

Diagnostic research happening at ASU focused on detecting diseases earlier to save lives

By Joe Caspermeyer, ASU News
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It was one of America's founding fathers, Benjamin Franklin, who may have foreshadowed today's health care innovation when he quipped the adage: An ounce of prevention is worth a pound of cure.

In other words: Early detection saves lives.

About this story

There's a reason research matters. It creates technologies, medicines and other solutions to the biggest challenges we face. It touches your life in numerous ways every day, from the roads you drive on to the phone in your pocket.

The ASU research in this article was possible only because of the longstanding agreement between the U.S. government and America's research universities. That compact provides that universities would

Diagnostics are at the very heart of health care innovation today. For every pin prick, imaging scan, or blood, stool or urine sample, it was a scientist, clinician or engineer who often spent years behind the scenes, developing and bringing a new test to the market, to ultimately make a difference in the everyday lives of people.

Such tireless efforts continue at Arizona State University, to save even more lives. Here are some of the ways ASU is helping to make our lives better through diagnostics.

Supporting Arizona during the COVID-19 pandemic

In 2019, SARS-CoV-2, a deadly viral contagion, took root in the United States. In less than two years, the novel virus claimed more than one million lives in the U.S. and close to 7 million globally, as scientists around the world engaged in a frenzied race against the disease.

Amid the chaos, the Biodesign Institute at ASU emerged as a leader in the state's response to the pandemic.

Led by Executive Director Dr. Joshua LaBaer, a team at the Biodesign Institute developed Arizona's first easy-to-use [saliva-based COVID-19 diagnostic test](#) in 2020.

This revolutionary diagnostic tool increased accessibility to COVID-19 testing and offered test results typically in less than 48 hours. This helped provide invaluable public health information to state leaders and hospitals on the prevalence and spread of the disease.

The test detects the virus through saliva samples that people collect themselves.

"We realized that testing was the key to understanding where this deadly virus was going," LaBaer says. "Every decision we made was based on how to save the greatest number of people, identify the largest number of cases and get the answer out there."

Today, it's been five years since the pandemic upended the world. At one point during the crisis, knowing one's COVID infection status became critical to our everyday lives, dictated association with loved ones, and protected our families.

LaBaer's leadership of ASU's COVID research efforts inspired his fellow innovators. His rallying cry over daily Zoom calls was: "Let's go save some lives."

Seemingly overnight, ASU became the fastest, most reliable COVID testing facility in the entire Southwest due to the innovative saliva test that was faster and more reliable than those from even commercial labs.

When all was said and done, since early 2021, ASU processed more than 1.5 million tests.

not only undertake the research but would also build the necessary infrastructure in exchange for grants from the government.

That agreement and all the economic and societal benefits that come from such research have recently been put at risk.

Learn about more solutions to come out of ASU research at news.asu.edu/research-matters.

Bringing diagnostics into more homes

As alarming as those times were, the COVID crisis helped fuel a diagnostic home testing renaissance.

The growth in diagnostic research and innovation efforts is fueled by the need to help treat the increasing prevalence of chronic diseases and the rising demand, as seen during the COVID pandemic. People want the convenience of low-cost, point-of-care testing and at-home diagnostics to make medical decisions easier than ever before.

Mara Aspinall, a professor of practice at ASU's College of Health Solutions and a partner at Illumina Ventures, said self-tests have become an important and growing element of the health care system, due in large part to the COVID-19 pandemic.

These simple, at-home COVID-19 tests challenged the public's perception around self-testing, which could be completely performed by individuals at home without the need for a trained expert.

"The idea of testing yourself for an infectious disease sounds good, but you're not fully confident until you've done it at least once," Aspinall said. "And what COVID did is push so many Americans to try it at least once."

Now, Matthew Scotch, associate dean of research and professor of biomedical informatics in the College of Health Solutions, wants to use the same benefits of over-the-counter, or OTC, tests to combat the annual flu season, which was the deadliest in two decades this past year.

"OTC flu tests have the potential to revolutionize public health by making early detection and rapid treatment more accessible for everyone," Scotch said.

He feels that the FDA needs to prioritize full approval of these tests to maximize their impact on influenza outcomes and public health as soon as possible.

"We're optimistic and excited about their potential to help patients manage influenza and reduce the burden of this serious disease," Scotch said.

OTC flu tests can lead to new, faster flu treatments. Home tests could also mean fewer in-person clinic visits and ultimately lower the burden the disease places on society.

Treating chronic disease ... a simple breath away

For chronic diseases like diabetes or heart disease, obesity is a leading comorbidity that can make treatment of these illnesses harder.

That's why ASU scientist Erica Forzani and her colleagues came up with [Breezing](#), a handheld device that requires just one simple breath to give an instant readout of one's individual metabolic rate.

[Breezing began](#) as a 2013 startup based on technology developed by researchers at Arizona State University. At the time, it was the world's first portable device that can track an individual's

metabolism and use that information to provide diet and exercise recommendations for maintaining or reaching a healthy weight.

The latest version, Breezing Pro, is now widely used in research, sports training, fitness training, and wellness management for general lifestyle and well-being purposes. Breezing also offers free meal planning and a web-based app for tailored exercise planning.

Breezing was also awarded as a top 10 winner in the 2018 ACA Innovation Challenge and was a finalist in 2020 in the R&D 100 Awards science and technology category.

Targeting early detection of cancer

Diagnostics are involved in more than 60% of clinical decision-making, and the industry employs more than 3.5 million people worldwide. Diagnostics are critical to making personalized medicine — the process of targeting drugs to those for whom they will be most effective — part of the new daily standard for health care.

Nowadays, physicians are attuned to a slew of advances to deliver state-of-the-art health care prevention through biomarkers — the unique molecular fingerprints of disease — which can provide lifesaving early warning signals to those managing life-threatening or chronic diseases.

Early detection of cancer, for example, significantly improves treatment outcomes and survivability.

When ovarian cancer is diagnosed at an early stage, the five-year survival rate is about 94%. However, less than 1 in 5 cases is detected in an early stage, because symptoms are typically minimal and invasive surgery is required for diagnosis. To date, no screening biomarkers are recommended for the general population in detecting ovarian cancer.

Breast cancer also remains a common and devastating health problem, despite recent advances in early detection and treatment. The disease will strike almost 1 in 8 U.S. women over her lifetime, according to the American Cancer Society.

That's why researchers at the Biodesign Institute developed a series of biomarker technologies for use in the early detection of breast cancer, ovarian cancer and HPV.

Biomarkers are substances within the body that indicate the presence of a disease before an individual shows other symptoms. ASU researchers continue to work to identify and test new biomarkers for a wide range of conditions based on individual patient profiles.

Provista Diagnostics, a leading molecular diagnostics company focused on developing and commercializing proprietary diagnostic, prognostic and predictive tests for cancers affecting women, licensed these technologies for evaluation and potentially further development.

The technologies licensed by Provista were primarily developed in the labs of professors Joshua LaBaer and Karen Anderson.

"With the advent of molecularly targeted therapeutics, biomarkers that are associated with biological subtypes of cancer may be useful for predicting responses to therapeutic interventions," said Joshua LaBaer, director of the ASU Biodesign Institute and Virginia G. Piper Center for

Personalized Diagnostics. "If we can significantly advance the early detection of these cancers, we can save thousands of lives each year.R

Lab-on-a-chip devices for the developing world

According to medical journal [The Lancet](#), 47% of the world [does not have access](#) to diagnostic tests.

Inexpensive point-of-care tools are essential to help meet this need. Market research company [MarketsandMarkets](#) estimates the revenue for microfluidics devices will [grow from \\$22.3 billion to \\$41.1 billion](#) between 2023 and 2028, an increase of more than 80%.

New "lab-on-a-chip" devices, being simple and cheap to build, are in high demand to increase access to accurate medical tests. ASU researcher Krishnendu Chakrabarty works to help ensure the safety and accuracy of lab-on-a-chip devices using watermarks.

With dramatic increases in both the need for lab-on-a-chip tests and medical device regulation, Chakrabarty emphasizes the importance of the research team's work for the future of the medical device security and testing fields.

"This is a cost-sensitive market," he says. "These are disposable one-time-use devices, so they can't cost much. One way to lower the cost is to have a distributed supply chain because there are specific entities that do the best job on specific parts of production. We are providing the mechanisms so you can validate various steps in this entire assembly process."

Continued innovation relies on workforce development

ASU has not only come up with ingenious new diagnostics but also provides education and training to build the diagnostic workforce of the future.

One of these efforts is to train future cytologists. The cytology workforce that stands at the front line of cancer screenings and diagnostics is experiencing a profound shortage.

In response, Arizona State University's [College of Health Solutions](#) has [launched an innovative partnership](#) with [Labcorp](#) and [InStride](#) that provides training to build the workforce of tomorrow.

Together, these ASU efforts are not only providing high-paying jobs of the future but also saving more lives.

This story was compiled from various ASU News sources.

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Main image



ASU created a diagnostics test to look for COVID-19 infections at the Biodesign Institute's Clinical Testing Lab in 2020. ASU photo

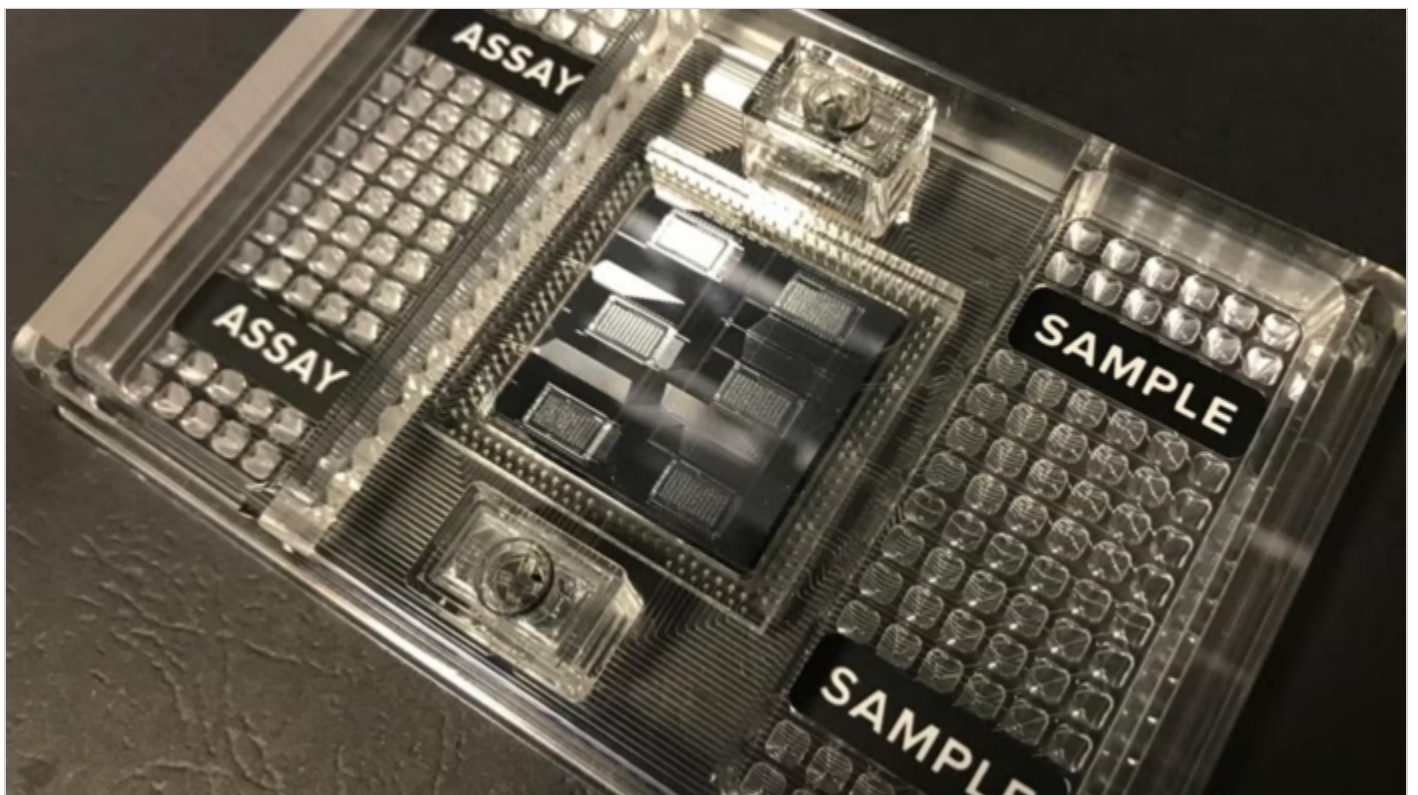
Text image(s)



ASU's saliva test increased accessibility to COVID-19 testing and increased turnaround times for results. Photo by Deanna Dent/ASU



A demonstrator uses the Breezing device, which gives an instant readout of a person's metabolic rate. Courtesy photo



Arizona State University Fulton Professor Krishnendu Chakrabarty collaborated with colleagues to develop methods that detect whether a lab-on-a-chip medical test is fraudulent or has been tampered with. Courtesy photo