

Texas Tech Today



Texas Tech Laboratory Was State's First to Offer Coronavirus Testing

GLENYS YOUNG | APRIL 23, 2020

Two decades ago, Texas Tech created The Institute of Environmental and Human Health. In the age of COVID-19, that investment is paying dividends.

Nearly 23 years ago, the Texas Tech University System's Board of Regents unanimously approved the creation of The Institute of Environmental and Human Health (TIEHH), a new institute to assess toxic chemical impacts on the physical and human environment. Since then, its growth has been exponential.

Proposed as a joint venture between Texas Tech University and the Texas Tech University Health Sciences Center (TTUHSC), TIEHH fused the resources of Texas Tech's academic campus and its premier medical facility to address environmental and human health issues from a multidisciplinary perspective.



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While TIEHH has played an important role since its inception, that role is perhaps even more widely appreciated today, in the age of COVID-19. As a member of the Centers for Disease Control and Prevention's (CDC) and Texas Department of State Health Services' Laboratory Response Network (LRN), TIEHH's Biological Threat Research Laboratory was the very first lab in the state of Texas to begin testing for the virus.

"From its inception, TIEHH has always been viewed as a research asset for Texas Tech University, as well as an ally for the beef and dairy producers, and the human population that

relies on agriculture for the economic prosperity of West Texas," said Joseph A. Heppert, Texas Tech vice president for research and innovation. "Lubbock and the regional agribusiness activities that help support this region exist in an environment where incursions from invasive species, zoonotic disease and extreme weather can threaten human and animal health, as well as the vibrancy and prosperity of small rural communities.

"TIEHH has been a critical research tool, helping West Texas track and minimize such threats to the vitality of the region. We are extremely proud that, in the depths of the current crisis, it is also contributing to meet the diagnostic needs of Texas citizens through its assigned region, which encompasses the Texas Panhandle and much of the Midland-Odessa basin."

Early years

On May 1, 1997, Ron Kendall – known throughout the country as a leading expert on environmental contaminants that affect fish and wildlife – was recruited to Texas Tech. He began the process of bringing in nine faculty, 20 doctoral students and five staff in environmental toxicology, and when the Board of Regents signed off on May 9, Kendall became TIEHH's founding director.



Kendall

In its early years, TIEHH was located mostly on Texas Tech's main campus, spread throughout multiple departments. Reese Air Force Base, six miles west of Lubbock, had been selected by the Base Realignment and Closure Commission in 1995 and officially closed on Sept. 30, 1997. So as the U.S. Air Force left, university leadership began the process for TIEHH to become the anchor tenant at the new Reese Technology Center.

Kendall worked with then-Texas Tech University System Chancellor John T. Montford and then-Sen. Robert Duncan – later Texas Tech's fourth chancellor – and others to secure an initial \$4 million award from the Texas Department of Economic Development to begin renovation of Building 555 at Reese Technology Center into laboratories for research. In December 1999, it was dedicated as TIEHH's new home. The



Anderson.

Department of Environmental Toxicology subsequently was founded as the academic home for TIEHH's core faculty. "It was chaotic at the beginning," said Todd Anderson, a President's Excellence in Research Professor in the department, and one of only three original faculty members still here today. "Our facility at Reese had not been renovated yet, so we were spread out all over campus and the TTUHSC. I didn't even have a desktop computer to work on. City leader-

ship was nervous about the impact of the closure of Reese Air Force Base, so as one of the first occupants of the new Reese Technology Center, there was some added pressure on us to be successful."

Philip Smith, who arrived at Texas Tech as a third-year doctoral student, recalled the continued military presence even as TIEHH began to move into its new facility.

"It was really exciting," said Smith, who joined the faculty after defending his dissertation in November 1999. "There was huge support from within the university, within the community, from our representatives in state and federal government and a lot of funding being brought to bear. A lot of new equipment; everything was new. You could see the changes happen daily."

Seshadri Ramkumar, a professor and director of the Chemical Countermeasures & Advanced Materials Laboratory, first became connected with TIEHH in 1999 before joining its faculty in 2002. He said the interdisciplinary nature of the research attracted him.

"TIEHH was leading the effort to bring in people from different disciplines – agriculture, engineering, modeling, even law – all together to work toward solving national issues," he said. "I'm a material scientist and an engineer by training, and being an engineer in that group of scientists, I felt they could embrace people of different disciplines and mindsets and the way they think and work toward common goals.

That's been the strength of TIEHH."



Ramkumar, a material scientist, poses with his invention, Towelie™.

Making an impact today

Today, the institute has 12 core faculty and more than two dozen staff, and the environmental toxicology academic program has 56 students. It occupies multiple buildings at Reese Technology Center, comprising more than 150,000 square feet. Facilities include research laboratories; support for high-performance computing; administrative and support space for graduate students, staff and faculty; and most notably, a Biological Safety Level 3 (BSL-3) laboratory in which researchers can study the pathogens that cause serious and potentially lethal diseases, including Zika virus, West Nile virus and the bacteria that causes brucellosis.

TIEHH Director Steve Presley, chair of the department, a professor of disease ecology and director of both the Biological Threat Research Laboratory and the Bioterrorism Response Laboratory, lists the BSL-3 lab as one of TIEHH's biggest advancements.

"We have established a BSL-3 research facility and regulatory diagnostic lab that is a national refer-



Presley.

ence lab for biological threat agents," Presley said, "and overall, the human health research capability of TIEHH has expanded."

While Presley says he doesn't consider himself an international expert on emerging and infectious diseases, his work speaks for itself. His operational and research experience has focused on the surveillance, prevention and control of biological threats in the environment, specifically vector-borne infectious diseases in tropical and semi-tropical environments.

Presley presents to the U.S. House Committee on Science, Space and Technology about the Zika virus in May 2016.

He has led malaria control operations and research efforts in Africa, Asia and South America, as well as Rift Valley fever, Crimean Congo hemorrhagic fever and cutaneous leishmaniasis studies in Africa and Asia. During the Zika virus outbreak of 2015 and 2016, Presley was one of only four experts in the nation who were invited to present to the U.S. House Committee on Science, Space and Technology about the preparations health agencies should take.

"I have been fortunate enough to have had a professional career that has allowed me work with outstanding collaborators and teammates to conduct research and implement outbreak prevention and control programs for a wide range of vector-borne and other zoonotic diseases – diseases that normally occur in animal



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populations but are transmittable to humans – in various countries on four continents, hopefully protecting many people through those efforts," he said.

Now, with the ever-present threat of COVID-19, Presley's Biological Threat Research Laboratory was the first lab in the state of Texas to begin testing for the disease. As a member of the LRN, the lab's expertise and technical diagnostic capabilities are available to the Texas Department of State Health Services to provide support to city and county public health agencies and other health care providers within a 67-county region covering approximately 66,000 square miles – from the northern border of the Panhandle south to Tom Green County.

"As both an academic research lab and a public health diagnostic testing lab, the Biological Threat Research Laboratory has been extensively involved in detecting, monitoring and researching outbreaks of infectious diseases of humans and animals occurring throughout Texas since 2003," Presley said. "The Biological Threat Research Laboratory team has provided public health emergency diagnostic testing for numerous actual and potential disease outbreaks over the years, including chikungunya, dengue fever, Ebola, seasonal influenza, West Nile fever, Zika fever and now COVID-19."

Presley's background in infectious diseases allows him a rare perspective to compare COVID-19 with other diseases he's encountered in his work. He says COVID-19 spreads faster than some because it's more easily

transmitted through aerosolized droplets, and it has a relatively high fatality rate, although pre-existing health conditions and advanced age are significant contributors.

"To me, the most intriguing aspect of the COVID-19 pandemic is the infectivity of the virus and how rapidly and predictably it has spread from its point of origin in China across the entire world, similar to expanding waves of water from a splash point," Presley said. "Secondly, but also directly related to COVID-19's rapid spread, is the high percentage of asymptomatic cases – people who are infected but report no symptoms – who remain engaged in commerce and the local community, which results in exponential numbers of other people being exposed to and infected by the virus."



Presley.

Testing for COVID-19

During the annual conference of the Texas LRN in February, a major topic of discussion was how the labs would prepare for and respond to the developing pandemic. Immediately after returning to Lubbock, the Biological Threat Research Laboratory team began its preparations.

TIEHH's Biological Threat Research Laboratory began testing for the coronavirus in late February.

On Feb. 28, Cynthia Reinoso Webb, the biological threat coordinator and technical supervisor of the Biological Threat Research Laboratory, officially notified the CDC and the Department of State Health Services that the lab's technical verifications and personnel training had been completed, and they were standing by to receive and test COVID-19 samples. They had the capability and capacity to test approximately 84 samples each day.

The lab detected and reported Lubbock's first case on March 17, but almost immediately, it became apparent that testing 84 samples a day was not going to be enough.

As the number of COVID-19 cases in the U.S. and in Texas increased, it was necessary to significantly increase the lab's capacity to test large numbers of clinical samples each day. With coordination through the Texas Tech Office of Research & Innovation, a collaborative partnership between Texas Tech and TTUHSC was established to increase the capacity of the Biological Threat Research Laboratory to test for COVID-19.

"In the midst of this once-in-a-century crisis, we are proud Texas Tech can provide essential services to the citizens of West Texas through our COVID-19 testing activities," Heppert said. "The staff at TIEHH, many of whom are newly trained volunteers from research and clinical labs at Texas Tech and TTUHSC, are tirelessly performing tests to benefit critically ill patients in this region. I am personally awestruck by their efforts.

"But we also remain proud that, prior to the emergence of COVID-19, Texas Tech, the TTUHSC and our Texas Tech University System partners at Angelo State University and TTUHSC-El Paso had already begun discussions about creating a Texas Tech University System Zoonotic & Infectious Diseases Research Center that would build on the expertise present in TIEHH. The vision of this center is to be a national model for similar units that will collaborate to detect new



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diseases before they emerge, develop more effective strategies for predicting their emergence, and create new preventative and therapeutic treatments to blunt the spread of these illnesses. In this manner, we believe Texas Tech will provide even greater service to the nation, the state and the citizens of our region."

Collaboration

Through the partnership, more than 30 volunteers from both campuses have joined the original five-person Biological Threat Research Laboratory team to create the Texas Tech/TTUHSC COVID-19 Testing Team. And with the significantly increased amount of resources made available through the partnership – including molecular diagnostic testing expertise, technology and funding – the lab can now test 350 to 400 samples each day.

"The immediate response and commitment of resources to the emerging COVID-19 pandemic by the Texas Tech University System has been nothing short of phenomenal," Presley said. "Almost immediately, academic administrators, faculty and researchers transitioned from normal day-to-day operations to supporting diagnostic testing for COVID-19 cases. Additionally, unprecedented partnering between Texas Tech and TTUHSC occurred essentially overnight to develop strategies and operational plans to significantly enhance the existing capabilities and sample testing throughput capacity of the Biological Threat Research Laboratory and to create the Texas Tech/TTUHSC COVID-19 Testing Team."

Volunteers now assisting in the project include Texas Tech and TTUHSC faculty members, research staff, graduate students and citizens who have no affiliation with either university but want to help "flatten the curve."

"Once the call went out for volunteers to work in the lab and to support the array of activities involved in sample testing, dozens of people immediately responded from the Texas Tech, TTUHSC and Lubbock community," Presley said. "The true West Texas spirit of our community coming together to aid each other in addressing any challenge has been, and continues to be, clearly evident in the fight against COVID-19."

As of April 22, the Texas Tech/TTUHSC COVID-19 Testing Team has tested more than 1,460 samples and reported 186 positive cases. Due to the nationwide shortage of testing reagents and supplies, the team – working with local and regional hospitals and clinics and the Department of State Health Services – selectively prioritizes samples to be tested. Those from hospitalized, critically ill patients and from individuals who have been directly exposed to COVID-19 cases receive priority for testing.

How testing happens

The swab samples collected at hospitals, clinics and health departments throughout the lab's 67-county coverage area are shipped to TIEHH, following strict guidelines to ensure both quality of the samples and proper biosafety practices.

At TIEHH, samples are taken into the receiving lab, where all relevant paperwork about the submitting facility and patient information is recorded and the samples are prepared for testing. Samples are then taken into the testing lab to begin the process of extracting nucleic acids that are specific to the coronavirus SARS-CoV-2, which causes COVID-19.

The extracted samples are then further processed and ultimately tested using polymerase chain reaction (PCR) assays, which analyze a short sequence of DNA. The data from the PCR instrument are then interpreted by the technical supervisor, and results are entered into an automated system to electronically notify the appropriate federal, state, regional and local public health agencies.

"From the time samples are transferred from the receiving lab into the testing lab, the testing process takes approximately six hours until the results are reported to the submitter and the appropriate agencies," Presley said. "The total amount of time required from when samples are received at TIEHH until the sample submitter is notified of the testing results is typically 12 to 24 hours. One of our major strengths and points of pride is that we guarantee 24-hour turnaround on testing samples."

