PROGRESS

Summer 2020

Young Family Faces COVID-19

Supporters Become Even Stronger Science Advocates

Texas Biomedical Research Institute

COVID-19 Innovation
at Texas Biomed

As of July 4, 2020, the United States had nearly 3 million cases of COVID-19 and nearly 130,000 deaths from the disease. As the world has grappled with a pandemic not seen in 100 years, scientists worldwide have been frantically searching for answers — aiming to discover a cure and a vaccine that will return our lives to normal.

What normal looks like in the future remains to be seen, as infectious diseases continue to threaten not only our economies and livelihoods but our very existence. In fact, infectious disease researchers have known a pandemic of this magnitude was just a matter of time.

But, scientists at Texas Biomed have been changing the way in which discoveries happen to maximize research efforts and speed up bioscience successes. With a mantra of team science, researchers at Texas Biomed have spent the past few months pulling together resources, expertise and critical assets into a singular focus on eradicating COVID-19 as part of its mission of eradicating infectious diseases.

COVID-19 studies are happening faster than ever before with more collaboration and information sharing than in any other time in history. For Texas Biomed, the basic discovery and preclinical role the Institute serves is critical to the successful development of therapies and vaccines, which will require preclinical testing using certified animal and laboratory models before eventual FDA approval.

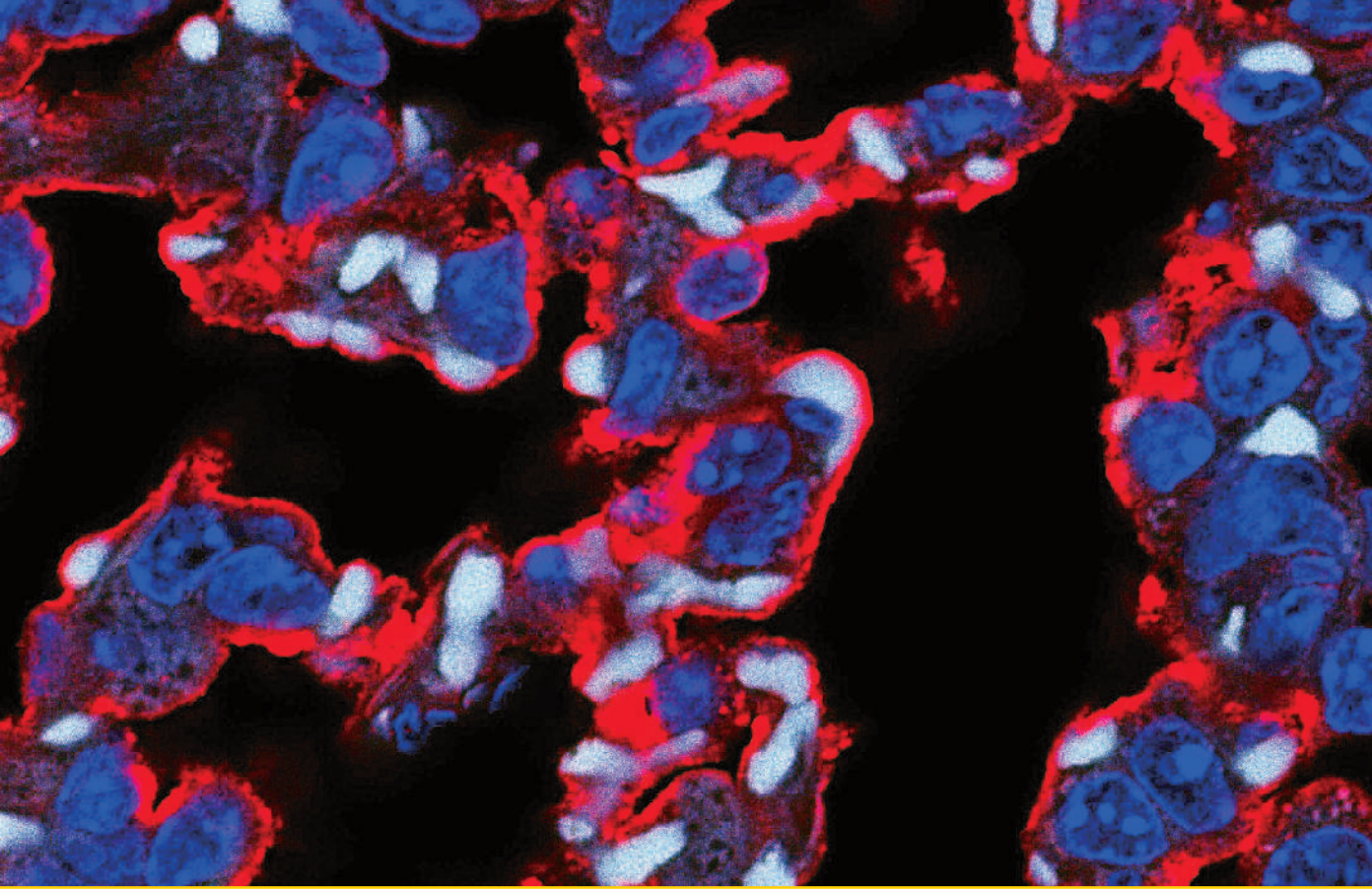
Texas Biomed, an independent not-for-profit research institute, has a long track record of successes such as developing a cure for Hepatitis C, and developing vaccines or therapies for Hepatitis B, Ebola, and HIV/AIDS. Texas Biomed plays a critical role in the development of therapies and vaccines for infections such as COVID-19 because of its unique combination of resources:

- High containment laboratories, including the only privately owned BSL-4 lab and 5 fully outfitted BSL-3 labs
- National Primate Research Center, one of just 7 in the country
- Qualified & Experienced Professionals in virology, immunology, microbiology, veterinary medicine, quality control and more
- Flat Organizational Structure – nimbleness and responsiveness
- Business Structure combining discovery research with a contract research enterprise

Texas Biomed most recently conducted the most complete and definitive study of laboratory models for testing COVID-19 therapies and vaccines. Raising $2.5+ million in seven days allowed the Institute to move quickly, and in eight weeks identify two possible large animal models and define rodent models for COVID-19 testing. The study evaluated three nonhuman primate (NHP) species (Indian rhesus macaques, African baboons and new-world origin common marmosets) and young and old animals, to determine susceptibility to the SARS-CoV-2 virus and the development of COVID-19 disease and completed a rodent study that will provide a model for rapid screening of therapeutics and vaccines. Over the course of the nonhuman primate study, the macaque and baboon models showed significant promise as animal models for COVID-19 disease studies moving forward.

Texas Biomed has additionally raised more than $5 million to accomplish the transition of every available laboratory to advance COVID-19 studies. The Institute has begun partnerships with several Fortune 500 companies to test therapies and vaccines against COVID-19 and develop better diagnostics for many diseases. Partnering private donor funds with corporate investment helps Texas Biomed move science forward faster and with high quality.

Additional studies to understand disease progression and impact are underway.



Micrograph shows the presence of SARS-CoV-2 Nucleocapsid protein (NP) in lung tissue of SARS-CoV-2 infected K18 hACE2 transgenic mice (a model to study Coronavirus disease infection). Lung tissue stained with anti-SARS-CoV-2 NP is shown in red, nuclei in blue and red blood cells (RBCs) are shown in white-grey. The image shows that the virus is in large quantities coating cells at the interphase of air and lung tissue. Credit: image courtesy of Drs. Xavier Alvarez and Anwari Akhter from a SARS-CoV-2 mouse model study led by Drs. Luis Martinez-Sobrido, Jordi Torrelles and Joanne Turner.

- A variety of SARS-CoV-2 grants have been submitted to the NIH, in addition to contracts with industry partners — one such pilot study is looking at the use of CBD in lowering inflammation levels due to SARS-CoV-2 infection.
- Texas Biomed researchers are partnering with a variety of local and national groups to study disinfectant efficacy, decontamination protocols, the impact of SARS-CoV-2 infection on pregnancy and heart disease and potential diagnostic tests.
- Texas Biomed and Southwest Research Institute have partnered on a study to test candidate vaccines and therapeutics identified through SwRI's Rhodium platform.
- Texas Biomed is participating in a rapid response pilot grant through the San Antonio Partnership for Precision Therapeutics (SAPPT) to study the role of a polybasic FURIN cleavage site in SARS-CoV-2 biology and therapeutic implications. The team is initially studying FURIN's role as a link to greater mortality rates for individuals with underlying cardiovascular conditions. This research team is working to identify those interactions FURIN has with the virus that could impact mortality rates, with the ultimate goals of being able to develop inhibitors to stop this interaction.
- Texas Biomed scientists are participating in pilot grants through the SAPPT to assess new vaccine compounds.

COVID-19 has fundamentally changed how we live and work and is the first time in more than a generation that the world has come together to tackle a common threat. This pandemic has shown us just how devastating infectious diseases can be, but it has also shown us how resilient we are and how we can turn that resilience into hope and innovation. Together, we are saving lives.

Young Family Faces COVID-19

Supporters Become Even Stronger Science Advocates

As of March 1, 2020, there were fewer than 50 cases of COVID-19 in the United States, according to the Centers for Disease Control. Terms like *social distancing* and *flattening the curve* were just starting to become mainstream. Within days, the world changed. On March 11, the World Health Organization designated COVID-19 a pandemic.

It was in this window of time, during a family Spring break trip to Colorado that the Ketabchi family became all too familiar with COVID-19. Evan Ketabchi and his wife Christina are longtime supporters of Texas Biomed. Evan serves as secretary on the Founder's Council and Christina serves on the Texas Biomedical Forum Board as a past science education awards chair and as incoming Parliamentarian.

"During the trip, the concern for COVID-19 really escalated nationally," Evan explained. "My in-laws are both in the high risk category, so we decided to quarantine upon returning. Four days into our quarantine, we were told we may have been exposed, and we started experiencing symptoms. There were only three to four cases in San Antonio, and we became three of the first 10."

Their youngest, who is not yet three, tested positive for COVID-19 but their 6-year-old tested negative. Exhibiting what have become classic symptoms of COVID-19, Evan said the worst of his symptoms were the extreme fatigue and body aches for days. Christina experienced similar symptoms but also developed bronchitis. Overall, the Ketabchis count themselves among the lucky ones with mild symptoms. The couple recalled feeling "off" a few days before but didn't think anything of it.

"This is something important for people to understand," Evan said. "Part of the challenge is not knowing who is carrying the virus. Most of the symptoms are so common that they are attributed to allergies, common cold or even a hangover, all of which provide an easy excuse for the symptoms."

"It is critically important to remember that the efforts of Texas Biomed and others isn't only about a virus impacting the world today but unknown viruses that are to come, for which we need to be prepared."

— Evan Ketabchi

Outside of their physical experience, the Ketabchis describe a psychological toll to which parents can certainly relate.

"There were many layers to this," Evan said. "For one, anytime your child is sick with something as unknown as this, there's fear and anxiety. At the same time, we were concerned with how the virus would affect the two of us and our ability to care for our family."

Having been one of the first diagnosed in the community, the Ketabchis also felt isolated, which was not helped by misinformation being shared in the community, but they credit their neighbors and friends for reaching out and finding ways to help.

"We are completely in the clear now, but there is a nervousness that remains," Evan explained. "We didn't realize how traumatic it was until a few weeks after."

Emerging from the virus with no lingering health threats, the Ketabchis are aware the outcome could have been different and urge people to adhere to the counsel of health officials.

Evan and Christina Ketabchi with their children. Photo by Josh Huskin.

"The world wasted a lot of time while the virus spread," Evan said. "That was time we could have planned and prepared to avoid total shutdown and likely save thousands of lives. We, personally, didn't believe it was a big enough issue to cancel a ski trip. That didn't work out so well for us."

Now with more than 3.4 million personal accounts of COVID-19 in the U.S. as of mid-July and worldwide economic stress that will live with all of us for years, scientists race for a vaccine and cure.

"We need to do everything we can to be in front of pandemics to prevent and control outbreaks," Evan said. "The significant research and ongoing efforts by institutes like Texas Biomed allow the nation to react quickly. It is critically important to remember that the efforts of Texas Biomed and others isn't only about a virus impacting the world today but unknown viruses that are to come, for which we need to be prepared."

In the meantime, while scientists work around-the-clock for a solution and neighbors have become everyday heroes, the Ketabchis want the community to remember that it's never too late to take precautions for yourself and our community, adding, "We need to take care of one another."

COVID-19 Research Supporters

Thanks to the support of our community, Texas Biomed was able to launch and complete the most comprehensive animal model study to date that has provided scientists greater understanding of the immune response to SARS-CoV-2. The Institute has positively identified two possible animal models to help move therapeutics and vaccines forward. The study was funded by philanthropic support from more than **300 donors** after a call-to-action campaign was launched in March 2020. The campaign raised more than **$2.5 million** in one week, and additional donor support has brought the total raised for COVID-19 research at Texas Biomed to more than **$5 million**. Thank you to the following donors who provided significant support to the Institute's COVID-19 efforts.

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*ALONGSIDE OTHER TEXAS BIOMED SUPPORTERS **TOTALING $88,000** IN SUPPORT OF COVID-19 RESEARCH

To support our efforts against COVID-19, please visit: www.txbiomed.org/coronavirus/.

New Virologist Hits the Ground Running Amid the COVID-19 Pandemic

A strategic plan is only as good as its execution. At Texas Biomed, the plan to recruit the brightest scientists to carry out its vision of eradicating infectious diseases is a critical component to the Institute's 10-year strategic plan. To that end, Texas Biomed has recruited 13 new scientists since 2017. One of those scientists is leading virologist Luis Martinez-Sobrido, Ph.D. He joined the Institute in February 2020, in time to join the COVID-19 scientific team. He has pioneered several key developments involving, among others, influenza (commonly known as the flu), arenavirus, SARS and Zika, and looks to scale his research at Texas Biomed.

Luis Martinez-Sobrido, Ph.D.

"Texas Biomed's mission is to protect you, your families and the global community from the threat of infectious diseases. Texas Biomed has a long history of expertise in infection-related science," said Professor Larry Schlesinger, M.D., President and CEO of Texas Biomed. "The recruitment of Dr. Martinez-Sobrido carries on this rich tradition, and his science is perfectly aligned with our mission. We are excited he has joined us."

Dr. Martinez-Sobrido was the first to develop a live attenuated vaccine (LAV) to combat several strains of the flu in dogs and horses. A LAV changes the virus so that it is still alive but the virus is not harmful, enabling the body to mount a better immune response with longer protection time. In several widely publicized studies, Dr. Martinez-Sobrido used reverse genetic approaches to develop these vaccines, which are currently licensed and undergoing testing. These approaches take RNA from the virus and work backward to generate a mutant gene that causes the virus to express itself differently than it normally would. This technology opens the door to study a virus in multiple ways, including understanding factors that control virus entry and exit from cells, replication in cells and gene expression. Understanding these mechanisms enables researchers to discover how a virus causes disease and know its weaknesses or targets that can be exploited to develop diagnostics, therapies, antivirals and/or vaccines.

"One of the things we will be working on at Texas Biomed is to develop new vaccines and antivirals for influenza in humans," Dr. Martinez-Sobrido said. "The current vaccine works, but it's not perfect since we need to be vaccinated every year, so we want to develop a universal vaccine for influenza that can be long-lasting."

With expertise in a wide range of viruses and technological approaches, Dr. Martinez-Sobrido fits the scientific scope of Texas Biomed. In his first month on campus, he began projects on the novel pandemic SARS-CoV-2 coronavirus.

"I'm part of the network of some of the world's brightest scientists here at Texas Biomed. I believe our work complements one another and pushes the boundaries of science," Dr. Martinez-Sobrido said. "Our partnerships with UT Health San Antonio and UTSA also present excellent opportunities to take part in some groundbreaking work, especially with COVID-19." In this regard, Dr. Martinez-Sobrido has already been awarded several collaborative grants with UTHealth, as well as grants through the San Antonio Partnership for Precision Therapeutics (SAPPT).

Dr. Joanne Turner is the Vice President for Research for Texas Biomed. Part of her duties is to recruit talented scientists to add to Texas Biomed's diverse roster of scientific fields.

"Dr. Martinez-Sobrido builds on our current strengths in molecular virology and viral immunology and adds new areas of investigation through his expertise in the study of influenza, Lassa fever virus, SARS, Zika and now SARS-CoV-2," she said. "His appointment has added extraordinary capabilities to the Institute's collaborative team of researchers."

Dr. Martinez-Sobrido's recruitment is supported by a grant from the Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation. Members of his team from the University of Rochester in New York joining him at Texas Biomed include Chengjin Ye, Ph.D., Jun-Gyu Park, Ph.D., Fatai Oladunni, Ph.D., Kevin Chiem, graduate student, and Desarey Morales, graduate student.

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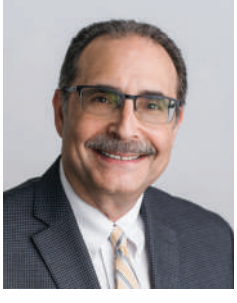
A Note from the President/CEO

We Are Making Progress

The term 2020 typically refers to someone with perfect vision, but the world was thrust into fogginess and confusion this year. An unknown virus, SARS-CoV-2, the cause of COVID-19, has brought the world to its knees and the global community has been forced to reckon with the true power of infectious diseases. COVID-19 has put a spotlight on the need for preparedness, showing us what years of diverting resources away from medicine and science does for our readiness and ability to respond when crisis hits. While the next pandemic was predicted, it is clear that we were not prepared.

And, while we are still learning how best to deal with this pandemic, COVID-19 has also spotlighted resilience, tenacity and compassion. Scientists are working around-the-clock and more collaboratively than ever to find therapies and vaccines for COVID-19. And, millions of dollars have been raised to combat the fallout from this pandemic, helping provide food, shelter, technology and yes, science. We are incredibly grateful to the San Antonio community for supporting Texas Biomed and the research we do. We have had people donate at all levels from high school students dedicating music videos to our scientists to companies providing lunches for our essential staff on campus to individuals and corporations donating millions to the Institute to further COVID-19 research.



Larry S. Schlesinger, M.D.

And, we are grateful to the Ketabchis, who are longtime supporters of the Institute, and who agreed to share their story of being impacted by COVID-19 in the hopes that their personal experience reminds people of the need for research and a little kindness.

Texas Biomed, like everyone, has been profoundly changed by COVID-19. While our team has always understood the importance of the work we do, the pandemic has renewed our dedication and passion for the mission of Texas Biomed — to protect you, your families and the global community from the threat of infectious diseases. We are in this together and your support is more meaningful than ever. Thank you.