in sustainability have achieved remarkable breadth, contributing to Stanford's international reputation for solving major environmental and energy-related challenges. Today, hundreds of laboratories, research centers and student organizations at Stanford work to solve the most urgent problems facing humanity—from food security and clean water to global warming and clean energy.

About 225 faculty and staff are engaged in energy-related research across the university, including at the Precourt Institute for Energy, the Woods Institute for the Environment and the TomKat Center for Sustainable Energy. The Jerry Yang & Akiko Yamazaki Environment and Energy Building was built in 2008 to facilitate interdisciplinary collaboration.

Accomplishing sustainability goals will require continued campus-wide participation. Stanford's My Cardinal Green program provides customized recommendations to participating members of the campus community that are relevant to their lifestyles and offers financial and other incentives.

Details about the programs and accomplishments that make Stanford more environmentally responsible can be found in the *Sustainability Year in Review*.

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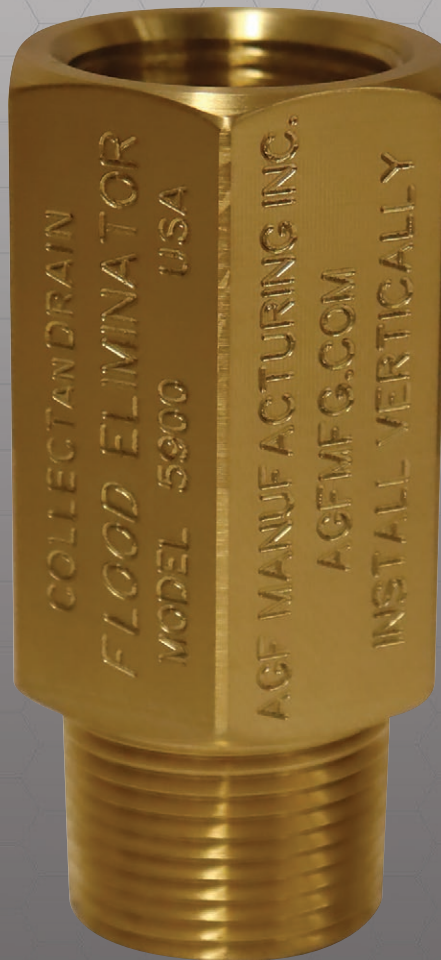


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